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South Carolina Biomass Council Project

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Project Summary and Relation to UN Sustainable Development Goals

During this project, I will pull from the white paper that was made by the interns before me. They focused on researching the clear cutting of along highways in South Carolina and other areas, and how they could potentially prevent it from furthering. Throughout their report, they compared tree policies in South Carolina with those in other states to see how South Carolina could improve or change regarding trees along highways and roads. This made my main objective for this summer to find ways to further prevent this problem of clear-cutting forests alongside highways in South Carolina and create and develop ideas that will promote the planting of more trees on public property throughout South Carolina.

Currently, as a more specified action, I want to focus on the restoration of urban forests, within Georgetown County and surrounding areas, in locations that are highly affected by flooding and could benefit from the advantages that trees provide for stormwater and floodwater collection and run off. I have created a process flow that is a more concise, understandable compilation of the steps necessary to complete landscape enhancement projects on South Carolina Right-of-Ways, which are areas that are closest to community members and can affect them the most. I plan to work closely with the programs that are already in place, such as Keep Georgetown Beautiful and Palmetto Pride, to further this goal. This project will work directly with many of the United Nations Sustainable Development Goals (UNSDG).

Based on its name, the South Carolina Biomass Council seems as though it focuses only on the use that trees and other organic materials can provide for energy. Even after my short amount of time with them, I can tell that they do place importance on finding ways to provide cleaner, renewable energy, they place most of their resources in finding ways to plant more trees and other green infrastructure in a variety of ways. Georgetown County

suffers greatly from increased flooding due to increased development, rising sea levels, and more frequent natural disasters, such as hurricanes and tropical storms. The South Carolina Climatology Office 2020 Year in Review Report stated that "Charleston Harbor tidal gauge reported 68 coastal flooding events", which was the second-highest amount of coastal flooding in a year, only surpassed by 2019's recordings[i]. The same report noted that there were eight tropical cyclones that affected South Carolina's coasts in 2020, all causing some form of flooding, beach erosion, heavy rains, or tornadoes. Both are especially important regarding Georgetown County because of its nature as a coastal region. Another climate issue that South Carolina faced that could potentially lead to increased flooding was reported by the South Carolina Climatology Office was the rainfall levels that reached 59.77" in 2020, 11.88" above normal. Each of these climate issues, combined with the increased amount of clear cutting of trees along highways can lead to detrimental structural problems within Georgetown County.

Obviously, trees cannot solve all these problems outright, but there is no doubt that an increased number of trees would have a positive impact on the climate of the community and the rest of the state. An increased focus on urban forests within Georgetown County, which would include initial planting of more green infrastructure, such as woodlands, wetlands, parks, or fields, continued maintenance of those areas, restoration of ecosystems already in place, and the prevention of destruction of those areas could lead to lower carbon levels, better natural stormwater filtration, lower summer temperatures, economic growth, and greater physical and mental health. Therefore, a focus should be placed on increasing community and government involvement in protecting the natural environment that is already there and pushing for more ways to add even more to it.

The first goal that this would affect would be 1.5, which states that there should be resilience built up for the poor living in areas more vulnerable to climate-related events[ii]. Many times, the lower socioeconomic communities are impacted more by environmental degradation, in this case floodwater and stormwater with nowhere to go and are the ones that are unable to fund solutions in those areas. Due to the lower income communities being the most affected, by focusing on planting trees where flooding is the most severe, it will be inadvertently solving this issue.

The second UNSDG that would be addressed through this project would be 3.4, which focuses on healthy living, specifically lowering premature deaths that could be caused by non-communicable diseases and promoting mental health and well-being[iii]. Both points, 3.4.1 and 3.4.2 are addressed under this broader statement. As the increased number of trees in an area is responsible for a decreased amount of carbon dioxide in the area, an increased amount of oxygen, and according to the South Carolina Forestry Commission, provide people with "feelings of relaxation and well-being" and "provide privacy and a sense of…security"[iv].

Another goal that will be achieved through this project is 6.6, an effort to protect and restore water-related ecosystems[v]. Georgetown, and all other coastal areas, are inherently water-related ecosystems. By preventing the destruction of forests and increasing the amount of urban forestry within these ecosystems, it is ensuring that these ecosystems are not further destroyed by erosion and flooding.

Goal 8.1 could potentially be supported through this project. This goal focuses on the annual growth rate of real GDP per capita[vi]. As urban forests grow, it leads to increased property values, amount of tourism and businesses that the community will attract, and overall, more

pride in the upkeep of the community. In return there could be an increase of economical growth.

By focusing on urban forestry, goal 11.3 will potentially be met through this project. This is a focus on creating inclusive and sustainable urbanization[vii]. This also includes the community's direct participation in urban planning, which will be necessary when working with such a historical area as Georgetown.

Goal 15.2 is responsible for promoting sustainable management of all forests, preventing deforestation, and focusing efforts on reforestation[viii]. By focusing on the prevention of clear-cutting alongside highways and increasing the number of trees that will be restored in the urban areas, this goal is in direct correlation with this project.

Empirical Data

Canopy Rainfall Interception, North Carolina Coastal Plain Loblolly Pine Plantation

Loblolly pines are widely found in the coastal plain region of South Carolina, initially due to their natural presence, and increasingly due to their use for lumber and plywood and their ability to grow in many, diverse ecosystems within South Carolina[ix]. Because of the immense presence that these trees already have in South Carolina, and their admirable characteristics, the South Carolina Floodwater Commission and the South Carolina Forestry Commission partnered to implement an initiative entitled "Power Plant SC"[x]. This was implemented during Earth Day of 2021 and was responsible for the distribution of over 3 million seeds to different environmental organizations across South Carolina, all of which were loblolly pines. There was a combination of seeds and seedlings that were planted, and as loblolly pines are able to grow over 50 feet in only 20 years and have a foot-wide base, it is obvious that time is of the essence when dealing with environmental issues.

This study was conducted over the course of ten years, between 2005 to 2014, to help encapsulate data on how impeding areas with a high frequency of loblolly pines can be towards rainfall. The area used in this study was in the coastal region of North Carolina, housed approximately 1400 trees, and received an annual precipitation average of 1321 mm[xi]. The interception of rainfall is pertinent to the coastal region because of the increased high levels of flooding due to ocean levels rising, increased development, and more frequent hurricanes that bring more frequent floods. As the rainfall is intercepted by the mass of loblolly pine plantations, they are going directly into the ecosystem, and further the hydrological cycle, rather than remaining as stormwater runoff and causing further flooding.

In reference to Georgetown County's canopy, there are tree protection ordinances in place that help to maintain the lush landscape that is naturally established. Before development can occur, which is a growing threat to wildlife and forests in Georgetown County, a plan must be presented that includes the "size and species of existing significant and landmark trees and the proposed location of new trees"[xii]. This ordinance, along with its enforcement by the Zoning Administrator, helps ensure that even if trees and canopy cannot be maintained in their original form and area, there is still a requirement to conserve the habitats that would otherwise be lost.

Comparison of carbon storage, carbon sequestration, and air pollution removal by protected and maintained urban forests in Alabama, USA.

This was a study completed on the campus of Auburn University in order to discern the distinction between total air pollution removal in protected urban forests compared to maintained urban ecosystems. Within this study, air pollution is used as an overarching term to include carbon monoxide, ozone, nitrogen dioxide, and sulfur dioxide. The study states the differences in

the protected urban forest being a larger area that, while being protected, can grow naturally and is only passively maintained. This could be seen as an arboretum, research forest, or park. In contrast, a maintained urban forest is the landscape surrounding buildings, housing, or along smaller roads that is constantly trimmed, cut, and mowed to sustain an image. Because there is a difference in the amount of growth allowed of the trees, their proximity to each other, and the total mass of trees in a single area, the total air pollution removal levels will be affected.

By using a software application called "i-Tree Eco" that can provide data regarding total air pollution removal, and carbon removal, sequestration, and storage for specified plots of land, they were able to recognize that the protected urban forest was "estimated to remove more than 8 times the amount of total air pollution per ha (hectare) as the" maintained urban forest[xiii]. The maintained forest housed 7345 total trees on 237 hectares and the protected forest held only 891 trees on 5.5 hectares, which was shown in Table 4[xiv]. While this highlights the importance of proximity and mass number of trees in a single area when it comes to total air pollution removal, the achievements made by the maintained urban forest cannot be ignored. According to their research, the total air pollution removal amount for the maintained urban forest still amounted to 2,969.1 kilograms per year, which further converts to $15,880.27 saved each year through natural air pollution removal demonstrated in Table 5[xv].

Case Studies

A Study of 12 Communities, Trees to Offset Stormwater

This study was conducted by the Green Infrastructure Center Inc. (GIC) in order to further explore how urban tree canopies, and other urban forestry and green infrastructure, can affect and reduce stormwater runoff[xvi]. Stormwater runoff heavily affects many urban areas that

are developed to a certain extent, so it is important to find a balance between nature and development that works for individual communities. This particular study focused on 12 communities across the Southern United States, in Virginia, North Carolina, South Carolina, Georgia, Florida and Alabama. Each of these areas were chosen for their variation in size, development, and ecological makeup. The increased flooding caused by stormwater runoff in southern cities was reason for this study to take place, so that other southern communities could use this information as a guide for their own green infrastructure plans.

The South Carolina community that participated in this study was Charleston, which is a very close neighbor to Georgetown County, so it is not a great stretch to relay this information to be more conducive for the city of Georgetown. Both suffer greatly from flooding and increased sea level rising, while depending on their waterfront economies and ports. In each area that was included within this study, there was a high importance placed on community involvement and input, which is very necessary to create a longstanding, sustainable community that is highlighted with the UNSDG 11.3. Through this community input, the GIC saw many ideas based around the need for more smart and sustainable development, and more education on the benefits of green infrastructure, the environment in general, and the rules and regulations that are already in place in reference to the environment in their own communities.

The GIC was able to develop a data sheet that compiled the types of trees in urban areas with the amount of rainfall and stormwater runoff that already occurred and create a concise spreadsheet to show how much rain could potentially be intercepted by creating a larger canopy. The focus on the canopy interception alone was very important because, even though trees can absorb runoff through their roots, it becomes more difficult as a storm endures, and the ground becomes more saturated. Below is an illustration that helps demonstrate how a larger canopy can

further reduce the amount of water that ever reaches the groundwater reservoir, thus never becoming stormwater runoff with flooding potential. This illustration also helps to show the importance of these mature trees being planted upon a parcel of grass or pervious surface that can allow infiltration of the stormwater. When they are planted upon narrow strips of land, surrounded by impervious surfaces, they are less likely to be successful in impeding the amount of runoff they are able to intercept.

Figure 1.0

After using the data on the current canopy cover in the researched area, the GIC were able to calculate planting efforts. “If they were to increase the canopy from 63 percent to 67 percent,” there would be a “decrease in stormwater runoff (or increase in capture) of 88 million gallons”[xvii]. Utilizing natural green infrastructure, such as planting projects to increase tree

canopies and create more pervious surfaces to increase stormwater absorption, could help to prevent further destruction of buildings, homes, and coastal forests.

A Plan for Resiliency of Southern Coastal Forests

The Green Infrastructure Center is currently in the process of conducting a project entitled “A Plan for Resiliency of Southern Coastal Forests”. Although the end results of this project are not finalized, there is current research based in a small area of Georgetown County that features each core forest rank and connectivity. As previously mentioned, the analysis done in Alabama elevates the importance that small areas of uninterrupted, protected forests can have on carbon sequestration levels and total air pollution removal. The GIC documented each forest core in order to show the future risk that is posed to them from a multitude of dangers, such as fires, invasive species, ocean surges, and urban development.

The GIC defines these forest “cores” as areas of 100 acres or more that support species that must remain undisturbed within their habitats to survive. These forest cores can then be connected by corridors that are ideally 100 meters or more of a similar habitat. The GIC’s current research shows the number of core forests that can be found within their study area along with the threat that they will face within the next few decades based on current trends and research. Below is an image displaying the research area with green areas showing low threat, yellow areas mid threat, and red areas showing high threat. It is important to note that this research is ongoing and could potentially change before the completed Resiliency Plan is released.

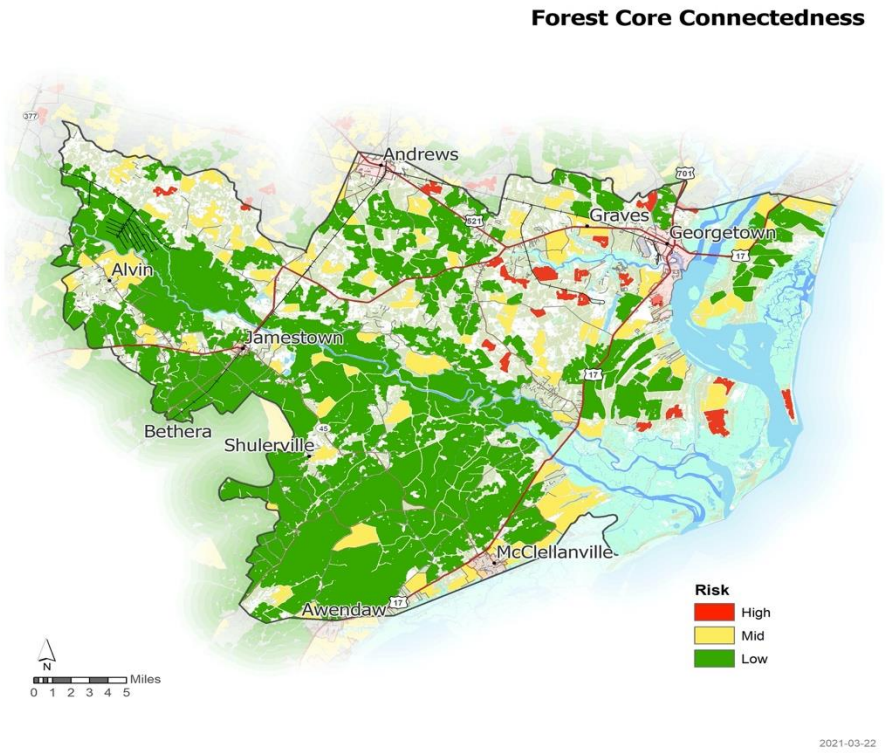

Figure 2.0

Conclusion and Recommendations

A way to increase urban forestry on a local level is to increase the amount of planting projects and landscape enhancement projects done by government agencies, non-government organizations, and local volunteer groups. While there is still work to be done in preventing further clear cutting along South Carolina highways, that does not prevent conservation and planting efforts to continue on a smaller scale. Throughout this project, I created a process flow for landscape enhancement projects along South Carolina right-of-ways. By creating a single, comprehensive document with all the necessary information for these planting projects, there is an increased chance of community members finding this information to be more accessible and functional. The process flow was compiled directly from multiple South Carolina Department of Transportation documents and employees who specialize in landscape projects that affect public roads and can hopefully be used to increase these number of projects.

One thing that I am finding especially important when discussing sustainability and focusing on planting trees is that it is crucial to have the community involved. Sometimes it is difficult to care about the environment because it can feel overwhelming and helpless to make minor changes when there are large corporations causing so much of the problem. But the changes really do happen at home. Each of the benefits of increased urban forestry result in benefits for the people that will be directly living in that community. They are the ones that will directly benefit from increased tourism and property values, lessened flooding and stormwater buildup, better equipped green infrastructure to handle natural disasters, and overall increased mental and physical health. Of course, when these practices are followed by multiple communities across the state, the country, and the globe, it helps decrease the larger problems, such as carbon emissions, and the rising of ocean levels and global temperatures, but it must begin locally and personally. Not only will it create a better, more sustainable future for the next generation in the community, but it will help lead the rest of the world to a recovering future.

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