EXURBANIZING WATER: STREAM MANAGEMENT DECISION-MAKING AMONG NEWCOMER AND GENERATIONAL LANDOWNERS IN SOUTHERN APPALACHIA

by

SAKURA R. EVANS

(Under the Direction of TED GRAGSON)

ABSTRACT

Water is arguably the most vital element necessary to sustain life on this planet, making the management and protection of water resources an issue of critical importance. As rural land is increasingly fragmented and sold to private buyers and developers in southern Appalachia, the impact of land use decision-making at the parcel level becomes a serious threat to stream health and water quality. In this dissertation, I focus on the interaction of stream management decision-making and the processes of exurbanization that are shaping this region by examining how two different landowner groups perceive water, their stream management practices, and whether exurbanization is resulting in differential stream management among Newcomer and Generational landowners. My analysis of land use decision-making is supported by qualitative and quantitative data collection and analysis in the southern Appalachian community of Macon County, North Carolina. I found that over half of all landowners surveyed were removing riparian vegetation and large woody debris from their streams on a regular basis, and while my analysis of sociodemographic and property variables show that Newcomer and Generational landowners are in fact two distinct sub-cultures of landowners, my findings suggest that presently this difference is not translating into land use decision-making. Despite different

motivations for engaging in this behavior, Newcomers and Generationals are equally practicing this environmentally harmful form of stream management. Therefore, my hypothesis that these two landowner groups would be differentially managing their streams was proven incorrect, which I attribute to the shared perception of water as a communal resource. Both Newcomer and Generational landowners shared similar perceptions of water use and threats to water quantity and quality, and both groups identified local government as the most significant obstacle to ensuring water security into the future. My findings contribute to literature examining the impacts of exurbanization on environmental resources, the anthropology of water, as well as a regional studies of water use and management. The research presented in this dissertation provides a baseline for understanding how landowners conceptualize water in southern Appalachia, and empirical data on how landowners are managing the streams on their property.

INDEX WORDS: Southern Appalachia; exurbanization; perceptions of water; land use decision-making; cognitive anthropology; stream management; riparian zones; large woody debris

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SAKURA R. EVANS

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by

SAKURA R. EVANS

Major Professor: TED GRAGSON

Committee: JULIE VELASQUEZ RUNK
NIK HEYNEN
CATHY PRINGLE
REBECCA MOORE

Electronic Version Approved:

Maureen Grasso
Dean of the Graduate School
The University of Georgia
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For Marianna and Nyla

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CHAPTER 1

INTRODUCTION

Research Problem Description and Justification

This research explores land use decision-making among landowners in southern Appalachia. I focus on the interaction of stream management decision-making and the processes of exurbanization that are shaping this region through the lens of cognitive anthropology. In particular, I examine 1) the impacts of exurbanization on water resources by reviewing how two different landowner groups, Newcomer and Generational landowners perceive water, 2) stream management practices and the motivations driving management decision-making at the household level, and 3) whether exurbanization is resulting in differential stream management among Newcomer and Generational landowners. My analysis of land use decision-making is supported by qualitative and quantitative data collection and analysis in the southern Appalachian community of Macon County, North Carolina.

The Blue Ridge EcoRegion in the southern portion of the Appalachian mountain chain possesses unique geologic features formed over hundreds of millions of years of erosion, resulting in a region that is cooler and wetter than the surrounding piedmont and coastal areas of the southeast, and boasting extremely high levels of biodiversity. Landowners are having a direct impact on the health of this environment through their land use decision-making, especially stream health and water quality. These impacts are being further exacerbated as increased population density and development, contribute to environmental degradation. This suggests that stream health and water quality may become compromised as the region grows and an

increasingly heterogeneous population of landowners have direct control over streams on private land.

Although the region currently boasts good water quality, these favorable conditions may quickly change as population growth and development continue, and episodic droughts and extreme weather events due to regional climate change become more frequent. Considering the political, social, and economic importance of water, the direct impact private landowners have on water resources through stream management, and the population and development pressures associated with exurbanization, research exploring stream management at the household level can directly contribute to regional policy aimed at effectively managing and protecting water resources. I argue that understanding how landowners perceive water and streams, how these perceptions guide their stream management decision-making, and determining whether different landowner groups are perceiving and managing streams in different ways, provides an opportunity for informed interventions in local education, restoration, and conservation, as well as a framework for facilitating behavior change on a regional scale.

My dissertation research is centered on the southern Appalachian community of Macon County, North Carolina. Three factors make Macon County particularly well-suited for research examining stream management decision-making, and the impacts of exurbanization on water resources.

> (1) Abundance of water. The extensive network of waterways in southern Appalachia means that branches, streams, and rivers are found on private residences throughout the region, and each of these landowners have access to, and direct impact on, the stream bordering or running through their property.
>
> (2) Exurbanization. Southern Appalachia has been identified as a region

experiencing rapid exurbanization, and Macon County is exceeding growth rates for both the surrounding six counties and the state, making it one of the fastest growing counties in North Carolina. And as of 2012, over half of all landowners in the county filed their taxes out-of-state, evidence that the county is currently split between Newcomer and Generational landowners.

(3) Lack of regulation. At present, Macon County has few regulations governing land use. A sedimentation and erosion control ordinance exists to regulate the impact of land disturbing activity on water quality, however several residents are unaware of its existence and many others complain that it is not enforced. Therefore, there is little evidence of institutional forces dictating or constraining decision-making and behavior in regards to water and stream management.

Chapter Objectives

In Chapter 2, I review the literature concerning human environment relations from a cognitive anthropology and perspective, specifically research examining perceptions, preferences, and values for mountainous and water-rich scenarios. How people relate to rural, forested settings has been a large area of research because it has been argued that preferences and perceptions for environmental surroundings directly influences decision-making and behavior. Because of water's importance for ecological and social well-being, many researchers have contributed to this literature by analyzing stream management techniques and behaviors, and the ecological impacts of these behaviors on stream health and water quality, primarily in natural resource management, landscape planning, and restoration and conservation literatures. However, I focus my literature review on studies that explore the impacts of exurbanization on environmental resources. In this paper, First, I provide an overview of exurbanization,

highlighting how this form of regional growth impacts the social dynamics of rural communities, and how these social tensions in turn impact their surrounding environment. I then review the ecological impacts of exurbanization on stream health and water quality, and apply these concepts to exurbanization in southern Appalachia. I review the theoretical framework of cultural constructions of nature and demonstrate how this approach can contribute to studies of decision-making and behavior. I conclude with a presentation of literature calling for the inclusion of empirical research in water policy and management, and provide specific examples of how socioecological analyses can contribute to water conservation and restoration efforts.

Chapter 3 examines perceptions of water by two landowner groups in southern Appalachia by assessing Newcomer and Generational landowner views on water use, threats to water, and future water security. In this chapter, I argue that although both groups demonstrate small variations in their perceptions of water, the same overall perceptions of water as a communal resource was shared. Both landowner groups used this perception in their decision-making about stream management, specifically engaging in behaviors that don't impact their neighbors or larger community. Both landowner groups also feared water security was threatened by the processes associated with exurbanization, and both felt the local government had demonstrated an inability to protect water resources into the future. I follow with a brief discussion of how the community has responded to these fears in a way that mimics their views on water sharing - through social cooperation and community-based environmental education. Finally, I conclude by highlighting the important contribution of anthropological research to natural resource issues and policy interventions.

The research presented in Chapter 4 examines the actual stream management techniques practiced by riparian landowners in Macon County. In order to fully understand how landowners

conceptualize stream health and interact with their stream, this chapter uncovers the decision-making processes and motivations guiding stream management. First, I provide an overview of the most noticeable changes to streams, and the rates of riparian and large woody debris removal and landowner's reasons for engaging in that form of stream management. I then discuss the primary drivers of stream management decision-making and outline the importance of incentives for behavior change. I conclude with recommendations for stream restoration, arguing that education is the most culturally appropriate and preferred method of intervention.

The research described in Chapter 5 follows up on the previous chapter, and examines whether exurbanization is resulting in differential stream management by Newcomer and Generational landowners. It has been theorized that different cultural groups living in the same area and engaged in more or less the same activities may have strikingly different models of nature (Atran and Medin, 2008), and cultural influences on behavior will be evidenced in data that derives from different groups of people with different cultural histories behaving differently in the same physical environment (Atran, Medin, and Ross, 2005). I examine differences in sociodemographic variables, environmental values, preference for stream appearance, stream management techniques, and perceptions of stream quality. I discuss my findings and conclude with suggestions for guiding policy efforts, and outline why a cognitive anthropology approach is a useful method for researching the impacts of exurbanization on the landscape due to its utilization and treatment of cultural variability.

Chapter 6 summarizes the main findings from each of the chapters and presents my overall conclusions of this research and its implications for water policy and management. I follow with a discussion of the broader theoretical significance of my findings, and discuss some

of the possible limitations of my research. I conclude with recommendations of future directions for research.

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CHAPTER 2

IMPACTS OF EXURBANIZATION ON WATER IN SOUTHERN APPALACHIA: A LITERATURE REVIEW

Introduction

Water is arguably the most vital element necessary to sustain life on this planet, making the management and protection of water resources an issue of critical importance. As rural land is increasingly fragmented and sold to private buyers and developers in southern Appalachia, the impact of land use decision-making at the parcel level becomes a serious threat to stream health and water quality. Understanding landowners' perceptions of land use and management is central to reversing stream degradation at the household level (Dutcher et al, 2004), therefore it is necessary to look beyond anthropogenic impacts on stream health and address the cognitive processes informing the decision-making and behavior of landowners. If policy aimed at better management of environmental resources is to be effective, it must be informed by research grounded in the processes of human-environment relations.

In this paper, I review stream management decision-making in southern Appalachia as it relates to the processes of exurbanization. I begin by providing an overview of exurbanization, highlighting how this form of regional growth impacts the social dynamics of rural communities, and how these social tensions in turn impact their surrounding environment. I focus on the ecological impacts of exurbanization on stream health and water quality, and examine how these processes are influencing water resources in southern Appalachia. I then review the cognitive anthropology literature of cultural models and highlight examples to demonstrate why this

theoretical approach is well-suited for studying the cognitive processes informing the decision-making and behavior of landowners. I conclude with a presentation of literature calling for the inclusion of empirical research in water policy and management, and provide specific examples of how socioecological analyses can contribute to water conservation and restoration efforts.

The Blue Ridge EcoRegion in the southern portion of the Appalachian mountain chain currently boasts good water quality, however these favorable conditions may quickly change as population growth and development continue, and episodic droughts and extreme weather events due to regional climate change become more frequent. Landowners are having a direct impact on the health of this environment through their land use decision-making, and these impacts are being further exacerbated as the pressures associated with exurbanization threaten stream health and water quality. Because of the political, social, and economic importance of water, research exploring stream management at the household level can directly contribute to regional policy aimed at effectively managing and protecting water resources. To better understand these impacts now and into the future, it is particularly important to examine how these different social groups in southern Appalachia are making decisions about the management of streams on their property.

Exurbanization: Social Change and Human-Environment Relations

Referred to as exurbanization, amenity migration, counterurbanization, rural sprawl, or neo-rural migration, the influx of urban migrants into rural communities has been increasingly studied over the last fifty years, both domestically as well as internationally. Coined by Spectorsky in 1955, exurbanization represents a "rural restructuring" (Gosnell and Abrams, 2009; Nelson, 2001; Woods, 2003) as rural communities, environments, and economies shift from productivist to post-productivist or neo-productivist landscapes (Darling, 2005; Gosnell and Abrams, 2009; Holmes, 2002; Ilbery and Maye, 2010; McCarthy, 2007; Wilson, 2001). While the concept of exurbanization conforms to the general idea of "sprawl," Cadieux states that the characterizing feature of exurbanization that differentiates it from unplanned residential development on the urban periphery is the amount of land (2009). She argues that exurban

development is so desirable specifically because it involves low population density and large parcel sizes, and it is the "material and ideological benefits of sprawling nature [that] attract amenity migrants to exurban landscapes" (2009:343).

Scholars have used several different methods to define exurbanization, including parcel acreage (Brown, et al., 2005; Kaplan and Austin, 2004; Lohse and Merenlender, 2009), emphasizing links between exurban development and the urban core (Culbertson, et al., 2008; Joseph and Smit, 1981), and the geographic distinctions of urban, suburban, and rural (Loeffler & Steinicke, 2006; McCarthy, 2007; Shelley and Roseman, 2001). However, Nelson (1992) characterized exurbanization by its sociocultural impacts on the landscape:

> ... the continued deconcentration of employment and the rise of exurban industrialization, the latent antiurban and rural location preferences of U.S. households, improving technology that makes exurban living possible, and the apparent bias of policy favoring exurban development over compact development (p. 350-351).

Because exurbanization is a gradual process that has peaked and plateaued over the years, consensus on how to measure social change associated with the exurbanization is also still developing. Many studies have used length of ownership as the metric for determining Newcomer status, with the standard of 10 years of ownership frequently utilized (Graber, 1974; Fortmann & Kusel, 1990). Others follow a different model which uses the year immigration to the community dramatically increased, thereby signifying the start of population growth and the beginning of the process of exurbanization (Blahna, 1985; Gosnell, Haggerty, & Byorth, 2007; Krannich et al., 2006; Smith & Krannich, 2000).

This influx of new residents into rural areas has deep impacts on the social structure of traditional communities as long-time residents interact with, and share their community with, a diverse population of in-migrants. What defines an in-migrant, or "Newcomers," varies, but characterizations often include wealthier, more educated, more urban interests, economically

independent of productivist land uses, lacking social and familial ties to the community, and a taste for regional culture and history (Gosnell and Travis, 2005; Gosnell and Abrams, 2009; Gragson and Bolstad, 2006; Larsen and Hutton, 2012; Graber, 1974). In contrast, native landowners, or "Generationals," are characterized as older, less wealthy, multi-generational, possessing strong social and familial ties to the community, maintaining livelihoods dependent on productivist land uses, and more likely to share the same values and ideals (Gosnell and Abrams, 2009; Gragson and Bolstad, 2006; Hatch, 2009; Nelson, 1992).

The effervescence resulting from this cultural mixing often plays out in local politics, local economy and business, the commodification of cultural heritage, and social stratification (Darling, 2005; Gosnell and Abrams, 2009; McCarthy, 2007; Nelson, 1992). Gosnell and Abrams have argued that the draw of natural, recreational, and cultural amenities is both a driver and an outcome of urban-rural migration as retirees, amenity-seekers, and second-home owners relocate to a region and trigger changes in local land use and tenure, governance, social structure, and economy (2009).

Scholars have also taken a more critical perspective on the push-pull effect of exurbanization, illustrating how it directly contributes to widespread social inequalities. McCarthy (2007) has stated that the countryside is increasingly becoming a global commodity, with exurban development and land use becoming a spatial expression of growing class polarization. He argues that exurban migration results in rural gentrification, and transitions into "exurban" status represent a transition out of "rural" status. According to McCarthy, this desire for rural living is fueled by discourse of "the good life in the country" and represents just another form of social segregation as wealthy urbanites attempt to avoid the societal ills of urban living by escaping to a life in the country. Similarly, Darling presents research on the impact of

exurbanization in the Adirondacks, which she also refers to as rural gentrification, arguing that the flow of capital into rural communities directly contributes to social inequality. Utilizing Neil Smith's theory of the Rent Gap (1987), she illustrates how rural environments are becoming gentrified as wealthy urbanites relocate to rural areas and purchase homes, causing regional property values to increase and push out native residents. She describes this land use as representative of the postproductivist economy based on exploitation of land for the purposes of capital accumulation, emphasizing that the patterns of land use "are far less significant than the patterns of ownership which characterize it" (2005:1027).

In addition to the way exurbanization impacts the social dynamics of rural communities, research has also focused on how social conflicts arising from these mixed groups of landowners are impacting their surrounding environment. Krannich (2011) conceptualizes these spaces as "socially constructed landscapes" which are linked to the biophysical environment because they function as a stage for human activities. As different social groups interact with, and socially construct, landscapes within the same community, conflicts can arise. Cadiuex describes this process as "competing discourses of nature," in which contrasting views of how nature in exurbia should be managed and maintained leads to power struggles over whose definition of "nature" is privileged, and in what ways.

Egan and Luloff (2000) discuss the implications of diverging attitudes and opinions on forest management in rural communities. They argue that the influx of urban residents into rural forested communities is directly impacting forest economies and policies as wealthy, educated in-migrants often disapprove of activities threatening the aesthetic value of their surroundings, driving local economies away from natural resource extraction to the service industry. According

to the authors, "as America's population distribution changes, so too do the social, economic, and political influences that shape the use and management of forests" (2000:29).

Hurley and Walker (2004) provide a case study in which "competing visions for the future" undermined local land use planning in a California community. Local government developed a planning process to mitigate the impacts of rapid exurbanization in their rural community, and some residents perceived this attempt at land use planning as a threat to their private property rights and engaged in acts of protest and resistance. In particular, discourse surrounding "outside interference" and "global conspiracy" were utilized to derail the program. The authors highlight this case study as an example of how different views of land management are increasingly playing out in land use planning as heterogeneous groups of landowners with different values and beliefs relocate to rural areas and engage in community politics.

While exurbanization is clearly impacting regional environments through land use planning and policy, one of the most serious threats to environmental health is the impact of land use decision-making at the parcel level. As more rural land becomes fragmented and sold to private buyers and developers, the result is more landowners on smaller parcels, intensifying the overall impacts of land use on natural resources at the regional scale.

Impact of Exurbanization on Stream Health and Water Quality

Exurbanization has been identified as the fastest growing land use in the United States (Brown et al., 2005; Heimlich & Anderson, 2001; Lohse & Merenlender, 2009; Theobald, 2003), and several scholars have expressed growing concern over the impacts of exurbanization on environmental resources (Abrams, et al, 2012; Dale et al., 2005; Odell & Knight 2001; Maestas

et al., 2003; Hansen et al., 2005; McAlpine, 2006). In particular, much research has focused on the impacts of exurbanization on water due to shifting land uses as increased population density, residential development, and commercial development lead to impaired stream health and water quality (Compas, 2007; Gosnell, Haggerty, and Byorth, 2007; Lohse and Merenlender, 2009; Nassauer et al, 2004; Radeloff, et al, 2005). As residential and commercial development increase to accommodate growing populations of retiree and amenity residents, research has shown that increased impervious surfaces, stream sedimentation, and erosion are contributing to impaired stream health and water quality (Lohse and Merenlender, 2009; Nassauer et al, 2004; Radeloff, et al, 2005).

Recent research finds exurban development expanding 14.3% nation-wide by 2020 (Theobald, 2005), with a significant amount of the residential development occurring along or near waterways (Compas, 2007). This becomes problematic when coupled with recent findings that households are one of the largest producers of non-point source pollution (US Environmental Protection Agency, 2007), which is now considered the biggest threat to water quality in the US (Dutcher et al, 2004; Ryan, 2009). Therefore, stream management by private landowners, particularly the management of riparian zones, has been highlighted as a critical area for research and restoration (Audrey, Briggs, Kroesen, 2009; Groffman et al, 2003). The importance of riparian management for stream health often lies in the cumulative impacts of individual behavior, resulting in environmentally significant impacts in the aggregate (Bolstad and Swank, 1997; Booth et al, 2004; Groffman et al, 2003; Nassauer, 2001; Nowak and Cabot, 2004; Pickett et al, 2007; Stern, 2000; Theobald, 2000).

Because stream health and water quality are directly impacted by the condition of their riparian vegetation, much research has been done on the management of streams and their banks.

Riparian zones are the interface between terrestrial and aquatic ecosystems comprising the environmental conditions through which water and materials move (Gregory et al., 1991; Knoepp and Clinton, 2009). They are an essential component in the functioning and health of forested ecosystems because of their role in regulating stream temperature, regulating the physical structure of streams, absorbing nitrate from shallow groundwater, and buffering the movement of pollution from entering the water system, making them critical areas for habitat preservation (Bunn et al, 1999; Hession et al, 2003; Houser et al, 2005; Silk and Ciruna, 2005; Wallace et al, 1999; Young and Huryn, 1999).

Scientific research has shown that maintaining a buffer of vegetation along a streambank or allowing boulders, trees, and leaves to remain in the waterway benefits stream health by providing aquatic habitat, regulating stream temperature, stabilizing streambanks, and filtering water before entering the stream (Clinton, Vose, and Fowler, 2010; Fischenich and Morrow, 2000; Flebbe, 1999; Wallace, Grubaugh, and Whiles, 1993; Walker et al, 2009). However, many household stream management practices include mowing lawns to the stream edge and suppressing riparian vegetation, drawing water directly from streams for irrigation, and allowing livestock and pets direct access to streams. The removal of logs, branches, and limbs from streams is another common practice with detrimental impacts to stream health. Referred to as Large Woody Debris (LWD), logs, branches, and limbs are a natural element found in streams and provide food and habitat for fish and aquatic bugs. While it is recognized that the removal of riparian vegetation and LWD are common forms of stream management in southern Appalachia (Clinton, Vose, and Fowler, 2010; Flebbe, 1999; Wallace, 1993; Walker, et al., 2009), the motivations for engaging in activities that directly contribute to stream degradation are rooted in

long-standing traditions and beliefs about land management and mountain agriculture specific to this region.

Exurbanization in Southern Appalachia

Composing the southern portion of the Appalachian mountain chain that spans from Georgia to Maine, southern Appalachia spans from southern Virginia to north Georgia, and eastern Tennessee to the western Carolinas. This research focuses on The Blue Ridge Ecoregion in particular, which is a mountainous region with unique geologic features formed over hundreds of millions of years of erosion. This has resulted in a region that is cooler and wetter than the surrounding piedmont and coastal areas of the southeast, and which boasts extremely high levels of biodiversity. Elevation ranges from 600-2000 masl, with a temperate deciduous forest structure. The climate ranges from humid subtropical to marine humid temperate, and precipitation ranges from 1700 mm at lower elevations to 2500 mm on the upper slopes (Swank, Vose, and Elliott, 2001).

Southern Appalachia has a long history of intensive land use, a continuing legacy of resource exploitation, poverty, isolation, and societal ills, as well as a proud tradition of self-reliance, strong moral values, and a strong belief in private property rights. Over the years, several social scientists have attempted to formulate theories to explain the "Problem of Appalachia" (Friedmann, 1966) or as noted by Ron Eller, mountain life is "so frequently studied and yet so misunderstood and maligned" (1991: 149). Previous ethnographic research in Southern Appalachia has revealed a familistic society generally cautious of outsiders and reluctant to discuss personal matters with those external to kin or social networks (Brown & Schwarzweller, 1970; Halperin, 1990). Others cite a lack of community cohesion or identity as a characteristic feature of Appalachia and its people (Shapiro, 1978). Early color writers painted a

picture of the southern mountains as devoid of community, full of independent, isolationist, and reclusive mountaineers, exemplified by the works of John C. Campbell (1921), Thomas R. Ford (1962), and Jack Weller (1965). Theories of the societal ills of Appalachia abound, ranging from genetics (Caudill, 1963; Estabrook, 1926; Fiske, 1897; Hirsch, 1928), to geographic isolation (Frost, 1899; Semple, 1901; Campbell, 1921), to more sociocultural and economic theories emphasizing the culture of poverty (Weller, 1965), central place theory (Hansen 1966; 1970; 1972), and internal colonialism (Caudill, 1965; Lewis, Johnson, and Askins, 1978).

However, recent scholarship has studied Appalachia not as an island of cultural malaise, but within the greater context of regional, national, and even global interactions (Billings and Blee, 2000; Dunaway, 1996; Eller, 2008; Lewis and Billings, 1997). This research has demonstrated that mountain communities in Appalachia differ from the institutions and organization of major American cities, as well as the early characterizations of individualism and fatalism found in the aforementioned works (Keefe, 2009). Walls and Billings placed Appalachia within the industrialist framework of capitalist development (1991), continuing this research in later works examining Appalachia within the larger globalized economy (Billings and Blee, 2000). Beaver explains that the terrain and geographic isolation of mountain communities developed from clusters of homes settled on prime agricultural land, with informal community organization and flexible social networks based on kinship (1984). She argues that Appalachian communities carry a strong sense of place and it's this place, full of steep terrain, unpredictable weather, flooding, and geographic isolation, that has shaped the social relations, organization, and culture of mountain communities.

This historical reputation portraying southern Appalachia as isolated and backwards has largely persisted despite the region maintaining global economic ties since the 1600's (Straw

and Blethen, 2004). When the Europeans arrived in the mid-16th century they encountered a human-generated landscape formed over 10,000 years of Native American occupation (Davis, 2000; Williams, 2002; Yarnell, 1998). The Cherokee population began trading with European settlers shortly after Fernando de Soto's arrival in the southeast in the mid 16th century, and by the 1750's the Cherokee were providing 60,000 deer skins annually to Charleston for export to Europe (Bolstad and Gragson, 2008). The native populations became increasingly reliant upon European trade goods, thereby securing their position as a peripheral fringe of the capitalist trading system in northwest Europe (Williams, 2002).

Figure 1 Picture of the Little Tennessee River. Photograph by the author.

Following the English settlement of the America's, the region became inundated with immigrants hailing from Germany starting as early as 1700, followed by Scotch-Irish and Irish by the mid-1700's (Gragson, Bolstad, and Devine, 2008; Williams, 2002; Yarnell, 1998). The Cherokee transitioned into a full-time farming mode of subsistence harvesting row crops and

livestock, continually engaging in failed treaties and often violent confrontations with settlers ending with the Indian Removal Act of 1830 and their forced expulsion from Southern Appalachia in 1838 (Yarnell, 1998). By the 19th century, economy in the southern mountains was largely dominated by livestock, farming, mining and timber, and after the American Revolution agriculture boomed in Southern Appalachia as the region exported foodstuffs to the lower South to feed the abundant slave population (Gragson, Bolstad, and Devine, 2008). The agricultural prosperity of the 1850's stimulated the growth of a transportation network of interstate and local railways, allowing for increased imports and exports of cash crops and subsistence crops across the region.

As population increased due to the agricultural abundance, total farm size and number of farms increased while the size of farms decreased, initiating the beginning of the decline of agriculture in Southern Appalachia. Between 1900-1950, the total farm area decreased by 25%, and faced with severe soil erosion and less productive land, many landless families left their farms to relocate in rural areas surrounding regional centers to find wage labor to support their families (Gragson, Bolstad, and Devine, 2008). This phenomenon became known as the Great Out Migration, and between 1940-1970 over 2 million people migrated out of Southern Appalachia (Culbertson et al, 2008). Scholars began analyzing the systemic basis of the region's impoverishment and two predominant theories gained a following: the 'Culture of Poverty' theory became a prevalent social explanation for Appalachia's inability to adopt and reflect the greater American goals of wealth and prosperity (Billings, 1974; Billings and Blee, 2000), and World Systems theory was used as a geographical explanation for Appalachia's role as the periphery whose wealth and resources were extracted to support the growth and dominance of

first the British empire followed by the U.S. government centered in the northeast (Beaver, 1984).

Figure 2 Picture of an agricultural valley along the Little Tennessee River. Photograph by the author.

Lack of access to the region was identified as the primary obstacle driving the stagnation of Appalachia (Rephann, 1993), and to improve conditions in this impoverished region of the United States, the Appalachian Regional Commission (ARC) was established in 1965. The conceptual model for ARC operations was grounded in the assumption that federal public

investment in private capital accumulation will lead to higher levels of economic development (Mencken and Tolbert 2005), and this objective was to be achieved primarily through federal investment in highway infrastructure. Despite over 3,000 miles of highway completed as of 2002 (Lein and Day, 2008), contemporary research has found that the efforts of the ARC failed to include the concerns and needs of local populations, resulting in a multitude of unintended consequences (Friedmann, 1966; Hansen, 1966; Isserman and Rephann, 1995; Mencken and Tolbert, 2005; Widner, 1973; Wood, 2001), including the out-migration of rural Appalachian residents flocking to suburban zones of urban peripheries, the in-migration of wealthy outsiders to rural, exurban mountain communities, and the initiation of an economic shift to tourism and service sectors from agriculture and industry.

Access into the region was achieved, and in-migration to the southeast has been steadily increasing between 1950-1990 (Wear and Bolstad, 1998), exemplified by shifting economies and the growth of recreation and retirement communities (Keilman, 2003; Liu et al, 2007; Mackun, 2005; Morrill 1978; Shelley and Roseman 1978), with the tourism and service sectors experiencing a growth of 600% (Gragson, Bolstad, and Devine, 2008). Yet, despite over 40 years of government investment into infrastructure and development, with consistent population influx, Southern Appalachia still retains some of the highest illiteracy rates, lowest education rankings, and consistently high levels of unemployment compared to the rest of the country (US Census Bureau). As a result, Southern Appalachia is gentrifying as older, wealthier, and more educated in-migrants are relocating to the region primarily for retirement and recreation purposes (Gragson, Bolstad, and Devine, 2008).

In the 1990's alone, the rural South grew by over 1 million, generally favoring the same regions along the peripheries of regional urban centers, following well-worn migration paths

carved out from recurring episodes of population influx over time (Cromartie, 2001). Yet surprisingly, research on exurbanization in southern Appalachia is minimal in comparison to other regions of the United States. However, focus has increased in recent years as scholars acknowledge the unsurpassed growth and development throughout the southeast (Cromartie, 2001; Eller, 2008; Haas and Serow, 1993). Morrill (2001:37) has stated that "As much as half the area of the nation experienced an apparent reversal, predominantly from net out-migration in 1965-70 to net in-migration in 1970-75. This turn-around is most obvious and dramatic in Appalachia…" (2001:37), while Culbertson et al. proclaim, "Perhaps no other rural region of the United States has been as dramatically transformed over the last few decades as southern Appalachia" (2008:78). Cromartie (2001) provides an in-depth overview of the recent migration into the rural south, the pull of rural amenities for urban migrants, and the resultant economic development issues plaguing rural communities, and Cho et al. (2005) present research showing that "…residential development is the dominant driving force of land-use change in the Southern Appalachian Highlands" (549). Haas and Serow (1993) determined that climate, scenic beauty, environmental amenities, recreation, and affordability were the primary pull factors drawing in-migrants to the region in their survey of over five hundred new residents in western North Carolina, while Eller (2008) has written extensively on the role of the Appalachian Regional Commission and how its policies set the stage for exurban growth by providing the infrastructure for migration.

Figure 3 Picture of billboard advertising land sale of the failed development formerly known as "Wildflower." Photograph by author.

As increased population growth and development continue in this region, researchers, policymakers, and the public alike have begun to grow concerned about the consequences of exurbanization on water quality and stream health. Almost 70% of forestland in the Southeast is privately owned (Wear and Greis, 2002), and many of these landowners have direct access to streams on their property. Because land use at the parcel level has a direct impact on stream health, it is critical to understand how landowners are engaging with water resources in this region. As southern Appalachia continues to grow and more urban migrants settle in rural mountain communities, it is particularly important to examine how these different social groups are making decisions about the management of streams on their property.

Examining Exurbanization from a Cognitive Anthropology Perspective

Research has shown that landowner decision-making about stream management has lasting repercussions, both positive and negative, on stream health (Audrey et al. 2009; Lohse and Merenlender 2009). However, the majority of research has primarily focused on the ecological impacts of human land use on stream health and water quality, while largely overlooking the cognitive processes guiding the behavior that results in stream degradation. To better understand these impacts now and into the future, it is necessary to look beyond anthropogenic impacts on stream health to the cognitive processes informing the decision-making and behavior of landowners.

Cognitive anthropology is a subdiscipline within cultural anthropology that explores the sharing and transmission of culture and knowledge (D'Andrade, 1995). This is a popular theoretical foundation for analyzing culture sharing and dissemination by ethnographers, linguists, and archaeologists who engage in the interpretation and symbolism of cultural groups. Cognitive anthropology takes a distributional view of culture which exists as a shared understanding amongst people across space and time. Cultural knowledge is shared and disseminated within a social group through the use of cultural models, the coherent logical structure through which members of a culture or social group function and interact according to shared understandings or expectations (Atran and Medin, 2008; Bang, Medin, and Atran, 2007; Kempton et al, 1995). These shared understandings are the "basic conceptual underpinning of popular thinking about the environment," which helps people understand environmental problems, justify environmental values, and provide an organizational basis for reasoning (Kempton et al, 1995). It is the complex combination of values, culture, and external factors that

influence how individuals interact with their environments, and how landowners make decisions about land and stream management.

The cultural models that structure an individual's environmental knowledge also affects their perception and in turn their preference for environmental surroundings. Preference theory explains that culture has a strong influence on preference, and when combined with external factors outside the realm of personal control, directly contribute to decision-making (Dearden, 1984; Dutcher et al, 2004; Hunziker et al, 2008; Kaplan and Austin, 2004; Kaplan and Herbert, 1987; Knopf, 1987; Lichtenstein and Slovic, 2006; Purcell et al, 1994; Wohlwill, 1976; Zube and Pitt, 1981). The cultural models that individuals use to organize information about the world are responsible for constructing beliefs; beliefs inform how people evaluate their surroundings; and evaluations result in rankings of classes of objects creating individual preference (Druckman and Lupia, 2000; Lichtenstein and Slovic, 2006). In short, people develop preferences to provide inferential structure to their interactions with the world. Therefore, cultural models provide the structure organizing how landowners interpret and perceive information about their environment, which informs their decision-making process, and ultimately dictates socially acceptable actions that fit within their cultural model of the environment (Kempton et al, 1995).

Knowledge organization affects perception of the environment, and influences preference for the environment, and many scholars agree that assessing variability in the organization of knowledge within a social group provides a unique opportunity to study the organization and distribution of culture (Barnett, 1953; Boster, 1987; Handwerker, 2002; Keesing, 1994; Pelto and Pelto, 1975; Wallace, 1961). Different cultural groups living in the same area and engaged in more or less the same activities may have strikingly different mental models of nature (Atran and Medin, 2008), and cultural influences on behavior will be evidenced in data that derives from

different groups of people with different cultural histories behaving differently in the same physical environment (Atran, Medin, and Ross, 2005). Therefore, examining how two different cultural groups behave in the same environment provides data on the role of culture in human-environment relations.

Research assessing how different social groups perceive and interact with their surrounding environment have demonstrated they hold varying degrees of environmental knowledge, beliefs, and values, which reflect how they interact with their environment. In their analysis of framework theories among Native Americans and European Americans in a rural Wisconsin community, Bang, Medin, and Atran utilized an epidemiological approach to studying cultural variation in which "culture is studied as causally distributed patterns of ideas, their public expressions, and resultant practices and behavior in a given context" (2007:13873). The authors determined that epistemological orientations affect organization, reasoning, and environmental relations, illustrated by the two social groups differing in how they talked about nature, as well as how they perceived the role of humans in nature. Results indicated that both groups share essentially the same model, knowledge base, and behavior, but there appear to be clear cultural differences in how this knowledge is organized, rather than differences in the amount of knowledge. The authors argue that the differences between the two groups represent different models of knowledge organization, demonstrating that similar behavior by two social groups can have very distinct cultural meanings because they operate from different models, which the authors argue can lead to misunderstandings and social conflicts over resources.

Lansing, Lansing, and Erazo (1998) present similar research examining different valuations of water by two cultures. The authors postulate that the value of environmental resources are not fully calculable using conventional economic theory, which supports their

argument that "value is not a measurable physical property, but a social construction" (1998:2). While the European Americans in the region valued the Skokomish River for the monetary profits derived from its two dams and hydroelectric power plant, the native Skokomish tribe valued the river for it's "natural capital." The authors demonstrate that different cultures inhabiting the same physical space were differentially valuing the river, resulting in social conflict, inequality, and the disenfranchisement of the native Skokomish people (ibid).

Gosnell, Haggerty, and Byorth (2007) assessed the motivations of two social groups and how this influenced their land use by examining differences in stream management decision-making among Newcomer and Generational landowners in an exurban community of southwestern Montana. They found that the management decisions of Generational landowners were focused more on increasing irrigation efficiency, while the management decisions of Newcomer landowners were primarily related to recreation, aesthetics, and conservation. The authors concluded that changing land ownership has had effects on regional water management, resulting in both negative and positive ecological impacts, and argue that current policies and laws governing water resources may not adequately address the complexity surrounding opportunities and challenges for water conservation. These authors echo the sentiments of literature calling for the application of empirical science to policy making and natural resource management (ibid).

The Role of SocioEcological Research in Water Management and Governance

While it is recognized that harmful stream management practices occur throughout the region, little to no data exists on the primary drivers informing decision-making about stream management in southern Appalachia, or recommendations on how to work within the relevant social context to effectively encourage behavior change without imposing regulations. Empirical

research supports the argument that culturally appropriate methods of addressing environmental issues in a manner that will garner community support and avoid social conflict are more likely to result in successful policy interventions and mitigation efforts (Flint, Luloff, and Finley, 2008; O'Brien, 1994; Swart et al., 2001). And specific to stream management, studies have shown that landowner perspectives and preferences are central to the success of riparian management and restoration (Buckley and Crone, 2008; Flint, Luloff, and Finley, 2008; Larson, 2009; Nowak and Cabot, 2004; O'Brien, 1994; Pickett et al, 2007; Piegay et al, 2005; Rosenberg and Margerum, 2008; Ryan, 2009; Shandas, 2007; Silvano et al, 2005; Sweeney and Blaine, 2007; Theobald et al, 2000), illustrating how preference and perception coupled with socioeconomic circumstances are key factors influencing good stream management and central to reversing harmful management practices at the household level (Dutcher et al, 2004; Larson, 2009; Rosenberg and Margerum, 2008).

Many empirical studies have been conducted examining motivations for restoration and conservation. In addition to financial incentives for participation in restoration programs, research has shown that non-monetary incentives play a larger role in land use decisions, and riparian management programs and policy would be more effective if geared towards these motivations (Koontz, 2001; Ryan, 2009; Stern, 2000). Case studies have shown that many of the issues landowners consider when making land use decisions include flooding, water quality, community, property rights, tradition and order, access to waterways, stewardship, and aesthetic preferences for their landscapes (Dutcher et al, 2004; Flint, Luloff, and Finley, 2008; Larson, 2009; Larson and Santelmann, 2007; O'Brien, 1994; Rosenberg and Margerum, 2008; Ryan, 2009; Shandas, 2007; Sweeney and Blaine, 2007). Common barriers to the adoption of natural resource management and restoration include cost, time and labor, maintenance, lack of

information, property value, the risks associated with adopting alternative land management practices, and proximity to resources (Buckley and Crone, 2008**;** Hairston-Strang and Adams, 1997; Larson and Santelmann, 2007; Rosenberg and Margerum, 2008; Shandas, 2007). Luckily, scholars identify the lack of access to adequate information as the most prevalent, and most easily rectified barrier (Booth et al, 2004; Brook, Zint, and Young, 2003; Dutcher et al, 2004; Shandas, 2007; Theobald et al, 2000). Furthermore, research has shown that landowners have identified educational outreach as the preferred method of policy intervention in natural resource management, stating that regulations should only be implemented as a secondary option (Dutcher et al, 2004; Larson, 2009; O'Brien, 1994).

Additional recommendations for natural resource management and restoration at the household level include involving landowners in the planning process, ensuring restoration efforts address their concerns, and acknowledging that landowners are not solely responsible for the environmental degradation found in their communities (Booth et al, 2004; Dutcher et al, 2004; Flint, Luloff, and Finley, 2008; Ryan, 2009). Abstract arguments and generalized guidelines should be avoided, instead framing problems as individual tasks with explicit instructions for landowners to follow (O'Brien, 1994; Sweeney and Blaine, 2007). Additionally, community involvement should proceed with transparency, address all conflicts head-on, and acknowledge the multiple interests of stakeholders involved (Buckley and Crone, 2008; Flint, Luloff, and Finley, 2008). From a planning and policy perspective, local and regional planning should examine population growth projections and direct growth away from identified hotspots for restoration (Booth et al, 2004; Larson and Santelmann, 2007; Theobald, 2003), and should never adopt a one-size-fits-all approach to restoration (Allan, 2004; Larson and Santelmann, 2007).

These studies demonstrate that appealing to the interests, values, and logic of local landowners to encourage more sustainable land use practices will prove more effective than imposing regulation. When landowners are managing land in a manner that upholds social expectations and beliefs about stewardship, particularly in a region like southern Appalachia that still holds strongly to the value of private property rights, cooperation will be achieved through incentives, transparency, being supportive of landowners, and nonthreatening actions rather than imposition or enforcement. If policy aimed at better management of environmental resources is to be effective, it must be informed by research grounded in the processes of human-environment relations.

Conclusion

Resource depletion, global climate change, and environmental degradation are impacting the quality and availability of water resources throughout the southeast, making the management and protection of these resources a priority. In the southeastern US, episodic droughts, threats to water quality from agriculture and development, and shifts in rainfall intensity and dispersion due to global climate change are having dramatic consequences for regional flora and fauna. Therefore, research assessing how local communities are perceiving and using their water resources under the social and environmental pressures associated with exurbanization provides a valuable opportunity for contributing to scholarship examining human-environment relations.

As demonstrated earlier, the theoretical approach of cultural models as utilized within the discipline of cognitive anthropology is well-situated for such analyses because of its emphasis on variability and treatment of cultural transmission. Instead of focusing on how two population groups are different, it could be more beneficial to examine how they are blending together and synthesizing their understandings of their surrounding environment. Communities experiencing

the impacts of exurbanization are ideal opportunities for studying the processes of cultural transmission and evolution, and identifying the environmental beliefs, values, perceptions, and preferences of the community is a critical first step. As development and population density continue to increase, it will become necessary to reconcile the impacts of behavior at the local scale with the hydrologic processes associated with exurbanization at the watershed scale (Groffman et al, 2003). Understanding landowner perceptions of their environmental surroundings, and how that informs their land management decision-making can provide an opportunity for the progressive introduction of widespread local interventions in education, restoration, and conservation, as well as a framework for facilitating behavior change on a regional scale. Environmental policy and governance will continue to occur, and by failing to participate in the process social scientists are opening the door for those lacking the expertise necessary to contribute to such discussions (Gragson and Grove, 2006).

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CHAPTER 3

CULTURAL PERCEPTIONS OF WATER IN SOUTHERN APPALACHIA[1]

[1] Evans, S.R. To be submitted to *Cultural Anthropology*.

Introduction

When I decided to do research in southern Appalachia, I wanted to study forests. I wanted to understand why people managed forests the way they did, and how they made those decisions. However, once I started doing pre-dissertation research in the area, I quickly realized that forests were not a relevant issue for the people who live there. When I asked questions about forests or trees, landowners would give simple, uninterested responses and then quickly change the subject to water. They would respond to my questions about land management with comments about managing the stream on their property, they would ask my opinion about the ongoing drought, and they would tell me stories about their childhood playing in the Little Tennessee River that runs directly through the center of town. It became very clear that water was far more important to the people of this area, and because I wanted to do research that was relevant for the people I was studying, I redirected my focus to decisions about stream management, perceptions of stream health, and preferences for stream appearance.

In my many conversations with landowners about streams, I learned a lot about water. Most importantly, people who live here are very proud of the water. They boast about the taste and clarity of their water, often referred to as "sweetwater," or try to convince you the water coming out of their spring is the purest in the county. Water is everywhere in southern Appalachia. There is a vast network of branches, streams and rivers criss-crossing the landscape and it's visible on private property, in towns and city centers, and even along the roads and highways as you drive through the mountains. Water's presence in this region is also felt in the place names, regional icons and images, and everyday discourse. In many ways, much of southern Appalachia's appeal is the abundance of water found throughout the region. The

mountain views and breathtaking vistas are so picturesque because those views usually include a waterfall, a raging river, or shimmering lake. It truly is a beautiful place, and much of its beauty comes from its water.

However, water quality and stream health have become issues of concern for many residents in this region as increased population growth and development driven by exurbanization are contributing to erosion, sedimentation, and increased impervious surfaces. Coined as 'Exurbanization' by Spectorsky in 1955, the influx of urban migrants into rural communities has been identified as a primary driver of economies transitioning from natural resource extraction to the service industry (Egan and Luloff, 2000), as well as the fastest growing land use in the United States (Brown et al., 2005; Heimlich & Anderson, 2001; Lohse & Merenlender, 2009; Theobald, 2003). Much like the flows of a river, exurbanization is often described as flows of people migrating from urban centers to rural areas for aesthetic and recreational amenities:

> …short-distance rural-to-urban migration flows have tended to reverse themselves through the process of exurbanization. As larger urban centers have experienced mass suburbanization of both people and jobs and as perceived urban problems have intensified, there has been a tendency for people to migrate to small towns and rural areas at considerable distances from urban central business districts, yet within commuting distance of suburban jobs and shopping. Urban Americans have become increasingly desirous of rural residential settings which are still within easy access of urban amenities. (Shelley and Roseman, 2001: p.15).

Interest in exurbanization often lies in its impacts on the social structure of rural communities as longtime residents interact with, and share their community with, a diverse population of in-migrants. As new residents relocate to rural areas for recreation, second-homes, and retirement, regional communities become increasingly comprised of two cultures: long-term Generational landowners and Newcomer landowners. The cultural mixing can often play out in local politics, local economy and business, the commodification of cultural heritage, social

stratification, as well as land use (Abrams et al., 2012; Armstrong and Stedman, 2013; Egan and Luloff, 2000; Gosnell and Abrams, 2009). And, scholars have recently begun to express growing concern over the impacts of exurbanization on water resources due to shifting land uses as increased population density, residential development, and commercial development lead to impaired stream health and water quality (Compas, 2007; Gosnell, Haggerty, and Byorth, 2007; Lohse and Merenlender, 2009; Nassauer et al, 2004; Radeloff, et al, 2005). However, one of the most serious threats to stream health and water quality is the impact of land use decision-making at the parcel level. As more rural land becomes fragmented and sold to private buyers and developers, the result is more landowners on smaller parcels, intensifying the overall impacts of land use on water resources and stream management at the regional scale.

Therefore, understanding how landowners perceive water will contribute to a greater understanding of how landowners make decisions about the management and use of water, and hopefully guide policy efforts aimed at maintaining and protecting water resources into the future. To address this issue, I answer the following questions: 1) How do landowners in southern Appalachia perceive water and streams on their property, specifically water ownership, water use, and water stewardship, 2) Do landowners perceive an impact on water resources from the processes of exurbanization, and 3) How have landowners responded to these perceptions in their water use and stream management?

Anthropology of Water

Water has become an area of interest in many arenas, especially in the last 10-15 years as the global climate change debate has fueled concerns over drought, flooding, pollution, water wars, and rising sea levels. Even popular media has picked up the thread, with a recent review in the New York Times titled "Plenty of Water, but Little to Drink," featuring a selection of

mainstream books on contemporary water issues (Dean, 2013). Water has been called the next oil, with predictions of future wars fought over water rights, access, and distribution. Despite a long-standing trend in our own field of anthropology favoring research on terrestrial habitats, a number of scholars have begun to address this shortcoming in recent years, with water becoming an increasingly popular topic of research. For instance, the journal Cultural Anthropology published a virtual issue titled "Water" edited by Ashley Carse in 2010, the same year Ben Orlove and Steven Caton (2010) published their widely read article "Water Sustainability: Anthropological Approaches and Prospects" in the Annual Review of Anthropology.

Recent ethnographies have also demonstrated the critical role of water in human environment relations. In her extensive ethnographic research on the meaning and value of water, Strang explains that "Patterns of [water] use are a manifestation of social, economic, and political relations" (2004:2), with waterways often facilitating social cooperation, economic obligations, and social connection among rural residents through the co-management of water resources. She argued that this maintained an "epistemic community" in which people shared knowledge and values, representing a collective identity of people linked both physically and socially. Trawick's (2001) research on water use in the Peruvian Andes also represents an example of how water is used to facilitate social solidarity and cooperation within a community. Despite water resources being scarce and fluctuating in this region, which can lead to hierarchical control and unequal access, he found the community instead adopted a culture of proportionality and material symmetry in their system of water distribution and irrigation. He argues that the egalitarian tradition of water sharing is a principle with strong associations to Andean ethnic identity, which still persist today.

Strang has also argued that water management is highly localized and often results in long-term social and economic relationships that can span generations and regime changes, supporting stable social relations over time. As such, she posits that "Water in the environment offers a visual manifestation of ideas about social connection, and the concept of water as a physically shared 'substance', which is the 'essence' of social and spiritual identity" (2006:77) Through his work with the Balinese, Lansing (1995) has highlighted the social, economic, and religious role of water in the complex spiritual rituals of rice cultivation. Rather than simply used to grow rice, water fuels an institutional network of water temples which is used to organize irrigation and provide stability and permanence in traditional Balinese states. Similarly, Velasquez Runk (2009) has outlined the role of water in indigenous cosmology in her work with the Wounaan of Panama. She argues that the social and river networks form a "rhizomic cosmos" which organize how the Wounaan conceptualize social, spatial, and environmental understandings. However, their riverine based system is often overlooked in forest-focused conservation efforts in the region, forcing the Wounaan to emphasize their connection to Western ideals of arboreal conservation in order to regain political leverage and equalize power relations.

Research has search has shown that although water is globally important, there are cultural differences in how people perceive and value water resources. An excellent example is Lansing, Lansing, and Erazo's (1998) article presenting research examining different valuations of water by two cultures. The authors postulate that the value of environmental resources are not fully calculable using conventional economic theory, which supports their argument that "value is not a measurable physical property, but a social construction" (2). While the European Americans in the region valued the Skokomish River for the monetary profits derived from its

two dams and hydroelectric power plant, the native Skokomish tribe valued the river for it's "natural capital," which the authors define as all that is encompassed by the concept of social capital put forth by R. Putnam (1995), with the inclusion of ecosystem services. The authors demonstrate that different cultures inhabiting the same physical space were differentially valuing the river, resulting in social conflict, inequality, and the disenfranchisement of the native Skokomish people.

Like much work of the work in cognitive anthropology, this approach follows the argument that cultural influences on behavior will be evidenced in data that derives from different groups of people with different cultural histories behaving differently in the same physical environment (Atran, Medin, and Ross, 2005). Because conceptions of nature are not objectively given but culturally constituted understandings that organize knowledge, inform perception, and situate experience within the environment (Eder 1996), individuals relate to, and interact with, their surrounding environment in a way that is culturally determined and socially significant. Therefore, examining how two different cultural groups behave in the same environment provides data on the role of culture in human environment relations. As such, I argue this approach is extremely well-suited for research examining the impact of exurbanization on environmental resources.

While no anthropological studies on the impacts of exurbanization on water exist to my knowledge, there is exurbanization literature in which two different cultures of landowners are assessed to determine if they are behaving differently in the same environment, and if their differential behavior is resulting in negative environmental consequences. An excellent example is research conducted by Gosnell, Haggerty, and Byorth (2007) examining differences in stream management decision-making among Newcomer and Generational landowners in southwestern

Montana. They found that the management decisions of Generational landowners were focused more on increasing irrigation efficiency, while the management decisions of Newcomer landowners were primarily related to recreation, aesthetics, and conservation. The authors concluded that changing land ownership has had effects on regional water management, resulting in both negative and positive ecological impacts.

Building on these literatures, in this article I examine the impacts of exurbanization on water resources through an anthropological lens by reviewing how two different landowner groups living in the same community perceive water. I begin by presenting an overview of southern Appalachia and an introduction to the community, as well as a brief description of my research methods. Next, I will discuss how landowners perceive water and present findings which indicate that despite the many differences between the two groups of landowners, very few differences currently exist in their perceptions of water. I review three themes regarding perceptions of water, and use several quotes to illustrate how their shared perception of water guides decision-making about the management of streams. I then discuss perceived threats to water and demonstrate that the locus of these fears lie in the pressures and processes associated with exurbanization. In particular, I review perceptions of threats to water quantity, water quality, and the failure of local government to protect the community from these threats. I follow with a brief discussion of how the community has responded to these fears in a way that mimics their views on water sharing - through social cooperation and community-based environmental education. Finally, I conclude by highlighting the important contribution of anthropological research to natural resource issues and policy interventions.

Southern Appalachia

Southern Appalachia has a long history of intensive land use, a continuing legacy of resource exploitation, poverty, isolation, and societal ills, as well as a proud tradition of self-reliance, strong moral values, and a strong belief in private property rights. When the Europeans arrived in the mid-16th century they encountered a human-generated landscape formed over 10,000 years of Native American occupation (Davis, 2000; Williams, 2002; Yarnell, 1998). By the 19th century, economy in the southern mountains was largely dominated by livestock, farming, mining and timber. While the regional economy of southern Appalachia was stimulated throughout the first half of the 20th century by two world wars and New Deal programs, many lacking a steady income began migrating to major city centers, marking the beginning of the 'Great Outmigration' that lasted from roughly 1940-1960. This event is the start of southern Appalachia's transition away from agriculture and industry to recreation and retirement communities (Keilman, 2003; Liu et al, 2007; Mackun, 2005; Morrill 1978; Shelley and Roseman 1978), and over time, those who left the southern mountains were replaced by an influx of second-home owners and retirees (Gragson and Bolstad, 2006), representing the beginning of exurbanization in southern Appalachia.

Unlike other regions in the US, research on exurbanization in southern Appalachia is minimal in comparison. However, focus on this region has increased in recent years as scholars have acknowledged the unsurpassed growth and development throughout the southeast. Morrill (2001) has stated that, "As much as half the area of the nation experienced an apparent reversal, predominantly from net out-migration in 1965-70 to net in-migration in 1970-75. This turn-around is most obvious and dramatic in Appalachia…" (p. 37), and Culbertson et al. (2008) proclaim, "Perhaps no other rural region of the United States has been as dramatically transformed over the last few decades as southern Appalachia" (p. 78). Cho et al. (2005) present

research showing that "…residential development is the dominant driving force of land-use change in the Southern Appalachian Highlands" (p. 549), while Haas and Serow (1993) determined that climate, scenic beauty, environmental amenities, recreation, and affordability were the primary pull factors drawing in-migrants to the region in their survey of over five hundred new residents in western North Carolina.

For the purpose of this research, southern Appalachia is defined as spanning from southern Virginia to north Georgia, and eastern Tennessee to the western Carolinas. This research is centered in the southern portion of the Blue Ridge Mountains, a mountain chain with the highest peak in eastern North America, Mt. Mitchell, as well as the Great Smoky Mountain National Park. The Blue Ridge Ecoregion has unique geologic features formed over hundreds of millions of years of erosion, and the result is a mountainous region with a temperate deciduous forest structure that is cooler and wetter than the surrounding piedmont and coastal areas of the southeast, boasting extremely high levels of biodiversity. The region is characterized by steep topography, with elevation ranging from 600-2000 masl. Climate ranges from humid subtropical to marine humid temperate, and precipitation ranges from 1700 mm at lower elevations to 2500 mm on the upper slopes (Swank, Vose, and Elliott, 2001).

Research was conducted in Macon County, North Carolina. Nestled in the foothills of the southern Appalachian mountain chain, Macon County covers 520 square miles, includes parts of the Nantahala National Forest, with the Little Tennessee River flowing north through the county forming an expansive system of waterways. A mixture of heavy forest and pastoral agricultural valleys, Macon County is experiencing a changing demographic like most of southern Appalachia. According to the census bureau, the county had a population of approximately 33,000 residents in 2012, and has experienced a 68% increase in population between 1980-2010.

This exceeds growth rates for both the surrounding six counties and the state, making Macon County one of the fastest growing counties in North Carolina (http://www.census.gov/). The impacts of increased population growth and density are also visible on the land, with the number of farms and farm size decreasing as the value of farm land and buildings increase, and the number of non-farm private businesses increasing 148% between 1990-2009.

Methods

Prior to my dissertation research, I spent two and a half years conducting preliminary research in Macon County, and two summers assisting in stream surveys and biomonitoring. I moved to the county in June of 2011 and carried out ethnographic research until June 2012. I began my research by conducting 8 interviews with county and state government officials, local NGO's, and active community members to learn about common stream management practices in the region and acquire recommendations for interview participants. I then conducted 17 semi-structured interviews with 21 landowners[2] between September 2011 and February 2012, and all landowners interviewed had a stream running through or bordering their property. Landowners were found through a snowball sampling approach, and interview lengths ranged from one hour to three hours, resulting in a total of 28 hours of audio. In addition to the interviews, landowners also took me on walking tours of their property and showed me their stream(s), explained how they managed different parts of their property, shared stories about their land, and answered additional questions about preferences, perceptions, and values. I analyzed all the interviews using a grounded theory approach to determine the dominant themes governing water and streams, and from this I developed a 12 page mail survey that asked questions about preference for stream appearance, property and stream management, environmental values and opinions, and sociodemographic information.

[2] To protect the anonymity of the landowners I interviewed, all quotes in this paper use pseudonyms.

Survey design followed the Dillman Tailored Design Method (Dillman 2000), and a pilot survey was conducted in a neighboring county prior to the survey in Macon County. Parcels qualified to receive a survey if there was a stream running through or bordering their property, and a total of 3,272 riparian parcels were identified using publicly available county parcel data overlaid with a stream layer in ArcGIS. Of the 3,272 parcels I selected a random sample of 2,060 for the survey using a random number generator. Surveys were only mailed to landowners with streams on or bordering their property - parcels without a stream did not receive a survey. Of the 2,060 surveys mailed, 52 were returned undeliverable and 326 were returned completed, for a response rate of 16%. Following Dillman's Tailored Design Method would normally guarantee a much higher response rate, however southern Appalachia contains a private, insular community of residents with a tradition of self-reliance and a strong belief in private property rights. Therefore, many survey recipients may have interpreted the mail survey as an imposition or a form of outside interference and chosen not to participate. Although the overall response rate was low, the number of returned surveys was sufficient to run statistical analyses with confidence. I analyzed the open-ended comment boxes from the survey using Content Analysis building off of the thematic framework developed during analysis of the interview data. Content was coded and compared to the interview data to check for outliers or new themes. Content Analysis of the survey showed that responses were in line with the interview data and contribute to the overall conclusions of the cultural perceptions of water in Macon County. Both the grounded theory and content analysis approach were performed following the framework outlined in Bernard and Ryan (2010).

In order to successfully accomplish my research objectives, I had to follow a classification system for determining how to identify respondents as Newcomer or Generational

landowners. While consensus on what defines a Newcomer or how to measure social change associated exurbanization is still developing, many studies use length of ownership as the metric for determining Newcomer status, with the standard of 10 years of ownership utilized (Graber, 1974; Fortmann & Kusel, 1990). However, this paper follows a different model which uses the year immigration to the community dramatically increased, thereby signifying the start of population growth and the beginning of the process of exurbanization (Blahna, 1985; Gosnell, Haggerty, & Byorth, 2007; Krannich et al., 2006; Smith & Krannich, 2000). Although in-migration and exurbanization is a gradual process that has peaked and plateaued over the years, demarcating a cutoff year to distinguish between Newcomer and Generational landowners was necessary to accomplish the goals of this research.

For my field site of Macon County, North Carolina, census bureau data clearly marks 1970 as the beginning of population growth in the community. Since the dramatic spike in population beginning in 1970 cannot be explained by the birth-death ratio, it is presumably the result of in-migration to the county and the beginning of exurbanization, and therefore the dividing line between Newcomer and Generational landowner. Therefore, for the purposes of this research, Newcomers are defined as a landowner who is not from Macon County or has not been a resident of Macon County for at least 40 years. If a landowner has owned their property for 40 years but reported it as a secondary residence (seasonal, weekend, or vacation home), they were also considered a Newcomer. Generational landowners were defined as a landowner from Macon County, or someone who has been a resident of Macon County for at least 40 years and reported their property as their primary residence. If the landowner was under 40 years of age, they were from Macon County, and their residence type was Primary, they were considered a

Generational. In a few instances where landowners did not fit into the predetermined categories, I assigned them to the category the I felt best represented their status.

Table 1 Framework for differentiating between Newcomer and Generational landowner

NEWCOMER LANDOWNERS	GENERATIONAL LANDOWNERS
Not from Macon County	From Macon County
Has not been a resident of Macon County for at least 40 years	Has been a resident of Macon County for at least 40 years
If a landowner has owned their property for at least 40 years but reported it as a secondary residence (seasonal, weekend, vacation home), they were considered a Newcomer	If a landowner has owned their property for at least 40 years and reported their it as their primary residence, they were considered a Generational
If a landowner was under 40 years of age, they were not from Macon County, and their residence type was secondary, they were considered a Newcomer	If a landowner was under 40 years of age, they were from Macon County, and their residence type was primary, they were considered a Generational

Perceptions of Water

Water is for Everybody

The most dominant theme I uncovered, the perception that water is a shared resource for the community, was expressed by both Newcomer and Generational landowners. Unlike land which is stable, bounded, and rightfully owned and controlled by a single landowner, water was consistently described as shared specifically because it is unbounded, connected, and unable to be controlled by a single landowner. Because of water's transitory nature, constantly flowing through a landowners property onto their neighbors property, rights to water are perceived as rights of access but not ownership. Respondents often referred to water as a collective resource

that socially and geographically connected them together as a community. Just as the streams and rivers are connected through tributaries and branches to form a network, so are the landowners in Macon County through their position along those waterways.

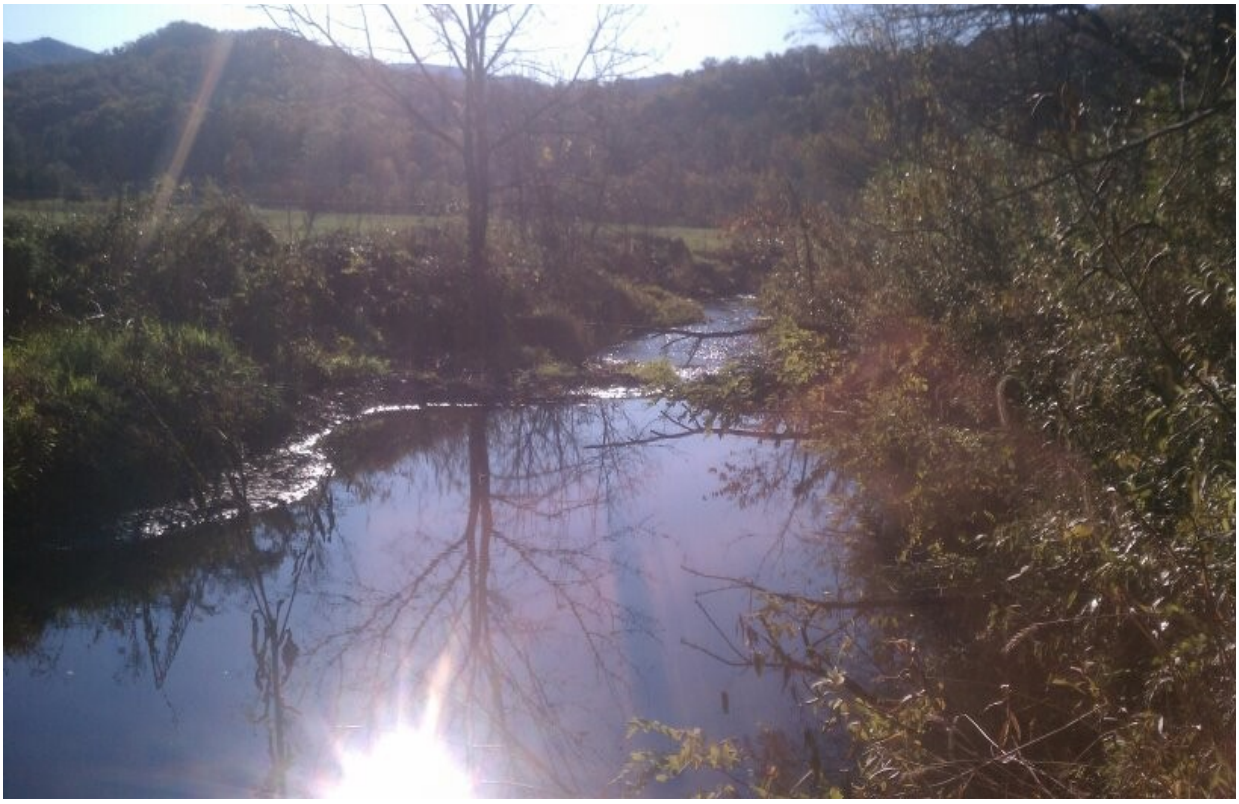

Figure 4 Picture of the Little Tennessee River. One side of the river is privately owned, the other side is a preserve. Photography by the author.

Because water is fluid and constant, unacceptable use or management by a single landowner could impact every landowner downstream of that individual. Residents acknowledge the hierarchy in their geographical relationships to water and rather than support the idea that "the man at the head of the spring gets the best drink of water," the overwhelming majority of landowners embody the ethos that access to clean, abundant water is the right of every

landowner and it is socially unacceptable to jeopardize that right for one's neighbors or those downstream.

> Once you build down there, you're responsible to this community because that river serves everybody, not just you, your needs. (Arnold)

Landowners justified the idea that water is shared in several different ways. Some commented that water should be shared so that everyone could have the opportunity to enjoy it and appreciate its natural beauty, and some emphasized the impacts of water pollution and overconsumption by landowners on the environment. However, comments regarding sharing water primarily focused on two issues: ownership and equal rights. Many landowners expressed the belief that access to water should remain equal by right, whether that be human right or the rights of land ownership. Parcels with streams are highly desirable in this region, and many landowners said the presence of water on the property was a primary factor in their parcel selection. Therefore, if a landowner is willing to pay more for streamside property, they have an equal right to the water in that stream.

> Everyone along the stream has a right to the water. (Survey NN28)

> Everyone on the stream is entitled an equitable flow of the stream. (Survey 2030)

Furthermore, many people pointed out that as landowners, they legally do not own the water on their land. Their ownership extends to the land underneath the water, but not the water flowing in the stream. Many landowners also viewed the issue of ownership from a collective perspective, stating that water doesn't belong to an individual but to the public.

> I think I own the land under the stream but not the water as it moves across the mountain; therefore not my water. (Survey 1154)

> …it's a community resource. It's something that's flowing through their land. It's not something they're creating. (David)

It's this transitory nature of water, never fixed but always flowing, that makes it impossible to control or maintain. And if a landowner cannot control or maintain the resource, they have no right to claim ownership of it. Therefore, the belief that water is shared reinforces behavior that is deemed acceptable by the community (not using all the water, not polluting the water, not preventing another persons access, etc…) and castigates behavior that would benefit one landowner at the expense of others.

"The Downstream"

The perception that water is meant to be shared was regularly expressed using the metaphor "the downstream," which represents the acknowledgment that the water is only flowing through a landowner's property and any inputs or damage caused will negatively impact those living downstream. The idea of "the downstream" was regularly used in everyday discourse by both landowner groups to refer to thinking of others and behaving in a way that respects ones neighbors. It's a phrase that reinforces the idea that an individual's land use decision-making affects those around them, and in regards to water and streams, specifically those who live downstream of their land.

> Feel as a landowner I have the right to use the water from the stream but not to the detriment of neighbors downstream. (Survey 86)
>
> We all have a moral obligation to those who live downstream to use only the water we need to keep its quality high. (Survey NNC10)
>
> I believe that good citizens do not have the right to harm downstream property owners. (Survey 1674)

The concept of "the downstream" was frequently mentioned during discussions of reasonable and unreasonable uses of water and streams. I asked interviewees to describe what was reasonable and unreasonable use of the water and streams on their property, and responses for what would be a reasonable use often centered on recreation or aesthetics. All interviewees

agreed that recreating in the stream (children playing, tubing, swimming, fishing, etc...) is a reasonable use. Similarly, many interviewees responded that manipulating the stream for aesthetic purposes was also acceptable, including building a pond, building a waterfall, and installing a water wheel. Landowners felt that these uses were not harmful to the water and some people said that it actually increased their appreciation of the stream. A few interviewees mentioned more practical uses, such as drilling a well for drinking water, using stream water to irrigate their garden, and even installing hydroelectric to generate power, but these responses were less common.

Unreasonable use of water and streams typically involved any use that would negatively affect the stream or water. Examples of unreasonable use include activities that cause erosion or sedimentation, dumping waste or chemicals into the stream, placing a septic system too close to a stream, and allowing cattle in the creek due to erosion and fecal coliform contamination. Interestingly, a few people also told me that no use is unreasonable because a landowner has the right to do whatever they choose to do on their property. However, this was often followed by the disclaimer that although anything is reasonable, they would never do anything to affect the water quality for those downstream. Therefore, the importance of social relations and the idea that how one manages their stream and land directly impacts those downstream was still prevalent among those landowners. Overall, people generally agree that any use that does not harm, degrade, or endanger the water or stream is reasonable.

> The water flows off my property to somebody else's. So, anything I do to the water is going to affect the people downstream. (Carl)

> I think you have to be mindful of what's downstream so they have some water, too. You know, maybe a lot of landowners would just say, 'Well, it's on my property, it's mine, I can do whatever I want.' I see a little big, a bigger picture, personally. (David)

Interestingly, landowners placed a lot of emphasis on behavior that affects water quantity. Many people have noticed that the water levels in their streams have dropped as the region has endured episodic drought in recent years, which is often referred to as "dry times." Some landowners highlighted this impact of regional climate change on water and streams and responded that reasonable or unreasonable use would depend entirely on drought conditions, explaining that any use that affected water quantity would be unreasonable regardless of whether it was benign. Any landowner that "used up all the water" or any use that "caused the stream to dry up" is viewed as unreasonable because it violates the perception of water as shared, and is perceived as acting in a way that could potentially harm a neighbor. During "dry times," it is expected that resource use should be commensurate with the current environmental conditions and landowner behavior should accommodate times of scarcity.

> If I block my creek and let water pool up for our pleasure etc…-it would prevent those downstream from having the best from theirs. I would only pump water out for organic garden (our food supply) as absolutely needed, and if creek was flowing enough. (Survey 447)

Water Stewardship

The perception of sharing water extends beyond the realm of social obligation, as many landowners also described their relationship to water as a personal responsibility. This was the only instance in which Newcomer and Generational landowners described different perceptions of how they relate to, and interact with, water on their property. I specifically asked landowners if it was their responsibility to protect the water and streams on their property, and all but one landowner replied 'Yes.' The one person who felt it was not his responsibility to care for the water and streams on his property believed that as long as the federal government, specifically the Army Corps of Engineers, claim they own the water that flows through his property, it is not his responsibility. If that were to change and he was afforded ownership of that water, he would

care for it the same way he cares for his land. When I asked those landowners who felt it is their responsibility to care for the water and streams on their property to elaborate, explanations varied but the most common response was that as landowners it is their job to care for the land. Some called it a job, some called it a responsibility, but several people referred to themselves directly as stewards. All viewed themselves as caretakers, and caring for the water on their land is a responsibility that comes with being a landowner.

> I think we have a higher responsibility. I think we have a responsibility to the earth, to future generations…to not only to people downstream that depend on the resource, but to the wildlife that lives here. I think we have a responsibility to be a good steward. (Arnold)

> I was brought up to be a steward of the land, whether it's the land or the streams. You don't take care of the streams, you won't be taking care of the land. (Sarah)

As mentioned, small differences in the way landowners described their role as stewards quickly became evident. Generational landowners tended to describe stewardship as "caring for the streams." They saw their land use and stream management as a form of "care" and perceived this as a necessary function of land ownership. For these landowners, people have a place on the landscape and actively managing the streams and land is a critical component of land ownership. For a few landowners, this specifically means maintaining the appearance of their streams. They perceived streams overgrown with thick vegetation as unsightly and reflective of poor management, likely related to concerns about public judgment stemming from a tradition of clean, manicured yards and dislike for streams that are overgrown with vegetation. Landowners who allow their streams to grow thick buffers of vegetation along the banks can be criticized for not "keeping up the land" or maintaining their property. Therefore, maintaining stream appearance as a form of stewardship reflects the idea that a landowner is responsible for actively caring for the land, including how it looks.

> I think there's a kind of tradition here of people being pretty good stewards on their land, and keeping up with their land well... They seem to take a pride in it and usually want to leave their land better than they found it. (Dennis)

Conversely, some landowners described stewardship as "not harming the streams." They perceived the best form of land management to be little to no management. For these landowners, not managing their stream or interfering with the land was their idea of stewardship. This hands-off approach was typically expressed by Newcomer landowners. Unlike the landowners who viewed human management of streams as a necessary function of land ownership, Newcomers generally had little to no agricultural experience, were from urban centers, and didn't grow up learning land use traditions from relatives. For many of these landowners, "nature" is equipped to handle itself and human intervention is unnecessary and often detrimental.

> Um, I guess I'm from that old school thought of leave a place as good as, if not better than, you found it. You know, and that includes water. And, I know a little bit of this is tough just by the, by the nature of, you know, we make waste and whatever, but try to leave a light footprint. (David)

Additional explanations given were a landowner's responsibility to future generations and a responsibility to wildlife. Some landowners talked about future generations as a general concept, while others talked about their children and grandchildren as the future inheritors of their land. The belief that land is heritage was a common theme in landowner discussions of stewardship, and many of the older Generational landowners told stories of being taught how to manage streams and care for water by their parents and grandparents, and how they've shared those same lessons with their children and grandchildren. And finally, many landowners discussed stewardship for water as a way to support and protect wildlife, either for hobby purposes, hunting, or the intrinsic value of wildlife. Landowners often spoke of managing land to attract wildlife for hunting or bird watching, or manipulating stream habitat to attract fish.

Regardless of their motivation, in general landowners value the abundance of wildlife in this region and are concerned with managing land and streams in a manner that supports their presence.

> I try to maintain my property (16 acres) for the wildlife-I am a 'wildlife watcher.' I do nothing to deter them, if anything I encourage them to come onto my property-all animals, reptiles, bugs…I use no chemical not even bug spray-I KILL NOTHING! The environment and all its creatures are very important to me. (Survey 1823)

> Property owners have every right to use the naturally occurring [water] on their property KEEPING IN MIND being a good steward of this water as it must be shared with vegetation, wildlife, and other landowners as well. (Survey NN9)

Perceived Threats to Water

In addition to questions about stream management, preference, and perception, I also talked to landowners about exurbanization and asked their opinions about the changes happening in their community. Regardless of whether they were a Newcomer or Generational landowner, people expressed concern over the impacts of increased population and development on the community's water resources, specifically water quantity and water quality.

Water Quantity

Water quantity was often mentioned as a major concern for the region as the population continues to grow and drought frequency becomes more regular, putting pressure on the availability of water resources. As mentioned earlier, landowners have noticed decreased stream levels and often attribute this change to drought and increased water consumption by the growing population. Despite water being abundant and free-flowing throughout much of the region, landowners still view it was a finite resource and sustaining water quantity into the future was a dominant concern.

> The developers come in and they keep building more, and more, and more houses and that's more straws going down into the ground into a limited supply of water. And then, when we get drought, that just makes it worse. (David)

> The water source for the town is our creek here, and people, I don't think, have taken as good a care as they could have. And, I wonder sometimes, with the development that's going on, and the growth, will they need to seek or look for other sources of water? Because there is a lot of growth and I'm not sure that this little creek can supply that. (Dennis)

Some landowners expressed concern that the county would be forced to build a water treatment facility, and worried about the cost to taxpayers, most of whom currently receive their water free of charge from wells and springs. Others were considering the possibility of re-drilling their well to reach further down into the water table to access water. I regularly heard horror stories of neighbors and friends who have already had to re-drill wells, despite not a single landowner I interviewed reporting the same problem. Some landowners had experienced problems with sedimentation in their wells and a few tested positive for fecal coliform contamination, but none at dangerous levels. In fact, most reported water levels in their well were stable and nobody I spoke to had encountered problems with water scarcity. Regardless, many landowners perceive water scarcity as a real threat and view drought and increased population growth as the cause.

> I don't think Cartoogechaye Creek is supposed to supply much more. So, I think the water is gonna impact the people more than the people impact the water. Well, we don't have enough water to go around. You're gonna be piping water all over the place. If you put too many wells in one reserve, you're gonna pull it dry. The next time you have a drought, these people are gonna have no water. (Nancy)

Water Quality

In addition to water quantity, landowners are also concerned that the consequences of continued population growth and development would impact water quality. Overwhelmingly, people identified sedimentation from development and pollution from population density as the biggest threats to water quality in their community. Development was seen as the primary cause of streams filling up with silt and sediment, with several people recounting stories of rivers

turning yellow or red from the soil washing down the mountains below construction sites. Residents also feared increased population density would lead to the contamination of groundwater, expressing skepticism that the "system" could function with many more septic tanks before contaminating streams or groundwater, which is of extreme concern to landowners drawing water from a well, or in some cases, directly from the stream. As many of the landowners I interviewed assured me, once the resource is polluted, it doesn't matter how much is left because nobody will be able to use it.

> I don't know how much more it can stand really. They come in and they want a well, and they want a septic system. I don't know how many septic systems you can put in a land until it runs over. (Sarah)

> I think the contamination of groundwater is a huge possibility. I think it can come from old wells that aren't closed properly. I think it can come from leaking underground storage tanks. I think any number of things, and to me, that's just a real serious issue cause we kinda trust that our groundwaters gonna be safe and good to drink and it's not a given. (Karen)

The perceived threats to water quantity and quality reflect the fear that as the community continues to grow and faces social and environmental pressures on water resources, water may no longer be abundant, safe, and free. The concerns expressed by these respondents demonstrate a fear that external pressures on water resources could overwhelm the current model of water sharing and break down the social expectation that landowners consider the needs of others when consuming this resource. And this concern is exacerbated by the current lack of faith in local government and their ability to protect water resources for all of Macon County.

Water Management by Local Government

Drawing on both interviews and surveys, it became abundantly clear that residents of Macon County held strong opinions about local political issues, and many wished to discuss them. Despite the interview and survey protocols dealing primarily with water and stream

management, respondents repeatedly went to the subject of local politics, particularly those surrounding water. From this, two key concerns about water management became clear: 1) residents feel there is a lack of leadership from local government in protecting environmental resources, and 2) existing regulations implemented to protect water resources are not being enforced.

Regardless of whether landowners were new to Macon County or had lived there all their life, whether they were politically conservative or liberal, the common thread was that nobody is happy with the local government. The pro-regulation group criticizes the county leaders for the lack of regulation and what they see as local government privileging big business over community, environment, and rural character. While the anti-regulation group sees the county leaders as crumbling under the pressure of NGO's and "tree-huggers," and not doing enough to support economic growth. In particular, people were especially disenchanted with the county commissioners, often criticizing them for lacking leadership and avoiding taking a stance for fear of not being reelected. This lack of leadership has lead many landowners to identify the commissioners as the most significant problem affecting the county.

> You're just hungry for somebody finally to say, 'I don't care if I'm reelected, this is what's right for Macon County.' (Karen)

> No one has really been able to impart the vision necessary to inspire the residents… We don't have anybody that's taking a leadership role to show the community what we could do with a little vision. (Ethan)

In addition to lacking leadership, the county commissioners were often described as ill-equipped to deal with current issues involving water. In particular, respondents expressed concern over their lack of forward-thinking and their ability to protect the county from future issues affecting water, with comments about water wars and bigger cities attempting to steal Macon County's water frequent occurrences.

> Because everybody's runnin' out of water. Georgia's runnin' out of water. Aren't they wanting the Little Tennessee or something to go down there? (Grace)

> Burgeoning populations, more demand on water resources. I think water, I think they're going to be fighting wars over water in the future. (Arnold)

The other common complaint about water management in Macon County is the lack of enforcement of existing regulations. Many landowners argued that there is no point in voting for increased regulation to protect water resources because even if passed, it wouldn't be enforced. A sedimentation and erosion control ordinance was established, but some respondents felt it was largely ignored, while others didn't know it existed.

> When's the last time you talked to anybody that was fined or…? It's one of those things. You give it lip service, but as far as action… (Arnold)

> One of the problems I think we do have here is that we don't have any, we have very little enforcement. We have a lot of laws that are totally ignored. Even where they do have people to enforce it like in the town of Franklin, it's ignored. (Ethan)

The complaint about enforcement is particularly interesting because it was obviously a divisive issue between Newcomer and Generational landowners. Newcomer landowners I interviewed and spoke to often confided in me that Generational residents in charge of enforcement wouldn't enforce violations because they were either related to the violator, went to high school with them, or was married to their relative. It was perceived that the social relationships among Generational residents in the county superseded the law, and they expressed an 'Insider v. Outsider' scenario in which they, as Newcomers, were outsiders and therefore did not expect local county officials to uphold the law and protect their rights as landowners.

> I believe the property across the stream from our property (less than 1 acre) was given a septic permit because of people they know that work for the county that is not legal, contains false numbers and measurements and could contaminate our waters and is a widespread occurrence in this county. (Survey 404)

A respondent from the pilot survey conducted in a neighboring county called to discuss a problem he was having with his neighbor. The man told me his neighbor was bulldozing his side of the stream, causing his own streambank to erode. He said the neighbor was related to the county official responsible for enforcement of water regulations so he knew nothing would be done. Furthermore, he told me that he was worried about retaliation from his neighbor should the neighbor discover it was him who had complained, and asked that his name not be mentioned if we discussed the matter with any county officials.

While family and friend loyalties among Generational residents may play a role in the lack of enforcement, I believe it is more complex than many Newcomers perceive. I argue it is a difference of cultural understanding and the norms regulating behavior. I interviewed multiple county officials, some with the authority to enforce and some without, and all told me their preferred course of action is to speak to an alleged violator first and work toward a solution, resorting to enforcement only if necessary. They argued problems of land management typically arise for two reasons: first, a lack of knowledge about proper land or stream management. Newcomers are regularly accused of being ignorant to the regional soil and water conditions, and often practice land management that is inappropriate in this mountainous area. Second, many landowners are unable to manage their land for various reasons, so when a problem does occur, such as active erosion of streambanks, a fallen tree causing flooding, or even cattle in the stream, they don't have the resources to fix the problem. An overwhelming majority of the county is comprised of older residents, with the average age of survey respondents being 65 years old, and many are physically incapable of engaging in management that requires a good deal of physical labor. Additionally, there is a rather high rate of poverty in the county, and many residents are unable to afford potentially costly stream management. Understanding the constraints faced by

several residents in the county, officials explained they initially opt for non-enforcement to determine if the situation can be rectified without punishing the landowner. It is only when a landowner repeatedly fails to comply that the county officials authorize enforcement and penalize the landowner.

This approach to enforcement is in line with traditional values of social relationships and non-interference found throughout southern Appalachia. Whereas a Newcomer may view the lack of enforcement as preferential treatment from one Generational resident to another, it is actually the cultural norm to talk through a conflict with deference to the landowner, acknowledging there may be a logical reason the landowner is violating a regulation, preferring to resolve the matter with various forms of support, including educational, financial, and physical.

Social Cooperation and Community Building

If landowners no longer operate by the model of water sharing under the pressures of population growth, development, and regional climate change, enacting legislation to ensure that water remains accessible and equitable is a logical solution. However, respondents clearly feel current government officials are failing to adequately respond to these pressures by demonstrating weak leadership and non-enforcement of existing regulations designed to protect water in Macon County. This failure of the local government to provide water security for its citizens has resulted in several community organizations taking it upon themselves to educate landowners about proper stream management and water conservation.

Two local environmental organizations have played a large role in directing efforts to protect natural resources in the county, including biomonitoring of streams and rivers, restoration, conservation easements, supporting farmers and the local food movement, as well as

nature walks, workshops in rain barrel construction and native species identification, and more. Recently, the smaller organization was absorbed into the larger organization, The Land Trust for the Little Tennessee, which is now one of the most active and notable community organizations in the region. The staff of the LTLT is a mixture of both Newcomer and Generational residents, helping them to garner support from both groups within the community. While many Newcomers mentioned this organization as their primary resource for information about environmental issues and community events, fewer Generational landowners utilized their resources. A few Generational landowners expressed dislike toward the organization, saying their approach was too aggressive or reproachful, however these individuals also acknowledged the LTLT performed a critical function in the community through their biomonitoring and restoration programs.

Another organization, Friends of the Rickman Store, was formed around the restoration of a historic general store and has also been heavily involved in hosting community workshops, info sessions, and cultural revival programs. Interestingly, this organization is run almost entirely by Newcomers, largely retirees who moved to the community and volunteer their time. As mentioned earlier, many new landowners are unfamiliar with the regional environment and encounter problems with land and stream management (flooding, erosion, pests, etc...). Because the members and audience for this organization are primarily Newcomer landowners, the Rickman Store program tends to focus on many of these issues and often hosts workshops lead by local county officials or specialists offering advice and education to landowners.

In addition to the two examples mentioned above, there are several more local and regional organizations actively participating in community-based environmental education, including community clubs that meet 1-2 times a month, a master gardener series, a women's

political forum, an EcoForum at a local Unitarian Church, as well as countless recreational clubs. Many Newcomer landowners described these organizations as a valuable resource, a centralizing locus of community and social interaction, and often their first stop for information about regional water issues. Whereas these activities and responsibilities are often sponsored by local government in other areas, it has largely fallen to the local community organizations in Macon County. However, it is important to recognize that many county employees are still involved in local environmental efforts, largely as volunteers or hosts at community-lead workshops, especially from the local extension office and the Soil & Water Conservation District. I highlight this point to demonstrate that many government officials support the efforts being made by community organizations and would happily take on those responsibilities as part of their own government programs. Unfortunately, budget cuts to environmental programs at the county, state, and federal levels have reduced, and in some cases eliminated, funding for environmental education and outreach.

Conclusion

While the two landowner groups demonstrated small variations in their perceptions of water, specifically how they viewed themselves in relation to water in their environment, the same overall perceptions of water as a communal resource was shared. Both landowner groups also used this perception in their decision-making about stream management, specifically engaging in behaviors that do not impact their neighbors or larger community. Both landowner groups also feared water security was threatened by the processes associated with exurbanization, and both felt the local government had demonstrated an inability to protect water resources into the future. In response to this shortcoming, a network of community organizations and individual county officials have worked together to encourage social cooperation and

community-based environmental education without any institutional support. However, it is still unclear whether these efforts will be enough to ensure water quality and quantity into the future. Although the region currently boasts good water quality, with several landowners commenting that water quality is better now than it was fifty years ago due to improved sewage treatment and agricultural decline, these favorable conditions may quickly change as population growth and development continue, and episodic droughts and extreme weather events due to regional climate change become more frequent.

In my meeting with some employees of the North Carolina Division of Water Quality, I asked them what would be the most important thing we could do to ensure continued protection of water resources in the region. One of the men told me the most significant thing we could do is train more people like me. Flattered, but confused, I asked him to elaborate. Citing my ability to cross boundaries as an anthropologist, he told me not to simply teach people about water and stream management, but to teach people how to teach people about water and stream management. Acknowledging his own difficulties conversing with landowners and educating the public about stream management, and now his inability to offer outreach due to budget cuts, he said more people are needed who can speak with different audiences and understand multiple viewpoints, and most importantly, translate those viewpoints in a way that other audiences would understand and appreciate. Essentially, he viewed anthropologists as "cultural brokers" or intermediaries who could cross disciplinary, industry, and cultural boundaries to work toward successful resolutions for socioecological issues. I argue this is exactly where anthropological research can be applied to broader issues of social importance.

If policy aimed at better management of water resources is to be effective, it must be informed by research grounded in the processes of human-environment relations. Understanding

landowner perceptions of water and how that informs their stream management decision-making can provide an opportunity for the progressive introduction of widespread local interventions in education, restoration, and conservation, as well as a framework for facilitating behavior change on a regional scale. Environmental policy and governance will continue to occur, and by failing to participate in the process social scientists are opening the door for those lacking the expertise necessary to contribute to such discussions (Gragson and Grove, 2006).

Water is arguably the most vital element necessary to sustain life on this planet, therefore the governance and management of water resources is an issue of critical importance. In our increasingly globalizing world, the study of water often goes beyond the community scale, expanding into discussions (and negotiations) of transboundary, continental, and even global management frameworks. While this scale of analysis is critical for working toward larger goals of water equity, justice, distribution, and access, I argue that issues of water governance and management should also address the processes occurring at the local scale and assess how local landowners are affected by, and perceive, current water within their own community. As Hastrup explains, "regulation must be grounded in the actualities of life, where it happens locally. People experience the effects locally where they live, not globally" (2009: p.28).

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CHAPTER 4

STREAM AND RIPARIAN MANAGEMENT IN SOUTHERN APPALACHIA[3]

[3] Evans, S.R. To be submitted to *Society and Natural Resources.*

Introduction

While the scientific community has identified riparian vegetation as a primary contributor to stream health and water quality, it is unclear how private landowners view stream health, perceive stream degradation, or understand their impact on streams as landowners and decision-makers. To better understand how landowners conceptualize stream health and interact with their streams, it is imperative to go beyond basic stream management practices and uncover the decision-making processes and motivations informing landowner behavior.

Unlike the West, southern Appalachia has a long history of resistance to zoning and regulation, and recent steep slope ordinance and regulation debates have proven those sentiments remain strong throughout the region. By understanding the social context surrounding stream and land management in this region and working within the existing structure of individual control and autonomy over one's property, efforts to protect and restore stream health will be more successful in both the short and long term. Rather than addressing the prevention (or restoration) of stream degradation solely from a regulatory approach, I argue that identifying the logic and motivations behind stream management decision-making is a critical component of effective intervention. This research supports findings that argue for culturally appropriate methods of addressing environmental issues in a manner that will garner community support and avoid social conflict (Flint, Luloff, and Finley, 2008; O'Brien, 1994; Swart et al., 2001).

Literature Review

Water is the resource of most concern in the southeast, with the majority of the region's drinking water supply coming from nine major rivers in Southern Appalachia (Swank and Tilley,

2000). Because stream health and water quality are directly impacted by the condition of their riparian vegetation, much research has been done on the management of streams and their banks. Riparian zones are the interface between terrestrial and aquatic ecosystems comprising the environmental conditions through which water and materials move (Gregory et al., 1991; Knoepp and Clinton, 2009). They are a critical component in the functioning and health of forested ecosystems because of their role in regulating stream temperature, regulating the physical structure of streams, absorbing nitrate from shallow groundwater, and buffering the movement of pollution from entering the water system, making them critical areas for habitat preservation (Bunn et al, 1999; Hession et al, 2003; Houser et al, 2005; Silk and Ciruna, 2005; Wallace et al, 1999; Young and Huryn, 1999).

Recent literature has identified nutrient loading from urbanization and agricultural land uses as significant threats to riparian zones (Brett et al, 2005; Gragson and Bolstad, 2006; Groffman et al, 2003; Johnson et al, 1997; Jordan et al, 1997), both of which characterize past and present land use in southern Appalachia. While the region has experienced a steady decline in agricultural land use over the past 100 years due to regional economies shifting away from production to service industries, development and population growth driven by exurbanization has been trending upward since the 1970s. Recent research projects exurban development expanding 14.3% nation-wide by 2020 (Theobald, 2005), with a significant amount of the residential development occurring along or near waterways (Compas, 2007).

Land use affects stream health by impacting the proximal controls regulating stream metabolism (Houser et al, 2005; McTammany et al, 2003; Young and Huryn, 1999), and findings suggest the effects of land use can override regional constraints on stream metabolism (Bernot et al, 2010). Because almost 70% of forestland in the Southeast is privately owned (Wear and

Greis, 2002), concerns over riparian management are often directed at the household level where the majority of modifications to forested ecosystems are taking place (Pearson, 1993). This becomes problematic when coupled with recent findings that households are one of the largest producers of non-point source pollution (US Environmental Protection Agency, 2007), which is now considered the biggest threat to water quality in the US (Dutcher et al, 2004; Ryan, 2009). Therefore, the importance of riparian management and stream health often lies in the cumulative impacts of individual behavior, resulting in environmentally significant impacts in the aggregate (Bolstad and Swank, 1997; Booth et al, 2004; Groffman et al, 2003; Nassauer, 2001; Nowak and Cabot, 2004; Pickett et al, 2007; Stern, 2000; Theobald, 2000).

Scientific research has shown that maintaining a buffer of vegetation along a streambank or allowing boulders, trees, and leaves to remain in the waterway benefits stream health by providing aquatic habitat, regulating stream temperature, stabilizing streambanks, and filtering water before entering the stream (Clinton, Vose, and Fowler, 2010; Fischenich and Morrow, 2000; Flebbe, 1999; Wallace, Grubaugh, and Whiles, 1993; Walker et al, 2009). However, many household land use practices in southern Appalachia are doing the opposite by mowing lawns to the stream edge and suppressing riparian vegetation, drawing water directly from streams for irrigation, and allowing livestock and pets direct access to streams. The removal of logs, branches, and limbs from streams is another common practice with detrimental impacts to stream health. Referred to as Large Woody Debris (LWD), logs, branches, and limbs are a natural element found in streams and provide food and habitat for fish and aquatic bugs.


Figure 5 Pictures of actively eroding streambanks on private property. Photograph by the author.

While it is recognized that these management practices occur throughout the region, little to no data exists on the primary drivers informing decision-making about stream management, or recommendations on how to work within the relevant social context to effectively encourage behavior change without imposing regulations. The majority of research has primarily focused on the ecological impacts of human land use on stream and riparian health, while largely overlooking the cognitive processes informing decision-making and behavior that are resulting in riparian degradation. This research builds on several studies arguing that landowner perspectives and preferences are central to the success of riparian management and restoration (Buckley and Crone, 2008; Flint, Luloff, and Finley, 2008; Larson, 2009; Nowak and Cabot, 2004; O'Brien, 1994; Pickett et al, 2007; Piegay et al, 2005; Rosenberg and Margerum, 2008; Ryan, 2009; Shandas, 2007; Silvano et al, 2005; Sweeney and Blaine, 2007; Theobald et al, 2000; Wear, Turner, and Flamm, 1996), showing that preference and perception coupled with socioeconomic circumstances are key factors influencing good riparian management (Larson, 2099; Rosenberg

and Margerum, 2008). Understanding landowners' perceptions of land use and management is central to reversing harmful management practices at the household level (Dutcher et al, 2004).

To better understand these impacts now and into the future, this research presents baseline data on private landowner management of streams by answering the following three questions: 1) Are landowners perceiving stream degradation, and if so, what do they believe is causing it? 2) How do landowners manage their streams, and to what degree is this impacting stream health? And 3) What are the primary drivers influencing stream management decision-making? This paper then presents recommendations for effective riparian protection and restoration and suggestions for how local and state policymakers can best support private landowners with government programs.

Study Site

For the purpose of this research, Southern Appalachia is defined as spanning from southern Virginia to north Georgia, and eastern Tennessee to the western Carolinas. This research is centered in the southern portion of the Blue Ridge Mountains, a mountain chain with the highest peak in eastern North America, Mt. Mitchell, as well as the Great Smoky Mountain National Park. The Blue Ridge Ecoregion has unique geologic features formed over hundreds of millions of years of erosion, and the result is a mountainous region that is cooler and wetter than the surrounding piedmont and coastal areas of the southeast, boasting extremely high levels of biodiversity. Elevation ranges from 600-2000 masl, with a temperate deciduous forest structure. The climate ranges from humid subtropical to marine humid temperate, and precipitation ranges from 1700 mm at lower elevations to 2500 mm on the upper slopes (Swank et al. 2001).

Research was conducted in Macon County, North Carolina. Nestled in the foothills of the southern Appalachian mountain chain, Macon County covers 520 square miles, includes

parts of the Nantahala National Forest, with the Little Tennessee River flowing north through the county forming an expansive system of waterways. A mixture of heavy forest and pastoral agricultural valleys, Macon County is experiencing a changing demographic like most of southern Appalachia. According to the census bureau, the county had a population of approximately 33,000 residents in 2012, and has experienced a 68% increase in population between 1980-2010, exceeding growth rates for both the surrounding six counties and the state, making Macon County one of the fastest growing counties in North Carolina (http://www.census.gov/). The impacts of increased population growth and density are also visible on the land, with the number of farms and farm size decreasing as the value of farm land and buildings increase, and the number of non-farm private businesses increasing 148% between 1990-2009.

Methods

Data were collected and analyzed using a combination of qualitative and quantitative methods. A total of 8 interviews were conducted with county and state government officials, local NGO's, and active community members prior to the landowner interviews to target specific stream management practices in the interview protocol, and acquire recommendations for interview participants. Landowners were found through a snowball sampling approach and seventeen interviews were conducted with a total of 21 landowners between September 2011 and February 2012. All landowners had a stream running through or bordering their property, and interview lengths ranged from one hour to three hours, resulting in a total of 28 hours of audio. Interviews used a semi-structured questionnaire format, followed by a walking tour of the landowner's property. All interviews were transcribed and analyzed using a grounded theory

approach to determine the dominant themes associated with aesthetic preferences for streams, stream management, and perceptions of stream health.

From the analyzed interview data, a 12-page mail survey was developed that included five sections asking questions about 1) preference for stream appearance, 2) details about their property, 3) stream management practices, 4) their opinions and values, and 5) sociodemographic information. Survey design followed the Dillman Tailored Design Method (2000), and a pilot survey was conducted in a neighboring county prior to the survey in Macon County. Surveys were mailed in August 2012, followed by reminder postcards two weeks later, and a second round of surveys mailed to non-responsive addresses another two weeks later. Parcels qualified to receive a survey if there was a stream running through or bordering their property. A total of 3,272 stream parcels were identified using publicly available county parcel data overlaid with a stream layer in ArcGIS. Of the 3,272 parcels a random sample of 2,060 were selected for the survey using a random number generator. Surveys were only mailed to stream landowners - parcels without a stream did not receive a survey. Participation was encouraged in the form of a lottery where six landowners who returned surveys were chosen at random to receive a monetary award: one award of $150, two awards of $100, and three awards of $50, totaling $500. Of the 2,060 surveys mailed to landowners, 52 were returned undeliverable and 326 were returned completed, for a response rate of 16%. Following Dillman's Tailored Design Method would normally guarantee a much higher response rate, however southern Appalachia contains a private, insular community of residents with a tradition of self-reliance and a strong belief in private property rights. Therefore, many survey recipients may have interpreted the mail survey as an imposition or a form of outside interference and chosen not to participate. Although

the overall response rate was low, the number of returned surveys was sufficient to run statistical analyses with confidence.

Survey data was analyzed both quantitatively and qualitatively. Quantitative analysis was performed using the statistical software SPSS and included binary and ordinal logistic regressions, t-tests, and chi square tests. All statistical analyses were reviewed and confirmed by a statistician. Qualitative analysis of the open-ended comment boxes was done using content analysis, building off of the thematic framework developed during analysis of the interview data. Both the grounded theory and content analysis approaches were performed following the framework outlined in Bernard and Ryan (2010).

Findings

Table 2 Profile of survey respondents.

SAMPLE SIZE	n=326
GENDER	66% Male, 34% Female
MEDIAN AGE	65 years old
MEDIAN INCOME	$30,000-50,000 (22%), followed by $50,000-70,000 (19%)
MEDIAN EDUCATION	High School (30%), followed by Bachelor's degree (28%)
MEAN PARCEL SIZE	1-5 acres (45%)
MEDIAN OWNERSHIP LENGTH	11-20 years (30%), followed by 6-10 years (20%)
RESIDENCE TYPE	Primary (84%), Secondary (16%)
FARM	Non-Farm (80%), Farm (20%)

Noticeable Changes to Stream

Survey respondents were presented with a 5-point Likert scale asking them to rate the degree of change affecting their stream across nine different variables: Water level, amount of silt/sediment, number of fish, algae, water clarity, amount of household garbage in stream, frequency of flooding, water temperature, and erosion. While a majority of respondents reported 'No Change' for all nine options, the following three options had the highest rates of change:

39% reported significant-somewhat decreased water level, 34% reported significant-somewhat increased silt/sediment, and 31% reported significant-somewhat increased erosion. When asked which is the most significant change to their stream, the same three options ranked the highest: 37% reported decreased water level as the most significant change, 27% reported increased silt/sediment, and 20% reported increased erosion. Compared to the other six options, changes to water level, silt/sediment deposition, and bank erosion are arguably the most visible and noticeable processes affecting stream appearance so it is not surprising these ranked highest amongst riparian landowners. Also not surprising, 8 of the 9 noticeable changes to streams were reported as negative changes, indicative of landowners perceiving decreasing stream health. Only 'Amount of household garbage' was reported as a positive change, with 13% reporting the amount of household garbage had decreased over time, compared to 7% reporting that it had increased.

When asked what they think is causing these changes to occur, the respondents were largely in agreement, citing 1) weather/climate and 2) development/construction. Overwhelmingly, these two processes were reported as the cause of stream change across all nine options. Responses to this question were independently provided in an open-ended comment box and respondents were not prompted with a selection of possible causes, making this level of consensus all the more significant. Of the 197 respondents that reported decreased water level, increased silt/sediment, or increased erosion as the most significant change affecting their stream, 83 cited Weather/Climate as the cause and 46 cited Development/Construction. As mentioned previously, increased drought due to regional climate variability and development due to population growth and exurbanization have both been identified by researchers as significant threats to stream health and water quality. These results demonstrate that landowners are

cognizant of the drier climate and rapid land use changes affecting Macon County and are aware of these impacts on local stream health.

Researchers have also identified land management at the household level as another threat to stream health and water quality. However, land management was only listed as a cause of stream change by respondents 15 times, and always in reference to either agriculture or a neighbor's poor land management. While on the surface this seems relatively predictable, but it is problematic: land and stream management at the parcel level has a far greater reach than development projects that occur at discrete moments in space and time, or regional climate variability that fluctuates incrementally over time. Considering the rate of population growth across southern Appalachia, and the exponential growth of landowners as land is fragmented and sold across the region, the impact of land and stream management at the parcel level has the potential to cause significant degradation to stream health and water quality when assessed in aggregate. As more landowners move to the region, many with little to no knowledge about the unique ecological conditions of the mountainous terrain, extensive network of waterways, or soil composition, their stream management decisions (in addition to increased impervious surfaces, septic systems, and water consumption) will have serious repercussions on both stream health and water quality, as well as quantity. These findings demonstrate that riparian landowners are failing to acknowledge the impacts of their own land management on their streams, instead pointing the finger at the larger scale processes occurring throughout the region.

Removal of Riparian Vegetation and Large Woody Debris

Since research has identified the removal of riparian vegetation and large woody debris (LWD) as detrimental stream management at the parcel level, these two management practices were assessed in the survey. When surveyed, 57% of respondents reported removing all or part

of the riparian vegetation from the stream on their property, with 64% of those who removed it doing so once a year to once every few years. Similarly, 60% of respondents removed LWD from their streams, and 73% of those who removed LWD removed it a few times a year to once a year. Combined, 40% of respondents removed both riparian vegetation and LWD, and only 26% removed neither riparian vegetation nor LWD. The top three reasons for removing riparian vegetation were: 1) It looks better, 2) To access the stream, and 3) To see the stream; while the top three reasons for removing LWD were: 1) To prevent the stream from pooling or flooding, 2) It looks better, and 3) To keep the stream clean. However, when asked if logs, branches, and limbs were bad for the ecological health of streams, 45% of landowners reported that it wasn't. This shows that despite understanding that LWD isn't harmful to streams, landowners are still removing it, suggesting there is another reason for engaging in this behavior. Logistic regressions of the survey data determined that three factors were significant determinants for the removal of riparian vegetation and LWD.

Table 3 Results from statistical analysis on riparian and LWD removal.

Dependent Variable	Model	N	Independent Variable	Mean	df	p value
Why do you cut riparian vegetation - To see the stream	Binary Logistic	190	Property Type		1	.002
Riparian vegetation removal frequency	Ordinal Logistic	175	Length of Ownership		5	.043
Large woody debris removal frequency	Ordinal Logistic	174	Age	65.32	1	.037
Why do you remove LWD - It keeps the stream clean	Binary Logistic	229	Age	65.31	1	.05
Why do you remove LWD - It keeps the stream healthy	Binary Logistic	229	Age	65.31	1	.043
"Part of being a good neighbor is keeping my stream/land looking clean and beautiful"	Ordinal Logistic	302	LWD Removal		1	.000
"Fallen branches, limbs, and logs are bad for stream health"	Ordinal Logistic	316	LWD Removal		1	.000

Property type presented as a highly significant indicator of removing riparian vegetation to see the stream, and using an ordinal logistic model length of ownership presented as a significant indicator of riparian removal frequency, with landowners who owned their property "less than 1 year to 5 years" having the lowest riparian cutting frequency. Age was the only significant indicator associated with LWD removal. Using an ordinal logistic model, age presented as a significant indicator for large woody debris removal frequency, with older landowners more likely to remove LWD more often. And, using binary logistic models, age was also a significant indicator of older landowners removing LWD because it keeps the stream clean and healthy.

Primary Drivers of Stream Management at the Household Level

These findings go further by identifying the primary drivers of stream management and decision-making, as well as effective methods of intervention to work with landowners toward land management practices that are more congruous with ecological sustainability. Knowing what riparian landowners do to their streams, how often, and profiles of which landowners are more likely to practice riparian or LWD removal isn't enough to address the issue of local land use impacts on stream health. This research has identified Tradition/Habit and Aesthetics as the two primary drivers of riparian and LWD removal in southern Appalachia.

Respondents explained that the habit of removing large woody debris from streams is partially due to practical reasons rooted in the long agricultural history of the region. Keeping streams clear of logs, branches, and limbs was safer for people, their livestock, and their crops. Over time, landowners have become accustomed to streams cleared of logs, branches, and limbs, and perceive the removal of large woody debris as a necessary form of management and stewardship. Today, older landowners are more likely to remove large woody debris, and say

they do it to keep the stream healthy and clean. This is likely because older generations of landowners kept their streams clean for agricultural purposes, and they continue to do it today even though they no longer use their land for agricultural purposes. Now that agriculture is no longer the predominant form of land use, the removal of large woody debris is associated more with tradition than necessity. However, the tradition and habit of clearing streambanks and streams is pervasive, and during interviews several landowners admitted they clear riparian vegetation and LWD because that is what their parents and grandparents did, and it is how they were taught to manage their land.

Likewise, aesthetics, hereby defined as managing land to achieve a sense of beauty or attractiveness, is another reason landowners give for removing riparian vegetation and LWD from their streams. Many landowners, especially those new to the area, expressed their desire for a clear view of their stream from their home, and stream views obstructed by trees and bushes or full of logs, branches, and limbs are not considered attractive and inviting. Often described as "keeping up the land," landowners strive to maintain a "clean" appearance for their land and streams, resulting in management that leads people to clean their streams of large woody debris and keep their streambanks cleared of riparian vegetation. A person's yard and land is an extension of their own identity and reputation amongst their peers, and it is therefore not surprising that landowners who remove LWD from their streams were significantly more likely to agree with the statement “Part of being a good neighbor is keeping my stream/land looking clean and beautiful.”

Figure 6 Picture of stream cleared of all riparian vegetation. Photography by author.

While these two drivers of land use decision-making can be discussed independently, they are not discrete, isolated motivators of behavior. In fact, both tradition and aesthetic preference for riparian and LWD removal relate back to social conventions of cleanliness, order, and control. The way a landowner manages their land reflects upon their social value within the community, and advertises their identity, values, and status to the community. There is a sense of social pressure to keep your yard and stream looking clean, and if you don't it reflects poorly upon you and your reputation. People who don't keep up their land may be thought of as lazy or slovenly. During an interview with an elderly landowner, he acknowledged helping his ill neighbor maintain his yard because an overgrown yard would look messy and disorderly, and he wouldn't want people to think poorly of his neighbor or the neighborhood. Just as "keeping up the land" is a sense of pride for most landowners, keeping streams clear of LWD and riparian vegetation relates to tradition, values, and what many landowners perceive as stewardship.

Figure 7 Picture of a stream recently cleared of all riparian vegetation. This pasture regularly held cattle that were often found standing directly in the stream. Photograph by author.

Overwhelmingly, landowners who removed LWD from their streams were more likely to agree with the statement "Fallen branches, limbs, and logs are bad for the ecological health of the stream." After storms, landowners will often remove debris from their yards and streams, preferring that their yards be orderly and streams clear of obstructions. In interviews, several landowners referred to this debris as "trash" that needed to be cleaned up and disposed. Interviewees distinguished between "trash" and household garbage, often commenting that garbage in streams was not a big problem anymore, but cleaning the streams of "trash" was a constant, never-ending process.

It is this ethic of tradition and aesthetics which often results in landowners "cleaning" their streams and removing riparian vegetation and LWD. These values are so deeply entrenched, it would require a new cultural understanding of environmental processes to change

it. It's not just changing someone's mind about how they manage their land, it's changing the way they view themselves, social conventions, and the larger human-environment relationship. Because how a landowner manages their land is a reflection on their societal value and status, affecting change will require a restructuring of social values as well as land use decision-making.

Incentives for Behavior Change

While money is often an important factor in land use decision-making, many empirical studies have shown that non-monetary incentives also play a large role in land use decisions, and riparian management programs and policy could also be effective if geared towards these motivations (Koontz, 2001; Ryan, 2009; Stern, 2000). For example, many of the issues landowners consider when making land use decisions include flooding, water quality, community, property rights, tradition and order, access to waterways, stewardship, and aesthetic preferences for their landscapes (Dutcher et al, 2004; Flint, Luloff, and Finley, 2008; Larson, 2009; Larson and Santelmann, 2007; O'Brien, 1994; Rosenberg and Margerum, 2008; Ryan, 2009; Shandas, 2007; Sweeney and Blaine, 2007). And while common barriers to the adoption of prescribed stream management include cost, time and labor, maintenance, lack of information, property value, the risks associated with adopting alternative land management practices, and proximity to resources (Buckley and Crone, 2008; Hairston-Strang and Adams, 1997; Larson and Santelmann, 2007; Rosenberg and Margerum, 2008; Shandas, 2007), scholars identify the lack of access to adequate information as the most prevalent, and most easily rectified barrier (Booth et al, 2004; Brook, Zint, and Young, 2003; Dutcher et al, 2004; Shandas, 2007; Theobald et al, 2000). Research has shown that landowners identified educational outreach as the preferred method of policy intervention in natural resource management, stating that regulations should only be implemented as a secondary option (Dutcher et al, 2004; Larson, 2009; O'Brien, 1994).

In this regard, southern Appalachia is no different and in both interviews and surveys, participants preferred education and information about proper stream management over regulation, as well as financial support. Whereas information about stream management leaves decision-making control in the hands of the landowners, financial incentives are perceived as authoritative and outside of their control. Maintaining control and ownership over land is very important to many landowners in this region, and financial incentives mean an obligation to comply with management guidelines. It was often expressed by interviewees that education and information should be the primary focus of outreach efforts, while those who seek financial support for restoration or preservation could seek it out from local agencies, leaving regulation as a last resort. I argue that education and information about sustainable stream management could contribute to overcoming the social constraints of tradition and aesthetic preference, particularly when the benefits of riparian vegetation and LWD are explicitly outlined to landowners. Common themes that emerged in both interviews and surveys were concern over drinking water quality and quantity into the future, attracting wildlife to streams and land, especially trout, songbirds, and aquatic mammals, and preserving the natural beauty of the streams and mountains for their children and grandchildren. Therefore, if presented in a manner that appeals to common concerns and desires, such as preserving water quality, supporting both aquatic and terrestrial animals, and acting as a steward of the streams and mountains, landowners may be interested in the information being offered and prepared to weigh the costs of behavior change against the benefits, and make informed decisions based on proven scientific information without feeling pressured or forced.

Conclusion & Recommendations

The management of riparian zones by private landowners directly impacts stream health, and subsequently water quality, throughout southern Appalachia, making it necessary to reconcile the impacts of behavior at the local scale with the hydrologic processes at the watershed scale (Groffman et al, 2003). Unlike urban areas where local or state government often regulate development near flood plains and riparian zones, no such regulation currently exists in Macon County. Therefore, it is even more imperative that government officials, natural resource managers, and decision-makers understand landowners' values, perceptions, and preferences for stream and riparian management in order to develop methods of intervention that reflect the values and desires of private landowners in this region.

I argue that appealing to the interests, values, and logic of local landowners to encourage more sustainable land use practices could prove more effective than imposing regulation. When landowners are managing land in a manner that upholds social expectations and beliefs about stewardship, particularly in a region that still holds strongly to the value of private property, cooperation will be achieved through incentives, transparency, being supportive of landowners, and nonthreatening actions rather than imposition or enforcement.

Several studies support these findings, with many outlining comprehensive frameworks for community-oriented riparian protection and restoration, including involving landowners in the planning process, ensuring restoration efforts address their concerns, and acknowledging that landowners are not solely responsible for the environmental degradation found in their communities (Booth et al, 2004; Dutcher et al, 2004; Flint, Luloff, and Finley, 2008; Ryan, 2009). Abstract arguments and generalized guidelines should be avoided, instead framing problems as individual tasks with explicit instructions for landowners to follow (O'Brien, 1994;

Sweeney and Blaine, 2007). Furthermore, community involvement should proceed with transparency, address all conflicts head-on, and acknowledge the multiple interests of stakeholders involved (Buckley and Crone, 2008; Flint, Luloff, and Finley, 2008). From a planning and policy perspective, local and regional planning should examine population growth projections and direct growth away from identified hotspots for restoration (Booth et al, 2004; Larson and Santelmann, 2007; Theobald, 2003), and should never adopt a one-size-fits-all approach to restoration (Allan, 2004; Larson and Santelmann, 2007).

Building on the aforementioned recommendations, tailored suggestions for implementing efforts in southern Appalachia are presented here in a two-part plan for encouraging sustainable stream management at the household level. First, work within the existing framework of resources and support. County, state, federal, and non-governmental resources are already available to landowners, but some these programs could benefit from increased visibility within the community. Many new homeowners moving to the region are unaware of these agencies, and those who are aware often don't know about the services and resources provided. I recommend existing agencies develop free community workshops on stream management. Seventy-seven percent of survey respondents reported interest in attending management workshops if they were free and local. Another area for improvement is eligibility for support and resources - some resources are only eligible for agricultural land, leaving non-farmers without needed assistance. With the consistent decline of agricultural land in the region and the growth of residential development, these programs should reevaluate their eligibility criteria in order to continue meeting their program goals. And lastly, agencies should accommodate landowners voluntarily implementing buffers on their streams for their desire to keep unvegetated gaps. While research on the impacts of gaps in riparian buffers on stream health and biota is still being conducted in

the region, I argue that the benefits of any vegetation on previously cleared riparian zones outweighs the impacts of gaps in a vegetated buffer.

And secondly, direct efforts and resources toward education. Increased support for education is needed from all levels of government, as well as more personnel dedicated to educating and supporting local landowners. Positions for government officials tasked with educating landowners have been systematically eliminated or reassigned in recent years, often leaving one extension agent to cover multiple counties, with budgets for environmental education being reallocated or cut entirely. For those with the opportunity to educate landowners on stream management, emphasize their opportunity to become even better stewards of their land rather than highlight everything they have been doing wrong. Educate landowners on which species to plant in riparian zones, how to maintain their riparian buffer over time, what to expect in terms of appearance and composition, and who to contact with questions and concerns. Educating landowners involves supporting them through the entire process of buffer implementation, not just the initial planting.

For those landowners that are more skeptical or defensive about changing their management regime, emphasize the financial benefits of healthy riparian zones and allow for change to occur over time. First, point out that the ecosystem services provided by a healthy riparian buffer in the form of natural water filtration is more cost effective than the expense of building a water treatment plant to perform the same service. Macon County has the lowest tax rate in the state of North Carolina, and many landowners will see the logic of an argument when it relates back to keeping their taxes low. Clean water is going to become a bigger issue as population and residential development continue to grow, and the cost of a tax-funded water treatment plant in the future compared to the cost of planting riparian buffers now may convince

some skeptics. And since the driving economy in the region is tourism-based, maintaining the environmental health and beauty of the region is also critical for local economic prosperity to continue and thrive. Lastly, allow for change to happen over time. Just as it took people decades to embrace recycling and accept it as the norm, it will take time before the region can change their model of stream management and accept the necessity of riparian buffers and LWD as preferable stream management. However, when presented as a source of pride and stewardship for the community, it can become commonplace and expected.

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CHAPTER 5

EFFECTS OF EXURBANIZATION ON LAND USE: AN ASSESSMENT OF STREAM MANAGEMENT AMONG NEWCOMER AND GENERATIONAL LANDOWNERS IN A SOUTHERN APPALACHIAN COMMUNITY[4]

[4] Evans, S.R, and D. Jensen-Ryan. To be submitted to *Landscape and Urban Planning*.

Introduction

Exurbanization, the influx of urban migrants into rural communities, is identified as a primary driver of economies transitioning from natural resource extraction to the service industry (Egan and Luloff, 2000). Exurban development has also been identified as the fastest growing land use in the United States (Brown et al., 2005; Heimlich & Anderson, 2001; Lohse & Merenlender, 2009; Theobald, 2003), and scholars have expressed growing concern over the impacts of exurbanization on environmental resources (Abrams, et al, 2012; Dale et al., 2005; Odell & Knight 2001; Maestas et al., 2003; Hansen et al., 2005; McAlpine, 2006), particularly the impacts on water (Compas, 2007; Gosnell, Haggerty, and Byorth, 2007; Lohse and Merenlender, 2009; Nassauer et al, 2004). As residential and commercial development increase to accommodate growing populations of retiree and amenity residents, increased impervious surfaces, stream sedimentation, and erosion have resulted in impaired stream health and water quality (Lohse and Merenlender, 2009; Nassauer et al, 2004; Radeloff, et al, 2005). Furthermore, increased population density also applies pressure on the regional water supply due to increased water consumption.

However, one of the most serious threats to stream health and water quality is the impact of land use decision-making at the parcel level. As more rural land becomes fragmented and sold to private buyers and developers, the result is more landowners on smaller parcels, intensifying the impacts of land use on regional resources. Stream management by private landowners, particularly the management of riparian zones, has been highlighted as a critical area for research and restoration (Audrey, Briggs, Kroesen, 2009; Groffman et al, 2003). Riparian zones are the interface between terrestrial and aquatic ecosystems comprising the environmental conditions through which water and materials move (Gregory et al., 1991; Knoepp & Clinton, 2009), and are a critical component in the functioning and health of forested ecosystems because of their

role in regulating stream temperature, regulating the physical structure of streams, absorbing nitrate from shallow groundwater, and buffering the movement of pollution from the surrounding landscape from entering the water system (Bunn et al., 1999; Hession et al., 2003; Houser et al., 2005; Silk & Ciruna, 2005; Wallace et al., 1999; Young & Huryn, 1999).

Likewise, the removal of logs, branches, and limbs from streams is another common practice with detrimental impacts to stream health. Referred to as large woody debris (LWD), logs, branches, and limbs are a natural element found in streams and provide food and habitat for fish and aquatic bugs. Scientific research has shown that maintaining a buffer of vegetation along a streambank and allowing boulders, trees, and leaves to remain in the waterway benefits stream health tremendously (Clinton, Vose, & Fowler, 2010; Fischenich & Morrow, 2000; Flebbe, 1999; Wallace, Grubaugh, & Whiles, 1993; Walker et al., 2009).

Despite their important ecological functions, the removal of riparian vegetation and LWD are a common practice in southern Appalachia, making studies of the preference for stream appearance, stream management, and perceptions of stream health areas of critical importance. Because southern Appalachia is a water-rich area of the United States undergoing rapid exurban development, this region provides an excellent opportunity to determine how exurbanization is affecting the environment by examining intra-community patterns of stream management amongst two populations of landowners in the same community.

Literature Review

Interest in exurbanization often lies in its impacts on the social structure of rural communities as longtime residents interact with and share their community with a diverse population of in-migrants. As new residents relocate to rural areas for recreation, second-homes, and retirement, regional communities become increasingly comprised of two cultures: long-term generational landowners and newcomer landowners. The cultural mixing can often play out in

local politics, local economy and business, the commodification of cultural heritage, social stratification, as well as land use (Abrams et al. 2012; Armstrong and Stedman, 2013; Egan and Luloff, 2000; Gosnell and Abrams, 2009).

Ample research has been conducted on the impacts of exurbanization on private land use. Because Newcomer livelihoods are typically economically independent from productivist land uses (Gosnell and Travis, 2005), newcomer landowners are more likely than their generational neighbors to be engaged in consumptive (recreation and aesthetics) and conservation land uses (Gosnell, Haggerty, and Byorth, 2007; Huntsinger and Fortmann, 1990; Schrader, 1995; Daley et al, 2009). While this is often characterized as post-productivist land use, Ilbery and Maye (2010) argue that many Newcomers are actually engaged in neo-productivist land use, as several continue to farm or ranch on rural land. However, these attempts at farming and ranching, often referred to as "hobby farms," follow new models of production entrenched in contemporary ideals of sustainability, holism, and technology, representing what Holloway (2000) describes as 'Symbolic labor.'

In order to fully understand the land use consequences associated with exurbanization, Abrams et al. argue (2012) that research must examine both the motivations of land use decision-making by Newcomer and Generational landowners, as well as the outcomes of those decisions. An excellent example of this approach is research conducted by Gosnell, Haggerty, and Byorth (2007) examining differences in stream management decision-making among Newcomer and Generational landowners in southwestern Montana. They found that the management decisions of Generational landowners were focused more on increasing irrigation efficiency, while the management decisions of Newcomer landowners were primarily related to recreation, aesthetics, and conservation. They concluded that changing land ownership has had effects on regional water management, resulting in both negative and positive ecological impacts.

We contribute to this literature by presenting data on differential land management by Newcomer and Generational landowners in southern Appalachia by utilizing a research protocol based on the theoretical framework of cultural models commonly used in cognitive anthropology. Cultural models are the coherent logical structure through which members of a culture or social group function and interact according to shared understandings or expectations (Atran and Medin, 2008; D'Andrade, 1995; Kempton et al, 1995). D'Andrade (1995) describes a basic cultural model in all cultures as the representation of what happens inside people – in their minds or psyches – that result in their doing what they do. Very simply, cultural models are shared understandings of how society works within a given culture, and these models provide individuals with an understanding of how to function within their society according to social expectations of proper behavior.

Therefore, in terms of our surrounding environment, what we think of as 'natural' is a product of socially constructed, shared cultural models (Vogel, 1996). Conceptions of "nature" or what is "natural" are not fixed or static (Abrams et al, 2012; Halfacree, 1993; Cadiuex, 2011; Castree, 2005), they are culturally constituted and based upon shared social beliefs and understandings that allow people to perceive and process their environment according to social norms. This collective understanding is the "basic conceptual underpinning of popular thinking about the environment," helping people understand environmental problems, justify environmental values, and provide an organizational basis for reasoning (Kempton et al, 1995). Abrams, et al. (2012) argue that land use dynamics are often a result of the production and maintenance of particular "natures" through social relationships with the non-human world. We agree, and propose that cultural models are well-equipped to investigate how different populations are relating to their surrounding environment and engaging in social productions of

"nature" specifically because this theoretical approach embraces the variability found within culture.

Many scholars agree that assessing variability in the organization of knowledge within a social group provides a unique opportunity to study the organization and distribution of culture (Barnett, 1953; Boster, 1987; Handwerker, 2002; Keesing, 1994; Pelto and Pelto, 1975; Wallace, 1961). This approach addresses variability at the individual level by recognizing that the level of consensus on what is considered socially acceptable behavior does not reflect the existence of a cultural model. Individuals may understand what is considered to be socially acceptable behavior and choose not to comply. Rather, the mere fact that individuals share an understanding of what is socially acceptable is what constitutes evidence for a cultural model. How they choose to use that information is a reflection of human agency, because as individuals we still choose whether or not to behave according to social expectations. By focusing on why people choose to comply or not comply with the cultural model governing land use, it is possible to learn more about the organizational structure of the model and the external factors influencing land use decision-making. Scaled up to a community or regional level, this approach postulates that different cultural groups living in the same area and engaged in more or less the same activities may have strikingly different mental models of nature (Atran and Medin, 2008), and cultural influences on behavior will be evidenced in data that derives from different groups of people with different cultural histories behaving differently in the same physical environment (Atran et al, 2005).

Therefore, this paper operates on the hypothesis that intra-community patterns of stream management amongst Newcomer and Generational landowners in southern Appalachia will differ due to different environmental models informing their understanding of what constitutes proper stream management. Because almost 70% of forestland in the Southeast is privately

owned (Wear and Greis, 2002), and many of these landowners have direct access to streams on their property, we chose to assess the impacts of exurbanization on water resources by examining whether Newcomer and Generational landowners exhibited differences in their preference for stream appearance, management of streams, and perceptions of stream health. In effect, we are deciphering the cultural models informing how these two landowner groups interpret and perceive information about stream management, which guides their decision-making process and ultimately dictates socially acceptable behavior that fits within the cultural model of stream management.

Research Methods

Study Site

For the purpose of this research, southern Appalachia is defined as spanning from southern Virginia to north Georgia and eastern Tennessee to the western Carolinas. This research is centered in the southern portion of the Blue Ridge Mountains, a mountain chain with the highest peak in eastern North America, Mt. Mitchell, as well as the Great Smoky Mountain National Park. The Blue Ridge Ecoregion has unique geologic features formed over hundreds of millions of years of erosion, and the result is a mountainous region with a temperate deciduous forest structure that is cooler and wetter than the surrounding piedmont and coastal areas of the southeast, boasting extremely high levels of biodiversity. The region is characterized by steep topography, with elevation ranging from 600-2000 masl. Climate ranges from humid subtropical to marine humid temperate, and precipitation ranges from 1700 mm at lower elevations to 2500 mm on the upper slopes (Swank et al., 2001).

Southern Appalachia has a long history of intensive land use, a continuing legacy of resource exploitation, poverty, isolation, and societal ills, as well as a proud tradition of self-reliance, strong moral values, and a strong belief in private property rights. When the Europeans

arrived in the mid-16th century, they encountered a human-generated landscape formed over 10,000 years of Native American occupation (Davis, 2000; Williams, 2002; Yarnell, 1999), and by the 19th century the economy in the southern mountains was largely dominated by livestock, farming, mining, and timber. While the regional economy of southern Appalachia was stimulated throughout the first half of the 20th century by two world wars and New Deal programs, many lacking a steady income began migrating to major city centers, marking the beginning of the 'Great Outmigration' that lasted from roughly 1940-1960. This event is the start of southern Appalachia's transition away from agriculture and industry to recreation and retirement communities (Keilman, 2003; Liu et al., 2007; Mackun, 2005; Shelley and Roseman, 1978), and over time those who left the southern mountains were replaced by an influx of second-home owners and retirees (Gragson & Bolstad, 2006).

Although research on exurbanization in southern Appalachia is minimal in comparison to other regions of the United States, focus has increased in recent years as scholars acknowledge the unsurpassed growth and development throughout the southeast (Cromartie, 2001; Eller, 2008; Haas and Serow, 1993). Morrill (2001, p. 37) argued that, "As much as half the area of the nation experienced an apparent reversal, predominantly from net out-migration in 1965-70 to net in-migration in 1970-75. This turn-around is most obvious and dramatic in Appalachia…," while Culbertson et al. (2008, p. 78) proclaim, "Perhaps no other rural region of the United States has been as dramatically transformed over the last few decades as southern Appalachia."

Research was conducted in Macon County, North Carolina (Figure 8). Nestled in the foothills of the southern Appalachian mountain chain, Macon County covers 520 square miles, with 45% of the county comprised of public lands, primarily within the Nantahala National Forest. Land cover is a mixture of heavy forest and pastoral agricultural valleys, with 75% of the county currently forested (Kirk, Bolstad, & Manson, 2012). Macon County lies within the Little

Tennessee Watershed, with the Little Tennessee River flowing north through the county forming an expansive system of waterways. According to the census bureau, the county had a population of approximately 33,000 residents in 2012, and has experienced a 68% increase in population between 1980-2010, 245% increase in median household income, as well as increased levels of education, and per capita water use (http://www.census.gov/). Increased population growth and density are also impacting land use, with farm acreage decreasing 14% and number of farms decreasing 9% in the ten-year period between 1997-2007, while the value of farm land and buildings increased 100% and the number of non-farm private businesses increased 28% during the same period (ibid). This level of growth exceeded rates for both the surrounding six counties and the state, making Macon County one of the fastest growing counties in North Carolina (ibid).

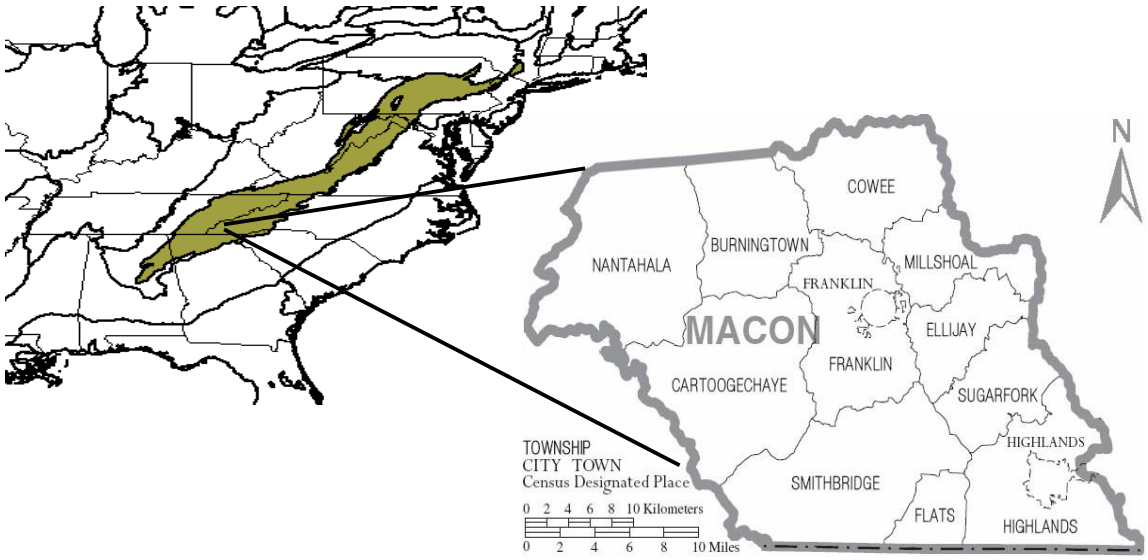

Figure 8 Position of the field site within the Appalachian mountain chain.

Data Collection and Analysis

Data were collected and analyzed using a combination of qualitative and quantitative methods. A total of 8 interviews were conducted with county and state government officials, local NGO's, and active community members prior to the landowner interviews to target specific

stream management practices in the interview protocol, and acquire recommendations for interview participants. Landowners were found through a snowball sampling approach and seventeen interviews were conducted with a total of 21 landowners between September 2011 and February 2012. All landowners had a stream running through or bordering their property, and a mix of both newcomers and generational landowners were sought to best represent the diversity of opinion and management practices, as well as for comparative purposes. Eight interviews were conducted with generational landowners, and nine with newcomer landowners. Interview lengths ranged from one hour to three hours, resulting in a total of 28 hours of audio. Interviews used a semi-structured questionnaire format, followed by a walking tour of the landowner's property. All interviews were transcribed and analyzed using a grounded theory approach to determine the dominant themes associated with aesthetic preferences for streams, stream management, and perceptions of stream health.

From the analyzed interview data, a 12-page mail survey was developed that included five sections asking questions about 1) preference for stream appearance, 2) details about their property, 3) stream management practices, 4) their opinions and values, and 5) sociodemographic information. Survey design followed the Dillman Tailored Design Method (2000), and a pilot survey was conducted in a neighboring county prior to the survey in Macon County. Surveys were mailed in August 2012, followed by reminder postcards two weeks later, and a second round of surveys mailed to non-responsive addresses another two weeks later. Parcels qualified to receive a survey if there was a stream running through or bordering their property. A total of 3,272 stream parcels were identified using publicly available county parcel data overlaid with a stream layer in ArcGIS. Of the 3,272 parcels a random sample of 2,060 were selected for the survey using a random number generator. Surveys were only mailed to stream landowners - parcels without a stream did not receive a survey. Participation was encouraged in

the form of a lottery where six landowners who returned surveys were chosen at random to receive a monetary award: one award of $150, two awards of $100, and three awards of $50, totaling $500. Of the 2,060 surveys mailed to landowners, 52 were returned undeliverable and 326 were returned completed, for a response rate of 16%. Following Dillman's Tailored Design Method would normally guarantee a much higher response rate, however southern Appalachia contains a private, insular community of residents with a tradition of self-reliance and a strong belief in private property rights. Therefore, many survey recipients may have interpreted the mail survey as an imposition or a form of outside interference and chosen not to participate. Although the overall response rate was low, the number of returned surveys was sufficient to run statistical analyses with confidence.

Survey data was analyzed both quantitatively and qualitatively. Quantitative analysis was performed using the statistical software SPSS and included binary and ordinal logistic regressions, t-tests, and chi square tests. All statistical analyses were reviewed and confirmed by a statistician. Qualitative analysis of the open-ended comment boxes was done using content analysis, building off of the thematic framework developed during analysis of the interview data. Both the grounded theory and content analysis approaches were performed following the framework outlined in Bernard and Ryan (2010).

To determine respondent’s preference for stream appearance, the first section of the survey posed eight questions asking respondents to answer each question using the provided insert depicting six photographs of streams with different types of riparian vegetation (Figure 9).

A. Questions about your stream preference: For this question, please refer to the photos on the insert included with this survey. These photos feature six different streams in Macon County and are intended to represent the diversity of streams in Macon County.

For each of the following 8 questions, please circle one letter for the stream that best represents your preference or opinion.

Which stream photo looks the most similar to the stream on your property?	A	B	C	D	E	F
Which stream photo do you think is the least attractive (beautiful, aesthetic)?	A	B	C	D	E	F
In your opinion, which stream photo looks like the healthiest stream?	A	B	C	D	E	F
In your opinion, in which stream photo would you be most likely to find snakes?	A	B	C	D	E	F
If you were to choose one of these streams to have on your property, which would you choose?	A	B	C	D	E	F
In your opinion, which stream photo looks like the cleanest stream?	A	B	C	D	E	F
Which stream would you prefer for recreation (playing, swimming, tubing, etc.)?	A	B	C	D	E	F
In your opinion, which stream photo looks like the least natural stream?	A	B	C	D	E	F

Photo Insert – Please select one photo for each of the 8 questions in Section A of the survey.

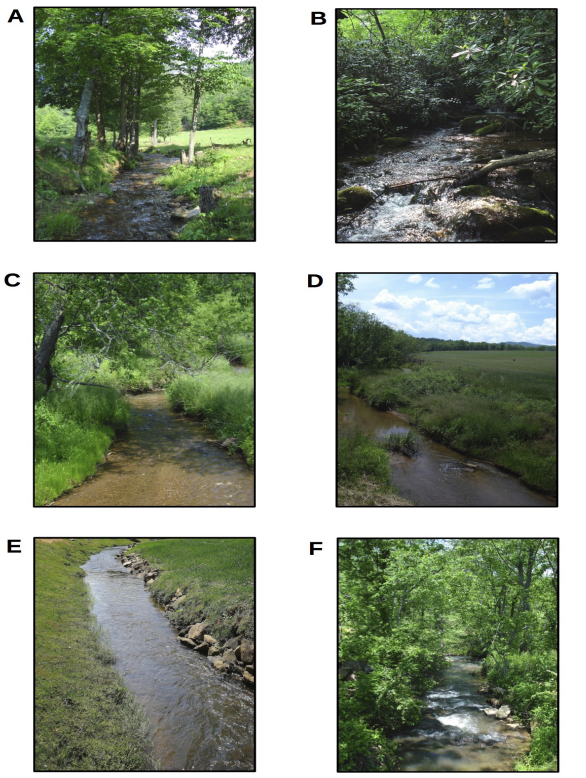

Figure 9 Photo insert and questions about preference for stream appearance included in the mail survey. Photographs by the author.

The stream photos included streams of similar size and a gradient of riparian vegetation ranging from: no riparian buffer, grass mowed to streams edge (Photo E), agricultural field, bushy vegetation along stream, no trees (Photo D), to thick riparian buffer, dense canopy of rhododendron (Photo B). Each of the six streams is located in Macon County and was chosen to represent the actual conditions of riparian vegetation found in the county, ensuring that respondents were presented with realistic and familiar stream scenes. The photos were 3x4 inches, printed in color on 8.5x14 photo quality paper, and inserted as a leaflet into the first page of the survey.

To determine stream management techniques, respondents were asked a series of questions about riparian removal and LWD removal to determine whether they engage in the

activity, how often they engage in the activity, and why they do it. The options provided for why they engage in riparian or LWD removal were sourced directly from interviews with landowners and government officials, and respondents also had the additional option of providing their own explanation for why they engage in the activity in an open comment box.

To determine environmental values, survey respondents were presented with 13 questions asking them to rate their level of agreement/disagreement on a 5-point Likert Scale ranging from Strongly Disagree to Strongly Agree. Question topics included property rights, water quality, ecological knowledge, water scarcity, as well as the relationship between the environment and the economy.

To determine perception of stream health, survey respondents were presented with a 5-point Likert Scale asking them to rate the quality of the water in their stream from Very Poor to Very Good. This was followed by a chart asking respondents to rate the degree of change affecting their stream across nine different variables from Significantly Decreased to Significantly Increased: water level, amount of silt/sediment, number of fish, algae, water clarity, amount of household garbage in stream, frequency of flooding, water temperature, and erosion. They were then asked to choose which of the above changes has been the most significant change to their stream, and had the option of describing what they believe caused that change in an open comment box.

Defining and Operationalizing "Newcomer" and "Generational"

Consensus on what defines a newcomer or how to measure social change associated with the influx of new residents into a community is still developing. Many studies use length of ownership as the metric for determining newcomer status, with the standard of 10 years of ownership frequently utilized (Graber, 1974; Fortmann & Kusel, 1990). However, this paper follows a different model by using the year immigration to the community dramatically

increased, thereby signifying the start of population growth and the beginning of the process of exurbanization (Blahna, 1985; Gosnell, Haggerty, & Byorth, 2007; Krannich et al., 2006; Smith & Krannich, 2000). Although in-migration and exurbanization is a gradual process that has peaked and plateaued over the years, demarcating a cutoff year to distinguish between Newcomer and Generational landowners was necessary to accomplish the goals of this study.

For our field site of Macon County, North Carolina, census bureau data clearly marks 1970 as the beginning of population growth in the community. Since the dramatic spike in population beginning in 1970 cannot be explained by the birth-death ratio, it is presumably the result of in-migration to the county and the beginning of exurbanization, and therefore the dividing line between Newcomer and Generational landowner. Therefore, for the purposes of this research, Newcomers are defined as a landowner who is not from Macon County or has not been a resident of Macon County for at least 40 years. If a landowner has owned their property for 40 years but reported it as a secondary residence (seasonal, weekend, or vacation home), they were also considered a Newcomer. Generational landowners were defined as a landowner from Macon County, or someone who has been a resident of Macon County for at least 40 years and reported their property as their primary residence. If the landowner was under 40 years of age, they were from Macon County, and their residence type was Primary, they were considered a Generational. In a few instances where landowners did not fit into the predetermined categories, judgments were made and they were assigned to the category the authors felt best represented their status. All statistical analyses were run on the survey respondents as a whole, as Newcomers, and as Generational landowners.

Results

Table 4 Profile of survey respondents

SAMPLE SIZE	n=326
GENDER	66% Male, 34% Female
MEDIAN AGE	65 years old
MEDIAN INCOME	$30,000-50,000 (22%), followed by $50,000-70,000 (19%)
MEDIAN EDUCATION	High School (30%), followed by Bachelor's degree (28%)
MEAN PARCEL SIZE	1-5 acres (45%)
MEDIAN OWNERSHIP LENGTH	11-20 years (30%), followed by 6-10 years (20%)
RESIDENCE TYPE	Primary (84%), Secondary (16%)
FARM	Non-Farm (80%), Farm (20%)
LANDOWNER GROUP	Newcomer (n=237), Generational (n=88)

Sociodemographic and Property Variables

For income and education, data were analyzed using an ordinal logistic regression and results show that newcomers are more likely to have a higher income compared to generationals, and to have attained higher levels of education compared to generationals. Religion data were analyzed using a chi square test and results show that newcomers are more likely to be non-Baptist Protestant and less likely to be Baptist compared to generationals. Overall, 37% of respondents reported their political affiliation as “Republican,” 32% as “Democrat,” 22% as ‘Independent,’ and 9% as “None.” While more generationals did report their affiliation as Republican and more newcomers did report their affiliation as Democrat, the difference was not statistically significant. Compared to 2010 United States Census data for Macon County and the entire state of North Carolina, survey respondents were older, more educated, and included more males than females (Table 2).

Table 5 Comparison of the sample of survey respondents to the county and the state.

	Survey – Macon County	Census – Macon County	Census – North Carolina
Population	n=326	33869	9752073
Median Age	65 years	47.8 years	37.4 years
Gender – Male	66%	49%	49%
Gender – Female	34%	52%	51%
Median Income	$30,000-50,000	$38,653	$46,291
% HS Graduate or Higher	97%	84%	84%

Table 6 Results from statistical analysis on sociodemographic and property variables.

Dependent Variable	**Model**	**N**	**Independent Variable**	**df**	**p value**
Median household income	Ordinal Logistic	296	Newcomer	1	.004
Level of education completed	Ordinal Logistic	314	Newcomer	1	.001
Length of ownership	Ordinal Logistic	322	Newcomer	1	.000
Property Size	Ordinal Logistic	319	Newcomer	1	.040
Property Type	Binary Logistic	303	Newcomer	1	.002
Newcomer & Religious affiliation	Chi Square	228		4	.017

For property size and length of ownership, data were analyzed using an ordinal logistic regression and results show that newcomers were more likely to have smaller property sizes and not surprisingly, a shorter length of ownership. For property type, data were analyzed using a binary logistic regression and results show that newcomers are more likely to report their property as a secondary residence compared to generationals. And, similar to results by Kirk et al. (2012) on long-term development patterns, this research found no significant relationship between newcomer status and parcel elevation, contradicting the widely held belief in Macon County that a consequence of population growth due to exurbanization has been increased residential development at steeper elevations by new landowners. The elevation range for survey respondents was 1,935 to 4,195 feet, the mean elevation for respondents as a whole was 2,434

feet (n=276), while the mean for newcomers was 2,413 feet (n=202), and for Generationals 2,488 feet (n=74)[5].

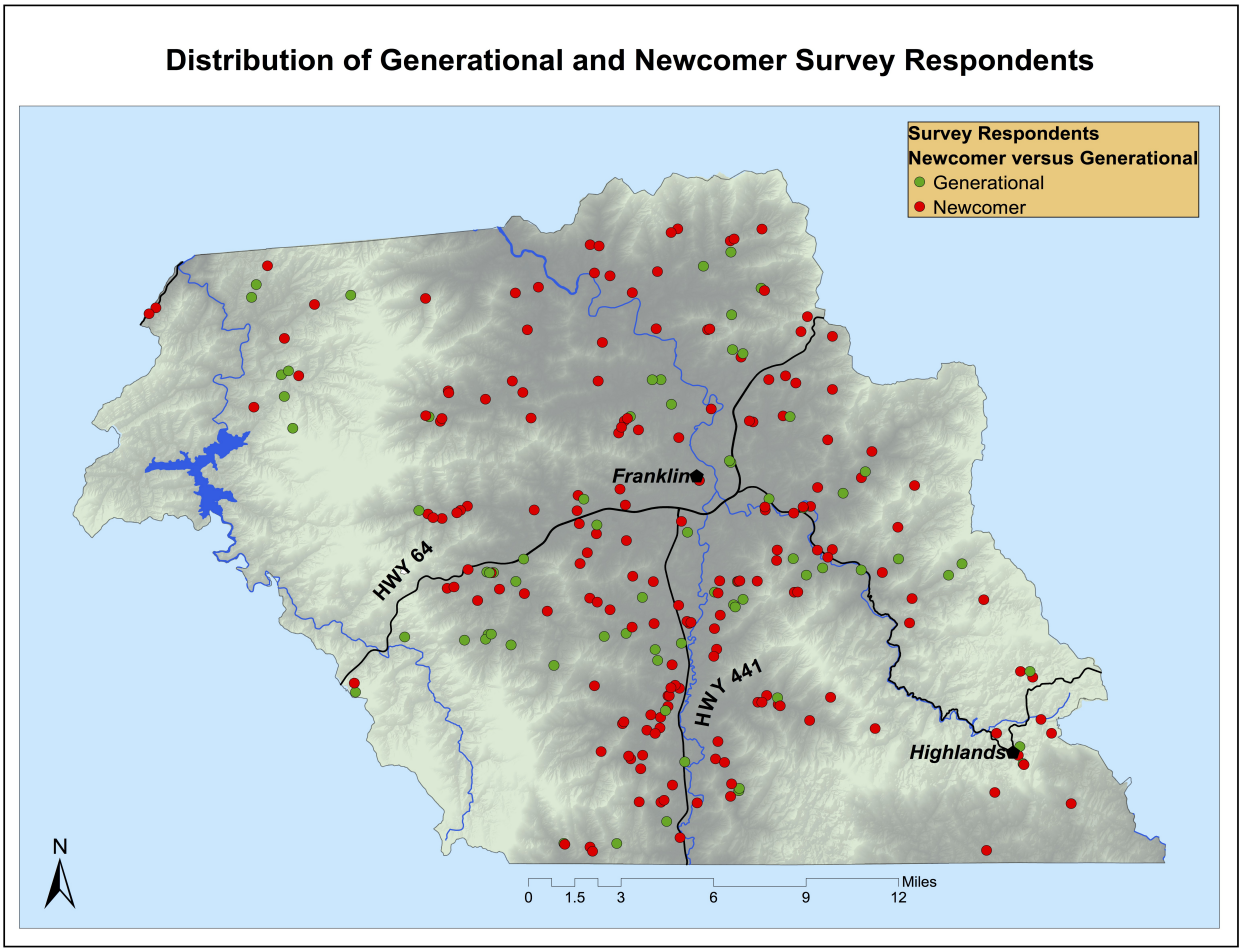

Figure 10 Map of the distribution of survey respondents, differentiated between Newcomer and Local. Map by Jessica Cook Hale.

Environmental Values

Analyzed using ordinal logistic regressions, only three questions presented significant differences between newcomer and generational landowners. Compared to generationals, newcomers are significantly more likely to disagree with the statements: "Among the

5

50 surveys were excluded from elevation analysis because the respondents chose not to include their name or address on the returned survey and intentionally obscured or removed the survey code so their identity and parcel information could not be determined.

fundamental rights in this country is the use of ones' property without outside interference," and "God intended for the environment and all its resources to be used by humans, therefore we have a right to harness nature for our benefit." newcomers were also significantly more likely to disagree with the statement "Landowners have the right to use as much water on their property as they choose regardless of how it might affect those downstream." This result was corroborated by another question in a separate section of the survey stating the inverse, for which newcomers were more likely to agree, "Landowners DO NOT have the right to use as much water as they choose...," verifying content validity on the issue of water use.

Table 7 Results of statistical analysis on environmental values.

Dependent Variable	Model	N	Independent Variable	df	p value
"Among the fundamental rights in this country is the use of ones' property without outside interference"	Ordinal Logistic	314	Newcomer	1	.005
"God intended for the environment and all its resources to be used by humans, therefore we have a right to harness nature for our benefit"	Ordinal Logistic	309	Newcomer	1	.000
"Landowners have the right to use as much water on their property as they choose regardless of how it might affect those downstream"	Ordinal Logistic	317	Newcomer	1	.000
"Landowners DO NOT have the right to use as much water as they choose regardless of how it might affect those downstream"	Binary Logistic	288	Newcomer	1	.000

When assessed as a whole, some important findings were found related to water quality and exurbanization. 53% of respondents agreed with the statement "Drinking water contamination is not a problem where I live," while 30% were unsure and 16% disagreed. However, 40% agreed that "Water contamination from livestock is a problem in Macon County," and 73% agreed with the statement "I am concerned about the quality of my drinking water."

56% of respondents were unsure if "There is enough water to support continued population growth in Macon County," and 24% disagreed. An overwhelming 91% agreed with the statement "Part of being a good neighbor is keeping my stream/land looking clean and beautiful," while 93% agreed that "Economic prosperity in Macon County is dependent upon a healthy environment."

Preference for Stream Appearance

Overall, the majority of respondents selected Photo B as the healthiest, cleanest, and most preferable to have on their property, followed by Photo F and Photo A. Furthermore, the majority also selected Photo E as the least attractive and least natural, followed by Photo D and Photo C. When results were analyzed differentially as newcomers and generationals no significant difference was found for any of the eight questions.

Stream Management

To determine whether differences between newcomers and generationals translate directly onto their stream management, survey respondents were asked specific questions about the removal of riparian vegetation and large woody debris. Assessed as a whole, 57% of respondents reported removing all or part of the riparian vegetation from the stream on their property, with 64% of those who removed it doing so once a year to once every few years. Similarly, 60% of respondents removed LWD from their streams, and 73% of those who removed LWD removed it a few times a year to once a year. Combined, 40% of respondents removed both riparian vegetation and LWD, and only 26% removed neither riparian vegetation nor LWD. When comparing stream management between newcomers and generationals, no significant differences were found.

When asked if LWD is bad for the ecological health of streams, there was a large degree of uncertainty. As a whole, 30% of respondents were unsure, 45% believe LWD is not bad for

the ecological health of streams, and 25% believe it is bad for streams. Viewed separately, difference in responses from landowner groups were not statistically significant, with 33% of generational landowners believing LWD is bad for streams compared to 23% of newcomers, and 40% of generationals believing LWD is not bad for streams compared to 47% of newcomers.

Table 8 Results of statistical analysis on riparian and LWD removal.

Dependent Variable	Model	N	Independent Variable	df	p value
Why do you cut riparian vegetation - To see the stream	Binary Logistic	190	Property Type	1	.002
Riparian vegetation removal frequency	Ordinal Logistic	175	Length of Ownership	5	.043
Large woody debris removal frequency	Ordinal Logistic	174	Age	1	.037
Why do you remove LWD - It keeps the stream clean	Binary Logistic	229	Age	1	.05
Why do you remove LWD - It keeps the stream healthy	Binary Logistic	229	Age	1	.043

Statistical analysis showed that three other factors were in fact determinants for the removal of riparian vegetation and LWD: age, property type, and length of ownership. Age was the only significant indicator associated with LWD removal. The older the landowner, the more likely they are to remove LWD from their stream more often, and more likely to remove LWD because they believe it keeps the stream clean and healthy. Property type presented as a highly significant indicator of riparian removal, with 58% of secondary residences (seasonal, vacation, weekend) reporting they cut riparian vegetation to see the stream, compared to only 29% of primary residences. Length of ownership also presented as significant, with landowners owning property "Less than 1 year – 5 years" having the lowest riparian cutting frequency compared to all other ownership lengths.

Perceptions of Stream Quality

Analyzed using ordinal logistic regressions, the majority of respondents reported 'No Change' for all nine options of noticeable changes to their stream, with the following three options showing the highest rates of change amongst respondents as a whole: 39% reported significant-somewhat decreased water level, 34% reported significant-somewhat increased silt/sediment, and 31% reported significant-somewhat increased erosion.

Table 9 Results of statistical analysis noticeable changes to stream.

Dependent Variable	Model	N	Independent Variable	df	p value
Noticed change to water level - decreased	Ordinal logistic	307	Newcomer	1	.023
Noticed change to number of fish - decreased	Ordinal logistic	283	Newcomer	1	.021
Noticed change to flooding - decreased	Ordinal logistic	297	Newcomer	1	.031

When comparing newcomer and generational landowners, generationals were more likely to say that water level had decreased, the number of fish had decreased, and the frequency of flooding had decreased. Overall, newcomers demonstrated a higher level of agreement by reporting they were "Unsure" of changes affecting their stream, whereas generationals were more likely to either agree or disagree. In contrast, when asked to rate the quality of the water in their stream on a 5-point Likert Scale ranging from Very Poor to Very Good, generationals demonstrated a higher level of agreement, ranking their stream quality as "Good," while newcomers demonstrated more variation in opinion, more likely to rank their streams as "Fair" or "Very Good."

Discussion

Table 10 Comparison of Newcomer and Generational landowners across five areas.

SocioDemographic and Property Variables	Newcomers are more likely to have a higher income, higher levels of education, smaller property sizes, shorter length of ownership, and are more likely to report their property as a secondary residence compared to Generational landowners.
Environmental Values	There appears to be a sense of agreement between the two groups across larger values, including quality of life, environmental stewardship, the importance of water quality, and economic prosperity, but they differ on values affecting their private property rights and water use.
Preference for Stream Appearance	No significant difference was found for any of the stream preference questions, and there is a large degree of consensus on which streams appeared healthy, clean, unnatural, and unattractive.
Stream Management	No significant difference was found for riparian removal or LWD removal.
Perceptions of Stream Quality	Generational landowners were more likely to perceive changes to their stream quality compared to Newcomers.

Sociodemographic and Property Variables

In general, newcomers in Macon County are more educated, wealthier, and more likely to be Democrats compared to generational landowners. These results are in line with the aforementioned census bureau data, supporting the argument that Macon County has experienced dramatic increases in median household income and education over the last 40 years, as well as earlier research characterizing the region as wealthier and more educated due to population influx driven by exurbanization (Gragson & Bolstad, 2006). Unlike the common belief held by the community, however, Newcomers are not aggregating on the steep mountain slopes throughout Macon County. These findings support the current pattern of residential development and density in forested areas near the city centers rather than steep mountain slopes, as outlined

by Kirk et al. (2012). However, as density increases it is possible that preference for lower density areas (and isolation) may drive new homeowners to purchase and build on parcels at higher elevations in the future.

Environmental Values

In this research, differences in environmental values among Newcomers and Generationals gravitated toward issues of private property rights and water use. Unlike Generational landowners who often value their land and stream for its productive capacity, Newcomers tended to value their land for its aesthetic beauty and prioritized appearance over functionality. This is understandable when viewed within the historical context of land use in Macon County and its shift from an agricultural economy to the current economy based on tourism and recreation. Whereas local livelihoods were once dependent on the land for agriculture, timber, and mining, nowadays livelihoods are disconnected from the productive capacity of the land. In general, generational landowners were more concerned with upholding private property rights and maintaining individual control of the resources found on one's property. Because generationals are more accustomed to private ownership of land and little to no land use regulation, we believe the prospect of external control over these resources is perceived as an infringement upon their rights as property owners. In contrast, newcomers were more open to external regulation of natural resources, possibly because they primarily hail from metropolitan and urban centers and are more accustomed to living with water, and sometimes land, as municipally-managed resources and the established use of regulations as a planning tool. However, there appears to be a sense of agreement between the two groups across larger values, including quality of life, environmental stewardship, the importance of water quality, and economic prosperity. This demonstrates that while landowners may share similar values on larger scale ideological issues, such as environmental stewardship and water quality, they differ

on values affecting their private property rights and water use, and the appropriate mechanisms for managing land and water in Macon County, North Carolina.

Preferences for Stream Appearance

No significant difference was found for any of the stream preference questions, and there is a large degree of consensus on which streams appeared healthy, clean, unnatural, and unattractive. Amongst both groups of landowners, respondents stated that they preferred a mixture of vegetation along streambanks, including both trees and grass. Trees were often mentioned as desirable because they are perceived as naturally occurring along streambanks, they help to prevent erosion and keep stream temperatures cool for trout, and provide shade for recreation. Grass was desirable because it was viewed as cleaner and safer for children, provides easier access to the stream, and is more comfortable for recreation. In general, interview participants said they would be happy with fully vegetated riparian buffers as long as gaps were left unvegetated and seeded with grass to provide for access and recreation.

Stream Management

Despite earlier research and our hypothesis of differential approaches to stream management, no significant difference was found for riparian removal or LWD removal. However, newcomers were more likely to report their property as secondary residences, which was a significant determinant of riparian removal in order to see the stream. In interviews, it was often expressed that seeing and hearing the stream were important factors to newcomers and often guided their stream management decisions. Therefore, although the data do not support a direct connection, these results demonstrate a correlation between newcomer status and riparian removal.

Interestingly, one of the most frequent comments in both surveys and interviews related to the ecological knowledge held by generational landowners and the relative ignorance of local

ecological conditions and stream management held by newcomers. This lack of regional ecological knowledge amongst newcomers was repeatedly mentioned by generational landowners, government officials, and community organizations. It is alleged that this ignorance results in poor land and stream management, often leading to erosion and flooding. Although this research did not measure actual ecological knowledge and cannot affirm or deny the validity of this complaint, many newcomers acknowledged their ignorance in interviews and cited generational landowners as their primary source for information and education about proper land and stream management. Several newcomers attended local classes on gardening, erosion prevention, invasive species identification and removal, rain garden and rain barrel construction, and solicited neighbors for advice. Therefore, the lack of a difference in stream management between the two groups could be explained by the predominance of newcomers soliciting generational landowners for advice and adopting local strategies for land and stream management.

Although no significant difference in stream management was found, the adoption of local management practices by newcomers will have both positive and negative ecological impacts. Generational landowners are deeply committed to environmental stewardship and maintain a strong pride in the abundance and beauty of their regional environment. They are acutely aware of land management practices that contribute to erosion or flooding and frequently volunteer advice on how to avoid such degradation. However, generational landowners also engage in land use practices and stream management techniques that impair stream health and water quality, particularly linked to agricultural practices. Although agriculture has significantly declined over the last forty years, many of the land use traditions persist today, specifically riparian and LWD removal. As a whole, 60% of all respondents removed riparian vegetation

and LWD from their streams, including newcomers, suggesting that newcomers are moving to the region and learning this stream management technique from local sources.

Perceptions of Stream Quality

The changes to stream quality that generational landowners were more likely to perceive (decreased water level, increased silt/sediment, and increased erosion) are all long-term processes that require knowledge of earlier environmental conditions. Due to their shorter length of ownership and residence in the county, it is likely that newcomers simply lack the long-term knowledge of previous conditions, making them less able to perceive the same environmental change that generationals perceived. Similar to the conditions related to stream management, differences in perceptions of stream quality reflect the lack of ecological knowledge possessed by newcomers, and their inability to gauge change in their surrounding environment compared to generational landowners.

Conclusion

As outlined above, there was no significant difference in preference for stream appearance or stream management between newcomer and generational landowners. However, there were limited differences in environmental values, and a significant difference in perceptions of stream quality between newcomer and generational Landowners. While the descriptive statistics, sociodemographic variables, and environmental values on water use and property rights demonstrate there are distinct characteristics differentiating newcomers from generationals, at present these differences are not being translated into decision-making about stream management. The difference between these two populations appears to be more complex, and we that argue research examining the impacts of exurbanization on social and ecological systems needs to address this complexity by looking beyond polarized conceptions of newcomer versus generational. This paper demonstrates that social responses to exurbanization vary, and

additional place-based regional approaches would greatly contribute to our understanding of exurbanization's impact on ecology and society, as well as provide insight for those responsible for the management and governance of these regions.

To encourage protection of water resources into the future, we recommend government officials and land managers focus their efforts on educating landowners about environmentally beneficial stream management, especially the importance of riparian vegetation and LWD. Because both newcomers and generational landowners expressed strong stewardship ethics in their responses to questions about environmental values, framing these suggestions in terms of land and water stewardship may prove more successful. Furthermore, we recommend focusing efforts on generational landowners because as the data suggests, newcomers are likely learning about stream management from local sources. Therefore, educating generational landowners about stream management will spread to other generational landowners as well as newcomers through the existing networks of social relations within the community. If educational efforts remain consistent and focused, over time the accepted method of stream management will likely evolve to reflect the practice of maintaining vegetated riparian buffers and LWD in streams. As explained earlier, culture is not static and cultural understandings of "nature" are based upon shared social understandings of the surrounding environment, understandings which are malleable, adaptive, and reflexive.

We believe the theoretical approach of cultural models as utilized within the discipline of cognitive anthropology is well-situated for such analyses because of its emphasis on variability and treatment of cultural transmission. Instead of focusing on how two population groups are different, we argue it could be more beneficial to examine how they are blending together and synthesizing their understandings of their surrounding environment. Communities experiencing the impacts of exurbanization are ideal opportunities for studying the processes of cultural

transmission and evolution, and identifying the environmental beliefs, values, perceptions, and preferences of the community is a critical first step. As development and population density continue to increase, it will become necessary to reconcile the impacts of behavior at the local scale with the hydrologic processes associated with exurbanization at the watershed scale (Groffman et al, 2003). And understanding the different models governing land use decision-making at the parcel level provides an opportunity for the progressive introduction of widespread interventions in stream management, as well as a framework for facilitating behavior change on a regional scale.

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CHAPTER 6

CONCLUSION

In this chapter, I summarize the results of my earlier chapters by reviewing the major findings of each individual paper. I then present my overall conclusions of this research and its implications for water policy and management, and follow with a discussion of the broader theoretical significance of my findings. Finally, I address some possible limitations of my research and conclude with a discussion of future directions for research.

Summary of Results

Perceptions of Water

My first paper examined the impacts of exurbanization on water resources by reviewing how two different landowner groups living in the same community perceive water. I addressed this issue by answering the following questions: 1) How do landowners in southern Appalachia perceive water and streams on their property, specifically water ownership, water use, and water stewardship, 2) Do landowners perceive an impact on water resources from the processes of exurbanization, and 3) How have landowners responded to these perceptions in their water use and stream management?

My findings show that the two landowner groups demonstrated small variations in their perceptions of water. Both Newcomers and Generational landowners perceive water as a shared resource for the community. Unlike land, which is owned and controlled by a single landowner, water was consistently described as shared specifically because it is unbounded, connected, and unable to be controlled by a single landowner. This perception that water is meant to be shared was regularly expressed using the metaphor "the downstream," representing the

acknowledgment that an individual's land use decision-making affects those around them, and in regards to water and streams, specifically those who live downstream of their land. Furthermore, the perception of sharing water extended beyond the realm of social obligation, as many landowners also described their relationship to water as a personal responsibility, and this was the only instance in which Newcomer and Generational landowners described different perceptions of how they relate to, and interact with, water on their property. Generational landowners tended to describe stewardship as "caring for the streams," and perceived actively managing the streams and land as a critical component of land ownership. In contrast, Newcomer landowners described stewardship as "not harming the streams," and preferred to engage in little to no management of the stream on their property, arguing that nature is equipped to handle itself and human intervention is unnecessary.

Interestingly, both landowner groups also shared perceptions about the impact of exurbanization on water resources. In particular, landowners were concerned about impacts to water quantity and quality from increased population growth and development. Landowners perceived water scarcity as a real threat and view drought and increased population growth as the cause. Several landowners have noticed decreased water levels in their streams and attribute this change to drought and increased water consumption by the growing population. In addition, landowners were also concerned that the consequences of continued population growth and development would impact water quality and identified sedimentation from development and pollution from population density as the biggest threats to water quality in their community. Development was seen as the primary cause of streams filling up with silt and sediment, and residents also feared increased population density would lead to the contamination of groundwater, which was a significant concern for landowners drawing water from a well, or in some cases, directly from the stream. Furthermore, both felt the local government had

demonstrated an inability to protect water resources into the future, highlighting a lack of leadership from county commissioners and the failure to enforce existing regulations implemented to protect water resources.

In response to these concerns over water security, a network of community organizations and individual county officials have worked together to encourage social cooperation and community-based environmental education without any institutional support. Local environmental organizations and community groups have played a large role in directing efforts to protect natural resources in the county, along with county officials volunteering their time to teach community-lead workshops. Due to budget cuts for environmental programs at the county, state, and federal levels, funding for environmental education and outreach programs have been significantly reduced, and in some cases eliminated.

Stream and Riparian Management

My second paper examined the decision-making processes and motivations informing the stream management practices of riparian landowners. I addressed this issue by answering the following questions: 1) Are landowners perceiving stream degradation, and if so, what do they believe is causing it? 2) How do landowners manage their streams, and to what degree is this impacting stream health? 3) What are the primary drivers influencing stream management decision-making?

My results demonstrate landowners are somewhat aware of stream degradation, identifying decreased water level, increased silt/sediment, and increased erosion as the most noticeable and significant changes to their streams. This is not surprising as changes to water level, silt/sediment deposition, and bank erosion are arguably the most visible and noticeable processes affecting stream appearance. Furthermore, eight of the nine noticeable changes to streams were reported as negative changes, indicative of landowners perceiving decreasing

stream health. When asked what they think is causing these changes to occur, respondents cited 1) weather/climate, and 2) development/construction. Increased drought due to regional climate variability and development due to population growth and exurbanization have both been identified by researchers as significant threats to stream health and water quality, and these results demonstrate that landowners are cognizant of the drier climate and rapid land use changes affecting Macon County and are aware of these impacts on local stream health. However, landowners failed to identify land management as a threat to stream health and water quality, particularly at the household level. These findings demonstrate that riparian landowners are failing to acknowledge the impacts of their own land management on their streams, instead pointing the finger at the larger scale processes occurring throughout the region.

Survey results show that 57% of respondents reported removing all or part of the riparian vegetation from the stream on their property, and 60% of respondents removed large woody debris from their streams. Combined, 40% of respondents removed both riparian vegetation and LWD, and only 26% removed neither riparian vegetation nor LWD. The top three reasons for removing riparian vegetation were: 1) It looks better, 2) To access the stream, and 3) To see the stream; while the top three reasons for removing LWD were: 1) To prevent the stream from pooling or flooding, 2) It looks better, and 3) To keep the stream clean. However, when asked if logs, branches, and limbs were bad for the ecological health of streams, 45% of landowners reported that it was nor. This shows that despite understanding that LWD is not harmful to streams, landowners are still removing it, suggesting there is another reason for engaging in this behavior. And, statistical analysis of the survey data determined that three factors were significant determinants for the removal of riparian vegetation and LWD. Property type and length of ownership presented as highly significant indicators of riparian removal, while age was the only significant indicator associated with LWD removal.

My research indicates that Tradition/Habit and Aesthetics as the two primary drivers of riparian and LWD removal in southern Appalachia. The habit of removing large woody debris from streams is partially due to practical reasons rooted in the long agricultural history of the region, and during interviews several landowners admitted they clear riparian vegetation and LWD because that is what their parents and grandparents did, and it is how they were taught to manage their land. Similarly, aesthetics was another reason landowners gave for removing riparian vegetation and LWD from their streams. Respondents acknowledged they desired a clear view of their stream from their home, and many strived to maintain a "clean" appearance for their land and streams.

And finally, both interviewees and survey respondents preferred education and information about proper stream management over regulation and financial support. Whereas information about stream management leaves decision-making control in the hands of the landowners, financial incentives were perceived as authoritative and outside of their control. It was often expressed that education and information should be the primary focus of outreach efforts, while those who seek financial support for restoration or preservation could seek it out from local agencies, leaving regulation as a last resort

Effects of Exurbanization on Land Use

My third paper examined how exurbanization is affecting the environment by measuring intra-community patterns of stream management amongst two populations of landowners in the same community. I addressed this issue by posing the hypothesis that intra-community patterns of stream management amongst Newcomer and Generational landowners in southern Appalachia will differ due to different environmental models informing their understanding of what constitutes proper stream management, and measured differences across five variables: 1)

sociodemographic variables, 2) environmental values, 3) preference for stream appearance, 4) stream management, and 5) perceptions of stream quality.

In general, results showed that Newcomers in Macon County are more educated, wealthier, and more likely to be Democrats compared to Generational landowners. And, Newcomers were not disproportionately aggregated on steep mountain slopes as is commonly believed within the community. Differences in environmental values among Newcomers and Generationals tended to gravitate toward issues of private property rights and water use. Generational landowners were more concerned with upholding private property rights and maintaining individual control of the resources found on one's property. In contrast, Newcomers tended to value their land for its aesthetic beauty and prioritized appearance over functionality. However, there appears to be a sense of agreement between the two groups across larger values, including quality of life, environmental stewardship, the importance of water quality, and economic prosperity, demonstrating that both groups may share similar values on larger scale ideological issues, such as environmental stewardship and water quality, but differ on values affecting their private property rights and water use, and the appropriate mechanisms for managing land and water in Macon County, North Carolina.

No significant differences were found for any of the stream preference questions, and there was a large degree of consensus on which streams appeared healthy, clean, unnatural, and unattractive. Amongst both groups of landowners, respondents stated they preferred a mixture of vegetation along streambanks, including both trees and grass. And, despite earlier research and my hypothesis of differential approaches to stream management, no significant differences were found for riparian removal or LWD removal. As outlined in the preceding chapter, statistical analysis showed that three other factors were in fact determinants for the removal of riparian vegetation and LWD: property type, length of ownership, and age.

However, when comparing Newcomer and Generational landowner perceptions of stream quality, Newcomers demonstrated a higher level of agreement by reporting they were "Unsure" of changes affecting their stream, whereas Generationals were more likely to say that water level had decreased, the number of fish had decreased, and the frequency of flooding had decreased. Yet, when asked to rate the quality of the water in their stream, Generationals demonstrated a higher level of agreement, ranking their stream quality as 'Good,' while Newcomers demonstrated more variation in opinion, more likely to rank their streams as 'Fair' or 'Very Good.'

Conclusions of this Research

Stream management by private landowners is directly impacting stream health and water quality throughout southern Appalachia, with over half of all landowners surveyed removing riparian vegetation and large woody debris from their streams on a regular basis. While my analysis of sociodemographic and property variables show that Newcomer and Generational landowners are in fact two distinct sub-cultures of landowners in this community, my findings suggest that this difference is presently not translating onto land use decision-making. As such, impact of land use on stream health at the household level cannot be attributed to one landowner group over the other. Both Newcomer and Generational landowners shared similar perceptions of water use and threats to water quantity and quality, and both groups identified local government as the most significant obstacle to ensuring water security into the future. Furthermore, both groups equally removed riparian and LWD from their streams. Despite different motivations for engaging in this behavior, my results demonstrate that Newcomers and Generationals equally practice this environmentally harmful form of stream management.

Therefore, my hypothesis that these two landowner groups would be differentially managing their streams was proven incorrect, which I attribute to the shared perception of water

as a communal resource. I assumed water would be viewed much like land and treated as private property that could be rightfully owned and controlled by a single landowner. However, I quickly discovered that the opposite was true, and water functioned as a form of social connection, which Strang argues is the "essence" of social and spiritual identity (2006). She states that rivers "...linked people not only physically but also in social terms, mediating familial and community ties and reciprocal exchanges. The necessity of co-management also maintained an 'epistemic community' in which people shared knowledge and values" (2004:26).

Just as the streams and rivers are connected through tributaries and branches to form a network, landowners in Macon County acknowledged their position along those waterways and often discussed water as socially and geographically binding them together as a community, demonstrated by the commonly used metaphor of "the downstream." The perception that water is meant to be shared was regularly expressed using the metaphor “the downstream,” which represents the acknowledgment that water is only flowing through a landowner's property and any inputs or damage caused will negatively impact those living downstream. Discourse of "the downstream" was commonly used by both landowner groups to reinforce the idea that an individual’s land use decision-making affects those around them, and just as they can be impacted by their neighbor upstream, their actions affect those who live downstream. And in the aggregate, everybody's land use decision-making impacts water resources for the entire community because each individual branch, spring, and stream feeds into the Little Tennessee River that is such a dominant and important feature in Macon County. Therefore, the connected network of waterways that feeds this regional water system acts as a symbolic representation of the social connections that has maintained community and identity in this mountainous region for centuries.

It is the strong social and spatial connections to water that has guided the community's response to water security concerns in a way that mimics their views on water sharing - through social cooperation and community-based environmental education. Although the region currently boasts good water quality, these conditions may quickly change as population growth and development continue, and episodic droughts and extreme weather events due to regional climate change become more frequent. Under these pressures, landowners may no longer follow the model of water sharing currently practiced in this region, and the community may begin to experience what Cadieux describes as "competing discourses of nature," in which these socially constructed landscapes become a stage for human activities (Krannich, 2001) where social conflicts arising from "competing visions for the future" become imprinted on the landscape (Hurley and Walker, 2004). So far, the failure of the local government in Macon County to provide water security for its citizens has resulted in several community organizations taking it upon themselves to educate landowners about proper stream management and water conservation, however it is still unclear whether these efforts will be enough to ensure water quality and quantity into the future.

Therefore, efforts to improve access to information about stream management is needed. Respondents identified this approach as preferred over regulation and financial incentives, making investments into education a culturally appropriate means of intervention. Furthermore, empirical studies have demonstrated that non-monetary incentives play a large role in land use decisions, and riparian management programs and policy would be more effective if geared towards these motivations (Koontz, 2001; Ryan, 2009; Stern, 2000). Although lack of access to adequate information was identified as the most prevalent, and most easily rectified barrier (Booth et al, 2004; Brook, Zint, and Young, 2003; Dutcher et al, 2004; Shandas, 2007; Theobald

et al, 2000), current budget cuts to government-sponsored environmental education and outreach programs pose a significant hurdle.

Like the failure of local government in Macon County to engage in political action which inspires confidence in water security, the state and federal budget cuts to programs educating landowners about land use and water conservation exemplify policy grounded solely in conventional economic theory, which Lansing, Lansing, and Erazo argue is an inadequate measure of the full range of services provided by environmental resources (1998). If policy aimed at better management of water resources is to be effective, I argue that it must be informed by research grounded in the processes of human-environment relations. Understanding landowner perceptions of water and how those perceptions guide stream management decision-making can provide an opportunity for engaging in socially relevant forms of intervention, and in the long-term will contribute to widespread behavior change on a regional scale.

Research Significance

My findings contribute to literature examining the impacts of exurbanization on environmental resources. The work presented in this dissertation draws on several case studies highlighting the role of the social dynamics associated with mixed communities of landowners translating onto the management, use, and reimagining of the landscape and environmental resources. Like the case study by Gosnell, Haggerty, and Byorth (2007), my research found that stream management by Newcomer and Generational landowners is driven by different motivations, however my findings have demonstrated that these differences currently are not resulting in differential forms of stream management.

Furthermore, my research contributes to theories of cognitive anthropology, as well as the anthropology of water. My findings have elucidated the role of cultural models in informing how people understand their environment and legitimate their decisions and behaviors by examining

landowner values, preferences, perceptions, and uses of water. Examining the variability found within two subcultures of landowners in Macon County contributes to a greater understanding of the role culture plays in human-environment relations by taking a place-based approach and exploring the way individuals differentially understand and manage water resources. As such, my research has added to this literature with an empirical case study demonstrating that different groups of people with different cultural histories did not behave differently in the same physical environment, as proposed by Atran, Medin and Ross (2005). In fact, the distinct subcultures of Newcomer and Generational landowners I assessed in Macon County possessed different values, sociodemographic characteristics, and cultural backgrounds, but these differences did not result in differential patterns of stream management.

The findings presented in this dissertation also provide a regional case study of water in North America that adds to the growing literature base of anthropological studies of water, which is valuable for purposes of regional and cultural comparisons. Anthropological research on water has yielded tremendous findings on human adaptability and resilience, engineering and innovation, and understandings of how humans relate to the environment. I argue that water is the most vital element necessary to sustain life on this planet, and in our increasingly globalizing world, the study of water is of critical importance. While a majority of research has focused on transboundary, continental, and even global management frameworks, addressing issues of water equity, justice, distribution, and access, my research contributes to this literature by assessing how local landowners in southern Appalachia are affected by, and perceive, current water issues within their own community.

Possible Limitations of the Research

A possible drawback of my research pertains to the survey. I received more surveys from Newcomers (n=237) than Generational landowners (n=88), and this unequal distribution could

have skewed the statistical analyses and produced a bias in my results that favored Newcomer perceptions, values, and beliefs. However, measures were taken to correct for any errors and all statistical analyses were reviewed and confirmed by a statistician.

In addition to an uneven distribution of landowners, the survey also had a rather low response rate (16%). Following Dillman's Tailored Design Method (2000) would normally guarantee a much higher response rate, however southern Appalachia contains a private, insular community of residents with a tradition of self-reliance and a strong belief in private property rights. Therefore, many survey recipients may have interpreted the mail survey as an imposition or a form of outside interference and chosen not to participate. Although the overall response rate was low, the number of returned surveys was sufficient to run statistical analyses with confidence.

Future Directions for Research

The research presented in this dissertation provides a baseline for understanding how landowners conceptualize water in southern Appalachia, and empirical data on how landowners are managing the streams on their property. Future research can contribute to long-term evaluations of human-environment relations in this region by repeating some of these analyses at a later date and measuring how responses have changed or remained constant. If regional climate change projections prove true and the region begins to experience less frequent precipitation and more intense storm events, my findings can be used as a contextual basis for understanding future research on the management and use of water resources.

Similarly, further research on exurbanization in this region would greatly contribute to the broader literature on exurban development. My research focused specifically on the impacts of exurbanization on water resources through an analysis of stream management decision-making by Newcomer and Generational landowners. However, a more critical analysis of the

social dynamics, tensions, and conflicts found in this region would prove very fruitful. Social perceptions of Newcomers by Generational landowners, and vice versa, frequently came up during my interviews and discussions with the community. While my data reflects some poignant insights into this dynamic, I feel I barely touched the surface of the tremendous cultural mixing that has been playing out in this region over the last forty years. Although I was able to successfully answer the research questions I undertook for my research, I feel like I am left with many more questions about the social changes occurring in this region. Southern Appalachia is highly understudied in exurbanization literature, and it would make a valuable contribution to broader understandings of the processes, drivers, and impacts associated with exurban growth and development.

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