



02

Natural Resources



Natural resources are all around us, even in the urban core. The air we breathe, the water we drink, the food we eat, and the places we play outside are all resource-driven. Natural resources provide clean air, water, food, habitat, opportunities for recreation and tourism, and help mitigate extreme weather events. Planning for the conservation and preservation of our natural resources is critical to Columbia's future.

Cover photo courtesy of Van Whitehead

IN THIS SECTION

Introduction	93
Guiding Principles	94
Existing Conditions	99
Anticipating Change	111
Recommendations	115

TOPICS

Access to Natural Areas,
Ecosystem Services,
Conservation, Preservation,
Adaptation, Mitigation, Clean
Energy, Climate Change,
Resiliency



Introduction

In considering natural resources, we tend to think of resources individually instead of as part of a system. The interaction between resources and their functions makes up the natural environment. Ecological functions are defined in terms of ecosystem services - for example, trees provide clean air, water, and shade. However, the value of those services to people is difficult to fully quantify. Recent studies have focused on the economic impact of natural resource-based sectors¹, such as forestry or outdoor recreation; however, it is much more difficult to quantify the value of ecological functions. For example, according to the U.S. Forest Service, “every dollar spent on planting and caring for a community tree yields benefits that are two to five times that investment – benefits that include cleaner air, lower energy costs, improved water quality and stormwater control, and increased property values.”² We often forget about the valuable ecological functions our natural resources provide, and as a result tend to overlook this value when examining the costs and benefits of land use and other decisions.

When discussing natural resources, we tend to focus on conservation and preservation. Conservation and preservation efforts are critical to providing Columbians with all the components of a high quality of life - access to natural areas, healthy foods, clean air and water, and more are all contributing factors that relate back to natural resources.

In this chapter, the need for adaptation and mitigation efforts is also touched upon; conservation and preservation alone cannot prepare Columbians, or our ecosystem, to handle the natural resource impacts associated with many of the changes we now anticipate, including population growth and increases in the frequency and intensity of extreme weather.

Photo courtesy of Van Whitehead



Guiding Principles

- » **Fostering a culture**
- » **Leading by example**
- » **Reduce, reuse, recycle**
- » **Clean and accessible waterways**
- » **A robust urban tree canopy**
- » **Natural resources benefit our community's health**
- » **A prepared and resilient community**
- » **Clean and sustainable energy**
- » **A data-driven and innovative approach**

We believe in **fostering a culture** that appreciates and is committed to protecting and preserving our natural resources.

Ensuring the protection and preservation of our natural resources relies heavily upon human behavior. As Columbians we are passionate about the region's natural resources. We believe our rivers, our trees, and our vistas define our City, and we treasure access to our waterways and our natural areas.

We also understand that the protection and preservation of our natural resources is not a simple set of actions. By fostering a culture of understanding and appreciation, we also help foster the behavior necessary to meet our community-wide goals. We recognize that through engagement, outreach, and education efforts, well-informed Columbians can more effectively translate knowledge into action.

We believe in **leading by example** - the actions of our employees and our citizens set the standard in our state.

By demonstrating a commitment to action, City employees show community members how everyday choices can conserve and protect our natural resources. Through reuse and recycling, reducing energy and water usage, using purchasing power to promote change, reducing emissions, utilizing clean renewable energy, and focusing on the resiliency of City operations, the City can be a shining example for the Midlands and beyond.

City employees, however, cannot and should not take on this role alone. When Midlands residents lead by example, they do so in a way that has the potential to impact not only the region but also the state and nation. Energy usage and other behavioral shifts will be necessary community-wide to reduce emissions and increase resiliency. As the first community in South Carolina to commit to 100% clean, renewable energy, Columbians should seize the opportunity to showcase and share our successes as we move forward on this path.

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We believe in a Columbia that **reduces, reuses, and recycles** - decreasing our production of waste and pollutants.

Reduction, reuse, and recycling are not just about making sure that the recyclable items make it into the blue roll cart and to the curb every other week. As a city we can reduce our impact on natural resources first and foremost by reducing use. While municipal operations can lead by example, the participation of all Columbians is critical to success.

Making the choice to reduce our energy usage through behavioral changes, transportation choices, and building design can make our built environment more sustainable. Reducing our use of single-use products can reduce our impacts globally, as well as reduce the City's waste stream, lightening the load on our landfills and thereby on our future population. As with reduction, reuse of products has similar effects - reducing production-related resource usage and sending fewer items into the waste stream.

Though recycling should be treated as the last resort, it too decreases our impacts on natural resources. Choosing products with recycled content and choosing to recycle single-use products helps reduce the use of natural resources for production.

We believe in **clean and accessible waterways**.

As a provider of municipal water, stormwater management, and wastewater treatment, the City of Columbia is intricately involved in water quality issues throughout our watersheds.

As a community nestled on the banks of the confluence of the Broad and Saluda rivers into the Congaree, our rivers help to shape our community identity. Ensuring that appropriate public access is available to allow Columbians of all ages and abilities to interact with our waterways is critical.

Though strides have been made, regionally our rivers and streams suffer from a variety of sources of pollution. Increases in population and extreme weather events and temperatures are likely to further impact our water quality and riparian ecosystems. Through engaging with our riparian areas, Columbians are able to better understand the value of our most visible natural resource, and are more likely to work together as community stewards of our waterways.

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We believe in a **robust urban tree canopy** that contributes to the health and beauty of our city.

During an early *Columbia Compass* survey, respondents were asked to identify the degree to which they agreed or disagreed with statements. With 5 representing strongly agree, an average rating of 3.59 was given in response to the statement of "My neighborhood has a rich and healthy urban tree canopy." Throughout the surveys and public meetings, residents routinely brought up the tree canopy: why they desired a robust tree canopy, where trees were and were not located, and the age and health of street trees.

Furthermore, we recognize that a healthy and vibrant canopy provide key benefits to Columbians and to our ecosystem. Healthy and mature trees make neighborhoods feel more walkable and beautiful, provide wildlife habitat, filter stormwater, and help clean our air. According to the USEPA, surfaces shaded by trees or vegetation may be 20-45 degrees cooler than peak temperatures of unshaded materials.³ In famously hot Columbia, tree-lined streets are more active - businesses thrive, visitors meet and greet one another on shaded sidewalks, and residents spend more time outside in their yards and on their porches.

We believe in a Columbia where our **natural resources benefit our community's health**.

Access to quality natural resources has a direct impact on public health. Natural resources provide important ecosystem services, support local agriculture, and provide opportunities for recreation.

Locally, we know that residents of the Midlands suffer from some rather striking health issues, with high rates of chronic health issues like diabetes and obesity. According to the South Carolina Department of Health and Environmental Control (DHEC), almost ½ of Richland County⁴ adults consume less than one serving of fruit per day, and nearly 70% of Richland County adults are overweight or obese.⁵ In addition to those ecosystem services that natural resources provide that affect our daily health (such as clean water, air, and sunlight), we know that individuals with access to built and natural facilities are 43% more likely to exercise than those with poor access⁶, making public access to natural areas essential to community health. In fact, there are over 485 published studies linking time in nature to better health.⁷

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We believe in a **prepared and resilient community** in the face of our changing climate.

Planning for resiliency involves thinking about how we adapt to and mitigate risks resulting from changes, whether those changes are due to population growth, development pressures, or our changing climate. The system in which we operate is dependent on our natural resources. In planning for resiliency, we seek to mitigate damaging impacts on those resources, while also relying on those same resources to provide our system with resiliency.

The Fourth National Climate Assessment identified four key messages for the Southeast; preparing for these impacts is critical to Columbia's future.

- increased urban infrastructure and health risks are posed by heat, flooding, and vector-borne diseases.
- Flood risks in coastal and low-lying regions will continue to increase.
- Natural ecosystems will be transformed, placing the ecological resources we depend on at risk.
- There will be economic and health risks for rural communities, especially in agricultural, timber, and manufacturing.⁸

We believe in a Columbia powered by **clean and sustainable energy**.

As part of a global movement, in June 2017 Columbia committed to transitioning to 100% clean and renewable energy by 2036. Columbia was the first municipality in South Carolina to make this commitment, and the 26th in the United States. As of February 2020, 153 cities, 13 counties, and 9 states have committed to being powered by clean and renewable energy.⁹

This commitment is not to be taken lightly. Fulfilling this goal will require action not just by the City, but by regional partners, across sectors, and by everyday citizens. As the paths toward commitment vary by community, Columbians will have to determine and hold to the specific steps they are willing and able to take to ensure this commitment becomes a reality.

This commitment can also catalyze Columbia, sparking growth in renewable energy, technology, and construction sectors; reducing transportation and utility costs for residents; and aligning our community identity with our vision for the future.

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We believe in a **data-driven and innovative approach** towards natural resource conservation and preservation.

Understanding where and why Columbia is succeeding and struggling in conservation and preservation efforts will be critical to charting our path forward. In order to track the City's progress as it works to reduce, reuse, recycle, and move toward 100% clean, renewable energy, data on program participation, energy usage, and greenhouse gas emissions will help the City better prioritize implementation efforts. Data collected locally can help us track our footprint on the ecosystem, such as water quality readings, ozone levels, and extreme heat and precipitation.

Data can also provide critical information about key benchmarks, helping Columbians better anticipate and adapt to coming changes. Data points are critical to the development of key messages set forth by international, national, and state bodies about the anticipated impacts of climate change. The same data points can also be critical to include in local messaging, helping individuals better understand and plan for these impacts.

Existing Conditions

THE DATA

As part of the planning process an assessment of existing conditions was conducted. The information that follows is meant to serve as a brief snapshot of the state of the region's natural resources as well as some of the efforts regarding their conservation and preservation. An existing conditions report, provided in Appendix B, covers these items in greater detail.

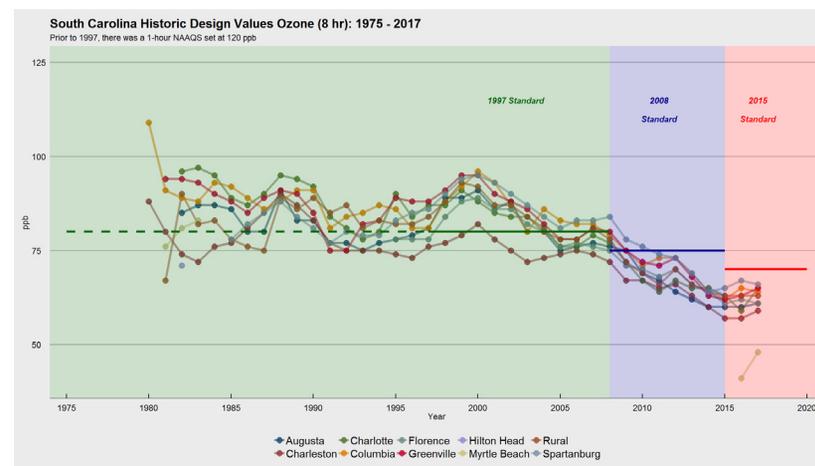
AIR QUALITY

As a result of the standards implemented by the Clean Air Act, industrial emissions, vehicle emissions, and fuels have become much cleaner¹¹, leading to an overall trend of air quality improvement even as the number of passenger vehicles on the road continues to increase. Emission standards have continued to strengthen in the years since the Act's adoption, resulting in an overall trend towards improvements in air quality both regionally and nationally. While at one time the City of Columbia's air quality did not meet US Environmental Protection Agency's (USEPA) air quality standards (and was designated as in non-attainment), the City's air quality is currently within the standards.

DHEC monitors air quality throughout the State for compliance with the Clean Air Act. With the aforementioned reduction in smokestack emissions, air quality monitoring in the Midlands currently measures only ozone and particulate matter levels to monitor attainment. Elevated ozone levels, which tend to occur on hot sunny days, can result in a number of health problems. According to the USEPA, "ozone is a powerful oxidant that can irritate the airways."¹² People with asthma, children, older adults, and those who work or recreate

outdoors are at greatest risk for health complications due to elevated ozone exposure.

The figure below shows the design values (determined by the annual fourth-highest daily maximum 8-hour ozone concentration, averaged over three years) for cities throughout the State, contrasted with the National Ambient Air Quality Standard (NAAQS) for ozone in place at the time. The chart helps to depict a nationwide trend in emissions. While emission levels show an overall downward trend, this may be tied to the linkage between human behavior and the state of the economy. During economic booms emissions tend to increase, as construction, production, vehicle miles traveled, and other sources of emissions rise. Likewise, during economic downturns, more fiscally conservative behaviors result in decreased emission-generating activities.

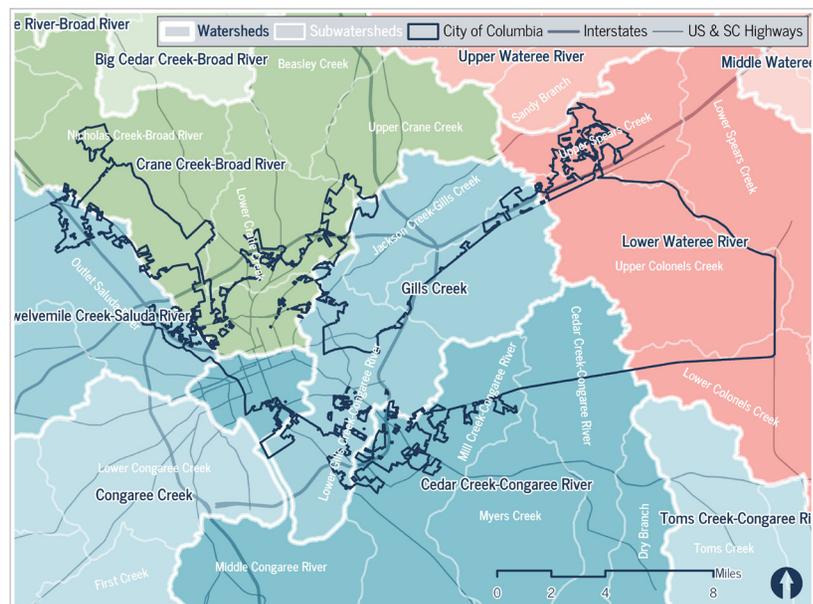


Ozone Values Over Time, courtesy of SCDHEC, Bureau of Air Quality¹⁰

Existing Conditions

WATERSHEDS

Located east of the Eastern Continental Divide, the water in South Carolina's rivers and streams flows towards the Atlantic Ocean by way of eight major river basins. The City of Columbia falls within six different regional watersheds and 16 different subwatersheds. These watersheds are determined by topography and natural formations, and do not adhere to municipal boundaries. Changes within these watersheds, whether they are increases in development and impervious cover, the removal of vegetative cover, or shifts in the types of land uses, can readily impact downstream areas.



Map of regional watersheds and subwatersheds. The coloration of the regional watersheds (HUC 10 digit watersheds) corresponds with the major river basins each regional watershed feeds into. Watersheds shown in green are within the Broad River basin, those shown in blue are within the Saluda River basin, and those shown in Red are within the Catawba River basin.¹³

WATER QUALITY

Water quality issues in the Midlands have received more attention from the public and stakeholders than air quality concerns, perhaps due to both their prevalence and their visibility. Regionally, our rivers and streams suffer from a variety of sources of pollution, from nonpoint sources (runoff) to point sources (piped discharges). Pollutants from bacteria to industrial waste such as coal tar continue to affect the vitality of our regional waterways, with impacts to drinking water, recreation, and plant and animal life. Water quality issues are addressed locally by governmental and non-governmental entities, and though strides have been made, water quality issues continue to affect our local waterways.

As a provider of municipal water, stormwater management, and wastewater treatment, the City of Columbia is intricately involved in water quality issues throughout our regional watersheds. The City of Columbia is currently taking part in a number of projects which use federal grant funding to improve water quality by addressing nonpoint source pollution. The City's stormwater program is also targeting nonpoint source pollution through watershed planning and stormwater infrastructure improvements, recently funded through the City's first "green bond" initiative. Columbia Water continues outreach to help citizens understand how they can be a part of the water quality solution. The City is addressing point source pollution concerns through the Clean Water 2020 Program, which is a formal response to the regulations of the Clean Water Act as they relate to the City's aging wastewater system and sanitary sewer overflows (SSOs).

Existing Conditions

WATER QUALITY

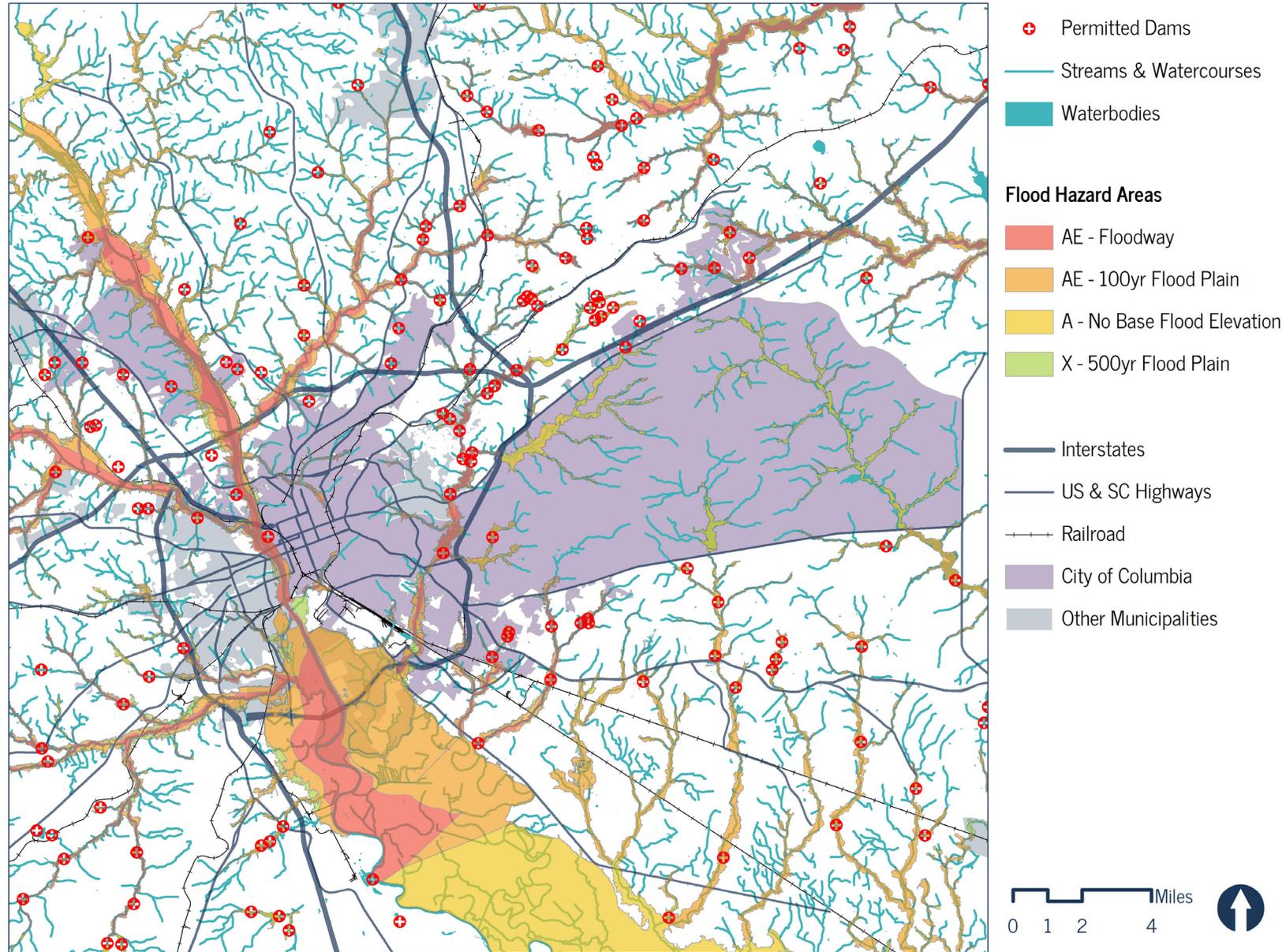
Due to the shape of watersheds, water quality issues are most successfully addressed regionally. Much of the point source pollution in the Midlands is coming from outside of the City of Columbia – especially as we’ve seen increased development throughout the Midlands. The Congaree Riverkeeper, and regional watershed organizations continue to work to address regional point source and nonpoint source water quality issues in rivers and streams throughout the Midlands. These organizations educate the public, monitor water quality, and partner with local and state agencies to improve water quality through the reduction of both point source (discharge) and nonpoint source (runoff) pollution. Regional coalitions have also formed, including both governmental and nongovernmental agencies, to address water quality concerns. At the State level, SCDHEC works to assure water quality compliance with the Clean Water Act, and administers the State’s water quality program which includes impaired waters [303(d)] listings and the Total Maximum Daily Load (TMDL) program, along with a number of water quality improvement activities and grants.

FLOOD HAZARD AREAS

Located at the confluence of two major riverways, Columbia floods somewhat regularly, and many of our riparian corridors have remained in a natural state over the years due in part to these anticipated flood events. Flood hazards are dynamic and can change frequently due to a variety of factors, including weather patterns, erosion, and new development. The Federal Emergency Management Agency (FEMA) works to mitigate the effects of flooding through mapping flood hazards through the Flood Insurance Rate Map (FIRM) program, working with local governments to address flooding issues, underwriting the National Flood Insurance Program (NFIP), and providing grant funding for mitigation efforts. Updated flood maps were adopted by Richland County in 2017 and Lexington County in 2018.

Flooding impacts can be exacerbated or intensified in certain locations due to the existence of natural and man-made pinch points along waterways. Dams can act as pinch points, where dam releases and/or failures can intensify the downstream effects of flooding. As the City and the Midlands have grown in population, land development occurred hand-in-hand with dam development over the years. These dams were developed for a variety of reasons: to provide for agricultural irrigation, drinking water, transportation, recreation, electrical generation, and as amenities to development. During the 2015 floods, greater than 20” of rain fell in and around Columbia, with more than 12” of rain falling within 48 hours, stressing the already strained flood capacity of many of these dams, and resulting in dam failures and extraordinary flooding throughout the region. According to SCDHEC data¹⁴, there are currently 17 permitted dams within City of Columbia limits; these are mapped on the following page.

Flood Hazard Areas and Permitted Dams



Map illustrating locations of permitted dams (SCDHEC, 2018) and flood hazard areas. As defined by FEMA¹⁵, the floodway is the stream channel and that portion of the adjacent floodplain which must remain open to permit passage of the base flood (the floodway is the area that will likely flood in a flood event). Zones AE and A are anticipated to have a 1% chance of flooding in a given year (hence the 100-year storm moniker) – Zone AE includes a base flood elevation, which is the elevation to which floodwater is anticipated to rise during the base flood. This elevation is then carried over to the requirement for the elevation or flood-proofing of structures. Zone X is a moderate flood hazard area, and is calculated as a 0.2% annual chance of flooding in a given year (hence the 500-year storm moniker).

Existing Conditions

WETLANDS

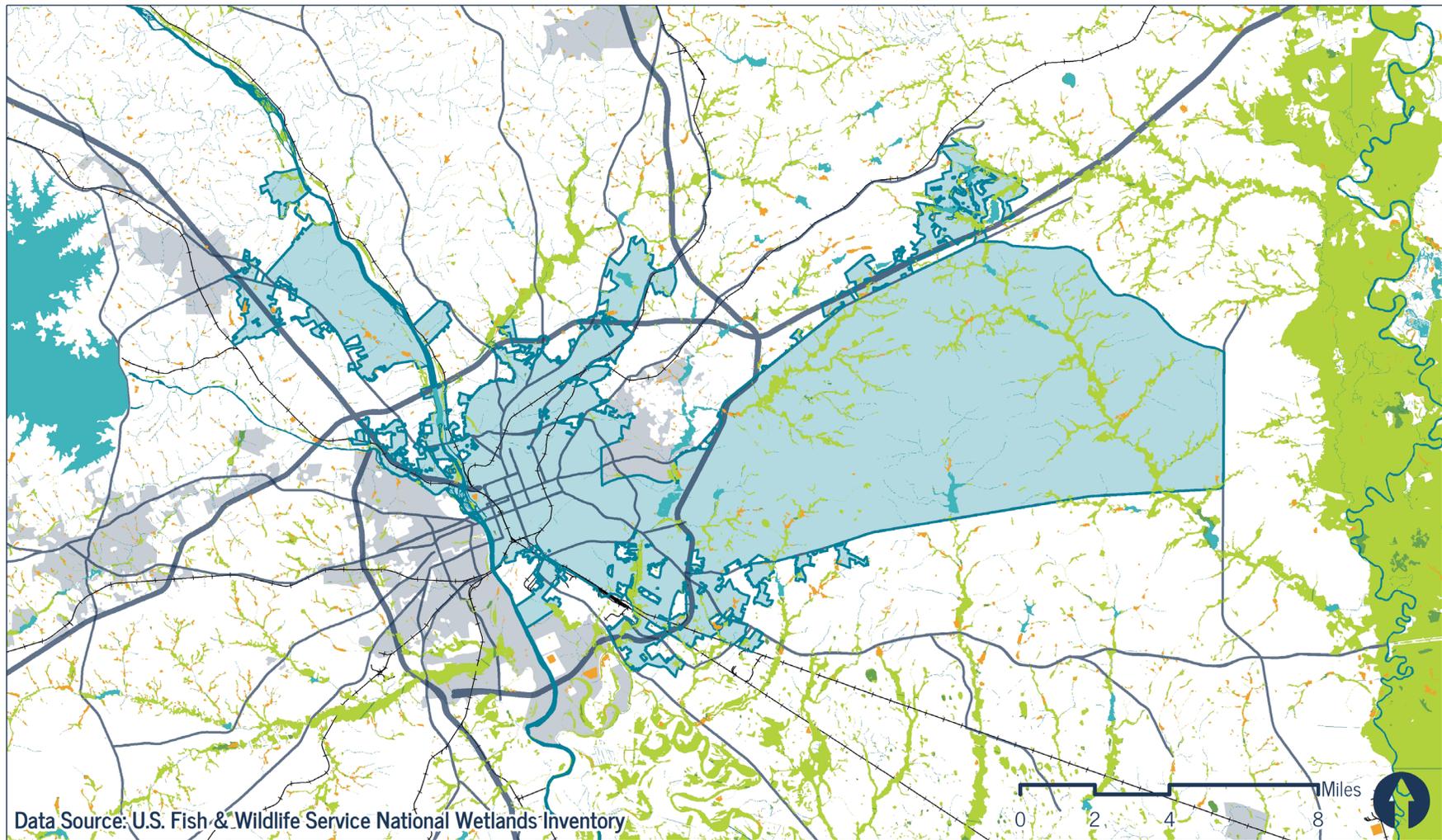
Though many may see little beauty in a swamp or soggy area, wetlands provide valuable ecosystem services and are “believed to be the most diverse ecosystems in the world.”¹⁶ Wetlands can be either permanently or seasonally saturated with moisture, and in the Midlands, wetland areas along streams and rivers help mitigate natural hazards by providing valuable flood storage, as well as habitat, water treatment, and other ecosystem services.

Protection or regulation of wetlands has changed substantially over the years, and many wetlands have already been lost (either drained or filled) due to development or agricultural practices.¹⁷ While newer federal and state laws do protect wetlands, these laws remain in flux. In the Midlands, our most famous wetland area falls within Congaree National Park, however wetlands are prevalent throughout the Midlands. A map on the following page depicts regional wetlands.



Wetlands provide a variety of ecosystem services, as shown in the above graphic.

Regional Wetlands



Data Source: U.S. Fish & Wildlife Service National Wetlands Inventory

Wetland Type

Freshwater Emergent Wetland

Lake

City of Columbia

Interstates

Railroad

Freshwater Forested/Shrub Wetland

Riverine

Other Municipalities

US & SC Highways

Freshwater Pond

The above map indicates wetlands, by type, which are identified as part of the National Wetlands Inventory (data current as of 10.15.2018).¹⁸

Existing Conditions

DATA GAPS - TREE & VEGETATION COVERAGE

The extent and health of Columbia's tree and vegetative cover cannot be easily quantified. Aerial photography taken for tax-mapping and code enforcement purposes does not accurately portray vegetative cover, as these images are purposefully taken at a time when the tree canopy and other vegetative cover is least visible, so as not to interfere with the visibility of structures and other improvements. This means that imagery does not capture the health of vegetation, nor the width of canopies. Furthermore, analysis of imagery colors on a pixelated level can be problematic, as the brown-gray of trees often matches the color of roofs, rivers, and other non-vegetated surfaces. The last extensive survey of street trees maintained by the City of Columbia was conducted in the late 1990s.



DATA GAPS - SPECIES RICHNESS

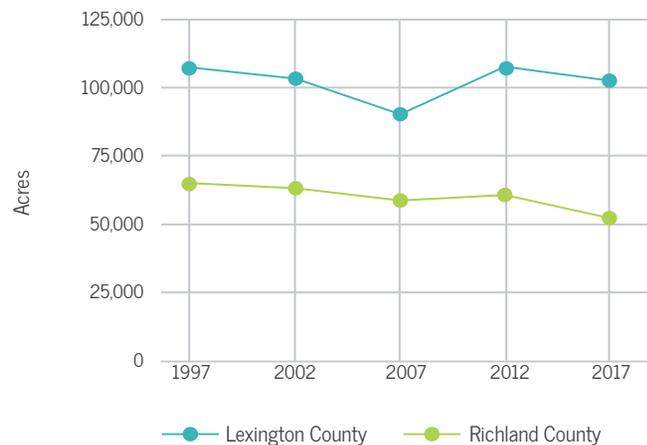
A greater variety of species leads to increased resiliency in the local food system and within the local ecosystem. While the SC Gap Analysis mapping project helped to identify land cover, species distributions, species richness, and stewardship lands, this project was closed out in 2001.¹⁹ Though this data set has not been updated, it is important to note the value of biodiversity to our region. In May of 2019, the United Nations released a report stating that up to one million of the world's estimated 8 million plant and animal species are at risk of extinction. Though these extinctions are not expected to be evenly distributed across the globe, some of these impacts will be felt locally. As part of the May 6, 2019 Media Release on the Global Assessment, Cristiana Pasça Palmer, Executive Secretary of the Convention on Biological Diversity, noted, "Healthy biodiversity is the essential infrastructure that supports all forms of life on earth, including human life. It also provides nature-based solutions on many of the most critical environmental, economic, and social challenges that we face as human society, including climate change, sustainable development, health, and water and food security."

Existing Conditions

AGRICULTURE

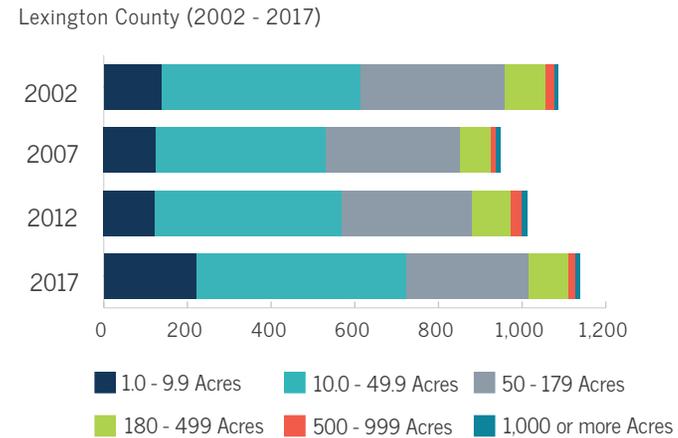
The United States Department of Agriculture (USDA) recently published the 2017 Census of Agriculture, which counts all farms and ranches nationwide which raise and sell (or would normally sell) \$1,000 of products within the Census year. This Census is taken once every five years, and provides vital insight into agricultural practices both nationally and at a county level. This data is summarized at the county level, and the data available since 1997 show that Lexington County has a larger number of farms, and a greater number of acres in farmland operation, than Richland County, which is not surprising given its more rural nature.²²

Farm Operations - Total Acres
(1997 - 2017)

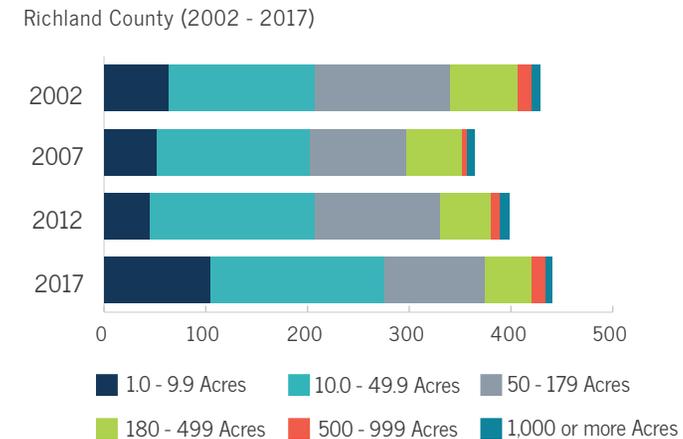


The above graph depicts acreage in farm operation. While the combined number of acres in farming in both counties have been relatively stable since 1997, the overall acreage under farming activity has decreased.²⁰

Farm Operations by Farm Size
Lexington County (2002 - 2017)

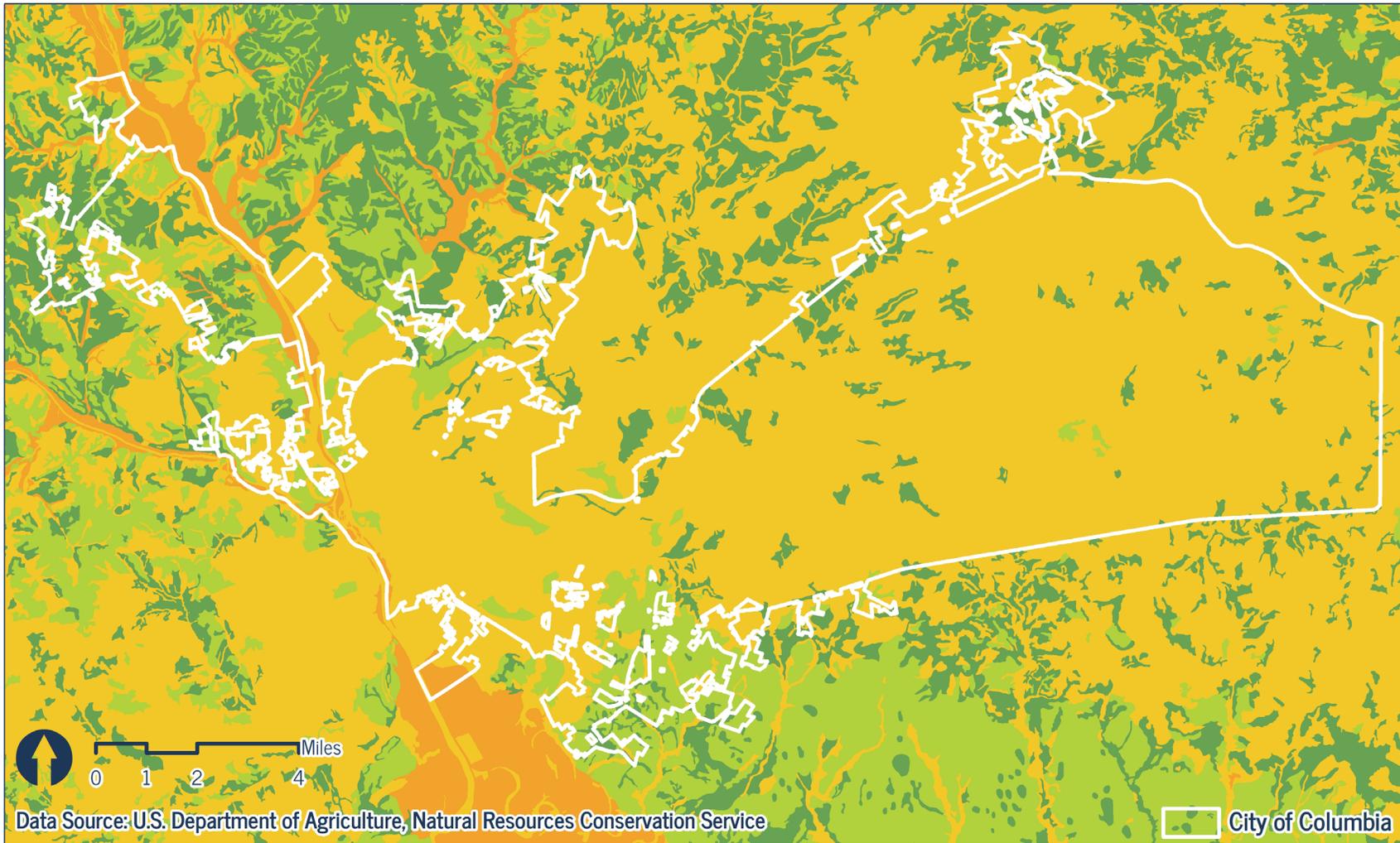


Farm Operations by Farm Size
Richland County (2002 - 2017)



As shown in the above two graphs, both Richland and Lexington counties, the largest percentage of farming practices takes place on farms between 10 and 50 acres in size. The majority of farming practices in both counties take place on farms between 10 and 179 acres in size.²¹

Map indicating soil types classified by agricultural value as defined by the USDA Natural Resources Conservation Service²³



- Farmland of statewide importance
- All areas are prime farmland
- Prime farmland if drained & either protected from flooding or not frequently flooded during the growing season
- Not prime farmland

Within the City of Columbia, a large portion of the farmland of statewide importance and prime farmland areas fall within the Harbison/Broad River area and are scattered throughout Fort Jackson and towards the southeastern areas of the City. These farmland areas are relevant not just for food production, but also timber and other natural resource production.

Existing Conditions

ACCESS TO NATURAL AREAS

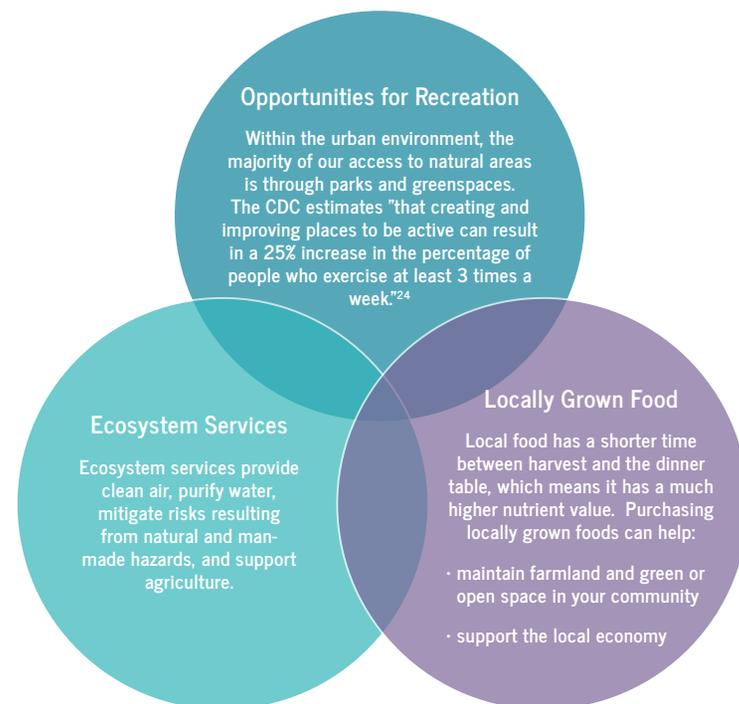
Access to high-quality natural areas is in turn a quality of life indicator, and a desirable asset for all generations. For example, while the Midlands as whole has a younger population than the state²⁵, we know that this access is important to our aging population as well. A 2002 study found that two of the best predictors for 5-year survival for older adults were having a place to take a stroll, and living near parks and trees.²⁶

Located at the confluence of two rivers, Columbians have access to a number of natural areas, many within local and state parks. The Midlands is also home to South Carolina's first²⁷ National Park, Congaree National Park, designated for its natural significance. As noted above, and in the survey results that follow in this report, citizens strongly desire both the protection of and access to natural areas, especially areas along rivers and streams. Often, these discussions center around "controlled access" – balancing the desire for public access with strategies to mitigate potential environmental and other impacts resulting from unfettered access.

PUBLIC HEALTH & NATURAL RESOURCES

Access to quality natural resources has a direct impact on public health. Natural resources provide important ecosystem services, support local agriculture, and provide opportunities for recreation. Locally, we know that residents of the Midlands suffer from some rather striking health outcomes, with high rates of chronic health issues like diabetes and obesity. According to DHEC, almost ½ of Richland County²⁸ adults consume less than one serving of fruit

per day, and nearly 70% of Richland County adults are overweight or obese.²⁹ In addition to those ecosystem services that natural resources provide that affect our daily health (such as clean water, air, and sunlight), we know that individuals with access to built and natural facilities are 43% more likely to exercise than those with poor access³⁰, making public access to natural areas essential to community health. In fact, there are over 485 published studies linking time in nature to better health.³¹



The above diagram depicts some of the many natural resource impacts on public health.

Existing Conditions

CITY SERVICES

As a large employer, service provider, and utility, the efficiency and resiliency of City services and programs has a direct impact on our regional natural resources. The City continues to invest in solid waste and recycling services, and has begun to invest in sustainable building practices and renewable energy generation. While these City services are addressed more fully in the Community Facilities section, it is important to note the power the City has to both conserve and protect our natural resources and set a positive example for the Midlands as a whole.

COMMISSIONS & ADVISORY COMMITTEES

The City of Columbia has established several commissions and committees that help focus on, promote, and advocate for City policies regarding natural resource-related concerns. The Tree & Appearance Commission, Climate Protection Action Committee (CPAC), Food Policy Committee, and to some degree the Bicycle Pedestrian Advisory Committee (BPAC), are all engaged on topics which impact natural resource management and sustainable practices.

STAR COMMUNITIES

The City participated in the STAR Communities program, receiving a three star community rating in 2017, and was the first STAR Community to be certified in South Carolina. The STAR Community rating system is utilized by cities and counties to identify successes as well as opportunities for improvement, and to focus on sustainability and resilience in local government. Since the City's three star rating, the STAR program has merged with the U.S. Green Building Council, to combine with the LEED for Cities certification program. The City was awarded the following scores in each goal area:

Goal Area	Points Achieved
Built Environment	59.0/100
Climate & Energy	50.4/100
Economy & Jobs	70.4/100
Education, Arts, & Community	68.5/100
Equity & Empowerment	39.4/100
Health & Safety	45.8/100
Natural Systems	43.9/100
Innovation & Process	32.5/50
Total	409.9/750

STAR Community Report - overall scores for Columbia, SC

Existing Conditions

READY FOR 100% CLEAN RENEWABLE ENERGY

City Council committed to transitioning to 100% clean and renewable energy in Columbia by 2036, the City's 250th anniversary. This commitment was made in Resolution 2017-058, and nationally the City was the 36th city to make such a commitment as part of the Sierra Club's Ready for 100 Campaign. Though this resolution is not an existing condition per se, as a policy announcement, it will lay the groundwork (along with the existing conditions herein) for how Columbia addresses natural resource issues in the years to come.

Committed communities throughout the nation are exploring strategies to shift to clean and renewable energy while addressing equity and access issues. The Sierra Club is actively working to help identify strategies for the diverse group of communities that have signed on to the Ready for 100 Campaign. At the local government level, these strategies tend to fall into three categories: addressing the local government agency's resource use through increased efficiencies, alternative fuels and power sources, and/or the purchase of offsets; incentivizing private developers to utilize clean and renewable energy and address resource conservation through site design; and working with local utility providers to address the needs of the local community while pursuing clean and renewable energy solutions.

RESOLUTION NO.: R-2017-058

Establish a Community-wide Twenty Year Target of Powering the City of Columbia, South Carolina with 100 Percent Clean, Renewable Energy

WHEREAS, the City of Columbia seeks a healthy, sustainable future powered by 100 percent renewable energy; and,

WHEREAS, the transition to renewable energy will improve air and water quality and protect the health of our families, particularly the most vulnerable across our community; and,

WHEREAS, renewable energy represents an economic opportunity for business growth and new investments in our community; and,

WHEREAS, one out of every fifty new jobs added in the United States in 2016 was in the solar industry and the number of solar jobs in the City of Columbia increased by 46 percent from 2015 to 2016; and,

WHEREAS, renewable energy, like wind, solar, and energy efficiency, offer price stability, reduced electricity costs, and affordable solutions to Columbia residents; and,

WHEREAS, according to the Department of Energy, the cost of wind power is down 41 percent since 2008 and solar costs are down between 54 percent and 64 percent in that same period; and,

WHEREAS, individuals, families, businesses, and institutions throughout the City of Columbia seek greater energy freedom through the expansion of local and distributed energy sources like photovoltaic solar and electric vehicles; and,

WHEREAS, actions by local government and businesses are already a significant driver of renewable energy growth and can put the country on track to meet its former commitment to the Paris Agreement under the United Nations Framework Convention on Climate Change; and,

WHEREAS, the City of Columbia is committed to prioritizing equity, affordability and access for all residents of the City of Columbia to transition to 100 percent clean energy; NOW, THEREFORE

BE IT RESOLVED this ___ day of _____, 2017 that the Mayor and City Council of the City of Columbia commit to establish a community-wide twenty Year target of powering the City of Columbia, South Carolina, with 100 percent clean, renewable energy.

Requested by:

Mayor Benjamin _____


Mayor

Approved by:


City Manager

Approved as to form:


City Attorney

ATTEST:

City Clerk

Introduced: 6/20/2017
Final Reading: 6/20/2017

Last revised: 6/14/2017
17062763

Resolution 2017-058, establishing a community-wide twenty year target of powering the City of Columbia, South Carolina, with 100 percent clean, renewable energy.

Anticipating Change

DEMOGRAPHIC SHIFTS

The population in the Central Midlands is expected to continue to grow exponentially, from 839,819 people in 2020 to an estimated 1,365,128 in 2050.³² No matter where in the Midlands these new residents choose to live, work, and play, this growth will place pressures on both our built and natural systems, the latter of which do not adhere to municipal boundaries.

Among other items, access to quality natural resources, walkable communities, and outdoor recreation, as well as a focus on sustainable practices and local foods in a large part defines quality of life³³ for the many in the Millennial and younger generations. While Columbia's population will likely remain younger than the state average, a portion of our population will age³⁴, and the elderly population has greater health risks associated with air quality and extreme temperatures. Our changing climate and increasing population will strain our resources and require a shift in our processes and approaches to natural resource management, conservation, and preservation. It is yet unclear how the impacts of climate change will lead to further demographic shifts for our region.

URBAN HEAT ISLANDS

Urban areas tend to be hotter than nearby rural areas because they contain more impervious areas than vegetative natural areas.³⁵ These urban areas become “heat islands” because they are warmer than their surroundings. Impervious surfaces – areas rainwater cannot penetrate – hold and reflect heat.³⁶ Such surfaces include concrete, asphalt, roofs, and highly compacted urban soils which cannot support vegetative growth or help filter rainwater. The urban

heat island effect is detrimental to natural resources both because of direct impacts to our natural systems (such as water quality, vegetation, and animal life), and indirectly through causing an increase in energy consumption.

According to the USEPA, heat islands affect communities by increasing summertime peak energy demand³⁷, air conditioning costs, air pollution and greenhouse gas emissions, heat-related illness and mortality, and water quality. High pavement and rooftop surface temperatures also heat stormwater runoff, which quickly drains into streams, rivers, and lakes. Rapid temperature changes resulting from warm stormwater runoff are particularly stressful, even fatal, to aquatic life. Many cities have worked to calculate baseline data, and track the effects of both the urban heat island, and mitigation strategies, over time. At this time, the City of Columbia does not gather or maintain all of the data sets necessary to develop a baseline and track mitigation progress.



The illustrative map to the left shows (in gray) non-residential impervious areas and roadways in a section of Columbia's urban core.

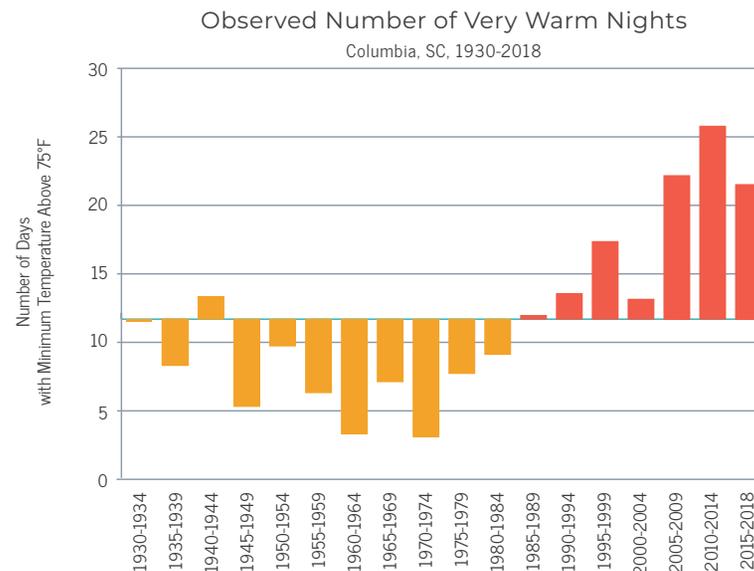
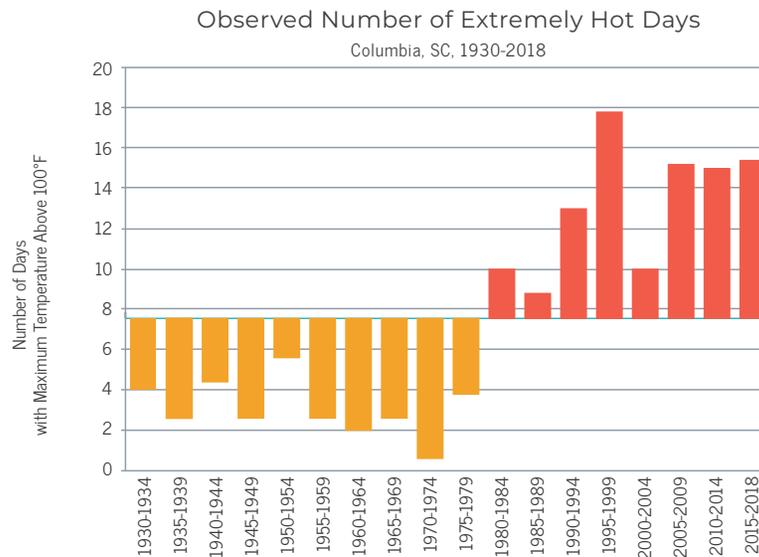
Anticipating Change

CLIMATE CHANGE

Our climate is changing. In the southeast, we continue to see historical shifts, with an increase in the number of hot days, warm nights, and days with heavy precipitation (greater than three inches). While it may be easiest to visualize record days and nights, we are also beginning to see shifting seasons, such as when summer bleeds further into fall, with a record 132 days between our first and last 100 degree days in 2019.³⁸ These shifts are also indicators of the changing strain on our energy and natural resources.

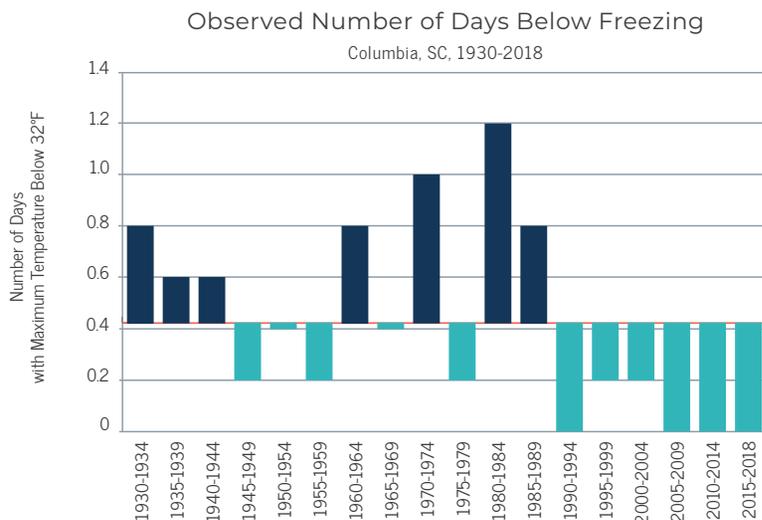
The charts that follow track historical shifts in temperature, many of which we also understand anecdotally. In 2017, Columbia observed its highest annual count of days with a maximum temperature at or above 80°F – 198 straight days (54% of the year).³⁹ In 2018, the warmest temperature of the year observed at any weather station in the southeast was in Columbia, SC; a temperature of 105°F was observed at the University of South Carolina on July 11.⁴⁰ These records, combined with the data shown herein which indicates shifting temperatures and increased extremes, all have real impacts – to our growing seasons and the viability of local crops; to our heating and cooling costs; to ozone levels and therefore health risks; and to the size of the insect population (and therefore increases in vector-borne diseases).

The Columbia, SC data depicted in the charts that follow in this section of *Columbia Compass* was compiled and analyzed by Dr. Ken Kunkel, North Carolina Institute for Climate Studies and Dr. Greg Carbone, Department of Geography, University of South Carolina; data source CICS-NC and NOAA NCEI.

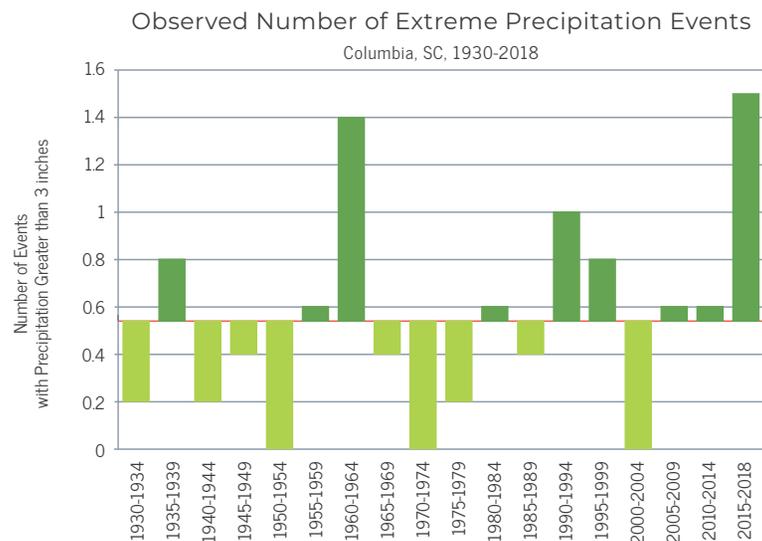


Anticipating Change

CLIMATE CHANGE, CONTINUED



While Columbians are quick to cite the records broken in October of 2015⁴², the increase in extreme precipitation events, not just in Columbia but also upstream of the City's waterbodies, have led to increased flooding throughout our region. Extreme precipitation events (precipitation events of greater than three inches) often overwhelm stormwater management systems, leading to increased flooding, and decreased ability to provide filtration and treatment for nonpoint source pollution associated with stormwater. It is important to note that flood hazard mapping (discussed earlier in this report) is developed by using historical data and flood risks, and does not (and to some degree cannot) address those increased risks associated with the increased number of extreme events tied to climate change.



Climate change will continue to directly impact our natural resources and our way of life; how proactively we approach the factors that lead to climate change as well as the effects of climate change will define our future as a community. The Fourth National Climate Assessment, Volume II⁴¹, identified four key messages for the Southeast:

- Increased urban infrastructure and health risks are posed by heat, flooding, and vector borne diseases.
- Flood risks in coastal and low-lying regions will continue to increase.
- Natural ecosystems will be transformed, placing the ecological resources we depend on at risk.
- Economic and health risks will increase for rural communities, especially in the agricultural, timber, and manufacturing sectors.

Anticipating Change

ADAPTATION & RESILIENCY

“Resilience is the capacity of a system to absorb disturbance and still retain its basic function and structure.”⁴³ Planning for resiliency involves thinking about how we adapt to and mitigate risks resulting from changes - whether those changes are due to population growth, development pressures, or our changing climate. The system in which we operate is dependent on our natural resources; in planning for resiliency, we seek to mitigate damaging impacts on those resources, while also relying on those same resources to provide our system with resiliency. In the face of shifting demographics, climate change, and increased ecosystem stressors, planning for resiliency appears to be the next global shift in planning practice that has a direct interest in natural resource planning.

While CPAC has an interest in the City’s resiliency, and many City operations are shifting to include resilience thinking⁴⁴, the City does not currently have a municipal resiliency strategy. Resiliency planning does not follow a specific model, but considers three broad forms:

- “The direct strength of structures or institutions when placed under pressure
- The ability of systems to absorb the impact of disruptive events without fundamental changes in function or structure
- The ability of systems to adjust to provide similar functions achieved in new ways.”⁴⁵

At their core, the recommendations that follow examine how to adapt to these changes and to build resiliency within our natural and man-made systems while also responding to the immediate concerns of the City and public.

Recommendations

Specific recommendations for priorities and actions for the coming years are made in the pages that follow. Recommendations are the heart of the plan document. Built upon the foundation of the data and public input collected, through these recommendations we develop an action plan for the next ten years and establish the framework for our 2036 vision to be realized. Throughout Columbia Compass, these recommendations are organized in the same format, and all of the recommendations of the plan are compiled and summarized within the Priority Investment chapter.

RECOMMENDATION FRAMEWORK

The recommendations that follow are organized to provide information about the critical path forward, and where necessary, to provide helpful case studies that may help the responsible party/ies as they move toward implementation. Each recommendation is made in the form of an action statement, the primary topical theme is identified in a box in the upper left, and key components are identified as follows:



WHO IS RESPONSIBLE?

Responsible parties may include City departments and divisions, but may also include partner agencies and organizations. Where multiple responsible parties are identified, a lead party or primary facilitator will be designated.



DURATION

Implementation of recommendations will be staggered throughout the next ten years; the schedule for implementation is set forth in the Priority Investment chapter. The duration set for each recommendation identifies the amount of time it will take to complete these recommendations:

- short - 1 to 3 years
- medium - 4-6 years
- long - 7-10+ years

"Ongoing" may be added to short, medium, or long to indicate where a recommendation may be for a continual action, but the action may have a short, medium, or long duration. For example, the planning process for developing a neighborhood plan tends to take one year, but the City will plan for more than one neighborhood over the course of the 10 years to come, so the duration would be listed as "short, ongoing" in this case.



PRIORITY

Recommendations are prioritized to correspond with the Priority Investment element. Prioritization helps us recognize items that may need to be completed prior to beginning others, as well as helps identify those priorities of greatest import to the City. By setting a prioritization system, we can strategically work toward implementation, even as funding is limited.

Recommendations



COST

Estimated cost ranges are made for each recommendation with the recognition that costs may change depending on the market and when implementation takes place.

¢ = \$0 to \$25,000	\$\$\$ = \$100,000 - \$500,000
\$ = \$25,000 to \$50,000	\$\$\$\$ = \$500,000 to \$1.5M
\$\$ = \$50,000 to \$100,000	\$\$\$\$\$ = \$1.5M +

 Many of the recommendations within the plan require staff support - where this is the case, the symbol to the left will accompany the estimated cost. Where staff support is a significant component of cost, often such support is already being provided, but an expansion of efforts may be necessary.

* Often, implementing recommendations requires an upfront cost, though the recommendation itself will be cost-neutral or result in increased savings in the long run. This is generally noted in the text of the recommendation, but is also denoted by a small asterisk next to the estimated upfront cost.



REFERENCE TO THEMES & OTHER ELEMENTS

The need for and impact of recommendations may relate to more than one element and theme. The primary theme is identified in **bold**, with secondary themes also listed. The topical index lists all recommendations by theme. Recommendations are housed under the chapter they are most related to, but their relationship to additional elements is listed herein.



DATA TO BE COLLECTED

In many cases data must be collected to move forward strategically with a recommendation and/or to measure success.



MEASURING SUCCESS

This section identifies milestones and benchmarks for each recommendation.



CONNECTION WITH ENVISION COLUMBIA

Envision Columbia is City Council's vision and strategic plan; this section identifies how a recommendation helps to further the vision set forth in the Envision Columbia focus areas.

RECOMMENDATION

Develop and adopt a comprehensive update to the City's Climate Action Plan.

The City of Columbia's *Climate Action Plan* was developed in 2006 in partnership with City staff and community leaders, and guides the work of CPAC. The Plan was developed to provide measures to reduce levels of greenhouse gas (GHG) emissions in Columbia consistent with the Paris Agreement, targeting a 28% reduction from 2006 levels by 2025. Most of the recommendations of the plan deal specifically with City operations, and while the plan has been updated to reflect the status of recommendations, it currently does not address the larger community reduction of GHGs, adaptation, resiliency, or sequestration strategies along with emissions reductions. As more communities have taken on climate action planning since the City's initial planning effort, the City has the opportunity to learn from the successes and failures of others and implement current best practices in updating the plan. Updating the plan will be critical to meeting the City's Ready for 100 goal by 2036.

WHO IS RESPONSIBLE?

- Sustainability Division (primary)
- Climate Protection Advisory Committee (CPAC)
- Community Partners

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

The cost of planning efforts can vary widely based upon the size of the community, data availability, staff/consultant mixture, and level of detail desired.⁴⁶

PRIORITY

HIGH
start within 3 years

COST

\$\$-\$\$\$\$* 

THEMES

- Plan & Implement
- Conserve & Preserve
- Partner

OTHER ELEMENTS

Updates of this plan should relate to all of the elements of Columbia Compass.

DATA TO BE COLLECTED

- Prior to embarking on a plan update, the City should gather data on best practices in order to determine the desired outcomes of the planning process.
- Data to be collected during the planning process likely includes an updated GHG emissions inventory, to track the success of the current plan implementation, and help identify sectors to target. Data regarding climate impacts on community facilities and community systems will also be important to collect.

MEASURING SUCCESS

Simply measured, success will be the development and adoption of an update to the plan. However, success should be measured by more than just this planning activity. The plan should be integrated into other City planning efforts and into its systems, and implementation of this plan, as well as iterative updates, will be necessary to prioritize in order to realize some of the other recommendations of Columbia Compass.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Develop and adopt a comprehensive update to the City's Climate Action Plan.

Case Study 1

Pittsburgh Climate Action Plan, Pittsburgh, PA

The City of Pittsburgh began climate action planning in 2006 as a community-initiated process. Pittsburgh's plan was stakeholder-based, and the *Pittsburgh Greenhouse Gas Emissions Inventory*, which calculated baseline emissions for the year of 2003, was conducted by a student and faculty research team at Carnegie Mellon University. This initial plan set a goal of emissions reductions of 20% below the baseline year to be achieved by 2023.

Pittsburgh's first major update to the initial plan occurred in 2012, reviewing and revising the GHG reduction efforts and proposing new measures to help meet the targets initially set by the first plan. In 2012, an updated GHG emissions inventory was completed, and plans are now in place to update the inventory data annually. In 2015, Pittsburgh joined the 100 Resilient Cities program, and in 2016 the City hired a chief resilience officer. The Planning Department now houses a Division of Sustainability and Resilience, which works to implement projects and initiatives of the plan, and make an annual progress report.⁴⁷

The third iteration of Pittsburgh's climate action plan, *Pittsburgh Climate Action Plan 3.0*, built on the 2013 GHG emissions inventory update. The same community group that had been involved in the two prior planning efforts, now named the Pittsburgh Climate Initiative Group, was heavily involved in this most recent update as

well. *Pittsburgh Climate Action Plan 3.0* focuses more strongly on sustainability and resilience strategies for the community, in addition to strategies for carbon sequestration. The plan has targets that align with those of the Paris Agreement - for future carbon neutrality and a reduction of 80% below 2003 GHG emissions levels by 2050. *Pittsburgh Climate Action Plan 3.0* is organized into six sectors, and each sector identifies goals, objectives, strategies, challenges, existing projects and prior work, and champions. These six sectors are:

1. Energy generation and distribution
2. Buildings and end-use efficiency
3. Transportation and land use
4. Waste and resource recovery
5. Food and agriculture
6. Urban ecosystems

Pittsburgh has also adopted a timeline for the development of its next climate action plan - 4.0. Boswell, et al., note that "each iteration of the plan is stronger, more aggressive, and more integrative. This progress and explicit recognition of the ongoing process of implementation maintain community involvement, local commitment, and municipal staff commitment."⁴⁸

RECOMMENDATION

Develop and adopt a comprehensive update to the City's Climate Action Plan.

Case Study 2

GreenPrint, Miami-Dade County, Florida⁴⁹

The County developed one of the first community-based climate action plans worldwide in 1993, setting goals for greenhouse gas (GHG) emissions reductions and calling upon state and federal governments to improve vehicle gas mileage and energy consumption. The County updated their plan in 2006, and while noting that reductions in emissions were achieved as a result of plan implementation, 27% population growth over the 13 prior years had led to an overall increase in emissions. The same year, the County also created the Miami-Dade County Climate Change Advisory Task Force (CCATF), made up of technical climate change experts to advise the Mayor and Board of County Commissioners and keep the County moving forward.

In 2009 the County partnered with ICLEI - Local Governments for Sustainability to revisit the plan and expand upon its scope through a test of the ICLEI Sustainability Planning toolkit. This process resulted in the *GreenPrint: Our Design for a Sustainable Future* plan in 2010. This plan was broadened to address climate change not only through emissions reduction but also through a broader set of environmental and sustainability initiatives.

The County built further upon this planning momentum, joining with Broward, Monroe, and Palm Beach Counties to form the Southeast Florida Regional Climate Change Compact in 2010 in order to better coordinate climate action on a regional scale. This coordination includes both mitigation and adaptation efforts, and compact

members include both counties and municipalities in the region. The County utilized *GreenPrint* as a tool, working with regional partners to link the local implementation efforts into a more regional initiative to develop the *Regional Climate Action Plan*. Compact members utilize the regional plan as a guide for developing sustainable communities, planning for transportation, water supply, management and infrastructure, natural systems, agriculture, energy and fuel, risk reduction and emergency management, community outreach, and government policies. Members of the compact work together to track implementation and learn from and build upon each other's successes.

Most recently the County has created a Sea Level Rise Task Force, designating adaption action areas where the County will target resources and implementation. The County also created an Enhanced Capital Plan that approaches planning for capital improvements while considering climate change related risks. The community also partnered with the Rockefeller Foundation on the *Resilient305 Strategy* (2019), a strategy for greater Miami and the Beaches.⁵⁰



Southeast Florida Regional Compact logo used with permission; Resilient305 cover used with the permission of Miami-Dade County Office of Resilience.

RECOMMENDATION

Identify and implement robust strategies for managing natural hazards and increased strains on natural resources, including consideration of climate change-related risk.

Resiliency planning involves thinking about how we, as a community, adapt to and mitigate risks resulting from changes, whether those changes are due to population growth, development pressures, or our changing climate. Columbians understand firsthand the extreme effects of natural events, however this recommendation is about more than just planning for emergency response to these sorts of natural hazards. Now is the time to take a multi-disciplinary and strategic approach to long term planning and investment in order to ensure the vitality of our future population. The development of, implementation of, and adherence to a resiliency plan for the City which comprehensively addresses not only City systems but also our impacts and reliance on natural systems is critical.

WHO IS RESPONSIBLE?

- Community Development (primary)
- Emergency Management (primary)
- Sustainability Division (primary)
- City Council
- City Management Office
- Climate Protection Advisory Committee (CPAC)
- All City departments

DURATION

MEDIUM, ONGOING
4-6 years to complete, recurring

Costs identified are associated with the planning effort. While costs may be incurred in the short term through implementation, implementing these mitigation and adaptation strategies should provide a long-term cost savings to the City and community.

PRIORITY

HIGH
start within 3 years

COST

\$\$-\$\$\$* 

THEMES

- Plan & Implement
- Built Environment
- Lead By Example
- Safety

OTHER ELEMENTS

- Community Facilities
- Economic Development
- Housing
- Population

DATA TO BE COLLECTED

The resiliency planning process will both gather and identify missing data necessary for implementation. Data gathering regarding both City services and natural systems will be critical to this effort. A review of anticipated impacts and recommended regional strategies should also be conducted, including the key messages set forth by the Fourth National Climate Assessment and the Centers for Disease Control and Prevention's Building Resilience Against Climate Effects (BRACE) Framework.

MEASURING SUCCESS

The first step to success is the development and adoption of a comprehensive resiliency plan for the City. Subsequent measurements of success should include plan implementation, and more qualitatively, a shift towards a more resilient mindset City-wide.

CONNECTION WITH ENVISION COLUMBIA

- Plan
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Identify and implement robust strategies for managing natural hazards and increased strains on natural resources, including consideration of climate change-related risk.

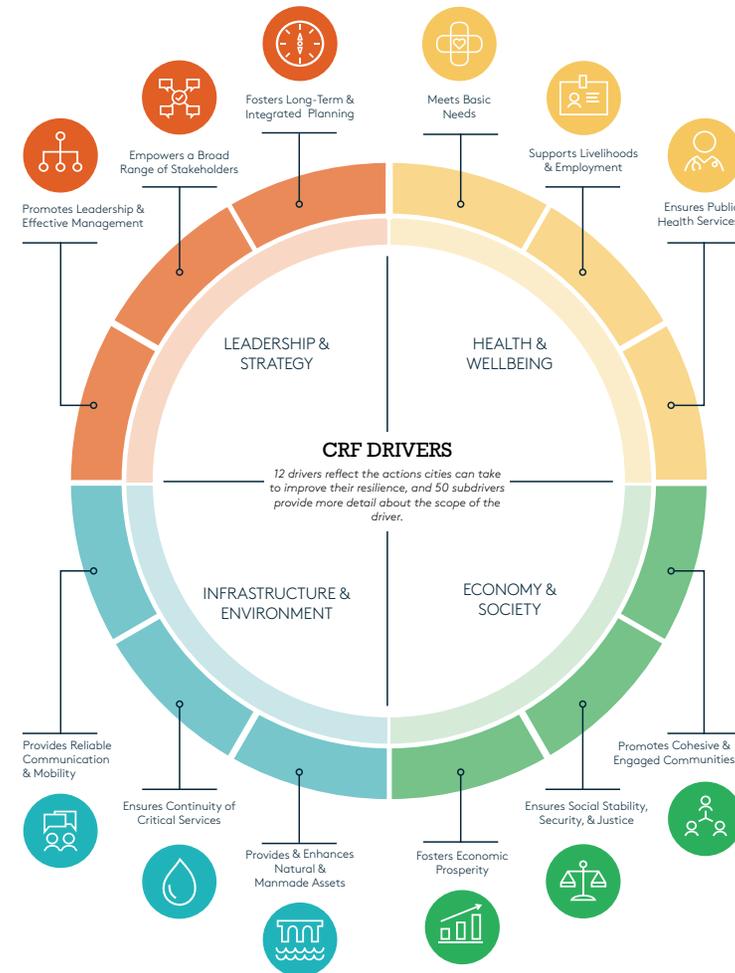
Case Study 3

Resilient Atlanta, Office of Resilience, Atlanta, GA

The Rockefeller Foundation pioneered the 100 Resilient Cities program, growing and catalyzing the urban resilience movement for six years through the development of an international network of cities and resilience officers. The City of Atlanta was a participant in this program, joining in 2016. The City hired a chief resilience officer, and developed a comprehensive resilience plan which identified critical challenges and develops strategies which hinge on four key visions for the future of Atlanta:

1. Preserve and Celebrate Who We Are
2. Enable All Metro Atlantans to Prosper
3. Build Our Future City Today
4. Design Our Systems to Reflect Our Values

The Mayor's Office of Resilience works to implement the recommendations of this plan, creating and supporting "programming that addresses the region's most pressing stresses and building capacity among residents and city systems alike to better withstand future shocks."⁵¹ The City and its partners have taken on a number of resilience initiatives, including a Clean Energy Plan to move Atlanta to 100% clean energy and AgLanta Grows - A - Lot, which gives entrepreneurs, non-profits, and residents the opportunity to adopt vacant, city-owned property to start an urban garden or farm through a five-year licensure process.



City Resilience Framework Drivers, *Resilient Atlanta*, used with the permission of the City of Atlanta

RECOMMENDATION

Identify and implement robust strategies for managing natural hazards and increased strains on natural resources, including consideration of climate change-related risk.

Case Study 4

Sea Level Rise Plan, Mastic Beach, NY⁵²

Mastic Beach, NY is a south shore community on Long Island which was hit hard by Hurricane Sandy, and is faced with permanent risk of flooding through sea level rise. In order to help community members to think about the future, the Regional Plan Association project team created a game to help citizens visualize their future for the next 50 years, identifying not just their goals and aspirations for themselves, but for their community after they are gone. During the game, planners asked the groups to select what types of projects and policies would need to be implemented to achieve their hoped-for future. Planners then synthesized community responses into three scenarios, identifying the long-term trade-offs of each option.

The three scenarios were: a baseline approach, a waterfront downtown, and an environmental showcase. The baseline approach identified where permanent flooding would occur due to sea level rise if no actions were taken. The waterfront downtown approach looked at what the future might be if steps were taken to protect the downtown waterfront - creating hills and berms, installing pumping stations, and creating a secondary downtown to relate to the waterfront downtown. The environmental showcase looked at how the community might densify out of the long term flood zone while creating an eco-tourism based showcase for the town, restoring wetlands, creating recreational water trails, and reducing the town's footprint and revenue from property taxes.

Each scenario resulted in a model which identified the specific impacts tied to the path chosen - impacts on infrastructure, economic development, housing, and more. The development of these three scenarios helped stakeholders visualize the anticipated impacts and therefore the difficult decisions before them, and to make a community-based decision on how to move forward strategically and toward a shared vision.

Though Columbia is not at risk of sea level rise, this type of visioning process may be necessary for City staff and the community to better understand the process behind comprehensive hazard mitigation planning. A greater community-wide understanding of natural hazards and the increasing strain on our natural resources might help to gather consensus around the implementation of critical adaptation and risk mitigation strategies.

Baseline Approach



Waterfront Downtown



Environmental Showcase



Images used with the permission of the Greater New Haven Chamber of Commerce and the Regional Plan Association

RECOMMENDATION

Identify and implement robust strategies for managing natural hazards and increased strains on natural resources, including consideration of climate change-related risk.

Case Study 5

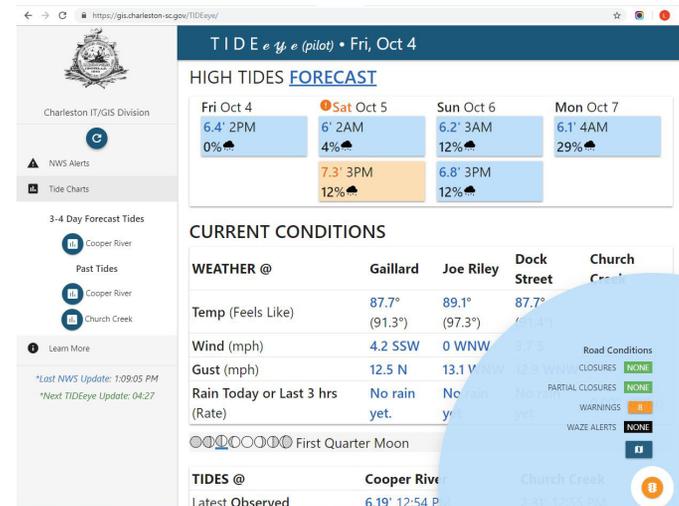
Mayor's Office of Resilience & Emergency Management, Charleston, SC⁵³

The City of Charleston's sustainability efforts were initially housed in the planning department, however the Mayor created the Office of Resilience & Emergency Management in 2018, which now houses resiliency, emergency management, and sustainability in one office. The creation of this office has fostered multi-disciplinary collaboration, and the office has worked on a number of planning initiatives regarding hazards and risks, as well as on collaborative efforts with other City departments. The office also oversees the Resiliency & Sustainability Advisory Committee, which is comprised of 13 voting members, including technical experts, stakeholders, three Council members, and the Mayor.

The office has led the discussion of how to both mitigate and adapt to the increased tidal flooding due to sea level rise, as well as other anticipated climate change impacts. Charleston has partnered with scientists and technical experts to identify the short- and long-term hazards the City will face. Major current and upcoming projects of the office include an All Hazards Vulnerability and Risk Assessment, a Flooding and Sea Level Rise Strategy, a Hazard Mitigation Plan, a Flood Condition Awareness Program, Dutch Dialogues (conversations about the Dutch approach to "living with water"), and a coastal flood risk management study of the Charleston Peninsula with the US Army Core of Engineers. As a result of these projects, the City has gathered data and developed new reporting systems, such as the infrastructure story map, which have helped the City with education and outreach

efforts, gaining community buy-in, and will help lay the groundwork for their coming comprehensive plan update.

In addition to providing information about anticipated impacts and policy changes, the office offers citizens information on how they can personally become involved in resiliency efforts and planning for natural hazards. The City has an Adopt-A-Drain program, provides information about tree planting, rainwater capture, landscape stewardship, and impacts of impervious surfaces. The same webpage also links citizens to information about how they can make a plan for hazard mitigation, purchase flood insurance, report storm damages, and be more tide aware. The City is also piloting a mobile friendly app called Tide Eye, which monitors tide and wind speeds in real time, as well as forecasts the next few tides based on National Weather Service thresholds.



A screenshot of the Tide Eye Pilot, City of Charleston GIS, used with permission

RECOMMENDATION

Continue watershed-based planning efforts and collaborations to improve water quality.

The City falls within six different regional watersheds and 16 different subwatersheds. Partnering with other local governmental bodies and stakeholders is essential to these watershed plans, especially as municipal boundaries do not match watershed boundaries - none of the 16 HUC 10 digit subwatersheds fall completely within the City limits (a map of these is provided in the *Natural Resources Existing Conditions Report*).

The City of Columbia has worked on a number of watershed and subwatershed plans over the years, and these planning efforts have helped to build stakeholder awareness and partnerships as well as identify strategies that have lead to water quality improvements.

WHO IS RESPONSIBLE?

- Engineering (primary)
- Utility Operations (primary)
- Other local governments
- Local watershed associations and other related nonprofits
- SCDHEC

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

Some grant funding is available for watershed planning efforts. Implementation costs associated with recommendations in watershed plans will vary on a plan-by-plan basis, but costs should be identified within plans where possible.

PRIORITY

HIGH
start within 3 years

COST

\$
annually

THEMES

- Partner
- Conserve & Preserve
- Plan & Implement

OTHER ELEMENTS

- Community Facilities
- Land Use

DATA TO BE COLLECTED

- A prioritized list for watershed planning efforts should be developed based upon water quality need and development pressures. This list should include both new watershed plans and updates to existing plans.
- A variety of data will be collected as part of these planning efforts.

MEASURING SUCCESS

Success will be measured by the number and regularity of watershed planning efforts, implementation of these planning efforts, and continued improvements to water quality.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Enhance
- Lead

RECOMMENDATION

Bolster the City’s urban forestry, landscaping, maintenance, and planting programs.

In famously hot Columbia, the City's urban tree canopy and vegetation are critical parts of providing for ecosystem services within the built environment. Trees and vegetation provide critical shade, habitat, and stormwater retention and treatment, among other ecosystem benefits.⁵⁴ Trees and vegetation are also a good investment: they increase property values, enhancing walkability and public spaces, adding vitality to residential and commercial areas alike.

The City of Columbia is responsible for the maintenance of, in many locations, an aging tree canopy. In recent years the City has also targeted landscaping and maintenance along key corridors - a critical part of revitalization efforts. Public input received during the planning process regularly indicated desire for vibrant and well-maintained urban trees and landscaping, coupled with an understanding of the current limitations due to staffing levels and maintenance demands.

WHO IS RESPONSIBLE?

- Forestry & Beautification Division (primary)
- Parks & Recreation (primary)

DURATION

SHORT, ONGOING
1-3 years to complete,
recurring

The City's tree canopy and vegetative landscaping will continue to require maintenance, however cost savings should be realized when the Division is able to act proactively instead of responding reactively to needs.

PRIORITY

HIGH
start within 3
years

COST

\$\$\$*
annually

THEMES

- Built Environment
- Conserve & Preserve
- Plan & Implement

OTHER ELEMENTS

- Community Facilities
- Economic Development
- Land Use

DATA TO BE COLLECTED

- A regularly updated needs assessment which details the cost and time associated with existing and desired landscaping, maintenance, and planting programs, as well as the costs of attracting and retaining qualified employees.
- As coordination of new programs and focus areas should build upon implementation recommendations in adopted City plans and policies, a collaborative list of these should be developed.
- Once staffing and funding is available, a tree/vegetation study should be undertaken for strategic planning purposes.

MEASURING SUCCESS

Success for this recommendation can be measured both quantitatively and qualitatively. Benchmarks include the ability of the Forestry Division to maintain necessary staffing levels; regularly maintain the existing urban tree canopy and vegetative plantings; facilitate streetscaping and planting programs; and develop a data-driven and proactive approach to the City's forestry needs.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Develop a utility undergrounding plan which prioritizes corridors for implementation and explores regulatory and funding options to enable a healthy urban tree canopy and more complete streets.

Due to limited space, overhead utilities along key corridors can conflict with the health of the urban tree canopy and walkability, as well as the appearance of the City. During the planning process members of the public with varied interests, from economic development and cultural resources to transportation and land use, identified the undergrounding of utilities as a priority goal and high impact strategy for key corridors.

Utility undergrounding programs are both high in cost and impact, and the development of an undergrounding plan which identifies key corridors, strategies, and funding sources for implementation is a important first step.

WHO IS RESPONSIBLE?

- City Manager (primary)
- Planning & Development Services (primary if regulatory)
- Public Works (primary)
- Business districts
- Engineering
- Utility Operations
- Tree & Appearance Commission

DURATION

MEDIUM
4-6 years to complete

Plan development would occur in the medium term, but implementation of the plan would likely occur in the long term. Cost to the City varies largely depending on funding mechanism utilized.

PRIORITY

HIGH
start within 3 years

COST

¢ - \$\$\$* 

THEMES

- Built Environment
- Conserve & Preserve
- Plan & Implement

OTHER ELEMENTS

- Cultural Resources
- Economic Development
- Land Use
- Transportation

DATA TO BE COLLECTED

- As part of the planning process, regulatory and funding options should be researched, key corridors for implementation should be identified, and implementation costs should be estimated.
- Once the plan is developed and adopted, key corridors should be mapped for the purposes of tracking and permitting of development.
- Implementation may benefit from access to updated baseline data for the City's urban tree canopy and vegetative plantings.

MEASURING SUCCESS

Success will be measured through the development and adoption by Council of an undergrounding plan. Subsequent funding and/or regulatory support established in order to implement the plan is also a measurement of success.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Develop a utility undergrounding plan which prioritizes corridors for implementation and explores regulatory and funding options to enable a healthy urban tree canopy and more complete streets.

Case Study 6

Power Line Burial Project, Hilton Head Island, SC

Hilton Head's Mayor and Council prioritized the undergrounding of utilities on the island due to both expected improvements in reliability (especially in high-wind events) and aesthetic quality. The Town's undergrounding program began with one key corridor, and then expanded to encompass a much broader scope. The Town of Hilton Head Island began the 15-year, \$34 million project in 2004, targeting 28 specific sites across the island where existing above-ground power lines should be buried.⁵⁵ In all, over 40 miles of feeder lines and 200 miles of non-feeder lines have been buried. The Town also adopted an ordinance requiring new development to bury lines, so that project efforts were not quickly overshadowed.

The project was funded through a partnership and cost-sharing agreement between the Town and Palmetto Utilities. To cover their portion of the project funding (which is greater than half of the cost), the Town instituted a project-specific franchise fee, administered in partnership with Palmetto Electric. The three percent franchise fee is passed on to customers and tied to their energy usage, generally adding four to five dollars to a residential power bill per month.

The City's Chief Building Inspector and Palmetto Electric have worked closely together on project implementation. With the undergrounding of lines, new connections are required to existing structures. Palmetto Electric contacts the City with a list of addresses with each phase, and the Chief Building Inspector sends letters to

property owners with information about the upcoming power line burial in their area, as well as a list of approved electrical contracts. Property owners can utilize electricians from the list, or another licensed electrician of their choice, to facilitate the connection to the new buried lines. The selected electrician submits a permit application and bid to the Chief Building Inspector, who verifies that the bid is within range, issues the permit, and then contacts the power company with approval so that they can issue a payment directly to the electrician once the work is complete and inspected. Along with burying the lines themselves, the project also required the conversion of traffic signals to underground lines; this effort was also covered by the franchise fee.

The project has benefited the Town, residents, and Palmetto Electric alike, helping with power losses due to wind events, requiring less maintenance than power poles would, and improving aesthetics. The undergrounding project began on the south side of the Island and moved northward, targeting key commercial corridors during the off-season when possible.⁵⁶



Before and after utility undergrounding at 278 and Palmetto Dunes; courtesy of Tony Pierce, Chief Building Inspector, Town of Hilton Head Island

RECOMMENDATION

Develop a utility undergrounding plan which prioritizes corridors for implementation and explores regulatory and funding options to enable a healthy urban tree canopy and more complete streets.

Case Study 7

Utilities Undergrounding Program Master Plan⁵⁷,
San Diego, CA

The California Public Utilities Commission required all new construction to install utilities underground beginning in 1967, unless overhead utility poles were already present. The City of San Diego began undergrounding all utilities in 1970, but because of the magnitude of this work, the project is expected to continue long into the future. The program is managed by the City's Transportation and Storm Water Department, and requires cooperation from the electrical provider, San Diego Gas & Electric, as well as other utilities that operate within the City. While California has established tariff rules which require utilities to participate in the undergrounding of existing utilities, the City also has regulatory requirements, franchise agreements, and policies which require their participation.

The City's undergrounding program is funded through a surcharge component to residents' electric bills, which is managed separately from the City's General Fund. This Surcharge Fund also finances resurfacing or slurry sealing of trenched streets, installs new street lights to meet street design manual standards, installs ADA curb ramps, and plants trees along City streets in coordination with property owners.

The City adopted its first undergrounding program master plan in 2003, which served to coordinate the construction and project sequence for the entire program. This plan divided the projects into lists by Council Districts, and then broke these projects into

smaller projects. Each of the subprojects was assigned a ranking (specifying when the undergrounding would occur), as well as a cost estimate. Subsequent plan updates in 2009 and 2017 utilized the same framework, but allowed for more detailed analysis of projects through the use of GIS.

The 2017 update is a five-year plan which prioritizes projects with the greatest public benefit, while also distributing them equitably throughout the City. Greatest public benefit is determined by a number of criteria, including land use, view corridors, areas with high overhead concentration, community plan consultation, and proximity to public facilities such as trolley stations, parks, schools, and major streets.

Another goal of the 2017 update is to decrease neighborhood impacts by coordinating with other planned projects in the area. The City will use coordination tools in GIS and the City's conflict check coordination tool to help ensure compliance with its One Dig Policy, and minimize neighborhood disruption.



A key corridor in San Diego contains no overhead powerlines, but does contain plenty of space for trees and vegetation, as well as for users of all modes of travel. Image iStock.com/Ron and Patty Thomas

RECOMMENDATION

Leverage limited resources and provide consistent messaging by partnering to grow awareness of sustainable and environmentally sound practices and affect cultural change in the Midlands through education and outreach.

Engagement and outreach is critical to facilitating cultural change, and the City can help lessen our environmental impact as a community through clear and consistent messaging. The City's messaging on recycling, animal waste disposal, litter, stormwater management, and other topics often echoes messaging provided by surrounding municipalities, counties, non-profits, and state government agencies. Continuing to provide consistent messaging, and expanding local, regional, and statewide partnerships to leverage limited resources and grow the reach of these campaigns can help reinforce and broaden critical messaging throughout the Midlands.

WHO IS RESPONSIBLE?

- Sustainability Division (primary)
- Business districts
- City departments including: Public Works, Columbia Water Public Relations, Parks & Recreation, Public & Media Relations
- Local watershed associations and other related nonprofits
- Neighborhood and community leadership
- Other local governments
- State agencies such as DHEC, Commerce, DNR, Agriculture

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

Many City departments are already working toward this goal; continuing to expand upon this practice, and track cost savings and improvements should be an ongoing effort City-wide.

PRIORITY

HIGH
start within 3 years

COST



THEMES

- Engagement & Outreach
- Conserve & Preserve
- Partner

OTHER ELEMENTS

- Community Facilities
- Land Use

DATA TO BE COLLECTED

Each City department conducting or reinforcing messaging regarding sustainable and/or environmentally sound practices should compare their messaging to the messaging provided by different departments, local governments, non-profits, and state agencies on the topic. Columbia can lead by example, and work to expand upon and create new partnerships to provide for more consistent and effective messaging.

MEASURING SUCCESS

Departments should be able to measure success by tracking the number of campaigns which:

- are consistent with national messaging practices for that topic; and
- represent partnerships which leverage limited resources.

Success can also be measured both quantitatively and qualitatively through tracking the success of messaging in contributing to more sustainable and environmentally friendly behaviors in the Midlands.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Enhance
- Lead

RECOMMENDATION

Harness the City’s buying power to reduce resource use and pollution.

In procuring everything from equipment and office supplies to new facilities, the City’s investment has a meaningful impact on our local and regional economy. The City already incentivizes minority and women-owned businesses, mentor-mentee relationships, and local contracts through its procurement process, and these procurement goals have paid dividends in our community.

Setting policies and targets which incentivize and/or require the use of recycled content or recyclable goods, hybrid or zero emission vehicles, energy star appliances, resource conservation-focused equipment, and LEED or LEED-equivalent facilities is a simple way the City can contribute to a shift in our local economy and drive change.

WHO IS RESPONSIBLE?

- Procurement & Contracts (primary)
- Sustainability Division
- City Architect
- City Council
- All City Departments

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

Modifications to purchasing requirements can be accomplished in the short term, but should be carried forth and expanded upon as deemed necessary or impactful. While the short term costs for procurement may increase, long term cost savings, both locally and globally, provide a high return on investment.

PRIORITY

HIGH
start within 3 years

COST

¢ - \$\$\$\$\$* 

THEMES

- Conserve & Preserve
- Lead By Example

OTHER ELEMENTS

- Community Facilities
- Economic Development
- Housing
- Transportation

DATA TO BE COLLECTED

- Identify certifications or practices that would lead to a meaningful impact if incentivized and/or required.
- Determine which certifications or practices could be easily integrated, and which might be more difficult either due to City practices or market availability.
- Establish baseline data for certain product and equipment resource usage, to be tracked departmentally or through contracts.

MEASURING SUCCESS

Initial success will be measured through the development and adoption of procurement standards which will lead to reduced resource use and pollution generated by the City. Long term success can be measured by tracking improvements to subcategories, such as the resulting decrease in emissions, fossil fuel usage per vehicle miles traveled, and increase in savings associated with energy and resource usage.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Build upon City efforts to improve water quality through the implementation of green infrastructure, best management practices (BMPs), and other targeted stormwater and wastewater infrastructure improvements.

Columbia Water is already working to improve water quality through the above practices, and should continue to do so, expanding upon current programs. Through using green bonds, partnering with community organizations and state agencies, working toward implementation of adopted City plans, and capitalizing on planned infrastructure improvements, the City can continue to target water quality concerns. With green infrastructure improvements, partnership with the City's Forestry Division will be critical to success.

WHO IS RESPONSIBLE?

- Engineering (primary)
- Utility Operations (primary)
- Parks & Recreation
- Planning Division

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

Continuing and expanding upon partnerships and programs underway will help to extend water quality improvement efforts throughout the City, making a meaningful and lasting impact. In many cases, these projects may already be funded, however new projects may vary greatly in cost.

PRIORITY

HIGH
start within 3 years

COST

\$\$ - \$\$\$\$\$
annually

THEMES

- Built Environment
- Conserve & Preserve
- Lead By Example

OTHER ELEMENTS

- Community Facilities
- Land Use

DATA TO BE COLLECTED

- Water quality data is already collected, and collection should be continued.
- Comparing water quality data to watershed-specific improvements should be a part of the long-term goal of this process.

MEASURING SUCCESS

While generally the City's services should be equitably spread across Columbia, water quality improvements should be prioritized by need. Success can be measured through improvements to water quality, increases in the amount of naturalized buffers along watercourses, and other quantitative measures.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Plan for the preservation of land near rivers and streams, and provide appropriate public access where possible.

The statement "Land near rivers and streams should be protected and made accessible to the public" received wide support during the first Columbia Compass survey. Implementation of this recommendation includes both exploring regulatory options and partnering with local non-profits and other partners to preserve sensitive areas through purchase or conservation easement. Regulatory options could include requiring new developments to plan for the preservation of land near rivers and streams as part of site plan development, and providing or enhancing appropriate public access where possible. Working with local non-profits and other agencies could include targeting areas for conservation, the dedication of conservation easements on City properties, and/or partnering to fund the purchase of land or conservation easements in riparian and stream bank areas.

WHO IS RESPONSIBLE?

- Parks & Recreation (primary for public access)
- Planning & Development Services (primary for regulatory options)
- Engineering

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

Some regulatory options will be addressed in the City's code rewrite in the short term, and could be revisited in the near future. The City should set aside funding to capitalize on grant opportunities, utility projects, and potential partnerships with property owners on an ongoing basis to target these lands.

PRIORITY

MEDIUM
start within 4-6 years

COST

€ - \$\$\$\$\$\$ 
every two years

THEMES

- **Conserve & Preserve**
- Built Environment
- Equity & Accessibility

OTHER ELEMENTS

- Community Facilities
- Economic Development
- Land Use

DATA TO BE COLLECTED

- Best practices for regulatory options should be examined as part of developing a recommendation for any amendments to the City's code.
- Implementation of this recommendation should build off of water quality data and prioritization lists for City infrastructure and facilities projects.
- Public access points, conservation easements, and conserved lands should be mapped and updated regularly in order to best identify missing connections and target areas.

MEASURING SUCCESS

As a two-part recommendation, success can be measured both in the number of opportunities created for conservation and/or public access through development regulation, and in the partnership efforts the City is involved in which result in the permanent conservation of land.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

Plan for the preservation of land near rivers and streams, and provide appropriate public access where possible.

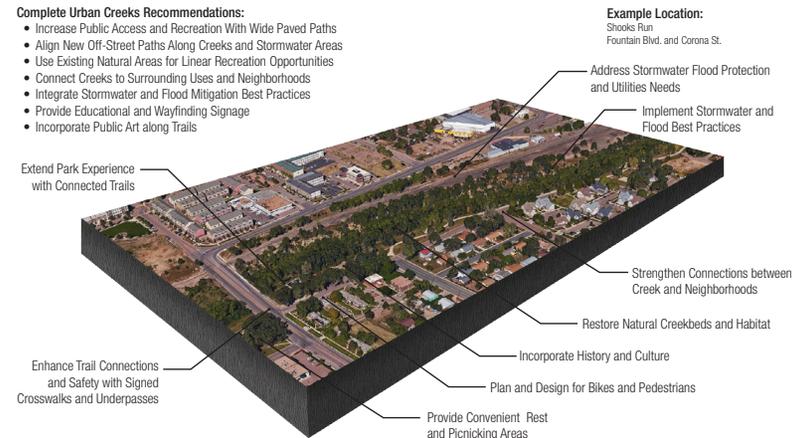
Case Study 8

Complete Our Creeks, *PlanCOS*, Colorado Springs, CO

PlanCOS is the community of Colorado Springs' plan for the physical development of the City. Adopted in 2019, the plan's vision for 2040 is "we will build a great city that matches our scenery." The plan is organized around six vision themes, and each vision theme contains big ideas. As a part of the Majestic Landscapes vision theme, Complete Our Creeks states that "our creeks and stream corridors should be the lifeblood and arteries of our green infrastructure. We plan to fully incorporate our creeks as multipurpose and accessible corridors. They should be actively considered as places for wildlife, recreation, transportation, utilities, and the conveyance of stormwater."⁵⁸

The plan expands upon the vision through the development of typologies for land development, including a typology for Complete Urban Creeks. Typologies provide an illustrative context for the different functions and desirable patterns throughout the City, aligning with the goals of the plan. These typologies are undergirded by the development of two policies and strategies aligned with each policy. These strategies provide guidance to the City on how to move this vision forward. The policies for complete urban creeks are:

- "Utilize, maintain, and expand upon open space and natural areas along creeks to convey stormwater while meeting recreation, education, and transportation needs consistent with the Complete Creeks Typology.
- Preserve and maintain the creek and waterway system as an essential component of stormwater infrastructure."⁵⁹



Complete Urban Creeks Typology, used with the permission, City of Colorado Springs. Graphics by Logan Simpson LLC.

Some of the strategies supporting these policy statements include:

- "Design stormwater projects to incorporate recreation, education, and transportation uses and facilities when feasible" (ML-3.A-1);
- "Educate citizens on the impact of development on wildlife and encourage the preservation of significant wildlife corridors and contiguous open lands through regulation" (ML-3.A-4);
- "Encourage streamside adjacent developments and those that are located near existing or future trail systems to dedicate lanes, access, or easements to allow for creek improvements, points of connectivity, and other critical trailhead elements" (ML-3.B-1); and
- "Create management plans for greenways to strategically address maintenance and ensure ecological functions are enhanced." (ML-3.B-3)⁶⁰

RECOMMENDATION

Continue to facilitate stream and wetland restoration through regional partnerships and property maintenance and improvements.

Similar to the preservation of land near rivers and streams, stream and wetland restoration projects are essential to improving water quality. These types of projects are already spearheaded by City departments, and should continue to be pursued as opportunities arise. These restoration efforts can be coupled with maintenance of City property and improvements to City infrastructure and facilities. As with most approaches to water quality improvements, stream and wetland restoration projects often hinge on regional partnerships between a variety of actors. Generally, this recommendation would be specific to improvements within City-held properties or easements, though restoration efforts could be funded or co-sponsored by partner entities.

WHO IS RESPONSIBLE?

- Engineering (primary)
- Parks & Recreation (primary)
- Support Services
- Utility Operations
- Local nonprofits
- Other local governmental agencies
- DHEC & DNR
- USACE & USEPA

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

Stream and wetland restoration projects work hand-in-hand with City infrastructure improvements and resiliency planning efforts, as they aid our natural systems in hazard mitigation and the provision of other key ecosystem services.

PRIORITY

MEDIUM
start within 4-6 years

COST

\$\$\$ 
every two years

THEMES

- Conserve & Preserve
- Lead By Example
- Partner

OTHER ELEMENTS

- Community Facilities
- Land Use

DATA TO BE COLLECTED

- Implementation of this recommendation should build off of water quality data and prioritization lists for City infrastructure and facilities projects.
- Participation in these projects should be tracked for the purposes of annual reporting.

MEASURING SUCCESS

Success will be measured by tracking the City's participation in stream and wetland restoration projects annually. While some years might see participation in more projects than other years, this is tied to the natural ebb and flow of grant funding and capital investment, and the true success will be the total number of projects over the ten year time period, instead of a yearly increase in the number of projects when compared to prior years.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Enhance
- Lead

RECOMMENDATION

Examine how to best facilitate stream and wetland restoration through providing for flexible site design and/or other incentives.

Similar to the preservation of land near rivers and streams, stream and wetland restoration projects are essential to improving water quality. While improvements can be completed by the City on City owned or maintained lands, the majority of properties along watercourses and wetlands are privately held. These are often recognized as amenities with development, and as such it is in both the developer's and City's best interests to allow for flexibility in site design to ensure minimal impacts to these areas. Incentivizing meaningful stream and wetland restoration has been found to be a successful regulatory approach nationwide.

WHO IS RESPONSIBLE?

- Planning & Development Services (primary)
- Engineering (primary)
- Economic Development

DURATION

SHORT, ONGOING
1-3 years to complete,
recurring

Flexible site design and other incentives are being considered as part of the code rewrite process, and should continue to be examined to facilitate restoration and protection of these critical natural resources.

PRIORITY

HIGH
start within 3
years

COST



THEMES

- **Conserve & Preserve**
- Built Environment
- Plan & Implement

OTHER ELEMENTS

- Economic Development
- Land Use

DATA TO BE COLLECTED

- Best practices for regulatory options should be examined as part of developing a recommendation for any amendments to the City's code. Research should include the development of a rubric to ensure that stream and wetland restoration projects are meaningful and any necessary maintenance is provided for by the developer in the long term.
- Implementation of this recommendation should build off of water quality data.

MEASURING SUCCESS

Success can be measured quantitatively and qualitatively by tracking the usage of flexible site design and other incentives which facilitate stream and wetland restoration by developers.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Work with local nonprofits and other partners on stream restoration and cleanup efforts.

The City has a history of partnering with local nonprofits and neighborhood associations on stream restoration and cleanup efforts. This partnership might be through project management, provision of matching funds, or through providing an education and outreach component to couple with cleanup efforts. Continuing to participate in these partnership opportunities helps further the City's goals for improved water quality, and can help with providing messaging to the community on environmentally sound practices.

WHO IS RESPONSIBLE?

- Engineering (primary)
- Public Works (primary)
- Utility Operations (primary)
- Local nonprofits
- Neighborhood and community leadership

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

The City should take advantage of these opportunities as they are available, and as staffing and funding permit.

PRIORITY

LOW
start within 7-10 years

COST

¢-\$

THEMES

- Partner
- Conserve & Preserve
- Lead By Example

OTHER ELEMENTS

- Community Facilities
- Land Use

DATA TO BE COLLECTED

While data is not necessary to the success of this implementation strategy, tracking City partnerships and participation in restoration and cleanup efforts is desirable for annual reporting purposes. Where outreach opportunities or volunteers are involved, the number of individuals participating should also be tracked.

MEASURING SUCCESS

Success is qualitatively measured through the strength of continued partnerships. Quantitatively, success can be measured through participation by the City, however the true success will be the total number of projects over the ten-year time period, instead of a yearly increase in the number of projects when compared to prior years.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Continue to invest in clean, renewable energy generation for community facilities.

There are long term financial and environmental benefits from investing in clean, renewable energy generation in existing and new City facilities. In famously hot Columbia, our offices, parks, utility stations, and parking facilities offer opportunities for solar installation, providing a cost savings to the City and therefore to tax payers. Technological advances continue to reduce costs and improve efficiencies, and by deploying renewable energy generation in City facilities, City government can lead by example as we pave the way for the community to rely 100% on clean, renewable energy sources by 2036. Furthermore, a shift to clean energy means a long-term improvement to air quality and public health.

WHO IS RESPONSIBLE?

- Engineering (primary*)
 - Parks & Recreation (primary*)
 - Support Services (primary*)
 - Utility Operations (primary*)
 - Procurement & Contracts
 - Sustainability Division
- * primary dependent on facility*

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

In order to realize the shift by 2036, clean and renewable energy generation should be a part of the conversation from the start. This should be coupled with the community facilities planning recommended in the Community Facilities Element.

PRIORITY

HIGH
start within 3 years

COST

¢ - \$\$\$\$\$*

THEMES

- Innovation & Technology
- Conserve & Preserve
- Lead By Example

OTHER ELEMENTS

- Community Facilities
- Land Use

DATA TO BE COLLECTED

- With implementation, cost saving and fossil fuel savings should be tracked.

MEASURING SUCCESS

Clean, renewable energy generation should be coupled with efforts to conserve resources through increased efficiencies and energy saving equipment and systems. Therefore, success is measured in several stages: through the implementation of the recommendation to harness the City's buying power; through the examination of opportunities for clean, renewable energy generation with community facilities planning, and through the installation of clean, renewable energy generating systems on existing and new City facilities.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

Continue to invest in clean, renewable energy generation for community facilities.

Case Study 9

Various City Programs, Phoenix, AZ⁶¹

The City of Phoenix has a long history of investment in both energy efficiency improvements and renewable energy generation for community facilities.

Investment in Energy Efficiency

In 1983 the City of Phoenix created a revolving fund to invest in energy efficiency projects on City properties (the Energy Conservation Savings Reinvestment Fund). The cost savings associated with these projects was quantified, and then half of the savings are recontributed to the fund to finance more energy efficiency measures. Phoenix established the fund in 1983, first capping reinvestment at \$500,000, and then \$750,000. This revolving fund financed capital improvements to structures, covering items such as HVAC and lighting upgrades. Currently the City operates an energy efficiency fund through Public Works. This fund is meant to help finance projects which make sense but might not otherwise be incorporated into the City's Capital Improvement Plan (CIP). The fund is managed by a small internal committee, and departments submit funding requests for funding.

Solar Energy Investment

The City began the installation of solar panels on transit canopies in 1990. By Spring 2020 the City will have 30 Megawatts of solar power generation spread across 30 sites, making Phoenix the city with the largest amount of solar power generation in the nation. (These facilities included parking lots, recreational facilities, fire

stations, a water treatment plant, apartments, an ASU facility, and a museum. The City utilizes the solar-generated power to directly power City facilities, which is a higher return on investment than simply selling the power back to the grid - for example, on two parking lots where solar arrays are installed, these arrays supply 90% of the power used by the facilities, vastly reducing the City's power bill. The City is also currently engaging with its local utility provider to develop a MOU to work with the local utility to help the City move towards its carbon-neutral goals.



Solar installations installed on and powering City facilities, courtesy of City of Phoenix

Leadership in Energy and Environmental Design (LEED)

In 2006, the City updated its internal building requirement policy to require 2006 LEED Silver standards be met for all of its own new buildings. As a result, these standards have been incorporated into not only internal projects but also any bid construction projects for City facilities. The City is currently in the process of working with Council to adopt an official building policy which would require that new projects align with updated LEED standards as long as there is a life cycle cost benefit, no matter the payback period (whether each dollar will see an equal return on investment due to sustainable construction design over one year, or over 20 years). In order to be certified, LEED buildings must save energy, water, resources, generate less waste, and support human health.

RECOMMENDATION

Continue to invest in clean, renewable energy generation for community facilities.

Case Study 10

Buncombe Bioreactor & LFGTE, Buncombe County, NC

Buncombe County opened a new landfill in 1997. During the landfill siting process, the County recognized that it was in its best interest to keep this new landfill in service as long as possible, and examined options to extend the landfill's life early on, incorporating an alternative liner system. As such, the County worked with the USEPA to receive regulatory flexibility under Project XL to add liquids to landfill cells with alternative liner systems. To date, the only liquids used have been leachate (essentially, the liquid that drains from the decomposing trash) - by recirculating leachate during warm months through the landfill cells, the decomposition rate is increased, increasing the available air height in the landfill cells.

This focus on superior environmental performance for the landfill put the County in an excellent position for grant funding through the federal stimulus (ARRA). As the recirculation of leachate led to a drastic reduction in the need for vehicular transport to and subsequent treatment of leachate at the sewer treatment plant, the County was successful in an application for grant and loan funding to expand leachate recirculation and to add a landfill gas to energy generator which captures and converts methane into electricity to be sold through Duke Energy and the French Broad Electric Membership Corporation.

Savings by the numbers:

- Current projections show the County has **added 5-7 years of landfill life** due to landfill settlement tied to leachate recirculation and through steepening the side slopes.
- Recirculation of leachate (instead of hauling it to and treating it at the sewer treatment plant) has **saved the County \$3,856,003 since 2012**, with a current annual savings of around \$30,000. In addition, the tanker truck is no longer making regular trips to the plant, six miles away down a winding road, further **reducing greenhouse gas emissions**.⁶²
- From late 2011 through June 2019, the landfill gas to energy generator generated **a total of 69,013 Megawatt Hours of electricity**. The generator does require a lot of expensive maintenance, but the revenue from the power purchase agreement plus the renewable energy credit revenue received due to the destruction of methane without a regulatory requirement allows the County to break even, while **producing enough green energy to power an average of 687 homes per year** between 2012 and 2018.⁶³



County seal and ProjectXL logo used with the permission of Buncombe County

RECOMMENDATION

Invest in and incentivize clean, renewable energy usage in development.

The City has committed to 100% clean, renewable energy generation by 2036 in Columbia, however this goal cannot be achieved through the upfit of City facilities alone. To achieve this goal, the City will need to work with homeowners, business owners, and developers to provide regulatory opportunities and incentives for conversion to clean, renewable energy sources. While technological improvements and efficiencies continue to make this shift increasingly attractive to Columbians, the City can and should also play a role in encouraging this cultural shift in our approach to our built environment. As with the generation of clean, renewable energy by City facilities, reducing energy consumption should also be a target of any regulatory and/or incentive measures.

WHO IS RESPONSIBLE?

- Planning & Development Services (primary)
- Engineering
- Community Development
- Development corporations
- Economic Development
- Office of Business Opportunities
- State Energy Office
- Utility Operations

DURATION

SHORT, ONGOING
1-3 years to complete, recurring

Flexible site design and other measures proposed in the code rewrite may better accommodate renewable energy usage, however opportunities to provide both regulatory and programmatic support should continue to be examined and implemented.

PRIORITY

HIGH
start within 3 years

COST

¢ - \$\$\$\$\$* 

THEMES

- **Built Environment**
- Conserve & Preserve
- Innovation & Technology

OTHER ELEMENTS

- Economic Development
- Housing
- Land Use

DATA TO BE COLLECTED

- Best practices for regulatory language, regulatory incentives, and financial incentives should be studied for implementation by the City.
- Use of regulatory incentives and financial incentives specific to the installation of clean, renewable energy generation should be tracked for annual reporting purposes, and to understand the success rates of each incentive so that funding is most efficiently allocated.

MEASURING SUCCESS

Initial successes would include the adoption of the code rewrite and examination of best practices and potential integration with City programs and policies. Subsequent success would be measured in the institution of regulatory measures and incentives and programmatic incentives, and the success of these policies and programs in spurring a shift to clean, renewable energy generation and usage.

CONNECTION WITH ENVISION COLUMBIA

- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Invest in and incentivize clean, renewable energy usage in development.

Case Study 11

Upper Peninsula Zoning District, Charleston, SC

The City of Charleston undertook an in-depth analysis of redevelopment in the Upper Peninsula, inclusive of robust community input. As a result of this analysis and input, recommendations were made to adopt a new zoning district for the upper peninsula, incentivize sustainable building practices, and ensure a mix of uses.

The resulting Upper Peninsula Zoning District, adopted in 2015, is meant to encourage sustainable and responsible growth within the Upper Peninsula. It does this through loosening zoning height and density restrictions in exchange for the provision of community amenities. Such amenities include affordable housing, renewable energy generation, and the provision of privately-maintained public green spaces. The zoning district also encourages street vitality and walkability through requirements for active ground floors on designated corridors, allows for open air rooftop uses, and non-building adjacent parking. The zoning district was applied to areas capable of handling growth, and did not include any properties zoned for single family, protecting existing residential neighborhoods.

In order to build a structure of five stories or greater, or to have unregulated density, a proposed project must receive points through site design options, which include the provision of renewable energy, but many others of which also work to reinforce energy efficiency and sustainability. For five stories, five points are required; for 12 stories, 12 or more points are required. There is a total of 29 available points.⁶⁴

Incentive Options	Description	Point Value	Maximum Allowable Points
Stormwater Management	Decrease stormwater runoff and impervious surfaces	2	2
Vegetated Green Roof	Vegetated Green Roof (greater of 700 square feet or 30%)	1	2
	Vegetated Green Roof (greater of 1,500 square feet or 60%)	2	
Building Certification Programs	LEED Silver	2	8
	LEED Gold or Charleston RISES	6	
	LEED Platinum	8	
Mobility & Transportation	Alternative Transportation	1	1
	Exceptional Bicycle Parking & Facilities	1	1
	Contribute to Mobility Improvement Fund	varies	varies
Renewable Energy	Renewable Energy (5 kW System)	1	2
	Renewable Energy (12 kW System)	2	
Outdoor Public Space	Quality Outdoor Public Space (2,500-5,000 square feet)	1-2	4
	Quality Outdoor Public Space (5,000 - 20,000 square feet)	2-3	
	Quality Outdoor Public Space (20,000 square feet or more)	3-4	
Workforce Housing	60% Area Median Income (greater of 10 units or 5%)	2	9
	80 - 120% Area Median Income (greater of 15 units or 10%)	3	
	80 - 120% Area Median Income (greater of 25 units or 15%)	4	

Recreated from the City of Charleston Zoning Ordinance, Section 54-299.32. - Incentive Options, Table 1

Invest in and incentivize clean, renewable energy usage in development.

Case Study 12

Retrofit Chicago Commercial Buildings Initiative⁶⁵,
Chicago, IL

The City of Chicago, along with regional public, private, non-profit, and utility partners, launched the Retrofit Chicago initiative in 2012 as part of the City's implementation of *Sustainable Chicago 2015*. Reflective of the U.S. Department of Energy's Better Buildings Challenge launched in 2011, the Retrofit Chicago program sought to reduce energy usage in commercial buildings by at least 20% within five years of a participant joining the program. Through their voluntary participation, program members receive incentives, resources, technical support, and peer learning opportunities which help them meet goals while reducing operating expenses. Participants also receive public recognition for energy efficiency leadership.

Participants in the program commit to:

- Reduce energy usage in one or more buildings by at least 20% within five years
- Begin energy efficiency work within six months of joining
- Track progress and share best practices with the public
- Serve as ambassadors to other buildings interested in increasing energy efficiency.

Participant buildings vary in size, age, and energy efficiency opportunities - the program remains ongoing, but as of July 2014 participants included buildings between 7 and 117 years of age, reflected a range of EnergyStar scores, and included a number of

sectors - commercial office buildings, hotels, university facilities, cultural institutions, and multi-family residential. By July 2014, participation included 48 buildings spanning 37 million square feet.

The "Retrofit Chicago Commercial Buildings Initiative Best Practices Report" (July 2014) identifies a number of lessons learned from the first two years of the initiative. These are:

1. Cross-sector partnership with key leadership is essential. This allowed public, private, and non-profit partners to be available to provide outreach efforts and resources to building managers and property owners.
2. Setting the stage for a quick ramp-up period with the support of cross-sector partners was key to building early momentum and achieving early wins.
3. Commitment and goal setting helped property managers communicate goals, prioritize, and push for larger-scale and more valuable energy efficiency improvements.
4. Participation in utility energy efficiency incentive programs increases when utilities were an early partner and therefore able to clearly communicate opportunities for participation.
5. One-on-one and peer support was critical to program success - "welcome calls" established a dialogue between new participants, technical partners, peer support, and the City.

RECOMMENDATION

Work with the community and local utility providers to improve efficiencies while prioritizing access for citizens facing the largest energy burdens (financial burdens) and pollution hazards.

The transition to clean, renewable energy should benefit all Columbians while also addressing equity issues. The Southeast and South Carolina lead the nation in high "energy burdens" - essentially, the proportionate cost of electric and gas bills when compared to household income. Pollution hazards, a subset of environmental justice issues, also disproportionately affect lower income populations. As part of working towards being ready for 100% clean, renewable energy, the City of Columbia should engage with citizens and utility providers to ensure that lower-income residents have access to energy efficiency improvements and clean energy sources, and are protected from pollution hazards. This might involve lobbying efforts, home improvement programs, and advocating for appropriate separation of pollution hazards from residential areas, and brownfield cleanup and redevelopment, regardless of the level of neighborhood involvement.

WHO IS RESPONSIBLE?

- City Council (primary)
- CPD - Code Enforcement
- Community Development
- Development corporations
- Office of Business Opportunities
- Planning & Development Services

DURATION

LONG, ONGOING
7-10+ years to complete, recurring

Existing City programs which aid home and business owners could be revised to target and emphasize energy efficiency improvements; costs and responsible parties vary depending on approach.

PRIORITY

HIGH
start within 3 years

COST

¢ - \$\$\$\$\$* 

THEMES

- Partner
- Built Environment
- Equity & Accessibility

OTHER ELEMENTS

- Economic Development
- Housing
- Land Use

DATA TO BE COLLECTED

A more complete understanding of the energy burdens faced by low income residents may help make lobbying and advocacy efforts more robust; however in general this recommendation does not require that data be collected, rather that efficiencies be programmed and advocated for that conserve energy and therefore lessen the burden.

MEASURING SUCCESS

Success will be measured by the continued and expanded incorporation of energy efficient measures in projects sponsored by Community Development and the City's development corporations. Success can also be measured by the continued advocacy of the City on behalf of its citizens for lower energy costs and increased programming to offset costs by local energy providers.

CONNECTION WITH ENVISION COLUMBIA

- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

RECOMMENDATION

Work with local utility providers to improve efficiencies while prioritizing access for citizens facing the large energy burdens (financial burdens) and pollution hazards.

Case Study 13

California Youth Energy Services⁶⁶, California

Climate Careers, or California Youth Energy Services (CYES), is a partnership between the nonprofit Rising Sun Center for Opportunity and Pacific Gas & Electric (PG&E). This program, begun in 2000, is focused on creating youth employment and empowerment while also addressing greenhouse gas (GHG) emissions and engaging youth in climate change action. The program arose out of an early partnership with Rising Sun and the City of Berkeley. Berkeley High School students who had participated in a residential energy efficiency workshop decided they wanted to translate their education into action.

The program trains youth (ages 15-22) in the Bay Area and Central Valley of California to provide free energy assessments, install simple energy efficient measures, and help educate the community to save water, reduce energy usage, and save money. Energy assessments, or Green House Calls, are provided free to residents during the summer months, and are conducted by a team of two youth during a pre-arranged appointment. During the visit, the youth Energy Specialists check the home for efficiency, provide personalized recommendations for savings, and install energy and water-saving equipment as needed.

Rising Sun also works with adults to begin a career in construction or solar installation through their Opportunity Build program.



1,883
Youth Employed



46,691
Homes Served
With Green House
Calls



GHG reductions
equivalent to
22,770
cars removed
from the road for
a year



355,555
Efficient Light
Bulbs Installed

Program impact, to date, according to the Rising Sun Center for Opportunity's website.

RECOMMENDATION

Work with local utility providers to improve efficiencies while prioritizing access for citizens facing the large energy burdens (financial burdens) and pollution hazards.

Case Study 14

SmartRegs Ordinance, Boulder, CO

Like homeowners, renters choose their living quarters based on a variety of factors - the energy efficiency of rental housing is not always apparent, nor can many afford, financially or otherwise, to make this a primary factor in their choice. The City of Boulder recognized that renters, unlike property owners, were unable to make critical changes to their place of residence to improve energy efficiency and therefore decrease energy costs.

Rental housing represented over 50% of the City's total housing stock, making the goal of energy usage reductions in rental housing not only meaningful but critical to the City's overall GHG reduction goals.⁶⁷ Furthermore, 70% of the City's housing stock was estimated to be built before 1980, meaning it was more than 30 years old⁶⁸, and therefore less likely to have been retrofitted to reflect some of the energy efficiency improvements made in recent years. The City already had a rental licensing ordinance in place which required rental unit owners to complete a health and safety inspection every four years, and therefore had an up-to-date database of properties that would need to come into compliance.⁶⁹

The development and adoption of SmartRegs stemmed from the City's commitment to climate action, targeting a substantial decrease in greenhouse gas (GHG) emissions. In January 2011, the City of Boulder became the first municipality in the nation to require

existing residential rental properties to meet a minimum energy efficiency standard. The adoption of the SmartRegs ordinance followed over a year of community engagement and collaboration, including some critical concessions - while the SmartRegs became effective in 2011, property owners were not required to come into compliance until January 2019, giving them ample time to become compliant with the new energy efficiency standards.

Landlords were given two paths for compliance with the new SmartRegs: proof that their rental properties met a minimum Home Energy Rating System (HERS) Index score of 120, or through participation in a streamlined prescriptive approach that awarded points for energy efficient features. Through case studies of individual structures, the Department of Energy found that this prescriptive checklist was "an effective alternative to a more comprehensive, costly audit."⁷⁰

The City realized that ensuring early compliance would be critical to full compliance in 2019. The Boulder County and the City of Boulder launched complementary EnergySmart programs. The County's program was funded by the federal stimulus (ARRA) and open to all residential and commercial property owners, whereas the City's program was only open to properties requiring upgrades to comply with SmartRegs. These complementary EnergySmart programs provided funding for home assessment and energy advisor advice, as well as local monetary rebates per upgraded unit. The rebates offered were in addition to those offered by utility providers, the State of Colorado, and other rebates.

RECOMMENDATION

Improve existing and create new public access points to the rivers.

Throughout the planning process, citizens commented on the potential our rivers held - for recreation, cultural and economic development, and for defining the region's identity. Access to the rivers from the City of Columbia, however, is quite limited. The City should focus on providing for and improving existing access to the rivers through City parks. As activity is brought to the riverfront, community leaders and developers should strongly consider providing for additional access through private development.

Providing increased public access that is appropriate, sensitive to environmental and flooding concerns, and that can accommodate recreational users is key to activating our rivers. Access designs should consider: the needs of recreational users; waterfronts as a space for interaction with natural areas (scaled appropriately) - not just as an exhibit on display; and how best to address, protect, and preserve ecosystem services and wildlife while balancing public accessibility.

WHO IS RESPONSIBLE?

- Parks & Recreation (primary)
- Engineering
- Utility Operations
- Local nonprofits and community leaders

DURATION

MEDIUM
4-6 years to complete

The maintenance and improvement of existing facilities should be the highest priority, followed by the creation of new access points.

PRIORITY

HIGH
start within 3 years

COST

¢ - \$\$\$\$\$*

THEMES

- Equity & Accessibility
- Built Environment
- Conserve & Preserve

OTHER ELEMENTS

- Community Facilities
- Economic Development
- Land Use

DATA TO BE COLLECTED

A comprehensive look at existing access points, the amenities provided (and their appropriateness), and what amenities should be prioritized on a per-park basis should be included within the parks master plan.

MEASURING SUCCESS

Success will be measured first by the incorporation of public access improvements into the Parks and Recreation Department planning and budget, but mainly by the addition of and improvement to existing public access in a manner that is sensitive to environmental concerns. As public access is improved and added, materials should be developed for dissemination to the public that identify the amenities available at access areas, and the appropriate activities for these areas.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Enhance
- Lead

RECOMMENDATION

Integrate our rivers into City life by developing the riverfront sustainably and in a way that brings activity to the riverfront while protecting ecosystem services.

As Columbians, our rivers are a large part of our identity and they also pose one of our greatest opportunities. During our first phase of engagement, many citizens noted that the riverfront was underutilized and disconnected from the City, in spite of its proximity. While we can look to other cities, most riverfront development examples are in fact redevelopment. Historically, Columbia did not industrialize along the riverfront, constricting and polluting our rivers in the same way others have. We are downstream of watersheds that take in increasingly heavy rains, and our river floods regularly, so providing hardscaped development right up to the river is neither sustainable or wise. This recommendation encompasses both examining the development and use of City-owned or operated riverfront properties, as well as strategies to encourage and/or require appropriate private riverfront development.

WHO IS RESPONSIBLE?

- Engineering
 - Local nonprofits and community leaders
 - Parks & Recreation
 - Planning & Development Services
 - Utility Operations
- Primary responsible party will depend on location and ownership.*

DURATION

LONG, ONGOING
7-10+ years to complete, recurring

An examination of design and other regulatory standards to facilitate sustainable private development may be a shorter-term strategy, but the development of the riverfront will be a lengthier, ongoing process.

PRIORITY

HIGH
start within 3 years

COST

\$\$\$ - \$\$\$\$\$*

THEMES

- Built Environment
- Conserve & Preserve
- Partner

OTHER ELEMENTS

- Cultural Resources
- Economic Development
- Land Use

DATA TO BE COLLECTED

- An examination of best practices coupled with local desires for the riverfront should be part of the development of any modifications to regulatory standards. This information should also serve as a guide to projects on City-owned or operated riverfront property.
- Implementation of this recommendation should also consider cultural resources recommendations related to general design and, more specifically, to the development of a riverfront sculpture park.

MEASURING SUCCESS

Short term success could be measured through the examination and update of regulatory standards for riverfront development, as well as the updates to community facilities which incorporate the recommendation of providing quality and appropriate public access to the rivers. Long-term success is measured in a more qualitative manner - it isn't the number of developments, or the acreage developed, but rather the sense that everyday life in Columbia has become more vibrant through an improved connection to our rivers.

CONNECTION WITH ENVISION COLUMBIA

- Attract & Retain
- Plan
- Connect
- Empower
- Prosper
- Enhance
- Lead

Integrate our rivers into City life by developing the riverfront sustainably and in a way that brings activity to the riverfront while protecting ecosystem services.

Case Study 15

Ecological Riverfront Design, Various Cities

Most waterfront cities developed alongside the water with first transportation of goods, and later production of goods, at the heart of their development. Though this is part of Columbia's story, Columbia's riverfront is unique in many respects, as given its shallow waters and regular flooding, a large portion of the City's riverfront remains in a relatively natural state.

Cities have been returning to and restoring their urban riverfronts for a number of years. Revitalization of riverfronts started as early as the late 1960s⁷¹, and the success of these efforts, coupled with the availability of funding for clean water projects⁷² and brownfield redevelopment⁷³, helped spur cities to re-visualize their waterfronts as vital assets. This return of urban life and wildlife to the water's edge has been so prevalent throughout the nation that the American Planning Association released a Planning Advisory Service Report titled *Ecological Riverfront Design: Restoring Rivers, Connecting Communities*, in 2004. While the riverfront redevelopments of many of the cities may not be comparable to Columbia in landscape or land use context, this white paper offers key takeaways for sustainable riverfront development.

The report sets forth five general principles for riverfront development:

1 "Ecological goals and economic development goals are mutually beneficial..."

Healthy, functioning rivers are appealing and attractive to residents and businesses. An engaged public that enjoys riverfront features and activities also cares about the river's long-term health.⁷⁴

2 "Protect and restore natural river features and functions..."

Natural river features such as meanders, backwaters, wetlands, and gradually sloped banks serve essential ecological functions. They also provide human benefits such as cleaner water and flood storage.⁷⁵

3 "Regenerate the riverfront as a human realm..."

Good riverfront designs consider the needs of all neighborhoods, ages, and cultures in the community. They allow community members to experience the river up close. In turn, this physical and visual access helps create lively, diverse places that encourage a sense of community and appreciation for nature.⁷⁶

4 "Compromises are necessary to achieve multiple objectives..."

Riverfront redevelopment aimed at boosting a city's economic vitality need not eliminate natural features, compound riverfront damage, or limit public access. Riverfront communities will benefit from integrating and balancing ecological, social, and economic concerns.⁷⁷

5 "Make the process of planning and designing riverfronts broadly participatory..."

Riverfront planning and design must include the participation of a wide variety of community members. The process must extend beyond identifying traditional stakeholder groups and reach out to neighborhoods that historically may not have used the riverfront.⁷⁸

RECOMMENDATION

Integrate our rivers into City life by developing the riverfront sustainably and in a way that brings activity to the riverfront while protecting ecosystem services.

Case Study 15 (continued)

Ecological Riverfront Design, Various Cities

In addition to the general principles, the report also sets forth **planning principles** and **design principles**, based upon the successes and lessons learned from other communities. These principles have helped, and continue to help, provide guidance to communities returning to their waterfronts.

Planning Principles

- 1 "Demonstrate characteristics of the city's unique relationship to the river in the riverfront design.
- 2 Know the river ecosystem and plan for a scale larger than the riverfront.
- 3 Because rivers are dynamic, minimize new floodplain development.
- 4 Provide for public access, connections, and recreational uses.
- 5 Celebrate the river's environmental and cultural history through public education programs, riverfront signage, and events."⁷⁹

Design Principles

- 1 "Preserve natural river features and functions.
- 2 Buffer sensitive natural areas.
- 3 Restore riparian and in-stream habitats.
- 4 Use nonstructural alternatives to manage water resources.
- 5 Reduce hardscapes.
- 6 Manage stormwater on site and use nonstructural approaches.
- 7 Balance recreational and public access goals with river protection.
- 8 Incorporate information about a river's natural resources and cultural history into the design of riverfront features, public art, and interpretive signs."⁸⁰



Endnotes

- 1 A recent Clemson University study found that natural resource based sectors contribute \$33.4 billion in economic activity to the state's economy, and are responsible for 218,719 jobs Clemson University. (2018, January 18). *Clemson study: Natural resources have a \$33.4B impact on the state's economy*. Retrieved from The Newsstand: <https://newsstand.clemson.edu/mediarelations/clemson-study-natural-resources-have-33-4b-impact-on-states-economy/>
- 2 U.S. Forest Service. (2011, March 8). *News Releases - 2011*. retrieved from U.S. Forest Service Pacific Southwest Research Station; https://www.fs.fed.us/psw/news/2011/110308_arborday.shtml
- 3 USEPA, <https://www.epa.gov/heat-islands/using-trees-and-vegetation-reduce-heat-islands#1> accessed 11.10.19. Akbari, H., D. Kurn, et al. 1997. Peak power and cooling energy savings of shade trees. *Energy and Buildings* 25:139-148.
- 4 SCDHEC tracks health statistics at the county level; the bulk of Columbia's population resides in Richland County
- 5 Alta Planning + Design. (2016). *Walkable 29203: Crane Creek & North Main Areas Pedestrian Master Plan*.
- 6 SCDHEC & Eat Smart Move More SC. (2015). *South Carolina Health + Planning Toolkit*.
- 7 Reuben, A. (2019, May). Science's Newest Miracle Drug is Free. *Outside Magazine*.
- 8 Reidmiller, D.R.; Avery, C.W.; Easterling, D.R.; Kunkel, K.E.; Lewis, K.L.M; Maycock, T.K; Stewart, B.C. (eds). (2018). *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II, Report-in-Brief*. Washington, D.C.: U.S. Global Change Research Program, U.S. Government Publishing Office.
- 9 Sierra Club, <https://www.sierraclub.org/ready-for-100/commitments>, accessed 2.13.20.
- 11 According to the USEPA, when compared to the 1960s, tailpipe emissions from new passenger vehicles are 98-99% cleaner, sulfur levels in fuel are more than 90% lower, and lead in fuel has been eliminated. USEPA. (2019, April 19). *History of Reducing Air Pollution from Transportation in the United States*. Retrieved from USEPA Website: <https://www.epa.gov/transportation-air-pollution-and-climate-change/accomplishments-and-success-air-pollution-transportation>
- 12 USEPA. (2019, April 19). *Health Effects of Ozone Pollution*. Retrieved from USEPA Website: <https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution>
- 10 SC DHEC Bureau of Air Quality. (2019). South Carolina Historic Design Values Ozone (8 hr): 1975-2017.
- 13 SCDHEC. (2018, October 15). GIS Data: watersheds & permitted dams.
- 14 SCDHEC. (2018, October 15). GIS Data: watersheds & permitted dams.
- 15 FEMA. (2019, May 29). *Managing Floodplain Development Through the NFIP - Appendix D: Glossary*. Retrieved from FEMA Website: <https://www.fema.gov/media-library/assets/documents/6029>
- 16 SCDNR. (2019, April 19). *Wetlands*. Retrieved from SCDNR Website: <http://www.dnr.sc.gov/wildlife/wetlands/>
- 17 Section 404 of the Clean Water Act does address the discharge of dredged or fill materials into wetlands and waters of the US, but this is tied to a specific type of activity.
- 18 U.S. Fish & Wildlife Service. (2018, October 15). National Wetlands Inventory (GIS data).
- 19 SCDNR. (2019, March). *South Carolina GAP Analysis*. Retrieved from SC DNR Website: <http://www.dnr.sc.gov/GIS/gap/scGAPhome.html>
- 19 Ibid.
- 22 USDA. (2019, May 7). Census of Agriculture Data, Census Data Query Tool, County Summary Highlights, Richland & Lexington counties, SC.
- 20 Ibid
- 21 Ibid.
- 23 USDA Natural Resources Conservation Service. (2019, April 20). GIS Data: Web Soil Survey - Lexington, Richland, and Kershaw counties.
- 25 See Population Element, Columbia Compass
- 26 Wells, N. M. (2017). The Role of the Natural Environment in Human Health & Well-Being. *Cornell Sustainability Conference*. Kowloon, Hong Kong.
- 27 There are other parks and sites within South Carolina which are designated for their historic significance and managed by the National Park Service, however Congaree National Park is the only National Park in the state designated for its natural significance.
- 28 SCDHEC tracks health statistics at the County level; the bulk of Columbia's population resides in Richland County.
- 29 Alta Planning + Design. (2016). *Walkable 29203: Crane Creek & North Main Areas Pedestrian Master Plan*
- 30 SCDHEC & Eat Smart Move More SC. (2015). *South Carolina Health + Planning Toolkit*.
- 31 Reuben, A. (2019, May). Science's Newest Miracle Drug is Free. *Outside Magazine*.
- 24 Alta Planning + Design. (2016). *Walkable 29203: Crane Creek & North Main Areas Pedestrian Master Plan*.
- 32 Central Midlands Council of Governments (March 2018), *Central Midlands Region Population Projection Report, 2020-2050*. Columbia.
- 33 For further discussion: Flint, A. (2014, May 5). *What Millennials Want - And Why Cities Are Right to Pay Them So Much Attention*. Retrieved from CITYLAB Website: <https://www.citylab.com/equity/2014/05/what-millennials-wantand-why-cities-are-right-pay-them-so-much-attention/9032/>. Hewko, J. (2018, January 10). *This is what millennials want in 2018*. Retrieved from World Economic Forum website: <https://www.weforum.org/agenda/2018/01/this-is-what-millennials-want-in-2018/>. Rosenbloom, C. (2019, February 21). 9 ways millennials are changing the way we eat. *The Washington Post*.
- 34 For an in-depth discussion of the age cohorts of Columbia's population, see the Population Element.

- 35 Surfaces shaded by trees or vegetation may be 20-45 degrees cooler than peak temperatures of unshaded materials. USEPA, <https://www.epa.gov/heat-islands/using-trees-and-vegetation-reduce-heat-islands#1> accessed 11.10.19. Akbari, H., D. Kurn, et al. 1997. Peak power and cooling energy savings of shade trees. *Energy and Buildings* 25:139-148
- 36 On a sunny summer day, roofs and pavement can be 50-90 degrees hotter than air temperatures. USEPA, <https://www.epa.gov/heat-islands/heat-island-impacts#1>, accessed 11.10.19. Berdahl P. and S. Bretz. 1997. Preliminary survey of the solar reflectance of cool roofing materials. *Energy and Buildings* 25:149-158
- 37 Studies suggest 5-10% of community-wide demand for electricity is tied to the heat island effect. Ibid.
- 38 U.S. National Weather Service Columbia SC. (2019, October 5). Daily Temperature Data - Columbia Area, SC (Facebook post), and follow up telephone conversation with Leonard Vaughan, Climate Programs Lead, October 9, 2019
- 39 NOAA National Centers for Environmental Information. (2017, December). *National Climate Report - Annual 2017*. Retrieved from NOAA Website: <https://www.ncdc.noaa.gov/sotc/national/201713>
- 40 NOAA National Centers for Environmental Information. (2018, December). *National Climate Report - Annual 2018*. Retrieved from NOAA Website: <https://www.ncdc.noaa.gov/sotc/national/201813>
- 42 State records were broken for both the 24-hour and 5-day total rainfall records throughout the State in October 2015 – in Columbia, 17.7 inches of rain were recorded on October 4th, with 15.1 inches falling in less than 10 hours that morning. Runkle, J., Kunkel, K., Stevens, L., Frankson, R., Stewart, B., & Sweet, W. (2017). *NOAA National Centers for Environmental Information State Climate Summaries South Carolina*. NOAA Technical Report NESDIS 149-SC.
- 41 Reidmiller, D.R.; Avery, C.W.; Easterling, D.R.; Kunkel, K.E.; Lewis, K.L.M; Maycock, T.K; Stewart, B.C. (eds). (2018). *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II, Report-in-Brief*. Washington, D.C.: U.S. Global Change Research Program, U.S. Government Publishing Office.
- 43 Walker, B., & Salt, D. (2006). *Resilience Thinking: Sustaining Ecosystems and People in a Changing World*. Washington, D.C.: Island Press.
- 44 For example, the City of Columbia is a part of a water system agreement that allowed for drinking water aid during the 2015 hurricanes.
- 45 Boswell, M.R.; Greve, A.I.; Seale, T.L.. (2019). *Climate Action Planning: A Guide to Creating Low-Carbon, Resilient Communities*. Washington, D.C.: Island Press, page 193.
- 46 Boswell, M.R.; Greve, A.I.; Seale, T.L.. (2019). *Climate Action Planning: A Guide to Creating Low-Carbon, Resilient Communities*. Washington, D.C.: Island Press. suggests that costs range from \$50,000 to \$300,000 in 2019, and that planning additionally requires significant staff hours to complete (page 61).
- 47 City of Pittsburgh, Pennsylvania. (2019, October 3). *Sustainability & Resilience*. Retrieved from City of Pittsburgh Website: <https://pittsburghpa.gov/dcp-sustainability-resilience>
- 48 Case study information summarized from Boswell, M.R.; Greve, A.I.; Seale, T.L.. (2019). *Climate Action Planning: A Guide to Creating Low-Carbon, Resilient Communities*. Washington, D.C.: Island Press.; quote taken from page 276 of same.
- 49 Case study information summarized from Boswell, M.R.; Greve, A.I.; Seale, T.L.. (2019). *Climate Action Planning: A Guide to Creating Low-Carbon, Resilient Communities*. Washington, D.C.: Island Press.
- 50 Miami-Dade County, Florida. (2019, October 3). *Resilient305*. Retrieved from Miami-Dade County Website: <http://www8.miamidade.gov/global/economy-resilience/resilient305.page>
- 51 City of Atlanta, Georgia. (2019, October 2). *Resilience Initiatives*. Retrieved from City of Atlanta Website: <https://www.atlantaga.gov/government/mayor-s-office/executive-offices/office-of-resilience/sustainability-initiatives>
- 52 Information adapted from "Addressing Climate Change through Resilient Development: A CEDAS Academy Webinar", specific to the presentation by Rob Freudenberg of the Regional Plan Association. The webinar aired on May 28, 2019. Additional information about the planning process was provided by Ellis Calvin, Data Research Manager, Regional Plan Association, via email correspondence.
- 53 Information in this case study was taken from a presentation by Katie McKain at the Fall 2019 SCAPA conference in Columbia SC on 10.4.19, as well as the Mayor's Office of Resilience & Emergency Management website, <https://www.charleston-sc.gov/1931/Mayors-Office-of-Resilience-Emergency-Ma>, accessed 10.4.19
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- 63 SCS Engineers, PC. (2019). *Buncombe County North Carolina 2019 Mid-Year Bioreactor Progress Report*. Alexander: SCS Engineers, PC.
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- 66 Information used in this case study was obtained from Rising Sun Center For Opportunity. (2019, October 6). *Rising Sun Center for Opportunity*. Retrieved from Rising Sun Center for Opportunity website <https://risingsunopp.org/>
- 67 "Evaluation of Boulder, CO SmartRegs Ordinance and Better Buildings Program," U.S. Department of Energy, April 2012.
- 68 Ibid
- 69 "Delivering Energy Efficiency to Middle Income Single Family Households," Environmental Energy Technologies Division, Lawrence Berkeley National Laboratory, December 2011.
- 70 "Evaluation of Boulder, CO SmartRegs Ordinance and Better Buildings Program," U.S. Department of Energy, April 2012, page 16.
- 71 Otto, B., McCormick, K., & Leccese, M. (2004). *Ecological Riverfront Design: Restoring Rivers, Connecting Communities*. Chicago: American Planning Association.
- 72 In 1972 Congress passed the Federal Water Pollution Control Act Amendments, now known as the Clean Water Act, which, among other things, allocated federal dollars to eligible wastewater treatment projects.
- 73 In 1980 Congress passed the Comprehensive Environmental Resource Compensation and Liability Act of 1980 (CERCLA), also known as the Superfund Act, which helped hold polluting entities liable for site cleanup. The Brownfields Revitalization and Environmental Restoration Act of 2001 helped to provide substantial funding for brownfield cleanup and redevelopment.
- 74 Otto, B., McCormick, K., & Leccese, M. (2004). *Ecological Riverfront Design: Restoring Rivers, Connecting Communities*. Chicago: American Planning Association. Page 34.
- 75 Ibid, page 36.
- 76 Ibid, page 37.
- 77 Ibid, page 38.
- 78 Ibid, page 40.
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- 80 Ibid, page 47.