URBAN POLITICAL ECOLOGY AND EXURBAN ENVIRONMENTAL KNOWLEDGE IN POST-2008 SOUTHERN APPALACHIA

by

JAMES SETH GUSTAFSON

(Under the Direction of Nikolas C. Heynen)

ABSTRACT

This dissertation draws on urban political economy, urban political ecology, and science studies to examine the social and environmental consequences of urbanization in historically rural areas, especially the driving influences prompting new rounds of urban development in the countryside and as how communities draw upon different forms of knowledge to address the socioenvironmental burdens and benefits of exurban growth. More specifically, the dissertation examines how the 2008 financial crisis impacted the politics of environmental knowledge and uneven development in exurban southern Appalachia. I draw on my diverse training in qualitative methods of archival work, interviews, and participant observation; quantitative examination of parcel-level tax data and other socio-economic and socio-ecological data; and spatial analysis using GIS. The case study I use is a local policy controversy in Macon County, North Carolina, regarding the regulation of steep mountain slope development to prevent landslides. This economically peripheral region experienced rapid urban growth from 1960-2008 but lacked state regulatory or civil society capacity to address the economic, environmental, and social upheaval resulting from the decades of growth and the post-2008 crisis. With varying degrees of success, local residents had long attempted to mitigate landslides and other negative environmental externalities of urban growth in their historically rural area, but did so only under the auspices of massive capital investment via residential construction. I show that as the financial crisis constricted this influx of capital, it intersected with attitudes toward expert geological knowledge and non-expert knowledge of the landscape, thereby thwarting attempts to mitigate landslide vulnerability.

INDEX WORDS: urban metabolism, urban political ecology, uneven development, environmental knowledge, Coweeta LTER, southern Appalachia

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DEDICATION

To Grandad, Grandmother, and Grandma Sydney, who witnessed this project's beginning

To Juniper, who witnessed its ending

To Katie, who saw it all the way through

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CHAPTER 1

INTRODUCTION

1.1 SOTHEBY'S EXURBIA

Sotheby's International Realty, the prestigious residential realty outfit catering to globally mobile and affluent individuals in the most upscale areas of major metropolitan areas of North America, Europe, and beyond, maintains an office in Highlands, North Carolina. Highlands, a town of less than 1,000 year round residents, sits in the southeast corner of Macon County, situated deep in the verdant southern Appalachian mountains of western North Carolina. Sotheby's Highlands office is simply called *Exurbia. Exurbia's* website features pictures of luxurious homes painted in evocative earth tones with faux-rugged stone chimneys, immaculately landscaped lawns, and single family homes whose post-2008 prices still mostly range from \$1 million to \$5 million. The homes are, by almost any standard, magnificent, and they mirror the sumptuous commercial amenities of Highlands: nationally known chefs and restaurants, posh boutiques and jewelers, and fashionable spas and inns, all situated within the spectacular vistas of this corner of southern Appalachia.

Curiously, *Exurbia's* website also offers a definition of 'exurbia' for their potential clients:

Ex-ur-bi-a \ ex- 'ser-bee-a ' \ noun. The migration from cities to high-quality small towns.

What is so striking about this definition is both what it reveals and what it obscures. Its simplicity and gloss rightly identifies a place infused with a class of exurban migrants, pursuing

a dream of returning to an imagined, small town America. This migration leaves room for the individual, though, to purchase that dream, to consume it on their own accord, and to flee their chaotic urban lives and embrace an 'authentic,' premium, and smaller-scaled lifestyle.

The omissions of this definition, though, are at once startling and unsurprising. The definition is overly simple and sanitized. It renders silent the consequences of this migration, in particular, the massive cultural, economic, and ecological changes resulting from migration of global capital, demographic change, conspicuous consumption, and land use change. At issue, too, is the descriptor 'high quality,' as this particular phrasing leaves unanswered the questions of who gets to experience the quality and at what cost to the proximate settlements does this high quality exist. Even though Sotheby's represents the upper-end of the mostly middle class-led exurbanization of southern Appalachia, ultimately, as in most discourses, what is omitted in this definition of exurbia works in concert with what is revealed to create a rationale for exurbia's (and *Exurbia's*) attraction of exurban capital investment.

Sotheby's is not alone in creating a narrative of exurban development that is partial to their own interests. On the contrary, narratives and definitions about exurbia, how it has come to exist, its essential qualities, and its primary drivers circulate through popular media and academic literature. In particular, understanding exurban development as a spatial formation of growth is the dominant narrative in academic research and education. For instance, the various models of sprawl, suburban, and exurban growth appearing in as explained in urban geography textbooks focus on the centrality of cheap land beyond the suburbs, the growth of increasingly less dense edgeless cities, and the bleeding together of metropolitan areas (e.g., Kaplan et al. 2009). As far as these models are concerned, though, this expansion is typically the end of the

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story. Ecologists studying the environmental effects of exurbanization, too, often approach these processes as questions of growth or increasing density (e.g., Kirk et al. 2012).

It is true that land use and land cover change, economic data, and population statistics indicate that exurban areas for several decades have been primarily characterized by urban expansion. Nevertheless, these growth-centered models of exurban development only offer unsatisfying accounts, missing socially systemic or foundational exurban transformations. They especially miss the latest chapter of exurban history, one dominated by crisis and major spatial reorganizations more commonly seen in urban settings. This is especially true in the post-2008 years, after the financial crisis ravaged exurban areas whose economic foundation had transitioned to residential housing during the last half of the 20th century. This transition is part of the urban expansion that most urban geography textbooks describe and that most ecologists understand as 'growth,' but it ought to be complicated by the characteristics of exurbanization that transcend growth and its synonyms. Exurbia is instead today a place of crisis, rupture, and major reorganization of political economic and political ecological relationships. In other words, exurbia is a thoroughly urban place, experiencing urban problems articulated in an exurban way. Indeed, recent changes in exurbia make impossible the current growth-centric understanding of exurbia and pose a problem for how contemporary scholars in a wide range of disciplines understand exurbanization.

A fuller understanding of the historical and geographical processes, causes, and consequences of the contemporary exurban crisis requires special attention to the abrupt shifts in the patterned flows of material and immaterial elements, ranging from water to capital to humans to knowledge. These flows, bound up in the booms and busts of urbanization, are the empirical focus of urban political ecology (UPE), whose key metaphor of urban metabolism attempts to

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account for these flows as they change and are changed by urbanization. Drawing on Williams (1976), I argue that the unstated, yet central, premise of urban metabolism is that urbanization is a process of creating *new objects and subjects*. By objects and subjects, I mean that the process of urban metabolism produces objects—new material things introduced into the patterns of urban life—and new subjects—people and institutions to consume, produce, desire, and use the objects. For instance, UPE research is dominated by the urban metabolism of water, a process creating hydrological objects (e.g., new sources of water drawn into the city) for hydrological subjects (e.g., individuals and institutions with management techniques, expertise, governance capacities, financial schemes, and consumption of urban water). Loftus, in his description of the fractured water regime of squatter settlements in South Africa, concretely describes subjectivity and its importance for understanding UPE. He writes (Loftus 2012, 45-46).:

...a profoundly gendered division of labor ensures a distribution of tasks that is generally favorable to men and, in turn, ensures that most men and most women in Amaoti interact with environments in profoundly different ways. ...[W]orldchanging perspectives emerge from consciousness of the coevolutionary processes out of which environments are constituted. ...Making the daily trek to a standpipe to fill a plastic bucket with water mediates a set of relationships with structures of local government; with distant shareholders and investment bankers; with gendered, raced, and classed subjects; and with the ground- or surface-water sources from which the supply is provided.

Here, Loftus argues that urban subjects and objects are not a set of preconfigured urban affects, but instead are rooted in and constitutive of the process of urbanization. In this example, urban water as an urban object is routed and rerouted, financialized and polluted, and piped and sanitized for particular subjects who come to know this water, its properties, its attendant sociotechnical systems, and modes of governance through their everyday experiences with it. Moreover, these localized urban metabolic processes are collectively constitutive of global flows of these same metabolized elements. This implies that any global rupture of these flows, like the severe constriction of credit and capital markets in the aftermath of the 2008 financial crisis, is uniquely and locally articulated in and expressed through particular urban metabolic flows. Instead of water or other material examples, this dissertation focuses on the metabolism of the immaterial, in particular, the urban metabolism of environmental knowledge. The argument of this dissertation is that during the 2008 financial crisis, as a short-term moment in long-term processes of uneven development in exurbia, new patterns of the metabolism of environmental knowledge emerged, as defined by the production of objects and subjects of environmental knowledge through the metabolic mechanics of production, circulation, and application.

The metabolism of environmental knowledge is understudied and undertheorized in UPE, but it represents an important part of a 'second generation' of UPE scholarship seeking to augment the primarily materialist 'first generation' UPE. In this dissertation, I am most interested in how environmental knowledge is metabolized during crisis, rather than accumulation, as a moment of urbanization. Often, crises in exurbia are related to the "second contradiction of capital": part of a larger process of uneven development in which often the accumulation of capital undermines itself by producing externalities that degrade the environmental conditions upon which the accumulation itself is based (O'Connor 1992). State and civil society are often situated in the fraught position of both responding to the environmental degradation via regulation or other measures while at the same time encouraging capitalist investment. In exurbia, this situation has often taken the form of local governments and interest groups incentivizing local residential construction while simultaneously developing zoning and

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municipal ordinances to mitigate the traffic, smog, water quality/quantity decreases, marring of viewsheds, and other consequences of exurban development that ultimately diminish the socioecological amenities that attracted the urban growth in the first place.

State and civil society intervention into this contradiction is rarely as simple as writing a cookie-cutter ordinance or zoning policy, though. Instead, it is a highly contested process in which a range of knowledges, including scientific knowledge, expertise, local experience, and non-expert knowledge about the landscape, the appropriate role of the local state, the nature and existence of environmental externalities, are produced, circulated, and applied to remake local environments for social and political ends (e.g., Brint 2004, Fisher 2000, Christensen 2008, Gauchat 2012, Nowotny et al. 2001, Oreskes and Conway 2008). In other words, these knowledges are *metabolized* in order to promote capital investment and to mitigate the negative externalities of urban development, often sharply conflicting along the way. This politics of local environmental knowledge is complicated enough and deserving of a study on its own merits. What further complicates the politics, though, is that these exurban interventions of local environmental knowledge into the contradictions of capitalist accumulation have mostly happened in the context of a half-century's worth of assumed exurban growth. This means that while exurban environmental politics may have long been contentious, clashing political actors were similarly grounded insofar as their positions were predicated on a kind of perpetual state of growth. By disrupting this assumption of growth, the 2008 financial crisis exposed the dubious foundation of steady growth as the status quo of the politics of environmental knowledge related to exurbanization. This dissertation examines the metabolism of environmental knowledgethat is to say, the production, circulation, and application of exurban environmental knowledge-

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during the exurban crisis, showing how new exurban objects and subjects of environmental knowledge are produced in historically rural areas.

The significance of these changing conditions of exurban development indicates an emergence of a new chapter of exurban history and politics. Rather than the smooth narratives of endless urban expansion or the prosperity-driven narrative of the amenity rich backdrop of baby boomer retirees' dreams, exurbia is instead a place confounded by crisis, rupture, and reorganization of political ecological relationships. The wake of the 2008 financial crisis challenged the long-standing interventions of environmental knowledge in the contradictions of capital at a time when urbanization casts doubt on the socioecological futures of exurban areas. I propose here an alternative understanding of exurbanization, rooted in in time and place as a highly politicized landscape, prone to crises, challenges, and controversies common in cities.

1.2 SOUTHERN APPALACHIA AND MACON COUNTY, NORTH CAROLINA

Exurbanization characterizes vast areas of metropolises and countryside in the United States (Berube et al. 2006), including much of southern Appalachia, but it is only the most recent chapter in that region's historical uneven development. Processes and conditions of uneven development characterize the historical geography of southern Appalachian communities and adjacent urban areas in that southern Appalachia has existed at the economic periphery of the eastern US, serving as areas of natural resource and labor extraction for eastern and southern US cities, as well as to the accumulation of capital and social power (Billings et al. 1999, Billings et al 2000, Gaventa 1982, Gregg 2010, Mangianiello 2010, Pudup et al. 1995, Marshal 2002). This is despite the region routinely represented as economically and culturally isolated. Today, like in other areas in the US and abroad, uneven development between southern Appalachia and the urban centers on its periphery is dominated by urban residents fueling exurbanization via amenity migration and second home construction (Gustafson et al. forthcoming, Nelson 2009, McCarthy 2008, Darling 2005, Dwyer 2000, Egan 2000, Ghose 2004). Because of southern Appalachia's temperate climate, relatively inexpensive land, and generally light development regulations, exurban residential developments constitute much of the economic and demographic growth on southern Appalachian communities' steep mountain slopes. This reflects not only increasing vulnerabilities to disasters and perilous hazards (Wisner et al. 2004 [1994]), but also the complex and evolving socioecological context that parallels other similar urban political ecologies (Cronon 1991, Gandy 2002, Heynen et al. 2006, Swyngedouw and Heynen 2003, Keil 2003, Glenna 2010, Kaika 2005, Swyngedouw 2004, Swyngedouw 1999).

Because the Coweeta Long-Term Ecological Research (LTER) program is located there, in addition to acrimonious political disputes and extreme exurban growth from 1960-2008, I chose a policy dispute in Macon County, North Carolina, as a case study to explore the role of environmental knowledge in uneven development. Macon County's physical geography, environmental history, and contentious politics establish the context and critical setting for this newly emerging landscape of crisis. The county is situated in the Piedmont megapolitan region, which includes much of southern Appalachia and regional cities like Birmingham, Knoxville, Atlanta, and Charlotte (Lang 2006). This region is projected to have a 50% population growth from 2000 to 2030, meaning that environmental concerns about land use change will only intensify in the coming decades. The region stands as a frontier of landscape transformation as flows of capital and humans increasingly metabolize its countryside, contrary to the stereotypes of Appalachia as isolated, culturally backwards, ignorant, and economically peripheral. These

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transformations are alarming because of the region's high biodiversity, its status as a 'watertower for the Southeast', and its proneness to catastrophic landslides (Gragson et al. 2008).

The cascading effects of the forty-year housing boom and the ensuing 2008 financial crisis are immediate contexts for the politics of land use regulation in Macon County. Currently, several large scale exurban housing developments on steep mountain slopes are waiting for buyers to purchase lots priced at a small fraction of their initial costs and some real estate agents, housing contractors, and others in the housing industry are taking the brunt of the current contraction of capital. Residents of the county also are concerned about the ecological effects of exurban development, including decreased stream water quality and quantity, landslides and other earth movements, summer haze related to ozone, and the clearing of hill slopes. These crisis conditions contextualize the mixed public responses to exurban development.

One common attempted response by local governments, civil society organizations, and residents to negotiating these conditions, which are at the heart of the second contradiction of capital in southern Appalachia, is local land use regulation. In response to exurban development, Macon County residents, like other residents in western North Carolina and southern Appalachia, have debated for several years on the merits of land use, zoning, and other local regulations. Often in these debates, conservation-minded stakeholders face off against anti-regulation land rights advocates as competing visions for the community's exurban future collide. Indeed, as one observer (Interviewee Z, CLP Archive 2011) of local politics noted in an interview:

That's really the current hot button issue, is steep slopes. It's huge here. You've got people who've got very strong opinions about it on both sides. People who are very vocal about and are very concerned about private property rights and infringing on their private property rights and those who feel as though this is a public safety issue—that you don't have a right to send sediment down on somebody else's property. You don't want people building above you on unstable places. There could be landslides. That's a really big deal now. We are the first

county to get these landslide hazard maps because of our Peek's Creek—I'm not sure how familiar you guys are with that—but that was one of the reasons we were the pilot study for those landslide cover maps. They've become really controversial because people are worried that we won't be able to build in all these places now, where there's landslide hazards. How's that going to affect property values? And arguments for that on both sides: are people going to want to move here if they think there's going to be a chance of landslides. People could lose their property.

To show how understanding exurbia as crisis prone matters in Macon County, I investigate a political controversy there as a moment revealing these deep exurban fissures (see Figure 1.1 for a timeline of important events). Though the State of North Carolina's interest in landslides in the western portion of the state began in 1998, this dissertation's entry point in the story is in 2004, when two hurricanes a week a part from one another passed over Macon County and dumped nearly two feet of rain in 24 hours. The result was the Peeks Creek landslide, where five people died, dozens were injured, and at least thirty homes were destroyed. Peeks Creek, dramatic land use changes, and poorly designed housing developments causing erosion problems prompted a 2010 effort to introduce a county steep slope development ordinance. This ordinance was relatively mild in its regulatory reach in that it did not prohibit construction even on the steepest slopes. Instead, the strictest provision of the ordinance simply required that above a 30 percent grade, a landowner would need a geotechnical engineer to approve the design.

This proposed ordinance also relied on a map of landslide prone regions of the county, commissioned by the state of North Carolina and completed by the North Carolina Geological Survey in 2006. This landslide map was controversial because it established the areas subject to regulation in the county. It, too, was highly politicized. The maps relied on GIS and LiDAR technologies, the merits of which were openly debated in public meetings and local newspapers. The consequences of using LiDAR-based maps for the ordinance, as one public meeting attendee

claimed, was clear: "Those maps are tied to the ordinance, and then they become law in Macon

County. And that should never happen" (Planning Board meeting, personal recording, 2011).

 Table 1.1. Timeline for Relevant Events

Year	Date and Event
1998	FEMA requires State of North Carolina to notify 22 western North Carolina Counties of landslide hazardous land
2000	State of North Carolina General Assembly legally charters a landslide hazard mapping initiative
2004	April: Macon Bank signs broker agreement with Beverly-Hanks Mortgage Services
	September 16: Peeks Creek landslide kills five Maconians
	November 6: Ultima Carolina LLC hosts Wildflower subdivision grand opening. Lots sell for \$100,000 to \$300,000 each.
2005	February: State of North Carolina General Assembly accelerates landslide mapping program in Hurricane Recovery Act of 2005
	June: Ultima Carolina LLC leader Robert Ullman meets with community in Franklin gymnasium, led by then-county planner Stacy J. Guffey.
2006	October: Governor Mike Easley releases North Carolina Geological Survey's Landslide Hazard Maps for Macon County. Macon is the first county whose maps are completed.
2007	August: Jackson County, an adjacent county to Macon, adopts Mountain and Hillside Development Ordinance.
2008	November: National and State elections sweep Democrats into office. Tea Party reaction is initiated.
2009	November 4: Macon Bank sues Ultima Carolina LLC, Beverly- Hanks, several Wildflower lot owners, and a local attorney.
	November 17: Thompson Road in Wildflower collapses.

Year	Date and Event
2010	January to May: Planning Board and Slope Subcommittee hold community meetings
	February 18: Macon County Steep Slope Subcommittee presents preliminary findings to Planning Board
	May: North Carolina Real Estate Commission rules that NCGS Landslide Hazard Maps are material facts and therefore must be disclosed during any transaction.
	November: So-called midterm Tea Party election more than recovers for Republicans many of the offices lost in the 2008 election at national, state, and local offices. Macon County's Commission elects more conservative members.
2011	May 19: Steep Slope Subcommittee's presents final recommendations regarding ordinance to Macon County Planning Board
	June: North Carolina General Assembly defunds the NCGS slope mapping program
	July: Leed Enterprises, LLC, buys Wildflower, renames it "The Ridges."
	July: Rick Wooten, NCGS Geologist and Lead on the mapping project, explains maps to Macon County Planning Board
	August: MaconSense founded
	August: County Commission tables ordinance. Planning Board approves Construction Standards instead.
	October: Sales at The Ridges commence. Lots sell for \$11,000 to \$30,000.
2012	November: Macon County elections still influenced by lingering ordinance debates and positions.
2013	January: Heavy rainfall initiates landslides across western NC, including one on Wayah Bald in Macon County.

Public skepticism toward cartographic expertise ran high, especially after the 2008 financial crisis. As a result, local realtors opposing the use of the maps have reportedly refused to show prospective buyers the maps, despite state law requiring realtors to do so. Furthermore, in late 2011, Macon County removed the maps from their website, citing a liability issue that the State of North Carolina insisted is not present. More generally, there remains a public sentiment that the knowledge created by these maps is factually incorrect about landscape features, that the county government is overreaching in their reliance on the maps, and therefore, that the knowledge should be restricted. After intense negotiations and under significant pressure from conservative land rights activists, the county commissioners tabled the ordinance indefinitely, thereby derailing for the foreseeable future any hope for the ordinance's passing.

This political culture of Macon County before and after 2008 made any hope of passing the ordinance quite difficult, but I show in this dissertation that there was a marked political difference before versus after the 2008 financial crisis. Like many exurban areas in the US, this is a historically very conservative place (Walker and Hurley 2012). Many of my interviewees have suggested that Maconians are only fine with the government as long as it does not touch their guns, their land, and/or their family. Per its reputation, there is also a strong insider/outsider social dynamic that can highly influence who is and is not allowed to participate fully in the inner workings of the county's political scene. As Bill Vernon (2013), property developer and long-time Maconian, wrote in a letter to the editor of the *Smoky Mountain News* entitled "The difference between us and them":

The word 'you' applies to all who want to add more government and regulations. The word 'we' applies to all of us who stand in opposition. The residents of Macon County are known for being fiercely independent. We love these mountains. We will give you the shirt off our back, but start messing with our 'stuff' (land, family property rights, etc.) and you'll have a fight! You say, "We must protect OUR mountains."

We say that these are not "your mountains" other than the 50 percent US Forest Service land in Macon County. The remaining 50 percent is owned by individuals who pay the taxes and whose name is on the deed. [...]

Our property values have been slashed, retirements decimated, our children forced to move away looking for work, our taxes increase daily and you want to regulate us even further than the myriad of regulations already on the books, thereby making it even harder for us to make a living?

We encourage all commissioners[...]to stand with Haven [an outspoken conservative Macon County Commissioner]. Stand tall...we, the silent majority, the working folks, stand with you!

These divisions of native and non-native, property owner and renter, freedom and law, independence and regulation, and Federal and local crosscut the political ecologies of Macon County life. Thus, while other surrounding counties have requested the state to do a similar landslide hazard map for their county and are paying hundreds of thousands of dollars to private geologists and cartographers to have their county mapped, Macon County removed the maps from their website in December 2011, pressured by a strong vocal minority attempting to enforce a public ignorance and suspicion of the maps. Macon County has tried to cope with the dramatic growth of their county for years—a population that has more than doubled since 1970—and this controversy is emblematic of the county's emerging political condition.

In this dissertation, I draw out the details and implications of this controversy in the context of three types of environmental knowledge in Macon County: 1) scientific and non-scientific narratives of Peeks Creek and landslides, 2) the NCGS Downslope Hazard Map, and 3) the proposed steep slope ordinance. All three of these types of knowledge illuminate a different side to Macon County's environmental politics in the era of exurbanization, especially insofar as they create new objects and subjects of knowledge. By 'types of environmental knowledge,' I am indicating that what people know about nature always exists in particular types, like maps, pamphlets, academic articles, data spreadsheets, or memories of their grandparents' farm. What

form of knowledge people use and how people use it to come to know nature reveals some things about the urban milieux in which they find themselves. Who produces a form of knowledge and why, from where and to where it circulates, and to what ends do people apply the knowledge these are all questions that not only show the finely-grained machinations of local politics, but they also disclose interesting and surprising things about exurban form, function, and future.

This dissertation shows the metabolism of environmental knowledge before, during and after the 2008 financial crisis, revealing the interrelationships between the types of knowledge and how their objects and subjects changed along that timeline. As exurbanization alters historically rural landscapes, the knowledge people have of nature also changes, which, in turn, will give shape to future patterns of exurbanization. To investigate this, my dissertation follows the metabolism—that is, the production, circulation, and application—of three types of environmental knowledge—landslide narratives, NCGS maps, and the failed steep slope ordinance—as they changed during the buildup to and the fallout from the 2008 financial crisis.

1.3 CHAPTERS

Chapter Two sets out a theoretical framework for understanding the exurban politics of environmental knowledge related to the exurban manifestations of the 2008 financial crisis. In particular, I draw on a UPE/science and technology studies (STS) joint framework that focuses on the creation of new objects and subjects of knowledge through urban metabolism as specified by the production, circulation, and application of environmental knowledge. The joint framework is mobilized in the context of a third body of literature, the small but growing exurban studies subfield. This allows me to focus on the three particular flows of knowledge, insofar as they are particular concatenations of human knowledge of the environment. I also bring this framework into UPE, arguing that the knowledge of nature in cities alters urbanization and is subject to alter because of urbanization. This dialectic between types of environmental knowledge and urbanization bridges the gap between UPE and STS, especially concerning issues of expertise and environmental management.

Chapter Three explains a mixed methodology for the project. By focusing on these three types of knowledge and their roles in the management of the ongoing exurban crisis, I propose that the people and processes that influence, contact, and modify these types come in to clearer view. So, too, do the types of knowledge themselves, as this strategy in many ways tracks them across their social lifespans—not just any particular moment of their birth, their movement, or their political enrollment. Current discussions in the UPE literature debate the relative merits of an actant-centered UPE rooted in actor network theory (Castree 1996, Furlong 2010, Holifield 2009), as contrasted by the process-centered UPE rooted in critical political economy (Swyngedouw 2004, Kaika 2005). In my framework and method, both the form and the process matter and I insist that understanding both is not only possible but also essential for the future of urban political ecological research.

In each of my three empirical chapters, I examine a particular form of knowledge, showing its production, circulation, and application function as the mechanics of its metabolism before, during, and after the 2008 crisis, as well as how it shaped the ongoing locally articulated consequences of the crisis. I do this, though, by linking the chapters together in a chronological narrative. Each empirical chapter examines the metabolism of a separate form of environmental knowledge, but it does so in a necessary sequence, moving from the Peeks Creek landslide narratives swirling in pre-2008 Macon County, through the creation of the NCGS Landslide Hazard Maps that were finished just as the financial crisis began, and concluding with the steep slope ordinance proposed and defeated in the depths of the crisis. It first examines the pre-2008 and widely accepted geological expert assessment of Peeks Creek that narrated Macon County as landslide prone because of human initiated soil disturbances. Second, this assessment served as a justification for the landslide hazard maps, which made legible very finely scaled areas of the county prone to landslides. The production, circulation, and application of the maps straddled the beginning of the financial crisis, showing a dramatic sea change before and after 2008 in the public and expert perceptions and advocacy for the maps. Finally, with the 2008 financial crisis still rippling through the county, the maps and geological assessments together made Macon County's landscape legally legible and subject to the planning board's authority. The following empirical chapters show the highly contested nature of how these types of knowledge intervened in the second contradiction of capital, showing that their public legitimacy and potency significantly changed during the buildup and fallout of the 2008 crisis.

Chapter Four examines the narrations of landslides in Macon County environmental politics. Geological expert narratives of Peeks Creek, and later the Landslide Hazard Map, brought landslides to the forefront of how county planners would approach growth in the county in the post-2008 lull in residential construction. Landslides are a regular feature of the landscape in southern Appalachia, but it took a particular set of circumstances to not only make landslides legible for regulatory purposes, but even to allow Maconians to think explicitly in terms of landslides as a chronically dangerous threat to their life, property, and economy. I examined archival sources and conducted interviews to show how knowledge about landslides required a discursive awakening, in large part due to the public comments of scientific experts at the NCGS and to a lesser but still significant extent the Coweeta Hydrologic Lab. The chapter goes on to reveal the implications for the steep slope ordinance debate of how Peeks Creek and other

landslides moved from flood-themed discourse to landslide-themed discourse, as well as the history of how landslides in general became discursively considered as chronically present features of the mountain landscape rather than hardly remembered flooding events.

Chapter Five considers the NCGS landslide hazard maps that were incorporated into the ordinance and that helped to delineate the geographical areas subject to the steep slope ordinance. Though the maps were passed unanimously in early 2005, received much local praise, and were anticipated throughout the region as a useful advisory tool, by 2011, the mapping program had been defunded by the state legislature and their legitimacy as a form of knowledge had been highly politicized in Macon County. This chapter accounts for how such a dramatic sea change in political opinion at the state and local level was made possible in part by the 2008 crisis in the state's western counties. The maps represent an unusual lay critical cartography, insofar as their political fate depended largely on non-expert opinion of the maps scientific, political, and epistemological worth in how they affected exurbanization.

Chapter Six turns to the ordinance itself. The ordinance's status as a law, with all of the county's punitive power behind it, made it unique as a form of environmental knowledge. Not only did it make legible steep slopes in a particular way, but it also mandated compliance from Maconians unaccustomed to and ideologically opposed to that particular legibility. The ordinance, as a piece of regulation, elicited strong reactions from conservative land rights activists whose organization preceded and exceeded the effort of the mostly disorganized and tardy pro-ordinance faction of the county. The ordinance's death-via-tabling by the planning board happened in August 2011. It remained a critical issue even through the November 2012 elections in the county, showing that beyond the grave, the ordinance as a form of environmental knowledge took on a posthumous vitality through the political conflicts it inspired.

CHAPTER 2

THEORETICAL FRAMEWORK

2.1 OBJECTS AND SUBJECTS

In an often overlooked chapter in his otherwise widely celebrated and cited reflections on the modes of city life and country life as represented in the English novels of the 19th century, Raymond Williams in *The Country and the City* dissects novelists' strategy of creating 'knowable communities' in their work. These knowable communities, he notes, are not static, placeless, or timeless creations. Instead, as Williams shows, knowable communities as demonstrated by the interaction between characters, the diction describing the action and plot, and the familiarity of settings and relationships are often contingent upon the degree to which the settings are urbanized. His observation is worth quoting at length. He writes (165, emphasis added):

There can be no doubt...that identity and community become more problematic, as a matter of perception and as a matter of valuation, as the scale and complexity of the characteristic social organization increase. Up to that point, the transition from country to city-from a predominantly rural to a predominantly urban society—is transforming and significant. The growth of towns and especially of cities and a metropolis; the increasing division and complexity of labour; the altered and critical relations between and within social classes: in changes like these any assumption of a knowable community—a whole community, wholly knowable—become harder and harder to sustain. But this is not the whole story, and once again, in realising the new fact of the city, we must be careful not to idealize the old and new facts of the country. For what is knowable is not only a function of objects—of what there is to be known. It is also a function of subjects, of observers—of what is desired and what needs to be known. And what we have then to see, as throughout, in the country writing, is not only the reality of the rural community; it is the observer's position in and towards it; a position which is part of the community being known.

Here, Williams initially recognizes the common observation of the increased complexity of

social organization in cities relative to the countryside, and that as historically rural areas undergo the processes of urbanization, the intimate and informal knowability of communities fractures. He then moves beyond the trope of 'simple country life' to note something more profound about the nature of urban life: that urbanization creates new *objects and subjects of knowledge*. In other words, transformations in the social categories of that which is worth and not worth knowing, who knows and who does not know, and what ought to be and ought not to be known are symptoms of urbanization.

Though Williams' aim is to critique Dickens', Bronte's, and other novelists' representations of knowable communities in the British countryside and cities, his argument has implications beyond literary criticism. In particular, Williams' insight into how urbanization changes the objects and subjects of knowledge can contribute to developments in two subfields relevant to this dissertation, those of UPE and the still emerging exurban studies. As a field of inquiry, UPE is fundamentally concerned with the production of urban nature, meaning that urbanization is a historical-geographical process of creating dense, uneven, and unequal networked relationships between humans and non-humans, connecting and disconnecting them by manipulating social and ecological processes (see Desfor and Keil 2004, Robbins 2007, Swyngedouw and Heynen 2003, Kaika 2005, Keil 2003, Loftus 2012). This creation and modification of relationships is often called 'urban metabolism' in UPE, and the term implies that the very definition of the urban condition is the "circulation of physical, chemical, and biological components" that "are never socially or ecologically neutral" (Heynen et al. 2006). As Williams notes, urbanization implies an increased complexity to the arrangements of social life in cities. This is not to say, of course, that rural social relations are somehow simple, but

only to note that a hallmark of the process of urbanization is the increasing density of the networked actors, objects, and subjects that constitute social relations. This observation is also at the heart of 'urban metabolism' as a metaphor for describing these arrangements, albeit in more geographic and historical detail.

Furthermore, and paralleling Williams' objects and subjects of knowledge, urban metabolism is not simply a new twist on old materialism, as it also considers the new patterned movements of humans and the changing knowledge they have of their environments: "While an understanding of the changes that have occurred within urban environments lies at the heart of [urban] political ecology research, they must be understood within the context of economic, political and social relations that have led to urban environmental change. ...The material production of environments is necessarily impregnated with the mobilization of *particular discourses and understandings* (if not ideologies) of and about nature and the environment?" (emphasis added, Heynen et al. 2006, 7). Most holistically, then, the concept of urban metabolism attempts to account for the ever-changing "flows of people, objects, resources, and knowledge" that constitute urbanization (Gustafson et al., forthcoming).

This framing of urban metabolism gathers an immense array of relations and processes under its purview. No single project could hope to capture all of them, but this chapter in particular theorizes the metabolism of these "understandings" of nature—I call them here types of environmental knowledge. In particular, I am interested in how the objects and subjects of environmental knowledge change in the exurban context of the 2008 financial crisis, a time characterized by uneven development, another central component to UPE. This is a timely investigation because the objects and subjects of environmental knowledge were only related to the contradictions of exurban *growth* from 1960-2008. The 2008 financial crisis though, has exposed the precarious financial, social, and environmental conditions of this growth, thus also provoking changes to how environmental knowledge participates in exurbanization. In other words, objects and subjects of environmental knowledge are now being remade under conditions of exurban crisis rather than exurban expansion.

This chapter establishes a framework to explain how the objects and subjects of exurban environmental knowledge changed from the pre-2008 financial crisis years to their contemporary articulation, revealing a politics of knowledge embedded in long and continuously evolving uneven development. I argue that 'first generation' UPE's central metaphor of urban metabolism is insightful, but despite its theoretical nod toward knowledge and discourse, it often empirically downplays the metabolism of the *immaterial* in favor of the metabolism of the *material*. To address this situation, the chapter also sets up a theoretical architecture in which the narrow theoretical question of how to theorize the objects and subjects of environmental knowledge is situated within the urban metabolism of the immaterial, which in turn is situated within the generalized theory of uneven development. More specifically, my argument furthers new 'second generation' UPE scholarship by developing a theoretical framework describing exurbanization as a socioecological process that metabolizes particular types of environmental knowledge, driven by its inherent tendency toward producing unevenly developed landscapes. Critically, I employ an emerging body of scholarship at the juncture of STS and political ecology to show that the processes of production, circulation, and application are the mechanics of metabolism. In short, I am interested in theorizing how the objects and subjects of environmental knowledge change and are changed through the uneven outcomes of urban metabolism.
To further explain this architecture, I later argue that how the urban metabolism of knowledge proceeds is conditioned by the broader contemporary historical geographical crisis. In other words, urban metabolism has to be further specified by the political economic climate in which urbanization unfolds. For the purposes of this dissertation, I examine urban metabolism not as urbanization as an abstract process, but instead in the historical geographical moment of urban crisis. While the devastation of the 2008 financial crisis was articulated disparately in local places, it was felt particularly acutely in exurbia as the future of past decades of development and a transition to residential housing construction as an economic foundation became suddenly untenable. I show that crisis, as a critical moment in the process of urbanization, provokes political responses through which new objects and subjects of environmental knowledge emerge.

Individual types of environmental knowledge are not clean, discrete entities. Instead, as feminist STS scholarship has demonstrated (e.g., Haraway 1991, Harding 2008), they are hybridized formations of knowledge, drawing on theories, experiences, and motivations from any number of sources, places, and scales (Goldman and Turner 2011). This means that a given form of knowledge, for instance, might contain traces of appeals to geology, neoclassical economics, long term land tenure, past experience with local governance, and any number of other lineages, trajectories, and influences. Thus, instead of appealing to 'scientific' versus 'local knowledge', a more compelling and realistic investigation would begin with the assumption that purely scientific or purely local ways of knowing are impossible. Rather, these knowledges are metabolized—*produced* with the historical and geographical contingencies of their respective strands, they become something new as they *circulate* through the social milieu, and their

application to varying political ends, too, alters their character.

To be clear, my notion here that objects and subjects of environmental knowledge emerge through processes of urbanization is not a replication the crudest political economic analyses that relegate urban objects and subjects to simple structural affects of the labor process. Some (e.g., Grove 2008) have accused first generation UPE of this replication. Though I do not agree with these cynical and narrow readings of the first generation UPE scholarship, second generation UPE articulates a fuller vision of subjectivity in a UPE framework (e.g., Loftus 2012, McFarlane and Rutherford 2008, Furlong 2010). In this small literature, subjectivity is articulated as a socially constructed but individually experienced mode of being with the non-human materialities of nature and technologies.

2.2 EXURBIA AS GROWTH

I begin by positing that exurban studies and UPE need one another. The reason UPE needs exurban studies is simple: most of first generation UPE's empirical focus is in locations commonly thought of as 'cities', yet its theoretical framework is not limited to only these sites. Wachsmuth (2012, 518) has termed this city-centrism "methodological cityism," in which

the city is taken to be the privileged analytical lens for studying contemporary processes of urban social transformation that are not necessarily limited to the city. So, while scholars working within the UPE tradition have produced insightful analyses of cities as products of global socio-natural processes, they have largely failed to investigate noncity products of those same processes.

This mismatch is a missed opportunity for research and for contributing to how we understand urbanization in the countryside. As I explain later, exurban studies also can offer tremendous nuance and insight into how uneven development is articulated in local contexts outside of cities. UPE's materialist roots can benefit from other streams of research in broadening exurban political ecology's theory and empirics.

Why exurban studies needs UPE requires a more involved discussion. Recent changes in the economies, environments, and governance of exurbia is an obvious empirical and theoretical opportunity for UPE. This is especially true given the recalcitrant credit markets, continuing environmental degradation, and fractured governance that characterizes the post-2008 financial crisis years. The exurban studies literature has almost entirely ignored these phenomena, a symptomatic blindspot in its oversight of the rich literature of uneven development. Though exurban growth in the US began in earnest in the mid-20th century, scholarship on the environmental implications of exurbanization began to substantially grow only in the 1990s and 2000s (e.g., Abrams et al. 2012; Gragson et al. 2008; Lumpkin and Pearson 2013; Kirk et al. 2012; Scott 2006; Fleishman and MacNally 2007; Hansen et al. 2005; Bock and Bock 2009). Much of this scholarship focuses on the astounding urban growth patterns extending deep into historically rural areas (Kirk et al. 2012, Berube et al. 2006). Indeed, growth is the central, though not quite exclusive, subtext of this literature, sidelining notions of uneven development and crisis, especially after the 2008 financial crisis. Underpinned by the notion of urban growth and relying on urban geographical models of growth, how scholars understand exurban environments reveals a widely-held assumption of exurbanization to be low-density development beyond the suburbs in historically rural communities.

That notions of 'growth' have come to dominate discussions of exurban environments is unsurprising. Exurbia did, after all, develop in the mid to late 20th century U.S.-American context of capital disinvestment in cities and reinvestment in suburbs, white flight, massive public investments in infrastructure, the personalization of automobile transportation, leisurely consumption of 'nature' in the countryside, easy financing of residential mortgages, industrializing agriculture, and cheap gas, all of which encouraged development in the countryside. Because of this, exurban scholarship has not had to seriously consider anything other than growth as exurbia's primary feature. This is reflected in how scholars measure environmental impacts in exurbia. Though assessments of exurban environments are generally critical of the environmental symptoms of exurbanization, two of the most common variables that measure environmental impacts on exurbia are density and land use/land cover change (Kirk et al. 2012, Berube et al. 2006, Theobald 2001 and 2004, Brown et al. 2008), both of which are expressly designed and employed to measure growth. In other words, the dominance of density and land use/land cover change as variables to assessing exurban environments are grounded in the same subtext of growth that undergird the political economy and political ecology of exurbanization itself and are relics of exurban scholarship at a particular stage of its history.

An assumption of exurbia-as-growth also underpins exurban social science exurban research. Spectorsky's (1955) work, noteworthy because he himself as an NBC television executive commuting from exurbia, proudly claimed the title of 'ex-urbanite', coining the term and focusing his quasi-autoethnographic work mostly on the movement of upper-middle class executives to areas beyond the suburbs and the resulting commuting patterns in the northeast. Berube et al.'s influential report for the Brookings Institute frames exurbia as the "fast-growing communities at the metropolitan fringe" in its title, for instance (2006, 1). Lang and Dhavale (2005) also frame the rise of megapolitan regions as networked growth between metropolitan areas, forming edgeless cities sprawling indiscriminately toward one another. Other more subtle

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assumptions of growth also underpin this literature. Debates over what makes a place exurban and how to quantify these qualifications (Wolman et al. 2005, Nelson and Sanchez 1999), early and recent counterurbanization research (e.g., Berry 1980, Loffler and Steinicke 2009), gerontological amenity migration (e.g., Bennett 1993, Case et al. 2008), and regional planning for exurban and megapolitan growth (Dewar and Epstein 2007), though widely divergent in their interpretations of and research foci in exurbia, all share a common, if implicit, understanding of urban growth as a central characteristic of exurbanization.

2.3 UNEVEN DEVELOPMENT AND THE MOMENT OF CRISIS

What, then, is an alternative to this paradigm of crisis-blindness? Or, how does uneven development work in exurbia? To answer that question, I begin with a general discussion of materialist arguments of ecological crisis, followed by 'crisis' in UPE and its implications for exurban uneven development.

In the trajectory from Marx through UPE, Smith's (2008) work in *Uneven Development* marks a watershed moment. *Uneven Development* takes much of the insight from Harvey's (2008) explicit spatialization of Marx's critique of capital in *Limits to Capital* and makes it relevant for scholars who study not only political economy, but also political ecology. He does this primarily through a critique of nature as it is commonly idealized, consumed, produced, and reproduced. With regard to crisis, Smith (2008, 167) distills Harvey's work on crisis, describing crisis' role as part of "the rhythm of accumulation". He (2008, 169) also distills Harvey's analysis of crises into three types: "*partial* crises which are localized (by sector or area) in their effect, *switching* crises in which capital vacates entire sectors or areas in favor of others, and

global crises in which the entire capitalist system is to some extent affected". Smith (2008, 170) concludes by agreeing with Harvey on the dialectical nature of crisis: "Crisis is not only the product of an inherent contradiction between the need to develop the productive forces and the conditions under which this must take place; in its concrete development as well as its genesis, economic crisis is also inherently contradictory. We need to look at some of the contradictory results of crisis, for no matter how disruptive and dysfunctional, crises can also be acutely functional for capital."

Smith's interpretation of crisis is largely what Marx, Harvey, and Storper and Walker have all posited. Where Smith differs, though, is his treatment of economic crisis with discussions of ecological crisis. While his original text addresses *economic* crisis but deemphasizes *ecological* crisis as it is conceived of today, it works to break down the naturesociety dichotomy by insisting on the boundless extractive capacities of capitalism—a dichotomy which plagued and continues to plague geography, ecology, biology, and other disciplines—as an initiator of ecological degradation. Smith insists on not simply the production of space, but also the production of nature. Whether the environment within which capital operates is the built environment or 'nature,' capital produces, consumes, and reappropriates the resources and people in the environments and incorporates them into its own rhythms.

For Smith, the necessary spatial outcome of these rhythms of the production of nature is uneven development, evident on the landscape of the city and the countryside. Indeed, one of the primary unevenly developed landscapes Smith addresses is the city-countryside (or urbanrural) difference. Despite his static and rigid conception of the 'urban scale' as only ontologically rooted in the materialist mechanisms of capitalist development, Smith's take on the production of uneven urban-rural relationships is insightful. In the most general sense, the urbanization of the countryside performs the same task of market expansion that colonialism does. Insofar as capital is constantly searching for the means of self-valorization, both far-flung colonies and proximate rural areas can serve that particular function. As rates of profit begin to decline in cities, as their sources of raw material begin to dwindle, and as the demand for goods is satiated, the countryside becomes increasingly attractive as a place for extraction, residence, and exporting of goods. This movement of capital to the countryside and away from cities is part of the seesaw effect of uneven development:

Capital moves to where the rate of profit is highest (or at least high), and these moves are synchronized with the rhythm of accumulation and crisis. The mobility of capital brings about he development of areas with a high rate of profit and the underdevelopment of those areas where a low rate of profit pertains. But the process of development itself leads to the diminution of this higher rate of profit....[A]t the urban scale, the development of underdeveloped areas leads to a rapid increase in ground rent and the frustration, after a point, of further development. (2008, 198).

This is the beginning of one contradiction of capital, that as ground rent begins to rise in less developed areas, it also becomes less attractive because the rate of return shrinks. With this falling rate of profit, capital has sought out other areas with higher margins and the influx of capital into the original area stagnates or halts, leading to crisis. Far from a state of spatial equilibrium, then, Smith notes that capital seeks and produces a highly heterogeneous landscape, one in which capital can move from underdeveloped locale to underdeveloped locale, always finding higher rates of return yet initiating a subsequent falling rate of return.

Smith's own view of the relationship between economic crisis and ecological crisis is furthered by O'Connor (1981), who pioneered work in structuralist assessments of economy and ecology, especially concerning notions of crisis. O'Connor's (1998) take on crisis is staunchly materialist, relying on notions of class struggle and others as an alternative to neomarxist definitions while also developing an ecological Marxist account of capitalism. O'Connor (1998, 167) writes of capitalism as "not only crisis-ridden but also crisis-dependent". He (1998, 168) goes on to clearly and succinctly note the environmental implications of crisis: "Crisis forces capital and state to confront their own basic contradictions, which are subsequently displaced to the political, ideological, and environmental spheres…here there are introduced more social types of production conditions defined both materially and socially." O'Connor speaks here of economic crisis, but his interpretation of ecological crisis is similar. Here, ecological crisis works in dialectical relationship with economic crisis:

Capitalist accumulation and crisis thus initiate ecological problems, which in turn (including the response of environmental and social movements to these problems) may cause economic problems. There is a mutually determining relationship—at the levels of production, market relations, social movements, and politics—between economic and ecological crisis trends and tendencies... Ecological and economic crises are in this sense self-induced, and environmental and socioeconomic reforms are two different sides of the same general process."

Of the explicitly Marxist theorists mentioned here, O'Connor does some of the most important and visionary work in tying economic and ecological crises to the structures of capitalism. O'Connor's work is exemplary also for its establishment of an ecological Marxism and political ecology whose definition of crisis has been expanded, integrated, and taken up by many, including geographers working on issues of uneven development in UPE.

The foundational works of UPE have drawn primarily upon the Marxist political economy and political ecology traditions for conceptions of crisis. A key text in this literature is Harvey's (1996) *Justice, Nature, and the Geography of Difference*. Harvey addresses urban processes throughout, but especially notes them in the chapter "The Dialectics of Social and

Environmental Change." He (1996, 186) writes:

[C]ontradictions in the social relations entail social contradictions on the land and *within* ecosystemic projects themselves. Not only do the rich occupy privileged niches in the habitat while the poor tend to work and live in the more toxic or hazardous zones, but the very design of the transformed ecosystem is redolent of its social relations. ...Created ecosystems tend to both instantiate and reflect, therefore, the social systems that gave rise to them, though they do not do so in noncontradictory (i.e., *stable*) ways.

Harvey elucidates a key point of UPE here, that ecosystems are not *a priori* givens, but instead are the results of metabolized nature—created, produced, and constitutive of the human social order. He (1996, 186) then goes on to famously note that "there is nothing *unnatural* about New York city". Sustaining certain configurations of nature in cities is an active and on going process that is reproduced daily. Smith notes this, too, when he wrote "there is no such thing as a natural disaster" in response to the continued repetition of "natural disaster" as the description of Hurricane Katrina (Smith 2006). The urban crisis is not, therefore, a natural crisis or an objectively unsustainable set up; instead, the real urban crisis is the one perpetuated by the unjust and unequal social arrangements dictated by capitalism and other systemic perpetuators of inequality (Heynen, Kaika, and Swyngedouw 2006, 10).

Harvey (1996, 186) also writes of urban ecological processes in cities and the unique urban role in political ecology. "[I]t is particularly odd to find many otherwise dedicated ecological thinkers excluding the massive transformations of urbanization from their purview while insisting in principle that in an ecological world everything relates to everything else. The long history of urbanization is, after all, one of the most significant of all the processes of environmental modification that have occurred throughout recent world history." This, then, is the point of departure for UPE: an insistence on seeing the processes and crises of urbanization and the inherent power relations therein as intimately involved with ecological projects and systems. Conceiving of ecology without urbanization or urbanization without ecology leaves one with a distinctly incomplete and lacking analysis of both.

Furthermore, as Braun (2005, 635) notes, much of the work in UPE scholarship strives to work against "the view that cities are purely *social* spaces, and that cultural, economic and political processes exist, by some strange magic, entirely separate from the countless nonhuman entities and organisms that are enrolled in, and help shape, urban life." Much of the UPE literature works on the produced environments of "socioenvironmental processes" (Heynen, Kaika, and Swyngedouw 2006, 11). In this sense, first generation UPE draws inspiration from the intersectional impulse of the environmental justice movement, while also holding tightly to a Marxist-inspired political economy framework. The simultaneously devastating and enriching effects of crisis are not bound to class analysis, but instead are probed by the questions of who pays for crisis and who gains from crisis. Thus, it is not only nature that is potentially brought into clearer focus, but also the integrated social fabric of race, class, gender, and other social categories caught in the interstices of crises of c

Interestingly, despite roots in Marxism as interpreted by Harvey and Smith (2008), much of the recent scholarship in UPE does not use the word 'crisis' as an explicit focal point. Instead, the dialectical processes of capitalist urban metabolism take the foreground. This does not mean, though, that crises are somehow absent from the literature. Indeed, crisis is the implicit focus of the entire enterprise of UPE by answering key questions about who gains, who pays, who suffers, and who prospers in the variety of moments of capitalist accumulation. Crisis, then, despite its relative paucity of explicit references in the UPE literature continues operate through structures and dialectics of urban life as constituted by and constitutive of capitalism.

Understanding how environmental knowledge participates in uneven development helps understand localized patterns of uneven development. What escapes this local relationship, though, are historical geographical moments like the 2008 financial crisis that move beyond the local state's jurisdiction, whose origins are in many local places but whose unfoldings are worldwide, and whose effects are locally articulated in highly differentiated places. Thinking through the implications of the 2008 financial crisis for exurbia is innovative primarily because exurban areas have not, generally speaking, experienced this kind of crisis in the same way that other urbanizing areas have.

The 2008 financial crisis, though, is not the same kind of crisis as exurban uneven development. Instead, local articulations of the 2008 financial crisis exacerbated the already present machinations of uneven development, making the decades-long deluge of capital to the countryside suddenly become a slow trickle. The lingering effects of the 2008 financial crisis have stretched municipal budgets (even as municipalities take up urban sustainability initiatives); has halted municipal plans for economic growth; and has encouraged state and non-state actors to seek financial safety in both re-regulation and deregulation (Oosterlynck and Gonzalez 2013, Pratt and Hutton 2013). While the ongoing production of symbolic and speculative capital investments, this contradiction was not the ultimate cause of the 2008 crisis and its devastating effects in exurbia and elsewhere. Rather, it was a mix of other factors like subprime lending, worthless investment vehicles touted by ratings agencies as sterling, consumer wages falling as mortgage rates rose, and more. Bad mortgages and bank failures in exurbia also contributed in

some small way to the global financial crisis, just as they did in any other location.

Not only is the crisis different, but the arrangements of local intervention were not intended to address the effects of global financial crisis. This means that the relationship of intervention into the second contradiction of capital was not intended to mitigate global crisis, yet it both feeds global crisis and is affected by it. From 1960 to 2008, a general expectation of growth dominated exurban politics, meaning that political arrangements were centered on understanding, mitigating, and encouraging the already growing capital investments in exurban locations. The financial crisis of 2008 dramatically challenged that assumption of perpetual growth.

This is not to say that the financial crisis simply befell exurbia, as though exurban growth played no role in it. Indeed, subprime lending plagued exurbia, too, leading to bank failures and massive defaulting on mortgages like in many other places. Local places experienced the crisis in particular ways at complicated, already existing socioenvironmental relationships in time and place. Harvey notes, too, that crises on smaller local or regional scales is often what precipitates crises at global scales. He (2006, 431) writes:

Crises build...through uneven geographical development, co-ordinated through hierarchical organizational forms. And the same observation applies to the impacts of devaluation. They are always felt at particular places and times and are built into distinctive regional, sectoral, and organizational configurations. The impacts can be spread and to some degree mitigated through switching of flows of capital and labour between sectors and regions (often simultaneously) or into a radical reconstruction of physical and social infrastructures. Global crises build up through the impact of less traumatic switching crises.

Related to Harvey's observation that large scale crises originate from smaller switching crises in local places, there is a growing body of geographic scholarship on the local articulations of the financial crisis (e.g., Martin 2010; Aalbers 2009; Huang et al. 2011). Virtually no scholarship,

though, directly addresses the political ecology of the financial crisis—let alone the urban political ecological or place-based impacts in exurbia—on the specific impacts on exurbia, how urban political ecological contexts were remade during the crisis.

Exurban areas, though, were set up to experience the financial crisis in ways similar and different from other urban areas. In many exurban locations, the 2008 financial crisis represents the culmination of a several decades-long transition from agriculture/extraction to residential construction/tourism driven economy, exposing historically rural areas to new forms of crisis and eliminating jobs in traditionally highly unequal and mostly poor areas. Because the residential construction industry was perhaps most directly affected by the severe contraction of credit after 2008, exurban areas that had transitioned to residential construction as the main sector of their economy were especially vulnerable. Because many exurban areas have long histories of high unemployment and existence at the economic periphery, the 2008 financial crisis is another chapter in the region's long history of uneven development.

2.4 UNEVEN DEVELOPMENT, THE RENT GAP, AND CIRCULATING EXURBAN CAPITAL

From any approach within UPE, then, exurbanization is more than density, land use/land cover change, and perpetual growth. Both empirics and theory note how uneven development, thematically central to UPE scholarship (see Swyngedouw and Heynen 2003, Keil 2003, Heynen and Robbins 2005, Swyngedouw 2004, Kaika 2005, Prudham 2004, Gandy 2002), is a foundation for understanding the changes to established political ecological relationships. These UPE scholars indicate that the scholarly and popular literatures' assumed narrative of exurban

growth as a foreseeably permanent condition misunderstands historic booms and busts of urban spatial formation. The assumed narrative also misunderstands the current state of exurbia in the wake of the financial crisis in exurban communities in the US and beyond. This is why a UPE framework locating exurbia as a place of crisis, uneven development, and changing urban metabolism is a vital contribution to the exurban studies literature.

Furthermore, the state of exurbia after 2008 is more than simply the falling rate of profit and the inability of the local state to respond effectively to the economic crisis and ecological degradation. The small critically-inspired section of the exurban studies literature explains this. These articles complement an understanding of uneven development, but only one directly addresses it. In the exurban studies literature, perhaps best represented in *GeoJournal*'s 2011 special issue, critical political economic and political ecological perspectives can deepen the central topics of representations of the rural (Woods 2011), state interests in exurbanization (Scott et al. 2011), local conservation efforts in the face of non-local interests (Hurley and Halfacre 2011), expertise and democracy in land use conflict (Young 2011), and exurbia as a place and process (Gosnell and Adams 2011; Taylor 2011).

I see three important contributions to exurban studies from the first generation UPE and the uneven development literature: rural gentrification and the rent gap; the peculiar mixing of symbolic and speculative capital; and the second contradiction of capital. All of these are inspired by Smith's, O'Connor's, and Harvey's political economy, but are much more nuanced and specific about how political economy operates in concert with of exurban cultural, governance, and environmental trends. Sayre's commentary in the *Geoforum* issue, as the only one substantively addressing uneven development, echoes Darling (2005), McCarthy (2007), and Robbins et al. (2011) as the other major recent contributions to uneven development in exurbia. McCarthy's argument is that the countryside is globalizing, meaning that individual rural places around the world are becoming new sites of consumption and accumulation. Sayre notes that the exurban studies literature highlights three trends for uneven development: the production of fictitious capital via the commodification of nature; that, along with Darling (2005) the widening rent gap between actual and potential rent is critical for understanding exurban land use; and that it is a particular combination of symbolic capital with speculative capital that distinguishes exurbia from other urban spatial formations. Finally, Robbins et al. (2011, 2), following O'Connor, argue that one important manifestation of the contradictions of capital in exurbia is the classic second contradiction of capital: that "the externalities of economic growth undermine the environmental conditions on which the economy depends."

Darling notes that the rent gap in urban settings is also prevalent in the hinterland areas, and in particular, the "wilderness" of Adirondack New York. As she (2005, 1021) notes, "the rent gap...is the difference between the *actual* ground rent an owner currently makes on a rental property and the *potential* ground rent that could be made if the property were put to what realtors call its 'highest and best use.'" In some contexts, this is the beginning of gentrification, in which rents and physical living conditions in a neighborhood decline to a low point, at which time landlords raise rents to pay for the sudden reinvestment. The landlords, having replaced old tenants with new, recoup their reinvestment costs and attract a wealthier class of tenants.

Darling (2005,1022) argues that this pattern happens in the hinterland, but with some vital changes, especially that "[w]hat gets produced in the process of urban gentrification is *residential space*. What gets produced in the process of wilderness gentrification is *recreational*

nature." In this sense, amenity migration is the very definition of the exurban rent gap, insofar as environmental leisure and consumption are the primary attractions of new residents. The implication here (2005, 1025), too, is that the hinterland rent gap is actually the gap between potential exchange value between agricultural or forested land and new construction. "Formerly productive agrarian land, in other words, might be understood as 'under-capitalized' in rent-gap terms, and subsequently 'revalorized' through residential real estate development...." This is in contrast to dilapidated housing versus renovated housing difference in the urban rent gap, but even so, the rent gap is still at the heart of the long-term process of uneven development because it exposes the locational switches of capital from inner cities to suburbs and exurbs.

Secondly, while the rural rent gap is an important contribution to exurban uneven development, Sayre's (2011) final insight—the peculiar combination of symbolic and speculative capital—alongside Robbins et al.'s (2011) argument about contradiction more specifically tailors their argument to exurbia, not simply rural areas. To unpack these terms first: symbolic capital in this sense is refers to the production of "environmental, aesthetic, and leisure-oriented" sensibilities and are "ideas, identities, and experiences" in addition to commodities and surpluses (Sayre 2011, 438). The exurban rent gap is deeply implicated in commodifying these sensibilities through the sale of homesites on particular parcels of land. Thus, exurbanization combines symbolic capital with fictitious speculative capital and, unlike real capital or money capital, it is the inflated market values of assets that have no material backing from commodities. Furthermore, exurbia as a site of the investment, accumulation, and production of symbolic and speculative capital functions like a spatial release valve of capital that must always seek new markets, new spaces and places, and new territories in which to reproduce itself and to stave off crises of overproduction.

In exurbia, the second contradiction of capital, the rent gap, and the unique symbolic/speculative capital merger are related to one another. In the U.S., the emergence of the rent gap and most of exurban growth began in the 1960s and accelerated in the 1980s and 1990s. The connecting of these areas to new regional, national, and global movements of capital implicit in exurbanization increased exurban areas' exposure to new booms and busts. The result in exurban areas has been a significant economic transition, coupled with major exposure to nonlocal financial markets, all of which has been accomplished in roughly forty years. For the second half of the 20th century, this relationship drove patterns of uneven development in exurbia. Exurbanization is often fueled by amenity migrants searching for the stuff of symbolic capital: a rural idyll, an intimate-feeling small town life, and natural pristineness and exurban areas are often marketed to amenity migrants promoting these characteristics (McCarthy 2008, Solecki and Leichenko 2006, Cloke 2006). Meanwhile, higher numbers of exurbanites create demand for further speculative investments, both of which further expand the already yawning rent gap. In some areas, including Macon County and other portions of southern Appalachia, this trend was so strong that it transitioned the local basis of economic activity from productivist agriculture and extraction to post-productivist residential construction (Gragson and Grove 2006). This economic boom brought jobs to historically poor, rural areas, though it also set up the region for unmitigated exposure to the 2008 financial crisis. Southern Appalachia in particular has long existed on the economic periphery of the eastern US and US Southern cities. For many of these areas, exurban growth has also meant jobs with decent pay, partially stemming the multi-generational tide of workers leaving southern Appalachia for bigger cities to

find work (Williams 2002).

The second contradiction of capital, though, contradicts this accumulation of symbolic capital and the rent gap. As the rent gap makes for a more lucrative real estate market with prices rising ever higher—meaning the incentive to develop forest or farm land is also ever higher—the increased presence of exurbanites undermines the value of the symbolic capital that attracted amenity migrants in the first place. For instance, an increase in non-local residents can undermine the stable sense of small town life; more cars can mean more traffic and smog; conspicuously sited residential construction tarnishes viewsheds; land use change contributes to erosion runoff into once clear streams. This not only undermines the very aesthetic qualities that attracted new residents in the first place, but it also can create resentment and worsen material living conditions for long-term non-exurban local residents. As negative externalities, these environmental consequences of exurban development diminish the environmental qualities attracting exurban growth in the first place.

There is evidence, too, that these externalities have broader consequences than as components of the second contradiction of capital. Environmental change at local sites of exurbanization in southern Appalachia are significant for the entire region for at least three reasons. First, southern Appalachia serves as the "watertower for the southeast" (Gragson et al. 2008), meaning that water quality and quantity issues originating in the upstream exurban mountains have likely downstream impacts to the Piedmont and coastal southeast. Secondly, some additional Coweeta LTER research has shown that socioecological metabolic changes resulting from infrastructural growth in the region has been linked to urban heat island effects (Gustafson et al., forthcoming), impacting regional climatic conditions. Thirdly, southern

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Appalachia is one of the most biodiverse regions in North America. Exurban development impinges on this biodiversity, largely through habitat loss and fragmentation.

Abrams et al. (2012) note that research on the local ecological consequences of amenity migration and exurbanization has usually relied on the narrative of extra-local migration transforming the ecologies of local exurban areas. While the environmental science literature paints a more complicated picture than an out-and-out indictment of exurban growth (e.g., Bock and Bock 2009), Abrams et al. (2012) note that the literature generally confirms that exurban growth is typically an ecologically disruptive force. Though this literature also problematically relies on a growth-centric model of exurbia, Abrams et al. (2012, 273) mention another issuethat "this body of work has tended to leave unexplored questions related to the complex social productions of nature characteristic of exurbanising landscapes. For example, how do contestations regarding politically-charged ideals of place, nature, and property rights influence the patterns of subdivision and development[?]" This is a fundamentally integrative question, one that pushes scholars interested in exurban environments to consider more than growth, more than land use/land cover change, and more than density in their models. The environmental outcomes measured by environmental scientists are intrinsically bound up with the complex social productions of nature and landscape.

How these negative environmental externalities are managed, especially by the state, is critical for understanding how the rent gap, accumulation of symbolic capital, and second contradiction of capital is or is not resolved, postponed, relocated, or perpetuated. As Sayre (2011, 76) notes, "...the state [in exurbia]...must strike some balance between economic growth, local legitimacy, and conformance to ... expectations of governance and investor confidence." The state, then, finds itself in the middle of the second contradiction, expected to promote economic growth as well as mitigate urban growth's environmental consequences. The local state in particular often does this through planning, though even the mundane mechanisms of planning are also subject to the balance of growth, legitimacy, and effective governance.

This mediating role of the state in contradictions of capital is made more complicated by the increased role of cities in environmental management and governance. Brenner (2004) notes that cities are becoming a primary terrain for state governance as governments and governance at other scales are reworked. This is true for urban environments, as cities take up the mantle of sustainability, climate governance, and more in response to and in coordination with initiatives from national and international governance organizations (Rice 2010), as well as for post-productivist rural townships (Lowe et al. 1993). Part of this emergence of local state environmental actions is a recognition that local ecological changes imply global consequences. The inverse, though, is also true, that local environmental changes are often the result of extra-local pressures. Local arrangements and practices of urban environmental governance, then, are continually subject to changing environmental conditions that originate inside and outside of their jurisdictions.

The state's role in exurban manifestations of contradiction is even further complicated because state planning apparata and practices in exurbia are relatively new. In exurbia, environmental changes ranging from development-led degradation to climate change provoke state and non-state actors to reconfiguring local state regulation through a few routes, but especially ordinances. The persistence of rural practices and the selective adoption of urban governance practices is a recent theme in some exurban-oriented scholarship (Walker and Hurley 2011, Cadieux and Taylor 2013, and Hurley 2013). These works show that whether or not communities adopt new forms of planning as a form of state practice, the resulting conflict around planning and its future success at managing the expectations of growth and the concomitant environmental degradation depends in large part on entrenched economic interests. The retreat of the state in urban and national modes of environmental governance and the rise of NGOs is a common theme in the environmental governance and neoliberalization of nature literatures (Agrawal 2005, Lemos and Agrawal 2006, Heynen and Robbins 2006, Bakker 2005, Castree 2008). Local governments (via 'urban sustainability') are becoming more involved with environmental governance even as their budgets make this difficult and even impossible. In exurban U.S., the state is often maligned and mistrusted by some residents, even as other residents also turn to the local state as the primary way of regulating/promoting growth.

2.5 URBAN POLITICAL ECOLOGY AND URBAN METABOLISM

The empirical purpose of much of first generation UPE research reveals the urban metabolism of material things. Drawing on its materialist roots, first generation UPE has focused in particular on the hydrosocial cycle, following the material flows of water through the city, untangling the ways urbanization creates new producers, consumers, finance schemes, incentives, pathways, and governance regimes for water. Though it rarely addresses the immaterial as a central focus of research, the metaphor of urban metabolism this body of research establishes is a good model for understanding the urban metabolism of the immaterial. Gandy's (2004) *Concrete and Clay* examines the technological transitions, historical periods, and political economic implications at the intersection of water, space, and power in New York

City. Gandy is particularly concerned with the dramatically altered landscape of the city and the upstate areas from which the city draws its water. He also situates his work within the broader realm of environmental history, noting that thirsty cities have long been a part of some of the most significant ecological changes in US history. The significance of Gandy's work is his attention to contingent historical and geographical empirics against the backdrop of social theoretical considerations of uneven development and the urban production of nature.

As the physical means of connecting objects and subjects of urban water, Kaika 's (2005) *City of Flows* untangles urban hydrotechnical infrastructure and its situation with respect to social relations. Kaika's study is a historical and geographical examination of modernity as seen through water projects in Athens and London. Infrastructure itself takes a central role in her analysis as a connecting technology, one that mediates the relations between nature, the city, and the home. For Kaika, modernity is beset with contradictions made manifest on the landscape in the form of banal engineering projects like water pipes and sewerage systems and extraordinary public works projects like hydroelectric dams. The domination of nature, the deterioration of urban infrastructure, the pursuit of urban sanitation, and the definition of the home in opposition of both nature and society are all components of modernity's vision for rationality, cleanliness, efficiency, progress, industry, and capitalist accumulation (2005, 4). Kaika's work is significant in that it understands infrastructural dynamics as part of capitalist development, as part of a modernist vision of social progress, and as a mediator between a variety of social spaces and places.

Similarly, Loftus (2006) seeks to understand the role of the water meter in Durban's water system. His perspective is strictly historical materialist, so the immediate significance of

his work is that rather than interpreting the infrastructure as static, he seeks to take the intricate dynamics of the technology itself and orient them within a Marxist framework. The meter in Durban came to increasingly enforce rigid water access limitations, despite official discourse about "free water" (2006, 1041). After considering the introduction of the meter in Durban, Loftus moves on to discuss the struggle for free water against the "dictatorship of the meter." He ends with the radical potential of community knowledge of the local waterscape that community workshops can use to undo the supposed rationality and actual ruthlessness of the water infrastructures, whose role in Durban's waterscape had become reified and sedimented into regimes of social power and domination.

Also related to the production of new objects and subjects control is Swyngedouw's (2004) examination of commodification, finance, construction, and access to water infrastructure in Guayaquil. As he highlights the variety of interests at a number of scales that become invested in the details of the engineering of Guayaquil's water supply network, he argues that historical and geographical legacies of infrastructural development are important considerations for the present and future of urban power relations. Despite these legacies, though, water access remains a contestable and necessary field for social movements (2004, 150). As far as infrastructure is concerned, Swyngedouw notes that the obdurate yet contestable nature of water infrastructure is a unique and significant contribution to UPE.

In Swyngedouw's (1999, 2007) work on water technology in mid-20th century Spain, he situates infrastructure as caught up in the political economy of a nationalist project of modernization. The major contribution of this work is, as he (1999, 445) notes,

a theoretical and methodological perspective that is explicitly critical of traditional approaches in water-resources studies, which tend to separate various aspects the hydrological cycle into discrete and independent objects of study. The traditional hydrological, engineering, geographical, political, sociological, economic, and cultural perspectives on water have produced a piecemeal perspective that maintains a particular water ideology, one that is increasingly less able to contribute in creative and innovative ways to the mitigation of growing problems associated with contemporary water practices.

The approach indicated here is noteworthy because of its openness to a blend of Latourian, Harawayan, and dialectical formulations of water resources. This blend is reflective of Swyngedouw's larger project of reducing fragmentation and division within water resources studies, thus creating an empirical hybrid of insights from water resources studies and a theoretical hybrid oriented within geographical historical materialism.

Finally, Bakker's (2003) work on the privatization of water in England and Wales is an important contribution to first generation UPE's understanding of the metabolism of urban water. Bakker is most concerned with the political economy of the environment and works to tease out the contradictions of the changing political economy of water, with an emphasis on the privatization of water delivery systems. She is also interested in the managerial expertise that is centralized in the government and water companies whose capacity to regulate the flow and price of water have remained in flux over time. Though technology, especially in the form of water meters, does play a role in her account, Bakker's main emphasis is on the political economic dynamics that have governed access to and the flow of water in England and Wales.

2.6 METABOLISM OF THE IMMATERIAL

If UPE's fullest empirical articulation of its broad theoretical vision, as demonstrated by Swyngedouw, Bakker, Loftus, Gandy, and others, is articulating the metabolic transformation of *material* elements like water by charting the production of new urban hydrological objects and

subjects in historical moments of urbanization, a gap in UPE's empirical work is thinking through the metabolism of the *immaterial*. It is my goal to augment the material emphasis by arguing that that the immateriality of the city—environmental knowledge in this case—is metabolized in the same way that the materiality of the city is metabolized, insofar as urban metabolism produces new objects and subjects for it, too. To illustrate the point: Gandy's spatial exploration of the sources and history of New York City's water regime; Swyngedouw's examination of Spanish national hydrotechnical projects; and Bakker's privatization of water revenue streams are all, at some level, about how cities metabolize water, making new urban hydro-subjects and urban hydro-objects. Water is re-configured, re-known, re-investigated, and re-produced according to urban political economic and other investments in social power. A major empirical point of this dissertation is to demonstrate that environmental knowledge is similarly metabolized through the process of urbanization.

UPE's 'second generation' of scholarship is currently growing steadily along at least two themes of research that can contribute to understanding the urban metabolism of knowledge, one inspired by the original impetus of materialist Marxian political ecology/economy and another more recent intervention inspired by STS. A major question in UPE, though, is whether first generation and primarily materialist UPE is compatible with varying strains of STS. In this context, scholars in the two contemporary streams of research in UPE, one materialist-inspired and the other STS-inspired, have commented on the merits of synthesizing these two theoretical frameworks, often with the purpose of clarifying the relationship between 'process' and 'form' (or 'thing'). Some of the first generation materialists have borrowed from actor-network theory (ANT) or proposed integration (Castree 2002, Heynen et al. 2006); some of the first generation materialists have serious reservations about integration (Kirsch and Mitchell 2004); some partial to ANT have resisted integration (Holifield 2009); and, finally, some in STS have proposed some form of integration (Furlong 2011). I propose here that returning to the original UPE metaphor of urban metabolism can provide common ground for UPE and STS to think through how environmental knowledge—a topic of importance to both UPE and STS—is produced, circulated, and applied in the context of urbanization.

I return, then, to the original source of urban metabolism in UPE, Swyngedouw's (1996) article "The City as a Hybrid". On metabolism (1996, 70), he writes: "...the 'world' is a historical-geographical process of perpetual metabolism in which 'social' and 'natural' processes...whose outcome (historical nature) embodies chemical, physical, social, economic, political, and cultural processes in highly contradictory but inseparable manners." Though a committed materialist, Swyngedouw's view of history and geography is reminiscent of certain kinds of ontological monism (e.g., Deleuze and Guattari's *A Thousand Plateaus*), despite his insistence on the dialectic. Indeed, he approvingly cites Latour's rhetorical question, belying a belief that metabolism is a fundamental process of ontologically uniting elements of disparate properties: "Is it our fault if the networks are simultaneously real, like nature, narrated, like discourse, and collective, like society?" (1996, 65). Knowledge, then, is part and parcel of this world-historical metabolism: "...constructing knowledge is in itself a deeply historical, dialectical, powerful process that is infused with and embodies the very metabolisms it claims to reconstruct as the very materiality of socio-nature itself" (1996, 71).

What Swyngedouw leaves unspecified, though, is knowledge itself, leaving it as an immaterial object to the abstract realms of representational discourse and linguistic construction.

This treatment of the immaterial is common throughout first generation UPE, symptomatic of its empirical and ontological emphasis on materiality despite its theoretical acknowledgment of the essential role of knowledge in processes of metabolism. In contrast, water, because of its material form, is quickly taken up as an object and subject *par excellence* of urban metabolic transformation. To abandon the interpretation of the objects and subjects of knowledge without further specification or theorization, though, leaves knowledge both amorphous and fetishized. Knowledge always comes in a particular form and always has a political history and geography to its metabolism, that is, its production, circulation, and application (Mitchell 2002, Jasanoff and Martello 2004, Robbins 2000, Forsyth 2013). This is to say that knowledge is never metabolized in the abstract, but instead, as Haraway (1998) and many others have noted, knowledge always exists in situated, particular, and peculiar forms.

Geographers outside of UPE and others have been interested in these situated types of knowledge in the literatures of material culture, technopolitics, and artifacts (e.g., Mitchell 2002, Holifield 2009). Social theorists and philosophers, too, have attempted to account for the agency of things and the impact of technology on social life. On some level, most of this vast literature is concerned broadly with the ontological status of 'things' with respect to other social theoretical ontological givens like forces and structures. This ontology provides a counterpoint to the dialectical and process-oriented philosophy that is most commonly associated with UPE and political ecology. The argument for an ontological recognition of things is expressed in a variety of forms, including Haraway's (1991) cyborgs, McLuhan's (1967) aphorism that 'the medium is the message', Latour's (2005) broad interpretation of agency, Bryant's (2010) recent work on the 'gravity' of objects, and Heidegger's (2010) distinction between things 'present-at-hand' versus

things 'ready-to-hand'. These arguments are interesting and are becoming part of a larger movement in geography toward flat ontologies (see Marston et al. 2005).

While parsing out the differences between these ontologies and advocating for one might be worthwhile at another time, the more modest claims of E.P. Thompson are most appropriate for this project. Thompson's work on the law in *Whigs and Hunters* is an excellent demonstration of the workings of artifacts or things (Thompson 1990). He (1990, 262) notes:

...if we say that existent class relations were mediated by the law, this is not the same thing as saying that the law was no more than those relations translated into other terms, which masked or mystified the reality. This may, quite often, be true but it is not the whole truth. For class relations were expressed, not in any way one likes, but *through the forms of law*; and the law, like other institutions...has its own characteristics, its own independent history, and logic of evolution.

Instead of concluding that the power of the elites lurks behind the law waiting to lay waste to the weak, Thompson observes that the law itself is the expression of power. Thompson investigates the law not to confirm the popular but misleading assumption of law as a tool for the powerful, but instead he reveals a much more complicated picture. The law, according to his reading of it, constrains the powerful that write it, dispenses some measure of progressive justice frequently, and often protects the most vulnerable. These conclusions are considerably more complex, nuanced, and interesting than those of authors who would dismiss this complexity for a smooth narrative of power. Furthermore, as Thompson notes, the law as a form of knowledge has a history in which it is made and remade with new objects and subjects at its core.

Thompson's reasoning augments my argument—that urban metabolism is a process by which objects and subjects of knowledge are produced—by showing that particular *types* of knowledge participate in the *process* of urbanization. My argument is more than the thesis that uneven development is articulated in local urban contexts. Instead, it builds on this thesis by

pushing UPE to consider that particular types of knowledge open and close possibilities for how uneven development plays out in context. It is essential to know the character, history and logic of these types in order to more fully understand urban metabolism and uneven development. Put another way, there is always a metabolic relationship between the 'process' of uneven development and the 'form' of environmental knowledge, insofar as processes must enroll types in their unfolding, even as things create and limit possibilities for how processes unfold. This relationship is currently acknowledged in theory but less so empirically in much of UPE.

2.7 URBAN METABOLISM AND ENVIRONMENTAL KNOWLEDGE

To tie Thompson's observation about the histories of the law to notions of urban metabolism, and to further illustrate this relationship between process and thing in UPE and STS, I offer Goldman and Turner's (2011) framework of production, circulation, and application of knowledge. In line with Thompson, their framework explores the characteristics, independent history, and logics of types of knowledge, drawing upon both political ecology and STS. Most importantly for my purposes, Goldman and Turner implicitly insist on the same themes of creating new object and subjects of knowledge, the core of what I argue is at the heart of urban metabolism. One weakness of UPE is its lack of emphasis on the immaterial, and in particular, environmental knowledge. While political ecology often considers the variety of environmental knowledges that impact environmental governance, UPE does not do so to the same degree. This is especially relevant for exurban areas, where types of environmental knowledge are rapidly changed, introduced, contested, and deployed in response to urban growth. Goldman and Turner show that regarding the politics of knowledge, STS and political ecology are mutually concerned about issues of the production, circulation, and application of knowledge (2011). They note, too, that while the *production* and *circulation* of expert environmental knowledge is generally understudied in political ecology, the *application* of knowledge is often an important part of political ecology scholarship. UPE, too, despite its emphasis on metabolism, emphasizes application and often misses production and circulation. Thus, accounting for production, circulation, and application in UPE would provide a fuller understanding of the urban metabolism of knowledge. Scholars working in political ecology have begun to engage with the literature in STS as a way to improve their understandings of the production, circulation, and application of environmental knowledge. STS is deeply invested in understanding the production and origins of types of knowledge, insisting that all types of knowledge, including scientific knowledge, are contingently political, historical, and geographical (Barnes 1982; Barnes, Bloor and Henry 1996; Wynne 2002).

As a field of inquiry, STS investigates some of these types that give expression to power relations, yet lacks the spatiality of the power relations so central to scholarship in UPE and political ecology. UPE, on the other hand, is traditionally focused on the power relations expressed in types of knowledge, but does not often track the historical development and circulation of these types of knowledge. As a result, Goldman and Turner's framework prompts scholars to consider the ways that environmental knowledge is produced, circulated, and applied. This is true, too, of UPE, where studies of the metabolic production of urban environments could be significantly improved by considering the production, circulation, and application of environmental knowledge.

Though the production, circulation, and application are not easily distinguished in the

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messiness of empirical investigation, I summarize in Table 2.1 Goldman, Nadasdy, and Turner's (2011) guiding suggestions as to the constitutive themes of the production, the circulation, and the application of knowledge from a joint political ecology/STS perspective. In many ways, this tripartite framework mimics urban metabolism as articulated by first generation UPE scholarship on water in that inherent to production, circulation, and application are social power relations as well as the content and types of environmental knowledge.

Table 2.1. Production, Circulation, and Application

Production	 the times, locations, and actors associated with the genesis of knowledge expertise, science, practitioners as situated producers of knowledge the complexity, multidisciplinarity, and 'multiplicity of environmental knowledge'
Circulation	 the movement of knowledge from site(s) and time(s) of production to site and time of application the obstruction and public availability of knowledge how forms and practices of environmental management are transformed, idealized, and generalized
Application	 environmental managers making particular choices about the use, appropriateness, and usability of knowledge the messiness of purportedly pure knowledge put to work in particular times and places which actors and institutions are and are not socially positioned to deploy knowledge

2.6.a Types of Environmental Knowledge

I argue that understanding the production, circulation, and application of types of

knowledge—that is, the metabolization of knowledge—illuminates how they participate in exurban uneven development. These types of knowledge are prominent in a range of literatures, and my analysis of their specific features in Macon County will be the focal point of later chapters. Other types of environmental knowledge, of course, are important in a range of other settings. These three, though, are both substantiated in the literature and are significant for Macon County's steep slope ordinance debate. Instead of describing power relations as simply happening, as Thompson implores us to avoid, accounting for the metabolic production, circulation, and application of types of environmental knowledge yields a narrative of environmental politics that recognizes the important enrollment of particular types of knowledge in exurban processes.

In light of this vision of production, circulation, and application as the core mechanics of urban metabolism, the next three subsections review the critical geography literature of maps, ordinances, and landslide discourse and orient them toward urban metabolism. An important conclusion from these review sections is that these types of knowledge make urban metabolism possible in addition to being metabolized through urbanization. Thus, they are not merely tools that regulate the metabolism of *material* elements like water. Instead, they, as *immaterial* types of knowledge, are also metabolized subjects and objects of urbanization.

2.6.b Maps

The metabolism of maps as types of knowledge casts a catholic vision for critical cartographic research. The practice of mapping is a practice of producing selective representations of the landscape, understanding the consequences of how these representations

move in space and time, and interpreting the power relations of how maps are deployed for particular ends (see Winichakul 1997, Anderson 1991, Mitchell 2002). Scholars in critical cartography note that the representational practices of maps and mapping are types of knowledge replete with power relations, indicating that the production, circulation, and application of maps is always a partial and power-laden exercise.

As a subdiscipline that incorporates critical theory, map making, and map meaning, critical cartography is an attempt to link processes and practices of cartographic knowledge with power (Crampton and Krygier 2006, Harley 1989). Early examinations of the power relations of maps began with critical perspectives of gerrymandering (e.g., Morrill 1987, Owen and Grofman 1988), while recent numerous authors have elucidated a deconstruction of maps and cartography, detailing the power relations, problems of representation, and assumptions of truth that are part and parcel of cartography (e.g., King 1996, Pickles 1995, Wood 1992, Black 1997, Elwood 2010). Other scholars working at the intersection of political ecology and critical cartography have created maps in conjunction with and using information from traditionally marginalized groups (Colchester 2005, Poole 2005, Rocheleau 2005, Rocheleau 1995, Topatimasang 2005). Critical cartography informs not only a burgeoning body of academic research on the always already political situation of cartographers, but also the political practices of social movements that conscientiously and creatively map and remap territories.

The politics of maps and critical cartography literatures often operate at the intersection of power, the technology of the map, knowledge, and space. Geographers are well positioned to critically examine the map as a form of knowledge that creates known and unknown landscapes, valorizes and demeans particular knowledge, and affirms the social positions of those who are able to produce, circulate, and apply the maps. The critical cartography literature rightly notes that maps help to produce subjects of representations of nature, that they can subvert power relations, and that they function in the maintenance and creation of unequal and unjust political ecological conditions (Crampton and Krygier 2006, Harley 1990, Monmonier 1995, Wood 1992). It does this mostly by critiquing practices of cartographic knowledge production. I aim to expand this discussion in the context of the downslope hazard maps to include the circulation and application of cartographic knowledge.

Neither cartography as a scientific practice nor maps as scientific artifacts are widely discussed in beyond geography. There is some scholarship on the ontological and epistemological implications for planners using GIS (Lejano 2008), but most of the STS-inspired cartographic commentary is by geographers and, as Cidell (2008) notes, it focuses mostly on participatory GIS, countermapping, and other more inclusively democratic cartographic techniques. What is missing, though, is "discovering how members of the public critique cartography as based on existing maps rather than through the production of new ones (Cidell 2008). This 'lay critical cartography' ought to find its roots in STS scholarship because how the public interacts with maps is essential to understanding the production, circulation, and application of types of environmental knowledge. Similar work of scholars explores contemporary theories of representation, ranging from intentionally misleading information on maps to incorporating the sites of underrepresented groups in cartographic data. As del Casino Jr. and Hanna write: "Maps are thus not simply representations of particular contexts, places, and times. They are mobile subjects, infused with meaning through contested, complex, intertextual, and interrelated sets of socio-spatial practices." (del Casino Jr. and Hanna 2006).

They continue:

"Thinking about map spaces in this way means neither the production nor the consumption of maps is separable from space in the most mundane of settings. Maps that people simultaneously make and use mediate their experiences of space. People's bodily practices of walking, driving, touching, smelling, and gazing, as well as their understandings of landscapes and places can be guided and informed by maps and by the innumerable intertextual and experiential references always present in any map" (del Casino Jr. and Hanna 2006, 44).

2.6.c Law

Most county or municipal ordinances are hardly the stuff of eye-catching, controversial, last-minute negotiations over domestic legislative issues or international policy. At first blush, ordinances seem rather innocent, simple, and plain, written to address some of the most mundane and banal details of local communities: street lane striping, sewer grate replacement, sidewalk widths and curb heights, noise control, zoning variations, parking lot space requirements, lawn grass length standards. Unsurprisingly, the public meetings in which ordinances are passed have a reputation for being poorly attended and would likely receive very little popular attention if not for the occasional local reporter's persistence or enthusiastic community blogger. Because of their limited jurisdiction and because they address some of the more taken-for-granted facets of local government, ordinances are sometimes an afterthought, taking a backseat in terms of enthusiasm, passion, and publicity to state, national, and international politics.

Despite this reputation, municipal ordinances are quite significant for the production of the urban situations and settings of everyday life. Even more compellingly, county commission meetings and other similar gatherings can be quite contentious and emotionally explosive events at which political contestation is laid most bare. Despite this political significance and passionate advocacy, political ecology that examines the mundane and minute shifts in municipal planning ordinances is present but scarce (e.g., Robbins 2007, Heynen 2006, Pincetl 2006, Qvistrom 2012, Hurley and Walker 2004). Though these ordinances are some of the most common technologies and techniques of arranging human-environment interactions, much writing on technologies of governance pays closer attention to high-tech and cutting edge technologies. A different perspective, though, is had by paying close attention to the very banal details of ordinances, tracking their metabolism by considering their points of origin, paths of circulation, and purposes of application. This close attention insists on the relevance, merit, and even engaging qualities of local ordinances. Furthermore, the cumulative effect on establishing human/non-human relationships, the spatial and temporal patterns in their contents and use, and their political application are relevant to emerging literature in political ecology.

Goldman and Turner's production-circulation-application framework with the law, as with cartography, captures a the strengths of recent scholarship at the intersection of legal studies and geography. As Thompson and, later, critical legal theorists have noted, laws are a constitutive part of social relationships (Holder and Harrison 2002, Whatmore 2002, Blomley 2003, Haney-Lopez 1996, Unger 1983). As a form of knowledge, laws are metabolized—they are created, circulated by, and applied by particular institutions who look to leverage its power over legal subjects and to produce particular kinds of objects and subjects of knowledge.

Whatmore (2002) and others have explored intersections of STS and geographic scholarship on critical legal theory (see Holder and Harrison 2002). Both STS and critical legal theory are interested in how the law develops in relationship to other institutions and in particular geographic settings (Jasanoff 2009). As Holder and Harrison note, "the continuing contestation
by geographers of the nature-culture binary, now undertaken in conditions in which biotechnologies 'defy the routine purification of the world' into the categories of nature or culture, sees science and law working in tandem to create new networks and commodity chains that reconfigure what counts as 'persons' and 'things', the 'global' and the 'local''' (2009, 4-5).

Much of this emerging scholarship focuses on recent developments in the latest technologies and techniques, often related to genetics, medicine, or energy. While these empirical foci are worthwhile, other scholarship re-interrogates the more traditional ground of property, land, and local ordinances, asking questions about the techniques of banal, everyday governance (e.g., Mitchell 2002, Rice 2010). The ubiquity of legal techniques' constant work of creating legal subjects—for instance, even in parking lot spaces (Blomley 2003)—provocatively questions the taken-for-granted and assumed features of places, especially cities. Likewise, urbanization provokes many historically rural areas to consider adopting legal responses to their changing environmental, social, economic, and political conditions. Zoning, construction ordinances, redistricting, infrastructural growth, and other everyday legal inscriptions on the landscape of large cities are often provocative in rural areas unaccustomed to some of these *de rigueur* elements of urban life.

2.6.d Landslide Discourse

Human and non-human relationships are governed in part by how humans conceptualize, categorize, remember, perceive, and ignore landscape processes. Together, these actions and more comprise discourses about 'nature'—socially produced knowledge of the landscape that, like laws and maps, are selective, partial, and simplified versions that both represent and recreate

landscapes (for exurban discourses on nature, see Cadieux 2011, Cadieux and Taylor 2012). These discourses help to govern human-environment relationships by producing patterns of interaction with and understandings of these relationships.

Environmental politics at any scale in part consists of political actors making claims and arguments about the qualities of landscapes, bodies, and processes (Braun 2000). There is no necessary correspondence between what actors say about landscapes, bodies, or processes—to be sure, the lack of correspondence can be intentional and politically advantageous—but these environmental discourses are intimately bound up with exercising power through establishing human-nonhuman relationships (Rose 2006, 1999).

Many studies have highlighted these types of knowledge as means of political power, especially with respect to colonialist ambition (Scott 1998, Said 1979, Mitchell 2002, Braun 2002). Their emphasis usually decries western scientific knowledge as a tool for presumptively categorizing landscape features for purposes of state calculation and measurement. This colonialist impulse in studies of environmental rationalities is relevant for how science and governance are coproduced (Jasanoff 2006), but these discourse-dependent rationalities ought to be explored further in other settings where state rationality is not the primary driver of governance. This is even more pressing when state projects are progressive and offer the most just of all politically feasible options.

2.8 CONCLUSION

This chapter has detailed the relevance of the urban metabolism of knowledge for exurbia. Most of so-called 'first generation' UPE's empirical focus is in locations commonly thought of as 'cities,' yet its theoretical framework captures a broader array of places than only dense urban cores. This mismatch is a missed opportunity for research and for contributing to how we understand urbanization in the countryside. As I explain later, exurban studies also can offer tremendous nuance and insight into how uneven development is articulated in local contexts outside of cities. Furthermore, the exurban studies literature challenges UPE's materialist roots to broaden its theory and empirics, especially its current notion of urban metabolism.

The contribution of this framework is several fold. First, it contributes to an ongoing debate in UPE about the merits of synthesizing first generation materialist and second generation STS-inspired strains of UPE. Materialist UPE and STS-inspired UPE are two of the major streams of research in the larger field of inquiry of UPE and have struggled over how to understand relationship between 'things' and 'process'. This chapter offers my own contribution to the debate over the synthesis or segregation of materialist UPE with STS-inspired UPE. Secondly, it develops a framework for understanding exurbia not as rural restructuring but instead as a distinctly urban environment produced by via metabolic process. This draws UPE's attention toward exurbia, which has yet to be done. In other words, the instantiation of exurban environments is highly contingent on the interaction of capitalist production and accumulation strategies with the myriad other social relations and environmental processes in particular times and places. Long histories of uneven development are not simply stories of the movement, production, and accumulation of capital. Instead, uneven development is an abstract process whose local unfoldings are always cut through, altered, and mediated by myriad other social processes and practices. Finally, it pushes existing exurban studies literature to reconsider the

current framing of exurbia, currently using the language of *growth*, to a new framing in the language of *crisis*. The post-2008 financial crisis years have cast doubt on the political ecological futures of many spatial formations, but exurbia's experience of the post-2008 years is both underexplored and unique among other urban formations.

I articulate a framework that moves to theoretically establish the grounds for exurban political ecology. My examination of what I call for convenience's sake 'exurban studies' shows that both exurban studies and UPE can complement one another in a more robust way than is currently expressed in either literature. Exurban studies understands well some of the ecological consequences of exurban growth, the ideologies of nature of amenity migrants, and economic transitions from agricultural to residential construction, but largely misses out on a thorough understanding of uneven development. In particular, notions of *growth* permeate the breadth of the exurban studies literature, leaving the uneven development-themed question and consequences of *crisis* unexamined. Given how deeply unsettling the post-2008 financial crisis was for exurbanizing communities, UPE's tradition of understanding uneven development stands to make a timely complement to exurban studies.

Conversely, while some of the political economy-oriented UPE literature has internalized the logics of uneven development and intentionally exposes the crises of urbanization, it leaves unexamined the implications of exurbanization so central to the exurban studies literature. This is a problem because exurban growth represents one major trend of urban futures not only in the US, but in many other places globally. Reports from the global South, and to a lesser degree, the global North, show megacities burgeoning with migrants from the adjacent countryside, the countryside, too, is increasingly drawn into urban patterns of capital accumulation, especially infrastructural growth, speculative land and housing markets, and changes to urban metabolic patterns. UPE offers insightful and necessary theory to understanding exurbia not as a place of transformed rurality or of perpetual growth, but instead as a frontier of urbanization, a spatial formation experiencing urban crises as an urban place in its own right.

CHAPTER 3

METHODOLOGY

3.1 TRACKING

Sarah Whatmore (2002, 213), in her work at the intersection of legal geography and STS, describes a methodological impulse that explores the social life and power of particular types of knowledge, ultimately imploring scholars to follow things closely:

...in terms of exploring innovative methodologies that track the power of law (like science) through the effacement of its own practices—the assemblage of particular interpretative communities; the reification of particular words and phrases; the sedimentation of precedents and protocols in technologies of documentation and record; the rituals of professional training, hierarchies, and divisions of labour, all of which are vulnerable to critical scrutiny only if one can get up close...

Like Thompson (1979) in *Whigs and Hunters*, Whatmore is not interested in reproducing a smooth narrative of power relations that enlists the law as a mask for power. Instead, by following the law, or other types of knowledge, Thompson and Whatmore insist on a line of scholarly inquiry that seriously considers types of knowledge whose metabolism is imbued into the expression of power relations. I harness the approach of Whatmore and Thompson in this chapter, detailing a methodological framework to track how different types of environmental knowledge are metabolized through exurban crisis in southern Appalachia, as evidenced by the changing objects and subjects of environmental knowledge.

In chapter two, I draw upon a juncture of STS, UPE, and political ecology literature for the theoretical undergirding of the project. One core argument of that chapter was that urban metabolism, as a motor for producing unevenly developed landscapes, has production, circulation, and application as its internal mechanics. This triad of production, circulation, and application relies strongly on an emerging STS-political ecology framework. Though this theoretical juncture is relatively underexplored in the literature, the methodological side of the juncture is even less explored. The lack of much explicit methodological explanation in jointly inspired STS and UPE scholarship is somewhat surprising given the methodological richness and diversity in both traditions. My goal in this chapter is to offer one way forward at this potentially fruitful intersection.

The central question of this chapter, then, is: how can a researcher methodologically account for the changing objects and subjects of environmental knowledge as they are produced through urban metabolism? The chapter addresses this question in three sections. First, I present a structured review of a threefold gap in the methodological trends of UPE-STS scholarship. Secondly, I frame a multi-method approach in the tradition of the extended case method, reliant primarily on ethnographic and archival investigation alongside supporting GIS techniques and economic data, to frame UPE-STS research. Lastly, I more concretely recount my research experiences in Macon County.

All three of these subsections serve as this project's methodological explanation further explaining Whatmore's methodological impulse, as I use her term 'tracking' as the core methodological concept within an extended case study framework. Tracking is a highly ethnographic and archival in nature, looking to watch how discourses, texts, knowledges, and artifacts organize and constitute scientific, legal, and other social practices. It is inspired by the more-than-human approaches embraced by Stengers, Latour, and other scholars of science studies that aim to uncover the agential differences and powers of humans and non-humans (see Whatmore 2003), though my goal here is to begin with the assumption of agential difference and instead use the idea of tracking to understand how, to what ends, and to what conclusions environmental knowledge is produced, circulated, and applied in the moment of crisis during long-term patterns of uneven development. This approach necessarily assumes that the forms of knowledge have some kind of agential power insofar as they can limit, delimit, enhance, and hinder social relations. By tracking the social lives of forms of knowledge, I show how they move through urban circuits of metabolism, noting how they create their own objects and subjects and how they become objects and subjects of urbanization.

3.2 THREE-FOLD GAP

The methodological gap at the intersection of UPE and STS is at least threefold: 1) most UPE-STS scholarship methodologically considers only one piece of the production-circulation-application nexus rather than tracking a form of knowledge through all three; 2) the small body of explicit methods scholarship strongly prefers either UPE or STS methods over the other, resulting in an uneven coupling of thoroughly integrated theory with decidedly segregated methods; and 3) most UPE-STS scholarship addresses questions of method implicitly rather than explicitly. To address this gap, I offer in this chapter one suggestion explicitly detailing the methodological implications of the metabolism of environmental knowledge. While some scholars (e.g., Goldman et al. 2011) have discussed only singular aspects of metabolism— production *or* circulation *or* application —the methodological contribution of this project is a more complete tracking of the metabolism of environmental knowledge, thereby following a

particular form through part of its socio-natural life and untangling its implications for uneven development along the way.

3.2.a Examining only one phase

One methodological tendency of UPE-STS scholarship is to only examine a form of environmental knowledge through one part of its metabolism—production, circulation, *or* application. Scholarship addressing the production and 'social construction' of scientific or environmental knowledge is especially common, but research on the circulation and application of knowledge are somewhat prevalent in the literature, too (Haraway 1988, Mitchell 2002). Though these authors' projects did not set out to examine more than one phase of production, circulation, or application, there is something added by examining all three in a single narrative.

By insisting on tracking the production, circulation, and the application as moments within the metabolic process, a few things become clearer. First, we gain clarity concerning the temporal character of production, circulation, and application. Types of knowledge are produced, circulated, and applied in different ways based in part on contemporaneous concerns, events, anxieties, and opportunities that would not occur at other times. By only focusing on production, for instance, the conditions under which the knowledge was produced may or may not be constant or even relevant for its circulation and application. Thus, tracking through all three further illuminates the temporal contingencies of the life course of environmental knowledge. Second, we gain further clarity concerning the spatial characteristics of environmental knowledge. For uneven development, this is especially important because, as this dissertation argues, the spatial unevenness of capitalist development is bound up with locally articulated types of environmental knowledge. Understanding the places of origin, the paths of circulation, and the sites of application of a single form of environmental knowledge complicates the narrative of smooth movements of knowledge across space while highlighting the spatial particularities of types of environmental knowledge. Lastly, as Goldman and Turner (2011) note, the processes of production, circulation, and circulation are impossibly intertwined. Artificially separating one of them from the others necessarily obscures how one of the three is implicated in the unfolding of the other two. While any analysis that relies on even naming them separately is somewhat guilty of artificially separating them, keeping the three together as much as possible would preserve their integrity to a greater degree.

3.2.b Implicit Methods

The second methodological tendency of UPE-STS scholarship is that its methods are often not made explicit. There are some exceptions to this (see Guy and Karvonen 2011), but much of the literature has seized on the UPE-STS juncture as a moment of theoretical innovation only. This presents a problem because what researchers actually do is as important as what they think. By not making explicit their methods, especially at a relatively new intersection of scholarship, scholars assume that standard disciplinary approaches to research questions are sufficient for cross-disciplinary questions.

The need for explicit methods is especially true when addressing environmental knowledge. Some scholars who consider environmental knowledge draw from an understated Foucauldian archaeological/genealogical methodology (e.g., Braun 2002) and are not expressly interested in the UPE-STS intersection. Others, though, are theoretically integrated at the

intersection of UPE-STS, but their methods are understated (e.g., Furlong 2010, Hommels 2005) and still others are rooted in Latourian ethnomethodology (Latour 1988, Garfinkel 2002). This is true, too, for the production-circulation-application framework that Goldman and Turner (2011) articulate, as their theoretical framework is not complemented by a similarly ambitious and integrated methodological approach. They hint that their framework is left open to methodological interpretation by the authors in their edited collection, but thorough methodological explanation is mostly missing from these authors' contributions.

3.2.c Unsurprising Empirics

Finally, some UPE and STS research approaches assume a normative empirical destination, meaning that there is an expected suite of empirical discoveries particular methods and traditions ought to make. One relevant example is that some STS research is explicitly designed to establish the empirical existence of non-human agency (e.g., Latour 2005, Bennett 2009). Rather than continuing to 'discover' this finding, the methods characterizing UPE-STS approaches should begin rather than end with the ontological notion that things matter in broader processual contexts of political economy and ecology. Socio-technical methodological approaches can inexorably lead the researcher to 'discover' what their Latourian/ANT theoretical framework has already confirmed: that non-human actants have some kind of agency. The ontological question of non-human agency is still an interesting and controversial claim in many scholarly arenas, but the assertion of non-human agency as a conclusion is neither interesting nor controversial at the intersection of UPE and STS. This is not to say that issues of non-human agency have been settled—to be sure, this is certainly not the case—but rather that UPE-STS

scholarship should begin with a notion that to some varying degrees *things matter*, rather than unsurprisingly arriving at that same conclusion. Here is another relevant example with particular respect to the UPE tradition: scholarship ought to assume, rather than 'discover,' divergent knowledge claims about nature and society. Discovering these claims was once groundbreaking, but asserting and reasserting their existence as a conclusion rather than an introduction is to unsurprisingly arrive at the normative empirical destination of the subdiscipline.

Similarly, Holifield (2009, 653) notes that Marxist UPE struggles to provide empirical surprise by focusing too intently on "stripping away diversions and unearthing deep societal causes of socioenvironmental justice....This is, in effect, a reiteration of an older argument that critical approaches of this kind 'can never fail to be right'." Holifield and Latour locate these empirical doldrums in the impulse of critical political economic scholarship, including much of UPE, to target fetishes and trace their foundation to materialist social relations. While Holifield's and Latour's observation of rehashed empirical findings is undoubtedly correct on some level, their own brand of ANT scholarship is also subject to similar criticism: that ANT too routinely sets out to show non-human agency its accounts. In other words, both theoretical paradigms are subject to repeating their favored collection of associated empirical findings.

Toward avoiding this repetition, I begin with these conclusions of STS and UPE—that things matter, that divergent knowledge claims exist, and that capitalist uneven development is a part of exurban development—as a theoretical *and* a methodological orientation. The more pressing question at the intersection of UPE and STS is to what degree these three claims matter to urban environmental futures. Making the decision to track types of environmental knowledge, or other artifacts and objects, through their production, circulation, and application, assents to the ontological significance of these things in the midst of their processual social lives, as well as to the existence of divergent types of knowledge. By making these choices, scholarship can refuse to simply empirically reconfirm the existence of Latourian/ANT agency in things, that particular types of knowledge are embroiled in politics, or that capital produces unevenly developed landscapes. Instead, it opens up from the inside the processes central to political economy and ecology, precisely by focusing on types of knowledge constitutive of these very processes of urbanization.

3.3 A MULTI-METHOD APPROACH

The purpose of the dissertation is to understand how exurban environmental knowledge is metabolized through uneven development in the post-2008 years. In particular, I investigated the production, circulation, and application of particular types of exurban environmental knowledge. Any single research technique would not have been sufficient to accomplish this purpose, so I relied on a four part methodology, which together constitute an expanded version of Burawoy's extended case method. The extended case method, as Burawoy (1998) describes it, takes advantage of the researcher's situated and reflexive ethnographic condition, "extract[ing] the general from the unique, to move from the 'micro' to the 'macro,' and to connect the present to the past in anticipation of the future, all by building on preexisting theory" (5). Ultimately, the extended case method seeks "to locate everyday life in its extralocal and historical context" (Burawoy 1998, 1), employing participant observation to understand the global and historical significance and consequences of local, idiosyncratic, and banal circumstances. For this project, the 'micro' is the steep slope ordinance battle in Macon County and the 'macro' is broader global

themes of the politics of environmental knowledge and the ongoing urban consequences of the 2008 financial crisis.

Though the extended case method is limited in Burawoy's description to participant observation, as I describe it here it has several strengths, including its question driven approach; openness to empirical surprise; illumination of logics, histories and trajectories that Thompson and Whatmore highlight; capacity for political critique; and ability to sketch the relevant power relations related to types of environmental knowledge. Bennett's work (xiv, 2010) on the "political ecology of things" describes a wide-ranging methodology that draws from a vital materialist tradition:

...my contention is that there is also public value in following the scent of a nonhuman, thingly power, the material agency of natural bodies and technological artifacts. Here I mean "to follow" in the sense in which Jacques Derrida develops it in the context of his meditation on animals. Derrida points to the intimacy between being and following: to be (anything, anyone) is always to be following (something, someone), always to be in response to call from something, however nonhuman it may be.

The implication here is that by following things, a researcher is actually investigating an essence of what it means for anything or anyone to exist. This meshes nicely with an understanding of metabolism as a fundamental condition of urbanization in so far as an investigation into metabolism ought to imply a following of the endless combination of material and immaterial elements of urban metabolism. Thus we see in this methodological impulse of following or tracking an insistence on understanding that the subjects and objects of any social relationship are highly dynamic and

There are some significant limitations, too. First, the narrative is susceptible to the same blind spots and inabilities of the researcher. Thus, my research is in large part a reflection of my position as a researcher involved in the metabolic production, circulation, and application of knowledge in my study site. This is different from some epistemologically realist positions in which where the researcher's subjectivity is understood to only cloud the objective reality about knowledge (e.g., Sayer 1984). Instead, along with the extended case method, I argue that I as a researcher am always and already implicated in the production, circulation, and application of types of environmental knowledge, even in ways I am able and unable to recognize. Indeed, the act of researching a form of knowledge might constitute a considerable part of that form's circulation. The researcher, then, ought to be explicit about their positionality in the circuits of production, circulation, and application rather than simply admitting to the relative unknowability of their research subject.

I consulted a wide range of sources for my data, drawing on an ethnographic suite of observation, interviews, and archival research (see Table 3.1). This included, but was not limited to one-on-one interviews, group interviews, academic articles, newspaper articles, letters to the editor, websites, and newspaper archives. Making these sources relate with one another, though, is the task of the following three chapters. My research methodology uses a variety of sources to track how types of environmental knowledge are produced, circulated, and applied, but also how to understand this triad in time and place (Yin 2003). Triangulation compares and contrasts a variety of sources in order to avoid relying too heavily or not enough on particular sources. By juxtaposing the sources, the researcher can notice prevalent themes across sources and interesting or persistent gaps that may appear in other sources. Triangulation is important for this project because of the variety of types of environmental knowledge, including maps, laws, and discourse.

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Table 3.1. Methods/Techniques and Notes

Method/Technique	Notes
Archives	Collected and analyzed 306 documents, not including webpages of MaconSense, Property Owners of America, and Stop Steep Slope.
	A sample of these documents include:
	Articles and other features from <i>The Franklin Press, The Asheville Citizen</i> <i>Times, Smoky Mountain News, Macon County News, Sarasota Herald-</i> <i>Tribune, and The New York Times</i> dated 2004-present
	Historical photographs of past flooding, landslides, and landscape events
	FEMA disaster claim documents, home owner insurance documents, State of North Carolina disaster claim documents
	Macon County Planning Board meeting minutes
	North Carolina Geological Survey landslide hazard maps and descriptions of data collected
	Publicly available legal case files from lawsuits involving Macon Bank, Ultima Carolina LLC, and private homeowners in Wildflower
Observation	Observed and participant observed at 10 public meetings. These include attending CLP translational dialogues, steep slope subcommittee and planning board meetings, and meetings of local environmental advocacy groups like SAMAB (Southern Appalachia Man and the Biosphere) and MaconSense.
Interviews	Conducted 22 semi-structured interviews of property owners, real estate developers, business owners, steep slope subcommittee members, a Coweeta Hydrologic Lab employee, an NCGS employes, Macon County planning department and other government employees, planning board members, road construction contractors, an environmental consultant, and MaconSense members.
GIS Maps and Tax	Used the NCGS maps in ArcGIS combined with the publicly available
Data	geo-referenced version of the Macon County property tax database to assess rates of second home ownership in landslide prone areas

I used observation because of its ability to reveal conversations, personal relationships, discrepancies between words and deeds, and the ability to see groups of people working and speaking together (Herbert 2000, Bordieu, 2002, Hoggart et al. 2002, Lichterman 2002). Because "so much depends on context" (Cook 2005), observing the steep slope controversy in the meetings where it was publicly debated was necessary and invaluable data. I paid careful attention to who did and did not speak as well as what was said and unsaid because these are the fine details of the particular ways knowledge is produced, circulated, and applied.

I used interviews because they can inform and improve data gathered through observation, allowing individuals to express their opinions, thoughts, and experiences in a way not often afforded to them in public settings of observation (Valentine 1997). Observing at public meetings offered an incomplete picture of the political dynamics of the county. The meeting's agenda and format often restricted attendees' ability to express themselves more fully, so interviews were necessary to understand some of the rationales, comments, proposals, clashes, and other regular features of the meetings.

I used archival documents because they offer a record of past events that would otherwise be inaccessible, they offer additional triangulation that is impossible to garner other ways, and they add invaluable perspective and data regarding present circumstances (Garraghan 1946, Gottschalk 1950, Howell and Prevenier 2001). I wanted to understand how Maconians developed a way to talk and think about landslides, especially after Peeks Creek. Because landslides are a long-term feature of the southern Appalachian landscape, turning to archival sources was one of the only options for recovering the ways Maconians considered events like Peeks Creek. I approached the archival documents looking for the language Maconians used to produce, circulate, and apply different classifications, descriptions, and assessments of landslides as processes of the landscape. The archival sources also served to establish a timeline of relevant events in the county and region.

All of these techniques were designed to illuminate the metabolism of environmental knowledge—how it was produced, circulated, and applied during the steep slope ordinance debate. The questions below (Table 3.2) are not exhaustive, but they are a good start to understanding the metabolic production, circulation, and application of knowledge. Answering them begins to give shape to the production, circulation, and application nexus. Several research techniques can answer these questions, including observation, participatory observation, interviews, archival research, and perhaps more. These techniques are often used in other research methods, like critical discourse analysis, narrative analysis, textual analysis, and others. The key difference with an ethnographic approach however, is the type of question and answer the researcher seeks, insofar as I was interested in more than just the changes of discursive formations, how research subjects' narratives make sense of the world, or subtextual themes as ends in themselves. Instead, my approach constructs a critical narrative of production, circulation, and application of environmental knowledge they participate in exurbanization. In this sense, I draw on the explanatory traditions and narrative style present throughout much of the political ecology literature while maintaining an STS-inspired focus on particular types of knowledge.

Theme	Question
Historical schematic information about the	Who produced, circulated, and applied the knowledge? Who did not?
form of knowledge	Where did and did not the form of knowledge originate? Where did and did it not circulate? Where was it and was it not applied?
State and civil society interests in the knowledge	What were the political rationales for the form's production, circulation and application?
	What does the production, circulation, and application of the form of knowledge make legible and illegible? How does the form of knowledge order the content of knowledge?
Experts and expertise	What kinds of expertise were required for the form's production, circulation, and application?
	What were the means and mechanisms of the form's production, circulation, and application?
Historical and geographic context	What were the contemporary economic, political, urban, societal (and other relevant categories) conditions for the form's production, circulation, and application?

Table 3.2. General Questions Relevant for Urban Metabolism of Knowledge

Constructing a critical narrative is a highly interpretive approach dependent on the sources, places, and people to which the researcher has access. Furthermore, the researcher should recognize their sometimes instrumental role in the circuits of production, circulation, and application. Far from separated from the movements of environmental knowledge, the insights about positionality from feminist scholarship rather implicates the researcher in these processes (e.g., Haraway 1988; Rose 1997; England 1994; Merriam et al. 2001). Any account of types of environmental knowledge, then, must also address the researcher's role in participating in these types of knowledge in the circuits of production, circulation, and application.

3.4 RECOUNTING MY EXPERIENCES

Individual research processes and experiences almost always vary from idealized research hopes and expectations. My experience is no exception; indeed, like most research projects, my methodological experience in researching and writing a dissertation did not follow an ideal path or my initial plan. In this section of the chapter, I recount my research experience and how I attempted to research and write about the urban metabolism of particular types of environmental knowledge in Macon County¹.

3.4.a The Coweeta LTER and Coweeta Listening Project

The Coweeta LTER (coweeta.uga.edu) is a National Science Foundation-funded project comprising dozens of researchers and students stationed at thirteen universities and colleges, though most of the personnel are stationed at the University of Georgia. It is part of a national network of LTER sites, of which it was one of the original six sites established in 1980, and its ties also extend to a growing international LTER network. While the themes of Coweeta LTER research can change after its funding renewal every six years, its past, present, and future research emphasize place-based, long-term, and integrative ecological science in southern Appalachia. Coweeta LTER also has a formal and working relationship with the USDA US Forest Service's Coweeta Hydrologic Lab, situated in Otto, North Carolina. The Coweeta Hydrologic Lab has existed in Otto for nearly 80 years and holds decades-long records of ecological variables in several USFS watersheds on the Coweeta Lab property.

¹ My research is approved under the University of Georgia's Institutional Review Board, number 2012-10230-1.

While writing and researching my dissertation, I worked as a research assistant for group of social science scholars at the Coweeta LTER collectively known as the Coweeta Listening Project (CLP). This research assistantship was vitally important for this dissertation's research, mainly because it provided me with contacts, regular trips to Macon County, a broader knowledge of community issues and concerns, and frequent engagements with community members. This invaluable ethnographic data would have been impossible to reproduce without the CLP.

The CLP aims to rework the traditional community-science power relations that privilege the scientist, scientific knowledge, and typical scientific methodology in favor of a more democratic, equal, citizen oriented approach to understanding scientific research and problems (Bidwell 2009, Funtowicz and Ravetz 1993, Hamlin 2008, Harding 2008, Ottinger 2010). The CLP meets with civil society groups, local environmental NGOs and governmental officials on relevant political ecological issues like water quality, water quantity, Hemlock tree disease, climate change, and land use change. Additionally, the CLP is co-authoring bi-monthly newspaper articles, for instance, as a way for ecological science on relevant local issues to be published in an accessible and interactive format.

Working as a member of the CLP has provided me with a way to interface with Macon County residents, expanding not only my contacts in Macon County, but also the potential usefulness of my work and the work of the CLP. My research provides some insight to the hurdles to translation and facilitation that inhibit scientist-community relationships in southern Appalachia. Additionally, by exploring the steep slope ordinance debate, it helps to ground an emerging focus in the CLP on environmental governance. Finally, the contacts, interviews, and

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archival documents I accumulate will be deposited into the CLP archive according to IRB procedures in order to build an archive of local environmental concerns and contributions by CLP and LTER scientists. Similarly, my research has also benefited from the continuously growing media archives of the CLP, which includes issues of local newspapers, correspondence with local residents, and interviews with scientists and non-scientists.

3.4.b Archival Sources

The main archival sources I used were public meeting minutes, websites, and newspapers. The websites were mostly political in nature, either established by political groups or local politicians in western North Carolina. The newspaper archival sources were usually local and included The *Smoky Mountain News* and *The Franklin Press*, but occasional other nonlocal newspaper sources proved to be necessary. Their websites, too, were valuable sources of information. The public meeting minutes, mostly from planning board and steep slope subcommittee meetings, were taken from the Macon County website.

These sources were important for me for several reasons. First, because there was an organized attempt on behalf of some Maconians to not respond to my interview requests, the websites established and operated by some of these non-responders were instrumental in understanding their position on steep slope issues, local politics, and their relationship to state and national politics. Furthermore, because their voices were so vocal in public meetings, websites, and letters to the editor in several papers, I was able to bring their perspectives into my research despite their unresponsiveness. Secondly, reading newspapers from these towns showed that much of the journalism in this region is done on local issues rather than state or

national topics. This included the political commentaries, letters to the editor, and editorial board comments. Even the sports, business, and culture sections are oriented toward county and town events. Because the steep slope debate dominated the county's political activity from 2009 onward, there seemed to be a comment, article, or letter at least weekly about the steep slope ordinance or planning issues in the papers.

3.4.c Observation

I engaged in observation at member meetings of MaconSense, township meetings, planning board meetings, steep slope subcommittee meetings, and invited presentations by the Coweeta Listening Project. This observation was helpful because it was often the very moments of production, circulation, and application I sought to understand. Some of these meetings invited more participation than others. I was a participant observer during some of the Coweeta Listening Project meetings in Macon County, but my participation at public meetings was very basic. It consisted of the kind of participation most Maconians would do—simply showing up to observe, contribute to and eat the potluck offerings, talk with other people, and perhaps make a comment. I did not comment at public governmental meetings because public comments were often restricted to residents of Macon County or to residents of the township in which the meeting was held. Other times, I strictly observed; for instance, I did not participate in the MaconSense meetings, but instead observed and conversed with some people after meetings.

With simple and participant observation, I was able to witness several important conditions that regulated and mediated the production, circulation, and application processes that characterized the steep slope debate. First, I was able to notice the socially obvious tension and anxiety that the steep slope ordinance debate had created. Discussing the steep slope issue nearly always elicited some kind of collective anxious responses, whether it was anger at the opposition, frustration with the pace of the ordinance process, nervousness about future landslides, or fear for property values and land rights. The very personal politics of the issue did not help ease these tensions, either. Political support or opposition of the issue created divisions within families and groups of friends. Maconians—especially those who had grown up in the county and were politically active—tended to know quite a bit about eachother's opinions and politics. This made the divides even more bitter. Indeed, several Maconians publicly expressed dismay and disbelief at how acerbic the community's public discourse had become. For all of the academic and dispassionate analyses of the confluence of crisis-like conditions in this dissertation and in the news media, the deeply emotional and relational toll of crisis on Maconians was a sobering reminder of the difficult lived experiences on all sides of the steep slope issue.

3.4.d Interviews

Interviews were helpful because my interviewees' response provided factual and interpretive information about the maps, ordinance, and landslide discourses (see Table 3.3). For the conditions of my interviews, I guaranteed that my interviewees' names and identifying information would not appear in this text. Any names I have attributed to interviewees are pseudonyms and in the citations, I have given them generic monikers. I interviewed a range of people, including but not limited to second home purchasers/owners, developers, realtors, GIS office workers, steep slope subcommittee members, county planning board members, the county

planner, NCGS cartographer(s), and road construction contractors. In my interviews, I looked for etic-related themes, but the questions and tone of the interviews were that emic-related themes were able to develop during the interviews (Yin 2003). Open-ended interviews are designed to allow for flexibility in pursuing etic themes, while also allowing for the flexibility of emic themes to surface. I conducted the interviews at locations most convenient and comfortable for the interviewee. In some instances, this was over the phone.

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Theme	Explanation
Relevant vocations and/or community activities, including political work	These questions sought to reveal the networks, associations, passions, political leanings, and other individual characteristics of the research subjects. I wanted to understand how subjects' everyday lives are entwined with their social and political beliefs.
Personal stake in regulation	These questions established a political economic positionality of my subjects in the debate. Their financial stake in the adoption or non-adoption of laws related to steep slope is relevant because of the cultural and economic cachet that homeownership, especially second home ownership, holds for many Americans.
Understanding of the expertise, science, and techniques used to produce the knowledge	These questions formed an understanding of how Macon County residents understand science, technology, and the roles of experts in the shaping of the social and ecological conditions of their lives. I explored how subjects contest, affirm, or ignore expertise and technology in their lives and whether skepticism on other topics (e.g., 'the government') impacts their attitude toward environmental knowledge.
Perspectives on how interviewees' positions on regulation in Macon County are related to regional and national political movements	Given the complex multi-scalar nature of political beliefs, I attempted to connect subjects' perspectives about local issues to regional and national issues, too. For example, the Tea Party has a strong national identity, but its membership is driven by associations at the local level. I was interested in how local issues are framed in national concerns and vice versa.
Interpretations of how the regulation, despite only affecting Macon County, is related to non- local flows of capital and people	These questions interrogated how residents of Macon County conceive of non-local second home owners and the recent rapid inmigration of people and capital to the region. I expanded on what kinds of mental connections exist for local residents, if any, between ecological change, capital flows, human migration, and government regulation.

3.4.e Positionality

One interviewee, a Maconian and a supporter of the steep slope ordinance, asked about my success in getting interviews. I told him that at the time I had mixed successes—that some people were enthusiastic about speaking with me and others were much more reticent. He said that did not surprise him given what his long-term experience living in the county and made a passing comment that one reason I might have difficulties is because I "look liberal." I replied with a puzzled smile and asked why, but he had already changed topics of conversation. His comment surprised me for two reasons. First, I am unaware of what exactly makes a person appear politically liberal or conservative. Secondly, I intentionally dress in a business-casual, and stylistically conservative manner for my interviews: a tucked-in collared dress shirt; cleanshaven face; dark rimmed glasses; dark brown leather shoes recently polished; and basic professional style pants. My haircut is typically short and I have a cloth messenger-style bag in which I carry my papers, notebook, and other supplies. I dress like this mostly because my interviewees are professionals or retirees and the locations of my interviews were often at offices or in private homes. From my perspective, none of these personal clothing items are coded necessarily as politically liberal or conservative. It could be that this person is alone in his assessment of my liberal-looking appearance, but my best guess is that if one interviewee is thinking it, some others are, too. When I relayed this story to some of my colleagues, I received a range of reactions. Most people laughed. I found it humorous, too. Some thought for sure my dark rimmed glasses made me look liberal; others guessed the interviewee was able to tell my political affiliation through our conversation and then projected it onto my physical appearance. Perhaps both and more possibilities are true.

As time has passed, though, this interviewee's comment has given me pause to consider more seriously the research process, and in particular, the degree to which researchers are embedded in the circuits of production, circulation, and application of environmental knowledge. My typical thoughts about positionality are that it is mostly a stable category, not in an *a priori* sense, but that the more or less standard considerations of one's race, class, and gender comprise the majority of one's positionality (Rose 1997, Herod 1999, Mullings 1999, England 1994, Kobayashi 1994). While I think it is true that race, class, and gender are foundational to positionality, I found that there is a dynamic, particular, and surprising geography to my positionality, too. Where I am, who I am interacting with, and what research activities I am doing at the time matter immensely in my positionality and confound the standardness of my racialized, class-based, and gendered social position in circuits of production, circulation and application of environmental knowledge.

My liberal appearance reported by this interviewee shows that understanding positionality is not something that can simply be checked off of a research methodology list. Neither is it a static condition, nor is it a perfunctory recognition of the valid poststructural observation that the researcher's experiences, thoughts, habits, and training matter as constitutive parts of the research and writing process. Instead, understanding our positionality is a discovery, an on-going process, showing us researchers our embodied, deeply fraught, and limited perspectives.

My positionality, of course, extends beyond my politically liberal appearance. While I did not anticipate my appearance to be part of my positionality in this way, I did anticipate the significance of some other parts of positionality. I am a white, relatively young married father

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who is not local or Appalachian. I mention these first because of the demographics of Macon County and because of their significance in my interviews. My interviewees tended to be middle-aged and older, mostly male and all were white. Macon County as a whole, too, tends to be older, very white, and socially conservative.

The political offices in Macon County are largely held by men, including those on the County Commission, Planning Board, and on the Steep Slope Subcommittee, though there have been a few politically involved female office holders. My sex was never explicitly discussed and there is not much coded language in my interviews that would suggest that my race or sex or gender was significant to my interviewees. This does not mean that gender considerations had absolutely no bearing on access or quality of interviews, but only that it does not clearly appear in the transcripts, in my memory, or in my notes. At public meetings, the vast majority of participants in the public comment sessions were men. Furthermore, some of the public meetings had potlucks ahead of the meeting and were thus held at a community hall outfitted with a kitchen. At these meetings, it was very common to see many of the women preparing, arranging, and serving the food and drinks. Many of the men would be speaking together outside of the kitchen, usually making small talk about the topics of the upcoming meeting, sports events, or the weather. During the meetings, almost all of the public speakers were men, though the attendees did not seem surprised if a woman rose to speak.

On the other hand, fellow Coweeta Listening Project graduate student, who is female, reported to me that despite reading about gender-limited and sex-limited access to interviewees in the Appalachian, exurban, and rural studies literature, she did not experience the amount of gender- and sex-based restrictions that she anticipated. Additionally, even though the official political positions in Macon County are dominated by men, the politically involved women I interviewed claimed that they had received little discriminatory treatment. They said their experience in Macon County politics was that most men did not anticipate women to be involved in politics, but that a motivated woman could, with more persistence, participate equally in county politics. Sex and gender issues, then, are likely significant for researchers and politically active Maconians. A project devoted to understanding gendered politics in southern Appalachia would certainly be more fruitful in describing and analyzing these exclusions and inclusions.

Most of the white privilege literature addresses the differential access to resources (in my case, interviewees and other sources for research) between whites and nonwhites. For researchers, the methodological assumption is that racial differentiation between interviewer and interviewee often produces different interview responses. It is difficult to address my racialized position in southern Appalachia because I am white, most of my CLP colleagues are white, and most Maconians are white, too. Based on previous research I have done and based on some examples in the qualitative methodology literature, I am sure my race likely affected the access to interviews and the qualities of my interviewees' responses. To what degree race impacted it, I do not know. What is clear, though, is that race is a major blindspot in exurban studies. While some work (e.g., Benjamin 2009) has unpacked the racialized migration to exurbs and other places, critical scholarly work on race in exurbia is sorely lacking. The racialized motives of white exurbanites, the exurban lives and histories of racial minorities who are long-time residents, and the racialized labor force that makes possible exurban residential construction are all obvious ways that race and exurbia intersect. For now, though, these issues remain largely unexplored theoretically, methodologically, and empirically.

My age and family status was significant during my research. I found that some interviewees became more comfortable talking with me knowing that I had a family. Interviewees enjoyed knowing more about my family and spoke with pride about their strong family ties. My family and married status lent me credibility and I needed some not only because I was a new acquaintance to most of my interviewees, but also because I am neither local nor Appalachian.

Appalachia's negative stereotype is a place of backwards, uncultured, and ignorant people. As with most stereotypes, this one is not only false, but it also is a myth that serves to establish and maintain inequality. Nevertheless, as in many communities, outsiders are sometimes viewed with skepticism and suspicion until trust is established. Many interviewees were suspicious of me when answered them that I was not only from out of state, but also raised in the suburban northern US. In several interviews, one of my more promising tactics at allaying this suspicion was mentioning that I knew northerners in the US are often haughty in their appraisal of US southern culture and history, despite the fact that segregation and other social ills are more prevalent and entrenched in northern states than southern states. I learned to pick up on the need for this kind of self-explanation when a few of my archival and interview sources referred to out-of-state migrants to Macon County as "foreigners," "flat-landers," and "goddamned Yankee half-backers." "Half-backer" is a southern Appalachian pejorative referring to non-local residents. In particular, it typically refers to northerners, who, after moving to Florida or other Southern states and not being able to handle the hot and humid climate, moved "halfway back" north, settling in Macon County and other places in southern Appalachia because of its relatively warmer winters and cooler summers. Similarly, "flat-lander" refers to residents from

non-mountainous locations. It has a unique reference to the residential construction industry when builders from topographically flat areas attempt to build in the mountains. The interviews with these kinds of discussions were with some generational land holders in Macon County. More frequently, though, my interviewees displayed no obvious preference as to my positionality, though I am confident that a native Appalachian or a native Maconian would have received somewhat different responses to similar lines of questioning.

3.4.f Organized Non-Participation

The other part of my positionality has to do with my university affiliation. As I discuss in other chapters, the Coweeta LTER and Lab as institutions of expertise and knowledge production are bound up in circuits of knowledge production, circulation, and application in Macon County. This is especially true in the case of landslide discourse, the NCGS maps, and the steep slope ordinance. Being a member of these institutions, and certainly as a university-affiliated member, undoubtedly had an impact on my research.

My status as a University of Georgia graduate student ended up having one of two reactions when I solicited interviews. The first reaction was generally positive. Most interviewees were interested in what I studied, what my personal background was, or had plenty of indirectly related questions for me about the Coweeta Hydrologic Lab, the Coweeta LTER, and the academic department and discipline in which I work. When asked about the reputation of Coweeta LTER and Lab in the area, two Maconians who I would trust to give an honest assessment said this in an interview:

Interviewee Y: ... I was just going to say that Coweeta has a long history here, 75 years last year, and I think they have a very positive image in the community, going way back. Two fairly recent retirees who live here have been very active

in the community over the years, Wayne Swank and Lloyd Swift. They're still very involved, at both Coweeta and at various activities. So those are terrific assets that you have. I've never heard anything negative said. Have you?

Interviewee Z: I can't really think of anything.

Interviewee Y: I think there's some confusion with this LTER thing and the University of Georgia connection. People may not be very aware of that. I think people would listen to you automatically if you have a connection with Coweeta.

Interviewee Z: I think so too. It's got a good reputation. (CLP Archive, 2011)

Another reaction, however, was an organized attempt to not participate with my research. I cannot be sure that my university affiliation was the only cause of this, but I am reasonably confident of it given some of my and other researchers' experience with particular Maconians. This is a serious accusation and I do not make it flippantly. I also realize that almost all qualitative researchers experience some sort of pushback, non-compliance, avoidance, or other difficulty in getting research subjects to agree to an interview. Nevertheless, some trustworthy sources revealed to me that my name and the name of another graduate student were actively circulated among some of the politically conservative activists in Macon County. More specifically, some of the activists spread the word—how far, I do not know—to not cooperate with our research. Both the other graduate student and I heard this separately from at least two sources and I was forwarded a quote from an email from a Maconian that accused the two of us being in collaboration with MaconSense, the pro-steep slope ordinance organization. Neither one of us are currently or have ever been collaborators with MaconSense. I did interview some of their group members, but my communication with them has never included cooperation on any front, especially on the steep slope ordinance issue. Indeed, given the politically divided nature of Macon County, the ongoing work of the Coweeta Listening Project, the reputation of

the Coweeta LTER, and the need to maintain my own academic freedom and credibility, I have conscientiously avoided affiliation with either side of the steep slope ordinance controversy in my research.

Some of the circumstances which led to these circumstances are also noteworthy. I have emailed and called several prominent members of politically conservative organizations in Macon County, introducing myself as a Coweeta-affiliated graduate student from the University of Georgia, interested in how communities approach exurban growth, and doing specific research about the steep slope ordinance as a case study. So that my affiliation was clear, I used my university email address. Beyond this, I gave no indication of other relevant affiliations, precisely because there were none. Even so, the most interaction I received from this group of potential interviewees was one email from the fall of 2011 stating that not until late 2012 would this person be available because of their busy schedule. Beyond this, I received no emails or phone calls despite repeated attempts to contact them.

3.5 A NOTE ABOUT NARRATIVE STYLE

To execute the empirical chapters to understand the metabolic production, circulation, and application of each form of environmental knowledge, I drew some stylistic and structural suggestions from Hart (2011), a former Pulitzer winning editor at *The Oregonian*. His book, *Storycraft*, offers some suggestions for constructing what he calls explanatory narratives. Rather than following a traditional narrative structure using conflict, climax, resolution and other standard techniques, an explanatory narrative attempts to follow a person or thing as it encounters people, places, and other things. It is through this following that readers come to know the social connections across space and time that the followed object makes possible. He

(2011, 184) writes:

To make this approach work, ...you can't just follow a route; you have to track a person or a thing....What you want is a description that follows a series of actions. It's based on careful observation. Close to the ground. Lots of specific detail and movement. Ordinarily you'd be following a single person. But there's no reason you can't track an inanimate object instead. It could be a ship or a gun or a load of coal. But it must move and in moving it will inevitably touch a series of characters. That brings the necessary humanity into the yarn. But it's the movement that matters. That creates the sequence of actions that establishes the narrative, and that's what gets you to places appropriate to explaining various aspects of your subject.

I was drawn to this suggestion because it corresponded so well with tracking the metabolic pathways of knowledge through their production, circulation, and application, and drawing out their connections to larger exurban processes along the way. Ideally and in the spirit of the extended case method, the style allows for an intimate discussion of details linked to broader processes and themes. In this way, the chapters 'zoom in' with empirical nuance and then 'zoom out' to give a broader context of exurban changes. In this sense, it also is similar to the geographic work that 'follow[s] the thing' (Cook 2004, Cook and Harrison 2007) in which multisited ethnographies are conducted by literally following an item, like a papaya, as Cook does, through following its geographic moment through its production process. It is similar, too, to Appadurai 1986). Above all, given that the goal of this dissertation is to tease out the relationship between broad exurban themes and the production, circulation, and application of environmental knowledge, the narrative suggestion and style seemed appropriate for the project.

3.6 CONCLUSION

The unwillingness of some potential interviewees to cooperate with research is a common experience for most qualitative researchers. In this particular circumstance, though, it indicates something more profound about the socioecological political condition of Macon County than the random handful of unsympathetic interviewees that exist in most places. Ultimately, the organized non-participation of some Macon County conservatives justifies the ambitions of this project because it shows just how sensitive and ruptured the circuits of knowledge production are in southern Appalachia, especially with respect to land use planning and exurbanization. Though anyone who lives or spends significant time in Macon County will probably hear rumors of its infamously divided political scene, we get a better sense of these divisions when we understand the politics of knowledge in the county.

Another advantage to using the extended case method as a methodological framework is that it understands my own positionality and the institutions with which I am affiliated as embedded in the same processes of production, circulation, and application and as existing during the historical moment of exurbanization. This is an important insight for researchers at the Coweeta LTER and the Coweeta Lab as institutions whose past and future presence in Macon County allows for opportunities to contribute to the betterment of environmental knowledge in the county and region. Knowing and understanding the consequences of one's own position in the circuits of environmental knowledge is to know the kinds of interventions that are possible, wise, and, hopefully, beneficial for all Maconians.

There are number of other approaches that might effectively illuminate the divisive environmental politics of Macon County. By using the extended case method to study the
production, circulation, and application of particular types of environmental knowledge, though, we become acquainted with some of the influential people and institutions of the county. We also come to know the fractured and controversial ways that these types of knowledge represent, illuminate, and conceal the environment at a time when exurban conditions change the value, content, and form of environmental knowledge.

CHAPTER 4

LANDSLIDE

4.1 PEEKS CREEK

We drove up Fishhawk Road on a cold, gray February morning, and then got out and walked another half mile up the mountain once the mud and snow had stopped the Jeep. That steep, craggy passage winds its way through the thick rhododendron and adelgid-ravaged hemlocks of Forest Service land and tracks trickling Peeks Creek, which averages maybe a few hundred feet to the southeast of the road. Dennis, a local property owner in Peeks Creek, was showing a colleague and me some of the upslope land above his small neighborhood. Dennis is originally from Florida, but he frequented Macon County during in the summers of his childhood and he was now retired and lived full-time in the Peeks Creek area. He lives in a modest newly constructed house on another small plot of downslope land toward the bottom of the creek that his family had owned for a couple of generations. During our walk, it became clear that the land and the man who owned it still bore scars from the Peeks Creek landslide nine years earlier.

During Hurricanes Francis and Ivan in September 2004, Dennis lived in south Florida, and he rode out the hurricanes there. Once Ivan had cleared Florida, the forecasters projected the hurricane's track to move through western North Carolina and both storms did pass over southern Appalachia. One morning a few days after Ivan cleared Florida, Dennis saw Peeks Creek on cable news with still early reports that the intense rain from Ivan's remnants had initiated a landslide there. He could scarcely believe that Peeks Creek was on television and that the storm that had just passed over him in Florida had hit his family's North Carolina community, too.

Two days later, Dennis found himself with his VHS video camera in Peeks Creek, filming with shaky hands and a choked-up narrator's voice the major clean up effort of not only his neighborhood, but also his own house. FEMA and North Carolina emergency crews were on hand and major media outlets covered the story, too. The landslide swept his house clean off its foundation, making a dramatic enough scene that his intact but severely askew and tilted bungalow appeared on the front page of *The New York Times* later that week. Dennis dryly noted that not many Maconians have had their residences on the front of the *Times* before and it surprised him that a nearby house, which had a giant tree trunk impaling it from end-to-end, was not the photographer's subject of choice. Dennis was also remembering the loss of his neighbors whom were from families he had known as a young boy—Sharon McCollum and her three-year old grandson, Colton, along with Kattie and James Watts and their unborn child.

If I had walked the Peeks Creek landslide area without Dennis, I would have missed most of the signs on the landscape that we were walking through the scene of a devastating geologic event. Only the trained eye of a local or an expert would be able to capture the changes to the landscape because young trees and tall grasses have grown over the area, hiding the soil deposits forming the landscape's deep scar. Seeing the thin, gently gurgling creek that February morning, fed by the recently fallen and slowly melting snow, it was hard to believe that in a matter of minutes one Thursday night, a raging flow of mud and rock originating near the top of Fishhawk Mountain moving at more than 30 miles per hour had shorn buried boulders in half, snapped massive tree trunks like toothpicks, crushed houses and cars, and snuffed out five Maconians' lives with impunity. Dennis said that at the time he wondered if thought the area would ever recover—he might have meant in more than one way—and that some of the geologists and state officials said it might be a decade or more before any plants even started to regrow.

Contrary to these estimates, though, the landscape is making a comeback and in this way, the landslide event is being erased on the landscape by ecological processes of invasion, succession, and recovery. This chapter shows how these ecological erasures also mimic how Maconians metabolize experiences with, scientific information about, and memories of landslides in the steep slope ordinance controversy, coalescing them into environmental knowledge of landslides. These landslide discourses are not erased, though, but are co-opted and tinkered with, they are enrolled to support political causes related to exurbanization, even oppositional causes at the same time. Maconians used this narration of landslides to intervene in processes of uneven development by politically and economically narrating the event itself with respect to historical environmental vulnerabilities, emerging local political trends, and the 2008 financial crisis. In particular, I show that despite the historical prominence and regular occurrence of landslides in southern Appalachia, Peeks Creek was initially framed as a flooding event, not a landslide. Thus, Peeks Creek was not always a landslide but instead had to become one.

Two factors, the solicitation of geological expertise and exurban residential housing on mountainsides, were particularly important in the broader recognition of Peeks Creek as a landslide. Thus, it was only when scientific expertise combined with local non-scientific knowledge at the height of the exurban boom in Macon County did Peeks Creek emerge in public narration as a landslide, crucially allowing a scientifically validated framing of Macon County as chronically landslide prone. It was upon this chronic vulnerability that Macon County

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planners bolstered their calls for a steep slope development ordinance. I also show that this perception of chronic vulnerability to landslides and the resulting ordinance followed a similar precedent for addressing and understanding chronic vulnerability to flooding. In one sense, then, the historical frequency of floods and their damage to economic livelihoods meant Maconians were used to living in a state of chronic vulnerability to environmental hazards that threatened their homes and livelihoods. It took urbanization, defined here as encompassing the solicitation of scientists for local environmental management in addition to creeping exurban settlement patterns up the mountains, to produce landslides as new objects of environmental knowledge and to produce Maconians as new subjects of this emerging landslide knowledge.

4.2 WHEN LANDSLIDES WERE FLOODS

Initially, the narration of Peeks Creek had little to no relationship to previous landslides, even though southern Appalachia's landscape is fundamentally defined by the enduring presence and slow erosion of its mountains, partly through landslides. The propensity of landslides in Macon County was first documented by Thomas L. Clingman, of Clingman's Dome fame, who wrote of 'waterspouts' in Macon County in July of 1876. Clingman described them in an address to The Philosophical Society of Washington in January of 1877 as waterspouts, "as they are popularly called." Clingman (1877) writes:

In the after noon of this day, June 15th, 1876, during the rain, which had been falling steadily for the greater part of the day, [Horatio Conley, a Maconian] was surprised to see the stream suddenly rise much higher than he had ever seen it at any previous time. ...The stream, however, rapidly subsided into its channel, but was still much swollen. ...While he and his wife were in the piazza of their house, next to the creek, their attention was arrested by a remarkable appearance up this ravine distance perhaps one hundred and fifty yards from them. They saw a large mass of water and timber, heavy trees floating on the top, which appeared ten or fifteen feet high, moving rapidly towards them, as if it might sweep directly

across the Tessantee [River] and overwhelm them.

Clingman goes on to speculate as to the intense, column-like rainfall that he imagined to have caused this event, dubbing it a waterspout, after the eponymous tornado-like features that that occur over lakes and oceans. In a remarkable twist, Clingman's above description and initial curiosity was from these waterspouts on Fishhawk Mountain, the very same origination point for the Peeks Creek landslide.

Clingman's waterspouts happened in the pre-precipitation measurement days in Macon County, but similarly intense and heavy rain events with five or more inches falling in 24 hours, the standard North Carolina Geological Survey uses as a threshold for their suite of landslide hazard maps, have happened twenty-one times since 1876 with another several coming very close to the threshold. At least seven, and likely eight, of these occurrances have been a result of the remnants of hurricanes or tropical storms passing over the mountains (NCGS 2012).

Like the Peeks Creek landslide, consequences of other major storm events in southern Appalachia have been deadly, too. Given its geographic situation, southern Appalachia is in prime position to experience major precipitation from hurricanes and/or moisture from the Gulf of Mexico. Hurricane Camille, one of the most powerful hurricanes in recorded history made landfall on the Mississippi Gulf Coast with record setting sustained winds over 190 miles per hour. Camille lost its tropical storm status before reaching the Virginia portion of the southern Appalachians, though the storm was still an unmitigated disaster as it dumped 28 inches of rain in 8 hours across southwestern Virginia (Williams and Guy 1969). Of the 150 people that died in Nelson County, Virginia, during the storm, nearly all of them perished in the 3,793 landslides, not drowning from the massive floods. Other named storms, too, including Hurricanes Agnes (1972) and (1995) and Tropical Storms Cindy (2005) and Ernesto (2006) have also caused hundreds of damaging landslides throughout southern Appalachia. The mountainous increase in elevation, too, makes for increased orographic rainfall, leading to higher amounts of precipitation at higher elevations. These factors combined with unstable soils and steep slopes make the southern Appalachians a largely landslide prone region.

I asked Dennis about the history of landslides in the county, whether he or anyone he knew anticipated any landslides resulting from the consecutive hurricanes, or whether landslides loomed large in the minds of Maconians. He qualified his insight, saying that he was not a local—despite a lifelong familiarity with Macon County and at least a part-time residence there-but that the possibilities of landslides had never crossed his mind and that the Peeks Creek event shocked and dismayed everyone he knew. Given that NCGS data show that from Clingman's report to present landslides after major rainfall are a prominent feature of the landscape in Macon County and southern Appalachia at large, Dennis' response to my question was surprising. To compare Dennis' response to how Maconians at large understood landslide propensities in the days leading up to Peeks Creek, I asked my interviewees about the history of landslides and consulted the local newspapers in Macon County to see if their coverage of the storms prior to Peeks Creek indicated any concern for landslides from heavy precipitation. I found no significant mention of the threat of landslides in those editions, though some mentioned flooding as a possibility. Furthermore, only one of my other interviewees—a geologist mentioned a history of landslides, including landowners whose families had lived in the county for generations.

Dennis' response, the paucity of newspaper references, and the near absence of interviewee comments regarding historical landslides seemed to indicate that landslides had somewhat faded from public consciousness at a time when events like Peeks Creek would suggest it might have been vibrantly in the forefront of public memories. After Peeks Creek, though, as one might expect, all of the local papers were filled with coverage of the tragic, dramatic event for months. The apparently minimal level of the public's consciousness of landslides prior to Peeks Creek, even in the face of ripe landslide conditions, was a critical moment in the future framing of the debate around the Peeks Creek landslide.

It was critical because the initial production of environmental knowledge of Peeks Creek produced the event as a flood, not a landslide. Thus, when forecasters put Macon County square in the predicted path of Ivan's remnants, its potential effects became prevalently addressed in the papers in the language of floods. *The Franklin Press* summarized the county's efforts to prepare for Ivan, noting that record setting rainfall would result in power outages, canceled events, unnavigable roadways, and, above all, extensive flooding. Stories of flood refugees in the county and warnings of the hazards of floodwater are dominant throughout these pre-Ivan preparations for the storm.

Exurban growth also altered how Maconians understood the hurricanes that had not yet reached them. In an editorial entitled "Unmatched Floridians," *The Franklin Press* (10 September 2004) lauds the resilience of Floridians who were taking shelter in western North Carolina during the storms.

Boxers refer to it as the "old one-two". Stagger the opponent with a hard uppercut, then deliver the knockout blow.

Hurricanes Frances and Charley proved to be formidable foes for Florida, delivering the one-two of powerful winds and punishing rain to the Sunshine State.

Florida may be down and out for the count right now, but Floridians sure aren't. Surrounded by devastated dwellings and wrecked businesses, they're staging the comeback. These resilient people plan to walk away winners at the end of this hurricane season.

The millions forced to flee from Charley and Frances did not leave willingly, but wisely heeded the warnings. Many came to Western North Carolina seeking refuge. Some who are seasonal homeowners returned to Macon County. We were glad they were safely with us while the storms wreaked havoc and destroyed their possessions.

Natures' fury can take away everything they own, but it cannot steal their will to survive and rebuild. For the Floridians we know, it will take more than two or three back to back hurricanes to dent their optimism.

The predominance of 'flood' over 'landslide' language continued in the local papers after

the landslide at Peeks Creek. Initially, the Peeks Creek landslide initially was not even a

'landslide.' Instead, the most prominent references to the Peeks Creek event were about

precipitation, hurricanes, and especially historic floods. It is important to note that this point

should not be made too strongly as there are occasional references to 'the landslide' scattered

throughout The Franklin Press, but the most analytical and common language is that of flooding.

For instance, the picture on the front page of The Franklin Press (21 September 2004) showed an

overhead shot of Peeks Creek's mangled houses with the caption: "Some homes along Peeks

Creek were picked up by the flood and moved off their foundations." Additionally, here are the

first several paragraphs covering the Peeks Creek event from The Franklin Press (Cunningham

2004):

A striking blue sky and crystal clear mountain views have replaced two days of torrential rains and heavy flooding. But it will take more than perfect weather for the county to recover form the devastating scars left by last week's storm.

Recovering from what has been called the worst natural disaster in the county's history will be an expensive and long, drawn out effort, said Warren McCabe, director of Macon County emergency Services.

It will take much longer for those who lost loved ones.

Remnants of Hurricane Ivan brought high winds and dumped more than seven inches of rain in the Franklin area Thursday night, washing out roads and bridges, uprooting trees, flooding homes, and leaving thousands without electricity....

The *Asheville Citizen-Times* (Ball 2004) also used language of floods: "As emergency workers used cadaver dogs and heavy equipment to search through the mounds of debris swept into a Macon County neighborhood during last week's flooding, there were reports of another body being found." That *The Franklin Press* editions' front-page article mentions mudslides twice, but only insofar as they were a result of flooding. Governor Easley's visit soon after the disaster was framed in the language of floods: talk of flood insurance, flood damage to homes, and flood mapping (Cunningham 2004d). A feature piece in the September 24 edition also addressed the historicity of floods, noting many of the same major precipitation events that the NCGS did in their contextual work for the landslide mapping project. The piece (Stoudemire 2004) reminded Maconians of historic flood events, noting,

In the early days, floods were referred to as "freshets," the overflow of a stream as a result of heavy rain or a thaw. According to 'Buncombe's Historical Freshets Since 1791 Recalled by Pioneer," in the July 27, 1916 issue of *The Asheville Citizen*, freshets occurred in Western North Carolina in April 1791, May 1841 and June 1876." Reflecting on the damage, a *Press* editorial read: "Residents could hardly believe the quiet stream they had known all their lives had turned into a raging river tearing through the settlement.

Interestingly, homeowners' insurance policies and FEMA classification parallel this interpretation of the Peeks Creek landslide as a flood event, not a landslide. One Peeks Creek community member showed me a set of homeowners insurance claims and FEMA documents from 2004. Under the "Cause of Damages" section, the application lists "Flood, Hail/Rain/Wind Driven Rain" rather than landslide, debris flow, or any other similar language. The State of North Carolina's Application form for State Disaster Assistance also lists "Hail/Rain/Wind/Wind Driven Rain." Similarly, *The Franklin Press* ("Governor Easley tours disaster area," 21

September 2004) notes that "Most home owners did not have flood insurance...For the future, [Governor] Easley said the state could consider preventative measures to protect flood damage to properties, such as relocating homes farther back from creeks. The state is still in the process of updating flood maps for Western North Carolina".

Within weeks, the flood discourse of Peeks Creek took on prime political importance in the county. Indeed, prior to Peeks Creek serving as an impetus for steep slope development legislation, it was deployed in the cause for a floodplain ordinance. For years, the town of Franklin had been struggling with a floodplain ordinance, what particularly it should address, and even whether it ought to be adopted. Macon County had adopted an ordinance in the mid-1990s, but Franklin had yet to follow suit. Ten days after Peeks Creek landslide, *The Franklin Press* (Lewis 2004a) raised the issue of the town of Franklin's refusal to adopt a flood plain ordinance in 1978, thereby disqualifying the town and its residents from participating in the federal government's flood insurance program. "Alderman Jim Williamson, who also worked as past town administrator, says the last time the board of aldermen considered adopting a flood plain ordinance, public outrage ensued. 'There were a whole bunch of people in opposition to it,' Williamson says. 'A whole lot of folks thought we were trying to take their property away from them.'"

On 28 September, the editorial board of *The Franklin Press* (2004c) admonished the town to reconsider the flood plain ordinance, invoking Peeks Creek to motivate town officials, showing that a disaster like Peeks Creek, depending on how it was framed, could be enrolled to support a variety of political causes. They wrote:

Perfect safety cannot be guaranteed. For example, the tragedy on Peeks Creek came like a thunderbolt. So far, no human agency can be blamed for the debris flow or avalanche that turned the community into a disaster zone. However, anyone familiar with simple physics—or plain commonsense could tell you that water will rise and rivers will spill over when enough rain falls.

As we change the landscape, and as streams naturally change their meanderings, the floodplain changes. Flood maps need to be updated periodically to reflect reality....

Updated flood maps pinpoint the most vulnerable areas. Being forewarned helps residents take protective action before major storms. Up to date maps help county officials determine where construction can safely be permitted. Armed with such information, officials can secure federal grants to move property out of danger areas.

When the General Assembly convenes in January, mountain legislators plan to push for the estimated \$5.2 million in state money needed to begin the mapping process for our counties. We hope they will make this a top priority.

We hope our local officials will also do all they can to facilitate the mapping and toughen regulations to protect citizens from future floods.

We strongly encourage town officials to reconsider a floodplain ordinance. Without such an ordinance, property owners in flood prone areas cannot get flood insurance. Zickgraf's recent uninsured loss of \$1.75 million demonstrates the terrible economic price a flood can exert.

Let's not wait on this. The time to act is now, before the consequences of inaction fade from memory.

Why Peeks Creek could be compellingly used to promote a floodplain ordinance partly

results from floods and their relationship to the historical economic geographies of Macon

County. In particular, the spatial locations of pre-exurban housing patterns are different from the

current exurban patterns of 'moving up the mountain' and would matter for what aspects of a

dramatic event become central in public discourse. In other words, floods would have figured

more prominently in the public's consciousness because of housing and work locations. Floods

were a more significant threat to life, land, and property than landslides were.

As Coweeta LTER research has shown (Gragson and Bolstad 2006), pre-exurban growth was largely concentrated in valleys and along waterways, even dating back to native American settlements. Living high along mountain ridges or at higher elevations was unnecessary and impractical for most. As one of my interviewees (Interviewee H) with a family history of six generations of Macon County landowners said: "A lot of folks who grew up here [did] rural agrarian farming in the valleys, along the creek in the bottomland and left the ridges [alone]. They also stayed back from the creeks, too." Economic activities and day-to-day livelihoods were often driven by access to water as a source of consumption, irrigation, and power. Indeed, Franklin and other small towns like it across the region relied on rivers for mill power. Floods also can contaminate well water, which is still the dominant source of residential water outside of Franklin and Highlands city limits. One *The Franklin Press* editorial (Editorial Board, 15 October 2004) even indicated a sense of betrayal from the streams and rivers that had fostered community livelihoods for generations:

As with many mountain communities, this settlement organized itself around a babbling stream. For some 180 years, Peeks Creek added to the idyllic quality of life in its narrow valley. No one imagined it would turn vicious and rip through the community as it did on the night of September 16, taking five lives and destroying at least 15 homes.

Debris flows rank high among the natural land-forming processes of the mountains. They occur commonly during severe storms, but this one was particularly large—and it occurred above an inhabited area.

Nothing known of Fishhawk Mountain's past suggested instability on this large scale, but the geological history of the mountains offered a general warning: This is landslide country.

This is not to say that pre-exurban livelihoods had no relationship to higher elevations.

Indeed, plenty of subsistence farmers took advantage of ridgelines and other less steep slopes to cultivate crops and the logging industry of the late 19th and first half of the 20th century clear-cut slopes of a range of gradients, often leaving entire ranges of mountains bare. Though landslides would have been detrimental to these economic activities and the livelihoods they sustained, the minimal to non-existent threat to towns and residences would not have prompted much concern. Even today, the town of Franklin has virtually no medium or high risk areas on the NCGS

Downslope Hazard Maps. Exurban growth, though, has pushed residential living higher on to

mountainsides and into areas more prone to landslide activities.

This reliance on rivers made them also a kind of communal icon, a material flow that

unified small communities and staged life and livelihoods for generations. Beth Hanger (28

September 2004), a Peeks Creek resident, reflected on her and her neighbors' relationship to the

creek in The Franklin Press weeks after the landslide:

The way it was is no more.

The creek started way above Joleeta's house, where the West Branch and the North Branch came together. These joined streamlets splashed over the rocks and laughing, invited other trickles and springs to mingle their waters. ...From there, the creek flowed under the first bridge, putting the road on the left, paralleling the water.

Deep under the tall trees and foliage, Peeks Creek flowed. It was a pleasure and delight to generations of Peeks Creek people. Dills and Crisps and Hollands and others were born, married, and died by its banks. They labored and loved, feasted and feuded, united by a thread of a mountain stream. Houses sprouted like mushrooms along its moist sides. People loved the creek's sweet song, gushing, rushing over its rocks. They trusted its constancy, even cantilevering a bedroom over its flow.

The Dill family held July reunions at the old home place by the creek. Children played in little pools in the creek and older men showed boys how they might catch a trout.

The women provided bounteous feats, laid out on long tables, and talked enough to satisfy conversation hunger. If they walked across the road from Daddy Dills' house and across the bridge over the creek, the thirsty could catch a drink of cold spring water pouring through a pipe at the spring house. ...

At 10 minutes after 10 p.m. Thursday night, Peeks Creek changed. What a difference! From a shaded, mossy rocky mountain stream we took pleasure in, it turned in to a glaring, open wound in the earth.

It is littered with huge piles of logs, rocks, and shattered house debris.

The people who loved it are in shock. Homes and some lives are destroyed. Many people have joined in the disaster relief. God's loving spirit is

evident in many merciful people laboring to help, heal, and restore. "The earth is the Lord's and the fullness thereof; the world and they that

dwell therein" (Psalm 24:1).

As a disaster-ridden man named Job said in ancient times, "The Lord gave, the Lord hath taken away; blessed be the name of the Lord." (Job 1:21b).

Hanger's account is an evocative remembrance of a lost place, explaining the intimate feelings of

near betrayal after a lifetime of relying on the constancy of the creek. Similarly, Marci A.

Holland (28 September 2004) writes in The Franklin Press about her upbringing on Peeks Creek:

The most prominent mountain among those surrounding our home, Fishhawk, was so named because of the shape along the top of the mountain that of a soaring fishhawk (osprey) with its wings spread wide. It always semed to me that Fishhawk Mountain had its arms outstretched as if to protect the valley below. Little did any of us know that it would be on this very mountain that destruction would begin. ...

I am among the sixth generation of Hollands to be born and raised on Peeks Creek. My husband and I built our home just a mile and a half away from Peeks Creek on River Road. The years I spent growing up on Peeks Creek are among my fondest memories. It was a wonderful place to grow up. The mountains and hillsides surrounding our home served as our playground. ...

My grandfather was among scores of children raised on the creek who walked to school everyday and attended the old Pine Grove School, which still stands at the beginning of Peeks Creek Road. ... My mother remembers when the valley used to be much more open when residents farmed the land and kept it clear for cattle. It was also logged to an extent. My grandfather was among those who logged the area. It seems like the mountains have closed in on us a bit in recent years. ...

Right now, it looks as if the land will forever be scarred from the events of September 16. We are saddened and shocked by the devastation that struck without warning. But, our community was built on faith, love, and hard work and it will thrive again. Especially for those of us whose families have lived there for generations, Peeks Creek will always be home. And the way of life we learned growing up in this small mountain valley will always be a part of us.

Hanger's and Holland's comments on Peeks Creek are not warnings about economic loss or

devastation; instead, they are eulogies of losing 'the old home place,' a remembrance,

questioning, and, in the last paragraphs, acceptance of the disaster and ruin of a place she and

others loved. Mountain life by the rivers and streams was both economically necessary and

culturally rich with meaning and purposes ultimately washed away by the creek around which

the community had long gathered.

A clue that exurban growth on the mountainsides had raised awareness of landslides comes from the *Mountain Home Guide: Eleven Factors to Consider Before You Buy or Build* published by Western North Carolina Tomorrow, a now defunct regional environmental nonprofit started in the 1970s (WNCT 2001). In their 36-page guide, WNCT discusses a variety of hazards and issues associated with building a home in the mountains: site stability; sewer, water, and stormwater; site access; flood plain awareness; 'stewardship of the land'; solar energy, rights to natural resources like timber and minerals on a lot; light pollution; and streambank erosion.

The natural processes of erosion, landslides, and others are entirely framed here in the context of mountain homes. The guide itself gives no indication to the broadening socioenvironmental issues of urbanization in rural mountainous areas, but its target audience of individual home owners/builders and timely intervention into an obvious trend makes clear that irresponsible urban development on mountain slopes was a target for WNCT. They (WNCT 2001, 4) write: "Steep slopes, shallow, rocky soils, and flood plains are a few of the many site limitations on building a house in this region of highly diverse environments. The types of limitations will vary depending on the elevation and specific location of your house or property. Every site will have some limitations. However, with proper planning, design, and construction, the environmental limitations can often be overcome and future problems avoided." While WNCT as an organization might have seen more systematic or structural origins associated with exurban growth, their solution here to environmental degradation lies entirely with the individual home builder. The guide addresses a gap in the knowledge a non-local builder might have. Only when exurban development had initiated environmental problems did WNCT address development on steep slopes and in other potentially sensitive or dangerous mountain sites.

4.3 THE INTERVENTION OF GEOLOGICAL EXPERTISE

Soon after the initial reporting of Peeks Creek and the simultaneous floodplain ordinance discussion, a landslide discourse emerged alongside the flood-related narrative of Peeks Creek. In the first months after Peeks Creek, any scarce mentioning of mudslides or landslides was not referenced with specific historical detail or precedent in the media, despite landslides being a frequent and defining feature of the region's mountainous landscape. Instead, it was a general sense of their imprecise conditions in the mountains. By the time the steep slope ordinance debate reached fever pitch in 2011, though, Peeks Creek was framed entirely in the language of landslides by both pro- and anti- ordinance politicians and citizens. In fact, talk of Peeks Creek as a flood exists only in the historical residue of newspaper articles and other texts. How landslide discourse, rather than flooding, came to narrate the event of Peeks Creek and who initiated that narrative is a story of how expert knowledge claims in southern Appalachia circulated from state-sanctioned scientists into the realm of local politics.

In short, it was not until locally-based scientists employed by state and federal agencies became involved that Peeks Creek became popularly considered a landslide event. The NCGS, on 16 September, warned the western counties that Hurricane Ivan's rain might oversaturate the ground, leading to landslides. "Given the wet soil conditions we already have in many of these areas, the risk of numerous, fast moving landslides is significant. Residents in landslide prone areas and anyone in mountainous areas should be aware of the warning signs and be prepared to move quickly. Intense rains have triggered landslides in the area before," said Gerry Wieczonek, a USGS landslide specialist, quoted in *The Franklin Press* (Editorial Board 2004b) a month after his warning. A telling example comes from the 24 September 2004 issue of *The Franklin Press*,

(Cunningham and McRae 2004)in which a long-form retelling of the Peeks Creek incident is

framed as a scientifically-validated landslide event:

A two mile gash on Fishhawk Mountain bears dramatic witness to the deadly events last Thursday in the Peeks Creek community.

But people still aren't sure how it got there.

A state geologist and local hydrologist who inspected the site are certain the even was cause by a debris flow, also referred to as a debris avalanche.

Such events can be caused by excess water saturating thin soils on steep slopes, causing everything above bedrock to slip quickly under the weight of gravity. Many follow existing streams.

These events are common in our mountain region, they said.

"It's a natural process—one of the main land-forming processes of the mountains, said Wayne Swank, a hydrologist and retired project leader at the U.S. Forest Service's Coweeta Hydrologic Laboratory in Macon County.

"It has been happening for millennia, but for most of that time there were not people in harm's way," Swank said.

From Wieczonek's quote onward, Peeks Creek slowly emerged as a landslide event

largely through scientific expertise, even as the flood discourse also persisted. When scientists' evaluation of Peeks Creek is mentioned in media sources, it only concerns landslides, not floods. The remainder of the fall of 2004, several articles address the science of Peeks Creek, and it is clear that their scientific discourse becomes an increasingly larger portion of the reflections on the Peeks Creek event. Rather than a 'flood' as was first articulated, terms like "landslide" and "debris avalanche" and "debris flow" become more common in the media, especially when reporting on scientific evaluations (Lewis 2004c). Over time, this discursive shift bled into non-science themed articles, like those around the public cost of debris cleanup (Cunningham 2004g).

The science of geology defines landslides as "a wide variety of processes that result in the downward movement of slope-forming materials including rock, soil, artificial fill, or a comination of these" (USGS Landslide Primer). There are at least nine different major types of landslides, ranging from rotational landslides, translational landslides, block slides, rockfalls, topples, debris flows, debris avalanches, earthflows, creeps, and lateral spreads. As the USGS notes, these all meet the basic definition of 'landslide' but are differentiated by their subsurface movements, geological causes, slope gradients, soil type and structure, and speed (USGS Landslide Primer). Given the particular soil types, structures, and slopes of western North Carolina, many of the landslides in the area are rockfalls and debris flows. In 2009, a massive rockfall covered a portion of I-40 in western North Carolina, resulting in months of clean up and the closure of the roadway, and the Peeks Creek landslide in 2004 was a debris flow. Debris flows are described as a "slurry" of mud, rocks, water, trees and other materials (USGS Landslide Primer). According to the landslide hazard maps, five inches or more of rain in 24 hours is typically the threshold of precipitation-triggered landslides of all types in Macon County.

Grounded in this scientific paradigm of approaching landslides, by December, a task force of geologists, climatologists, meteorologists, and state officials issued a scientifically authoritative report on the causes of Peeks Creek (Cunningham 2004h). That report frames the entire event in the language of landslides, slope failure, and debris flow, all of which work to categorize Peeks Creek in the terms of a landslide rather than a storm event, flood, or even a tornado, as some local rumors had claimed.

NCGS scientists also attributed a sense of the area's chronic past and future vulnerability to landslides. Endemic to scientific discussion of landslides is the estimation of exactly how chronically vulnerable an area is to landslides. In February 2005, the state's effort for landslide mapping was building momentum and had broad public support. Addressing the chronic vulnerability to landslides provided the justification for the mapping effort (Cunningham 2005a).

These landslides, in the words of the geologists, are 'repeat offenders' that have struck in the past and will certainly strike in the future (Cunningham 2005a.) Developing maps of the locations of these past and future offenses, though, was the NCGS's goal.

Framing Peeks Creek as an example of this chronic vulnerability gave landslides a history and future. This is significant because it was flooding's history and future that allowed it to be politicized and drawn into public debates around the town of Franklin's absent flood ordinance and the need to update floodplain mapping. Without the chronic vulnerability—that is, without the painful memories of the past coupled with the threats of the future—there would be no political impetus to address socioenvironmental disasters. Landslides, then, moved from events without a public sense of their history to events with a history and a future, allowing them to be politically co-opted in local policy debates. This was especially true in the steep slope ordinance debate.

An important difference between the articulations of the chronic vulnerabilities to floods versus landslides is how the public came to know and understand them. Susceptibility to floods was easy for media sources to articulate to the public: they used historic pictures, stories from generational landowners, and local memories to narratively reconstruct these events. It was as though these stories were latent in the public's consciousness, waiting to be excavated from the subsurface mine of collective memory at the right time. For instance, Danita Stoudemire's regular column in *The Franklin Press* usually offers a nostalgic and folksy take on life in Franklin, Macon County, and western North Carolina. She (Stoudemire 2005) offers her own memory of flooding there in a version of her column entitled "History tells us: Rivers will rise":

Though living on the Cullasaja River was full of adventure and excitement when I was growing up, I can also remember the devastation it has caused. I remember the many nights my mom walked the floors while Dad took a flashlight outside to see how high the river was. I remember seeing people taken from their homes in boats. I know all too well the story my folks tell of the flood of 1964. We lost everything we had in that flood. Our house was one of the homes talked about in *The Franklin Press*.

I remember, at the age of 13, walking out on our front porch and gazing at the lake that covered the entire area up to the porch. "How could a river swell to such massive lengths?" I thought with terror, as we went out the back door to escape.

No expertise was necessary to validate these memories and no scientist was on call to offer an authoritative opinion about flooding or to resurrect their happenings. Non-expert, local knowledge was sufficient to remind Maconians of the susceptibility of their valley bottoms to catastrophic flooding events.

To be applied in a steep slope ordinance, though, it became necessary for scientifically validated expertise to discursively reconstitute landslides as dangerously chronic features on the landscape. In the two years after Peeks Creek, all of the articles that characterize landslides in this way have some kind of scientific validation. Representatives from the NCGS weighed in: "Things have been going downhill in the mountains for a long time" and "Sometimes, moving a house over 50-feet can make a world of difference," said Wooten (Cunningham 2005a). So too did representatives from the Coweeta Hydrologic Lab: "It's not a question of if they will occur, but a question of when and where," said Dr. Mark Reidel, a research hydrologist at the Coweeta Lab (Maracle 2005). It was scientific validity, not local memory, that was the key validation of the past, present, and future chronic dangers of landslides.

This offering and solicitation of expertise matters in exurban places because land use, conservation, and other types of planning relies on these forms of expertise to manage the contradictions of exurban growth. This contradiction is often expressed in the terms of exurbanites being attracted to an area because of a particular environmental amenity like a sense of rurality, small town life, and pristine environmental conditions. These very qualities that attract exurbanites, though, are diminished by their increasing presence, thus eroding not only the conditions of exurban growth but also the quality of life of long term residents. In Macon County and elsewhere, these planning efforts have solicited expert opinion on land use regulations, seeking to ground their regulatory impulse in scientifically and expertly vetted research and opinion. This mimics urban planning practices long established in suburban and urban places, where planning is, to varying degrees, accepted as a matter of course. Expert intervention into questions of growth and planning, then, represents a broader trend in planning and local regulations to rely on expert opinion to manage exurban growth.

4.4 MOBILIZING AND CONTESTING GEOLOGY

In the context of Macon County's steep slope ordinance conflict, the broadest consequence of the scientific framing of the chronic vulnerability of the landscape to landslides was that it allowed landslides to be considered by planners. Up until the beginning of the steep slope ordinance debate in 2010, the work of scientists to frame Peeks Creek and other events in the context of chronic landslide vulnerability received scant negative attention, even from the land rights activists and plenty of positive reviews, especially in the largely pro-planning media. Neighboring Jackson and Buncombe counties had considered steep slope ordinances in the post-Peeks Creek era. Their political cultures are generally more progressive than Macon County's (Interviewee A), so the role of scientific expertise in the interpretation of landslides is likely different. Even so, it is noteworthy that it was only after Peeks Creek and the initiation of the landslide hazard mapping program that these ordinances went on the books elsewhere. Beyond simply making public comments about landslides, the bulk of the scientific activity that ultimately turned controversial after the mid-term elections of 2010 and during the steep slope ordinance battle was the production of the NCGS landslide hazard maps. I detail the maps' controversy in chapter 6 by explaining the politics of their production, circulation, and application in the ordinance debate. Chapter 5 also examines the politics of the steep slope ordinance itself, but in this chapter I want to describe the conflicting knowledge claims about the landslides themselves, even if it also overlaps thematically with the discussions in the chapters on the maps and the ordinance.

First, pro-planning Maconians who generally supported the ordinances latched on to the scientific framings of the landslides as chronically dangerous and augmented them with an explicit concern over human life. For much of the debate, this crowd consisted of a disorganized group of pro-planning Maconians, the planning board, and the steep slope subcommittee and was only politically organized by pro-ordinance group MaconSense after the ordinance was tabled. Their argument was essentially that scientists say that landslides like Peeks Creek will happen again and the county should do everything it can to avoid loss of life. These claims were often made with rigid fervor and conviction at public meetings, asking rhetorical questions like "How many lives will it take before you realize that this regulation is commonsense and is more important than your property rights?" "Preventing another Peeks Creek" also was a common refrain for pro-ordinance Maconians. Said one Cowee resident (Planning Board Meeting, 17 June 2010) at a public planning board meeting:

So, my question to the board today is this: is it possible that by taking the minimum approach to steep slope regulations that a slope could fail and that there could be a loss of life? If slope failure is possible, and if loss of life is possible, then maybe we could put a number on what this board feels is an acceptable loss rate. One person in 10,000? One person in one million? My hope for everyone

of you on this board is that you will be able to stand up at the judgment seat and state confidently that you took every precaution possible to preserve the lives of others. For it says in the Bible, if you have done it unto the least of these my brethren, you have done it unto me. I hope that all of you will construct these regulations as if the person you loved the most lives directly beneath the developments that your decisions will affect. I have hopes that all of you will call on the Lord privately and in prayer to guide you in deciding in what is right, what is just, and what is pleasing to him, because a man cannot serve two masters.

The emotional heft of these appeals, however, was regularly out-weighed by the presence of vocal land rights activists at public meetings, in newspaper editorials, and in online forums like blogs and other websites. Often, the expert validation of landslides as chronically dangerous remained as a foundation for the debate, thus circulating throughout Macon County and influencing applications of landslide knowledge. If the expert knowledge offered by scientists was embraced by pro-planning Maconians, it was only indirectly, not directly countered. For instance, one common argument against the ordinance was to point out that the Peeks Creek landslide started on National Forest land administered by the US Forest Service (Property Owners of America 2012). Thus, they argued, the steep slope ordinance, because it only regulated privately owned land in the county, would not have stopped Peeks Creek from happening. This argument both disarmed the emotional appeal of Peeks Creek and also taps into the skeptical sentiments many Maconians have toward government.

Alternately, ordinance opponents also framed their arguments in terms of landslides, but disputed their danger. Lamar Sprinkle (Macon County Planning Board recording, 17 June 2011), a building contractor and land surveyor on the planning board, regularly claimed at public meetings that Peeks Creek was "a freak event" and that it would likely never happen again. Despite historical evidence to the contrary and the tendency for landslides to happen along the tracks of previous landslides, Sprinkle's argument worked to undo the chronically dangerous discourse that experts and pro-planning advocates had set up. Similarly, some ordinance opponents also followed Wooten's statement that "things have been going downhill in the mountains for a long time," arguing that the paleohistory of the Appalachians meant that no amount of regulation could stop the eventual erosion of the Appalachians. As one (Drummond, 2012) put it:

The Appalachian Mountains were formed around 420 million years ago. Ever since they have been eroding away. Rains cause soil and rocks to move into the valleys. Landslides of varying sizes have occurred for eons. The Appalachians will continue to erode for the next 420 million years. That means every mountain will eventually succumb to this natural process until it may just be a bump on the landscape.

I'll "predict" that these mountains will continually have landslides. No one can predict when or where a landslide will occur. Every inch of every mountainside is susceptible to landslides.

The Landslide Hazard Maps are pure speculation. They are based on scientific "theories" not to [sic] "scientific methods"...

This argument presents rudimentary geology of the western North Carolina mountains, relying on some scientific information to make its argument. What the argument ignores, however, are other more advanced geologic knowledge that does not fit this Maconian's anti-ordinance ideology. More interestingly, though, the scientific framing of the region as being chronically landslide prone is transformed into some kind of inevitability, such that no homeowner, government, or political group can intervene in the area's geologic fate.

As chapters 5 and 6 discuss, geological and hydrological expertise is not necessarily an exogenous, non-local form of knowledge in western North Carolina. This is primarily because the producers of the knowledge at NCGS and at the Coweeta Hydrologic Lab are often intimately involved in the life of the county as residents and even as long-term 'natives'.

Scientific expertise, however, does represent a qualitatively different form of knowledge about the landscape. In particular, scientific expertise makes the landscape legible to regulation in ways that other knowledge of the landscape usually does not. That science can aid in state legibilities is a common theme in the state legibility literature, though its manifestations range widely depending on historical geographical context.

In contemporary exurban communities, one manifestation of these changing expectations is how the state relates to people and to the environment. Older visions of the state and one that continues in Macon County today eschews the contemporary state-as-planning model in favor of a state-as-guarantor of individual and property rights. In this way, the state ought not consider its subjects relationship to the environment. Instead, the state should be concerned with its subjects relationship to property and intervene usually only when disputes over property rights arise. Several of my interviewees noted this local sentiment about the state, finding that many of their neighbors simply wanted the government to leave them alone, especially on issues of property and gun rights.

Rather than having a relationship with property alone, though, planning advocates see the state as having a particular relationship to 'the environment' as something to be planned, regulated, and managed. This usually was not expressed in interviews as some kind of idealized vision, but rather a necessary intervention in how urban growth, without oversight, would imperil the social and ecological landscapes that made their community attractive and distinctive. Importantly, this was to be done through planning ordinances that actually encouraged growth by offering legal recourse to residents against environmental degradation by their neighbor as well as proactive prohibitions against such degradation. Landslides, then, as events that can violate property rights, that are often the results of environmental degradation, and can become something for which the state can plan, regulate, and manage. How the planning apparatus of the local state achieves these goals is often through cartographic and legal means, as was the case in the Macon County steep slope ordinance debate.

It takes a particular discursive construction, though, to make landslides legible to the local state's planning apparatus. In the case of Peeks Creek, the event moved from a flood event, to justification for a flood plain ordinance, to a landslide, to a justification for a steep slope ordinance, even though it was neither a flood event nor was it a result of human disturbances on steep slopes. This is not to say that Peeks Creek's disastrous outcomes would have been unchanged by either a floodplain ordinance or a steep slope ordinance. Indeed, there is some evidence that both ordinances would have at least alleviated some property loss, injury, and death. The point here is, however, to say that urban planning as a state apparatus, for good or for ill, relies at times on dramatic events as political justification for new state action. In exurbia, these state actions and their politics take a unique form because of the relative newness of planning.

4.5 CONCLUSION

Sometimes, types of environmental knowledge are metabolized in discrete types, like maps and laws of the later chapters. Other times, types of environmental knowledge are a set of loose and shifting categories, like landslide discourses, in which even how a geological event becomes a 'landslide' is highly related to both historical events and recent urban political economic affairs, and through this becoming is part and parcel of how exurbanizing communities approach urban human-environment relationships. The key theoretical insight from these empirical findings is that the environmental knowledge of landslides in Macon County is highly related to the long-term processes of uneven development. This chapter details how the dominant narration of landslide knowledge in Macon County, including Peeks Creek, became scientifically validated and relevant because of exurban growth. Not only is this relevant for understanding the important role science has in urban metabolism, but it is also relevant because it characterized the landscape as landslide prone. Landslide discourses were produced, circulated, and applied in a metabolic process consisting of exurban growth trends, increased involvement of experts in assessing landscape vulnerabilities, and the emergence of a public awareness of Macon County as a landslide vulnerable landscape. This step of producing the knowledge of a landslide prone landscape was necessary for the Landslide Hazard Maps and for the Steep Slope Ordinance; indeed, they would have been impossible with out it.

Thus, before Peeks Creek could motivate Macon County's steep slope ordinance and the NCGS maps, it first had to become a particular *object* of narration of landslide knowledge, relying on the *subjects* of Maconians' local histories of peeks Creek and scientists' geological expertise. The significance of this laid the groundwork for landslides to become cartographic and legal objects, thereby making them legible to the state. Peeks Creek as a discursively constructed and remembered event first was framed in the language of flood and major storms, in large part because floods have been the disaster most damaging and disruptive of county economic life for generations. Just as the local state responded to the area's chronic vulnerability to flooding, it also followed the same pattern in both producing the knowledge of chronic vulnerability to landslides and then acting to address it through an ordinance. In other words,

knowledge of vulnerability is not simply a natural state—it is a particular knowledge created and even necessitated by changing urban, socioenvironmental, and political economic conditions.

Before Peeks Creek, though, if landslides were known and experienced, they did not register highly in the public's awareness of them as measured by my interviewees and archival research in local newspapers leading up to and following the Peeks Creek event. It took local geologic experts, mostly from the NCGS and Coweeta Lab, to initiate the scientific discourse around Peeks Creek, which brought the event into clear discursive focus as a landslide. After it was given expert scientific discourse as a landslide, Peeks Creek's status provided policy makers a way to make the landscape legible for an ordinance. This happened mostly by providing landslide hazard maps and a scientific justification for the existence of a steep slope ordinance. Both pro- and anti-ordinance citizens seized on this scientifically verified framing of Peeks Creek, though they crafted entirely different arguments out of its expertise laden discourse.

This matters for understanding exurbia because it reveals the conflicted and changing interpretations of environmental knowledge driven in large part by exurban development. Increased capital investment brought by non-local residents exposes state and financial arrangements to new vulnerabilities, requiring different approaches to understanding the ramifications of disaster. Landslides that could jeopardize this continued exurban growth, now an essential part of the county, required attention from state legislators and local planners. For his part, Dennis, though having lifelong memories of Macon County, still considers himself part of this non-local trend of exurbanizing Macon County. He supports a steep slope ordinance, hoping against hope that some kind of regulation might prevent people like him from building in landslide prone areas of the county.

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Dennis also relayed excruciating stories of death and survival in Peeks Creek during our drive and walk up Peeks Creek. James and Kattie Watts, husband and wife, along with their unborn child, died in the Peeks Creek landslide. The family was from Pensacola, Florida, but had family ties to Macon County and had a small cottage in Peeks Creek. Knowing that Hurricane Ivan was likely to make landfall near Pensacola, the Watts's decided to take refuge in their Macon County cottage. Fleeing the storm's wrath in one place, the Watts's encountered it again in their haven in some kind of terrible twist of fate. Dennis said he knew Kattie from his childhood summers in Peeks Creek and mourned her. For another family Dennis knew, their story was similar in its terrifyingly coincidental events. A woman was home at the time that Thursday night and because of a phone call only minutes before the mud and water rushed down the mountain, she walked across her home to answer her phone. Minutes later, the landslide tore off part of their house, leaving the other portion nearly untouched. Answering the phone, she unknowingly moved to safety away from the soon-to-be-destroyed part of the house. She was still speaking into the phone's receiver when the landslide crushed the other side of her house. One family crossed state lines to flee a hurricane but could not avoid its pursuit. Another woman walked across her house to answer a phone and was saved.

Tragic events like this linger in the words, thoughts, and actions of the communities they ravage. Ironically, though it is politically expedient to decry the politicization of tragedies like Peeks Creek, the reality is that tragic events often have political significance long after they are over, especially as they are metabolized into the communities' urban political ecological memories and discourses. The tragedies themselves take on a particular life of their own as they are remembered, forgotten, resurrected, and co-opted, and in this way become woven into local

environmental knowledge. How we come to know nature, how we politicize it, and how we metabolize it, is often through events characterized by death, destruction, and suffering. The highly contingent circumstances of death and survival in these Maconians' lives and deaths also mimic the local historical contingencies of how these events become adopted into political discourse, freighted with all of their heavy emotional, political, and environmental meanings, existing in a macabre mix of public forgetfulness and political co-option at the exurban frontier.

CHAPTER 5

MAPS

5.1 SIX SHORT YEARS

As Macon County emerged as a chronically landslide prone area due to a combination of scientific narration of the Peeks Creek event as a landslide and exurban development away from valley bottoms and toward steep mountain slopes, mitigating landslide vulnerability in the western counties became a central concern for the State of North Carolina. Early in the legislative session following Peeks Creek, the State of North Carolina legislature passed through a 47-0 vote The Hurricane Recovery Act of 2005. Part of the act commissioned the North Carolina Geological Survey (NCGS) to produce a series of landslide related maps for each of North Carolina's nineteen westernmost counties. Public support for the act and the maps was high, especially given the deaths at Peeks Creek as well as the dozens of other landslides in western North Carolina in the wake of Hurricane Ivan's and Frances' remnants during the previous autumn. Rick Wooten, a Senior Geologist at the NCGS, was charged with leading a team of six other geologists in this state mandated landslide hazard mapping program.

In a parallel effort, in August of 2005 and less than a year after the Peeks Creek landslides, *The Franklin Press* (Lewis 2005a) reported that scientists at the Coweeta Lab were enthusiastically backing the landslide mapping effort. US Representative Charles Taylor had garnered a \$200,000 grant for Coweeta scientists to study the hydrologic factors at headwaters that initiate landslides in mountainous areas. Said Jim Vose, then the project leader at the lab: "This funding will provide us with the opportunity to make some significant contributions to [the mapping project], making a much stronger risk map." He continued: "This will allow us to assist in developing risk level maps for every county in Western North Carolina." The opportunity to contribute to the NCGS mapping effort seemed to be promising and enthusiastically welcomed by all parties. At the state and local level, with the public and scientists, the NCGS mapping project was a popular, useful, and useable project that aimed to address a relevant public problem.

By 2011, though, the sentiments at the state and local levels, and the popularity of the mapping program with the public and with Coweeta Lab scientists was dramatically different. At the state level, the legislature had defunded the mapping program in its 2010 budget and at the local level, Macon County's political scene was torn asunder by the merits of the maps and their role in the county's proposed steep slope development ordinance. At both levels, then, the once popular maps went from universally welcomed and approved to castigated and disregarded in about six years.

Furthermore, Coweeta's relationship to the maps also suddenly changed during these years. By May 2010 during the beginning of the steep slope ordinance controversy, the Coweeta Listening Project (CLP) took shape as a social science effort affiliated with the Coweeta LTER. The CLP had a range of goals concerning public-scientist and social scientist-physical scientist relationships in the Coweeta LTER and Coweeta Hydrologic Lab, including finding strategies to establish mutually beneficial relationships between these parties. The steep slope controversy seemed like a potential opportunity for the CLP to translate some of the expertise of Coweeta LTER and Lab scientists. While some CLP members wanted to use the bi-weekly "Science, Public Policy, Community" column in part to address the merits of the maps and several community members requested that the CLP do so, some scientists were quite reticent to comment on them. Only after the controversy had somewhat quieted a year later did the CLP intervene in the situation, writing a map-related column in *The Franklin Press* (Coweeta Listening Project Writing Collective 2012). One rationale offered by LTER and Lab leadership for this reticence was that Coweeta LTER and Lab scientists did not have explicit expertise in landslides; another was fear of being held legally responsible for opinions offered in the column; and another was concern over potential political backlash from the county's conservative politicians and landowners.

While those concerns may or may not be legitimate, the point here is instead to note that in the span of a six short years, the steep slope mapping project and maps themselves had gone from a publicly valorized post-disaster relief strategy to a political lightning rod at the local and state levels. It is especially curious that ecological scientists sought to distance themselves from the mapping program, especially, as chapter 4 showed, when it was geological expertise that initiated new object and subjects of landslides in western North Carolina in the first place. Memories and interpretations of Peeks Creek had been metabolized into scientifically vetted characterizations of the landscape as chronically landslide prone, yet scientists only six years later found it impossible to even offer an opinion about their existence. What happened from 2005-2011 to make such an improbable change in the public viability of the NCGS steep slope maps? Or, conversely, what can we learn from the steep slope maps about exurban political ecological changes during those six years? The maps' metabolic production, circulation, and application shows that the dramatic six year change in the maps' political viability was tied to exurban political ecological manifestations of the aftermath of the 2008 financial crisis. The politically and economically tumultuous events of the Tea Party take over of state legislatures in 2010, its reinvigoration of conservative politics at the local level, and the 2008 financial crisis had peculiarly exurban consequences, such that the mapping controversy in Macon County reveals something different than the now familiar and overly simplistic tale of anti-regulation activism in the era of the Tea Party.

Rather, the maps embody an interesting metabolic story. It is because they regulate and reveal the literally shifting soil foundations of exurban developments that they are so hotly contested. Yet unintentionally, they are also a cartographic story of other shaky foundations of exurban development: the shifting role of the state, the social fault lines of expertise and legitimate knowledge claims, and the fractured economics of exurbanization. Though the landslides in Macon County represent perhaps the most obvious environmentally unstable foundations of the county's exurban growth, the controversy over the maps also reveal the unsteady metabolisms of state governance, capital accumulation through residential construction, and highly contested cartographic expertise in exurbia. In other words, this chapter shows that the maps have two layers of objects and subjects because they both *reveal metabolic changes* and *are themselves metabolized*. This means that even as the maps reveal landslides as objects of environmental knowledge and NCGS geologists as the subjects of that knowledge, the maps are metabolized through local planners as subjects of the map establishing the map itself as an object of environmental knowledge.

5.2 CARTOGRAPHIC ORIGINS

Receiving their mandate from the State legislature, from 2005 to 2010, Wooten and his team of six other state geologists² mapped four western North Carolina counties using a variety of standard information gathering techniques ranging from LiDAR, GIS, soil maps, and on-theground sampling. Macon County, because of its rapid population increase and because of the deadly Peeks Creek landslide, was the first to be mapped. The NCGS geologists researched and produced the maps, which were made freely available on the NCGS website, offering a chance for the public and for county officials to see a team of scientific experts' take on landslide prone areas of their county. To be precise, the controversy in Macon County was over one particular map, the Macon County Downslope Hazard Map in the ordinance. Two other maps, though, were created—the Slope Movements and Deposits Map and the Stability Index Map—and they provide some of the scientific context and justification for the Downslope Hazard Map. The three maps display slightly different but mutually contextual information: the Slope Movements and Deposits Map displays locations where geologists know that landslides have happened; the Stability Index Map displays places where landslides are likely to start in the future; and the Downslope Hazard Map shows where landslides are likely to move in the future.

Wooten's team used a variety of data sources to create the maps, including soil maps, geologic maps, aerial photography, satellite imagery, and field samples (see Table 5.1). LiDAR data created the digital elevation model (DEM), which was used in part to calculate the slope. The DEM calculated the slope at a 95% confidence interval for 1.6 feet of error in elevation. This is highly accurate data, but this kind of high accuracy is regularly achievable when LiDAR is done correctly.

² Richard M.Wooten, Rebecca S. Latham, Anne C. Witt, Stephen J. Fuemmeler, Kenneth A. Gillon, Thomas J. Douglas, and Jennifer B. Bauer.
An interviewee familiar (Personal interview, Interviewee A) with the mapping project described this as a "state of the science" rather than "state of the art" endeavor, indicating that the NCGS geologists were relying on a well established suite of data and their compilation and analysis rather than trying out new, untested methods. North Carolina Governor Michael Easley (Office of the Governor, Press Release 3 October 2006) unveiled Macon County's steep slope maps in October 2006. "These maps will show which areas are prone to landslides and that will help developers, county officials, and residents decide where to safely build homes, roads, and other structures," he said in a press release, noting that the maps will "enable communities to evaluate and reduce the risks of building homes and other structures in landslide-prone areas of the North Carolina mountains." Easley's statements implied an intended pattern of movement of the maps, from the state level to local jurisdictions and communities. To this end, the NCGS made the maps available on their website and promised that four more western North Carolina counties would have maps by 2008.

Ta	ble 5.1.	Geol	ogical	and (Cartogra	phic	Fieldw	ork C	Contribu	ting to	NCGS	Mar)S

59 days of NCGS field crew visits to Macon County
615 on-the-ground locations of data gathering
155 field verified landslide process points
222 field verified debris deposit points
14 NCGS soil sampling and testing locations
LiDAR data (same data used to make state floodplain maps)
1954, 1993, 1998, and 2005 versions of aerial photography and other imagery (NCGS 2012).

5.3 STEEP SLOPE MAPS AND SECOND HOME OWNERSHIP

Easley's aim of using the maps to protecting infrastructural and residential construction in the mountains is noteworthy because much of what financed the exurban boom in Macon County was the rise of out-of-state second home ownership throughout western North Carolina. The county's exurban growth is significantly comprised of second home owners and developers in the county often market their services to Floridians and Georgians, who own the majority of second homes in the county.

Figure 1 (from Gustafson et al., forthcoming) shows the ZIP codes (ZCTAs as a proxy) in the southeastern US with three or more entries in the Macon County tax database. Most broadly, there is a clustering of second home owners from in and around southern Appalachia and metropolitan Atlanta, a dearth of them in the rest of the Piedmont, and then another major cluster in middle and south Florida. More specifically, outside of Macon County, the ZIP with the highest number of Macon County home owners is in metro Atlanta and was, in the pre-financial crisis years, the ninth wealthiest ZIP code in the US. This is not to say that all second homeowners in Macon County are exceptionally wealthy, but only to show anecdotally that the county attracts capital investments from around the region via second home ownership.



Figure 5.1 Macon County Landowners per ZIP Code tabulation area in the Southeast US

The Landslide Hazard Map, especially when combined with county tax data, reveals that patterns of residential construction in landslide prone areas are becoming the norm in Macon County. About 7% of Macon County residences, or roughly 1079 individual structures, are in high risk zones. Macon County does not have available online the date that these structures were built, so it is hard to argue that new construction happens more frequently in high risk areas on the landslide hazard maps. What is clear from overlaying parcel and structure data with the landslide hazard maps, though, is that rates of second-home ownership are slightly higher in moderate risk zones and much higher in high risk zones when compared to similar rates in low risk and all risk zones. In other words, non-local second home owners are more likely to own the homes in high-risk and moderate risk zones. The numbers are in Table 5.2.

The most striking relationship here is between risk zone and owner's primary residence. The percentages of homeowners in the various structure categories in every instance show that structures in high risk zones and moderate risk zones are more likely to be owned by second home owners (as either "w/ primary non-NC address" and "w/o Macon County ZIP"). Any number of other variables (e.g., slope aspect, road networks, utility infrastructure, land price, and more) determine the highly circumstantial and idiosyncratic site selection process for individual developments and home sites. It is impossible to say, then, that there is a direct relationship between second home ownership and moderate to high risk zones. What is clear, though, is that second homeowners consistently own more valuable homes in higher risk zones, regardless of the drivers of the trend.

Owner's Primary Residence	<u># of structures</u>	<u>% of subtotal</u>
All Residential Structures	25699	
w/Primary NC address	16719	65%
w/ Primary non-NC Address	8980	35%
w/ Macon County ZIP	15844	62%
w/o Macon County ZIP	9855	38%
Structures in High Risk Zone	1079	
w/Primary NC address	528	49%
w/ Primary non-NC Address	551	51%
w/ Macon County ZIP	464	43%
w/o Macon County ZIP	615	57%
Structures in Moderate Risk Zone	806	
w/Primary NC address	492	61%
w/ Primary non-NC Address	314	39%
w/ Macon County ZIP	446	55%
w/o Macon County ZIP	360	45%
Structures in Low Risk Zone	23776	
w/Primary NC address	15684	66%
w/ Primary non-NC Address	8092	34%
w/ Macon County ZIP	14920	63%
w/o Macon County ZIP	8856	37%

 Table 5.2. Owner's Primary Residence and Landslide Hazard Zone in Macon County

This trend is significant for a few reasons. With rare exception, second homeowners in Macon County are from less mountainous places than Macon County. Their unfamiliarity with the landscape and with the steep slope hazard maps may mean less familiarity with best practices for mountain slope construction sites and certainly less familiarity with the landslide hazard maps. Several of my interviewees (Interviewees P, Q, G) corroborated this suspicion, noting that out-of-state owners are frequently the most notorious for their unrealistic visions for what kinds of homes and developments are environmentally feasible in the mountains. If the historical

patterns of non-local home ownership in Macon County are even partially repeated in the future, it is likely that future soil disturbances and housing site locations in high- to moderate-risk zones will increase.

When commissioning the maps, then, state legislators were right to be concerned about the burgeoning population in the western counties. Not only has the population grown, but out of state ownership, a substantial portion of this growth, is happening at a greater pace in landslide prone areas than less prone ones. The aim of the maps to guide local decision makers and homeowners in the siting of residential structures seems both prudent and necessary.

By 2008, the Macon County planning board was ready to explore the maps' usage in a planning ordinance. To draft such an ordinance, the planning board created a steep slope ordinance subcommittee, comprised of a few planning board members as well as some volunteer Maconians. One of the main goals of the ordinance subcommittee was to study, understand, and evaluate whether or not the maps could be used in a local ordinance. This process ultimately resulted in a proposed ordinance that incorporated the maps. For pro-planning Maconians, it seemed a heartening development that the NCGS maps would give the proposed ordinance some rigor. At this moment, before the joining of the maps and the ordinance, heated political controversy seemed the remotest of possibilities.

5.4 WILDFLOWER, POSTER CHILD FOR EVERYTHING WRONG IN MACON COUNTY

One reason political controversy over the maps seemed so remote was because of the widely disdained environmental degradation and financial precarity of a residential subdivision in Macon County called Wildflower. Perhaps no other single episode embodies the economic

and environmental complexities and distresses that spawned the maps like the saga of Wildflower. A troubled subdivision started in 2004 by Atlanta-based builder Ultima Carolina LLC, Wildflower epitomized these concerns for Maconians. Indeed, it is impossible to discuss the origins and rationales for developing the maps with Maconians without hearing about Wildflower as a common rationale.

Wildflower, situated in the Cowee township of Macon County, encompassed over 2,000 acres and was a visionary and upscale exurban subdivision, early in the trend of luxury home sites in the southern Appalachians. Wildflower's several hundred lots routinely sold in the \$100,000 to \$300,000 range and were advertised, like many other developments, as ideal second home ownership plots for Floridians, Georgians, and other out-of-state buyers. Though the local construction industry would certainly benefit from Wildflower and other developments like it, Ultima encountered opposition from Maconians starting in 2005. That year, Ultima's founder, a Robert Ullman, met with the public at a meeting co-organized by Stacy J. Guffey, then the county's planner, in a local school's gymnasium. Neither Ullman nor his colleagues hailed from western North Carolina or any mountainous place; instead, they originated from much topographically flatter Atlanta and the Netherlands.

This particular 2005 meeting is routinely referenced by Maconians when talking about irresponsible development in their county. According to their reports and media reports, Ullman took a frank approach to answering community members' questions and critiques. As Giles Morris (2009) noted in the *Smoky Mountain News*,

'There's a reason people are drawn to these mountains,' said Ullman in Wildflower's press materials. 'The wrong kind of development can destroy that; the right kind can help to preserve it. This is not just about higher elevations. It's also about higher standards.'...'You are not going to avoid development, and you are not going to completely prohibit development,' Ullman told the crowd. 'If you think Macon County won't change, I can assure you it will.' Ullman said the best people could hope for was to pass some land-use regulations to prevent irresponsible developers from ruining the mountains.

At other public meetings, some Maconians remembered aloud the circumstances of the meeting, reminding their fellow citizens that Ullman said that he and other developers were attracted to the county specifically because of its lack of construction regulation and oversight. Said one Cowee resident (County Planning Board Meeting, 17 June 2010) at a public meeting:

We have a tremendous mess up in here as a result of this Wildflower development. I just recall, I forget what year it was, but I imagine that many of you were out at Cowee school and the Dutch fellow who agreed to meet with the community. And I remember what he said very clearly, he basically said: Because you have no guidance, I will do what I want. I don't know whether he left here wealthier or poorer, I really don't know how that played out. I do know that it was a hot situation. Homeowners in there are going to have incredible liabilities. I think that's just a real good example of the issues that we need to be ahead of when the economy picks back up. There was obviously a lack of understanding of how that mountain should be treated. If you're going to lay a lot of houses there, they did not do the right approach. I just recall that he basically challenged the community, if you do not have guidance, people like me will come in and do what we want to do.

Some mixture of regret and anger colors many Maconians' recollection of Ullman's public meeting—and of Wildflower more generally—and their discussion of the meeting remembers it as though it were a pivotal, county-wide teachable moment, a moment whose potential lessons would either condemn the county to a generation of environmentally irresponsible growth or goad stubborn politicians into protecting the county's landscape with a strong steep slope ordinance.

While some Maconians interpreted this meeting as a way to promote regulation, others saw it as a way to discourage state involvement in the name of cooperation and understanding. Wrote one Maconian (Roberts 2005) in a letter to the editor following this meeting: They [Cowee residents] have private property rights, which should be honored. The owners of the project [i.e., Ultima] have purchased property and plan an upscale, dignified development which should not be objectionable, according to the article in the paper.

The whole key, to me, is for the community and the developer to work together, rather than jumping on the "zoning" bandwagon again, which is the real meaning behind "land use planning."

The one thing mentioned by the developer and which would be most beneficial to the whole county is the affordable housing, and to which he indicated a willingness to be a participant. This would be an excellent idea, which should be developed before the Wildflower development gets too far along.

In an ironic twist unsurprising to many, Ultima's Wildflower became the paragon for

financially and environmentally irresponsible development in the county. Wildflower's high elevation and visible location left an obvious mark on a beloved mountain landscape, while complaints of erosion were brought to a head in 2009, when a Thompson Road, a street snaking through Wildflower, collapsed, burying an owned home site under half an acre of soil. Wildflower's road-related erosion and landslide issues were entirely Ultima's legal responsibility because it was privately owned and built road network. Complicating matters was the mid-2008 popping of the real estate market bubble. Because Ultima had borrowed nearly all of the capital necessary for Wildflower's development expecting to repay the loan with the sales of lots whose prices were rising ever-higher, the 2008 financial crisis could not have come at a worse time.

Ultima's risky borrowing was not the only suspect financial scheme that characterized Wildflower. A pair of 2009 lawsuits show that Ultima, along with several homeowners and a local law firm, was sued by Macon Bank for breach of contract, fraud, breach of fiduciary duties, negligent misrepresentation, unfair and deceptive trade practices, and professional malpractice related to a financial agreement undisclosed to Macon Bank, a local bank based in Franklin and issuer of mortgages for Wildflower. The details of this scheme are complex, but they offer important comparison to more widely publicized causes and symptoms of the 2008 mortgage crisis.

According to Macon Bank's accusations, here are the details: beginning in 2004, Macon Bank (2009) relied on a company called Beverly-Hanks Mortgage Services to "initiate the loan process with borrowers and provide Macon Bank with complete loan applications." In other words, Beverly-Hanks effectually served as Macon Bank's loan officer, being reimbursed one percent of the mortgage price. Their agreement stipulated that under Macon Bank's new 'lot loan' program, in which individual customers could get a mortgage through Beverly-Hanks for a lot for construction of a personal residence, the "loan-to-value ratio could not be greater than ninety percent" and that the loan was limited to primary or secondary home construction, not land speculation. At the height of the market, Wildflower lots were selling for \$300,000, meaning that these loans for a residential lot could technically be made for \$270,000 and would only require \$30,000 up front to secure the loan. Again, this was for a lot only and would likely require another mortgage to finance the construction of the house on the lot.

Several of these loans were successfully completed with the developer Ultima for the Wildflower subdivision. In 2007, though, Macon Bank received some loan applications directly, rather than through Beverly-Hanks, and noticed an alarming and significant addendum to the loan application. This addendum (2009) was an agreement between Ultima and the borrower, made without Macon Bank's knowledge but with the advisement of Beverly-Hanks. This agreement

...provided that 'upon the closing of the above-referenced transaction and disbursement of the seller's [i.e., Ultima] proceeds to Seller, Seller shall deposit into an escrow account established for the benefit of the buyer [i.e., the lot

purchaser] at BB&T the amount of \$ [a figure that was 10-15% of the contract price] of the full purchase price of \$ [price stated in the main body of the purchase agreement]....Online payment will be set up to pay the monthly mortgage, if any, until the \$ [a figure that was 10-15% of the contract price] is depleted and exhausted. Should Buyer sell the above-referenced property prior to disposition of the monies in the escrow account, Buyer is entitled to receive the remaining monies from the escrow account at BB&T...and the Seller has no claim to said monies.'

In other words, once the mortgage monies from Macon Bank had been successfully transferred to Ultima for the purchase of a Wildflower lot, Ultima would deposit 10-15% of the purchase price into an escrow account. This account would then pay the monthly mortgage payment back to Macon Bank, using the money that Macon Bank had just lent to the lot buyer. It is likely, then, that Macon Bank would have required a \$30,000 down payment for a \$270,000 lot loan, but would have been receiving monthly mortgage interest payments not from a borrower's income source, but instead from the money they themselves had lent the previous month.

A Macon Bank loan officer became aware of this situation in the summer of 2007 and alerted the bank management, which, despite having been fraudulently misled, nevertheless proceeded to process these loans with the so-called 'cash-back' agreement until August 2007. At this point, Macon Bank had misgivings about the cash-back agreement and rewrote their underwriting guidelines to emphasize that Macon Bank would not allow such cash-back agreements in the future. Given how attractive these arrangements were to lot buyers, Beverly-Hanks attempted until the fall of 2008 to convince Macon Bank's head underwriter to reconsider the Bank's new position.

During the fall of 2008, as the mortgage crisis was nationally and internationally spiraling out of control, Macon Bank began receiving calls from Wildflower lot owners that they would not make any more payments on their lot loan and would allow the bank to foreclose on their property. Macon Bank alleges—and it seems quite plausible—that by the fall of 2008 that the escrow accounts had run dry and that the buyers could no longer afford to make payments on the loan, if they even could have afforded to in the first place. Furthermore, Macon Bank avers that "real estate investment promoters were conducting seminars in which they encouraged investors to buy Wildflower lots, pay the interest with the cash-back from the developer, and then 'flip' the property at a profit when the money from the interest cash-back [agreement] ran out" (Macon Bank, 2009). Macon Bank had also discovered evidence of misrepresentation of income on a loan application. In short, because of these dubious dealings, Macon Bank now owned several lots of Wildflower subdivision that were then worth a fraction of their original value and had been deceived into making, according to *The Franklin Press* (McRae and Ellison, 9 November 2011), \$3,500,000 in fraudulent loans to Wildflower lot buyers.

By 2010, the banks, now in ownership of the foreclosed lots, were selling them at auction for a fraction of their original cost. Furthermore, the FBI was getting involved, and there were indications that one person involved with Wildflower had to enter the witness protection program because of threats on her life. It is worth quoting two Maconians (Interviewees Y and Z) intimately familiar with Wildflower at length:

Y: Well, [the lots are] for sale [for about \$12,000] and the banks are trying to make a little bit of their money back. They're just selling it for whatever they can get. Then, they're going to go back—in California, in some states you can go back on the person who took out the loan if they default and take from them. You get the property back, but it's not worth any more. You're going after them for more than, in some cases, more than they had on their lot. They don't have any money. They're trying—everything they own they could lost. And, of course, their crime was wanting to get property and make a little bit of money so they could retire. Anyway, everybody involved is guilty. The FBI, as I understand it, is investigating. There have been two people in California who have gotten calls from the FBI. I even heard that one of the original realtors has gone into the witness protection program, but I don't know if that is true, because of threats on her life.

She was from Lake Lure. But she got swept into this, she was a big sales person and so she helped steer people here. It was sort of a semi-con game. They would go put on a seminar for a group of investors and most of these people, they were just ordinary people who believed that if they didn't have a million dollars by the time they retired, they'd be poor the rest of their lives. And they didn't have a million dollars and they were trying to get a little bit of money. They go to this hot-shot realtor, nationally famous guy named Bob Diamond. He was one of the ones. He is still on TV as the big guru. He goes out and he does this seminar and people pay \$5,000 for the seminar. He tells them that these are great buys, western North Carolina is really growing, it's the next Highlands. \$200K now, you'll be able to flip it in a couple of years and you'll make a couple hundred thousand dollars. These poor souls believed it and bought sight unseen. Then they had a deal where they didn't have to put any money down. Part of the loan was put in an escrow and paid the first 18 months of their mortgages. So they were sitting around thinking that by the time 18 months was up, they could flip it. And then the market crashed and they're stuck with all that and they can't sell. They can't make the payments because the payments are a couple thousand dollars a month, five thousand dollars a month or whatever, and they don't have the money. This one poor guy, his wife's a realtor and he just worked for a cable company. We're not talking about fat cats. They were probably doing okay out in California during the hey day, but then, they've just lost-they're losing everything over this deal.

Z: I just can't imagine that. And that's certainly not the only example of subdivisions that that happens to. It's happened all over the place.

Y: Oh no, it's not. It's not even the worst. There's one in Cashiers. The mafia, actually. Money laundering.

Z: His name was Robufo. What a great money laundering name, Robufo. It was awesome, it doesn't get any better than that.

Y: He was getting people like a beautician to take out a loan in her name and then they'd pay her for doing it and she didn't know anything. They were just using her in this money laundering scheme, buying and selling. They build some houses up there, but they just walked away from them and they're sitting there. One of them burned down recently, under suspicion. It's just amazing. Who would think it?

These comments about the lawsuits involving Macon Bank and Ultima give a remarkable

picture of how exurban mortgages functioned in the lead up to the 2008 mortgage crisis. Macon

Bank and Ultima are not aberrations, either, as *The Franklin Press* (Morgan 2009) noted that a development in Cashiers was under investigation by federal prosecutors for fraud and income falsification. Contrary to some of the racialized and class-based popular narratives about pre-2008 sub-prime lending in the US in which poor black inner-city residents irresponsibly borrowed mortgage loans they could never even hope to repay, sub-prime lending in exurbia looks decidedly different, yet with some striking similarities. If Macon Bank was legitimately defrauded through the surreptitious arrangements by Ultima, Beverly-Hanks, and borrowers, they also cynically lent money for overpriced lots—never mind actual houses—for only a 10% down payment and seemingly did a poor job of verifying that their borrowers had an appropriate ability to repay the loan. Yet these loans were not made to working class or poor inner city residents to remedy deferred maintenance on primary residences. Instead, risky mortgages were available for residential lots, under the thin pretense of requiring future construction on the lot rather than speculation.

Furthermore, it would be impossible to separate these developments from the marketing strategies of Sotheby's, Ultima, and other realtors and developers in the area. Selling prospective buyers on the idealized vision of owning a second home in the mountains or training them to flip lots for a quick profit is deeply rooted in narratives of exurbia as a "migration from cities to high-quality towns". The ironic contradiction here is that these lending practices coupled with the sales pitch of second-home ownership contributed to the crushing of the economic and environmental basis of these imagined small town qualities Sotheby's, Ultima, and others, are dependent on offering to their clients.

Ultima, then, with its worsening regional reputation, having been sued and bankrupted in the 2008 financial crisis, still legally on the hook for mitigation of environmental issues in Wildflower, and unable to sell lots because of a tight mortgage credit market, was forced to sell Wildflower. Though any environmental mitigation was Ultima's responsibility, their impending bankruptcy meant that the repair of individual home sites fell to the homeowners. By July of 2010, though, over half of Wildflower's lot owners had themselves gone into foreclosure. Unsurprisingly, a host of lawsuits ensued, many of which are still in court, involving local banks, Wildflower, and individual lot owners.

In June 2011, Leed Enterprises, LLC, led by a local contractor, bought Wildflower from BB&T Bank, the lien holder of Wildflower, and began auctioning lots in October. Having renamed it "The Ridges" and denying any lingering or potential slope or erosion problems in the development, Leed sold Ridges lots at an auction, selling from \$14,000 to \$30,000 a piece—roughly a tenth of what the same lots went for only six years earlier. Though not to the same extent as Ultima's Leed's reputation is also suffering, as it has developed Diamond Falls Estates, another subdivision in Macon County. Reports are that Diamond Falls Estates, while promising a beautiful subdivision to buyers similar to those who bought in Wildflower, have only delivered a subdivision full of unpaved and barely navigable roads. Leed has insisted that "there were some issues [in Wildflower/The Ridges], but those are resolved. We have a well-funded group, we have a stake in the community, and we have eliminated any problems" (Ellison 2011). Given Wildflower's monstrously complex and damaging history and the emerging notoriety of Diamond Falls Estates, it remains to be seen how Wildflower/The Ridges' environmental costs and consequences will play out in the future.

5.5 LOCAL DEPLOYMENT AND RESISTANCE

The maps were created during the height of the pre-crisis construction boom in western North Carolina and Governor Easley had every interest in ensuring that this economic transformation of the region continued apace. Steep slope maps were one way to encourage local planning boards to assure developers and home buyers that their investments were located in safe places unlikely to be affected by landslides. Despite Governor Easley's planning aspirations, the state-to-local circulation of the maps after their production faltered on two fronts. First, despite its initial popularity in 2005, the landslide mapping program turned controversial in 2010 at the state level. The state legislature that in 2005 enthusiastically and unanimously funded the program was now Tea Party-led, and it eliminated the mapping program among other state programs to drastically reduce the state's budget. Though the maps were implicitly designed for local regulatory purposes, among other ends, the legislature seemed to care more about making a budgetary political statement rather than a regulatory one. The mapping program's cuts were rolled into a large appropriations bill rather than made in a politically staged battle. Legislators' comments, too, were mostly about practical and ideological motivations to cut the state's budget rather than an attempt to block map-inspired future regulation (Johnson 2011).

Secondly and paralleling the state level developments, the NCGS maps also encountered stiff political resistance in Macon County. Though some county politicians had expressed interest in the maps after their completion in 2008, by 2010, their support was waning. The steep slope ordinance's public meetings had drawn the interest of Macon County's well-organized and established conservative activists, who began voicing opposition to the maps as well as the

ordinance. Amid this public controversy, rumors swirled that the county might be liable for the information on the maps if they remained posted on the website. Since their public release, the maps had appeared on the county's website and were available for download. In December 2010, though, a *Smoky Mountain News* reporter noticed that the maps had been removed from the website, including most references too them as well as their download availability (Ellison 2010). The state of North Carolina reassured Macon County officials that the county would not be liable for any information present on the maps, but the maps remained and continue to remain absent from the website. My interviewees noted that public speculation remained rampant that the county was politically pressured to remove the maps from their website (Personal Interview, Interviewees B, D, G, H, I, N), though there has been no official county statement as to the disappearance of the maps. Circulation of the maps as a tool for public use was significantly hindered by the removal of the maps from the county website.

5.6 SECOND HOMES AND LANDSLIDE INITIATION ZONES

This hindrance posed a problem for Macon County, mostly because the landslide maps reveal some interesting trends regarding exurban development and landslide hazards in Macon County. The other two maps, known as the Slope Movements and Deposits Map and the Stability Index Map show a range of data regarding the locations of past landslides and their deposits in Macon County and the stability of soil across the county. The Slope Movements and Deposits Map has a breakdown of all of the detectable and measurable modern slope movements in Macon County. These slope movements include what are generally but unscientifically called 'landslides'. These events are called debris and earth flows, rock slides, rock and debris falls, rock and debris creeps, and earth blowouts. A summary of the map's slope movement statistics is below (Table 5.3), where type of slope is whether humans had previously modified the slope and where all slope movements is the total number of movements measured by the geologists (Wooten et al. 2006b).

Table 5.3 Number of Slope Movements on Modified and Unmodified Slopes in MaconCounty

Type of slope:	Modified Slope	Unmodified Slope	Unknown	Total
# of slope movements	95	67	5	167
% total	56.9%	40.1%	3.0%	100%

What the table's data show is that slope movements are roughly 17% more likely to occur on slopes that have been modified by humans. We also know that exurban growth in Macon County is happening increasingly in downslope hazard areas, especially with second home owners. As development changes the landscape of the county, that is, as forest and pastoral lands on mountain slopes are converted to residential and infrastructural uses, that land falls in the modified slopes category. While landslides can and do happen regardless of direct human impact on the landscape, they also happen more frequently on modified slopes. Exurbanization modifies slopes, thereby increasing the likelihood of slope movements on that land.

Complicating this further is the projection by Coweeta Lab scientists that extreme droughts and extreme precipitation events will be the hallmarks of future climate scenarios in southern Appalachia. Extreme precipitation events can cause landslides, of course, but extreme drought can compound the problem by destabilizing soil structure. Degraded soil structure can exacerbate the effects and likelihood of landslides (Coweeta LTER 2013). This is the unintentional coincidence of Macon County's future: more frequent and spatially extensive disturbance of landslide prone slopes, which are increasingly subject to landslide-triggering climatic conditions.

Catastrophic events, because of their drama and sudden tolls, often move decision makers to act, much like when the heavy rainfall and landslides from two hurricanes pushed the state legislature to commission the landslide hazard maps. These dramatic 'pulse' events, though, are exacerbated by the creeping 'press' events, like exurban land use disturbance and climatic changes (Collins et al. 2008). Importantly, then, the Slope Movement and Deposit Map shows that the interaction between the press events and the less dramatic but more pervasive and broad social and ecological trends can condition these extreme, harmful, and discrete events.

5.7 MAPS AS JUNK SCIENCE

For their part in the state-to-local circulation of the maps, Wooten and the NCGS geologists working on the landslide hazard mapping projects presented their findings at nearly 200 community meetings in western North Carolina and roughly 20 times in Macon County alone (Personal Interview, Interviewee U). These invited presentations were at organizations like land trusts, subdivision groups, watershed councils, planning boards, county commissions, and other similar civic and volunteer organizations. At one of these meetings in Macon County to a joint planning board-steep slope subcommittee, Wooten outlined the merits of the maps and their methodology. While many appreciated his presentation, some reported finding it highly technical and detailed, as Wooten did not hesitate from discussion mathematical equations and some of the nuances of GIS and LiDAR techniques. An anti-ordinance board member, at the

conclusion of Wooten's presentation, dismissively said aloud to the audience that no one understood Wooten's presentation and that now the planning board could return to its business (personal interview, Interviewee D).

This board member's sentiments mirror some of the major reasons for the impeded circulation of the maps in Macon County were the arguments conservatives deployed about the maps, aiming to showing the maps' inaccuracies, inappropriateness for regulation, and unreliability. Conservative groups like the local (and only) chapter of Property Owners of America sowed doubt about the quality, usefulness, and appropriateness of the maps, while the less organized pro-planning Maconians advocated for their incorporation into the ordinance. I draw primarily from Vic Drummond, a well-known county conservative and operator the blog Stop Steep Slope (stopsteepslope.wordpress.com), mostly because the blog articulates most succinctly the range of arguments presented on other blogs and letters. Drummond also ran for county commission in 2012 and, as of the summer of 2013, continues to keep his Stop Steep Slope blog online, even though the ordinance's fate is all but sealed.

He (Drummond 2011) offers this take on the maps: "No one can predict when or where a landslide will occur. Every inch of mountainside is susceptible to landslides. The Landslide Hazard Maps are pure speculation. They are based on scientific 'theories' not to [sic] 'scientific methods' referred to in the [FAQ's on the planning board webpage]." This misses the point that the NCGS do not purport to predict the certainty of landslides, but more importantly, accusing the maps of not predicting a landslide polemically and suggestively casts doubt on the credibility of the maps.

Drummond (2011) continues on the topic of accuracy:

"The statement that 'No qualified professional has disputed the accuracy of the

maps' is absurd. It depends on what the meaning of 'accuracy is.' [sic] The geologist who developed the Macon County Landslide Hazard Map says they are simply a planning tool. Doesn't that disprove their 'accuracy?' What is meant by 'accuracy?' That a landslide MIGHT occur on one of the predicted hazard zones? How can they be 'accurate' if they can't tell us that a landslide WILL occur if there is a 5" rain?"

Again, the author seems to misunderstand the meaning of the term 'accuracy,' but that

misunderstanding is beside the point: casting doubt on the maps raises questions to impede the

public's understanding of the maps. Similarly, Drummond (2011) raises questions about

LiDAR, GIS, and field techniques used to create the maps:

The NC geological Survey geologists...put [soil map information and a digital elevation model] into their computers and ran [SINMAP] while changing different input variables until the program generated a map that showed potential hazardous landslide origination points at points that included where their field survey's [sic] show landslides occurred. This required the SINMAP program to be run many times. The people running the program decide when they have generated a 'good' map. Too few or too many high hazard points are 'bad'. This is sort of like Goldilocks trying to pick which porridge temperature is just 'right.' The geologists then took their 'good' map of hazard zones and manually drew in areas that they felt represented landslide hazard zones shown on the Landslide Hazard Map

Even if his details are not right here about how the maps were produced and even if his last

sentence is unclear as to which maps the geologists compared, Drummond's argument is more interesting. He notes that geologists make choices that influence the content and expression of scientific findings and implicitly references a detached objectivity that scientists often claim, observing that the geologists do not measure up to this scientific standard of objectivity. Drummond (2012) has also referred to the maps as "bordering on 'junk science'" in another letter to the editor. Wooten and his team of geologists were not detached, objective experts. They were, in fact, paid to provide a useful cartographic tool, in addition to being residents of a landslide prone region of the state. What is rhetorically powerful about Drummond's statement, though, is the image of scientists creating maps they 'felt' like creating—a rigor-less image of irresponsibility and conflicted interest.

Finally, Drummond (2011) questioned the accuracy and appropriateness of LiDAR. In his mock FAQ's, he writes:

Is LiDAR accurate?

According to the Working Group [i.e., the steep slope ordinance subcommittee], "the data is accurate enough..." They admit it is least accurate in forests where the majority of steep slope property is located. When the decision on whether or not a site falls into a 30% or 40% slope and falls under the ordinance, is the data "accurate enough?" I'm not sure it is.

The sentence Drummond refers to is from the Steep Slope Subcommittee's website, which reads "The data is accurate enough to use for determining the slope of a property in Macon County" after noting that the LiDAR-derived DEM is accurate to within 1.61 feet at a 95% confidence level. Aside from Drummond's deliberate selective quoting of his opponent, his answer to whether LiDAR is "accurate enough" is meant to sow doubt about it's accuracy, suggesting that it is only barely or marginally accurate.

Those who crafted the ordinance were aware of these arguments against the science of the maps. As one interviewee (Interviewee O) noted, "They're based on the best information that's available, using LiDAR technology and a gazillion hours in the field verifying what the maps were showing. It's the best thing you could do. There's nothing out there better. Yet, because there is a lack of concrete 1+1=2 associated with the maps, there's some gray areas, sure, there's going to be some error associated with anything like that especially at the scale we're working. Because of that—because it wasn't definite—that created an opening for those who were opposed to the process."

Another argument against the maps was more frequently articulated in public meetings than it was in print. In the late summer of 2011 at a steep slope committee meeting in Cowee, a township in the northern reaches of the county, an older man whose family had owned and managed a large farm rose to speak out against the maps. He said that the LiDAR DEM had calculated the slope of his land, but that it was still safe for construction. He claimed to know this because he had taken a level out on his land, laid it down on a hill slope, and measured the angle between the level and a horizontal string. He (County Planning Board Meeting, 17 June 2010) also invited any map proponent to visit him on his land and he would show them the same demonstration.

I'm speaking here now because on this ordinance right here, if we get too far along with it, and if it become confiscatory, when you take the usability of a piece of land away from a man. Thousands and thousands of people in the county own a house on a lot and there's a number of people who own acres that this thing is really going to affect. In my case, I've got land that I've owned for 40, 50 years, 20 acres, that land, I've been paying based on an average of so much per acre. I know because I took my level out on the land and a goodly portion is around 30, 35, 40 percent grade. We have houses all over the county that have been built on that kind of a slope and it's never been a problem. But now, if you legislate my land out of usage and I've been paying based on a given price per acre on that land, are you going to then tell the county tax assessor on this land, this land, this land you've got to reduce their value because of the grade of the slope. I mean, how complicated is this going to get? My personal question is: how important is it to make it complicated to people and make it confiscatory versus how many issues and how many problems have been in the past that deserve this complication?

Other similar arguments complained that property lines and stream banks on the maps had been slightly misplaced and that the maps were, therefore, untrustworthy.

To some readers, this anecdote about the old man and the slope might be laughably

pitiful, but to some degree, the he was right: he accurately measured the slope on a three-foot

mini-transect of his land and found that it did not correspond to the DEM's assessment. Most

cartographers would note, too, that this discrepancy is entirely possible and even likely, depending on the resolution of the LiDAR data. The discrepancy reveals the kinds of difficult epistemological encounters that can happen when long-term first hand experience with the land and the seemingly abstract and detached portrayals of landscape characteristics made possible by LiDAR and GIS.

At work in this public meeting conversation was something different than simple ignorance: instead, it raises issues of what this epistemological encounter means for urban futures, how a better politics can negotiate these encounters, and how geographic technicians can better communicate their scientific portrayals of the landscape to those without their training and expertise. These kinds of questions target the heart of changing types of expertise in exurban landscapes, even in the face of Drummond's and other Macon County conservatives' deployment of these maps to subtly undermine public confidence in what is ultimately the best available information about the likelihood of dangerous landslides in particular places in Macon County.

5.8 APPLYING AND AVOIDING THE MAPS

In the heat of the steep slope ordinance battle, which developed early in 2010 and lasted until the ordinance was tabled in late summer of 2011, public controversy about the NCGS maps raged in public meetings and newspaper editorials. The impeded circulation of the maps still drew the ire of some Maconians and the rationales for why the maps were circulated and kept from circulating ultimately posed an important question: what exactly should be done with these maps? The county planning board and steep slope subcommittee, of course, were not the only political actors to do something with the maps. The planning board as a state actor had regulatory authority to deploy the maps in the ordinance used the maps for particular ends, too.

Macon County's planning board applied the maps to the ordinance to make the county's mountainsides into steep slopes able to be calculated, measured, and legislated. The maps were designed to make the landscape legible for local planners, especially to reduce human harm in light of the increasing exurban population of western North Carolina. This application of cartographic knowledge was controversial for conservative land rights activists, but enthusiastically welcomed by pro-planning ordinance advocates.

Interestingly, the most organized group supporting the maps in public debate was the steep slope subcommittee. No other pro-planning or pro-ordinance group had organized until MaconSense did in August 2011. By then, though, the maps had been divorced from the ordinance, the ordinance had been tabled, and only a weakened set of construction standards was even palatable to the planning board. The construction standards (Macon County Steep Slope Subcommittee, 2011) recommended:

The County should incorporate construction standards into the existing subdivision ordinance and erosion and sedimentation control ordinance, as well as in a new ordinance dealing with slope development. The standards should regulate cut slopes over 8 feet in vertical height which are steeper than 1 ½:1; and fill slopes over 5 feet in vertical height which are steeper than 2:1. All constructed slopes over 30 feet in vertical height should be regulated. Placement of fill material should meet the following minimum criteria:

1) The area upon which the fill is to be placed should be stripped and grubbed, and all vegetative matter should be removed.

2) A bench should be constructed at the toe of the fill

3) The fill material should be free of organic material and vegetative matter

4) Fill material should be placed in lifts not greater than 8 inches in thickness and compacted to a minimum of 90% Standard Proctor Density.

Rather than a vociferous defense of the maps and their appropriateness for the project, the subcommittee and planning board wrote (Macon County Steep Slope Subcommitee 2011) these notes in their FAQs about the ordinance and maps.

Q: Can the Landslide Hazard Maps predict landslides?

A: No techniques that are presently known can predict the time and place of future landslides with 100% accuracy. However, the maps are based on the best available scientific methods and data for making these predictions. The maps are planning and screening tools that show the general areas where landslides are likely to start, and where they will likely go should they occur. The maps are not a substitute for a site specific stability assessment by a qualified geologist or engineer. There are many examples of predictive maps being used to predict hazards. For example, the Flood Hazard maps are incorporated in a County ordinance, the State of NC Building Code uses maps to predict seismic risks, high wind risks, and even the risk of termite damage. All weathermen use maps to predict the weather. None of these is infallible, but all are useful. No qualified professional has disputed the accuracy of the maps.

This is a sample of the milquetoast but accurate language one might expect from a planning board patiently justifying their methodology, but it did not measure up in political effectiveness or fiery conviction to the subversive and polemical discourse of the county's land rights activists. The planning board, like many official bodies, had to first and foremost state their information plainly, clearly, and accurately so as to avoid public misinterpretation and to avoid misstating the legal ramifications of planning, mapping, and regulating steep slope development. Though their plain language is correct but uninspiring, it was magnified by the total absence of a politically organized effort to counter balance the county's land rights activists.

As for pro-mapping groups, the only organized non-conservative group was MaconSense³. Their stance on the maps, however, was essentially a strategy of non-engagement. Indeed, in retrospect, it would be hard to call them even a pro-mapping group,

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See Chapter 7 for a brief history of MaconSense

given their relative silence on the issue of the maps. While at their meetings they would talk occasionally about the maps, one of their members told me that they understood the map controversy to be a non-starter. Said one member (personal interview, Interviewee D) of MaconSense:

We have to talk about the technical components of the [maps]. But it doesn't really motivate anyone. If you're going to get into the components of it, which, again, gets really quickly into a technical conversation that doesn't seem to really motivate anybody. If you're going to talk 30 and 40 percent and stability index—if you're going to go through all of that, we have to tie each of those to real world stories. ...There seems to be this idea that if we could just get the facts out there then we would win the day. But that's just not true. ...We don't want to get into debates about the accuracy of LiDAR data. How do you form a message around that? It's just a quagmire you get sucked into.

This lack of desire to engage on scientific issues is interesting because some members of MaconSense sensed that the local skepticism toward scientific expertise was driven by non-local political trends. As one (Interviewee G) said: "[the skepticism of the maps] goes back to the same thing, this mistrust of global warming or fear of thinking that...the data's inaccurate or that there's an agenda. It surprised me, but I don't think it would have been as apparent 10 or 15 years ago. People in this community have had a pretty good respect for Wayne Swank and Coweeta and places of scientific research. It seems like people question science now more than ever. They don't really want to be confused by the facts." Ultimately, debating over the fine details of the maps and fighting the battles of expertise proved to be uninviting for MaconSense, especially because the group officially formed so late in the political process. Not having crafted the technical arguments in favor of the maps or cooperated with Wooten's team, instead they focused their energy on first, promoting the ordinance itself and second, countering land rights activists on the benefits and burdens of ordinances. Though the well-organized conservatives

disputed the maps on a number of points, their efforts were essentially ignored by MaconSense.

Though not affiliated with MaconSense, some pro-maps Maconians spoke out via several editorials about the viability of the maps. Most of these editorials were largely reactive, rather than proactive, attempting to counter conservative talking points about the maps. All of them, though, were framed in the terms of 'reasonability': that the reasonable position on the maps was to use them because of their scientific credibility and that a once progressive community like Macon County ought to use the maps as a sign of civility and character. "What has happened in Macon County?," Bob Scott (Scott 2011), a regular contributor to *The Franklin Press* wrote. "I've been here more than 40 years and I cannot think of a time when some of us appear to be so angry, vindictive and uncivil. I believe this began when the "Preserve Freedom, Stop Zoning" bumper stickers showed up and threats were leveled at public meetings by the 'Concerned Citizens'.. Scott's indignant tone mirrored the sentiment expressed frequently in the papers; for example, in the editorial board's (2011) commentary titled "LiDAR: If it's good enough for NASA...."

I, too, had a role in this 'reasonability' discourse in vetting the NCGS maps. In March and August of 2012, the CLP published two articles in the roughly bi-weekly "Science, Public Policy, Community" column in *The Franklin Press* referencing the steep slope controversy.⁴ The August article in particular sought to provide some scientific perspectives on the maps, their usefulness, accuracy, and importance for scientific inquiry. Given that the maps were a focus of my research, I was the lead writer on this particular piece. The August article appeared in print almost a year to the day after the planning board tabled the steep slope ordinance and discarded the maps. The article also was published well before the November 2012 election, when one

⁴ See https://listening.coweeta.uga.edu/articles/slope_mapping_and_LiDAR_data for the article.

county commissioner, an incumbent Democrat, lost his seat in large part because of his affirmative stance on the steep slope ordinance and the NCGS maps.

The timing of the article was intended to be safe above all else, even if it was a late contribution to the public debate. Offering a scientific validation of the LiDAR-based techniques used to produce the maps—even when the mapping controversy had passed and even when Coweeta Lab scientists had publicly supported the making of the maps just a few years earlier—was contentious. The collaborative writing of the article featured a higher than usual amount of deliberation, editing, and caution in order to avoid any hint of political affiliation.

The article itself, much like the other late advocacy for the maps, did not have any particular effect regarding the application of the steep slope maps, but the CLP's choice to publish an article on the maps, as well as the timing, shows how sensitive the politics of applying environmental knowledge can be and how quickly those politics can change. As a site-specific and long-term focused research project, Coweeta Lab and LTER have been and will forever be tied to Macon County. The positive and negative consequences of using scientific knowledge to comment on political affairs will likely be as long-term as the long-term ecological research program itself. Coweeta LTER and Lab scientists, like those in many other political ecological milieux, are intimately bound up in the circuits of production, circulation, and application of environmental knowledge, even as those circuits are in political flux. Exurban areas only now experimenting with state practices of planning pose a dilemma to the participation of scientists in public life: valuable opportunities complicated by higher scrutiny versus ignoring these opportunities for the security of science-as-usual.

5.9 CONCLUSION

What makes Macon County's controversy over the maps more striking is that two neighboring counties, Jackson and Haywood, are in the process of completing landslide hazard maps for their counties. While Jackson and Haywood were scheduled to be mapped by the NCGS, their maps were not completed before the General Assembly halted the mapping program. Instead of relying on the state, Jackson County and Haywood County are hiring Appalachian Landslide Consultants, a new firm started by the NCGS geologists laid off by the General Assembly. The estimates are that it will take \$160,000 to \$200,000 per county to complete the projects, relying largely on environmental non-profits and NGOs to raise the funds (Kasper 2013). The *Smoky Mountain News* (Johnson 2013) notes one reaction about the maps in Haywood County:

County Commissioner Kevin Ensley, a land surveyor and a developer, said he personally would like to use the landslide hazard maps in his profession. 'If I am planning a subdivision, if I know whether those hazard areas are, I can make adjustments....To me you know exactly where to build you house on that lot. It is important information. ... I am in the development business, and I thin it is important to know where those areas are. You can say, "These are precautions you need to take to build your house.""

It is unclear whether or not Haywood County would incorporate their maps into their steep slope construction standards or whether Jackson County would meld the maps with their existing steep slope development ordinance. What is clear, though, is that Macon County's fractured debate over the maps and the General Assembly's unwillingness to fund them has not dampened interest in knowing about landslide vulnerabilities in the region. Even though Macon County's urbanization is more pronounced than most of its neighboring counties and though Peeks Creek only directly affected Macon County, the region's governments and civil society has taken note

and are pursuing the landslide hazard maps in a way that seems impossible in Macon County.

Back in Macon County, Wayne and Cheryl Stacy, who moved to Franklin from Raleigh upon their retirement, bought a house in Macon County in 2012, though it was built in 1998 in the midst of the exurban boom years. The home is in a suburban style, gated subdivision close to the top of a mountain in Macon County in the northeast section of the county not far from Wildflower. Crucially, part of their property also sits in a high risk zone on the NCGS Downslope Hazard Maps and their subdivision is criss-crossed by high risk and moderate risk zones on at least a portion of every street.

The consequences of the NCGS maps' production, circulation, and application as they intersect with exurban finance, environment, expertise, and the state perhaps come together no better—or worse—than in the precarious situation of the Stacys. In the first two weeks January 2013, Macon County had received over 8 inches of rain. On the night of January 15 at 9:30, *The Franklin Press* reports that the Stacys were at home watching television when a landslide comprised of mud, water, rocks, trees, and other debris tumbled down the mountain, significantly damaged their garage, covered their driveway, and part of their road. At the time of the reporting, there was no official cause of the landslide, but by all indications, the landslide had started at an upslope property owners' lot. The upslope property owners, though, had foreclosed on their lot, meaning that the Stacys could not get insurance money from them. Their own insurance company, according to their *Press* quotes, does not even sell landslide insurance. More distressingly, Cheryl Stacy laments that she and her husband had no idea that the NCGS maps even existed. She (McCandless 2013) says:

"If we had known there was a steep slope survey map, we could have looked at it. People coming here from outside don't know much about the mountains. I think we could have benefited from that kind of a survey, being able to check it out....This type of thing has happened over and over again (landslides), so you would think that either county or the state—somebody—would have some kind of program set up to help people that are in this kind of situation. We've maintained the property and upgraded the property and put in good drainage. We did everything right. And through no fault of our own, somebody's lot above us breaks loos and comes down and does irreparable damage to our property. And we have no recourse."

The Stacys frustration is obvious and understandable as the landslide exposed the precarity of life and property in the mountains. Not having adequate insurance, not knowing the risk of owning a home in a landslide prone area, not understanding the deferred maintenance on the foreclosed upslope property—all of these constitute the fractured social and environmental relationships that characterize exurban growth in the Macon County. They also illuminate the environmental knowledge and ignorance resulting from broken circuits of NCGS maps production, circulation, and application. Indeed, the Stacys circumstance is precisely the kind of symptomatic condition that broken circuits of environmental knowledge inevitably create: an unnecessarily risky landscape, resting on unstable foundations of financial uncertainty, conflicting claims of expertise, environmental degradation, and changing roles of the state.

The controversy over the NCGS maps speak to larger issues than the dubious exurban futures of southern Appalachia. They question the politics of environmental knowledge and the common narrative of disinterested experts imposing statist and capitalist logics from afar; they offer a counterpoint to some political ecology literature by suggesting that state-led mapping rationalities can be a force for good; and they show that grassroots resistance to the state projects can promote ignorance and harm. The maps produce as *objects* of environmental knowledge the mountainous landscape itself, spatially defining it landslide proneness in a finely detailed manner. If the maps enabled the state, as a new *subject* of knowledge, to act in the interests of public safety and capital accumulation, then they also provoked a profound epistemological conflict with local residents who resisted seeing their familiar landscape according to the state's cartographic readings. These insights are made particularly clear when understood from the perspective of urban metabolism. The maps, as a spatially explicit type of environmental knowledge, both enabled and disabled some arguments about the nature of landslides in Macon County, but did so dynamically relative to the 2008 financial crisis. As the crisis worsened and as the epistemological difference between the cartographic expertise and the arguments against that expertise grew starker, it revealed a complicated metabolism of knowledge dependent on the state acting both in the public's interest and in the interest of exurban capital investment.

The state and the embrace of its maps, then, are not some kind of panacea here. State fickleness and susceptibility to the interests of land rights ideologues in Macon County alone should be enough to think otherwise. Rather, the point is that for experts, vulnerable land owners, and other citizens, the state legibility of the landscape can be an important ally in protecting life and landscape in a highly unevenly developed geography. More specifically, the cartographic impulse of planning presents an epistemological encounter between the state-as-planning agent versus state-as-guarantor of individual rights. In this encounter, visions of the landscape matter—what they make legible and illegible—making urban growth not only a classic battle over political economic interests but also a contest over what kind of knowledge ought to count in these historically rural areas' urban present and future metabolisms.

CHAPTER 6

ORDINANCE

6.1 A FAILED ORDINANCE

The county planning board began drafting an ordinance in early 2010 with the help of the newly appointed steep slope subcommittee. Only two years later, though, the county planning board tabled the ordinance on August 2, 2011, at a regularly scheduled planning board meeting. The steep slope subcommittee, having deliberated for nearly two years and having written a comprehensive ordinance utilizing the NCGS Landslide Hazard Map, presented their findings to the Planning Board months earlier. After using this time to deliberate, the fundamental sticking point in their discussions was the viability of the maps in the ordinance (Interviewees S, N, and B). Lewis Penland, chair of the planning board, amid a tense public controversy about the ordinance and unable to resolve other board members' differences about the maps, proposed a tabling of the ordinance and the extraction of the map-less construction standards as a way forward. Even the construction standards were eventually tabled, though, leaving none of the ordinance's contents on the books.

This did not come as a shock to most people closely involved in producing the ordinance, but it was a surprise to many in the community who had followed its production, circulation, and application over the previous months. Given widespread public support for an ordinance of some kind and the deliberate and careful composition of this particular ordinance, how did such a promising and relatively benign piece of local legislation end up indefinitely tabled? In other words, how did the steep slope ordinance fail? Most importantly, what does its failure reveal about its metabolism—that is, its production, circulation, and application? To put it another way, what does a failed local ordinance tell us about the metabolism of knowledge, especially in exurbia?

Answering these questions depends on how we understand the law itself. Some theoretical interpretations of the law would claim that ordinance only has power insofar as it is part of the structural edifice of social power; that is, that laws matter if they have the violent power of the state behind them, or, that laws matter when the state uses law to produce political subjects, or, that laws only matter insofar as they represent the mutually beneficial relationship of state power and capital accumulation. Laws certainly matter in these instances and many scholars have rightly illuminated these processes.

What these interpretations of the law miss, though is the law as it is embroiled in urban metabolism. Even in its failure to become law, the steep slope ordinance still was deployed and used for political ends, to make new urban ecological futures, and to transform the landscape into a particular kind of regulated (or un-regulated) space. In other words, an emphasis on metabolism clarifies that the ordinance did work in the world *because of its powers of metabolism and its ability to be metabolized*, even though it was not passed. In this sense, the defeat of the ordinance did not represent its death, but rather only a moment of its metabolism. Geographically speaking, application of the law as a form of environmental knowledge, is ultimately about transforming the county's urban futures via the ordinance.

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6.2 IS BOOM OR BUST THE IDEAL MOMENT FOR REGULATION? NEITHER.

In early 2010, sparked in part by the collapse of Thompson Road in Wildflower, the ongoing deferred environmental maintenance throughout the subdivision, and the enduring memories of Peeks Creek, Macon County's Planning Board envisioned a rough procedure for creating and passing an ordinance aimed at mitigating future environmental debacles like Wildflower. Though the ordinance had not yet been written, public meeting notes show that alongside Wildflower, the steep slope maps and Peeks Creek were essential elements of drafting an ordinance that would to some degree regulate steep slope development (Macon County Planning Board Minutes, February 18, 2010; see Table 6.1 for the recommendations). The planning board first established a steep slope subcommittee, nearly all of whose members were long-time residents and politically involved citizens. The subcommittee's individual members were the former county planner turned environmental consultant, a realtor, a planning board member, a residential housing builder, a land grading contractor, and a USFS Coweeta Hydrologic Lab scientist. Additionally, the subcommittee worked closely with a retired Georgia Tech engineering professor. Interviewees (Interviewees B, H, I, O) familiar with the formation of the subcommittee noted that all of these members' participation was solicited in large part for their sometimes particular, sometimes overlapping knowledge of Macon County's landscape.
Category	Slope or Area Determinant	Description of Regulation
Category One	0% Slope to 30% Slope	No action under a slope development ordinance
Category Two	30% Slope to 40% Slope	Attempt to handle through [existing] County Personnel using existing resources. Have clear cut guidelines as to which sites do not require a Design Professional. County could either approve project or require plans/Specs by a Design Professional.
		a) Require owner to provide a project/site plan showing areas to be graded, cut/fill heights and slopes, areas over 30% slope, and drainage plan. This may be prepared by the property owner or his/her designated representative.
		b) Site cannot lie in areas mapped as Lower Threshold, Upper Threshold, or Unstable on the Slope Stability Index Map, or in the High or Moderate relative Downslope Hazard categories on the Downslope Hazard Map, as shown on Slope Movement Hazard Maps of Macon County.
		c) Cut slopes over 8 feet in vertical height cannot be steeper than 1.5:1. Fill slopes over 5 feet in vertical height cannot be steeper than 2:1. No constructed slope can be over 30 feet in vertical height.
		d) Site preparation and compaction standards must be met.
		e) A minimum set back of 30 feet must be maintained between any stream and a land disturbance activity, with the distance being measured from the stream bank. Note: This distance is based on studies indicating the area usually affected by debris flows is approximately 30 feet to each side of a stream. The distance varies, however, the committee believes 30 feet is a reasonable setback.
		f) If the project/site does note meet the above criteria, it should be required that a design professional submit plans/specs for the project.

Table 6.1. Subcommittee Recommendations for Steep Slope Development Ordinance

Category	Greater than 40% slope	Require plans and specifications by a Design
		a) Plans/Specs must address/contain: Topographic survey, soils report, hydrology report, vegetative retention, percent impervious surfaces, environmental impacts, public safety impacts, cut and fill heights and slopes (including factor of safety against failure), compaction standards, stormwater run-off, and impacts on adjacent property.
		b) The plans/specs must be as stringent or more stringent than County regulations for other land disturbing activities and requirements of Paragraph 2 (above), with the exception of cut and fill slope ratios. Constructed slopes may be steeper if an engineered design is included and factors of safety against failure are provided.
		c) The Design Professional must certify that the project has been constructed in accordance with the Plans and Specifications.
Category Four	Slope Movement Hazard Maps	 a) Any site which is in a Lower Threshold, Upper Threshold, or Unstable designation on the Stability Index Map, or in the High or Moderate Relative Downslope Hazard Category on the Downslope Hazard Map should be required to have plans/specs prepared by a design professional submitted to the County. The plans/specs should address all items listed in #3 above. For any construction project, the recommendations apply only to that portion of the project in which the disturbed area is over 30% slope. An exemption is recommended for any project in which the construction results in a slope less than 30%, even though the initial slope may be over 30%.

Though the ordinance was not officially drafted until 2011, the subcommittee had communicated general outlines of what an ordinance might contain. Drawing on the subcommittee's collective expertise, the ordinance itself was relatively straightforward in its purpose, even if some of its details would later change. Using the NCGS Landslide Hazard Map as a guideline, the ordinance divided the county into four land classifications of increasing vulnerability to slope failure. The classifications were based on the LiDAR-derived slope of the land and whether the land fell into the varying categories on the Macon County NCGS Maps. The first category of established by the ordinance were of little consequence to landowners, the second only required geotechnical oversight if particularly precarious, and only the third required certain oversight by a geotechnical engineer. The final category, though, deemed the most risky by the ordinance's subcommittee, required that any significant land-altering activities on these lands explicitly defined on the NCGS maps would require not only additional county oversight but also an independent geotechnical engineer's approval of the plan. Unlike neighboring Jackson County's steep slope ordinance, Macon County's ordinance did not prohibit construction on any land.

Anticipating that some construction industry businesses, land rights activists, and some of the county's landowners would contest the ordinance, the subcommittee began political maneuvers and arguments for an ordinance even before it had been officially drafted. At public meeting, the subcommittee voiced these opinions clearly, in an attempt to address head on the expected opposition. Their points mainly focused on economic conditions, urban growth, and land rights. First, the steep slope subcommittee argued that their ordinance actually protected, rather than eroded, land rights. Downslope landowners' ought to be protected, too, they reasoned, and a slope ordinance aimed to prevent upslope developers from ignoring the vulnerability of their downslope neighbors (Interviewee B, P, Q, R, and V). As the chairman of the planning board (Macon County Planning Board Minutes, 20 May 2010) noted at a public meeting, land rights begin and end at the property line: "Your property rights stop where mine begin." Any type of development that unnecessarily risks the infringement of others' land rights ought to be regulated in such a way that protects landowners' rights. Using the language of land rights was strategic, of course, because of the centrality of property rights rhetoric of the county's political conservatives.

Secondly, noting that other western North Carolina counties had adopted steep slope ordinances and that other counties were trying to complete their own version of the NCGS's aborted landslide hazard maps, Macon County's steep slope subcommittee created an ordinance and justified it publicly by claiming that it encouraged, rather than discouraged, growth. A steep slope ordinance, they reasoned, would provide a sense of security for homeowners and developers, trusting that an ordinance would protect their investments from shoddy home and road construction (Interviewee B). In this view and contrary to prevailing logics of blanket antiregulation politicians, the proposed increased regulation would actually promote development and growth. The surprising unity of these two positions, despite their significant difference, is in their anxious eagerness to promote and foster urban growth. Indeed, both proponents and opponents of the steep slope ordinance were sure to regularly and repeatedly justify their positions by claiming that their policy position would bolster the county's economy through increased urbanization. This point is not to equivocate on the policy futures each side imagined for the county. In fact, their visions for Macon County on most points are quite different. The common goal of promoting urban growth, though via significantly different routes, reveals that there exists today no viable political or environmental imagination of Macon County's future outside of an increasingly urbanized one. Using ordinances to negotiate the contradiction of capital accumulation in the county, then, is not a negotiation of whether urbanization of the county ought to continue or whether urbanization is in the public's best interest, but rather how the county ought to go about promoting urban growth.

Finally, forming the subcommittee in the acutely lingering economic recession was strategic. Rising unemployment related to the county's sagging construction industry and increase in foreclosures prompted some advocates of local planning to consider crafting the ordinance. Several Maconians involved with first imagining the ordinance said that their explicit political strategy was to attempt to pass an ordinance in the midst of the downturn because the 2008 crisis, "gave us all a chance to catch our breath" (Interviewee B.) and assess the future growth of the county after decades of rapid growth. Ordinance proponents reasoned that a new ordinance at a less busy time would take advantage of the relative lull to establish protocols and routines of enforcement, as well as the potential confusion of a new ordinance during a busy time (Interviewee B). Secondly, in the minds of ordinance crafters, the downturn meant that fewer developers, contractors, builders, and landowners would be involved in the process, meaning that when the next wave of growth happened, a new ordinance would be already in place.

There was some hesitancy, though, in proposing the timing. Two interviewees involved with the planning board mentioned that the depth of the recession in the construction industry

represented a good time to pass an ordinance because there would be minimal interruption in the flow of capital into the county. On the other hand, it also represented a bad time to pass an ordinance because the citizens (Interviewees S and K) did not see the same need for it like they did when hundreds of building permits per month were being approved. In short, the lesson for these interviewees was that there is never a good time to propose an ordinance because citizens against regulation for ideological or financial reasons will always find an economic rationale to oppose regulation, regardless of whether the rationale is legitimate.

Related to this sensitivity of the timing of an ordinance was a larger vision of planning for Macon County that implicitly recognized the difficulties of regulating capital accumulation. Several interviewees familiar with the crafting of the ordinance situated the ordinance in the long trajectory of urban development in their historically rural county as they tried to protect its rural character and heritage while also accommodating the benefits of urbanization. Two interviewees even used the language of contradiction, noting that the rural, pastoral, and intimate character of Macon County's landscape and social life attracts migrants to Macon County even as their migration undermines the characteristics to which they were initially attracted. For these interviewees, their planning efforts, including the steep slope ordinance, existed at this difficult juncture of preservation of their county's environment in the face of capital investment paradoxically attracted to and compromising this character.

This contradiction, spoken of as a "moment" in some critical political economic theory, is in reality not a mere moment for Macon County planners. Rather, it is an enduring condition, where planners and other ordinance advocates are perpetually caught between encouraging the interests of local and non-local developers and landowners on the one hand and on the other the county's residents, landscape, and economy they are legally charged with protecting. In the years of exurban boom, interviewees noted that this contradiction expressed itself through the accumulation of capital through the residential construction industry, making it hard to manage adequate planning oversight of the growth. During the contemporary bust, though, the contradiction expresses itself in Macon County through the desperation of job losses, hits to municipal tax revenues, and voices clamoring that passing a burdensome ordinance only adds an insult to the financial injuries of local businesses. In either case, Macon County's regulation-averse political trends made producing a steep slope ordinance difficult under any economic circumstances in the contradiction.

Federal and state produced housing and construction industry data bolsters these claims, especially for Macon County. Figure 6.1 (US Census, 2011) graphs by year the building costs of new residential construction using the sum valuation of all new residential construction in Macon County from 1980-2011. In other words, the chart displays the annual change in value of all new construction in the county. Clearly, the precipitous drop in values in 2008 is most striking. The multi-decadal rise in new housing construction values, though, shows the rise of capital invested in Macon County. This is one indicator of the rise of residential construction in Macon County, as well as how the county became a site of significant capital accumulation.

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Sum of Building Costs for All Private Residences



Figure 6.1 Sum of Building Costs for All Private Residences

Similarly, figures 2 and 3 (Federal Bureau of Economic Analysis, 2011) show the economic rise of construction industry in Macon County, both as a profit making enterprise and as an increasingly central source of employment. Figure 2 displays the summed annual earnings of the county's construction industry from 1969 to 2010 and Figure 3 shows the county's annual number of construction employees during the same time period.⁵ At its peak in 2007, the construction industry employed nearly 10% of the county's roughly 30,000 residents and starting in roughly 1990, the rate of increase of annual earnings significantly increased until the 2007-8 financial crisis. After 2008, the construction industry lost over a decade of earnings increases, while it also returned to employment levels of over a decade earlier.

Finally, figure 4 (US Census) displays the annual totals of residential building permits issued by Macon County from 1980 to 2010. The graph shows a peak starting in the early 80s, followed by a sharp decline through roughly 1990. A mild recovery characterizes the 1990s and 2000s, followed by a steep plunge after 2008. At its height in the early 80s, Macon County

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Data were missing from the original source for the year 1978 in Figure 3.

issued about 650 building permits a year. In 2010, the county issued 77. One intriguing aspect of this graph is its absence of a marked increase from 1980-2000, as seen in the other graphs.



Annual Construction Industry Earnings

In Thousands of Dollars, Macon County, North Carolina

Figure 6.2 Annual Construction Industry Earnings

Construction Industry Employment





Figure 6.3 Construction Industry Employment



Figure 6.4 Residential Building Permits Issued Per Year

Even though Figure 1 shows the valuation of new construction rising markedly throughout the 1980s, 1990s, and 2000s, Figure 4 makes clear that this rise was not simply because more building permits were being issued. Indeed, many fewer building permits were issued annually in the early 1980s, when valuation was relatively low, than in 2007, when valuation was at an all-time high. Furthermore, there is only partial correspondence between the construction industry data and the building permit data, meaning that despite the drop in building permit issuances beginning in the early 1980s, the construction industry continued to grow in earnings and employees. All of this signals at least two likely things about the residential construction industry. First, the real estate bubble was in full effect in Macon County, and second, that new home builders were constructing increasingly expensive houses.

6.3 PUBLIC MEETINGS AND UNCIVIL DISCOURSE

By the summer of 2010, public awareness of the steep slope subcommittee had grown. In particular, it elicited nearly immediate reaction from the county's conservative land rights activists. Though the local chapter of the Tea Party had no official position on the ordinance, authors of the most strident anti-ordinance letters to the editor in local papers were penned by noted members and leaders of local conservative groups like Mountain Tea Party Patriots, FreedomWorks, and Property Owners of America. While hearsay and informal public polls suggested that a broad majority of Macon County supported a steep slope ordinance, the vocal and pugnacious land rights activist minority began to influence the public debate. Ironically, their influence gained its strength primarily through the subcommittee's public meetings held in each township of the county from spring to the fall of 2010—a strategy initiated by the subcommittee itself in hopes of garnering widespread public opinion and fostering a spirit of openness in the ordinance production process. Thus, the production of the ordinance was circulatory in nature, attempting to cull public input in very localized and public places.

These meetings, though they were an integral part of the ordinance *production* process, also represented the *circulation* of the ordinance though the county as it was the literal movement of the ordinance through the county. The ordinance's production, as well as its application, was further dependent on how it circulated in two other ways. First, the idea of a steep slope ordinance did not originate in Macon County, but instead circulated to Macon County from elsewhere. Ordinance proponents compared Jackson County and Haywood County, which have steep slope ordinances, with Macon County. "From looking at permitting statistics from WNC counties, such as Haywood and Jackson, which have adopted slope regulations, it appears that those regulations have had no negative impact on development" (Macon County Department of Planning, Permitting, and Development website). Though accurate, the Macon/Jackson comparison did not dissuade or persuade ordinance opponents. Secondly, and most abstractly, using ordinances to plan urban growth is taken for granted in most US cities. As a model for regulating and promoting urbanization, enacting ordinances is a prominent tool in the local planner's tool kit. In this sense, it is a model for state regulation and vision. Its existence is largely tied to urban development, though, so places without a history of urban development are also unlikely to have a history of experiences with ordinances. This use of ordinances as a planning device only relatively recent circulated to Macon County, though, and is noteworthy because it shows the controversies of planning as a new state practice in the urban frontiers of exurbia. In this way, the circulation of the ordinance as a 'global' model for

local state regulation of urban growth changes significantly as it moves into local ecologies, politics, and culture. Together, these three circulations of the steep slope ordinance reveal that how it moves through space and time is a complicated movement, dependent on its ontological status as an ordinance, but also as it is bound up with broad trends of urbanization and the intimate, finely grained histories and geographies of county townships.

From February to November of 2010, then, the steep slope subcommittee held joint monthly meetings with the planning board, rotating the location of the meeting to each of Macon County's townships. These meetings were essentially a participatory planning effort, strategically designed to both incorporate public input into the ordinance and to display the public transparency of the county government's deliberations (Interviewees B, O). The planning board/subcommittee, anticipating that public support for the ordinance would depend in part on whether its production was not perceived as an impersonal government mandate, ran all of their meetings in the format: first, the planning board briefly addressed any non-steep slope issues, then introduced an informational presentation led by Matt Mason, the county's then Environmental Services Supervisor. Mason's presentation was followed by a brief explanation of the rationale for a steep slope ordinance, which led to a public comment session limited to the residents of the township in which the meeting was being held.

Interestingly, the participatory nature of the meetings gave ordinance opponents a chance to seize on the production of the ordinance. First, conservative land rights activists took advantage of the multiple meetings organized over a several month span. Despite most planning board meetings being very poorly attended, these meetings were often packed overwhelmingly by the conservative activists judging by my own observation and interviewee's reports (see notes from Macon County Planning Board meetings on 20 May 2010, especially). Even though public comment was limited to the host township's residents, the presence of these activists seemed to encourage the bold and forceful rhetoric of the residents. For instance, Bill Vernon (Macon County Planning Board meeting, 20 May 2010), a local developer exasperatedly implored the Planning Board and subcommittee to "show me the problem" that the ordinance solves and that the Planning Board would "be better off not stirring the pot," meaning that the ordinance would cause more problems and issues than it solved. Wally Welch exclaimed at the 1 June 2010 Planning Board meeting: "Property owners are resistant to any new regulations that come along. We don't tell people they can't ride motorcycles because they are dangerous. We don't regulate waterfalls and people die on those; why should slopes be any different?" Another example was when Planning Board member and grading contractor Lamar Sprinkle (Macon County Planning Board meeting, 19 May 2011) said about the proposed ordinance "As a private property owner, this scares me to death."

Similarly, the activists also leveraged the several month long time frame of the series of meetings into an opportunity to develop blogs and websites supporting their views, to write dozens of letters to the editors of local and regional newspapers, and to organize their impressive presence at public meetings. One such example was when Vic Drummond, a local conservative activist and candidate for County Commission in 2012, subversively distributed an anti-ordinance proposal, dubbed a "Freedom of Choice" proposal, in the middle of the meeting, as well as a document detailing his own answers to the Frequently Asked Questions appearing on the Planning Board's slope ordinance website. Finally, the restrictions on speech during the public meetings resonated powerfully with the legally unrelated but still ideologically persuasive

concern of constitutionally guaranteed freedom of speech. More than one conservative editorial (e.g., Vernon 2010) decried the planning board's limits on speech, insinuating that the participatory approach was actually a farce designed to obscure the county planning board's true anti-land rights intentions.

I asked several pro-ordinance interviewees both involved and not involved with the participatory meetings about their efficacy and necessity. To a person, not one of them regretted having the meetings in this circulatory and participatory format. As one subcommittee member (Interviewee O) said: "Going around to each community, I think that's effective. I don't think you can't set up a Facebook page for something like this. These people won't do that. The newspaper, there's other outlets that are useful, but if you really want to make sure you're getting information out, for a community of this size, anyway, it's probably about as effective a means as there is. You still have to meet with citizens." Even though ordinance opponents used the meetings' duration and format to their own advantage, the interviewees saw this approach as necessary in the short- and long-term. In the short-term, producing the ordinance by circulating it through the county did give the committee an honest chance to consider new ideas, some of which improved the final version of the ordinance. Limiting public comments gave people a chance to participate that would have otherwise been crowded out by vociferous ordinance opponents. Ultimately, ordinance supporters saw this approach as necessary to the progressive planning long game in the county: while the openness of the process might hurt now, it will establish precedent for more democratic and transparent planning in the future.

By the mid-term November elections, these efforts at publicizing the land rights and economic issues at stake in the steep slope debate turned the county commission elections into an especially heated battle. At one meeting, Lewis Penland (Planning Board Meeting, 18 February 2011), the chair of the Planning Board, compared the divisiveness of the steep slope ordinance to the divisiveness of the Civil War, imploring community members to respect and honor one another. He said:

There are a lot of us in this room tonight whose ancestors participated in the Civil War, either in the North or the South, one way or another. It was an unfortunately thing, but it was a necessary process. That conflict divided families, neighbors, everybody. It doesn't have to be that way and we don't have to do that. We don't have to repeat that and we can learn from history. I strongly feel that people sitting at this table have the capacity and opportunity to do that.

Candidates were forced to take a clear and well-defined position on the steep slope debate and some conservative candidates made it the central plank in their electoral platform, even to the point of nearly excluding most other issues. Like most places in the US, the 2010 election in Macon County was a Tea Party-inspired corrective to the numerous national, state, and local Democratic electoral victories in 2008. In the county, conservatives further consolidated their control of county political offices. The future of the ordinance looked grim.

6.4 LOCAL EXPERTS AND EXPERT LOCALS

Macon County's anti-government political culture, general ideal types of working class rural Americans as fierce protectors of their beloved small towns, and stereotypes of Appalachia as a place of culturally backward mountain folks (think *Deliverance*) might make it easy to assume that the battle over the steep slope ordinance was in a classically scripted vein of political controversy: 'locals' fighting against 'non-locals' over the future of their place. The steep slope the inclusion of local expert knowledge in policy formation is noteworthy. This fusion of expertise and local affinity allowed the subcommittee to avoid some of the general antipathy toward outsiders,⁶ even to the point where the so-called 'old-timer vs. new comer' social division was not a primary indicator for who would be for or against the ordinance. It would be wrong to say that the steep slope subcommittee's composition led to the blurring of this historically sedimented and sharp social division, but it did close down a line of anti-outsider sentiment that is prominent in Macon County's social life and that could have provided additional persuasive force to regulation opponents.

Subcommittee Member	Occupation/Expertise
John Becker	Realtor
Barry Clinton	Coweeta Lab scientist
Susan Ervin	Long-time resident, concerned citizen
Stacy Guffey	Former county planner, consultant
Reggie Holland	Builder and realtor
Paul Shuler	Grading Contractor
Al Slagle	Hydrogeologist

Table 6.2. Subcommittee Members and Expert Knowledge

One need not look any further than the composition of the steep slope subcommittee to gauge how expertise-laden the document was. At every step, crafting the steep slope ordinance ordinance was a process infused with various forms of expertise. This infusion is often part of writing any comprehensive legally binding document, but the reliance on expertise in local public ordinances is also part and parcel of urbanization generally and the current unfolding of

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See my own experience with this stratification in this dissertation's methods chapter.

the latest chapter of exurbanization specifically. How urbanization plays out in relationship to the law is conditioned by the kinds of expertise used to advance, manage, and regulate urban development. Like other ordinances, this one too was a hybrid document, layered with legal, technical, scientific, local, and environmental expertise. That these types were brought together in place and time and text is no accident; instead, their concatenation is indicative of the linkages between expertise, law, and urbanization emerging in newly urbanizing places like Macon County.

The expertise included in the ordinance itself resulted in a technically proficient ordinance endorsed by a range of non-committee technical experts, yet it represented both a political advantage and a liability. First, the solicitation of expertise provided credibility with some who had otherwise suspected the ordinance of being a deterrent to development in an already down market. Another politically strategic advantage of adding layers of expertise was that rigorous parts of the ordinance would survive the county commission's review. More than one subcommittee member mentioned that this strategy was intentional—loading technical details and requirements into the ordinance draft with the hope that the committee's inevitable revisions, deletions, and criticism of the ordinance would leave effective parts rather than gut the entire document. One way that ordinances are metabolized is during their movement from the drafting to their public debate, especially after necessary revisions from municipal commissioners. Thus, ordinances are often drafted to contain extraneous provisions, knowing full well that commissioners will have to gut part of the ordinance to please their conservative constituents. As one Macon County political observer (Interviewee B) noted, this was not the case with the steep slope ordinance. Instead, because of the diversity of the subcommittee and

the rigor of the drafting process, the ordinance only contained the bare minimum of regulatory

oversight:

...usually you want to come out with a full recommendation that has lots of things in it because when it gets to the commission, it's going to get chopped up. You want it to leave the planning board not completely chopped because the commissioners will need to chop it up again because they'll have people they need to satisfy politically. They say "Well, I got rid of this thing over here." For example, [that's what happened] with the subdivision ordinance, [with a] whole section in the proposal for night lighting, which I think is a worthwhile thing because it is good for what people move here for and why we enjoy living in the country. [The ordinance was written] knowing that a strong man could cut it out and sure enough, one of the commissioners cut it out and got to rave about it: "Who put this in here?! How could the planning board put this in here, telling people how could they tell people how they have to treat their land/property?!" But, it was enough to distract from the rest of the stuff and also for him to go back and say, "I trimmed that thing up." With the slope ordinance, because the committee was so diverse, which is a good thing, [there was] a lot of give and take, and ended up with something that was absolutely bare minimum. But because of that and because it had met the approval of contractors, real estate people and developers, we thought we had a pretty good chance.

The ordinance's technical expertise was also disadvantageous for the steep slope ordinance crafters and supporters. One disadvantage was that some of the expert suggestions, rather than surviving through the commissions edits, instead became controversial enough that the commission tabled the ordinance, circumventing some of the subcommittee's strategy. Another implication for using multiple forms of technical expertise in the ordinance was that it allowed for ordinance opponents to use similar strategies of decrying expertise used in other public debates about scientific issues, like climate change. Public rhetorical opposition to the existence and/or the extent of climate change often seizes on legitimate scientific uncertainties, margins of error, and other normal parts of scientific research (see Proctor and Schiebinger 2008). These skeptical views often then serve as the political entry for 'common sense' views of the environment. In climate debates, one form of this environmental 'common sense' is that global warming does not exist or is exaggerated because the weather changes from hot to cold frequently.

Likewise, in the Macon County steep slope ordinance controversy, expertise was both solicited and also politically targeted. Against ordinance supporters' arguments that good, thoughtful regulation has promoted economic growth and protected property rights in other counties, slope ordinance opponents denied both of these arguments. Contrarily, slope ordinance opponents argued that "common sense" recognizes that regulation necessarily harms economic activity. As the planning board notes from 18 February 2010 show, Jimmy Goodman (Macon County Planning Board Notes, 18 February 2010), a planning board member noted that "The building industry is hurting and any future ordinances need to be looked at very closely. This industry that is about gone." Vic Drummond (stopsteepslope.wordpress.com. Downloaded 11 July 2013), on his Stop Steep Slope blog, wrote this in his revised answers to Macon County Planning Board's FAQ:

Won't the ordinance discourage development in Macon County?

Yes, Macon County development will be adversely affected. Common sense economics backs it up. This ordinance will increase the cost of building. When less expensive alternative are available elsewhere, developers and buyers will go elsewhere.

Won't the ordinance diminish the value of property with steep slopes?

Yes, it's the same economic reality as in [the question] above. Undeveloped land will lose value because it is more expensive to develop than competition. Existing homes that fall into the landslide zones on the Landslide Hazard Map, will be devalued as uneducated buyers will avoid the properties.

This common sense approach relied on neo-classical economics often argued for by groups like

FreedomWorks and the Tea Party, local chapters of which have an active and politically influential voice in Macon County.

Expertise in writing local ordinances, then, as represented by the collective legal and planning experience of the steep slope subcommittee was both requested by the planning board and was often admired in public forums (e.g., see Planning Board meeting notes from 18 February 2010). At the same time, its efficacy and legitimacy was derailed by an appeal to a different kind of technical knowledge, one that corresponded to the deep skepticism of the state and the region's self-image as an independent and free.

6.5 WHAT CAN A FAILED ORDINANCE DO?

Within a week of the ordinance's tabling in August 2011, some dismayed Maconians launched MaconSense, a county political action group in favor of smarter development in the county. Led by and comprised of a range of new residents and generational landowners, MaconSense initially supported the ordinance. The group soon refined their message to promoting 'safe slope' development and if the ordinance was the best way to accomplish that, then they were for it. More generally, MaconSense seemed to embody a somewhat more progressive voice for planning and though only active for several months, it seemed possible for a short time that MaconSense could provide a political counterweight to the well-organized conservative activists in the county. Though MaconSense began vigorously, it then fizzled out once the reality of the death of the ordinance became clearer. Despite an attractive website, a buzz of initial publicity in local papers, membership drawing from some of the oldest and most well-connected families in the county, and an enthusiastic core leadership, MaconSense lasted less than a year and has not been heard from in any policy debates after the steep slope ordinance.

MaconSense catalyzed not during the production and circulation of the ordinance, but only once it had been tabled. This is in stark contrast to the conservative groups in the county, like Property Owners of America, who had a strong, organized, and regular presence at nearly every ordinance relevant public meeting from the beginning. In this way, the ordinance elicited political responses from the community primarily on ideological divisions, rather than other social divisions like old timers/newcomers.

I asked interviewees about how they account for the pronounced ideological divisions, the late political organization of pro-ordinance Maconians, and the strong, vociferous response of the county's conservative activists that characterized the debate over the ordinance. While most interviewees reflected on the conservative heritage of the county and southern Appalachia in general, most also relied on the nature of the law as a regulatory tool. One subcommittee member opined that the law represents for anti-regulation activists a tool of theft. He (Interviewee O) said: "I don't think you and I, if were were supporting something like that, we wouldn't feel like we were losing anything. We would do it because we thought it was the right thing to do. It's right, and so if it's right, then it's going to happen. We'd just let it run its course. Where as if you feel like it's going to cost you money, you're going to be a bit more motivated to voice your opinion and get involved and that sort of thing." Here, the ordinance itself as a particular form of environmental knowledge matters because it provoked widely divergent political responses. The ordinance's punitive power incited a fear in those who perceive they would be subject to the penalties of the law, which, according to their complaints in public, included an inability to sell their land, increased development costs, loss of freedom to develop the land as they saw fit. This fear seemed greater than the hopeful promise of safer slopes and higher quality development that the ordinance represented to MaconSense and other ordinance proponents. Inspiring conflicting fear and hope in different groups, the ordinance initiated political antagonisms

It is not as though the ordinance was only a passive catalyst for these political developments. It also was actively applied by its opponents and supporters to achieve particular political ends in the county. In the 2010 elections, while the ordinance was still politically viable, a candidate's condemnation of the ordinance was a shibboleth for indicating authentic conservative values. By the 2012 election, opposing the ordinance still served the same purpose. In November of 2012, Paul Higdon, a Tea Party-inspired conservative won a county commission seat against incumbent Bobby Kuppers, a registered Democrat. While Kuppers (*Smoky Mountain News*, 17 October 2012) supported the ordinance before its tabling, he was hesitant to voice support for it during the election, claiming that "we have to make sure [steep slope regulations] fit with the economic climate we are in and do they make sense at this time." Kuppers also voiced support for the planning board, but as a way to have "adults sitting around a table as adults and working through the issues" rather than an effective tool of regulation, planning, and conservation. Kuppers' guarded position is in stark contrast to Higdon's (*Smoky Mountain News*, 17 October 2012) opinion:

Higdon believes there is a concerted effort to undermine the American values of capitalism, stemming from a United Nations doctrine known as Agenda 21. In short, Agenda 21 was launched by the U.N. more than two decades ago to work toward global sustainability. Conservatives have grown increasingly leery of Agenda 21 and now fear it is being covertly pushed on American society by operatives. Agenda 21 is aimed at limiting the private accumulation of wealth, and steep slope regulations are part of that movement, Higdon said. 'They are

designed to limit the rights and freedoms of private property owners,' Higdon said.

Higdon's sentiment about Agenda 21 and the steep slope ordinance reveals a suspicion about how the local state in Macon County is becoming a vehicle for planning. Other research shows that the import of urban planning notions and practices into historically rural areas can be threatening to citizens who perceive their local government as mostly having left them alone. One interviewee (Interviewee S) on the planning board speculated that some long-term residents may have been passively supportive of the ordinance, but were not motivated to actively support it because "they don't see what is so different now as compared to past years and generations". He (Interviewee S) continued: "Similarly, some newcomers [who might otherwise be sympathetic to the ordinance] are inactive because they've already bought their house and are either a) worried about their property's value as an investment and b) they've already bought their house and so don't care about what happens to the [rest of] the land [in the county]." Though Macon County's history of using ordinances as a tool for planning is brief, the steep slope ordinance is not the county's first ordinance-centered effort to manage growth. County regulations targeting the time, location, and consequences of residential in the last two decades include ordinances covering subdivision planning and erosion and sediment control, complemented by zoning and floodplain ordinances in the towns of Franklin and Highlands. These ordinances represent the advent of planning as a part of local government in Macon County.

Like in Macon County, resurgent conservative groups nationwide are more frequently engaging in some of the banal, everyday practices of local government as important terrain of politics. Local Tea Party groups have more recently begun to demonstrate at planning board

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meetings, county commissioners events, and other local political venues (Flint 2011, Kaufman and Zernike 2012). Their presence indicates a partial revival of interest in the machinations of local politics, often times during meetings that under most circumstances have low turnout and generate little public interest. As one Maconian (Roberts 2011) wrote in an editorial to the *The Franklin Press*:

Recent events in Macon County politics have me thinking about opinions. There seem to be differing viewpoints on the path that government needs to take in our county.

The first opinion is we need more government in our lives because what is best for one person is best for the community.

Every time I hear this statement I conjure up a vision in my head of an ivory tower in the middle of the county 1,000 feet tall with a group of people that know what is best for the COMMUNITY mapping out their view of what Macon County should look like.

The expertise in writing the ordinance, though, was not the only reason some Maconians opposed it. The steep slope regulation being a state-led ordinance—as opposed to, for instance, a non-state agreement among parties to support only steep slope developments which meeting agreed upon standards—matters in how it was opposed. Macon County's historically testy political relationship with regulation of any sort is relevant in this context. Ordinances themselves, with their own relationship to local political histories, as well as the discourse of 'regulation' co-opted as the inevitable inhibitor of economic growth, have enabling and disabling political conditions. If social change in exurbia—even something as small as a steep slope ordinance in Macon County—is to be brought about via the law, it will have to contend with the difficult histories of the law's partially independent logics, histories, and legacies that precede exurbanization and are not reducible to it.

That a steep slope ordinance was proposed at all, however, indicates the malleability of the state's and the law's social legacy. For the local state in Macon County to propose a series of urban planning ordinances, including the steep slope ordinance, across a decade indicates that urbanization is changing how the state uses the law in Macon County. In this new iteration of state creation of law, the state takes on an active planning character rather than a punitive one. This vision for local state action relies on a liberal paradigm of the state, one that is designed to encourage investments of capital, to secure life and liberty, and to protect the landscape.

These four rationales for state action—capital, life, freedom, and landscape—were at the heart of the justification for creating a steep slope ordinance. Ironically, they were also the core themes of anti-regulation opponents. The unity of the discourse here is striking, especially in the face of the bitter rhetoric and sharp public divisions on the appropriate role of the state in planning matters. Ordinance creators routinely presented a graph of monthly building permits in Jackson County versus Macon County, showing that Jackson had regularly higher monthly totals in years prior to and years after the crisis. They noted that Jackson's steep slope ordinance if anything had a positive effect on encouraging residential construction in the county.

The appeal to protecting life was most directly related to the Peeks Creek landslide. Impassioned pleas suggesting that commissioners would be potentially responsible for the deaths of Maconians in future landslides were often a part of heated public debate. As one citizen (Macon County Planning Board Minutes, 19 May 2011) said, "If we are considering loss of life, is one not enough?" Similarly, from the Planning Board Minutes from 17 June 2010: "Safety and welfare of the public should come before private gain. Private property rights do not extend beyond one's property line. Somebody always lives downstream and that somebody has rights. Do the right thing to make the mountains safe and streams clean." Additionally, another Maconian said at that meeting: "If slope failure and loss of life is possible, maybe we could put a number [i.e., monetary value] on the loss of life I hope the board constructs these regulations as if the person you love the most lives below the development the decisions you make will regulate."

Opponents often responded to this emotionally charged argument with a heady appeal to geology and private property. Landslides are entirely unpredictable, they argued, and the deaths of Peeks Creek residents would not have been stopped by a steep slope ordinance. This is primarily because the Peeks Creek landslide started on undeveloped USFS land high on Fishhawk Mountain, not in a potentially regulated subdivision. Opponents further argued that because of these unpredictable and unknowable geologies, restricting landowner freedom via the ordinance is an inappropriate violation. As Rose (2002) has noted, one of the most prevalent contemporary political discourses is that of 'freedom' and that 'freedom' as a restrictive and powerful governing principle is a supreme irony of our time. Anti-regulation Maconians often deployed the argument against the steep slope ordinance that regulation necessarily means an impingement on individual freedoms, in particular landowner freedom.

Countering this charge of restricting freedom, ordinance supporters had a two part argument along these lines: an individual's property rights and freedom ends at their property line, therefore we are actually protecting freedom and property rights by ensuring that the safety and property—that is, the freedom—of downslope property owners are not impacted by the irresponsibility of upslope builders and owners. One MaconSense member (Interviewee G) observed this 'freedom' discourse at a steep slope planning meeting: "It was an intense meeting and there was a lot of rhetoric about 'What is America?' ... There was a woman who said 'I love America, et cetera.' But I felt like it didn't really connect the dots. The idea was 'I love these mountains, I love my home, I but now the government is going to tell me what to do?' You could see she was trying to score points. [We at MaconSense] could say the same thing, too, that [we love the mountains] and we're trying to make it a safer place. I love my country just as much as you do. It was a very dramatic comment—I love it and they're trying to take it away from us.". In this way, ordinance supporters justified their position not by ignoring or dismissing 'freedom'-based arguments, but instead by doubling down on freedom as the goal of local state planning.

Thus, in Macon County, the steep slope ordinance's production could only be considered in terms of freedom. As Rose writes, arguing that the centrality of 'freedom' exists in discourses of governance is not to cast doubt on freedom as a potentially desirable condition of political life. Instead, it is to note that being governed so centrally through freedom has political consequences. One consequence is that the advent of the state as a planning agency means that planning in Macon County has to justify itself in terms of freedom, even if those terms are not ideal, accurate, or beneficial.

Another consequence of being governed by freedom is that some for freedom take precedent over other notions of freedom, despite their relative (or lack of) merit. For instance, while some Maconians viewed the steep slope ordinance protecting their property from others as a fundamental to their freedom, others argued that freedom entailed landowner rights to build as they wished on their land without regard to state interests in slope or safety. My own view is that the latter version of freedom is a more impoverished one than the former, amounting to a claim that a landowner's freedom to disturb steep slopes is of a higher priority than someone who wishes to be free of a preventable landslide crushing their house after a hard rain.

Even after the steep slope ordinance had been passed, its presence was still felt in terms of how Maconians governed in the name of freedom. Vocal and conservative County Commissioner Ron Haven, who won re-election in 2010 on an anti-steep slope ordinance, anti-NCGS maps platform, was seeking to replace members of the planning board and had proposed term limits for the board, entirely composed of volunteers. In an email sent to the planning board, all of the county commissioners, and several conservative activists—perhaps naively intending it to only be read by this group—Haven upbraided Planning Board Chair Lewis Penland for "his rude attitude, close minded, self agenda ideas [sic] [that have] no place on the planning board." Because of these personal attacks, the email was quickly forwarded around the county and to me, and its contents were detailed in *The Franklin Press*. Haven (letter, 2012) goes on to pay lip service to the merits of planning, but then writes:

There is a very big difference in planning and dictating. I Felt [sic] I was instructed by the citizens of Macon County by the results of the 2010 election to do some things to make the planning board work or abolish it. I feel this board is a nonfunctioning tool to the commissioner board and the citizens. When all that is important to make citizens surrender their property rights, hinder job growth, and be a dictater [sic] then where if freedom in America if it can't start at home.

In a moment of haste and honesty, Haven sweepingly characterizes the work of the planning board, its long hours of volunteer work, and extended, two year long debate over the minutiae of the steep slope ordinance as a dictatorial power grab, and as antithetical to freedom, American values, and economic prosperity.

Haven's stance belies an assumption that freedom and governmental regulations oppose one another in a zero sum game. From this perspective, freedom and law are opposites, meaning that more regulation is by definition less freedom. A final telling aspect of the governance through discourses of freedom is that the zero sum game of freedom and regulation is an unquestioned presupposition of the steep slope ordinance moving forward. Instead of arguing that regulation might represent an increase in freedom or that, like proponents of the ordinance had argued in 2011, the ordinance represented the protection of life and liberty, the main proponents of the ordinance now argue for a compromise in which the merits of land rights versus regulation must be weighed carefully. *The Franklin Press* Editorial Board, in a February 2013 editorial, urged the reconsideration of the steep slope ordinance. Rather than its previous unabashed support for the maps and vociferous advocacy for the steep slope ordinance, *The Franklin Press* (6 February 2013) took a more moderate position:

Compromise and common sense are the two key components that must be brought to bear in the search for a resolution [of the steep slope ordinance conflict]...members from both sides need to take a seat around a table and approach the problem with an open mind, a willingness to compromise, the ability to balance emotional convictions with scientific fact and find a middle ground that protects the community and the environment while not trampling on the individual and the economy.

This discourse from *The Franklin Press* matters for Macon County because they are the only remaining institutional advocate for the steep slope ordinance. Here, the issue is framed as a binary between scientific fact (i.e., the steep slope maps) versus emotional conviction (i.e., the fear of infringement on land rights); community and environment (i.e., the slope ordinance) versus the individual and the economy (i.e., again, the fear of infringement on land rights). Thus, even though the Editorial Board is urging a return to the ordinance deliberations, what cannot be shaken is the unquestioned idea that Maconians will sacrifice freedom in order to regulate steep slope development. Ironically, this is precisely the same view of freedom Commissioner Haven

holds.

Even more ironic, though, is how the freedom-regulation binary is itself a tool of governance. Today, the future of Macon County's steep slopes is subject to this zero sum game in which more regulation can mean nothing beside a theft of land rights. Decision making about the landscape must be made within this framework, meaning that it is the central problematic for conceptions of environmental governance in Macon County. Given the emotional and political weight that the word 'freedom' carries in American political discourses at all scales and especially in Macon County, this centrality of 'freedom' in any ordinance debate is a sign of both deepening intransigence and entrenchment of conservative political ecologies in local politics as well as the ensconcing of all environmental planning and politics in a narrative binary of freedom versus regulation.

6.6 CONCLUSION

On a warm and clear October afternoon during the height of the fall foliage season, I sat on the back porch of the Browns, a couple of 'old timers,' overlooking a tract of land that had been in the family since the 1800s. Their porch sat above several dozen acres of their own land, a winding country road, dark babbling brook, verdant pasture, and forest splashed with autumn colors. Further beyond the Browns' land, a mile or so into the quiet distance, a new housing development is perched on a steep mountain slope. The sight line from the edge of their porch, down the hill and across the pasture and forest, through the distance, and to the subdivision served as the focus of our conversation about the steep slope ordinance and urban growth in the county.

We talked about their self-identification as New Deal Democrats, as born-and-bred Southern mountain folk who know how to take care of the mountains, as native Maconians whose family has a unique stake in the social and environmental quality of life of the county. Their grown child was a highly successful 4-H competitor as a youngster because of her upbringing on the land; their family of several generations had seen calves born in the pasture; they had fought flooding and drought and erosion; they had harvested cords upon cords of wood from the forest; they had guns and defended their homestead. At the end of the sight line, they had come to disdain the Yankee halfbackers—who they said usually hail from Florida—because they represented the precarious future of their land. The migrants from Atlanta, the Florida license plates, the Northerners doing whatever the hell they wanted to the land, the transplanted teenagers and suburban moms wishing there was a mall close by—these types the Browns viewed at best with suspicion and had little patience for their lifestyles invading the county. They had relished a thousand sunsets like the one we watched together illuminate their hills. These are not Agenda 21 operatives or big-government socialists imagined by post-2008 Tea Party and Macon County land rights activists.

They are, however, ardent supporters of urban planning in the county and of the steep slope ordinance. To them, the steep slope ordinance was hardly impinged on their freedom as large landowners. Instead, they claimed it would deepen their freedom: it would allow them the freedom to enjoy the scenery of the county they love and it would free their land from irresponsible upslope land disturbances. It would also protect the life and freedoms of their family and friends who lived on other pieces of land much more vulnerable to steep slope development. The subdivision in the distance had already impinged on their historic viewshed and a development-initiated landslide nearby could easily scar some of the land they own if it continued.

The Browns confound some of the assumptions of ordinance supporters. Though they are older citizens in a legacy family who own acres of monetarily valuable land ripe for development, though they are skeptical of newcomers in a region infamously stereotyped for such sentiments, they are also prominent pro-planning voices who also ideologically support a land trusts and other conservation action. For all of the demographic changes in the county, the economics that refuse to make long-term large landholding easy, and cultural trends that indicate that families like the Browns will become increasingly scarce in the coming decades, these families have endured through many hardships in the mountains for two centuries. Perhaps they can survive the challenge of exurban booms and busts through initiatives like the steep slope ordinance. Ordinances might even become politically viable in these coming years as exurban migrants bring assumptions and expectations about land use planning with them to the mountains from the flatlands, countervailing the conservative political culture of the county. At the same time, exurbanization stands to make land tenure difficult for families like the Browns by raising land values and tax liabilities.

The Browns also confound some assumptions about the changing *object* and *subjects* of environmental knowledge. Despite their long-term knowledge of the land and their continued practices of old agricultural traditions, they also see value in the state legibility of the land through local planning, the geological expertise of understanding landslides, and the usefulness of cartographic expertise in preserving and conserving mountain landscapes. Even though the Browns are in some ways the archetypal rural Appalachian landowners denigrated by discourses

and assumptions of cultural backwardness and ignorance. Instead, the Browns politically support the production of the new objects and subjects of the landscape they work and love.

The exurban contradiction, then, is not only one of preserving the environmental amenities that both attract development and are degraded by it. Exurban growth also puts the freedom of families like the Browns at risk, thereby jeopardizing the sources of intimate and local expertise that wrote the steep slope ordinance, even as it might make passage of future ordinances more likely. Families like the Browns and their children and their grandchildren are some of the complicated heirs of urban life, growth, and regulation in America. What the life, death, and life after death of the steep slope ordinance reveals, though, are the murky metabolic futures of regulation in sprawling, urbanizing landscapes of southern Appalachia. Their land and other exurban land like it across the region and country is subject to new economic vulnerabilities, environmental degradations, regulatory uncertainties, and expert evaluations concurrently in flux.

Ultimately, the battle over the ordinance was a battle over what should and should not be the objects and subjects of legally legible environmental knowledge. Ordinances themselves are hardly a new tool of managing the relationships between objects and subjects of environmental knowledge, of course, but their usefulness, effectiveness, and unanticipated consequences are played out in distinct municipal contexts. The contested objects and subjects of Macon County's steep slope ordinance itself exists at an intricate intersection of some residents' long standing land rights ethic mixed with neoclassical economic principles, relatively newer ideas and practices of urban planning, and impossibly lucrative booms and crushing busts of urban growth. From the perspective of those that opposed to the ordinance, the object of environmental knowledge is primarily property and the subject of knowledge is the property owner. Thus, any deployment of environmental knowledge that upsets or threatens this arrangement of object and subject is interpreted as illegitimate. For those that supported the ordinance, though, the objects and subjects of environmental knowledge have broader social considerations. The object is the landslide prone and cartographically analyzed landscape made legible to the county planning board by geologic and cartographic expertise. What this moment in Macon County reveals about ordinances is not a story of uniform application of rational legal principles, but instead a conflicted and dynamic narrative of how local environmental planning in historically rural areas represents a shift in the objects and subjects of environmental knowledge.

Just as the physical qualities of water impact its urban metabolism, the qualities of the ordinance as a legal form of environmental knowledge impacted its metabolism. If the ordinance had instead been some kind of consensual, non-binding agreement among relevant parties, its production, circulation, and application would likely have been different. Macon County's and southern Appalachia's famous antipathy toward regulation, though, means that any ordinance-driven proposal *by virtue of being a law*, would have likely be deployed as a highly contested political object regardless of whether it becomes actual legislation. The steep slope ordinance, even in its tabled and defeated state, enabled a particular set of arguments and disabled others. Though defeated, its work was and is not done. The next chapters of the life-after-death of the steep slope ordinance, along with the lives of future ordinances, will go a long way to illuminating how these conflicts will resolve. How visions of freedom, ideas about legal expertise, economic rationalities, and practices of local governance take hold is rooted in the metabolism of the steep slope ordinance as a form of environmental knowledge.

CHAPTER 7

CONCLUSION

7.1 CHANGING LANDSCAPES, CHANGING METABOLISMS

An old cabin rests deep in the western North Carolina forested mountains between Boone and Asheville, about two hours northeast of Macon County. The image of the cabin is like something from a southern Appalachian postcard: old, dark, weathered wood siding, a high gabled roof, and sagging timbers coupled with a drooping porch. Dense verdant forest thickly surrounds the property, which is also bisected by quietly babbling Cattail Creek, a water source the architect originally harnessed with a small waterwheel, a pump for running water in the house, and a pool for bathing. The setting of the property is idyllic, situated picturesquely beside the old ravine, with views through some of the trees to the surrounding mountains.

My great-grandfather, Ed Mack, was that architect. He worked as a chemist, chairing university chemistry departments and leading the chemists of the Manhattan Project at Oak Ridge National Laboratory in Tennessee. It was during his time at Oak Ridge in the 1940s that he designed the cabin, taking weekends and occasional weeks with his family, my grandmother (his daughter) included, to the land to build it. The goal was to have a mountain home for family vacations within easy drive of Tennessee and southern Ohio, where their family lived for many years. They were, in a sense, early amenity migrants, owning this cabin as a rural second home for his upper-middle class family to get away from life in larger towns and cities.
If Ed Mack went to Appalachia with some similar sentiments about the landscape as today's exurbanites (though also with an entirely different way of financing, constructing, and living in his home), the Appalachian socioecological landscape itself was altogether different. The major difference between their family and the exurbanization of today is best expressed in terms of urban metabolism and uneven development. The slow trickle of second home owners in the 1940s, of course, is quite different from the sheer scale of exurbanization of today. Economically, Appalachia in the 1940s was in the midst of a timber industry bust and still twenty years before the first significant numbers of exurbanites would arrive. Furthermore, contemporary exurbanization is instead characterized by the migration of capital and debt through second mortgages and suburban style development exposed to the booms and busts of global financial markets, which was made clear by the economically devastating effects of the 2008 financial crisis. Environmentally, the region was still recovering from the logging industry clear cuts that decimated the forests of the region, but its land use was still largely small scale farming and forest or recovering forest.

Ecologically, contemporary exurbanization means higher impacts to the physical landscape ranging from erosion, habitat loss, and disturbing landslide prone mountain slopes. Instead of carefully situating and building homes outside of landslide prone zones and landslide initiation zones, it means building in places that local familiarity and expert geological knowledge might warn against. Governmentally, the state as a planning agency mitigating negative environmental externalities caused by the region's burgeoning population depends on expert environmental knowledge, exposing both state action and expertise to new public scrutiny. Local governments in 1940s Appalachia also had neither interest in urban planning ordinances nor anticipation of these ordinances becoming necessary tools to manage humanenvironment relationships in the mountains. Scientific expertise of understanding the landscape was mainly under the purview of federal agencies like the TVA or Forest Service rather than an increasingly common feature of how southern Appalachian residents and local governments came to know their landscape.

These descriptive changes that characterize many exurban areas around North America became clearer during the public controversy of the failed steep slope ordinance in Macon County. I chose to analyze this conflict by considering the politics of environmental knowledge because my field experience there seemed to indicate that the conflict was not just simply a squabble over a banal ordinance, but that the ordinance's environmental politics indicated deep, rifting divides over particular types of knowledge and their implication for the exurban present and exurban future of the county. These divides are symptomatic of shifts in how exurban natures are produced and they become clearer when we pay attention to the metabolism of particular types of knowledge and the relationship of metabolism to moments of crisis in broader patterns of uneven development.

The central empirical thrust of the dissertation, then, is to demonstrate just how environmental knowledge is metabolized through broader contemporary shifts, patterns, and processes of urbanization. This is why a thorough understanding and conceptualization of uneven development must be articulated: so that the physical, social, material, and immaterial transformations that together comprise the larger upheavals of exurban growth can be interpreted not as the chance happenings of the latest urban trends, but instead as the metabolic symptoms of urbanization as they unfold through crisis. Metabolism allows us to see the inner workings of urbanization at a variety of scales and in a range of places, connecting global movements of capital, humans, water, and any number of other components with their local rupturing and suturing in new and ever-varying combinations. I include in this exurban metabolism forms of environmental knowledge as they are metabolically produced, circulated, and applied, creating new urban objects and urban subjects of that knowledge along the way. All of this is to say that without understanding exurban uneven development through the lens of urban metabolism, we are left with an understanding of the politics of environmental knowledge devoid of their relationship to urbanization, our era's most dynamic and potent process of socio-spatial reorganization.

7.2 THE ARGUMENT AND CHAPTERS

The main objective of the dissertation is to show how new objects and subjects of environmental knowledge were produced in Macon County through urban metabolism during the build up to and subsequent bust of the 2008 financial crisis. The steep slope ordinance debate shows that how environmental knowledge participates in the contradictions of capital accumulation is not only highly contested, but that it also has changed throughout the buildup, crisis, and fallout of the lucrative residential housing market. In chapter two, my theoretical framework draws from a joint UPE/STS approach to show how environmental knowledge is metabolized. I offered Goldman et al.'s production, circulation, and application model to further specify the moments of the metabolism of the immaterial and how new objects and subjects of environmental knowledge are produced. A focus on the production, circulation, and application of environmental knowledge is useful because it illuminates the *processes* of how the knowledge came to be produced, circulated, and applied in the contradictions of capital. It is also useful because it can show how the *type* of the knowledge opens and closes opportunities to be contested and enrolled in processes of production, circulation, and application. This both-and/dialectical approach to 'process' and 'thing' encourages a fruitful dialogue at one intersection of strong ontological traditions in political ecology and STS.

Chapter Two also questioned conventional notions of urban metabolism as used in first generation UPE, which is intently focused on the metabolism of the material. I instead ask about the metabolism of the immaterial, arguing that it is also metabolized. By focusing on the metabolism of the immaterial, UPE gains a fuller understanding of urban metabolism and decenters the ontological priority of material metabolism. I also push UPE to consider broadening its empirics to the countryside, extending the notion of urban metabolism to empirically consider all that its ambitious theoretical vision sees. Though Macon County is not urban in any conventional sense of the term, it is urban from an urban political ecological standpoint insofar as it is increasingly drawn into urban circuits of capital, migration, and knowledge. Investigating the particularly urban questions of the politics of environmental knowledge is another way forward at the young intersection of STS and UPE.

One important point of Chapter Two was to intervene in the growth-centered assumptions of most of exurban scholarship in a variety of disciplines and to demonstrate that this assumption, while understandable in the era of exurban expansion, should be reconsidered in the era of exurban contraction and crisis. This characterization of the relevant environmental, planning, and urban studies literature is not intended to frame this literature as entirely onedimensional. Indeed, much of this work is data-rich, rigorously analytical, and even groundbreaking in its exposure of the growth period of exurban development in the United States from 1960 to 2008. Without it, urban scholars of all kinds would have a poorer picture of this particular moment of exurbanization. Furthermore, it would be a mistake to say that this entire literature could be condensed into the notion of 'growth' and its synonyms. The land use change, commuting patterns, demographic shifts, and other patterns this literature highlights are all related to growth, but they are certainly not reducible to growth. Importantly, many of these scholars, given their interest in the place of exurbia, are likely quite interested in the exurban causes and consequences of the financial crisis.

The point in this chapter is to say that at the center of most scholarly understandings of exurbia is that growth is a central and unquestioned tenet of most exurban scholarship and that this is the result of first, the historical circumstances of strong exurban growth patterns, and second, the absence of a theory of uneven development and urban crisis in the literature. This dissertation joins in the work of Immergluck (2009, 2010a, 2010b) and Schafran (2009, 2012), all of which are published in urban studies and planning journals, is an important step in crafting the next body of literature that will detail the crisis chapter of exurban history and geography. Schafran's work is critical in nature and deploys notions of crisis as it is understood from the perspective of critical political economy and social theory. Immergluck's work, on the other hand, is applied, quantitative, and analytical in its approach. These qualities make it particularly relevant for the policy-oriented, spatial analytical, and descriptively quantitative research of Berube and others. Both Immergluck and Schafran are unique, though, in their insistence in examining the causes, consequences, and responses to the financial crisis in exurbia.

In Chapter Three, I explained my reliance on participant observation, archival research, and interviews. I also relied on Coweeta LTER and Coweeta Lab data, as well as some GIS tax and parcel data available from the State of North Carolina and Macon County. More importantly, I also deepened my theoretical framework in this chapter, challenging UPE to consider singular types of environmental knowledge throughout the processes of metabolism. Goldman et al.'s commentary and edited collection, though helpful to a significant degree, still artificially and unhelpfully separate production, circulation, and application, leaving questions about the artificiality of isolating these three components of metabolism from one another, as well as further questions about what happened to particular types of knowledge before and after its production, circulation, or application.

To these ends, the structure of the empirical sections tries to capitalize on the encounters people and institutions have with types of environmental knowledge. This strategy, often deployed in journalistic format known as an explanatory narrative and often conducted to follow a person, thing, or object across space and time to craft a story out of the connections, also has strong precedent in academic writing in geography. This narrative style also allows for greater freedom in terms of what content can be included in the explanatory narrative, because it mostly allows the object to guide the researcher to unexpected empirical findings.

I did, of course, make pragmatic choices about what types of knowledge I followed, what sources I investigated, and what exurban themes I thought were most appropriate. Every researcher must make choices like these, though, and most of the choices I made in these regards were informed by the site-specific questions of who, what, where, why, when, and how of the metabolism of the individual types of knowledge. Each form of knowledge required a different suite of empirical sources and techniques, though, and still would have required these different suites regardless of my own choices. Investigating historical landslide discourses, for instance, requires archival research and cannot be done only through interviews. Thus, each of the three types of environmental knowledge dictated to a large degree how they needed to be investigated.

Chapter Four, the first empirical chapter discussed Maconians' knowledge of landslides from the Peeks Creek landslide in 2004 to the steep slope ordinance debate in 2011. I relied mostly on archival sources from newspapers to show that the discourse around Peeks Creek had transformed Peeks Creek from primarily a flooding event in 2004 to a landslide in 2011. Part of this transformation was related to county politics. This is evident in the weeks following Peeks Creek as the tragedy was used to question the town of Franklin's decades-long refusal to adopt a flood plain ordinance, thereby disqualifying the town and its residents from FEMA disaster assistance in the event of a flood. By 2005, the discourse of Peeks Creek had changed from flood-related to landslide-related. One reason this shift happened was because of the intervention of NCGS geologists whose investigations and frequent public commentary in the media framed Peeks Creek as a landslide. The commissioning and completion of Macon County's landslide hazard maps, too, was part of the official discourse of Peeks Creek becoming a landslide event rather than a flood event.

No media coverage prior to Hurricanes Frances and Ivan warned Maconians of landslides, but much coverage addressed the possibility of major flooding. A year later, though, when Hurricane Katrina was expected to move over western North Carolina, a sense of dread permeated the media about the possibilities of landslides and flooding. This trend continues today where landslides are mentioned as a frequent possibility when heavy, sustained rainfall is predicted for the region. These reports are made possible by a broader shift in the objects and subjects of landslide knowledge, made possible by NCGS and even Coweeta Lab expertise, which categorized landslides as an immanent and historical hazard on the landscape. The inscrutability of landslides—that they have happened before, will happen again, and that no one can accurately predict the exact place and time of their happening—was an important part of how scientific expertise characterized landslides. For the steep slope ordinance debate, this was a necessary justification for regulation of the landscape. Coupled with powerful emotional appeals to the tragic deaths of Peeks Creek, the chronic hazards of landslides began to mirror the chronically dangerous discourse around flooding, which was also a rationale for the floodplain ordinance.

Chapter Five addresses the NCGS landslide hazard maps, a more concrete contribution of expertise. While the creation of the maps did impact the discourse of landslides and Peeks Creek, their own production, circulation, and application added to the politics of environmental knowledge in exurban Macon County. Though the mapping program garnered much public support and a 2005 unanimous vote from the North Carolina legislature to commission them, by 2011 they maps were highly contentious at the local level and the mapping program was also defunded at the state level.

That the maps were included in the failed county steep slope ordinance explains part of this quick shift, but other factors also contributed. The maps spatialized the NCGS experts' discourse of landslides as chronically dangerous features of western North Carolina landscape, an idea that was not prevalent in policy debates prior to Peeks Creek. The maps also relied on particular GIS and LiDAR methods of calculating the slope of the land. At public meetings, both the spatialization of danger zones and the LiDAR slope calculations irked some landowners because the maps presented a radically different way of coming to know the landscape. These epistemological encounters happened frequently at public meetings and they revealed the divisions between how conservative land rights activists, especially those who were long term residents, understood the landscape differently than local planners, geologists, and GIS/LiDAR experts.

The circulation of the maps also illuminated some of the county's environmental politics and attitudes toward the maps. Though the maps were produced for public consumption and to public information, they were removed from the Macon County website, thus intentionally damaging circuits of knowledge circulation. The maps also were designed to move from the state level to the local level, a move that was also inhibited by regulation opponents. Though NCGS made hundreds of presentations in western North Carolina about the maps, opponents regularly relied upon specious claims regarding the merits and appropriateness of the maps. These arguments regularly took the form of questioning the reliability of LiDAR data, the inability of the maps to predict the exact time and place of a landslide, and the arbitrary qualifications that the NCGS geologists used to delineate landslide prone areas. These types of arguments against scientific measurements parallel some of the frequently claimed objections to climate science, tobacco research, and other similar public scientific debates.

Chapter Six, the last empirical chapter, addresses the steep slope ordinance itself, deliberately tracking its production, circulation, and application and how it establishes the state as a subject of the landscape of landslides and that landslides became an object of state knowledge and regulation. Even though the ordinance had a relatively short existence as a viable piece of local legislation, its life, death, and life-after-death showed that the ordinance was more than simply a law. Instead, it existed as a provocative form of environmental knowledge whose participation in county politics exceeded its original intent to regulate steep slopes. The ordinance itself was produced as a hybrid document layered with levels of geological, hydrological, legal, and construction industry expertise. The experts who informed it were all Maconians, too, confounding the stereotype of the non-local, disinterested, and objectivity obsessed scientist in a faraway lab. This contribution of qualified and local expertise disarmed potential arguments that would and have referenced this stereotype.

Intentionally crafted in the post-2008 aftermath in a moment of circumspection by the planning board and pro-planning advocates, the ordinance circulated around the county via public meetings in each of the county's eleven townships held from February 2010 through May 2011. It was during these meetings that some of the strongly ideological clashes fomented. Though the steep slope subcommittee had prepared rebuttals for some of the arguments against their still-developing ordinance, land-rights activists threatened by the steep slope ordinance because it was a form of regulation. Their well-organized presence at these meetings across the county allowed time for them to articulate their arguments against the ordinance in a sustained and vociferous way.

Though it seems oxymoronic to describe the failed ordinance in the terms of its application, the ordinance was applied beyond its death-by-tabling in August 2011. The tabling of the ordinance, for instance, sparked the formation of MaconSense, which, for its relatively short life, seemed as though it might provide some counterbalance to the efficient network of land-rights activists. The ordinance was also applied as a political test for county commissioner candidates in 2012. The incumbent, who was a moderate democrat, was unseated largely because of his support for the ordinance by a challenger who openly denounced the ordinance and claimed that the ordinance was linked to the United Nations' Agenda 21.

7.3 ACADEMIC AND PUBLIC SIGNIFICANCE

UPE has a strongly committed interest in social justice research, focusing on the stark environmental inequities that plague cities worldwide (Swyngedouw and Heynen 2003, Keil 2003). UPE also insists on a place-based understanding of urban environmental politics. In UPE, the urban is not a spatial container of political ecological developments. Instead, urbanization establishes new patterns of metabolism of biological, chemical, financial, and other components, even as the metabolized, consumed, and produced components give form and function to cities (Kaika 2005, Swyngedouw 2004). UPE draws attention to the false ideological separation between nature (as well as environment and ecology) and urban societies, a distinction that misses and obscures the necessary and inextricable connections of urbanization which unite humans and non-humans.

One contribution of this dissertation is that it addresses UPE's relative lack of emphasis on environmental knowledge. While political ecology often considers the variety of environmental knowledges that impact environmental governance, UPE does not do so to the same degree. This is especially true in exurban areas, where types of environmental knowledge are rapidly changed, introduced, contested, and deployed in response to urban growth. Goldman et al. (2011) note, too, that while the *production* and *circulation* of expert environmental knowledge is generally understudied in strains of political ecology, the *application* of knowledge is often an important part of political ecology scholarship. UPE, too, emphasizes deployment and often misses production and circulation. Scholars working in political ecology have begun to engage with the literature in science and technology studies (STS) as a way to improve their understandings of the production, circulation, and application of environmental knowledge, which I interpret as the metabolism of environmental knowledge. STS is deeply invested in understanding the production and origins of types of knowledge, insisting that all types of knowledge, including scientific knowledge, are contingently political, historical, and geographical.

UPE's emphasis on 'urban' areas, too, has missed some of the important issues of urbanization, urban metabolism, and uneven development in historically rural areas. This oversight is made even more significant because it is often in exurban areas where dramatic changes to resource extraction, patterns of metabolism, intensive land use change, and challenges to cultural and political modes of governance are most starkly drawn (Gustafson et al., in press). Exurban areas are the frontier of urbanization trends and are experiencing the crises inherent to urbanization for the first time. Many of these exurban changes have been left for scholars who study explicitly rural geography to investigate, but the importance of urbanization to these areas ought to be integrated more thoroughly into UPE.

This dissertation works to address some of these gaps within UPE. First, it draws attention to the uneven development of the countryside. Macon County's particular situation is unique in some ways, but it also indicates some emerging trends in exurban areas. A retrenchment of conservative politics in recent years makes for a 'Tea Party political ecology,' where even mundane local ordinances are subject to similar arguments made at other national

level debates. Anti-regulation activists who oppose at every turn the basic role of the state to govern increasingly hamstring local governments aiming to govern in the public interest. Southern Appalachia's self-styled independently minded citizens further complicate this development, making the regional UPE of southern Appalachia fraught with intractable socioecological issues like land use planning and climate governance. The local politics of environmentally related ordinances are important for political ecological reasons but are often overlooked by scholars of UPE. They are not, however, overlooked by anti-government activists and planning advocates in exurbia, indicating that UPE ought to reconsider the local politics of exurbia.

Another contribution from this dissertation is the methodological framework of understanding the metabolism of environmental knowledge. In this way, it contributes to the emerging literature at the intersection of UPE and STS, but does so from the unique position of emphasizing urban metabolism as the key metaphor for common ground between the two fields of inquiry. Goldman et al. (2011) are right to establish the triad of production-circulationapplication in a framework so as to integrate the similar concerns of political ecology and STS. The use of their framework so far, though, has been to investigate only the production, only the circulation, or only the application of knowledge. When scholars segment their analyses along these lines, however, a segmented view of knowledge results. Following a particular form of knowledge through its production, circulation, and application is a better choice because it only magnifies the strengths of the framework while minimizing its weaknesses. This dissertation has sought to exemplify this, following the landslide discourse, failed steep slope ordinance, and the NCGS maps through their production, circulation, and application. A final contribution of this dissertation is to the Coweeta LTER and Coweeta Listening Project (CLP). Coweeta LTER is a major producer of environmental knowledge in Macon County and southern Appalachia. While the CLP has not used this language specifically, we are broadly interested in the production, circulation, and application of the ecological knowledge Coweeta LTER scientists create, as well as other types of non-scientific ecological knowledge that often exist latently in the public's memory and practices. This dissertation's detailing of some of the production, circulation, and application of knowledge augments our understanding of not only local environmental knowledge, but the struggles over how environmental knowledge is used, known, and created; how exurbanization impacts environmental knowledge; and the centrality of environmental knowledge to the county's political struggles.

The research is also valuable because the CLP continues to search for ways of intervening in the circuits of knowledge production, circulation, and application. The CLP was started just as contentious steep slope politics got started, so finding a receptive audience on that particular topic was difficult, if not impossible. Going forward, though, it will remain important for the CLP to understand not just the existence of a variety of types of environmental knowledge, but how to intervene in some of these processes. Some of this work is ongoing with our regular column in *The Franklin Press* and with the translational dialogues, but this dissertation ought to inspire continued reflection on, monitoring of, and anticipation of opportunities to contribute relevant scientific information and to provide a space for the co-production—and perhaps even the co-circulation and co-application—of environmental knowledge.

7.4 CONCLUSION

Crises and contestation, then, characterize exurban uneven development in Macon County and pose a significant challenge to the future of exurbia. Rather than the smooth narrative of prosperity, of a flight to the countryside, or limitless urban expansion, exurbia is a chaotic, contested, and crisis-riddled landscape. Ironically, then, it is a real estate outfit that has told a more compelling narrative about the current crisis moment in exurban uneven development—not Sotheby's Exurbia office, of course, but the real estate offices that send out mailers that many of my colleagues and I regularly receive in Athens. Real estate development offices frequently send out promotional brochures (see Appendix A) for promoting mountain land sales in the north Georgia and western North Carolina mountains. This is especially true in the post-2008 boom, when land speculators were caught after the market's over-valued properties crashed.

The flier's offers are, by most standards, almost too good to be true, especially relative to the pre-2008 prices: "Big Views, Bordering National Forest w/ Cascading Stream (was \$170,000) \$9,900" and "NEW LOG HOME 2,400 sq/ft Package 3+ Wooded Acres Stream Frontage & Bordering NSFS \$49,900" and "Panoramic Mountain Views Overlooking National Forest (was \$165,000) \$8,900). It continues: "BANK FORCED LIQUIDATION SALE: Own Georgia's most desirable property for just pennies on the dollar!" This particular flier was from late 2011 and reports in Macon County are that the residential construction market is coming back, though nothing close to the late 1990s and early 2000s. A continued recovery would begin to buoy a desperate construction market reeling since 2008. As with most Americans, Maconians sense that the economic recovery still feels too tenuous to be trusted confidently.

Immanent recovery or not, the flier's anxiety, firesale prices, and urgency tell a story of exurban uneven development that is riddled by crisis, trying to right the ship that has been battered by waves of difficulties and ruptures. It, too, masks the ecological and other detrimental effects of exurban growth and is in that way just as pernicious than the Sotheby's Exurbia website. Both obscure the realization that most of our ideas about exurbia were created during the time of cheap land, booming economy, early baby boomer retirements, and easy credit for second mortgages. Those days, at least for now, are over, and our narrative of exurban growth needs to reconsider exurbia less as a place of boundless urban expansion and retirees' dreams and more as a place existing now at the confluence of exurban crises and conflicts

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APPENDIX A: CRISIS FLIERS

