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Despite growing interest in urbanization and its social and ecological impacts on formerly rural areas, empirical research remains limited. Extant studies largely focus either on issues of social exclusion and enclosure or ecological change. This article uses the case of sweetgrass basketmaking in Mt. Pleasant, South Carolina, to explore the implications of urbanization, including gentrification, for the distribution and accessibility of sweetgrass, an economically important nontimber forest product (NTFP) for historically African American communities, in this rapidly growing area. We explore the usefulness of grounded visualization for research efforts that are examining the existence of "fringe ecologies" associated with NTFP. Our findings highlight the importance of integrated qualitative and quantitative analyses for revealing the complex social and ecological changes that accompany both urbanization and rural gentrification. **Key Words: fringe ecologies, grounded visualization, nontimber forest products, rural gentrification, urbanization.**

尽管城市化及它对前农村地区的社会和生态的影响越来越受到瞩目，实证研究却仍然有限。现有研究主要关注社会排斥与封闭问题或生态变化。本文采用在美国南卡罗来纳罗州普莱森特山的香草篮子编织工作为例子来探讨城市化包括绅士化对香草的分布和可及性的影响。香草在这个迅速发展的地方是传统非洲裔美国人社区一个重要非木材林产品(NTFP)。我们探讨了可视化对研究有关非木材林产品的"附带生态"的存在的有用性。我们的结果指出综合定性和定量分析用来揭露伴随着城市化以及乡村绅士化的复杂社会和生态变化的重要性。**关键词：附带生态，扎根可视化，非木材林产品，乡村绅士化，城市化。**

No obstante el creciente interés en la urbanización y su impacto ecológico y social en áreas que anteriormente eran rurales, las investigaciones empíricas siguen estando limitadas. Los estudios existentes se concentran principalmente ya sea en problemas de exclusión y limitación social o de cambio ecológico. En este artículo se usa el caso de la cestería con hierba de la virgen (*sweetgrass*) en Mt. Pleasant, Carolina del Sur, para explorar las consecuencias de la urbanización, incluyendo el envejecimiento, en la distribución y accesibilidad de la hierba de la virgen, un importante producto forestal no maderable (nontimber forest product, NTFP) para las históricamente comunidades americanas africanas en esta área de rápido crecimiento. Exploramos la utilidad de la visualización empírica en los esfuerzos de investigación que están analizando la existencia de "ecologías marginales" asociadas con los NTFP.

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Nuestros resultados recalcan la importancia de los análisis cualitativos y cuantitativos integrados para revelar los complejos cambios sociales y ecológicos que acompañan tanto la urbanización como el envejecimiento rural. **Palabras clave: ecologías marginales, visualización empírica, productos forestales no maderables, aburguesamiento rural, urbanización.**

Rural geographers are increasingly focused on the influence of in-migration and associated urbanization on social and ecological change in formerly rural places. Likewise, there is growing recognition of the importance that nontimber forest products (NTFP) or resources play in some households in the United States, including subsistence activities (collection and use; Emery and Pierce 2005; Robbins, Emery, and Rice 2008). Previous research has examined rapidly changing rural areas (Brown 1995; Nesbitt and Weiner 2001) as well as urban settings (Jahnige 1999; Gabriel 2006). Urbanization, in suburban and exurban forms, simplifies and fragments existing land cover, often transforming ecological systems, functions, and species composition (see, e.g., Pickett et al. 2001). Meanwhile, research on rural change has identified the emergence of gentrification pressures in many places experiencing rapid in-migration and increasingly urban residential development (Brown 1995; Walker and Fortmann 2003; Ghose 2004) as well as processes of privatization that are reshaping resident interactions with their local environments (McCarthy 2001; McCarthy and Prudham 2004; Robbins and Luginbuhl 2005). Whereas the rural gentrification literature has highlighted processes of social and cultural displacement, research on privatization and nature has documented a new enclosure movement (McCarthy 2001; McCarthy and Prudham 2004). To date, researchers have identified several trends that raise questions about who has access to what kinds of nature and through what types of access regimes. What are the ecological and social consequences of urbanization for the "fringe ecologies" of once rural communities that practice some form of resource extraction from historical commons?

In this article, we use a pilot study to examine the usefulness of grounded visualization, or the integration of geographical information systems (GIS) and ethnographic techniques associated with grounded theory, for understanding the intersection of urbanization and NTFP practices. Through the case of sweetgrass basketmaking and "disappearing" sweetgrass (*Muhlenbergia sericea*), we develop a framework to examine the ways residential development is altering the resource ecologies associated with this form of coiled basketry practiced by African Americans in the greater Mt. Pleasant area of the South Carolina Low Country. Popular discourse on the status of basketmaking in the greater Charleston, South Carolina, area (Figure 1) portrays an art form associated with the Gullah culture under threat from the consequences of rampant residential and commercial development in formerly rural but now increasingly (sub)urbanized areas (Hunt 2006). We explore whether sweetgrass is diminishing as a result of ecological changes associated with residential and commercial development. In the process, we assess the extent to which social processes of enclosure and gentrification are central to understanding these altered ecologies. We draw on recent work in critical GIS (Knigge and Cope 2006; Kwan and Knigge 2006; Pavlovskaya 2006), rural studies (see, e.g., Madsen and Adriansen 2004), and land change science (see, e.g., Fox et al. 2002) that has emphasized the need to integrate qualitative and quantitative methods, particularly at the analytical level (Knigge and Cope 2006), to understand better processes important to rural change (Madsen and Adriansen 2004; McCarthy 2006). In particular, we rely on Knigge and Cope's (2006) concept of grounded visualization to reveal urbanization patterns and the complexity of the social and ecological consequences for sweetgrass distributions and resource access.

Our case has important implications for NTFPs and gathering practices. It specifically demonstrates the difficulty of mapping the disappearance (or persistence) of important natural resources on private lands in rural areas that are experiencing the ecological and social transformations that often accompany urbanization. We argue that "finding sweetgrass" is not as straightforward as it would first appear. Indeed, our framework strongly suggests that urbanization creates complex changes in the biophysical conditions of NTFP ecologies

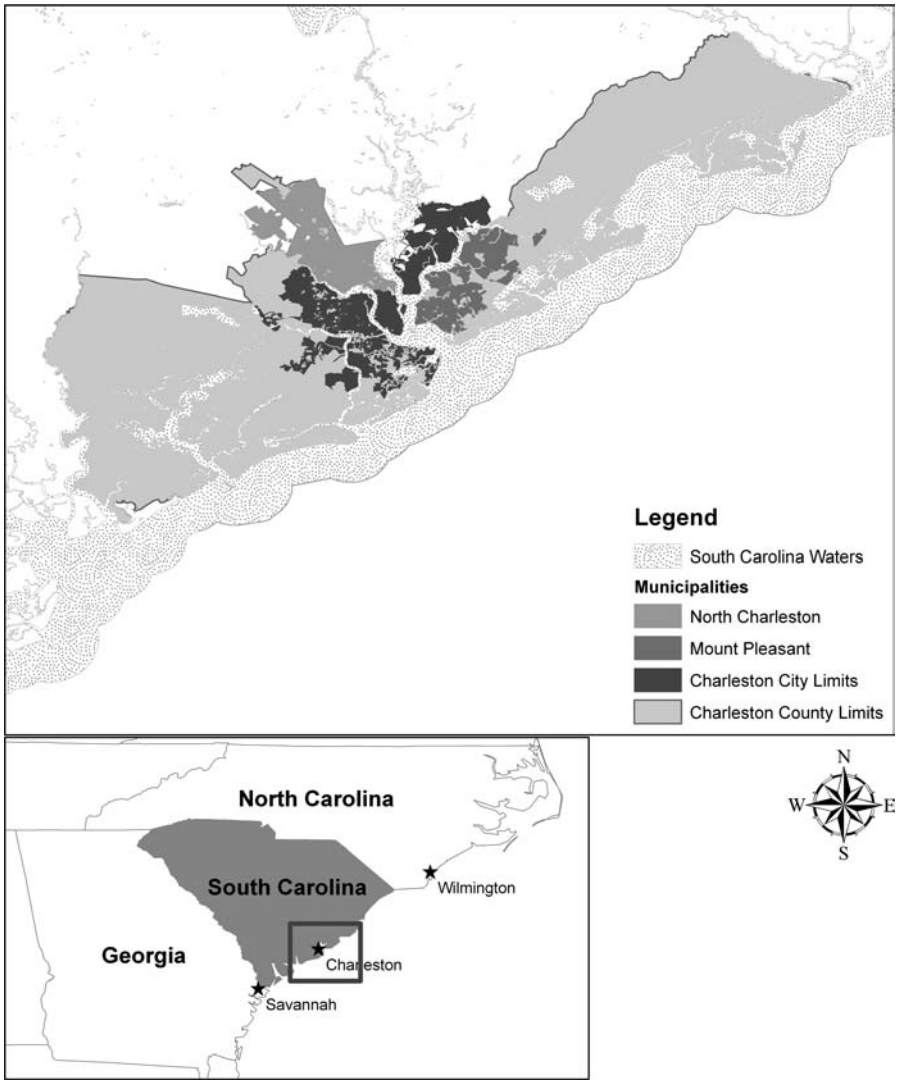

Figure 1 *Charleston County, South Carolina, in U.S. perspective.*

and the property regimes that are associated with gathering practices, such as with sweetgrass basketmaking. Specifically, although gentrification pressures appear strong and ongoing, the extent to which residential development contributes to complete enclosure, by which we mean the loss of access to historic commons through privatization, is less clear. Further, we contend that this case documents the importance of grounded visualization, precisely because this integrated qualitative–quantitative approach sheds light on the ways the social and ecological impacts of urbanization and associated gentrification are both interwoven and uneven. It highlights the importance of both remaining and emerging interstitial spaces associated with "fringe ecologies" in urbanizing places for marginalized communities, in this case comparatively poorer African Americans, and the continuation of their gathering

practices. A particularly important contribution is the more nuanced insight grounded visualization can provide to scholars and practitioners interested in understanding resource use and access in rapidly urbanizing landscapes.

Background Literature

NTFPs and gathering practices in the United States are increasingly recognized and studied by geographers (Alexander, Weigand, and Blatner 2002; Jones, McLain, and Weigand 2002; Emery et al. 2003; Emery, Martin, and Dyke 2006; Robbins, Emery, and Rice 2008), including collection of resources in rural (Jones, McLain, and Weigand 2002) and urban environments (Jahnige 1999, 2002; Gabriel 2006). This research paints a picture of fringe ecologies or interstitial spaces where wild nature produces a diversity of products that often are not the priority species for dominant land management regimes. To date, much of the research on NTFP gathering largely has focused on the Pacific Northwest and on conflicts between these nontraditional users and the more traditional users associated with forests managed for timber harvest or the management implications of harvesting levels (see, e.g., Love and Jones 2001; McLain 2002; see also Robbins, Emery, and Rice 2008). Existing research also has documented harvesting of products from national forests, such as fungi (Molina et al. 1993; Richards 1997; Liegel, Pilz, and Love 1998; Freed 2001), fruits and nuts (Freed 2001), and other botanicals (Vance 1995; Lynch and McLain 2003; Butler, Leatherberry, and Williams 2005) as well as, more generally, the collection of wild food (Palmer 2000; Pouta, Sievanen, and Neuvonen 2006) and berries (Cordell 2004). Importantly, collecting may fulfill both economic and noneconomic needs for the same person (Emery 1998, 2001; Jones, McLain, and Weigand 2002; Emery et al. 2003; Robbins, Emery, and Rice 2008). Researchers have also highlighted collecting by minority populations who gather materials for their household economies and who have experienced political tensions with other groups at sites where this gathering takes place (Hansis 1996; Richards and Creasy 1996; McLain and Jones 1997; Emery 1999, 2002; Brown and Marin-Hernandez 2000; Freed 2001; Jarosz and Lawson 2002).

Rural scholars have described the emergence of gentrification pressures in rural parts of the western United States (Brown 1995; Walker and Fortmann 2003; Ghose 2004), Canada (Halseth 1998), and the United Kingdom (Phillips 1993, 2004) that often result from changing investment strategies, economic restructuring, and changing government policy (Schroeder, St. Martin, and Albert 2006). Because property investment and residential development in these areas often centers on the valorization of landscapes for their aesthetic, ecosystem-related, and recreational qualities instead of their productive capacity (i.e., landscapes of consumption vs. landscapes of production), rural gentrification leads to social replacement and displacement as higher income property buyers acquire available land for personal home construction or residential development projects (Nesbitt and Weiner 2001; Walker and Fortmann 2003; Brogden and Greenberg 2003; Ghose 2004). For example, rural gentrification may lead to the marginalization of local culture, economies, and traditions by many, but certainly not all, newly arriving residents (Brown 1995; Nesbitt and Weiner 2001; Walker and Fortmann 2003; Walker, Marvin, and Fortmann 2003). These places may well experience changing resource ecologies (Brogden and Greenberg 2003; Walker, Marvin, and Fortmann 2003; Walker, Marvin, and Hurley 2006) and new ecological management regimes (Brogden and Greenberg 2003; Gosnell, Haggerty, and Travis 2006; Walker, Marvin, and Hurley 2006; Reed 2007). Indeed, Darling (2005) describes a particular form of gentrification, which she terms "wilderness gentrification," that results specifically from the effects of state regulation to protect natural areas that result in disinvestment in working-class housing and investment in increasingly expensive seasonal homes in these rural places. To the extent that scholars of rural gentrification have focused on the consequences for gathering practices, however, research has documented real and perceived losses of valued lifeways, often focusing on largely white resource users and the availability of what Brown (1995, 247) describes as "assets" (e.g., hunting areas, fishing sites, or even swimming holes; see, e.g., Nesbitt and Weiner 2001) that are lost through processes of enclosure. Yet, little systematic attention

has been paid to ways these socioeconomic transitions may inadvertently enclose these assets or displace people from resource areas, particularly in contexts where NTFPs occur on predominantly private and not public lands.

Research on the neoliberalization of nature and privatization largely focuses on new enclosure movements that destroy historic commons or access to public goods and the way that private property rights, which secure ownership for a few through the logics of the market, have been extended through policies ranging from global trade policy (McCarthy 2001; McCarthy and Prudham 2004) to changes in wildlife policy in the American West that seek to privatize formerly public goods (Robbins and Luginbuhl 2005). The central theme of this research identifies numerous and diverse practices and places where the logics of the market are "presented as an inevitable and natural state" (Heynen and Robbins 2005, 7). Swyngedouw (2005) has argued that tactics of dispossession are a central feature of contemporary global dynamics of capital accumulation. As Robbins and Heynen (2005, 7) note, however, we are only beginning to understand the intended and unintended consequences of resistance to neoliberalization and the ways this resistance helps us break down the "monolithic and aspatial conceptions of both economy and nature" that are central to neoliberalism. McCarthy (2005) reminds us, however, that it is difficult to keep nature truly cordoned off from resource users and, thus, there are always questions about who meets the criteria of membership for commons and access to their resources. In fact, McCarthy has cautioned us to closely examine trends that suggest the emergence of new commons and that raise new questions about how access is negotiated in these new configurations.

Urbanization, by which we mean the extension of urban infrastructure and services (e.g., sewer, water, etc.) that facilitate denser residential settlement across relatively wide areas, is transforming ecosystems (Theobald 2004; Johnson and Klemens 2005). In both its high-density suburban (i.e., two to eight dwelling units per acre) and relatively lower density exurban forms (i.e., between one dwelling unit per acre and one dwelling unit per forty acres), urbanization simplifies and fragments existing forests, fields, and other nonurban land covers (Theobald 2004; Johnson and Klemens 2005; Lambin and Geist 2006).[1] For most observers, suburbanization represents a dramatic transformation of ecological systems and their functions, including hydrology, energy flows, and plant and animal species dynamics (see, e.g., Pickett et al. 2001). For example, the monoculture lawn is often associated with habitat simplification and altered ecological functions (Robbins and Birkenholz 2003). Although landowners may also plant a variety of ornamental shrubs, trees, and flowers, these spaces may lack the species composition associated with the land covers they replace (Johnson and Klemens 2005). Likewise, exurbanization (or migration of urbanites to rural areas) is viewed as increasing the extent to which humans control the ecological processes and flows that control the structure and species composition of formerly rural land cover, particularly where this land cover was not associated with food or fiber production (Theobald 2004; Lambin and Geist 2006). This research has pointed to the strong potential urbanization has to alter habitats that support, and plant communities associated with, gathering practices and the ecological relationships therein.

Case Study and Methodology

Sweetgrass, as noted earlier, is a key natural and signature resource used in basketmaking, which, according to popular discourse, is being destroyed by rapid residential and commercial development (Hunt 2006). Baskets sewn by enslaved Africans were once essential to the rice economy that helped fuel the early growth of Charleston and its rural surroundings (Pollitzer 1999; Carney 2001). By the end of the twentieth century, despite the disappearance of rice production almost a century earlier, the descendents of these slaves and their hand-built stands had become a regular site along U.S. Highway 17 in the Mt. Pleasant area and in key tourist areas in peninsular Charleston. Basketmaking remains an important part of the household economies of many African Americans (Derby 1980; Coakley 2006) in the settlements that were once rural outposts of a then small-town Mt. Pleasant (today referred to as the "Old village"; Figure 2 inset). What was once

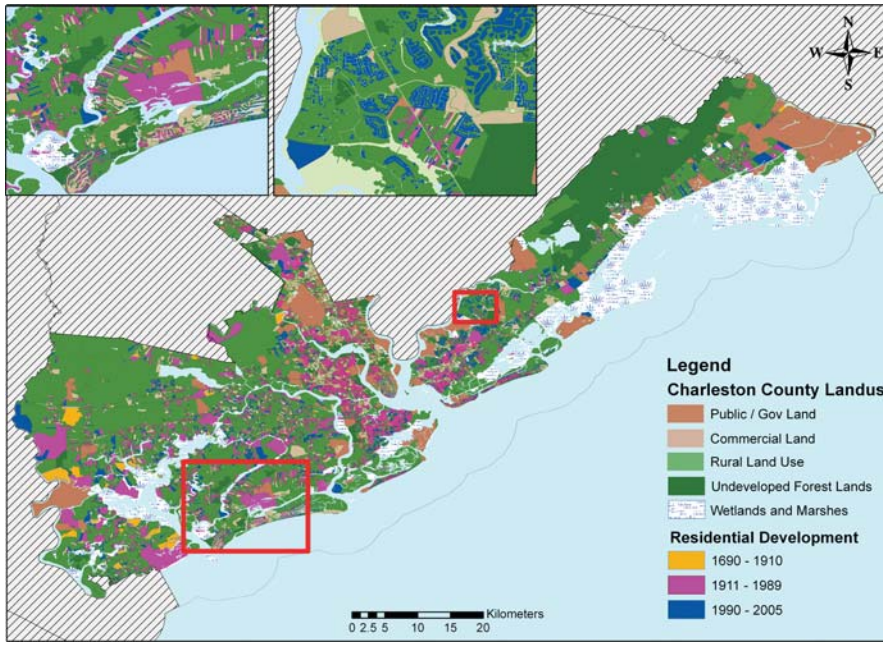

Figure 2 *Development trends in Charleston County, South Carolina, for the period since colonial establishment, highlighting significant hurricanes in 1911 and 1989.*

a small town has become South Carolina's fifth largest city and one of the state's fastest growing cities (U.S. Census 2000), complete with numerous upscale gated communities, some with golf courses and waterfront parcels with private docks. Residential subdivisions increasingly surround historic rural settlements and, in at least one case, largely have replaced an entire community, leaving only a few small pockets of homes with land-use patterns that are more rural in character and that are mainly invisible to passersby (see Figure 3 inset). Beyond its impacts on land ownership, residential and associated commercial development in the greater Mt. Pleasant area also have transformed patterns of land use and land cover associated with many former agricultural and timber land holdings.

Residential growth in South Carolina has outpaced the national average. In the greater Mt. Pleasant area, this rapid residential growth has transformed the area's socioeconomic and racial demographics. First, South Carolina's coastal counties, which comprise a large portion of the area known as the Low Country, experienced a 151 percent increase in population between 1950 and 2000, compared to a nationwide increase of 86 percent (National Park Service 2005). Growth in developed acres grew by 256 percent between 1973 and 1994, whereas the population grew by only 41 percent (Allen and Lu 2003). Conservative estimates suggest the Low Country's population will grow by another 500,000 people over the next thirty years (Coastal Conservation League 2006). Meanwhile, Mt. Pleasant's population grew from 30,108 in 1990 to an estimated 59,113 in 2006 and the town's area has grown to encompass 41.89 square miles (U.S. Census 2000). Second, over a century ago, African Americans comprised roughly 70 percent and whites just 30 percent of the population in South Carolina's coastal counties (U.S. Census 2007). By 1990, the percentage of African Americans in Charleston County and Mt. Pleasant had declined to 34.9 and 15.7 percent, respectively (U.S. Census 1990). Today, African Americans comprise 31.9 percent of

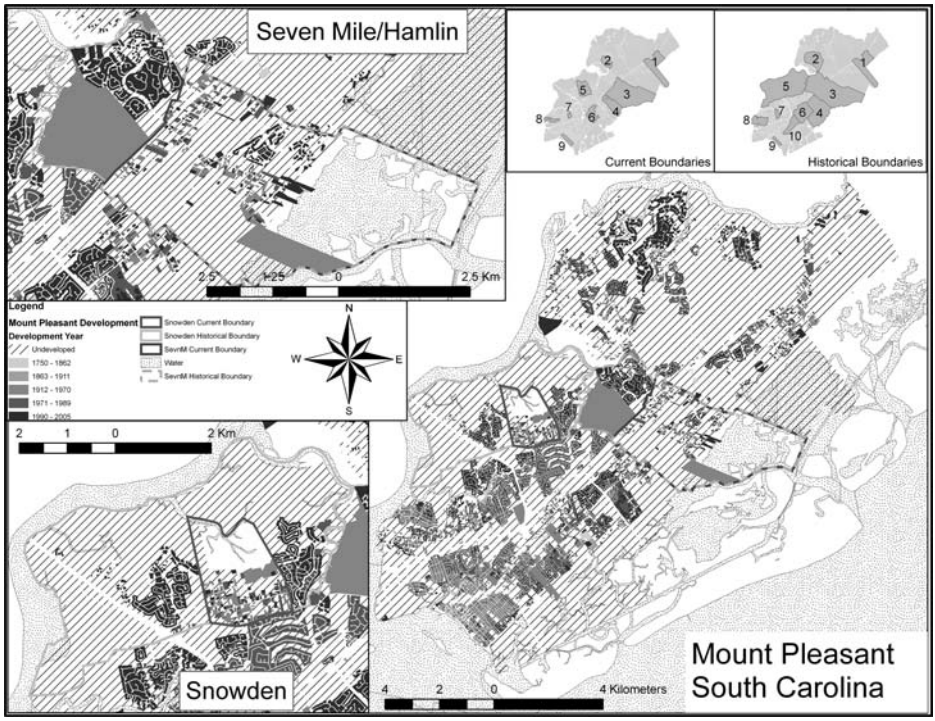

Figure 3 *Development trends in the greater Mt. Pleasant area, including changes to the boundaries of historically African American communities: 1–Ten Mile, 2–Phillips, 3–Seven Mile, 4–Six Mile, 5–Snowden, 6–Four Mile, 7–Green Hill, 8–Remley's Point, 9–Old Village, 10–Two Mile.*

Charleston County residents (U.S. Census 2006) and just 7.3 percent of the population within the town of Mt. Pleasant (U.S. Census 2000). Third, whereas the median household incomes were $37,810 (in 1999 dollars) in Charleston County, with 12.4 percent of families below the poverty line, median household incomes in Mt. Pleasant were $61,054, with 3.2 percent of families below the poverty line (U.S. Census Bureau 2000). Thus, as Mt. Pleasant has grown, public discussions about the threats to basketmaking have grown to include concerns about the vulnerability of these stands and the physical communities where basket makers live (Behre 2006; Dixon 2006; Hunt 2006) to the conditions that are resulting from the processes of capital investment and displacement that characterize gentrification, such as the inability of some landowners to keep up with increasing property taxes or for community members to afford to purchase new property. For example, basket makers and concerned citizens met in a December 2005 workshop to discuss "Sweetgrass Basketry: A Tradition Under Fire" at the Avery Research Center in Charleston, where many of these issues were raised. Certainly, urbanization and gentrification pressures hold potentially important implications for sewing and selling (see, e.g., Halfacre, Hurley, and Grabbatin 2008; Hurley and Halfacre forthcoming), but here we focus on the consequences of development for gathering activities that are central to basketmaking.

Although basketmaking relies on sewing raw materials into a final product and selling baskets at various market locations, the process begins with the gathering of four key natural materials from local Low Country woodland and wetland ecologies. Specifically, basket makers use blades or "threads" of sweetgrass (*Muhlenbergia sericea*), strips of the leaves of palmetto trees (*Sabal palmetto*), needles of the longleaf pine (*Pinus palustris*), and cuttings of black rush (*Juncus roemerianus*). Historically,

the plants necessary for these materials appear to have been widely available in local settings, either through collection or via cheap purchase from collectors (Hart, Halfacre, and Burke 2004). Today, sweetgrass is needed in the greatest quantity and currently is the most difficult to obtain (Derby 1980; Ohlandt 1992; Hart, Halfacre, and Burke 2004; Grabbatin 2007). Importantly, sweetgrass occurs naturally in clumps landward of the second dune line at beaches as well as in the boundaries between marsh and woods (Rosengarten 1986; Gustafson and Peterson 2007). Thus, the preferred habitats of sweetgrass potentially occur in the very areas that have become highly sought after for their attractiveness by developers and new residents who are able to pay high prices for waterfront land. Yet, the current extent of sweetgrass habitats in the South Carolina Low Country largely is unknown, as is the extent to which the ecological and social dimensions of urbanization have altered potentially suitable habitat and shaped conditions of access.

To explore the extent to which sweetgrass is disappearing and the role social and ecological dimensions of urbanization play in this disappearance, we use the grounded visualization approach described by Knigge and Cope (2006). Grounded visualization builds on the grounded theory approach described by Glaser and Strauss (1967) and Strauss and Corbin (1990) by bringing together ethnographic and GIS methods. Over a forty-year period, social scientists have regularly used the grounded theory approach, where researchers ground (or base) their theoretical development within data analysis, as opposed to a priori theorization within data collection. Through this method, themes and trends can be identified in a manner that allows for more nuanced understandings of dynamics. The marrying of ethnographic and geographic data to examine land use trends provides unique insight into the processes at play. Specifically, grounded visualization relies on recursive integration to analyze these normally disparate data. With recursive integration, researchers first create maps to look for patterns and new opportunities to pursue strategic fieldwork. Second, information from key informants is used to develop new maps that expand the understanding of particular processes and resulting patterns. Third, these maps are used to pursue new questions with key informants; this information is then used to develop more helpful maps. In this study, we began with early efforts to both map known distributions of sweetgrass and potential collecting sites. Next, we pursued key informant interviews to build a more grounded understanding of sweetgrass collecting in Charleston County. We used this information to revise our maps and develop our ecological model. Subsequent interviews incorporated these data to further explore urbanization and its impacts on collecting with basket makers and members of the area's historically African American communities. Coupling these analyses with fieldwork, we helped further develop our understanding of spatial dynamics of sweetgrass use and accessibility.

Our use of grounded visualization is intended to address two interrelated and overlapping difficulties that we see with finding disappearing resources in an area experiencing urbanization and the potential pressures associated with rural gentrification. First, from an ecological change perspective, assessing the status of sweetgrass is a difficult and expensive but relatively straightforward methodological proposition. In fact, there are a number of different approaches one could take, including the use of air photos, satellite data, or hyperspectral imagery (Airborne Visible/Infrared Imaging Spectrometer; Hirano, Madden, and Welch 2003) combined with rigorous ground truthing that is sensitive to land-use patterns (see, e.g., Fox et al. 2002), to measure the current extent of sweetgrass in the study area and begin tracking this over time. To date, no comprehensive remotely sensed data set exists to conduct this analysis for the area. This is due to two factors: (1) the resolution of available remote-sensing products is too coarse, and (2) the use of air photos is prohibitively expensive, given the six-week time window when sweetgrass is readily identifiable from the air. Likewise, there is no comprehensive historical data set to evaluate ecological changes to the area and, thus, to assess the impact of development on Low Country sweetgrass habitats. Given the expense and the difficulties involved, we use a GIS to model existing environmental parameters to characterize potential sweetgrass habitats. Second, there are no straightforward data sets on property *regimes*, or the combination

of ownership of land and the rights of access or use associated with a given parcel. One can map privately versus publicly owned land, but mapping property regimes is more complicated, as it involves understanding the terms under which nonowners may access resources.

Ethnography

Our ethnographic methods rely primarily on semistructured in-depth interviews, document analysis, participant observation, field research, and attendance at key community events. Our results present data from interviews conducted during June 2002 and January 2003 that were collected for an initial study that examined basket makers' views of and roles in past and current sweetgrass management (Hart 2003; Hart, Halfacre, and Burke 2004), interviews in the summer of 2003 about collecting strategies, and data from an ongoing study that specifically examines basket maker responses to urbanization. The 2002–2003 study included a total of twenty-three Charleston area basket makers (sixty were invited to participate), including basket makers from the three main locations in the Charleston area (see Hart, Halfacre, and Burke 2004 for complete details). The summer 2003 interviews included fifteen respondents from the same locations, and the 2006 data collection efforts included interviews with twenty-six basket makers (out of eighty-four who were invited to participate) from the same three sales locations as well as a newer sale site at the local farmer's market (located at Marion Square in downtown Charleston). In all three studies, participants were identified using both convenience and snowball sampling, with most identified specifically through field excursions to basket stands and additional interviews coming from referrals by participants. A variety of other ethnographic data also inform this research. Over the course of several years, we have observed local government meetings, visited with basket makers in their homes and stands, toured local communities with residents, and conducted field visits to numerous local subdivisions. We analyzed government documents related to land-use decision making, community workshops associated with planning processes, community governance in area subdivisions, Web sites and marketing materials for these same subdivisions, and newspaper stories and popular magazine articles about growth and sweetgrass basketmaking.

GIS

To explore the intersection of ecological and social change resulting from residential growth in the area and the implications for basketmaking, we created a series of maps that provide information on (1) the distribution of sweetgrass using both the botanical literature and information provided by basket makers themselves, which provides some baseline information on areas that have been accessible in the past; (2) land development trends in Charleston County since the South Carolina colony was founded, highlighting the relationship of recent development and parcels that allow access to deep water and spectacular views; (3) land development trends and changes in the boundaries of African American communities in the greater Mt. Pleasant area, which allows us to explore the socioeconomic demographics of the incorporated and the unincorporated portions of the Mt. Pleasant area; and (4) a model of suitability and accessibility that is derived from information about environmental conditions associated with habitat suitability, land ownership, and parcel sizes that suggest the likelihood that sweetgrass on a given parcel would be accessible for collection. On the face of it, the GIS component of our analysis might be seen as merely corroborating the stories told by basket makers. Yet, it is important in a rigorous critical GIS to seek correspondence between empirical observations made by researchers, key informants, and GIS data. We agree with Knigge and Cope (2006) that this process is also about finding areas of correspondence and important disconnects. This includes using the habitat model in discussions with informants that move beyond popular discourses about collecting. Importantly, we note that these maps integrate information from scientific experts with the local knowledge and experiences—both ecological and political—of basket makers themselves.

We reconstructed the historic distribution of sweetgrass according to herbaria records from in-state and out-of-state museums, a review of existing literature, and using information gathered from interviews with basket makers in 2002 about places where they were able

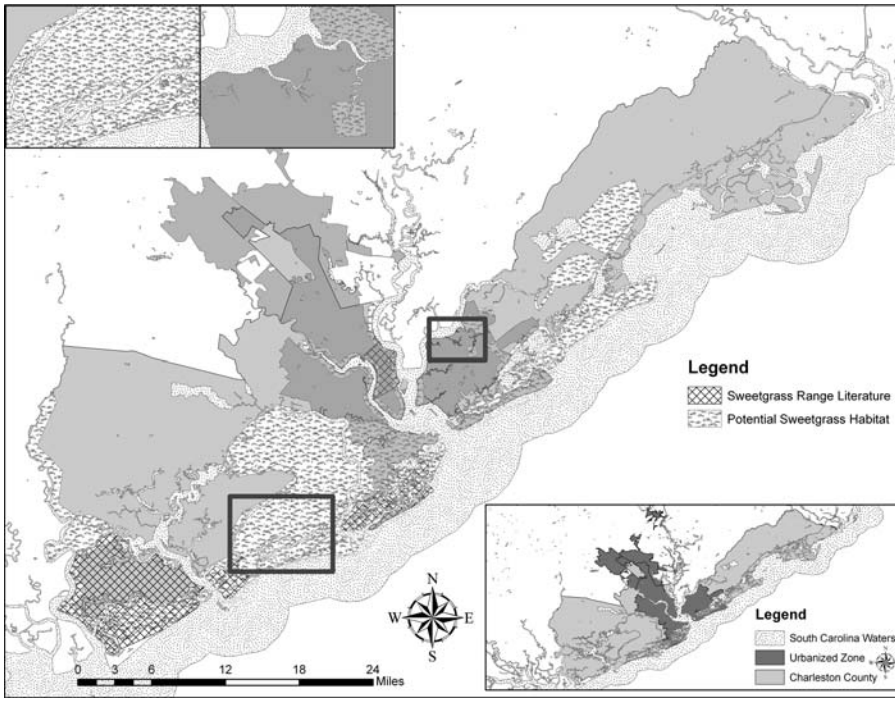

Figure 4 *Known distribution of sweetgrass (*Muhlenbergia sericea *and synonyms) according to herbaria records and interviews with basket makers.*

to collect "sizable quantities" of this resource (Figure 4). Three important points about using these types of data should be noted. First, herbaria records reflect the sampling priorities of prior research projects and available funds. Second, given a variety of methods, published literature is helpful in filling in gaps. Third, the locations identified by interviewees ranged from specific areas, such as an area along a particular creek or along a specific road, to more general locations, such as indicating an entire island. Read together, however, these three data sources point to areas that once supported important sites where harvesting took place or to sites that were potential collection sites.

Next, we examined the development trends in Charleston County over time (Figure 2), tracking the period prior to 1911, between 1911 and 1989, and since 1989. The period breaks were chosen to mark two periods when major hurricanes in 1911 and in 1989 (Hurricane Hugo) came ashore just north of the city of Charleston, both of which caused tremendous flooding and storm surge–related destruction to the area's developed and undeveloped environments (South Carolina Department of Natural Resources 2006). The 1911 hurricane is associated with the demise of the rice economy (and some argue the rice culture; see Edgar 1998) and a subsequent 1916 hurricane is often identified by members of the basketmaking community as a major impetus for the beginning of local basket sales to the public. The post-Hugo period is often described as the beginning of a dramatic increase in development in the greater Charleston area (Hart, Halfacre, and Burke 2004; Hurley and Halfacre forthcoming). Figure 2 was constructed using Charleston County's parcel database and tax assessor's database, together with data from the U.S. Army Corps of Engineers, to map jurisdictional wetlands. Importantly, Charleston County does not keep track of dates associated with the construction of commercial structures. Thus, commercial development is mapped separately from area residential development. This means that our analysis potentially underestimates the extent

to which sweetgrass habitats and access to existing habitats may have disappeared.

In addition, we specifically examined development trends in the greater Mt. Pleasant area, focusing on the relationship of recent development to the historically rural African American communities that are home to most basket makers (Figure 3). These maps include information about what members of these communities consider their historic (pre-1989 development) and current boundaries (see inset). Using these boundaries, we are able to explore the extent to which racial differences within Mt. Pleasant and across the greater Mt. Pleasant area are related to urban change and the communities where basket makers live (Figure 5) and how these patterns relate to the location of potentially suitable habitat. We also use this information to examine differences in property values for all residential parcels in the Mt. Pleasant area as well as two of these communities more specifically, which represent different development dynamics, based on current figures (Figure 6) and according to historical trends (Figure 7). These examples suggest the ways that processes of gentrification and enclosure differentially influence these places.

Finally, we estimated the disappearance of sweetgrass using a comparative model approach. Figure 8 considers current sweetgrass suitability and accessibility to basket makers. In mapping suitability and accessibility, we model the distribution of key ecological conditions that are, in the absence of development, believed to be controlling factors for the presence of sweetgrass together with pertinent information about land ownership and parcel size (Table 1). We followed a three-step approach to create our model. First, we overlaid information about soil composition, hydrology, and proximity to water using the ratings described in Table 1. Second, we identified and classified three land types by using information from Charleston County's tax assessor and GIS parcel databases (Table 1) to group private; nonprofit and churches; county, municipal, public utilities, state, and federal; and unknown lands into classes that attempt to capture the potential

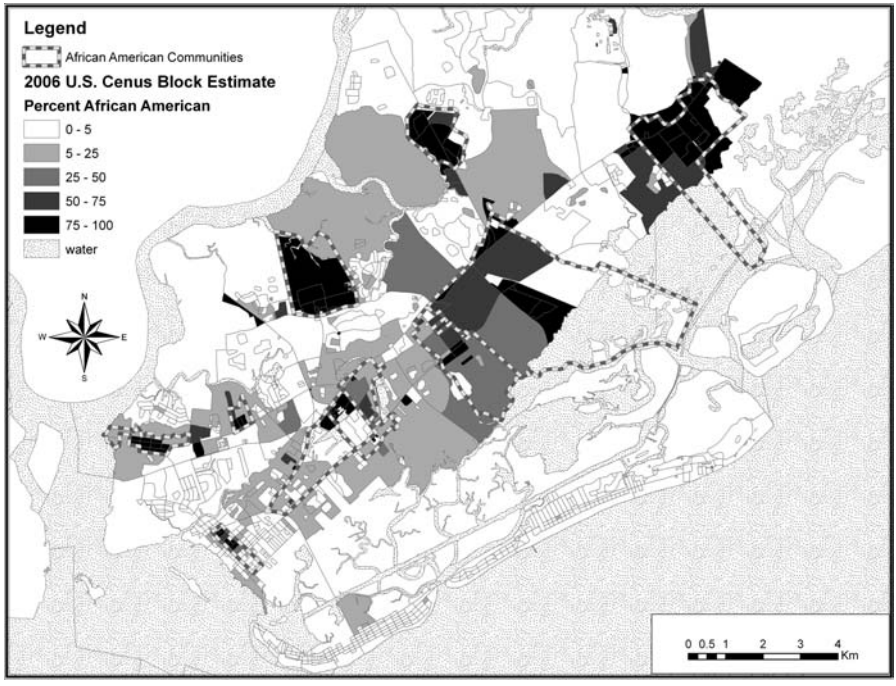

Figure 5 *Comparison of 2000 Census block data with the current boundaries of historically African American communities in the greater Mt. Pleasant, South Carolina, area.*

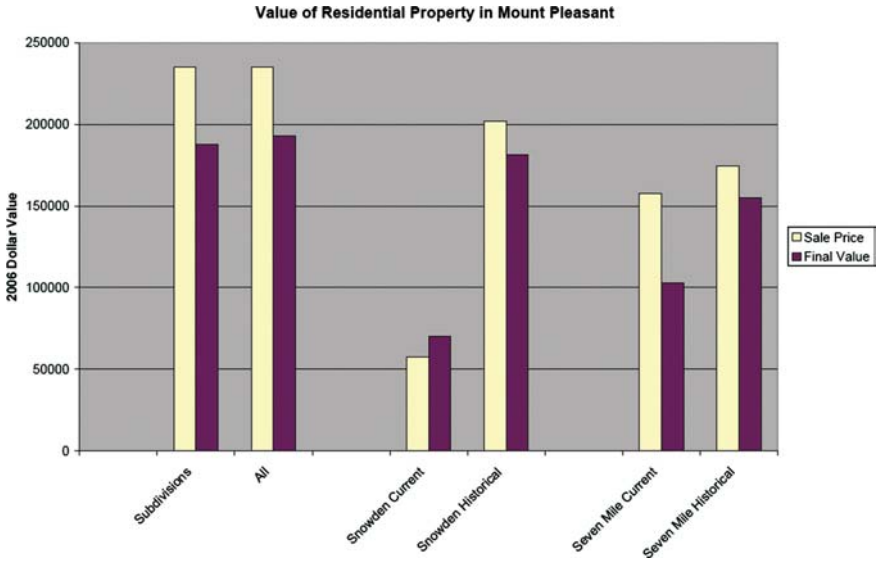

Figure 6 *Property values for all residential parcels and parcels in subdivisions in Mt. Pleasant, South Carolina, and residential parcels inside and outside of the historically African American rural communities of Snowden and Seven Mile.*

of basket makers to access these properties. We assessed the total acreage of all parcels, with land classified using three categories (categorized into less than ten acres, ten to ninety-nine acres, and greater than one hundred acres). Third, this information was integrated with data layers on past and current sweetgrass habitat (Figure 2). When all three steps are combined into the final model (Table 2), the resulting map depicts the potential for sweetgrass habitat and the likelihood of accessibility. This information allows us to compare area estimates of sweetgrass to assess disappearance of the resource during different time periods.

Results

GIS analysis of development patterns in Charleston County and Mt. Pleasant reveals a startling picture of the potential social and

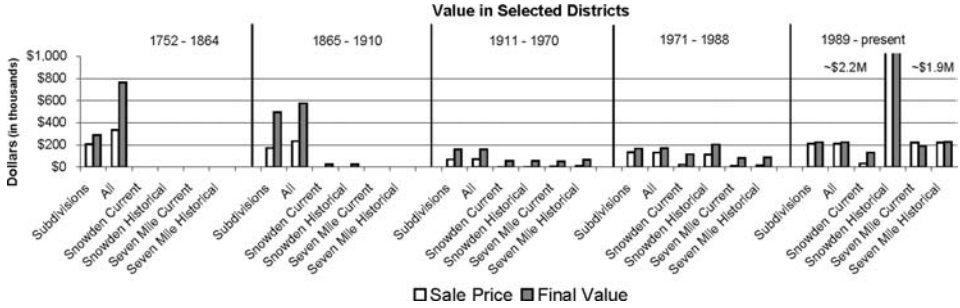

Figure 7 *Property values for all residential parcels and parcels within subdivisions by time period in Mt. Pleasant, South Carolina, and for those parcels inside and outside of the historically African American rural communities of Snowden and Seven Mile.*

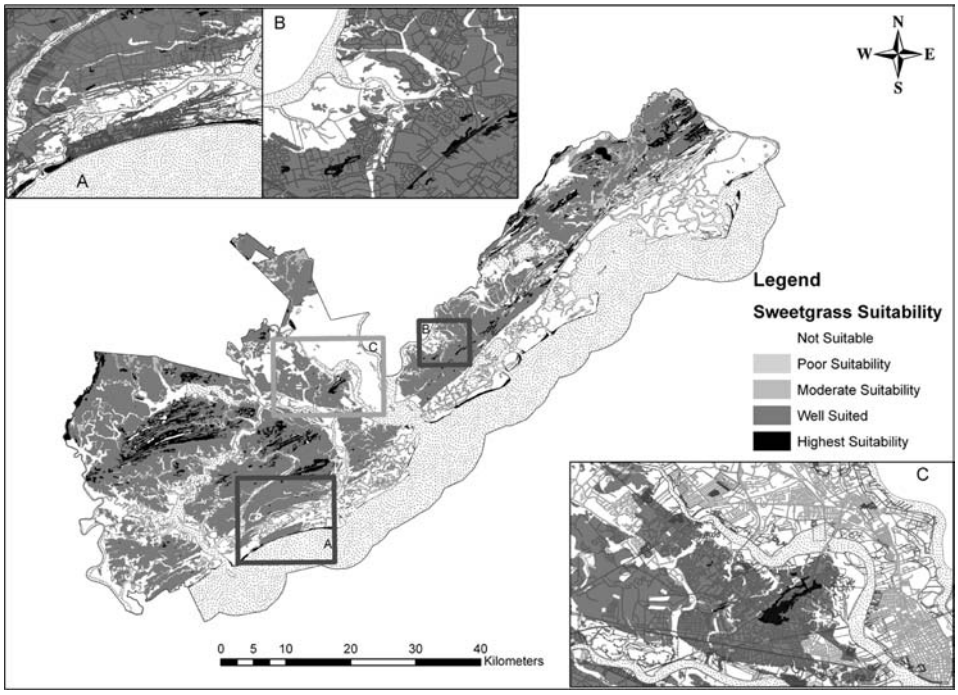

Figure 8 *Sweetgrass habitat suitability in Charleston County, South Carolina.*

ecological transformation associated with urbanization. This analysis of the development trends over time in the greater Mt. Pleasant area shows extensive building within the historical boundaries of Snowden, almost circling the community (Figure 3). Interestingly, development to the east of Snowden between 1990 and 2005 converted previous woodlands used for collecting, which is suggested by our habitat model. By contrast, recent subdivision in Seven Mile demonstrates how development both rings a particular area and creates what some observers in the area have referred to as "doughnuts" while also creating new subdivision enclaves within the community that potentially disrupt community woodlands (Figure 8). Examination of property values for Snowden and Seven Mile is particularly revealing. Recent development surrounding the current boundaries of Snowden is characterized by dramatically higher property values and the presence of new subdivisions along waterways. The values for Seven Mile reflect the fact that residential development is occurring both around and within the current boundaries (Figure 3). The stark differences in values suggest the presence of gentrification-inducing pressures related to investment and subsequent increases in property taxes (Figure 7). GIS analysis provides further evidence for social displacement in the "Two Mile" community, which largely has disappeared as a result of in-migration and development (Figure 3 inset). Further, review of 2000 Census block data shows that many of the areas with the highest percentage of African Americans in the town of Mt. Pleasant are historically African American settlements that have been annexed into the town. Yet, this coarse-scale picture appears to oversimplify the story of sweetgrass basketmaking resource ecologies.

The advantages of grounded visualization emerge as one considers both the stories told by the basket makers in relation to the social-ecological trends highlighted by our maps and the ways that this information reveals the partiality of both sources. For example, comparison of the map of development and the

Table 1 *Data used to create sweetgrass suitability and accessibility model*

	Attributes	Significance	Source
		Ecological	
Soil composition	Well drained sandy soils – 10 Well drained nutrient rich – 8 Nutrient rich – 5 Moist soils – 3 Human-altered soils – 1	Sweetgrass prefers well-drained, nutrient-poor soils. Dry, sunny, open areas are the most hospitable environment for sweetgrass to flourish. Sweetgrass thrives especially in the sandy areas just behind the dune line. It may also be found in silty soils that allow water to drain easily.	USDA-NRCS SSURGO data set
Hydrology	Wetland area ranked as a 5 Nonwetland areas are ranked as a 10	Sweetgrass is a facultive upland species 66 to 99 percent chance of being found in a nonwetland environment 1 to 33 percent chance of a wetland	SCDNR hydrography data set Significance ranks from: USDA "USFWS wetland regions and indicator categories" http://plants.usda.gov/wetinfo.htm
Proximity to water	25 m – 2 25–150 m – 8 >150 m – 2	Tolerance to submersion 0–25 m to water submersion is possible. Proximity to water is good submersion less possible. >15 m proximity to water is less than desirable.	Charleston County GIS Hydrography/ wetlands data set
		Social	
Tax assessor GIS parcel database	Private ownership < 9 acres – 2 County owned < 9 acres – 4 Private ownership 10–99 acres – 6 County owned 10–99 acres – 8 Private ownership ≥ 100 acres – 8 County owned ≥ 100 acres – 10	Access to land is more difficult on privately owned property. County owned refers to state and county or federally owned land that would have multiuse access.	Charleston County GIS Parcel and Tax ID database
Historic and current records of sweetgrass habitat GIS parcel database	Historic ranges weighted with an 8 Current range information rated with a 9	Developed through interviews with sweetgrass basket makers and from the published and unpublished USDA Forest Service literature	Developed by the College of Charleston Sweetgrass research team in the Intro to GIS class

Notes: USDA = U.S. Department of Agriculture; NRCS = National Resources Conservation Service; SSURGO = Soil Survey Geographic Database; SCDNR = South Carolina Department of Natural Resources; GIS = geographical information systems; USFWS = U.S. Fish and Wildlife Service.

habitat suitability model (Figures 2 and 8) suggests that sweetgrass is still available and theoretically accessible within areas where residential development has been extensive. Indeed, although a majority of basket makers in both our first round and second round of interviews described a lack of inexpensive, locally available materials and the need to purchase sweetgrass bundles at high prices from individuals who may collect these resources from other states, such as Georgia or Florida (as much as $50 for a bundle seven inches in circumference; Hart 2003; Hart, Halfacre, and Burke 2004, a few basket makers in the second round indicated that they both continue to find local stands of sweetgrass in the area and access them for collection. Yet, a number of new questions emerge about the ways that social and ecological changes interact to produce a disappearing resource. In the remainder of this section, we consider places where there is clear correspondence and the areas where disconnects emerge and suggest why these are significant to understanding the disappearance and persistence

Table 2 *Analysis of sweetgrass habitat models*

Time period	Model type	Square acres	Hectares	% of total	% Charleston County tota
Undeveloped parcels	Past	6,988,439,057.27	698,843.91	34.13	65.15
	Current	2,324,289,603.89	232,428.96	11.35	21.67
	Potential	7,883,887,275.78	788,388.73	38.50	73.50
	No sweet grass	12,592,154,458.82	1,259,215.45		84.33
1670–1910	Past	76,357,522.27	7,635.75	46.46	0.71
	Current	137,954,549.74	13,795.45	83.94	1.29
	Potential	76,357,516.42	7,635.75	46.46	0.71
	No sweet grass	87,984,638.25	8,798.46		0.59
1911–1989	Past	1,008,365,621.05	100,836.56	38.39	9.40
	Current	389,890,186.29	38,989.02	14.84	3.63
	Potential	1,046,536,746.90	104,653.67	39.84	9.76
	No sweet grass	1,580,023,783.02	158,002.38		10.58
1990–present	Past	398,556,384.57	39,855.64	35.23	3.72
	Current	107,950,806.35	10,795.08	9.54	1.01
	Potential	459,841,584.84	45,984.16	40.65	4.29
	No sweet grass	671,365,299.05	67,136.53		4.50
Charleston County	*Total area*	25,658,135,191.51	2,565,813.52	100.00	
	No sweetgrass	14,931,528,179.14	1,493,152.82	58.19	
	Sweetgrass	10,726,607,012.37	1,072,660.70	41.81	

of NTFPs in areas experiencing urbanization, including processes of enclosure and rural gentrification.

Urbanization and Ecological Change

It is difficult to measure the full extent of habitat loss or displacement from our coarse-scale analysis, but Figure 2 and Table 2 paint a stark picture of land-use change, both in terms of the extent and the specific location of new development (see also Figure 3) as well as the implications these trends have for disappearing sweetgrass. First, GIS analysis supports the claims of basket makers that development has reduced the overall amount of sweetgrass, providing evidence for sentiments such as these:

> When these new developments started coming over here … they [started] bulldozing all of our plants down. (Interview 1, 27 June 2002, Mt. Pleasant)

Table 2 clearly shows that only about 40 percent of the county overall is suitable as sweetgrass habitat and that according to the current access model less than 27 percent of the suitable land is in regions where gatherers now find sweetgrass. Importantly, this does not actually account for areas where they know sweetgrass is available but are unable to get to it due to property rights and ownership issues. Second, GIS analysis further supports the claims of basket makers about the importance of the particular location of development. As one basket maker explained:

> [T]here are subdivisions over in Mount Pleasant you know, that destroyed a lot of the places that the grass was growing … in the woods under pine trees. It's usually not a dry area, it's a damp area, but you know a lot of people like the waterfront area for homes, so, it destroys that. (Interview 2, 7 October 2002, Mt. Pleasant)

Although much development in Charleston County is strongly oriented toward the Charleston, North Charleston, and Mt. Pleasant areas, a significant percentage of development since 1990 has occurred along navigable waterways (Figure 2), or in areas along waterways, and within the rural and formerly rural parts of the county. This pattern of amenity development is particularly pronounced in Mt. Pleasant on the town's northern side along the Wando River. Residential development there highlights the extent to which new subdivision has occurred in close proximity to, surrounding, and within existing African American communities where many basket makers live (Figure 3). Further, discrepancies in land values highlight potential impacts of gentrification (Figure 6), and land-use patterns hint at the continuing availability of undeveloped, or even underdeveloped, land relative to existing zoning densities within these African American communities (Figure 3). Taken together, the conditions for increasing property

taxes that generate displacement pressures are ripe, particularly given that land continues to be developed in these areas. Still, the specific location of this development also raises more immediate questions about access.

Urbanization and Social Change

GIS analysis also substantiates common threads among respondents that emphasize the difficulty of obtaining sweetgrass as a result of enclosure. In these cases, development is about something other than just destruction:

> When the property was untouched and undeveloped, no one bothered us when we went out there [to gather sweetgrass] and now the developers came in and developed the land and of course it's private property now. And people are just people. People don't just trust anybody on their property. (Interview 3, 24 October 2002, Mt. Pleasant)

For example, a Mt. Pleasant basket maker summed up the situation of destruction and private property issues this way:

> From year to year you go to one place, and then you go back and there is no more [grass] there or the property is off limits. (Interview 4, 10 October 2002, Mt. Pleasant)

Another respondent described how

> [t]he grass situation becomes very scarce because people shutting off the property and don't want you to come on it. (Interview 5, 14 November 2002, Mt. Pleasant)

GIS analysis highlights the dramatic increase in the number of parcels along navigable waterways (Figures 2 and 3) and in other important amenity areas, such as the barrier islands of Seabrook and Kiawah (Figure 2, Inset 1). GIS analysis shows that, as development occurs, basket makers are forced to move from collecting from historical commons to new lands that remain accessible to them. Much of the land that is displayed in the current sweetgrass availability model falls within the lands that were developed earliest in the county's history (1670–1911; see Table 2). This is understandable, given that these lands have either questionable ownership status or are sites where long-term relationships with basket makers exist. Importantly, this constriction is essentially pushing more collectors into less and less land over time.

In fact, basket makers describe places where sweetgrass is abundant but they are excluded from accessing these sites. Significantly, many of these sites include the residential communities clearly associated with amenity migration and upscale development in the area. Basket makers indicate that they could find grass

> right around this area—Seabrook and Kiawah—you could just actually go there to the marshland and get it. . . . But it's a resort now. (Interview 4, 10 October 2002, Charleston)

As another person described the current situation at Kiawah, home to one of the area's five-star hotels and some of the area's most expensive residential homes "[t]here's grass in abundance. On Seabrook Island, there's grass in abundance, too" (Interview 1, 27 June 2002, Mt. Pleasant). The map of potential sweetgrass habitat signals the high probability that sweetgrass is available in both places, but Figure 3 also suggests the reality described by basket makers: This grass remains largely inaccessible because of the "gated" nature of these communities.

Overcoming the enclosure created by gated communities and private property restrictions is possible, according to our informants, but it requires knowing someone with "clout" who can help the basket makers gain entry into one of these exclusive communities where there is suitable grass. The terms and timing of access are nearly always controlled by the hosting community. Interestingly, however, it is precisely at this nexus that a few basket makers signal a bright spot among the proliferation of exclusive amenity subdivisions. For example, developers of a private island community on Dewees Island suggest that "all of the rules of traditional beachfront real estate development were broken" because "the process was driven by restoration and preservation" (Dewees Island 2007). Dewees's commitment to restoration extends to sweetgrass and the community's land manager has worked with local basket makers to arrange access to the grasses that result from these stewardship efforts (Interview 5, 13 June 2002, Mt. Pleasant; Interview 3, 24 October 2002). One respondent in a 2002 interview went so far as to suggest that the approach at Dewees might solve the situation. At the same time, another respondent

indicated that this access is not easily attained, describing how this person had "been trying to get over there for the last few years" (Interview 6, 15 June 2002, Mt. Pleasant). Likewise, recent efforts to arrange for harvest of grasses in other gated communities may be paying some dividends, with a special harvest taking place in the spring of 2008 on Kiawah Island (Figure 2, inset 1).

Beyond Dewees and Kiawah, basket makers describe a picture of supply and access that is further complicated by changes in land ownership, ideas about who has the right to use resources from a particular place, and race. On the one hand, a few basket makers have described private landowners who manage their property for natural resource activities, such as hunting, that also allow sweetgrass collection. At least one basket maker pointed to sweetgrass that was still accessible in Mt. Pleasant but remained vague about whether access to this collection site is the result of any informal or formal negotiation (Interview 7, 7 March 2007, Mt. Pleasant). Importantly, in more recent interviews some basket makers discussed access in ways that suggest understandings of what constitutes trespassing that may be different from that of newcomers, where "if there are no trespassing signs" present sweetgrass can be collected. Additional information is needed to assess the extent of formal posting and its relationship to gentrification pressures and patterns, particularly given that a number of authors have noted increases in posted lands (with "no trespassing" signs) in rural places characterized by exurban or amenity in-migration (Brown 1995; Nesbitt and Weiner 2001). On the other hand, there are clear social factors, including overt racism, at work in restricting access: One respondent spoke specifically of a landowner who did "not want any niggers on their property or walking by their property" (Interview 8, 11 November 2002, Mt. Pleasant). Such overt sentiments are rare in discussions with basket makers, although the strong demographic and property value trends in the county raise questions about how prevalent this issue, and its links to gentrification, may be. As local planners and policymakers indicate, there is a lack of awareness among developers and new residents of the distinctiveness and unique histories of African American communities in the greater Mt. Pleasant area, despite regular and ongoing attention in the local media.

Urbanization and Social-Ecological Change

Field research and observations of basket makers indicate that sweetgrass is being actively planted as part of the urbanization process. Traditional subdivision in the area, both in the form of entire communities and parcel-by-parcel development, is often marked by landscaping that includes the active planting of sweetgrass, albeit likely a different species (D. J. Gustafson, personal communication, February 2008). In these cases, plantings may occur in or along parking lots in commercial areas, in the welcome areas to a community, or in the open spaces that now characterize many subdivisions in the Low Country (Figure 9; Shuler et al. 2008). Indeed, a number of basket makers have indicated that landscaping-related plantings have become increasingly commonplace, including within urban jurisdictions. For example, the City of Charleston has planted sweetgrass in the median strip of a prominent boulevard. Across the Cooper River in Mt. Pleasant, sweetgrass has not only become a common name associated with strip malls and new businesses, but it adorns the fringes of parking lots and highway median strips. For this reason, some developed areas in the habitat model may in fact still contain sweetgrass.

Landscape plantings of sweetgrass have uncertain implications for basketmaking, however. On the one hand, basket makers indicate materials collected from landscaped areas and other places where sweetgrass has been actively planted in urbanizing areas are of poor quality. They describe the brittleness of the stems created by overfertilization; one basket maker has even referred to landscaped grasses as "sweetgrass on steroids" (Hunt 2006, 144). Moreover, basket makers describe the likelihood of gathering sweetgrass in these landscaped areas, or other interstitial spaces where sweetgrass grows in the Mt. Pleasant area, as even more unlikely than in "wild" areas. For example, although some basket makers have collected sweetgrass from plantings in public areas in the city of Charleston (Hart, Halfacre, and Burke 2004), recent interviews indicate they have been harassed by

Figure 9 *Sweetgrass plantings in the fringes along the conserved open space woodlands of a subdivision.*

public onlookers and even some government employees. On the other hand, recent events at the Kiawah Island resort, where gathering included landscaped plants of unknown species, suggests that these spaces represent important opportunities to supplement the resource supply of basket makers.

Discussion and Conclusions

We suggest that rapid urbanization is leading to a decrease in sweetgrass supply and access to this remaining supply. At the same time, sweetgrass persists within, or is even introduced into, the interstitial spaces that characterize the fringe ecologies of NTFP in transitional rural–urban spaces, both ecologically and socially. First, urbanization in formerly rural areas is blurring rural–urban land-use distinctions, with generally negative results for the persistence and accessibility of NTFP. We argue that these newly emerging suburban (even urban) spaces are characterized by ecological changes that lead to serious questions about the persistence of the local fringe ecologies that sustain basketmaking. Yet, these ecologies have not disappeared completely. Quite the contrary, they likely persist in the interstitial spaces between ownerships or on the perimeter of new residential and commercial developments, even as there are declines in contiguous rural spaces. In some cases, these habitats quite literally may ring new subdivisions, both as a consequence of landscaping trends and because some spaces are "untouched" by landowners, not in the sense of wilderness, but rather in the sense that project designs and other property management regimes have chosen not to actively manage these spaces for more traditional urban or suburban aesthetics. In other cases, these ecologies continue in the transition zones between terrestrial and wetland environments that have been unchanged by homeowners building on new parcels adjacent to waterways.

Second, increasing urbanization is leading to a literal and figurative fragmentation of ideas about private property. Here, the idea of fringe ecologies highlights the concerns about enclosure and access to NTFPs that emerge with the rural–urban transition and associated ideas about property rights. This process is very likely facilitated by the displacement of sympathetic landowners who succumb to the economic forces of gentrification, although little is known about how land transactions may influence issues such as posting in the South Carolina Low Country. Still, our analysis suggests that processes of displacement and enclosure are complex and uneven. Importantly, our grounded visualization demonstrates the importance of looking beyond physical indicators of enclosure, such as trespassing signs, to map spaces of exclusion and displacement. For example, some might view the case of resort development as a clear shift toward exclusion and enclosure, but here again we urge caution. If one were to simply read the presence of new upscale, gated communities as contributing to enclosure, the researcher would misrepresent places like Dewees Island where conservation of sweetgrass is ongoing and access is allowed, albeit negotiated in terms clearly favorable to the new property owners. Here we are cognizant of the overt racism experienced by one basket maker and the changing socioeconomic demographics in and around the communities where basket makers live. Thus, the challenge for finding disappearing resources in places characterized by urbanization and associated rural gentrification is to locate the social-ecological nexus of ecological change and shifting property regimes. Put another way, where are the ecological conditions that support NTFP *and* access being preserved and where are they not? Finding the interstitial spaces that support these fringe ecologies and the disappearing resources that are produced in these spaces also clearly depends on mapping social networking that mediates what, at first, appear to be hegemonic processes of enclosure and displacement.

Third, not all NFTP materials are necessarily equal: Our examination of the sweetgrass basketmaking suggests that the quality of particular plants may be important to our understanding of NTFP resource ecologies. Some basket makers indicate that landscaped plants are of inferior quality for their baskets, so the collection of sweetgrass from areas that include these plants raises new questions about the need to map the intersection of NFTP quality and property regimes. Future research needs to examine the ways that both differences in the social and ecological processes associated with wild nature and landscaping management regimes influence plant growth and the provision of accessible high-quality materials to support this art form.

In an urbanizing world, greater attention needs to be paid to these fringe ecologies, both by academic researchers and policymakers. As Emery and Pierce (2005) have suggested, we need to make room for the management of natural resources in new places. We propose that the case of sweetgrass basketmaking demonstrates that policy should include discussions about the potential of urban and suburban spaces to meet NTFP needs of resource users, not just meeting private demands for open space and natural amenities in residential developments (see Hurley and Halfacre forthcoming). For example, the presence of NTFP in the commons of new subdivisions and parks suggests that ecological governance in these areas might move beyond a narrow focus on amenities or recreation and foster management that is more compatible with notions of rural governance that have become prevalent within natural resources management paradigms elsewhere (e.g., community forests or so-called working landscapes; see McCarthy 2005, 2006). We emphasize, though, that it seems that we still largely are unable to imagine the presence of extractive activities in occupied suburban and urban neighborhoods. There is clearly a need to further explore the existence of such practices and links.

Importantly, finding the disappearing resources in the fringe ecologies that are important to marginalized communities who have gathered NTFP in historical commons requires the integration of qualitative and quantitative methods. Although GIS is essential to mapping the potential extent of, and modeling changes to, "fringe ecologies," our case demonstrates that remotely sensed ecological data and publicly available social and economic data will likely be insufficient on their own. As our pilot study only begins to demonstrate, changes in ecology and property regimes do not neatly correspond to readily existing ownership data.

Instead, the ecological and social transformations work in complex and uneven ways. We agree with other critical GIScientists who have pointed out that grounded visualization is crucial to revealing this type of information about social relations (see, e.g., Knigge and Cope 2006; Pavlovskaya 2006), but would hasten to add the ways these relations create spaces of inclusion and exclusion, not just enclosure, in areas experiencing rural gentrification and associated ecological changes. In this context, our maps illustrate a particular geography of private ownership but ultimately cannot reveal the complex geography of emerging property regimes that characterize both Low Country landscapes as a whole and sweetgrass ecologies in particular. To produce such a map, future research needs to pay attention to social and ecological distinctions that require greater input from basket makers, landowners, and policymakers alike. ■

Note

[1] Scholars differ on both how to quantify these concepts and the metrics to determine the boundaries between categories. For example, some scholars use population density to determine categories, with debates about how many people per acre constitutes suburban versus exurban (see Theobald 2004 for a full discussion of this issue). Others, however, including many planners, talk about suburban and exurban in terms of the density of dwelling units. We use the latter, as our ecological focus is largely on the subdivision of land for housing and its footprint.

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