



**PLANNING, PRIORITIES, AND
IMPLEMENTATION OF THE OCONEE
RIVERS GREENWAY**

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Jeffrey Beauvais
Christina Crespo
Katie Foster
Rhianna Hohbein
Sarah Horsley
Dina Rasquinha
Keysa Rosas



EXECUTIVE SUMMARY

Greenways represent a vision of connectivity, accessibility, and multi-functionality. The Oconee Rivers Greenway in Athens-Clarke County (ACC), Georgia has sections in various stages of planning, implementation, or completion. This presented an opportunity to examine how the shared vision of a greenway emerges from collaborative processes and is shaped by the social and ecological context. The understanding gained from this research contributes to a growing body of literature examining how and why certain collaborative efforts are able to succeed when many fail.

Greenway design and implementation is overseen by the Oconee Rivers Greenway Commission (ORGC). The ORGC is a private-public partnership with a hybrid model of governance designed to create and advise Greenway plans apart from political pressures, turnover, and resource provisioning issues that affect local government. However, the hybrid model is still subject to constraints when coordinating the efforts of non-profits, citizen groups, and government agencies that represent different backgrounds, objectives, and visions for the Greenway. In this report we examine how collaboration and goal negotiation affect Greenway planning and implementation in the context of a hybrid private-public model.

Our findings highlight both challenges and opportunities in negotiating multiple stakeholders' goals for and interpretations of the Greenway during its planning and implementation. Interview responses indicated that key concepts such as "connectivity", "greenways", and "conservation" are understood in multiple, sometimes competing, ways. Using a social network analysis, we studied the communication between and among individuals involved with the Greenway. We found that the ORGC encourages cohesive communication networks among most individuals involved in Greenway planning. However, we found that a small number of individuals held a disproportionate amount of "social influence." If these key actors should decide to retire from the ORGC, the communication network may become fragmented. Additionally, responses indicated that in implementing the network plan, funding and land acquisition opportunities often had the greatest influence on decisions concerning the construction of the Greenway. Goals that are not forwarded by these opportunities could lose traction in the implementation phase and consequently may require particular consideration throughout the entire planning process.

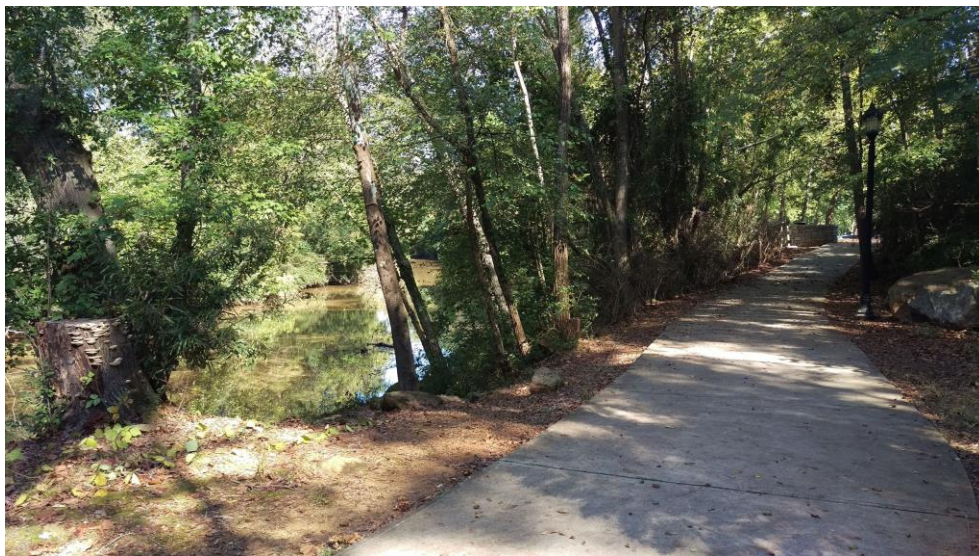
In order to assess if stated Greenway goals are being realized, we compared the location of the proposed Greenway trails with models for maximized ecological connectivity. We chose ecological connectivity as a useful test case given the simultaneous stress placed on the goal 'connectivity' in Greenway documents and in participant responses as well as the competing understandings of the concept. We found that Greenway trails were well distributed across the landscape with several zones of overlap between the modeled pathway and the current location of the proposed Greenway (e.g. Memorial Park to State Botanical Garden of Georgia). In other cases, modeled pathways did not coincide with the location of proposed trails (e.g. Botanical Garden to Rocks and Shoals). However, this was not unexpected given the tradeoffs inherent to managing competing goals within a project. This spatial model and analysis may be useful for the ORGC in future discussions of Greenway locations

KEY TERMS

- **Greenway** = Oconee Rivers Greenway Network
- **greenway** = greenways in general
- **Participants** = people who participated in interviews and survey
- **ORGC** = Oconee Rivers Greenway Commission
- **GNP** = 2016 Update of the Oconee Rivers Greenway Network Plan
- **ACC** = Athens-Clarke County
- **UGA** = University of Georgia
- **SNA** = Social Network Analysis
- **GI** = green infrastructure

Other Acronyms:

- **SCNC** = Sandy Creek Nature Center
- **UOWN** = Upper Oconee Watershed Network
- **SPLOST** = Special Purpose Local Option Sales Tax
- **SORBA** = Southern Off-Road Bicycle Association
- **ADDA** = Athens Downtown Development Authority



KEY TERMS

Setting

We examined the Oconee Rivers Greenway Network in the social and ecological context of Athens-Clarke County. Located in the hilly Georgia Piedmont, this combined city-county municipality contains the University of Georgia and a population of approximately 123,000 (US Census Bureau) with two major river systems amid a patchwork of secondary deciduous forest. The Greenway trail system currently has 3.5 miles of multi-use trail, 2.3 miles of street-based trail, 12.1 miles of foot trail, and 3 miles of multi-use trail. An additional 3.5 miles of multi-use trail have been approved and funded for construction.

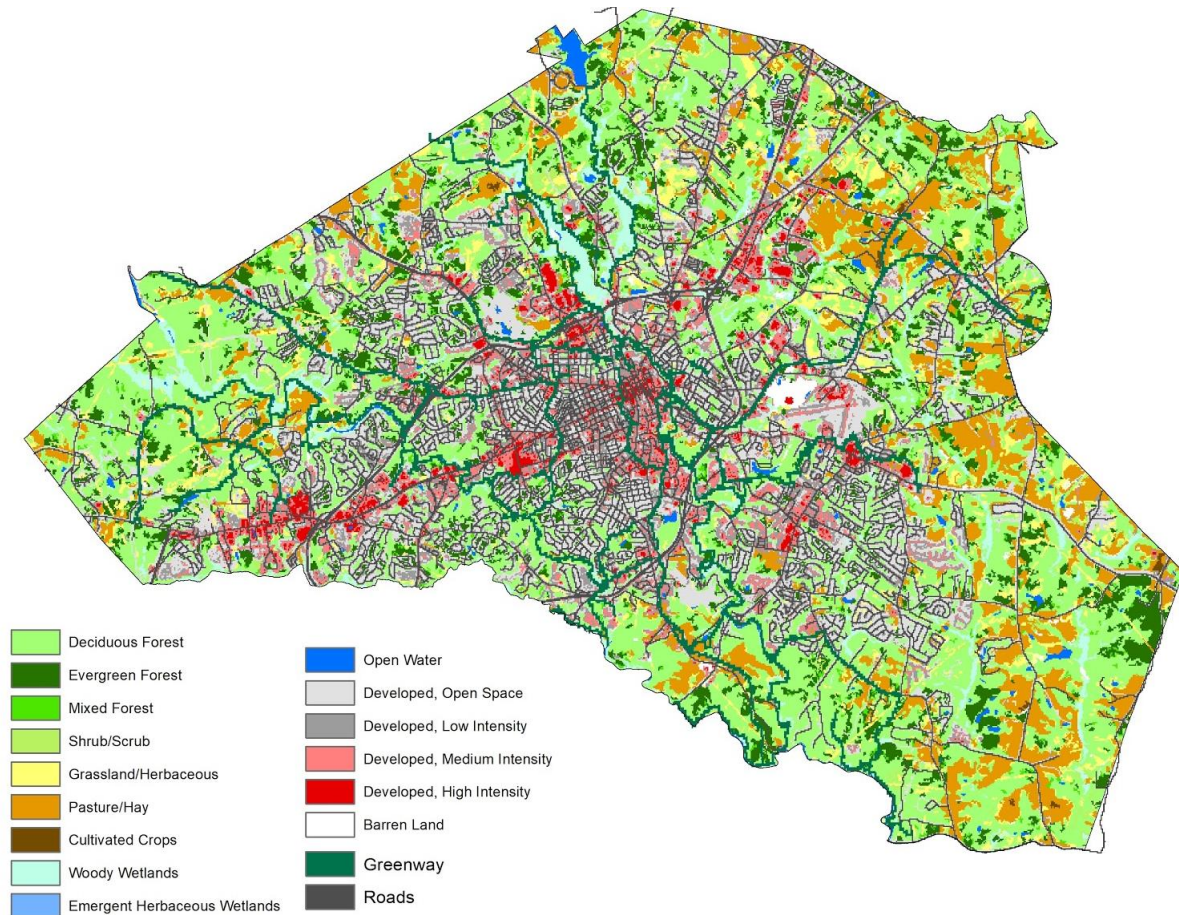


Figure 1. Map of land types in Athens-Clarke County

INTRODUCTION

Green infrastructure (GI) planning as an urban management process has grown in global prominence in recent decades. Cities across North America, Western Europe, and the UK are promoting GI innovations to manage and plan their urban spaces for enhanced storm-water management, infrastructure investments, and community involvement. According to the US Environmental Protection Agency (2017), “At the city or county scale, green infrastructure is a patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water.” Through the incorporation of greenspace in urban areas, GI approaches seek to mimic the functioning of natural systems and to mitigate issues of storm-water runoff and habitat loss associated with urban environments. Some examples of GI structures include green roofs, rainwater harvesting, planter boxes, bio-swales, green parking using porous/permeable pavements, and greenways.

Greenways represent a vision of connectivity, accessibility, and multi-functionality. The underlying principles of greenways are embedded in sustainability science—utilizing concepts of landscape connectivity, form, and function to create multi-purpose spaces to provide diverse ecological, economic, and social benefits. Some of the benefits commonly associated with greenways include increased access to green spaces (Mell, 2008), improved public health and well-being (Takano, Nakamura, & Watanabe, 2002; Tanaka, Takano, Nakamura, & Takeuchi, 1996), conserved environmental histories (Ahern, 2004), environmental education (Fjørtoft & Sageie, 2000), biodiversity restoration (Kong, Yin, Nakagoshi, & Zong, 2010), and climate change mitigation through sustainable design of housing and infrastructure (Beatley, 2012). Yet the realized benefits of a greenway are shaped by a range of factors, including the landscape features, decision-making dynamics, available resources, and socio-historical context. With many potential perspectives on what a greenway can and should accomplish, the creation of a shared greenway vision can be challenging.

The Oconee Rivers Greenway (hereafter referred to as “the Greenway”) has sections in various stages of planning, implementation, or completion. This presents an opportunity to examine how the shared vision of a greenway emerges from collaborative processes and is shaped by the social and ecological context. The primary entity involved in the Greenway design is the Oconee Rivers Greenway Commission (ORGC). The ORGC is a private-public partnership that consists of ten members who are appointed by the city government and five members who are appointed by the president of the University of Georgia, a large public research university located in town. Other Greenway organizational structures include citizen-only or government-only control and development. The ORGC’s hybrid model of Greenway governance can potentially create and advise Greenway plans apart from barriers that affect the local government such as political pressures, turnover, and resource provisioning. However, the hybrid model is still subject to constraints when coordinating the efforts of non-profits, citizen groups, and government agencies that all represent different backgrounds, objectives, and visions for the Greenway.

INTRODUCTION

In this study we looked at how collaboration and goal negotiation affect Greenway planning and implementation in the context of a hybrid private-public model. We hope this case study may prove useful for other green infrastructure planners or natural resource managers involved in the development of urban greenways. This report contains a synthesis of major findings, including observations of the internal and contextual challenges with negotiating multiple Greenway goals, as well as the limitations and benefits of a collaborative, hybrid governance approach. Furthermore, we sought to evaluate how successfully the ORGC is achieving one of its primary goals for the Greenway: ensuring ecological connectivity. This final objective was accomplished through spatial analyses. Our research culminates in general recommendations for greenway collaboration and development.

BRIEF METHODOLOGY

Through interviews, social network surveys, and analysis of public access records and planning documents, we examined how the various perspectives and primary goals of individuals ultimately influenced the prioritization of certain features and locations. Survey and interview participants were identified via planning documents followed by referrals from a social network survey. Results from the social network survey were imported into UCINET, a social network software program, to examine the structure and characteristics of the ORGC social network. We assessed the primary goals of participants through weighting and averaging commonly listed responses; we also examined interview data through an iterative qualitative analysis of how goals were discussed and justified in context. Finally, we compared the current location of the Greenway with the pathway that enhanced ecological connectivity using a modelling framework. Further methodological details can be found in the appendix (pages 31-33).

MAJOR FINDINGS

1. CHALLENGES IN NEGOTIATING MULTIPLE GREENWAY GOALS

Greenways are often proposed as providing a breadth of benefits ranging across ecological, health, community, and cultural services. However, when these benefits become goals of greenway development, resources must be allocated in ways that allow these benefits to come to fruition. Moreover, it may not be possible for a greenway to provide all benefits simultaneously (De Meo, 1993). As the Greenway is built, we see certain planned goals accomplished while others are put on hold. Our interviews with Greenway stakeholders allowed us to gain insight into how the range of goals were understood, supported, and negotiated within the planning and implementation processes.

The Greenway is subject to broader social currents that have shifted through time. These are translated into both community interests and the broader planning climate of the moment which shape how the Greenway is both understood and implemented. Some participants described the Greenway as being born out of the environmental movement in the United States— *“you were just coming out of the 70’s. Where in the 70’s, you didn’t get elected if you weren’t green. Because they came out of the 60’s and in the 60’s, rivers caught on fire. Silent Spring was a real thing.”* Rachel Carson’s highly influential book, *Silent Spring*, originally published in 1962, played a vital role in stimulating the environmental movement in the United States. The participant’s reference to the book situated their perspective within this broader movement and provided insight into the initial impetus for developing the Greenway. Another participant asserted that the Greenway was propelled forward by a community scale movement around Athens, driven by “very environmentally conscious people.” This initial motivation translated into the goals of using the Greenway as a means of land conservation and a way to cut down on pollution by providing alternative transportation opportunities. Reflecting this intention, one participant explained that the Greenway was originally created as a multi-purpose linear park, emphasizing that the human element is just one of many purposes.

However, others considered the motivation for developing the Greenway as more for resident and community well-being. One participant stated that the “diabesity epidemic,” referring to the rise in obesity and diabetes within the United States, was a major driver for their *“desire to create walkable communities for the health and edification”* of their surroundings. Yet, as another participant argued, these broader interests are not mutually exclusive: *“... if you want to cut pollution and you want to reduce the impact of automobiles, what do you need to do? You need to get people out of their cars. Well of course now that health and weight and all of those things are an issue, oh it’s all for exercise...and that’s the new buzzword. But in reality, it’s the same thing.”* However, one concern raised was that these shifting social currents may result in *“forgetting the underlying, or not fully understanding the underlying systems that the Greenway is protecting and providing for the community.”* This concern is bolstered by the statement that *“in the current planning climate, the tendency is to narrow down to where you’re really just talking about transporting people or moving people through a pretty environment.”*

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Alongside competing motivations, issues may arise when there are multiple interpretations or understandings of Greenway goals. Most notable in their variability were the concepts of “greenway,” “connectivity,” and “conservation” among Oconee Rivers Greenway stakeholders. For instance, some participants viewed the Greenway as just the trail, while others recognized it more broadly as the USGS designated 100-year floodplain. Connectivity was also discussed broadly among participants, with varied references to the importance of neighborhood and amenity connectivity, transportation connectivity, or corridors for wildlife. Others used the term in a different sense, with a focus on the importance of connecting people to nature, including the river, greenspace, and wildlife habitat. Conservation was interpreted as preservation by some (e.g., excluding public use for natural resource preservation), while others championed a multiple-use approach (e.g., allowing recreation trails on Greenway land to prevent it from being otherwise developed). While the Greenway Network Plan (GNP) defined some of these concepts explicitly, stakeholders nonetheless contributed to planning with their own interpretations in mind. These varied interpretations are important to consider because they serve as guiding concepts that drive Greenway trail design and land use.

Stakeholders known to be involved in or with the ORGC were asked to complete an online survey that asked them to list their top three priorities for the Greenway (i.e. those which most motivated them to become involved in the planning). Each priority was weighted by its order of appearance within each person’s list. Then all mentions of that priority were compiled to provide a weighted value. The three most frequently cited priorities included: connectivity (with an explicit focus on transportation), resource conservation, and recreation (Table 1). Connectivity of transportation routes, neighborhoods, and destinations were listed most often and ranked highest, but other forms of connectivity were expressed, including two references to wildlife corridors, and two mentions of “connectivity” without elaboration. Still others talked about a different type of connection: that between people and nature, or to the river, specifically. These results illustrated the many definitions of connectivity used by stakeholders. Similarly, a variety of responses were loosely categorized as “resource conservation,” demonstrating the many potential targets of conservation efforts perceived by survey participants.

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TABLE 1: GREENWAY PRIORITIES THAT MOTIVATE PARTICIPANT INVOLVEMENT	WEIGHTED VALUES	COUNT
Connectivity: transportation, neighborhood and destination, alternative transportation	31	13
Resource Conservation: habitat protection, watershed health, natural/cultural resource conservation	30	12
Recreation	14	7
Connecting people to nature	8	5
Health and wellness	8	4
Community-wide stewardship and land ethic	5	3
Connectivity: undefined	4	2
Access to amenities	4	1
Public safety (from transportation standpoint)	4	2
Weighing environmental and community benefits	4	2
Connectivity: river-side linear green area	3	1
Bringing equity perspective to the process	3	1
Community-building	3	2
Economic development	3	2
Greenway-adjacent land ownership	3	1
Increased access points	3	1
Connectivity: wildlife corridors	2	1
Creation of state recognized water trail, green space inside the loop	2	2
Family use opportunities	2	1
Green Infrastructure planning	1	1
Improvement of existing network	1	1
Making human connection to nature part of government function	1	1
Part of the job	1	1

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While the GNP treats the five goals of the Greenway as discrete benefits, conflicts and complementarities between Greenway goals were noted by half of those interviewed. Complementary goals were often identified between transportation, health and well-being, recreation, and education. In particular, connectivity of neighborhoods and recreation areas was identified as an integral component for achieving multiple goals of the Greenway:

"I think connectivity to accomplish those goals, ... honestly health, education, transportation, and recreation are all kind of connectivity things. I would say the majority of the goals of the Greenway is accomplished with higher connectivity."

Though connectivity was proposed by some participants as a means to achieve multiple goals, others described conflict between Greenway design intended for multiple goals, such as transportation/recreation and conservation corridors.: *"While we recognize that conservation is really important, we're not necessarily in the business of preserving and then barring people from entering."* One participant cited the proposed Cook's Trail bike path as a nexus of conflict between transportation and conservation goals, expressing some citizens' concern over the effect of a paved bike path on bird-nesting sites. While the GNP does recognize the potential for interactions among Greenway goals, more explicit attempts at identifying these complementarities could improve implementation strategies and allow the ORGC to maximize the benefits the Greenway provides. Likewise, explicit identification of conflicts between goals will make the planning and implementation process more transparent, allowing the ORGC to better mitigate these issues as they arise.

Interview data provided additional insight into the tensions inherent in decision-making processes about the Greenway. These tensions are summarized by the following questions:

For whom is the Greenway being built? The varied users of a greenway often require slightly different structural or functional features. For example, one participant mentioned, *"Runners don't want hard surface and they don't want to mess with bikes. Of course, mountain bikers don't want to mess with runners. You've got that whole issue of who gets to use the trail and what is it for. ... Once you get outside the main trunk... what kind of Greenway do you build?"* Besides runners and bikers, greenways could be built to accommodate families or students, therefore elevating aspects such as interpretive signage, playscapes, accessible trails for the elderly, disabled, or very young, or connectivity to schools. Another participant mentioned that some neighborhoods may be unintentionally excluded from the network and suggested stronger efforts to link underrepresented communities to natural spaces.

What is its primary purpose? As discussed earlier, greenways can be built to enhance a variety of education, health, conservation, economic, or transportation outcomes. However, many interview participants emphasized conservation goals of the Greenway initially, but then focused more on social benefits like health and wellness, alternative transportation, community building,

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and economic impacts for the rest of the time. These foci seemed to be influenced by professional and personal inclinations and constitute another area where diverse opinions can become an important challenge to greenway design. However, these diverse opinions can also lead to a more robust product that serves a greater portion of the population if successfully incorporated.

Public use versus conservation? As described above, this presents a particular challenge when the development of a greenway and subsequent increased foot or bike traffic may damage sensitive ecological areas. Divergent opinions were expressed in the interviews over the degree of acceptable use in certain sites and whether the potential increased sense of public land stewardship is worth the local environmental cost. This tension suggests a need for further candid conversations over how and where to justify public use and what type of trail is most appropriate based on the cultural and ecological conditions of the location. Participants discussed this issue on the Beech Haven site, where cultural resources are fragile and visitation is currently limited.

What metrics should be used to justify the expense? The use of tax revenues for green infrastructure projects tends to require additional justification and transparency. Yet metrics for justification can be shaped according to the priorities of the individual making them. For example, a section of the Greenway could be justified in terms of number of annual users or acreage of protected habitat. To illustrate, if more bikers use a trail than runners, this might justify constructing more bike paths than running paths. In these cases, the metric used could obscure important characteristics for a given population of Greenway stakeholders, especially if those stakeholders are not present in planning discussions. This highlights the need to gain broad participation from a wide range of stakeholder groups, to better identify how and where to incorporate appropriate design features that are useful to a diverse user base.

How is connectivity defined, and what sections get prioritized? The multiple definitions of connectivity represented in the survey results are also reflected in the interviews. One participant described a general difference in opinion over which type of connectivity to prioritize with the question, *“Should we be spending money connecting to neighborhoods or should we be spending money making the Greenway longer?”* There appeared to be a sizeable split among members of both the ORGC and the County Commission between those who wanted to focus on connecting existing segments of the Greenway and those who wanted to focus on neighborhood connectivity. This issue was evident in an even split among the County Commissioners when the adoption of the GNP came up for a vote—a challenge that was mentioned by one of the interview participants. This case further demonstrates how varying definitions can complicate decision making processes and produce conflict as to how, where, and when to prioritize building certain sections of a greenway.

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2. CHALLENGES IN COLLABORATION

Internal Dynamics - Insights from a Social Network Perspective

Social network analysis (SNA) is a tool that helps researchers document and examine patterns of communication among individuals. SNA can ultimately help explain why certain collaborations succeed or fail and how communication networks become greater than the sum of their parts (Bodin & Prell, 2011). SNA can be an especially useful tool for understanding collaborative efforts regarding natural resources that involve individuals from various organizations representing differing perspectives and goals. By asking ORGC members about the individuals with whom they communicated the most about the Greenway, we were able to map the strongest collaborative ties within and beyond the Commission.

Our SNA revealed that the ORGC has high cohesion among individuals (i.e., there are no distinct subgroups). This theoretically reduces the capacity for us-versus-them attitudes and encourages cooperation and constructive problem solving (Bodin & Crona, 2009). We found no evidence for cliques representing different priorities for the Greenway within the ORGC; individuals representing different viewpoints were well integrated into the social network, a potential strength of this network (see Figure 2).

Density is a metric that quantifies the number of communication ties (i.e., linkages) present within a network compared to the number of possible ties. The Greenway social network is considered moderately dense. A denser network is beneficial to building and maintaining trust among individuals and is critical to the ability for collective action. However, networks that are too dense may lose some capacity for innovation (Bodin & Crona, 2009). Individuals that communicate more frequently have the tendency to begin to share perspectives; this is known as the Social Learning Theory (Bodin & Prell, 2011). Individuals within overly dense networks may become homogenous, and social norms that arise due to these frequent interactions may prevent individuals from voicing opinions contrary to the status quo. This does not appear to be a concern for the Greenway social network because, as could be expected, ex-officio members and others from outside the ORGC were active but not as incorporated into the network as Commission members. The inclusion of peripheral individuals ensures the representation of alternative perspectives and prevents the network from becoming too homogenized.

While there were no distinct subgroups or cliques, there were three individuals who seemed to hold a disproportionate amount of influence in the social network. This has several important implications. Within SNA, these individuals are referred to as *key actors*. The presence of key actors can be beneficial or detrimental to the network, depending on the specific characteristics of these individuals. Their presence indicates leaders who are capable of initiating action or delegating tasks. However, they also have the ability to control or withhold information from others within the network, if they so desired. Furthermore, as mentioned previously, individuals

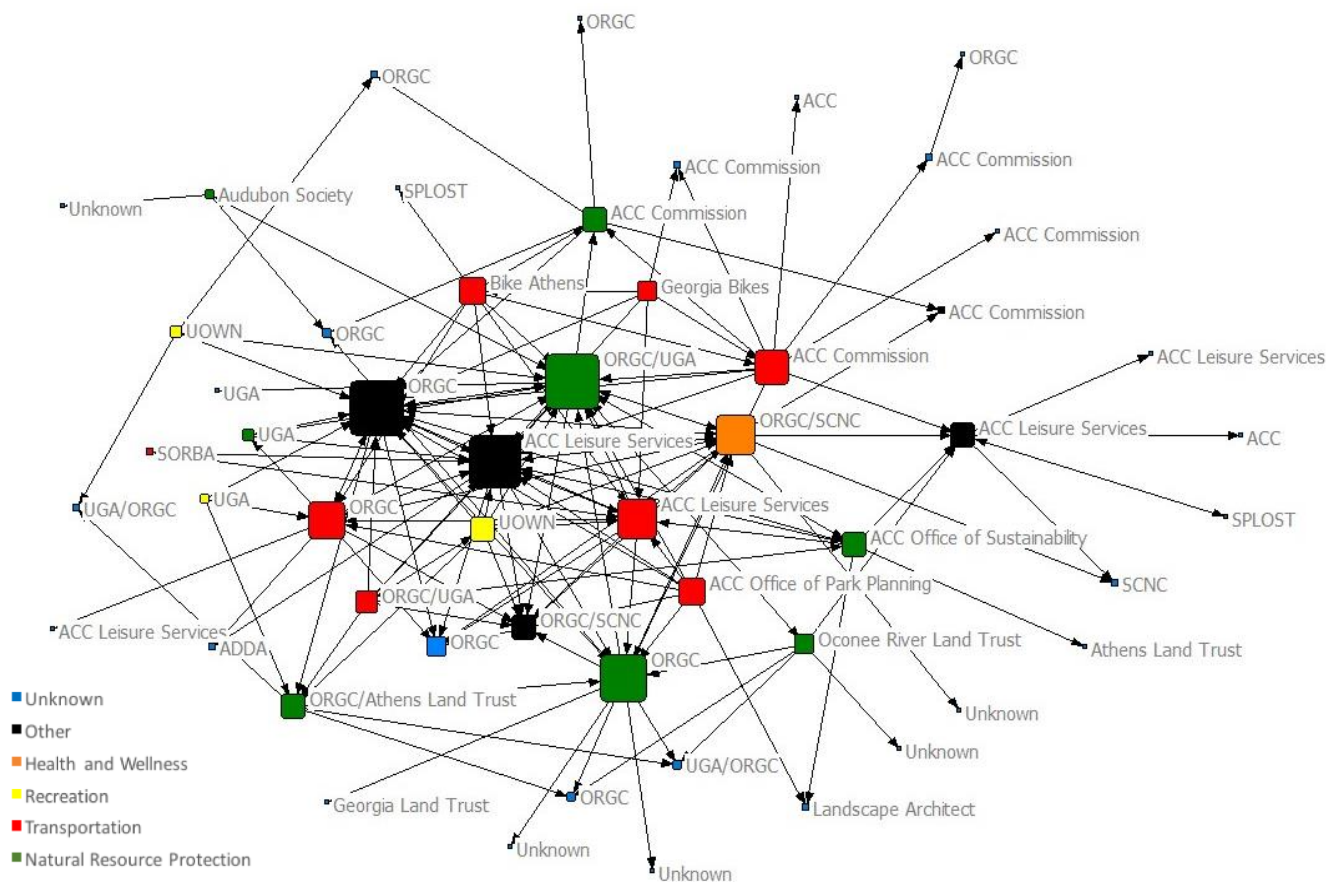
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who communicate frequently with each other have the tendency to become more similar over time. Three individuals hold a large proportion of the communication pathways, indicating that these individuals have the ability to influence more people than others within the network. Though many different priorities are outlined in the GNP and enumerated by participants in the online survey, the protection of natural resources is championed more often as the top priority and specifically, in some form, by all three of these key actors in the network. This is perhaps reflected in the GNP, where natural resource protection appears to be the most developed of the Greenway objectives. There are 17 actionable items dedicated to natural resource protection within the GNP, approximately 50% more than appear for the next most developed section, Transportation (and is twice that of the actionable items for each of the remaining Greenway goals).

Finally, key actors may play integral roles as bridges between otherwise unconnected people. Key actors who serve as bridges have the ability to bring together diverse perspectives and to draw on multiple resources through these many connections. The ability for an individual to serve as a bridge can be assessed by the relative frequency that the individual falls between two unconnected people (a metric known as *betweenness*). The Greenway social network currently benefits from one ORGC member, in particular, who is connected to a diverse array of people and who serves as a bridge between many otherwise unconnected individuals. Though this key actor has nearly as many network ties as other key actors, this person's contacts appear to be more diverse, and thus is capable of reaching otherwise untapped stakeholder groups. The danger to having only one person play such a role, however, is that if that person leaves the ORGC (by retiring, moving from Athens, etc.), the remaining Greenway social network will be fragmented. The degree to which each individual could fragment the Greenway social network through his/her departure is illustrated in Figure 3. For this reason, increased redundancy in contacts could be beneficial to ensure the resilience of the network to turnover of these key actors.

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Figure 2. The Oconee Rivers Greenway social network included a total of 53 different individuals working across a variety of organizations in both the public and private sectors. All squares represent different individuals and are labelled by their institutional affiliations where applicable. Lines that link different people represent frequent communication between the two. Participants were asked to indicate their primary motivator for becoming involved with the Greenway. Their responses were coded into one of six broad categories: Natural Resource Protection, Transportation, Recreation, Health and Wellness, Other, and Unknown (if that person did not respond to the survey request) and are indicated by color in the figure. The size of each square corresponds to the number of times that person was named by others as someone with whom they communicated the most about the Greenway and is one measure of that person's social influence within the network. Three individuals appeared to hold more social influence than others in the network. These three individuals each, in some way, cited an interest in natural resource protection as their primary motivation for their involvement with the greenway, though one had a combined response of "cultural and natural resource protection" while the another was interested in bringing people closer to nature; these latter two are coded as "other."



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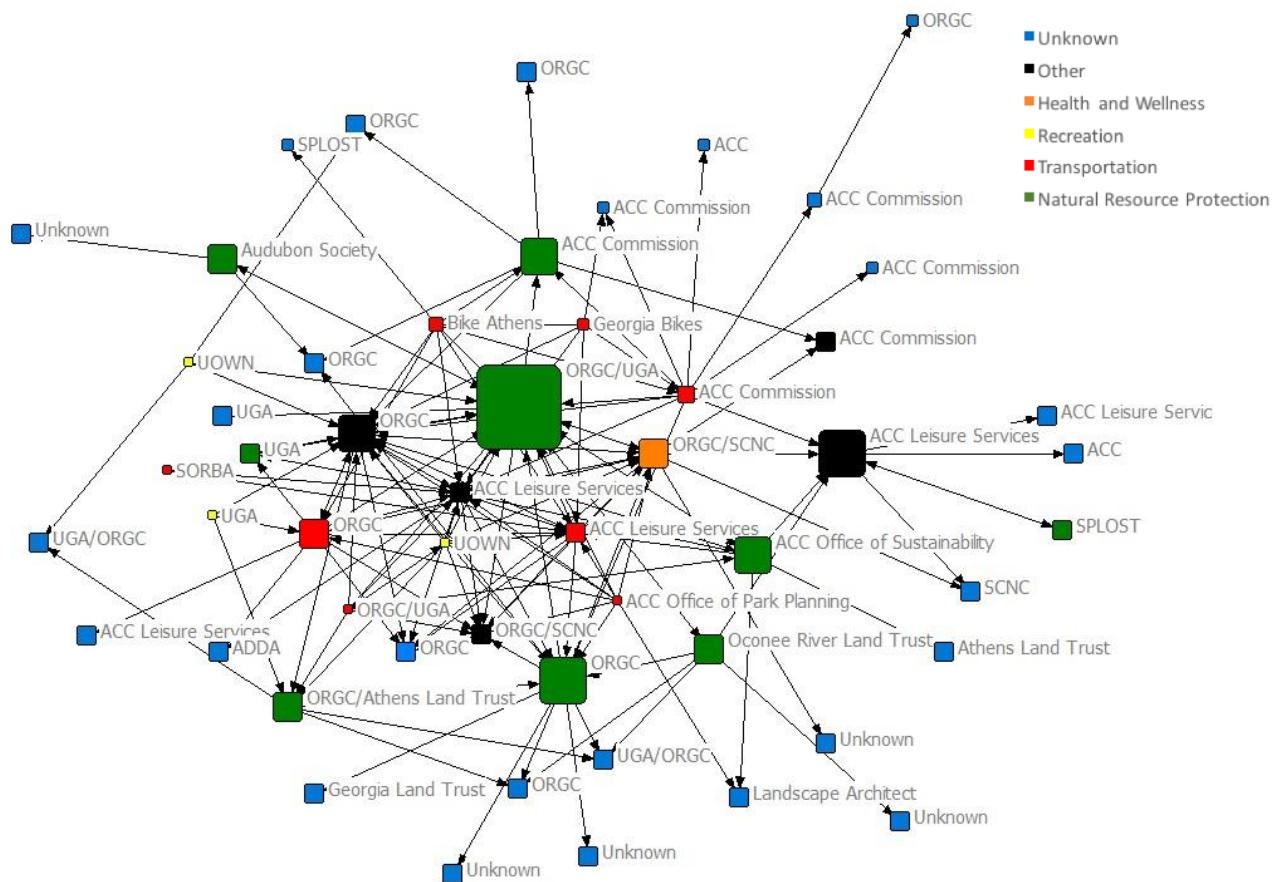


Figure 3. This figure is another visualization of the Oconee Rivers Greenway social network. As in the previous figure, each square represents an individual and is labelled by his/her institutional affiliation, where applicable. Lines that link two individuals are indicative of frequent communication between the two. In this figure, however, the size of the square is reflective of the degree to which the social network would be fragmented if the person were to leave. This metric of network fragmentation is directly related to *betweenness*, or the frequency with which an individual falls between two otherwise unconnected individuals.

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External Dynamics

In interviews, participants noted several challenges to collaboration with groups and individuals external to the ORGC. Participants commonly cited the challenge of public engagement. Many people interviewed noted poor attendance at public meetings and limited public involvement throughout the planning process. Additionally, several participants perceived that many of those who did attend were there to express concerns with the placement of the Greenway through or near their property, *"...from the Greenway a lot of participation [is] from the people who think their property will be affected by the Greenway coming by, so they will come to the meetings and there are a lot of conversations back and forth about where the trail is shown, how that may or may not relate to their property, what their concerns might be, how to ameliorate those concerns."* Two participants cited limited public awareness of the Greenway as contributor for the scarcity of public involvement. Three others focused on shortcomings of the ORGC and strategic partners: *"I'll just say, in general, that [in] Athens, for a college town especially, we do a terrible job of public engagement in all our planning efforts. We tend to just do open houses and not real engagement."* Despite these concerns, a few participants cited efforts of the ORGC to interface with the public that went beyond public meetings, including tabling at the West Broad Farmers Market. Collectively, the generally limited engagement of the public throughout the planning process stands to potentially exacerbate tensions over Greenway implementation. We recommend the ORGC review its public participation efforts and continue to extend participation opportunities directly into the community as it has done with the West Broad Farmers Market. Additionally, holding meetings and events at different times of day may increase the participation of those who are restricted by their work schedule or access to childcare.

In addition to a recognition of limited public involvement, nearly a third of those interviewed expressed specific concern over the minimal involvement of underrepresented populations, in particular the African-American communities in Athens. Difficulty fostering collaboration with the African-American community during the planning process stemmed from two sources: 1) lack of representation on the ORGC, and 2) lack of engagement during public input periods. The lack of minority representation on the ORGC was pointed out by two participants, one of whom stated: *"One aspect of it [the ORGC] though, that I think we need to do a better job on. . . We have a lot of retirees, which is wonderful in terms of people that are experienced and also have time to do work as a volunteer. . . We don't have a great deal of minority representation, in fact we don't have any right now."* This was echoed by another interviewee who noted, *"We are, for the most part, all white and represent. . . think we're representing 'the people,' but I think we are representing 'our people.' I think minority groups are underrepresented across the board including the Greenway Commission. I think we assume we know what people want. And we may be right. We may be wrong. We don't know."*

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3. TRANSLATING PLANS TO IMPLEMENTATION

The people involved commonly described Greenway planning as leveraging opportunities of funding and land acquisition rather than the steps laid out in the GNP. One participant described the implementation process by the following, *“It’s one thing to come up with a Greenway Network Plan and it’s another thing to fund it.”* While the GNP recognizes that Greenway goals and actions “are complex in nature and will take years to complete,” the opportunistic implementation process may benefit from a more explicit recognition of synergistic effects between these actions in the GNP. For example, while ‘Health and Wellbeing’ included just three actions to implement the goals of health promotion, many participants recognized that opportunities for health and wellbeing are inherent in actions such as providing a connection to nature, access to recreation trails, and safe and easy alternate transportation routes. While the GNP does recommend that certain sections of the Greenway be built in earlier stages rather than later, we investigated how other internal and external forces drive the process of implementation, and thus, the types of benefits and purposes the Greenway provides.

While individuals each had personal priorities for where, when, and how Greenway sections get implemented, a few key constraints emerged from interviews which guide the implementation process. These constraints included the source of funding, land acquisition, and to a lesser extent, the incorporation of “destinations” into the Greenway system to encourage use. An additional analysis of ecological connectivity provided insights to the landscape features which may promote or inhibit Greenway development.

Funding

Funding is a primary constraint, both in terms of amount, but also source. For example, much of the funding for the Greenway has come from transportation-related sources, including local tax revenues (i.e. TSPLOST, or Transportation Special Purpose Local Option Sales Tax) as well as a seed grant from the national government for the creation of the Cook’s Trail from ISTEA (Intermodal Surface Transportation Efficiency Act) funding. Because this money is tied to the development of alternative transportation infrastructure, these sources guide efforts to enhance Greenway connectivity and are reflected in an emphasis on transportation in both planning documents and interviews. Consequently, connectivity related to transportation or “connecting neighborhoods to destinations” was both the most frequently cited priority of the online survey results (n = 13 / 24 responses) and had the highest weighted average (meaning it was most often identified as a top priority). In interviews, transportation was mentioned as an important benefit or primary priority of the Greenway in 13 of 16 interviews. For example, one participant explained, *“the TSPLOST vote . . . is a transportation-based thing, so we had to make sure all the trails that were included were more transportation based and not so much recreation.”*

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This is not to say that acquiring funding with strict usage requirements is necessarily negative. We merely recognize that constraints attached to funding sources are a significant factor which guides the prioritization of certain features and sections of the Greenway, and recommend that green infrastructure planners actively integrate the limitations of certain funding sources into their overall network plans. As far as the Greenway is concerned, some interview participants indicated a general degree of satisfaction with the efforts to acquire diverse funding sources, and cited the appointment of a grants administrator with professional expertise in finding and applying for grants as a primary reason for this success. Several additional potential funding sources are described in the 2016 GNP. These include grants from state funds (e.g. Georgia Recreation Trails Program; Georgia Department of Transportation's Transportation Enhancement Grants), local funds (e.g. Special Purpose Local Option Sales Tax), non-profits (e.g. MillionMile Greenway Project; Alliance for Biking and Walking's Advocacy Advance Grants), and private companies (The Conservation Alliance).

Land Acquisition

Constraints to land acquisition were only explicitly mentioned in 2 of 16 interviews but were alluded to frequently by others interviewed. This challenge occurs when property in the proposed Greenway corridor is difficult to acquire, due to high cost or unwillingness of property owners to sell or donate land. Individuals involved in the Greenway planning process mentioned that land has not been acquired through eminent domain to date, but other creative measures have been undertaken to streamline efforts. This includes close partnerships and collaboration with public and private entities that acquire land, including the ACC Public Utilities department, as well as the Athens Land Trust and Georgia Conservancy, which are local and regional non-profits involved in land conservation. By coordinating with the Public Utilities department, negotiations over land acquisitions for sewer lines can occur in tandem with negotiations over Greenway land, thereby enhancing the potential of successful acquisition and establishing co-benefits for public tax spending. One participant described this approach as such, *"One of the cheapest, nicest ways to build a greenway is to put it right on top of a sewer line – that's what we're doing in a lot of places. You're already disturbing the land, it keeps it open for access to the sewer line. Because the Greenway is there if there is a problem with the sewer line, it is caught very, very quickly. If the manhole cover pops up and unwanted material comes out, you find out about it very quickly. If it's in the middle of the woods somewhere, you don't necessarily find it."* This respondent also noted the hesitation of some collaborators regarding this overlapping effort, citing the potential ecological risks that could result from a leaking pipe.

The leveraging of opportunities we observed in the construction of certain sections of the Greenway is related to the challenge of acquiring both land and funding. The cost of building a greenway is driven up when large tracts of land must be purchased from private landowners. However, the land acquisition process has also helped to facilitate partnerships between the ORGC and other local non-profit organizations (like the Athens Land Trust) and government

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agencies (like the Public Utilities Dept.) Other greenway planners may benefit from seeking out creative partnerships with organizations to help them attain their goals. However, this requires candid dialogue as to where and when various strategies are financially, socially, and ecologically appropriate and how to enhance co-benefits among involved parties. Tax incentives for landowners have also been useful for acquiring land for the Greenway. The 2016 GNP describes several of these incentives, including Conservation Use Assessments, land donations and bargain sales to the municipality, and conservation easements.

Trail Destinations

One interview participant mentioned incorporating destinations within the Greenway network to draw users down the trails, stating, *“We preferred to have some sort of attraction at the end of the Greenway so that it could become a destination rather than just a place to park and get on the Greenway.”* This was also reflected in planning documents such as the GNP, which identified a variety of cultural resources such as archaeological sites, historical markers, art installations, and other sites of public interest which can be incorporated into the Greenway. Additionally, the GNP specifies the goal of connecting to neighborhood facilities and amenities like parks, schools, and community centers, although interview data indicates varying perspectives on how these features should be prioritized.

Other participants described efforts to make the Greenway itself a destination, often citing other cities with impressive or expansive greenway systems. It was largely through this framing that the economic benefits of the Greenway were discussed, focusing on the system as a way to bring in visitors and to attract patrons to proximate businesses. One participant framed their vision thus, *“My vision...I guess a vision would be that a broad segment of our citizens, our population, understand the benefits of the Greenway and support its development, its maintenance, its growth. And come to it more often. It’s a destination for them. Furthermore, it’s a destination for individuals in the region. It’s a destination for people coming into town for conferences. It’s something that’s well known and considered one of the benefits of moving to Athens. Attracting more retirees. I guess I’d like to see it recognized as an asset and be better known. I’d also love to see commercial development, restaurants, shops. I’d like to see all of the downtown building of student housing, realize their value of coming up onto the Greenway.”* Economic benefits were largely described in terms of benefiting businesses and attracting tourism or new residents to the area. The potential impact on property values was mentioned less often, and, in several cases, was qualified with a reference to the potential negative effects of gentrification (i.e., when rising property values price people out of their homes), such as has occurred along the Atlanta Beltline. Gentrification was mentioned in three of the seven interviews in which economic benefits were discussed, indicating that at least some individuals involved in the Greenway planning were aware of this issue, even if they are not directly involved in strategies to try to prevent such negative effects.

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Ecological Connectivity

Ecological networks are linear structures that facilitate the movement and migration of flora and fauna, and, in some cases, humans. In highly anthropogenic landscapes, greenways may easily fit into areas such as natural corridors of rivers and ridges or canals and rural roads (Little, 1990), reducing the competition for space (Weber, Sloan, & Wolf, 2006) as well serving as critical areas for dispersal. The GNP identifies ecological benefits as one of the five main goals of the Oconee Rivers Greenway Network. We also found multiple interpretations of ecological connectivity among the participants, some of whom focused on the idea of natural corridors or wildlife habitat connectivity. Some participants envisioned the Greenway trails in ACC to the concept of a watershed. This notion of connectivity was associated with rivers cutting across the landscape but connecting multiple County Parks, preserving and enhancing ecological functions.

To identify areas of the greenway network that would provide the greatest ecological connectivity, we evaluated theoretically optimal routes of ecological connectivity among core areas of greenspace using a geographic information system (GIS). Our model assumed that different kinds of land cover were more or less difficult for flora and fauna to disperse or traverse. Natural wooded areas were considered to offer the least resistance to movement, while concrete parking lots, buildings, etc. were considered to offer the greatest resistance, with a gradient between these two extremes. With this information in hand, we predicted the most feasible paths for organisms to traverse between selected locations. We focused on the county parks of ACC (See Appendix, Section 3). The results of this analysis are illustrated in Figures 4 and 5. In Figure 4, the gradient of colors represent an increasing cost (in terms of distance and cumulative resistance encountered) of travel between county parks. Thus, as a hypothetical organism is moving away from any park, they experience an increasing cost from this effort. Figure 5 shows the specific paths of movement where these cumulative costs are minimized, in dark red. The other dashed lines are the locations of the proposed Greenway trails.

A few of the Greenway trails, especially those that connect Memorial Park to the State Botanical Garden of Georgia, overlap with the path of least resistance (Figure 5). However, some others do not, such as those which connect the State Botanical Garden to Rock and Shoals (on the bottom right of the map). In the first case, the distance between the two habitat patches is less than the distance in the latter (~2 miles versus ~4 miles). The resistance that would be experienced by any organism traversing between these areas also increases substantially in the former case than the latter (Figure 4). Thus, maintaining connectivity between patches of increasing distances apart will require more thoughtful consideration. The analysis also points out the need to accommodate areas which are predominantly surrounded by land covers which decrease connectivity while planning the location of the trails. Finally, it stresses that cost effectiveness of the trails in reducing environmental and anthropogenic disturbances to existing flora and fauna needs to be carefully assessed especially in those areas which are already well connected such as the Sandy Creek Park area, Cooks Trail, etc. This analysis may prove useful to the ORGC in future discussions of potential co-benefits that could be produced by placing the Greenway in certain locations that enhance the movement of flora and fauna.

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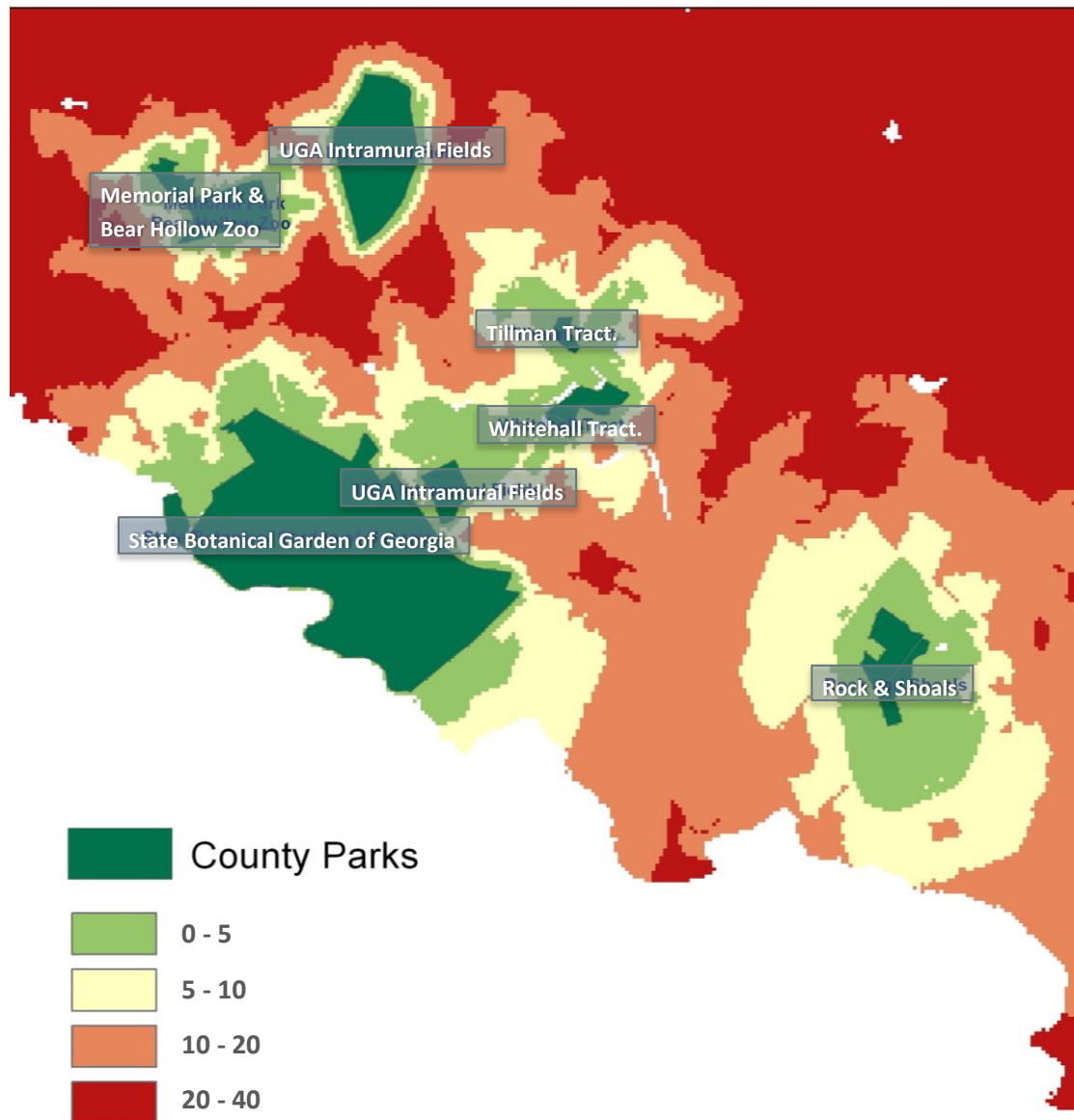


Figure 4. Cost-weighted distance surface for part of ACC. Increasing costs associated with traversing between two habitat patches (in this case, ACC parks) are indicated by shifts from green to red. The legend numbers indicate the distance in kilometers weighted by the resistance value associated with each land cover class.

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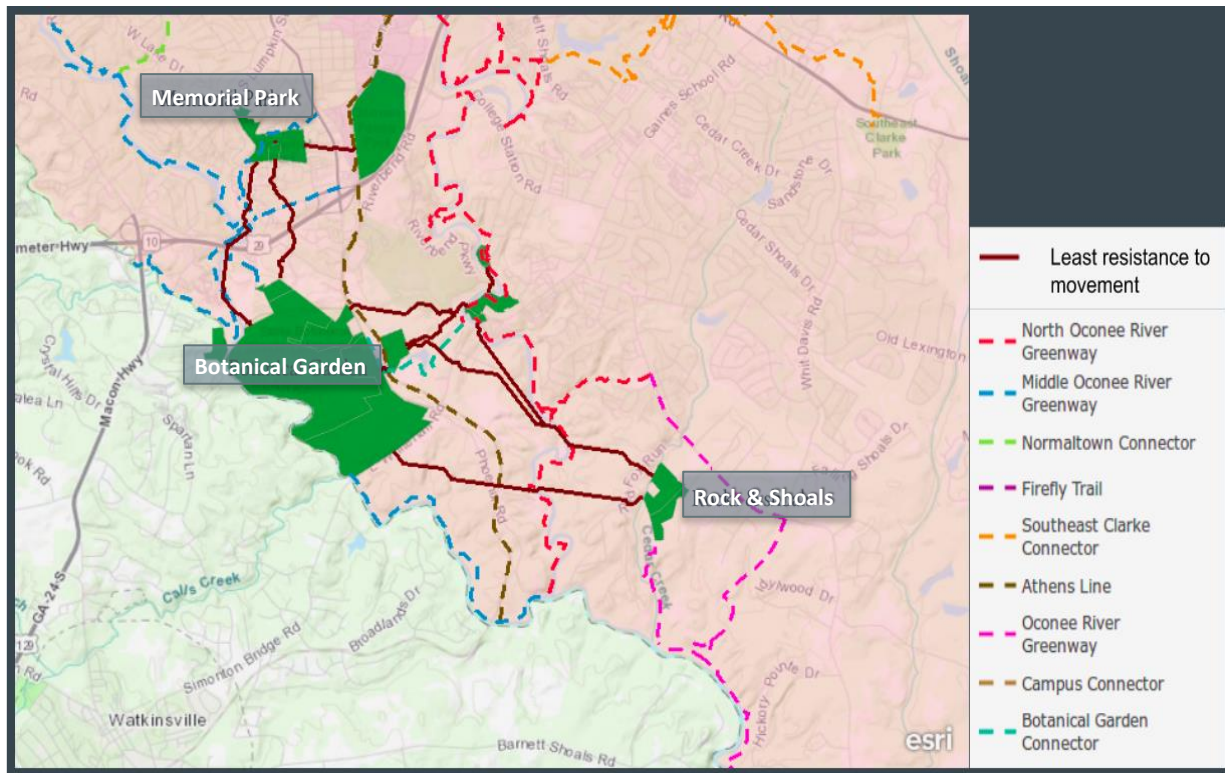


Figure 5. The path of least resistance (dark red) in comparison to the location of the Greenway trails (dashed lines).

RECOMMENDATIONS

RECOMMENDATIONS

Based on the results of this study, we suggest some general recommendations for future and current Greenway planners:

- Explicitly acknowledge the priorities among decision-makers, and strive for transparency with regards to the relative emphasis given to different goals. Organized processes such as structured decision-making often aid in making natural resource decisions among diverse stakeholders.
- Continue to engage community members with diverse expertise and priorities as ex-officios to ensure the ORGC does not become homogenous over time.
- Clarify definitions of key terms (such as connectivity, conservation, etc.) and ensure that that decision makers have consensus on their meanings this will help to reduce confusion or conflicting ideas.
- Develop strategies for enhancing potential synergistic benefits and managing potential tradeoffs of the project. Research has demonstrated the benefits of and methods for engaging in the explicit consideration of tradeoffs (Hirsch et al. 2013; Vercoe et al. 2014).
- Encourage more lines of communication among stakeholders involved to ensure the resilience of the social network to turnover of key actors (reduce the risk of social network fragmentation).
- Engage a diverse array of stakeholders to better align the goals of project with the needs and desires of the communities it serves.
- Pursue a variety of funding sources so that efforts do not become canalized toward specific outcomes.
- Combine the connectivity modelling analysis with field measurements of dispersal dynamics of flora and fauna to understand the sensitivity of each to the presence of the proposed trails.
- Construction of the trails in well-connected areas needs careful consideration.

APPENDIX

1. SOCIAL NETWORK ANALYSIS

Prior to conducting this research, approval was granted from the Human Subjects Review Board of the University of Georgia.

We used an online survey (SurveyMonkey Inc., San Mateo, California, USA) to gather the information necessary to construct the social network. The survey asked respondents to provide their name and institutional affiliation, and to list up to ten people (first and last names, institutional affiliations) with whom they communicated the most about the Oconee Rivers Greenway. The survey then asked respondents to list, in order of importance, the three priorities for/characteristics of the Greenway that had motivated them to be a part of the Greenway planning process. The survey concluded by asking respondents to indicate if they would be willing to take part in the in-depth interviews used for our other analyses.

The survey was first sent to all current members of the ORGC, as well as any individuals whose names we had identified in publicly available planning documents. Following this initial round of surveys, we then forwarded the survey link to any individuals that had been identified by previous respondents as one with whom they had spoken with the most about the Oconee Rivers Greenway. We sent email reminders to participants after one and two weeks to increase the response rate. The survey was open for one month, after which we downloaded the data, and imported it into UCINET software (Analytic Technologies, Harvard, MA) for analysis.

Within UCINET, we calculated scores of degree centrality (based on *in-degree ties*) and network fragmentation (based on *betweenness*) for each individual. We also calculated overall network density. We used the NetDraw network visualization tool to create the images included in this document.

2. INTERVIEW ANALYSES

Semi-structured interviews were conducted with 17 participants who were asked a series of open-ended questions about their motivations, collaborations, and involvement with Greenway planning and implementation. Additional questions were posed regarding initiatives already underway or slated for the imminent future, as well as people or organizations involved in implementing other objectives of the Greenway. Interviews were transcribed and assessed by multiple researchers within our study.

Participants were asked to identify and prioritize their primary motivating values through a free-listing exercise, which was analyzed by weighting responses by rank in their lists (1, 2, and 3) and

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multiplying by frequency across all lists for a final value. Other item responses were analyzed with an iterative thematic analysis to understand common themes discussed and their contexts.

This procedure was complemented with an iterative discourse analysis of publicly available media (planning meeting minutes, action plans) to determine common themes and the context in which they are discussed by various actors involved in the Greenway planning process.

3. CONNECTIVITY MODELLING

The Connectivity Linkage mapper in ArcGIS was used to model connectivity. The toolbox requires a resistance and habitat layer as input to model the path that offers the least resistance to movement. This approach seeks to compromise between minimizing travel distance between habit patches and minimizing exposure to unsuitable habitat. The County Parks shown in Figure 4 were considered habitat patches. The habitat layers were chosen based on the assumption that they could serve as potential habitats for biodiversity. These areas are also prioritized in the Greenway plan as potential connection points for the proposed trails. The unsuitable habitat, or the resistance data layer, was created by assigning different values to land cover classes (NLCD 2011) based on the study by Theobald et al. 2012 (Table 2).

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TABLE 2: RESISTANCE VALUES FOR EACH LANDCOVER CLASS

Code	Class	Resistance value
11	Open Water	0
21	Developed, Open Space	52
22	Developed, Low Intensity	64
23	Developed, Medium Intensity	76
24	Developed, High Intensity	85
31	Barren Land (Rock/Sand/Clay)	24
41	Deciduous Forest	7
42	Evergreen Forest	7
43	Mixed Forest	7
52	Shrub/Scrub	5
71	Grassland/Herbaceous	17
81	Pasture/Hay	56
82	Cultivated Crops	68
90	Woody Wetlands	11
95	Emergent Herbaceous Wetlands	11
2	Roads	100
3	Railroads	100

Datasets considered

The GIS layers used in this analysis included the National Land Cover Data (NLCD) 2011, the ACC roads, railroads and proposed Greenway trails collected from the UGA map library and the ACC Leisure services.

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Contact Information

Integrative Conservation Program
University of Georgia
Holmes-Hunter Academic Building
101 Herty Drive, Athens, GA 30602
Tel 706-542-0458 | **Web** icon.uga.edu

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