

Exurbanization and Its Impact on Water Resources: Stream Management among Newcomer and Generational Landowners in Southern Appalachia

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Introduction

Referred to as exurbanization, amenity migration, counter-urbanization, rural sprawl, or neo-rural migration, the influx of urban migrants into rural communities has been increasingly studied over the last 50 years, both domestically and internationally. Exurbanization, a term Spectorsky coined in 1955, represents a "rural restructuring"¹ as rural communities, environments, and economies shift from agricultural, or productivist, to other post-productivist or neo-productivist landscapes.²

While the concept of exurbanization conforms to the general idea of "sprawl," Cadieux explains that the characterizing feature of exurbanization that differentiates it from unplanned residential development on the urban periphery is the amount of land. She argues that exurban development is 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."³

Exurbanization is also the fastest growing manner of land acquisition in the United States⁴ and a primary driver of economies transitioning from natural resource extraction

to the service industry.⁵ Scholars have expressed growing concern over the impacts of exurbanization on environmental resources,⁶ particularly its impacts on water⁷ as increased population density applies pressure on the regional water supply due to increased water consumption. Furthermore, as residential and commercial development increase within a region to accommodate growing populations of retirees and amenity migrants, increased impervious surfaces, stream sedimentation, and erosion have resulted in impaired stream health and water quality.⁸

Yet, one of the most serious threats to stream health and water quality from exurbanization is the impact of land use decision-making at the parcel level.⁹ As more rural land becomes fragmented and sold, more landowners own smaller parcels, thus intensifying land management on regional resources. In particular, stream management by private landowners, specifically the management of riparian zones, or the area between land and rivers or streams, has been highlighted as a critical area for research and restoration.¹⁰

Southern Appalachia is a water-rich region with an extensive network of streams and rivers that effectively function as a water tower for the Southeastern United States.¹¹ The region is also undergoing rapid exurban development, providing an excellent opportunity to determine if, and how, exurbanization is having an impact on the regional environment. When viewed as a watershed, parcel level decision-making can directly impact stream health and water quality. Therefore, we chose to examine intra-community patterns of stream management among two populations of landowners in the same community by surveying values about property and water rights, preference for stream appearance, perceptions of stream health, and stream management practices.

Literature Review

Interest in exurbanization often lies in its influence 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 comprised of two cultures: long-term generational landowners and newcomer landowners (hereafter referred to as “generationals” and “newcomers”). The cultural mixing can often play out in local politics, economy and business, the commodification of cultural heritage, social stratification, and land use.¹²

Research on the impacts of exurbanization on private land use demonstrates how newcomer livelihoods are often economically independent from agricultural, productivist land uses,¹³ and newcomers are more likely than their generational neighbors to be engaged in consumptive (recreation and aesthetics) and conservation land uses.¹⁴ While this land use is often characterized as post-productivist, Ilbery and Maye argued 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 described as "symbolic labor."¹⁵

These changing social dynamics are further complicated by what Riebsame et al. identified as the "last settler's syndrome," in which new settlers want the area to remain as it was upon their arrival. Riebsame's research, which assessed perceptions of changing landscapes in the Colorado Mountains, also found that the arrival of more affluent migrants to an area often heightened class distinctions as in-migration increased property values, road congestion,

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the demand for community services, and the need for additional infrastructure. In Riebsame's study, the influences of exurbanization generated conflict within communities as they not only changed the landscape, but they also required changes in management and regulatory structures.¹⁶

In 1998, Ryan examined both the motivations and outcomes of land use decision-making by newcomer and generational landowners through research on a Midwestern

river corridor and found that farmers and generational residents responded more positively to scenes of domesticated farms and developed areas, whereas newcomers were more attracted to "natural" landscapes of rivers and woods. To newcomers, the "viewshed"—an area of land that is visible to the human eye from a fixed vantage—was most significant. However, this difference in perspective on the value of place (as either productive or aesthetic) is complex, as generational residents also share an appreciation for the aesthetic value. For instance, Hoag et al. found that farmers and ranchers would often rather donate their land to conservation easements than sell their land for development by newcomers.

Gosnell, Haggerty, and Byorth examined differences in stream management decision-making among newcomer and generational landowners in southwestern Montana, finding that the management decisions of generationals focused more on increasing irrigation efficiency, while the management decisions of newcomers related primarily 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.

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 recognize the unsurpassed growth and development throughout the Southeast.¹⁷ Southern Appalachia has a long history of intensive land use, resource exploitation, poverty, and isolation.¹⁸ 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 lacked a

steady income and began migrating to major city centers. This activity marked the beginning of the Great Outmigration from roughly 1940-1960 and initiated Southern Appalachia's transition away from agriculture and industry to recreation and retirement communities.¹⁹ Over time, those who left the region were replaced by an influx of second-home owners and retirees.²⁰

Cockerill and Groothuis present three socioeconomic case studies of newcomer and generational perspectives on the aesthetic value of the landscape, regional development, and water conservation in western North Carolina.

Similar to Gosnell, Haggerty, and Byorth, they found that long-time residents perceive natural resources as agricultural and productive, while newcomers view them as a recreational-scenic amenity. They also found that unlike generational landowners, newcomers are more likely to favor zoning, are more strongly motivated by aesthetics, and more likely to believe that land use is a

... newcomers are ... more likely to believe that land use is a community issue rather than a personal choice.

community issue rather than a personal choice. Groothuis also used the "last settler's syndrome" to explore land use issues and opinions on mountain views among newcomers and generationals in western North Carolina, finding that mountain views are important to all residents, but were acutely important to individuals who choose to retire to a particular region.

Specific to our field site of Macon County, North Carolina, Vercoe et al. provide a critical analysis of the conservation trade-offs associated with exurbanization, and they use an integrative framework to discuss the complexities entrenched in the discussions, negotiations, and conflicts found within communities experiencing exurban growth. Webster et al. examined the impacts of mountainside development on stream chemistry and found that both land cover and land use affect water quality, specifically an increase in nitrate concentration, which they attribute to increased mountainside development driven by newcomers moving to the community.

These findings are increasingly troubling because research in 2005 projected that by 2020 exurban development will expand 14.3% nationwide,²¹ with a significant amount of the residential development occurring along or near waterways.²² These concerns are compounded when coupled with U.S. Environmental Protection Agency findings that households are one of the largest producers of non-point source pollution—that is, pollution originating from diffuse sources that is picked up and carried away by water moving over or through the ground and deposited into lakes, rivers, wetlands, coastal waters, and ground waters, which is now considered the biggest threat to water quality in the US.²³ Almost 70% of forestland in the southeastern United States is privately owned,²⁴ and many of those landowners have direct access to the broad network of rivers, streams, and tributaries that cover this region. Therefore, the importance of stream management practices for maintaining

stream health and water quality lies in the cumulative impacts of individual behavior, resulting in environmentally significant impacts in the aggregate.²⁵ As such, stream management by private landowners in regions experiencing exurban growth, particularly the management of riparian zones, has been identified as a critical area for research.²⁶

Riparian zones are located between terrestrial and aquatic ecosystems. Because they comprise the environmental conditions through which water and materials move,²⁷ they are a critical component in the functioning and

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health of forested ecosystems. 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 water system.²⁸

In addition to the riparian buffer found along streambanks, logs, branches, and

limbs (referred to as Large Woody Debris, or LWD), are a natural element found in streams that provide necessary food and habitat for fish and aquatic bugs.²⁹ Although the removal of riparian vegetation and LWD is detrimental to stream health, these management practices occur throughout the region.³⁰ Unfortunately, very little empirical data exists on the frequency and extent to which landowners remove riparian vegetation and LWD, or whether these stream management practices occur among both generational and newcomers.

However, in order to fully understand the land use consequences associated with exurbanization, Abrams argued that research must examine both the motivations as well as the outcomes of land use decision-making by newcomer and generational landowners. Therefore, this research goes further and also examines landowner values about property and water rights, preference for stream appearance, and perception of stream health to provide further context for understanding how landowners manage their streams. By examining the motivations associated with decisions about stream management, this study builds on extensive research demonstrating that landowner perspectives, preferences, and socioeconomic circumstances are central to the success of good riparian management and restoration.³¹

Much of this literature describes the tensions between what is perceived as aesthetically pleasing compared to what is ecologically beneficial.³² Larned studied the advantages of macrophyte cover (aquatic plants) in stream rehabilitation and found that landowners preferred frequent weeding of riparian areas, even when this negatively impacted levels of macrophyte cover. Similarly, Lewis and Popp found significant disparities between public perceptions of ecosystem integrity and actual ecosystem quality; when streams “looked best”

to participants, they were unable to host trout or demonstrate other indicators of excellent ecological conditions. Chin found that except in Sweden, Germany,³³ and Oregon (USA), non-experts viewed rivers with wood as less aesthetically pleasing, more dangerous, and in need of additional improvement than rivers without wood. Gregory and Davis likewise found the general British public prefers channels unimpeded by woody debris. The prevailing negative perceptions of wood in rivers in the United States and around the world underscore the need for more aggressive environmental education and professional training.³⁴

Methodology: Defining Newcomer and Generational Landowners

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. In-migration and exurbanization are complex and gradual processes that can peak and plateau

Generational landowners ... have been residents ... for at least 40 years and reported their property as their primary residence.

over the years, making it difficult to distinguish between native landowners, newcomer landowners, or what Williams called "neo-natives," people he describes as back-to-the-landers who moved to the region in the 1960s and '70s to escape contemporary society. Unlike the newcomers, neo-natives identify more closely with native residents, tend to rely more on a land-based economy, and resent retirees and second-home owners building houses on the mountainsides.

Unfortunately, demarcating a cutoff year to distinguish between newcomers and generationals was necessary to accomplish the goals of this study. Some studies have used length of ownership as the metric for determining newcomer status, with the standard of ten years of ownership frequently used.³⁵ However, this research follows a different model that uses the year immigration to the community dramatically increased, thereby signifying the start of population growth and the beginning of the process of exurbanization.³⁶

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, consequently, the dividing line we have used to distinguish between newcomers and generationals.

Therefore, for the purposes of this research, newcomers are landowners who are not from Macon County or have not been residents of Macon County for at least 40 years. If a landowner has owned the property for 40 years but reported it as a secondary residence (seasonal, weekend, or vacation home), he/she was also considered a newcomer. Generational landowners are landowners from Macon County, or those who have been residents 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, was from Macon County, and the residence type was primary, he/she was considered a generational landowner. In a few instances where landowners did not fit into the predetermined categories, judgments were made and participants were assigned to the category the authors felt best represented their status.³⁷ All statistical analyses were run on the survey respondents as a whole, as newcomers, and as generational landowners.

Table 1: Profile of Survey Respondents

Sample Size	n=325
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 Frequency	Non-Farm (80%), Farm (20%)
Landowner Group	Newcomer (n=237), Generational (n=88)

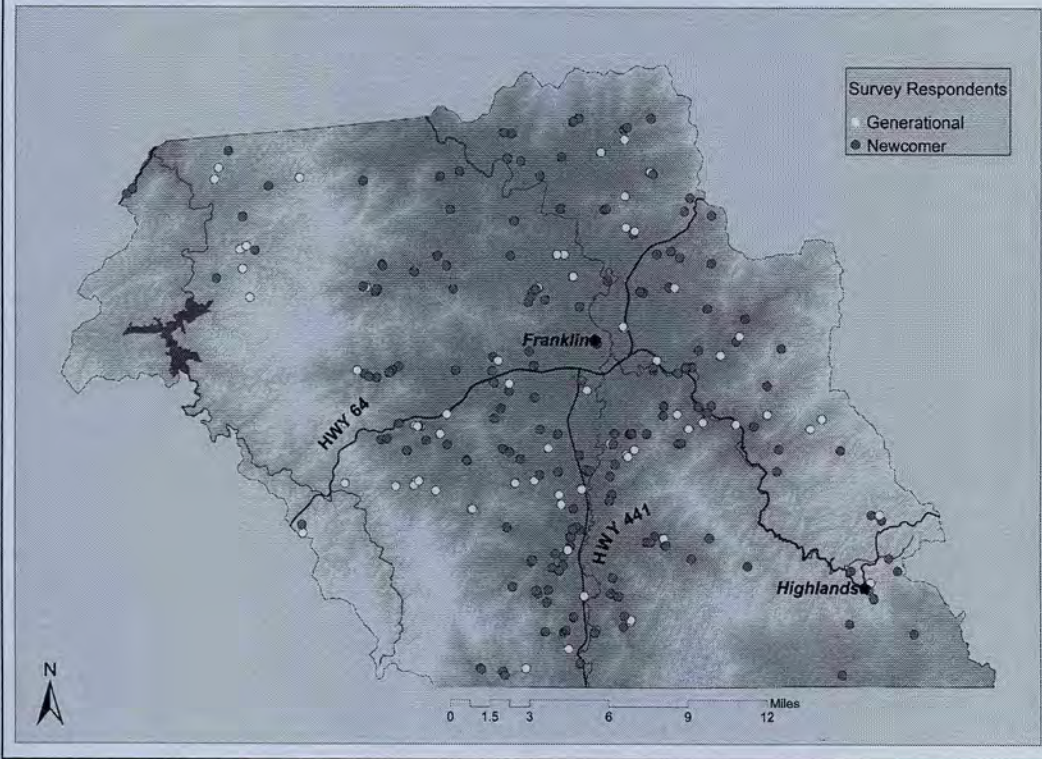
Site Description

The portion of Southern Appalachia under consideration spans from southern Virginia to north Georgia and eastern Tennessee to the western Carolinas. This research focused on the southern portion of the Blue Ridge Mountains, a region with unique geologic features formed after hundreds of millions of years of erosion. 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, and boasting extremely high levels of biodiversity. The region is characterized by steep topography, with elevation ranging from 600 to 2000 meters above sea-level. 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.³⁸

Our area of focus was Macon County, North Carolina. Nestled in the foothills of the Southern Appalachian mountain chain, it 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.³⁹ Macon County lies within the Little Tennessee Watershed, with the Little Tennessee River flowing north through the county, forming an expansive network of waterways.

According to the census bureau, the county had a population of 33,922 in 2010, and has experienced a 68% increase in population from 1980-2010, a 245% increase in median household income, as well as increased levels of education, and per capita water use. Increased population growth and density are impacting land use, with farm acreage decreasing 14% and the number of farms decreasing 9% in the ten-year period between 1997-2007, while the

Distribution of Generationals & Newcomers in Macon County, NC



value of farm land and buildings increased 100%, and the number of non-farm private businesses increased 28% during the same period. This level of growth exceeded rates for the surrounding six counties and the state, making Macon County one of the fastest growing counties in North Carolina.⁴⁰

Data Collection and Analysis

We collected and analyzed data using a combination of qualitative and quantitative methods. We conducted a total of eight interviews with county and state government officials, local non-governmental organizations, 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 17 interviews were conducted with 21 landowners⁴¹ from September 2011 to February 2012. All landowners had a stream running through or bordering their property: eight interviews were with generational landowners, and nine with newcomer landowners. Interviews ranged from one hour to three hours in length, resulting in a total of 28 hours of audio. Interviews followed 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 values about property and water rights, aesthetic preferences for

streams, stream management, and perceptions of stream health. The analyzed qualitative data from the interviews provided the basis for constructing the second phase of this study, a 12-page mail survey.⁴²

The mail survey included five sections with questions about 1) preference for stream appearance, 2) details about the property, 3) stream management practices, 4) opinions and values, and 5) sociodemographic information. Survey design followed the 2000 Dillman Tailored Design Method, and we conducted a pilot survey in a neighboring county prior to the survey in Macon County. Surveys were mailed in August 2012, followed by reminder postcards two weeks

We asked eight questions to determine respondents' preferences for stream appearance.

later, and a second mailing of surveys 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. Survey participation was encouraged through 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 as undeliverable, and 325 were returned completed, for a response rate of 16%. However, of the completed surveys, 50 of the survey participants 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, excluding this subset from analysis involving elevation or location within the county. Although the overall response rate was low, the number of returned surveys was sufficient to run statistical analyses.

We analyzed survey data 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. The University of Georgia Statistics Consulting Center reviewed and confirmed the results. We performed qualitative analyses of the open-ended comment boxes using content analysis, building off of the thematic framework developed from the interview data. Both the grounded theory and content analysis approaches were performed following the framework outlined in Bernard and Ryan.

We asked eight questions to determine respondents' preferences for stream appearance. The respondents answered each question using six photographs of streams depicting different types of riparian vegetation. The photos included streams of similar size and a gradient of riparian vegetation ranging from no riparian buffer, to bushy vegetation along the stream and no trees, to a thick riparian buffer. 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 3 x 4 inches, printed in color on 8.5 x 14 photo quality paper, and inserted as a leaflet into the first page of the survey. [To see these photos, turn to p. 38.] It is important to note that biases can occur when asking survey respondents to compare static images, especially images focused on riparian areas.⁴³ To minimize bias, all stream photos included in the survey were taken from the same angle and printed in color on photo quality paper.

To determine stream management techniques, respondents were asked a series of questions about riparian removal and LWD removal to determine whether and 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. Respondents also had the option of providing their own explanations in an open comment box for why they engaged in the activity.

To determine values on property and water rights, survey respondents answered 13 questions rating their level of agreement/disagreement on a 5-point Likert-type scale ranging from "strongly disagree" to "strongly agree." Question topics include property rights, water quality, ecological knowledge, water scarcity, and the relationship between the environment and economy.

To determine perception of stream health, we presented survey respondents with a 5-point Likert-type 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 in their stream, and had the option of describing in an open comment box what they believed caused that change.

While we are confident that the methods used for this study were best suited for the objectives of this research, we would like to acknowledge a few limitations. First, the response rate for the survey was low compared to generally accepted standards. Use of Dillman's Tailored Design Method would normally guarantee a much higher response rate; however, much of Southern Appalachia remains rural, with communities of residents with a widely held preference for privacy. This desire for privacy was evidenced by the surveys returned with the name, address, and survey code removed. Furthermore, at the time of the survey, there was an ongoing debate within the community about a set of proposed zoning regulations,⁴⁴ and questions about land management and water use may have been viewed as suspicious or politically motivated. In comparison, similar mail surveys produced response rates of 43% in Watauga County in 2005, and 30% in Watauga and Ashe counties in 2013.⁴⁵

Furthermore, generational landowners represented 27% of the survey responses while newcomers represented 73%, and this disparity may have

skewed some of the survey results. Because of this unequal distribution of survey responses, we relied heavily on the interview data to ensure the perspective of generational landowners was represented in this study. For future surveys examining exurbanization in Southern Appalachia, we recommend implementing measures to correct for this issue.

And lastly, it is important to acknowledge that survey data is self-reported data and reflects only stated behavior, not actual behavior. As with any form of self-reported data, misrepresentations can occur. However, the ethnographic data and landowner tours from the interviews help to balance the limitations of the self-reported survey data and provide context for the results of this study.

Findings: Sociodemographic and Property Variables

In general, the mail survey indicated newcomers in Macon County are more educated, wealthier, and more likely to be Democrats compared to generationals. For income and education, data was analyzed using an ordinal logistic regression, and results showed that newcomers are more likely to have a higher income and to have attained a higher level of education 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 reported their affiliation as Republican and more newcomers reported 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 more male than female.

Newcomers are also more likely to report their property as a secondary residence compared to generationals. For property size and length of ownership, we analyzed data 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, we analyzed data using a binary logistic regression and showed that newcomers are more likely to report their property as a secondary residence as compared to generationals.

However, similar to results by Kirk, Bolstad, and Manson, we found no significant relationship between newcomer status and parcel elevation, contradicting the widely held belief that a consequence of population growth due to exurbanization is 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 ($n=74$).

Values

In this research, differences in values among newcomers and generationals gravitated toward issues of property rights and water use. Only three questions presented significant differences between newcomers and generationals

when analyzed using ordinal logistic regressions. Compared to generational landowners, newcomers are significantly more likely to disagree with these statements: "Among the 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 this 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.

In general, our survey and interview data showed that generationals were more concerned with upholding private property rights and maintaining individual control of the resources found on one's property. Because generational landowners in this region are more accustomed to little-to-no land use regulation, we postulate the prospect of external control over these resources is perceived as an infringement upon private property rights. In contrast, newcomers were more open to external regulation of natural resources, possibly because they primarily hail from metropolitan and urban centers and were more accustomed to living with water, and sometimes land, as municipally managed resources.

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. The interview data corroborated the survey results as newcomers often spoke of their preference for maintaining the aesthetic beauty of their property. This is understandable when viewed within the historical context of land use in Macon County and its shift from an agricultural economy to a tourism and recreation-based economy.

However, the mail survey demonstrated 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. When assessed as a whole, some important findings were found related to water quality and exurbanization. Fifty-three percent 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

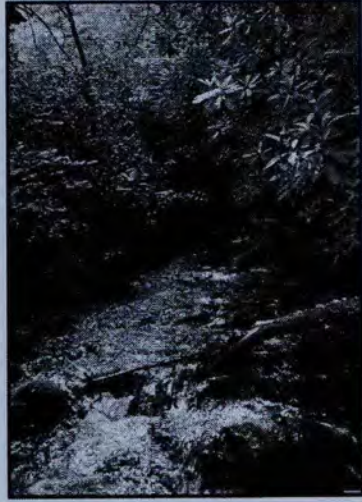
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A



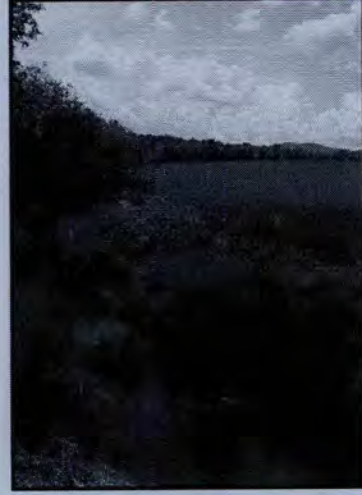
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C



D



E



F



“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.” Fifty-six percent 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 this 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.” This demonstrates that while landowners may share similar values on larger scale ideological issues, they differ on values affecting their private property rights and water use, and the appropriate mechanisms for managing land and water in Macon County.

Preference for Stream Appearance

From the mail survey, we found no significant difference for any of the stream preference questions, and there was a large degree of consensus on which streams appeared healthy, clean, unnatural, and unattractive. Overall, the majority of respondents selected Photo B as the healthiest, cleanest, and most preferable stream to have on their property, followed by Photo F and Photo A. Furthermore, the majority selected Photo E as the least attractive and least natural, followed by Photo D and Photo C. When results were analyzed differentially between newcomers and generationals, no significant difference was found for any of the eight questions.

During the interviews, both groups of landowners stated that they preferred a mixture of vegetation along stream banks, including both trees and grass. Trees were often mentioned as desirable because they are perceived as naturally occurring along stream banks, and they help to prevent erosion and keep stream temperatures cool for trout while providing 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, both newcomers and generational 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

Surprisingly, the survey yielded no significant difference for riparian removal or LWD removal between newcomers and generationals. 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 removing it 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.

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. Statistical analysis showed that three 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 landowners, the more likely they were 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

The adoption of local stream management practices by newcomers will have both positive and negative ecological impacts.

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. 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 survey data does not support a direct connection, these results do demonstrate a relationship 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 generationals and the relative ignorance of local ecological conditions and stream management held by newcomers. However, 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% believed LWD is not bad for the ecological health of streams, and 25% believed it is bad for streams. Viewed separately, difference in responses from landowner groups were not statistically significant, with 33% of generationals 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.

Yet, this lack of regional ecological knowledge amongst newcomers was repeatedly mentioned by generational landowners, government officials, and community organizations during interviews. It is alleged that this ignorance results in poor land and stream management by newcomers (such as building houses on mountainsides), 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 themselves acknowledged their ignorance during interviews and cited generationals 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.

Although no significant difference in stream management was yielded from the survey, 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, as evidenced from the surveys and interviews. 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, generationals 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 40 years, many of those land use traditions persist today, specifically riparian and LWD removal.

Perceptions of Stream Quality

When analyzed using ordinal logistic regressions, the majority of respondents reported “no change” for all nine options of noticeable changes to their stream. The following three options showed 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.

When comparing newcomer and generational landowners, generationals were more likely to say that water level, the number of fish, and 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-type 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.”

The survey indicated the changes to stream quality that generationals 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 possible that newcomers simply lack the long-term knowledge of previous conditions, making them less able to perceive the same environmental change that generationals perceive.

Overall, development and increasing population density were identified by interviewees and survey respondents as the biggest causes of sedimentation and pollution, and therefore perceived as the greatest threats to water quality in the region. Development was seen as the primary cause of streams filling up with silt and sediment, with several interviewees recounting stories of rivers

turning yellow or red from the soil washing down the mountains below construction sites. Landowners 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. Landowners also attributed decreased stream levels to drought and increased water consumption by the growing population.

Table 2: Comparison of Newcomer and Generational Landowners

Sociodemographic and Property Variables	Newcomers are more likely to have 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 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.

Conclusion

In order to fully understand the land use consequences associated with exurbanization, scholars argue that research must examine both the motivations and outcomes of land use decision-making by newcomer and generational landowners.⁴⁶ We contribute to this literature by presenting data on the stream management practices of newcomers and generationals in Southern Appalachia by surveying values about property and water rights, preference for stream appearance, perceptions of stream health, and stream management practices.

This research yielded no significant difference in preference for stream appearance or stream management between newcomers and generationals; however, newcomers and generationals had limited differences in values about property and water, and perceptions of stream quality. While the descriptive statistics, sociodemographic variables, and 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 stream management decision-making. The difference between these two populations appears to be more complex, and we argue that research examining the impacts of exurbanization on social and ecological systems needs to highlight the levels of complexity and polarizing misconceptions that exist among newcomers and generationals. Rather than focusing on how two population groups are different, we recommend that future research focus on how newcomers and generationals may blend together and synthesize their understandings of the surrounding environment. Communities experiencing the impacts of exurbanization are ideal for studying the processes of cultural transmission, and identifying the environmental beliefs, values, perceptions, and preferences of a community is a critical first step.

Yet, a gap remains between the possession of environmental knowledge and awareness, and engaging in pro-environmental behavior.⁴⁷ As the results of this study demonstrate, respondents seem able to identify a healthy riparian area, but some environmental practices in Southern Appalachia do not reflect this understanding. To help bridge environmental knowledge and action, Kollmuss and Agyemen advocate for focusing on external (e.g., institutional, economic, social and cultural) and internal (e.g., motivation, pro-environmental knowledge, awareness, values, attitudes, etc.) factors within a community. When education efforts reflect cultural understandings—through the distillation of internal and external factors—future planning of riparian landscapes can incorporate innovative design elements that could achieve ecological goals while also reflecting cultural values in Southern Appalachia.⁴⁸

Most importantly, our research demonstrates how social responses to exurbanization vary, and how place-based regional approaches can greatly contribute to our understanding of exurbanization's impact on environment and society. 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.⁴⁹ Understanding 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.

Notes

1. Gosnell & Abrams, 2009; Nelson, 2001; Woods, 2003.
2. Darling, 2005; Gosnell & Abrams, 2009; Holmes, 2002; Ilbery & Maye, 2010; McCarthy, 2007; Wilson, 2001. Lowe, et al., have defined productivism as "a commitment to an intensive, industrially driven and expansionist agriculture with state support based primarily on output and increased productivity" (p. 221).
3. Cadieux, 2011, p. 343.
4. Brown et al., 2005; Heimlich & Anderson, 2001; Lohse & Merenlender, 2009; Theobald, 2003.

5. Egan & Luloff, 2000.
6. Abrams et al., 2012; Dale, Archer, Chang, & Ojima, 2005; Hansen et al. 2005; Maestas, Knight, & Gilgert, 2003; Theobald, 2005.
7. Compas, 2007; Gosnell, Haggerty, & Byorth, 2007.
8. Lohse and Merenlender, 2009; Nassauer et al., 2004; Radeloff et al., 2005.
9. 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.
10. Audrey, Briggs, & Kroesen, 2009; Groffman et al., 2003.
11. Viviroli et al., 2007; Webster et al., 2012.
12. Abrams et al., 2012; Armstrong & Stedman, 2013; Egan & Luloff, 2000; Gosnell & Abrams, 2009; Keefe, 2000.
13. Gosnell & Travis, 2005.
14. Gosnell, Haggerty, & Byorth, 2007; Schrader, 1995.
15. Holloway, 2000.
16. Riebsame et al., 1996.
17. Cromartie, 2001; Culbertson et al., 2008; Eller, 2008.
18. Billings and Blee, 2000; Davis, 2000; Dunaway, 1996; Eller, 2008; Halperin, 1990; Reynolds, 2001; The Appalachian Land Ownership Task Force, 1983; Williams, 2002.
19. Keilman, 2003; Mackun, 2005; Shelley & Roseman, 1978.
20. Gragson & Bolstad, 2006.
21. Theobald, 2005.
22. Compas, 2007.
23. U.S.Environmental Protection Agency, 2007; Dutcher et al., 2004; Ryan, 2009.
24. Wear & Greis, 2002.
25. 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.
26. Audrey, Briggs, & Kroesen, 2009; Groffman et al., 2003.
27. Gregory et al., 1991; Knoepp & Clinton, 2009.
28. Bunn et al., 1999; Clinton, Vose, & Fowler, 2010; Fischenich & Morrow, 2000; Flebbe, 1999; Hession et al., 2003; Houser et al., 2005; Jones et al., 1999; Silk & Ciruna, 2005; Wallace, Grubaugh, & Whiles, 1993; Wallace et al., 1999; Walker et al., 2009; Young & Huryn, 1999.
29. Fischenich & Morrow, 2000; Flebbe, 1999; Wallace, 1993.
30. Clinton, Vose, & Fowler, 2010; Flebbe, 1999; Wallace, 1993; Walker et al., 2009.
31. Buckley & Crone, 2008; Flint, Luloff, & Finley, 2008; Larson, 2009; Nowak & Cabot, 2004; O'Brien, 1994; Piégay et al., 2005; Rosenberg & Margerum, 2008; Ryan, 2009; Shandas, 2007; Silvano et al., 2005; Sweeney & Blaine, 2007; Theobald et al., 2000; Wear et al., 1996.
32. Larned et al., 2006; Lewis & Popp, 2013.
33. Piégay et al., 2005.
34. Gregory & Davis, 1993; Wyzga et al., 2009.
35. Graber, 1974; Fortmann & Kusel, 1990.
36. Gosnell, Haggerty, & Byorth, 2007; Krannich, Petrzalka, & Brehm, 2006; Smith & Krannich, 2000.
37. A small number of respondents had grown up in the county, lived elsewhere a few years, and moved back to the county. In these instances, we used the cumulative number of years living in the county and if it was over 40 years, assigned them to the Generational category. Similarly, one landowner had owned the parcel over 40 years but had primarily used it as a seasonal home, only using it as a primary residence for a short period since retirement. And when asked, this individual self-identified as a Newcomer.
38. Swank, Vose, & Elliott, 2001.

39. Kirk, Bolstad, & Manson, 2012.

40. <http://www.census.gov/>.

41. Four couples were interviewed together, and 13 individuals were interviewed alone.

42. The subsequently discussed results section was gleaned from the 12-page mail survey. However, the findings section of this paper incorporates both interview and survey results. For a copy of the survey referenced in this article, see a link on *AppalJ*'s website: appjournal.appstate.edu. Please contact the primary author before using, reproducing, or publishing the survey.

43. Lewis and Popp, 2013.

44. Gustafson, 2015.

45. Cockerill and Groothuis, 2014.

46. Abrams et al., 2012.

47. Kollmuss & Agyemen, 2002.

48. Nassauer et al., 2001.

49. Groffman et al., 2003.

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