URBAN OPEN SPACE PLAN

Adopted By:

Durham City Council, May 2017

Durham Board of County Commissioners, September 2017

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I. INTRODUCTION

As Downtown Durham has evolved into a destination over the last decade, there has been a resurgence of interest in living close to Downtown. In every direction, houses in older neighborhoods are being remodeled, previously vacant lots are being filled in, and smaller buildings are being replaced by larger ones.

These trends mirror those occurring in cities across the United States. The Baby Boomer and Millennial generations are increasingly choosing to live in more urban environments with jobs, shopping, entertainment and other recreation facilities within a short commute. Despite the trend toward urbanization, access to green space still remains the top-most consideration for residents, based on a survey conducted by the North Carolina Chapter of the American Planning Association.

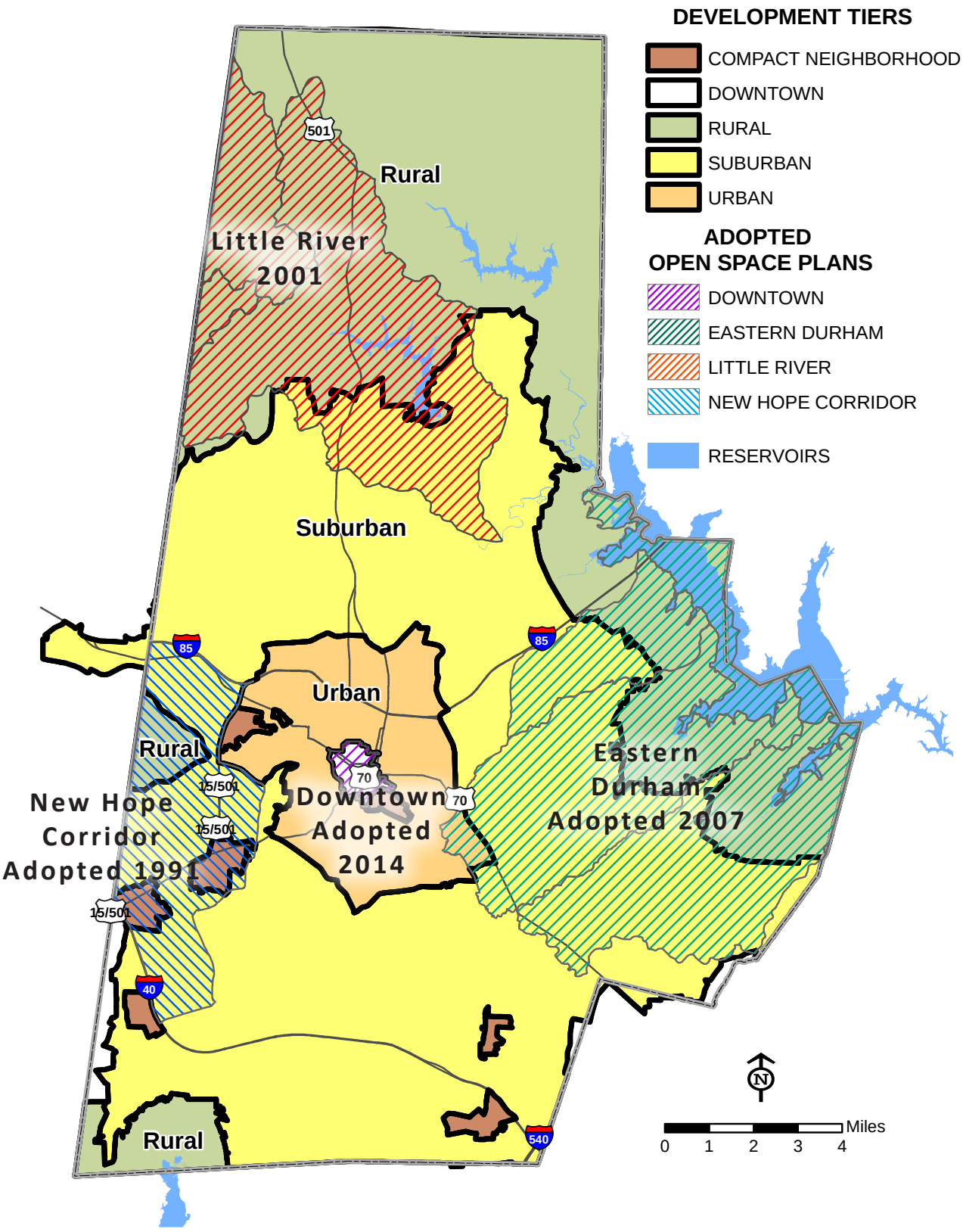
Striking a balance between urban development and the protection of open spaces is more important now than ever. Not only does open space act as a natural amenity, it serves vital ecosystem functions that will become even more important as global temperatures rise and local weather systems become less predictable.

Championed by the Durham Open Space and Trails Commission (DOST), this Plan aims to support the City and County Strategic Plans, complement existing adopted plans, and present a methodology for identifying open space properties with ecological and community significance within an urban context.

A. Study Area

Until recently, efforts to plan for open space in Durham have largely focused on rural and suburban areas of the county, where farmland preservation and the conservation of significant environmental features are paramount. In contrast, this plan focuses attention inward toward the core neighborhoods of the city known as the Urban Tier.

Figure 1. Open Space Plans and Development Tiers



Source: City of Durham

Borrowing from the concept of the rural-urban transect, the Durham Comprehensive Plan established a framework of Development Tiers that describe the variety of landscapes and urban forms across the county. Development Tiers are the basis for creating context-appropriate policies and establishing zoning regulations for development that will help shape the urban form. The Urban Tier was created to describe land primarily developed prior to the 1960s, with small lot sizes, developed in a traditional street grid pattern, and land with differing land uses in proximity to one another.

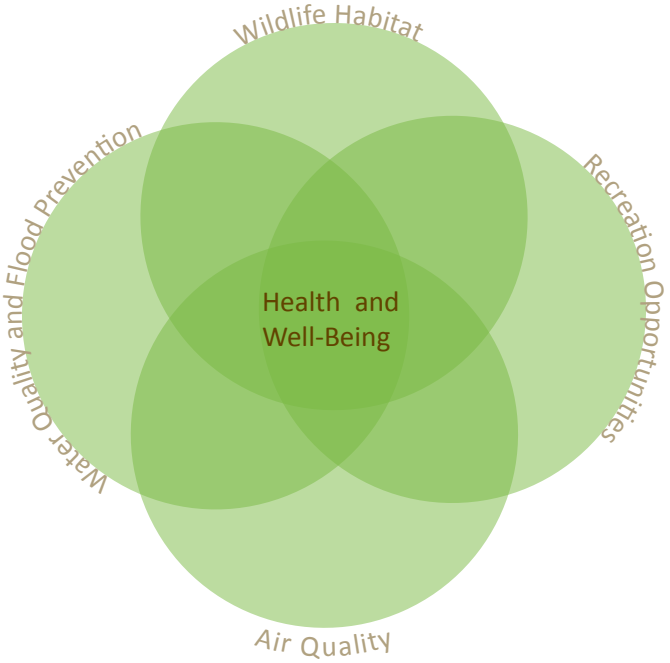
Figure 1 shows the geographic extent of the study area in relationship to previously adopted open space plans and the Development Tiers. Included in the boundary of this study are the Erwin Road, Ninth Street, and Alston Avenue Compact Neighborhoods (areas that surround future light rail transit stations). The study area includes approximately 13,000 acres (excluding the southern portion for which Eastern Durham Open Space Plan has already been adopted).

B. What is Urban Open Space?

While definitions of open space vary, for the purposes of this Plan open space is broadly defined as natural lands and waters permanently preserved in a natural state, or restored and enhanced to be consistent with the surrounding landscape. Open space lands possess values important to the health and well-being of the community including:

- Habitat for wildlife and flora;
- Water quality protection and preventing damaging flood events;
- Recreational and educational opportunities; and
- Improving air quality

Each of these values of open space will be explored in greater detail in Chapter 2.



C. Planning Background and Context

The Durham Comprehensive Plan, through its adopted Policy 7.2.2f, Urban Open Space Plan, directs that open space plans be developed for the Downtown, Urban, and Compact Neighborhood Tiers. Planning staff completed the Downtown Open Space Plan in late 2014. Development of an open space plan for the remaining Urban and Compact Neighborhood Tiers has been on the Planning Department's approved work program for the past several years.

The Urban Open Space Plan is a key initiative outlined in Goal 3 of the City's Strategic Plan to "Strengthen the foundation, enhance the value, and improve the quality and sustainability of neighborhoods." This Plan will contribute a map and inventory of public and private open spaces within the study area, with the objective of improving resident access to parks, trails, and other open spaces.

This Plan also supports the City Strategic Plan Goal 5, Stewardship of Physical and Environmental Assests, and the County Strategic Plan's goal to "protect our environment through planned growth, conservation, preservation, enhancement, and restoration of our natural and built resources by increasing energy efficiency and use of environmentally preferred transportation options, improving water quality, changing behaviors to achieve environmental quality, and protecting open space and preserving rural character." (Goal 4).

While this Plan aims to take a broad view of urban open spaces, there are a number of relevant plans and studies that can help guide these efforts. It is not the goal of this plan to supplant recommendations from these plans and studies, rather to stitch them together to create a complementary and complete picture of open space resources.

I. Durham Comprehensive Plan

Chapter 7, Conservation and Environment Element of the Durham Comprehensive Plan promotes the responsible use, protection and restoration of Durham County's green infrastructure. This Element contains goals, objectives and policies necessary for their long term maintenance and protection including the following:

Goal 7.1, Natural Environment. Provide a high quality natural environment. Minimize undesirable effects from development on air quality, water quality, and natural resources. Protect and preserve floodplains, natural inventory sites, and open space.

Goal 7.2, Open Space. Provide ample open and green spaces for Durham residents and wildlife and protect important open spaces in Durham County from the impacts of development.

Goal 10.1, Parks, Recreational Facilities, Trails and Greenways. Provide a system of parks, recreational facilities, and greenways that meets the needs of Durham's growing and diverse population.

Durham Comprehensive Plan

Chapter 7: Summary of Issues

- Protection of Natural Features
- Protection of Natural Inventory Sites
- Water Supply and the Vulnerability of Aquatic Species
- Air Quality
- Protection of Open Space
- Farmland and Development Pressures

II. Unified Development Ordinance

All development must comply with standards for environmental protection adopted in the Unified Development Ordinance (UDO). In 2008, Article 8 of the UDO was substantially amended to reinforce the importance of natural resources for water quality, flood prevention, wildlife habitat, aesthetic appearance and air quality. Regulations pertinent to the Urban Tier are summarized below.

III. 2014 Downtown Open Space Plan

The Downtown Open Space Plan's main goal is to create an interconnected network of high-quality open spaces that promote sustainability, placemaking, and livability through broad policy statements, site-specific recommendations, and implementation steps.

IV. 2013 Parks and Recreation Master Plan

The City of Durham Parks and Recreation Master Plan was adopted in 2013. Recommendations in the plan are based on three principles: making connections, improving sustainability, and optimizing current facilities and programs. Key recommendations are listed below:

- Continue to upgrade and renovate existing parks;
- Continue to make trails and greenways projects a high priority;
- Acquire land and build new parks in under served areas; add new uses as possible to existing parks;
- Complete an economic impact study on DPR's contribution to the Durham economy;
- Make asset maintenance a department priority;
- Enhance revenue generation; and
- Make natural resource management a department priority.

Summary of Environmental Protection in the Unified Development Ordinance

This table constitutes a brief summary of regulations that apply to properties in the Urban Tier; for complete review of environmental regulations consult Article 8 of the UDO.

Section 8.3 Tree Protection and Tree Coverage Standards

- A minimum of 3% of the site for developments in residential districts must qualify as tree coverage. Tree coverage is not required in non-residential zoning districts in the Urban Tier.
- Tree coverage requirements can be met by either preserving existing trees or planting replacement trees.

Section 8.4 Floodplain and Flood Damage Protection Standards

- Standards for construction or additions in Special Flood Hazard Areas and Future Conditions Flood Hazard Areas are outlined in this Section.
- These standards apply universally and are not specific to the Urban Tier.

Section 8.5 Riparian Buffer Protection Standards

- An undisturbed, vegetated buffer of 50 feet on either side of the stream channel applied to perennial and intermittent streams in the Urban Tier.
- In the Falls Lake Watershed Protection Overlay, perennial streams must be buffered 100 feet on either side.

Section 8.7 Watershed Protection Overlay Standards

- In the Falls Lake Watershed Protection Overlay, impervious surface is limited to 70% of the area of the site.

Section 8.8 Steep Slope Protection Standards

- Development is limited (not prohibited) in steep slope areas, defined as areas that have a grade (rise over run) of 25% or more, have an area of 5,000 square feet or greater, and are located within 200 feet of any floodway fringe or perennial stream of within 100 feet of an intermittent stream.
- These standards apply universally and are not specific to the Urban Tier.

Section 8.9 Wetlands Protection Standards

- Wetlands are primarily regulated by Federal and State governments
- Riparian buffer standards are followed

V. 2012 Trails and Greenways Master Plan

The current Durham Trails and Greenways Plan was adopted in 2012. It lists the following seven key goals for planning and implementation, all of which are coordinated to be compatible with other existing plans and will be compatible with the recommendations of the Parks and Recreation Master Plan.

- Connectivity
- Accessibility
- Right-of-Way Preservation
- Water Quality Protection
- Open Space Preservation
- Community Education
- Community Involvement

VI. 2010 Ellerbe Creek Watershed Management Plan

Protecting and improving the water quality and aquatic health of Ellerbe Creek is a primary goal of this plan. The purpose of the Watershed Management Improvement Plan is to provide the City with the necessary information and tools to accomplish this goal.

VII. 2012 Third Fork Creek Watershed Management Plan

The Third Fork Creek Watershed Improvement Plan is designed to prevent future water pollution and identifies special projects that can help improve current conditions.

VIII. Additional Watershed Management Plans

Watershed Management Plans for areas immediately outside of the study area may also influence recommendations. They include: Little Lick Creetk Watershed Plan (2016) and the Northeast and Crooked Creek Watershed Management Plan (2013).

IX. Durham County Open Space Matching Grants Program

The County Matching Grants Program was established in 1991 to provide grants to community non-profit organizations for open space and recreation projects throughout the County. When funds are available, Durham County contributes an annual allocation to support the Program. During the life of this Program, the County's investment of $1.5 million has leveraged over $3 million in monetary and in-kind contributions.

X. Joint Use Agreement

In 2011 a joint use inter-local agreement was created between the City of Durham (Parks and Recreation) and Durham Public Schools for shared useage of each other's facilities in the provision of programs. Due to liability and maintenance concerns, individual schools are able to determine if playground facilities are open to the public after school hours.

D. Community Engagement

Stakeholder interviews, surveys, public workshops and meetings with citizen advisory boards informed the direction and recommendations of the Urban Open Space Plan. The Open Space Committee of the Durham Open Space and Trails Commission was particularly instrumental in providing insights, knowledge, and feedback that contributed to building the Suitability Analysis in Chapter 3.

Community Forum Event Participants

I. Stakeholder Interviews

During 2012, Planning staff conducted interviews with a variety of stakeholders, ranging from developers and their consultants to community activists and key city staff in the Parks and Recreation Department and Public Works. Staff from institutions such as North Carolina Central University, Duke University and the Museum of Life and Science were also approached for their input. The goal of these meetings was to listen and learn about open space from a variety of lenses. Discussions ranged from site specific issues to broader policies, many of which are reflected later in this plan in Chapters 4 and 5.

II. Public Workshops

Staff conducted four community forum events, two in November 2014 , one in May 2015 and one in June 2015, each held in a different quadrant of the City. Participants who attended were asked to offer improvement ideas and preferences, together with their own and collective priorities for outdoor spaces in an urban setting. Input from group discussion was useful in development of the goals and direction for this Plan.

Key points garnered from these workshops include:

- Identify and locate open space areas that contribute to the community;
- Provide for additional tree canopy in neighborhoods;
- Prioritize trails and greenways projects;
- Serve many purposes and accommodate a wide variety of activities;
- Allow for round-the-clock usability;
- Allow passive and active recreational opportunities throughout the urban tier;
- Connected and walkable network that encourages pedestrian activity with in neighborhoods;
- Adjacency and accessibility to public facilities.

III. Citizen Advisory Boards

Throughout the planning process, planning staff briefed the Durham Open Space and Trails Commission (DOST) of progress at key milestones. The Open Space Committee of DOST was particularly influential in designing the open space environmental suitability analysis in Chapter 3. The Planning Commission also received a full presentation and opportunity to comment.

Illustrated aerial maps identified major landmarks and barrier crossings. The public was asked to identify issues, opportunities, areas of interest, potential open spaces and connections and other comments.

E. Plan Overview

This Plan is divided into six chapters, summarized below. It aims to support the City and County Strategic Plans, complement existing adopted plans, and present a methodology for identifying open space properties with ecological and community significance within an urban context.

Chapter 1: Introduction

This chapter presented a definition for open space, defined the study area, summarized plans and studies that provide a background to this planning effort, and described the community engagement effort.

Chapter 2: Open Space Inventory

This chapter will describe several benefits, or functions, of open space including promoting human health, providing for flood protection and improvements to water quality, providing habitat for biodiversity, improving air quality, and finally offering opportunities for recreation and enjoyment. An inventory of land that meets these functions is found in this chapter.

Chapter 3: Analysis

The open space inventory is analyzed through a number of lenses in this chapter to help inform this Plan's recommendations. The first analysis provides an environmental/community suitability score to help identify priority open space sites for future preservation or acquisition. In the second analysis, a proximity analysis was performed to better understand which parts of the community are well-served or under served by the current park and trail system. The results from the proximity analysis feed into the third analysis, which looks in more depth at access to open spaces for communities where there is a high incidence of environmental justice populations. Finally in the fourth analysis, assets, challenges and opportunities are identified for each of the five districts in the study area.

Chapter 4: Policy Recommendations

General and site-specific policy recommendations, including policy and program changes needed to facilitate implementation and described in this chapter. General recommendations can be applied across all urban open spaces and range from broad policy statements to additional recommendations regarding design and function. Site-specific recommendations will address particular needs in certain locations throughout Urban Tier for both existing open spaces and planned new spaces.

Chapter 5: Implementation

This chapter provides the "next steps" for implementation of objectives. Each objective contains a set of actions which represent steps in the implementation process.

Chapter 6: Conclusion

II. Open Space Inventory

Open spaces often serve a variety of overlapping functions. For example, The National Mall in Washington DC is known as one of the largest civic gathering spaces in the country. It also acts as a space for recreational sports, serves the environmental function of absorbing rainwater, and enhances the visual impact of the surrounding buildings. Recognizing the primary functions of open spaces can help assess the strengths and weaknesses of an open space network.

The functions of open spaces also vary depending on the context. In the Downtown Open Space Plan, emphasis was placed on open spaces as places for civic gathering. In the Little River, Eastern Durham, and New Hope Creek Open Space Plans, the primary function of preserving open space was for an environmental benefit. In an urban context, striking a balance between the two is both a challenge and an opportunity.

Particularly given the global trend toward increased urbanization, urban open spaces take on an elevated significance: they are vital to human health and well-being. This chapter will begin with a discussion of those benefits. This chapter will also explore several other benefits of open space: improving water quality and preventing damaging floods, preserving habitat for wildlife, improving air quality, and offering opportunity for recreation. For each aspect an assessment of current conditions will be followed by a review of current plans, programs and regulations. Together, this information helps to form an open space resource inventory.

A. Health Benefits of Open Space

Evidence that open spaces can improve public health is widespread. Urban open spaces have direct health benefits by removing pollutants from the air, allowing psychological and mental restoration and development to take place, and providing residents with spaces for physical activity and social interaction.

Much that exists in urban environments can be toxic to people. Air pollution, particularly from vehicles, has been linked to increased incidence of respiratory problems such as asthma and chronic bronchitis. Furthermore, studies have found economic consequences of these ailments including increased hospital visits for people with respiratory diseases and increased absenteeism from work and school. [1] Trees have been found to help mitigate these effects by absorbing gaseous air pollution. In fact, a 2013 study found trees in New York City saved society an estimated $60.1 million in mitigated health care expenses. [2]

Urban environments offer great intellectual, social, and cultural benefits to citizens, but along with these benefits come other factors that can impair mental processes such as attention, focus, memory and self control. Studies have shown that these challenges can be mitigated by exposure to trees and green space. This is particularly true for children. Contact with nature helps to develop cognitive, emotional and behavioral connections, and is important for encouraging imagination and creativity according to research. [3]

Finally, physical inactivity is a major public health risk. Studies suggest that providing residents with access to parks and open spaces can lead to higher rates of physical activity, which in turn can lead to a reduced risk of lifestyle related diseases, reduced stress, increased community cohesion and reduced health care costs. [4]

[1] Pope CA III, Bates DV, Raizenne ME. (1995) Health Effects of Particulate Aire Pollution. *Environmental Health Perspectives 103:5.*

[2] Nowak, David J. et al. (2013). Modeled PM removal by trees in ten US cities and associated health effects. *Environmental Pollution 178: 395-402.* Retrieved from: http://www.nrs.fs.fed.us/pubs/43676.

[3] Kardan, Omid et al. (2015). Neighborhood Greenspace and Health in a Large Urban Center. *Nature, S*cientific Reports 5, 11610. Retrieved from: http://www.nature.com/articles/srep11610.

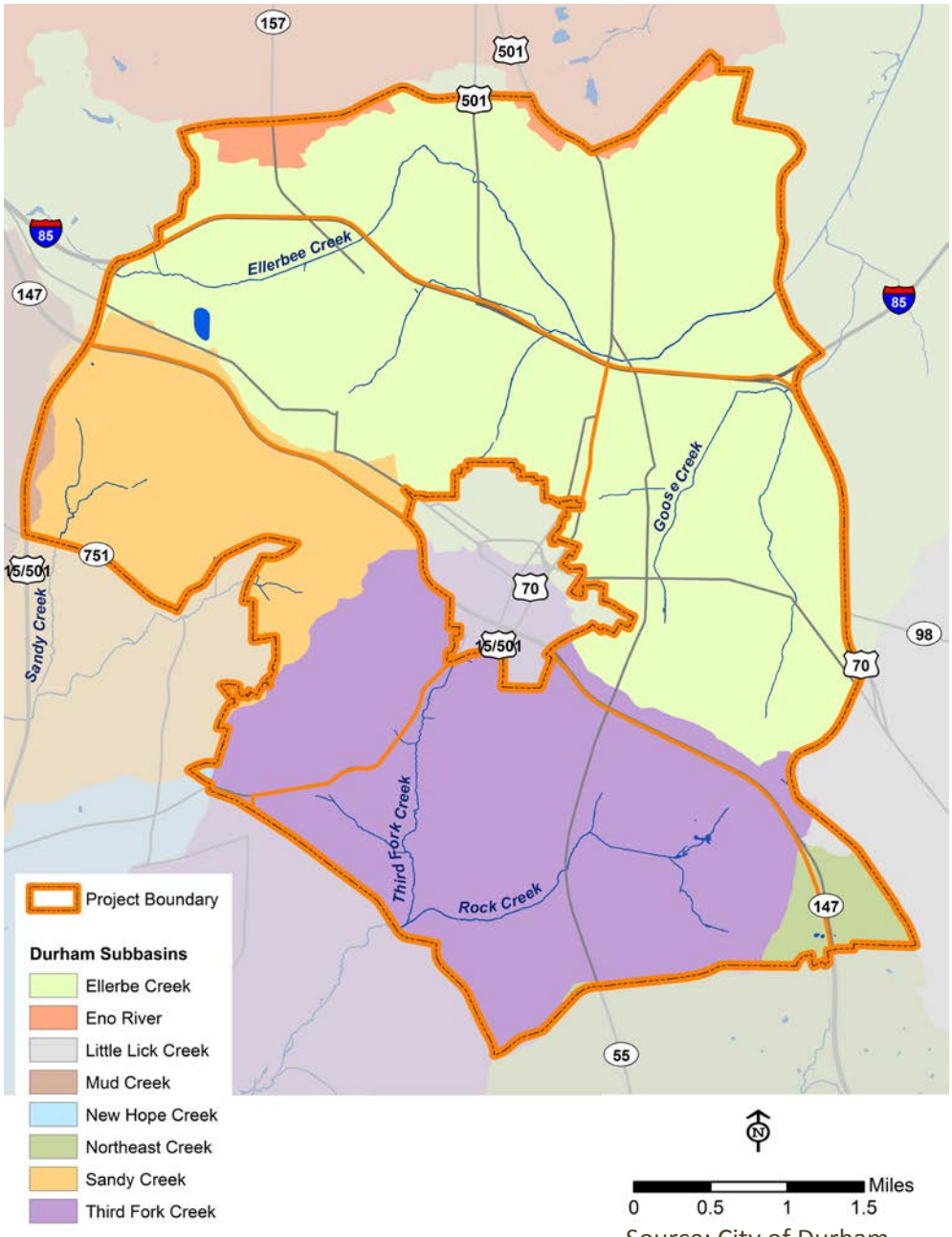
[4] Trust for Public Land. (2006). The Benefits of Parks: Why American Needs More City Parks and Open Space. Retrieved from: http://www.eastshorepark.org/benefits_of_parks%20tpl.pdf.

B. Water Quality Protection and Flood Prevention

Open spaces such as wetlands, vegetated stream buffers and natural floodplains play a vital role in filtering urban stormwater run-off, reducing the amount of pollutants entering steams, and holding back floodwaters.

A watershed is an area of land that drains water, and the pollution it carries, to a specific water body. Durham sits on top of a topographical ridge that largely parallels the North Carolina railroad corridor, with stormwater to the southwest generally flowing to Jordan Lake, then to the Cape Fear River and eventually into the Atlantic Ocean. Stormwater on the northeast side of the ridge line uses a series of creeks and streams to flow into Falls Lake, then to the Neuse River and on towards the Atlantic Ocean. A number of watersheds are encompassed in the Urban Tier, but Ellerbe Creek, Third Fork Creek, and New Hope Creek/Sandy Creek are the most prominent, as seen in Figure 2.

Figure 2. Watershed Subbasin Map



Source: City of Durham

I. Assessment: State of our Streams

Annually, the Stormwater and GIS Division of the City's Public Works Department prepares a State of Our Streams report aimed at monitoring the overall health of creeks, streams and lakes. The report documents key indicators of water health (bacteria, nutrients, turbidity, metals and biological oxygen demand), summarized in a Water Quality Index (WQI) score. The overall city-wide score for water quality in 2014 was 78, slightly down from a score of 82 the previous year. Individual watersheds are also monitored. Table 1 is a summary of the watersheds located in this plan's study area.

Table 1. Summary of 2014 State of our Streams Report

Watershed	2014 WQI	2013 WQI	Pollution Sources
Ellerbe Creek	75	79	▪ Erosion/sediment ▪ Private sewer overflows ▪ Cooking-related wastes like oil, grease and food.
Third Fork Creek	71	81	▪ Cooking-related wastes like oil, grease and food ▪ Private sewer overflows ▪ Sanitary sewer overflows ▪ Sediment from construction sites.
New Hope Creek (Sandy Creek)	N/A	87	▪ Cooking-related wastes like oil, grease and food ▪ Yard wastes ▪ Private sewer overflows.
Northeast Creek	77	78	▪ Private sewer overflows ▪ Cooking-related wastes like oil, grease and food ▪ Petroleum ▪ Yard Wastes.

II. Current Regulations related to Water Quality and Flood Prevention

Impervious Surface

As land develops, natural vegetation is often replaced by impervious surfaces such as streets, roof tops, and parking lots. Impervious surfaces impede the infiltration of water into soil, thus leading to an increased amount of stormwater flowing at faster speeds toward local streams. The effect can lead to more frequent and damaging flooding, erosion of stream banks, and increased water pollution.

The study area overtime has developed a significant amount of impervious cover. Impervious cover in a watershed results in increased surface runoff. As little as 10% impervious cover in a watershed can result in stream degradation. If over 10% of a watershed is covered with impervious surfaces, stream quality may be moderately impacted. Watersheds with over 25% impervious surfaces have severely impacted streams.

In addition to stormwater regulations that require the capture and treatement of stormwater on site, to protect the quality of drinking water supplies, the Unified Development Ordinance has specific standards for watershed protection overlay districts that limit impervious surfaces, designate minimum lot sizes, and require stormwater controls (UDO Section 8.7). It also has restrictions for wastewater treatment, sanitary sewer services, and storage of hazardous materials.

As seen in Figure 3, most of the Urban Tier does not lie within a Watershed Protection Overlay District. The exceptions are the far northern and far eastern portions of the study area, which are part of the Eno River Protected Area (E-B) and the Falls of the Neuse Protected Area (F/J-B), respectively. In both of these overlay districts, new development is allowed to cover only up to 70 percent of the site with impervious surfaces. Land outside protected watershed districts are not subject to this provision, and are allowed to cover 100 percent of the site with impervious surfaces.

Riparian Buffers

Maintaining vegetation on land adjacent to streams (riparian areas) is important for maintaining water quality, protecting against stream channel erosion, reducing sediment deposits, and conserving plant and wildlife habitat and movement corridors. In all areas of the Urban Tier, streams that are delineated through a survey as perennial or intermittent are required to be buffered 50 feet on either side. If streams are located in a Watershed Protection Overlay District, perennial streams require buffers on either side. Development is restricted within the protected riparian buffer zone.

Floodplains

Maintaining a stream's natural floodplain (land susceptible to being inundated by water) in an undisturbed or vegetated state can help to control stormwater, reduce the impact of damaging floods to stream banks and private property, improve water quality, and conserve plant and wildlife habitat. Floodplains, also referred to as Special Flood Hazard Areas by the Federal Emergency Management Agency (FEMA) are regulated in the Unified Development Ordinance (UDO Section 8.4). In general, new construction is only allowed in floodplains if certain regulations are met.

While building in floodplains is not advised, it has been unrestricted in the past and development is now restricted. Identifying key properties to acquire is important to preserve the biological health of streams, drinking water quality, and can provide open spaces for both human enjoyment and wildlife habitat.

III. Current Plans and Programs for Water Quality and Flood Prevention

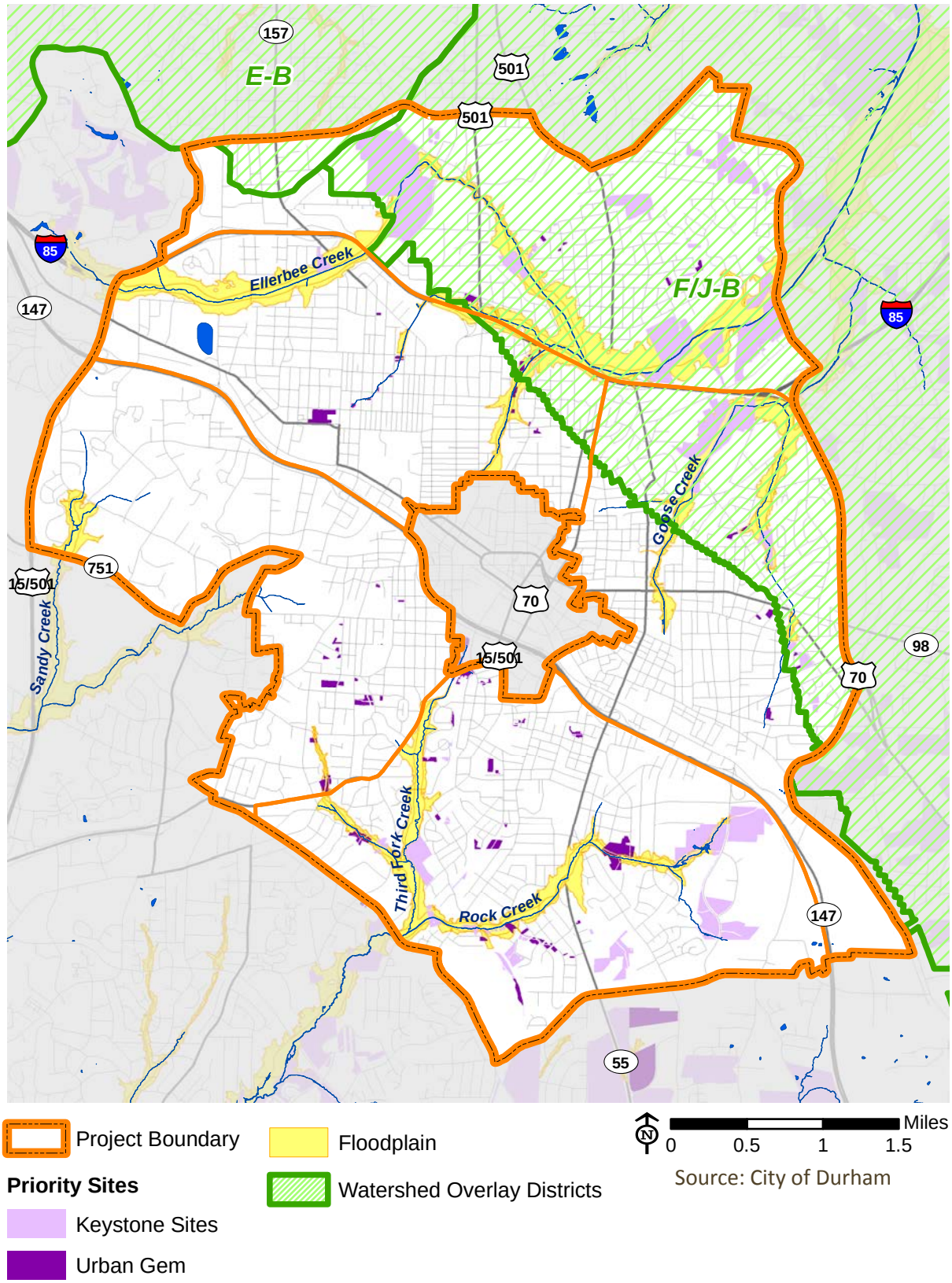
Watershed Management Improvement Plans

The Ellerbe Creek (2010) and the Third Fork Creek (2012) watersheds have been the subject of recent watershed management improvement plans (WMIP), which aim to improve the WQI scores and keep water safe for recreational activities, aquatic species, and ultimately, drinking water. WMIPs aim to assess current conditions, identify high-value stream and riparian areas where protection is critical, evaluate the feasibility of better site design techniques to prevent stormwater runoff, and project the future quality of watersheds.

In addition to recommending stream restoration projects, structural stormwater management control projects, and strategies for education of stormwater best management practices, Critical Area Protection Plans were developed to identify high-value properties to purchase or preserve. Within the Urban Tier, these plans identified (See Figure 3):

- Keystone Properties (176 Properties, 927 Acres). A parcel was categorized as a Keystone Property if it is near a large protected area.
- Urban Gem Properties (123 Properties, 82.5 Acres). Smaller, more urbanized parcels are categorized as Urban Gems.

Figure 3. High-Value Properties Identified in Watershed Management Improvement Plans



Watershed Special Projects

In addition to overseeing the creation and implementation of these watershed improvement plans, the Stormwater & GIS division of the City of Durham Public Works Department is heavily involved in special projects related to improving the health of watersheds. For instance, A constructed wetland that will filter polluted stormwater from 485 acres of downtown Durham is being considered for the former Duke Diet and Fitness Center site on West Trinity Avenue.

Green Infrastructure

Green infrastructure programs are intended to improve water quality generally through more extensive management of stormwater runoff. The City of Durham includes green infrastructure practices throughout the City by incorporating them into larger city projects, through research projects and grants, partnerships with local organizations, and by working with other city departments. Three commonly used green infrastructure practices are rain gardens, green roofs and the use of permeable pavers.

Rain Gardens

A rain garden is a planted depression or a hole that allows rainwater runoff from impervious urban areas, like roofs, driveways, walkways, parking lots, and compacted lawn areas, the opportunity to be absorbed. This reduces rain runoff by allowing stormwater to soak into the ground.

Permeable Pavers

Permeable paving is a range of sustainable materials and installation techniques for pavements with a base and subbase that allow the movement of stormwater through the surface. In addition to reducing runoff, this effectively traps suspended solids and filters pollutants from the water.

Green Roofs

Buildings with vegetation planted over a waterproof membrane have green roofs. Green roofs provide many benefits, including stormwater absorption, insulation, and lowering the air temperatures and reducing the heat island effect.

Low Impact Development in Streetscape Design

Streets are one of the largest sources of impervious surface. Implementing low impact development techniques, such as bioretention planters, along roadways can both improve water quality, increase the functionality of the storm drains, and enhance the city's appearance.

C. Wildlife Habitat

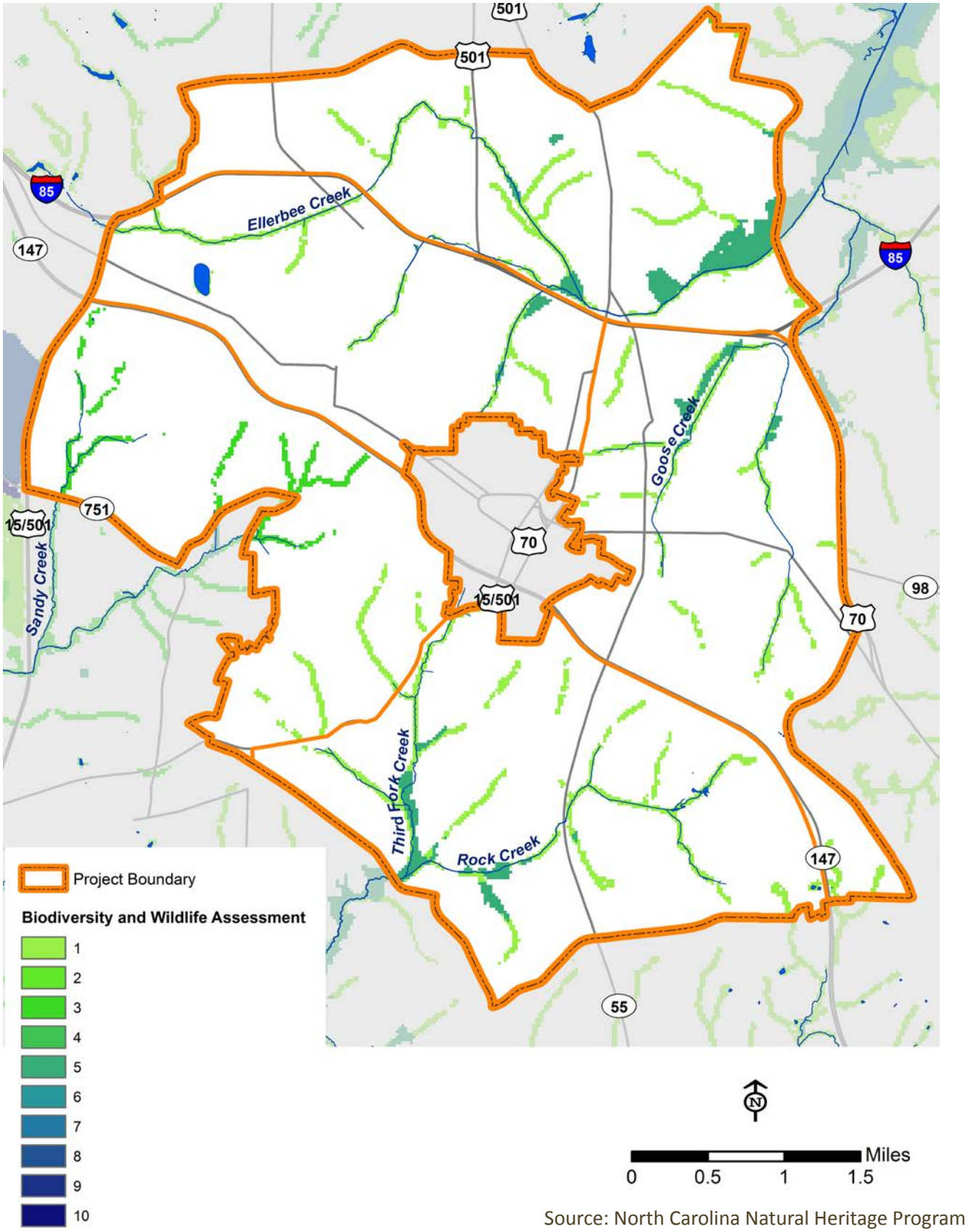
The typical urban environment – complete with shopping districts, a busy network of streets, and row upon row of houses – hardly seems like habitat for an abundance of plant and animal species. Yet, a properly designed urban open space network can protect natural habitats and preserve biodiversity. Open space networks that feature high connectivity and protect urban streams can act as wildlife corridors or urban forests, maintaining viable populations of species that would otherwise disappear from the built environment.

The North Carolina Natural Heritage Program (NCNHP) has created and maintains a Biodiversity and Wildlife Assessment, which provides a score from one (lowest) to ten (highest) of land that could be important from a biodiversity perspective. Biodiversity refers to the degree of variation of life forms within an ecosystem, and is one measure of the health of ecosystems. Factors contributing to the assessment include wetlands, significant natural heritage areas, element occurrences, important bird areas, landscape habitat guilds, and stream buffers among others. A detailed description of the Biodiversity and Wildlife Habitat Assessment can be found in the North Carolina Conservation Planning Tool website (http://portal.ncdenr.org/web/cpt/cpt-report). This resource provides the best information available regarding high-value land for wildlife protection in the Urban Tier (Figure 4).

Most land of high biodiversity and wildlife habitat value falls outside the boundaries of the Urban Tier, including New Hope Creek and Falls Lake. There are, however, some corridors connecting to these high-value conservation lands. Through the Urban Tier, there are frequent gaps in the corridors, indicating a high degree of habitat fragmentation. Strategies to connect and preserve these corridors should be examined.

As discussed previously, the Unified Development Ordinance requires stream buffers of 50 feet on either side of a stream channel, resulting in a 100-foot zone for wildlife movement. In areas designated as watershed protection overlay districts, a larger buffer is required that results in a 200-foot zone. In general, the wider the corridor the more beneficial it is for wildlife. While this requirement has been in place for a number of years, it only applies to new development projects. In the Urban Tier, which contains a lot of pre-1960s development, most opportunities to preserve these corridors through the development process are no longer available. However, as redevelopment occurs, opportunities to preserve stream corridors for wildlife should be sought.

Figure 4. Biodiversity and Wildlife Assessment



Source: North Carolina Natural Heritage Program

D. Air Quality

Vegetation in open spaces absorbs carbon dioxide and other pollutants from the atmosphere and provides shade, reducing air pollution levels and cools the air. In addition to environmental benefits, tree coverage in cities has also been linked to improvements in human health, economic improvement, child development, and crime reduction.

Tree Canopy

Goal 5 of the City's Strategic Plan sets a target that 40 percent of land area be shaded by tree canopy. According to the most recent analysis which used Environmental Protection Agency aerial LIDAR imagery, that target is currently being met at a city-wide basis. However, because of higher densities of development the Urban Tier falls short of that target (26.82%).

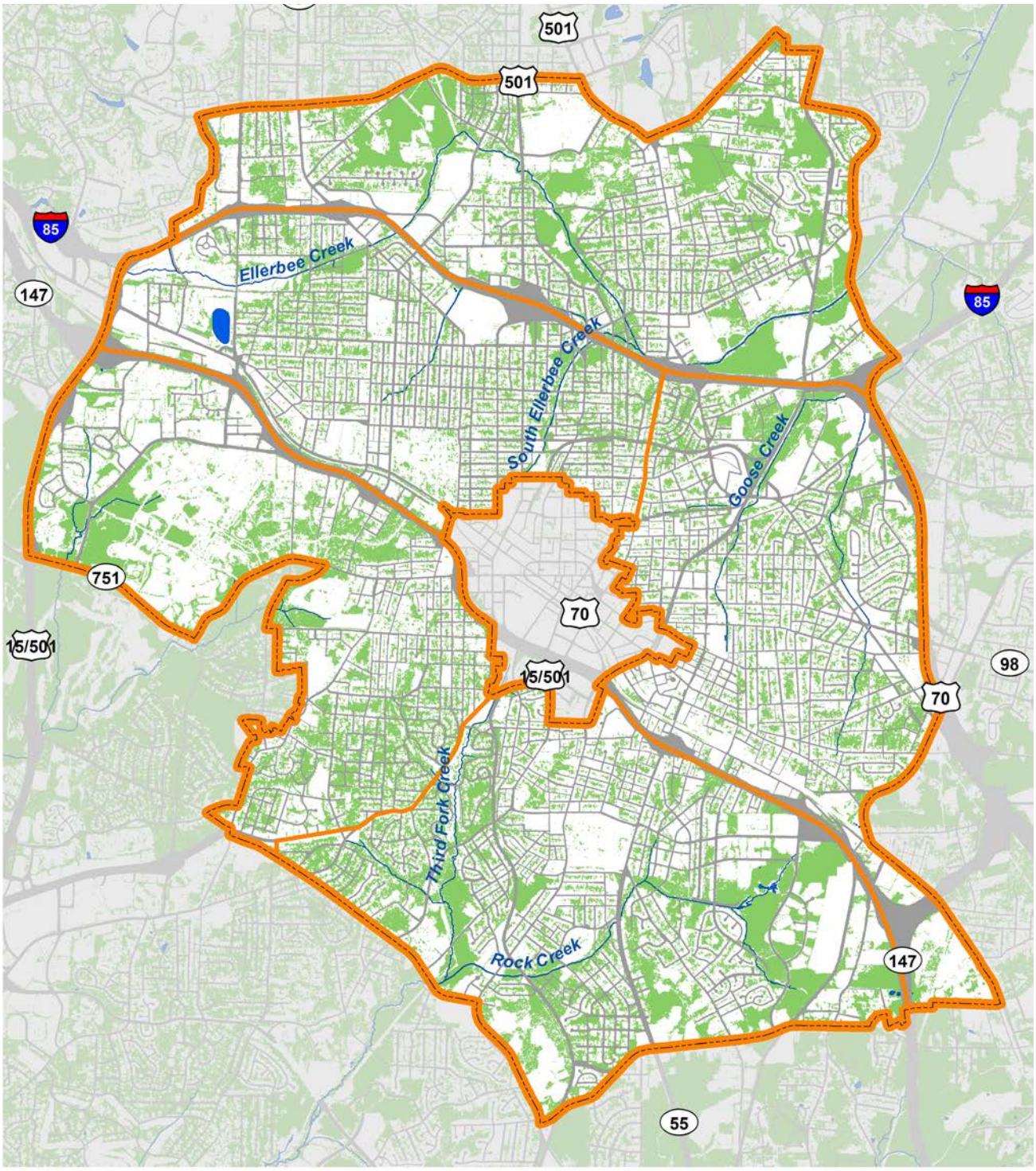
The Environmental Affairs Board (EAB) issued a report in January 2015 entitled *Recommendations for Sustaining a Healthy Urban Forest in Durham, NC,* documenting the looming challenges for the urban tree canopy. Within the next 20 years, most of the City's large willow oak trees planted in the 1930s will reach the end of their natural lifespan. The City's Urban Forestry Manager estimates that an average of 650 large trees will be lost every year over the next twenty years. The costs of such loss is far-reaching from city budgets, to community character, to the air quality and to the ambient temperature.

Urban Heat Island

One result of a diminishing tree canopy cover is the increase in ambient temperature, or an increase in what is commonly referred to as the urban heat island. The urban heat island explains why urbanized areas are often significantly warmer than surrounding rural areas. As buildings, roads, and other infrastructure replace open land and vegetation, these impermeable materials absorb and trap heat. At night the trapped heat is radiated back into the atmosphere, further increasing the ambient temperatures. Heat islands affect communities by raising summertime energy demand, air conditioning costs, air pollution, greenhouse gas emissions, and incidence of heat-related illnesses or mortality.

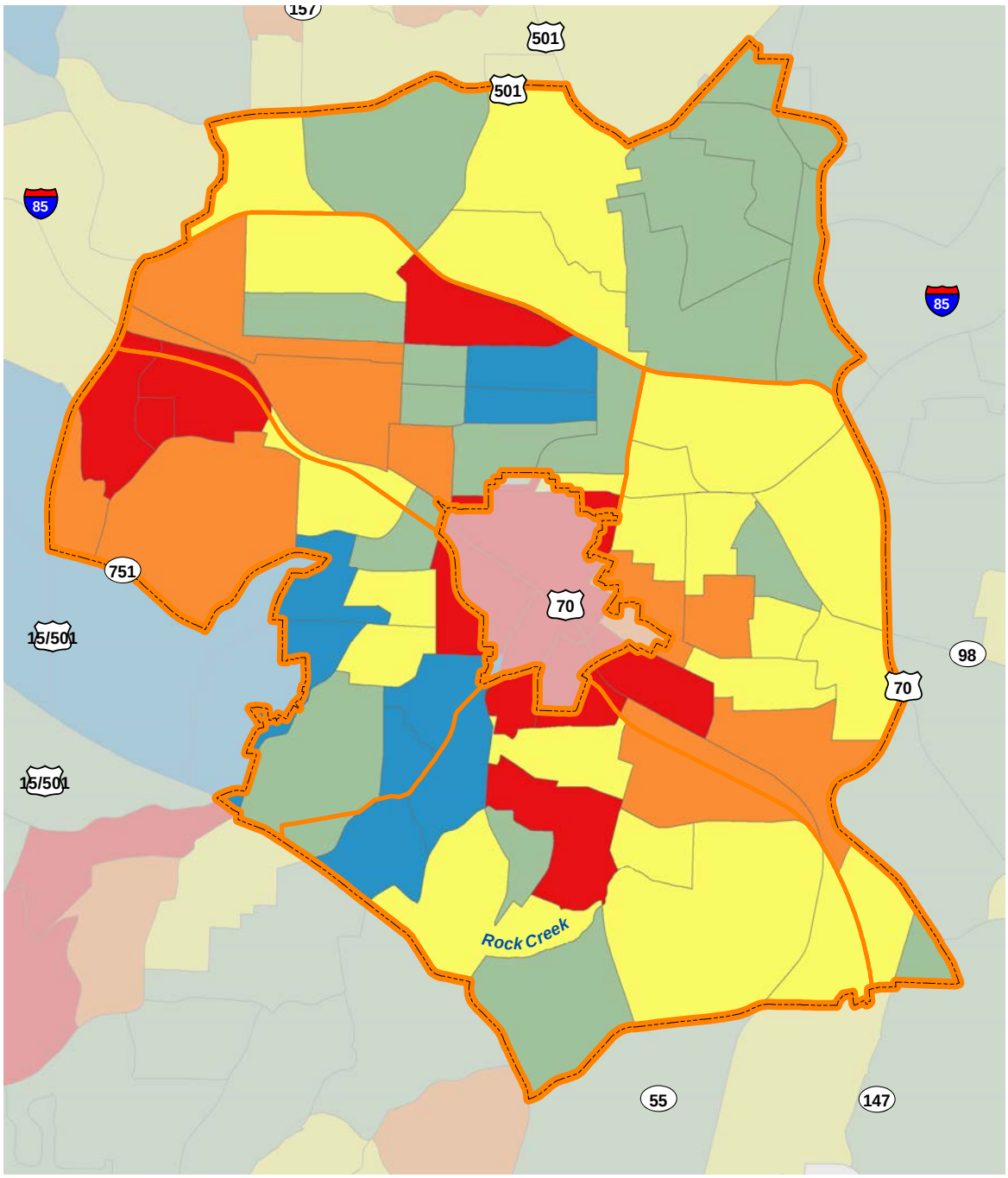
To demonstrate this effect, data from the EPA's EnviroAtlas (Figure 6) shows the average reduction in daily daytime ambient temperature (in Celsius) due to the presence of trees. When comparing this map to tree canopy cover (Figure 5), there is an obvious correlation between tree canopy cover and reduced temperatures.

Figure 5. 2007 Tree Canopy within the Study Area



Source: City of Durham

Figure 6. Average Reduction in Daily Daytime Temperature in Celsius Due to Tree Cover



Source: Environmental Protection Agency

E. Opportunities for Recreation

Open spaces are perhaps most recognized as places for recreation: places to play, hike, swim, or simply be outdoors. A variety of City and County departments maintain open spaces; however, this biggest player is Durham Parks and Recreation (DPR) who maintains 36 parks in the Urban Tier. Trails, environmental education centers and cemeteries also offer opportunities for recreation, and will be inventoried in this section.

I. Parks

The Durham Parks and Recreation Department (DPR) holds the primary responsibility of developing and maintaining park facilities and programs in the City of Durham. According to DPR records, there are 36 parks ranging in size and function in the Urban Tier study area. The 2013 Parks and Recreation Master Plan categorized parks into three types in order to more effectively assess challenges and opportunities, and implement the Plan's recommendations (Figure 7).

Regional Parks

Larger regional parks are generally unique in what they offer to users, thus drawing people from across the entire city (Table 2).

Community Parks

Community parks provide a focal point and gathering place for broad groups of users. Usually 5 to 25 acres in size, community parks are used by all segments of the population and generally serve residents from a one- to three-mile service area.

Community parks often include recreation facilities for organized activities, such as sports fields, skate parks, and play courts. Community parks may also incorporate passive recreation space and community facilities, such as community or senior centers. Because of their large service area, community parks require more support facilities, such as parking and rest rooms (Table 3).

Neighborhood Parks

Neighborhood parks provide access to basic recreation opportunities for nearby residents, enhance neighborhood identity, and preserve neighborhood open space. These parks are designed primarily for non-organized recreation. Located within walking and bicycling distance of most users, these parks are generally five acres or smaller in size and primarily serve residents within a half-mile radius. Neighborhood parks often include amenities such as playgrounds, turf areas, pathways and trails, picnic tables, sports courts, and benches (Table 4).

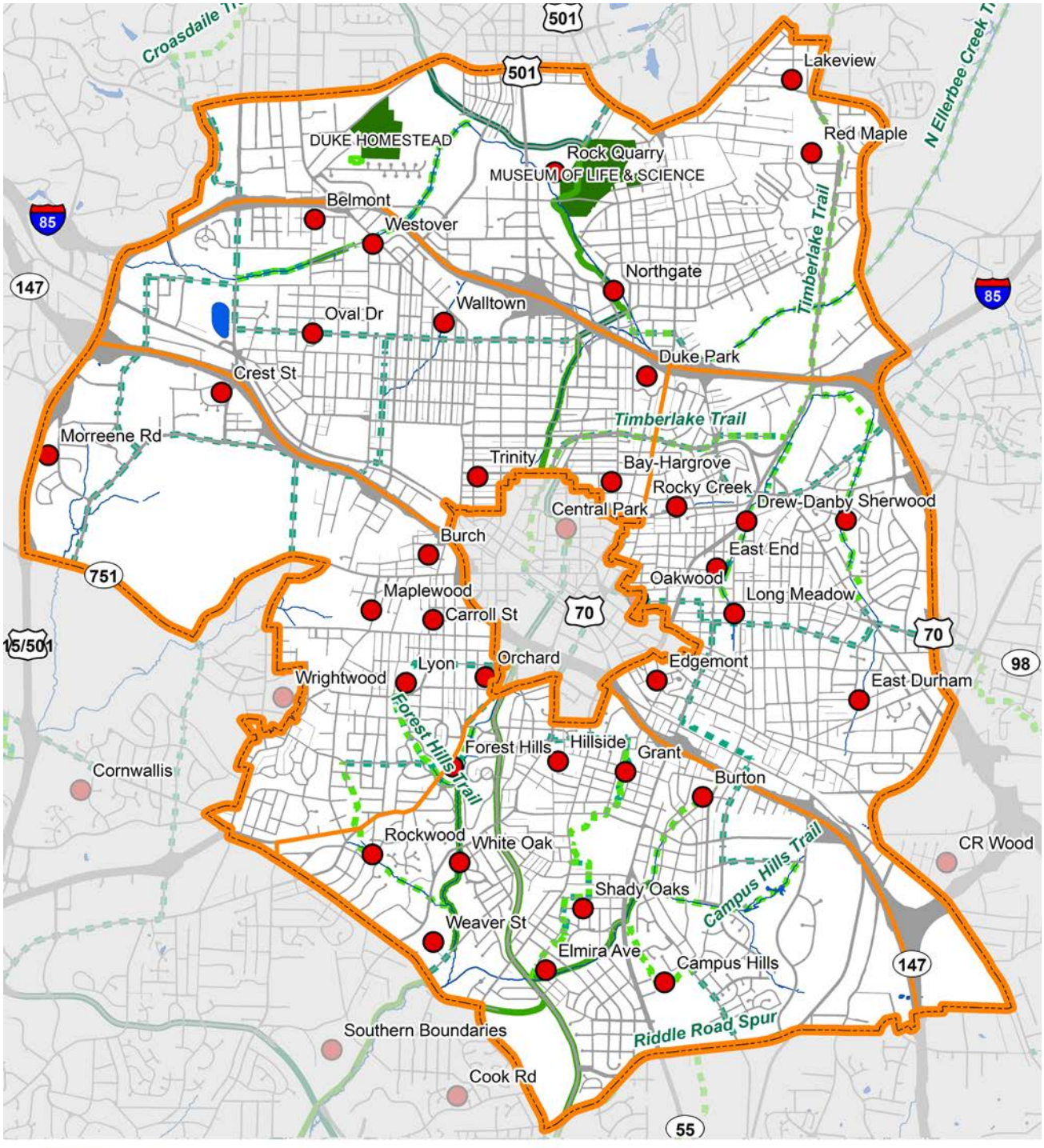
Table 2. Regional Parks in the Urban Tier

Park	Acres
Forest Hills Park	45.86
Northgate Park	30.35
Rock Quarry Park	46.1

Table 3. Community Parks in the Urban Tier

Park	Acres
Burton Park	10.34
Campus Hills Park	28.6
Crest Street Park	6.83
Duke Park	17.24
East Durham Park	9.01
East End Park	9.46
Elmira Avenue Park	11.86
Hillside Park	13.82
Long Meadow Park	15.58
Lyon Park	12.23
Morreene Road Park	11.96
Red Maple Park	11.13
Rockwood Park	12.23
Sherwood Park	15.1
Walltown Park	6.69
Weaver Street Park	7.5

Figure 7. Parks Inventory



Source: City of Durham

II. Trails

Trails often follow biotic corridors, provide access to recreation and education facilities, and act as open spaces in-and-of themselves. The Ellerbe Creek and American Tobacco trails form a north-south spine through the Urban Tier. Shorter segments feed into the trail network from the east and west, such as the Rocky Creek Trail or the Riddle Road Spur Trail. The existing trail network provides access to a number of parks in the Urban Tier including Elmira Avenue Park, Duke Park, Northgate Park, Glendale Heights Park, Rock Quarry Park, and Long Meadow Park.

Linking together parks and open spaces is a primary goal of the Trails and Greenways Master Plan. According to that plan, an additional 23 miles of trail are planned in the Urban Tier which would not only help stitch together urban parks, but larger natural and recreational areas outside of the study area.

Table 4. Neighborhood Parks in the Urban Tier

Park	Acres
Bay-Hargrove Park	0.59
Belmont Park	0.49
Burch Avenue Park	0.57
Carroll Street Park	0.79
Drew / Granby Park	0.44
Edgemont Park	0.77
Grant Street Park	5.48
Indian Trail Park	8.5
Lakeview Park	5.87
Maplewood Park	5.4
Oakwood Park	1.2
Old North Durham Park	3.58
Orchard Park	7.39
Oval Drive Park	3.44
Rocky Creek Park	1.37
Shady Oaks Park	1.4
Trinity Park	0.69

III. Environmental Education Centers

Museum of Life and Science

The Museum of Life and Science is one of North Carolina's top family destinations. Situated on 84-acres, this interactive science park includes a two-story science center, one of the largest butterfly conservatories on the East Coast, and beautifully landscaped outdoor exhibits which are safe havens for rescued black bears, lemurs, and endangered red wolves. Other popular attractions include over 60 species of live animals, a Dinosaur Trail, The Ellerbe Creek Railway, and an exhibit titled *Into the Mist*.

IV. Cemeteries and Burying Grounds

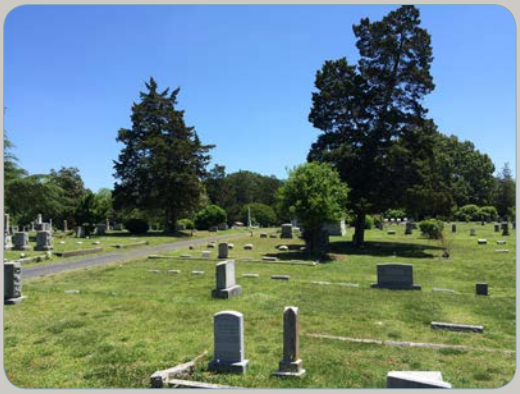
The study area has approximately 230 acres of cemeteries. Maplewood cemetery is owned and maintained by the city and spans 120 acres in the middle of the city. The two other cemeteries located in the study area are privately owned and maintained. Cemeteries provide relief in the form of open space. Many of these cemeteries are located in dense areas of the city in which open space is otherwise not abundant.

F. Open Space Land Inventory

Durham's open spaces are a system that includes parks, trails, environmental education centers, and cemeteries. In addition, numerous non-profit organizations and government agencies have been dedicated to conserving open space in Durham and across the Triangle for decades. This system provides more than 1300 acres of public and private open space within the Urban Tier. Figure 8 represents an inventory of land set aside for both active and passive recreation, scenic enjoyment, and a sense of well-being and community pride. Parks represent the largest proportion of total open space (524 acres), followed by other public land used for conservation purposes (418 acres), as seen in Table 5. These spaces provide relief from the densely confined aspects of the urban environment.

Table 5. Inventory of land set aside with an open space function

LAND USE	ACRES	PERCENT OF URBAN TIER
Cemetery/memorial garden	230.59	1.77%
Conservation - private	55.43	0.42%
Conservation - public	417.86	3.21%
Park lands	523.83	4.02%
Private outdoor recreation	150.76	1.16%
GRAND TOTAL	**1378.49**	**10.6%**



Maplewood Cemetery

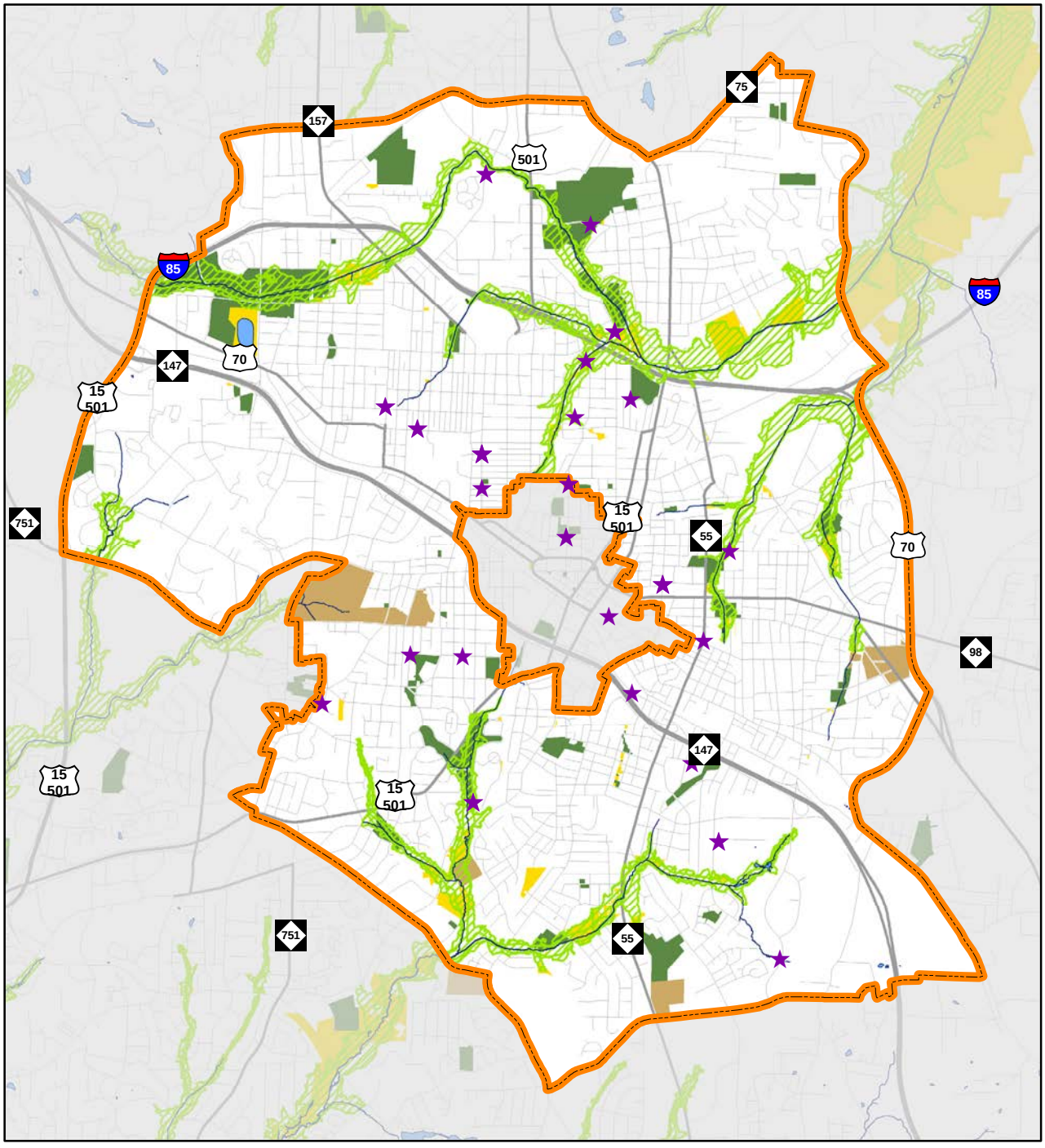
Based on this inventory, approximately 10 percent (8.8 percent, if cemeteries are excluded) of land in the Urban Tier is set aside for open space. While not a perfect benchmark, the Trust for Public Land's 2015 City Park Facts, show the median percentage of park land is 5.9 percent in cities comparable to Durham in terms of density (Table 6). Based on park land alone, Durham's Urban Tier is below average. To ensure that cherished open spaces remain usable to current and future generations, issues such as the ownership of open space parcels and the degree of protection from adverse uses needs to be considered.

Table 6. Parkland as a percentage of city area: A sample of comparable cities in Southeast US

CITY	PERCENT PARKLAND
Virginia Beach, VA	15.6 %
Nashville, TN	10.1 %
Charlotte, NC	6.3 %
Memphis, TN	4.8 %
Greensboro, NC	4.0 %
Durham, NC	4.02 %

Source: 2015 City Park Facts, Trust for Public Land

Figure 8. Open Space Inventory



III. ANALYSIS

In this chapter, the open space inventory is analyzed through a number of lenses to help inform this Plan's recommendations. The first analysis provides an environmental/community suitability score to help identify priority open space sites for future preservation or acquisition. In the second analysis, a proximity analysis was performed to better understand which parts of the community are well-served or underserved by the current park and trail system. The results from the proximity analysis feed into the third analysis, which looks in more depth at access to open spaces for communities where there is a high incidence of Environmental Justice populations. Finally in the fourth analysis, assets, challenges and opportunities are identified for each of the five districts in the study area.

A. Environmental and Community Land Suitability Analysis

In order to assist in prioritizing land for future preservation or acquisition, an environmental and community suitability analysis was performed. Land preserved or acquired could be the basis for a network of parks and other public open spaces that create open space corridors that enhance connectivity for people and wildlife. The inputs of the analysis, which focused exclusively on the physical features of the land and its location with respect to other community property (see Table 7), were identified by the Durham Open Space and Trails Commission (DOST) in 2012.

Table 7. Suitability Analysis Attributes

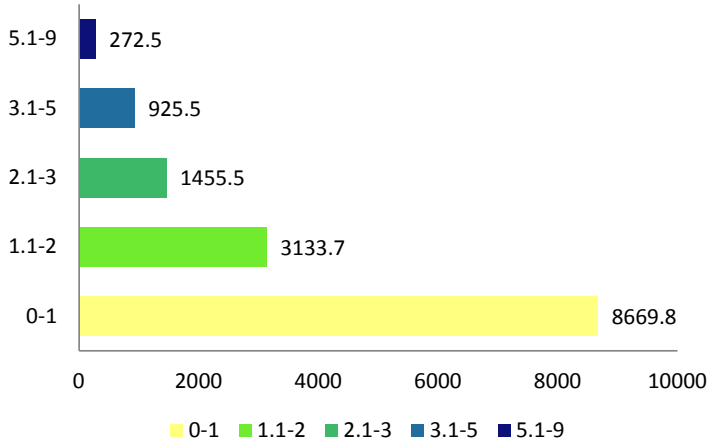
ENVIRONMENTAL ATTRIBUTES	COMMUNITY ATTRIBUTES
Floodplains	Land adjacent to schools, libraries, or other community facilities
Land with more than 50% tree cover	Land within 200 feet of a greenway/trail
Riparian buffers	Land adjacent to protected public or private land
Steep slopes	Vacant land (publicly or privately owned)
Wetlands	

ArcMap GIS was used to complete the analysis. If an attribute was present at a particular location, one point was added to the score. The suitability score, based on the above features identified by DOST in 2012, is the sum of all attributes present at a particular location. Sites with higher suitability scores are considered more suitable for preservation or acquisition.

Figures 9 and 10 depict the results of the analysis. Across the entire study area, 272.5 acres were identified as the most suitable for open space preservation or acquisition. Further analysis found that the most suitable land was found in District 1 (111 acres), followed by District 5 (75 acres) and District 3 (54 acres). The map in Figure 10 reveals that most of this highly suitable land follows the waterways of the Ellerbe Creek, Third Fork Creek and Goose Creek.

Figure 9. Open Space Suitability Results

Suitability Scores by Acreage



Suitability Scores by Percent of Study Area

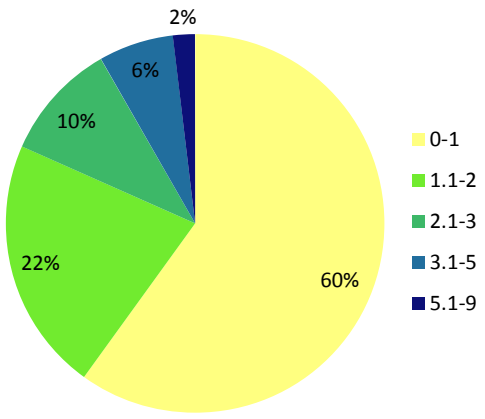
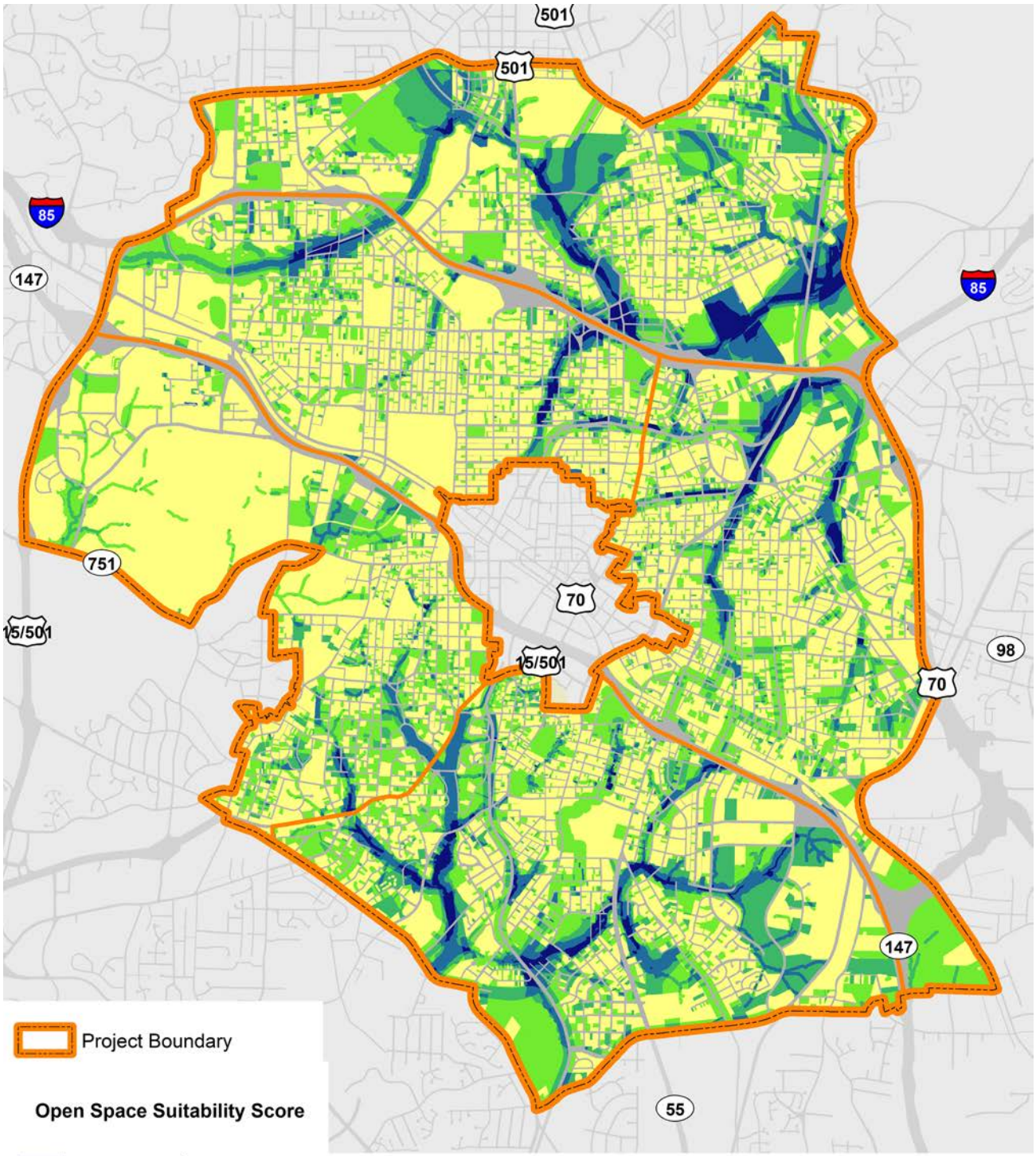


Figure 10. Existing Open Space Opportunities



Source: City of Durham

Figure 10 shows (in blue and green) areas that represent existing opportunities to acquire and protect high quality open space, based on the physical suitability of these areas and their situation with respect to other local features. Certainly much of the open space protected in the future will consist of exactly these areas. But this map must not be viewed as designating the only areas where future open space might exist. Early in the process of identifying the attributes listed in Table 7, DOST recognized that relying exclusively on these criteria imposed problematic restrictions on the City's ability to deal with the urban heat island effect in some of its densest neighborhoods where there were very few existing, undeveloped tracts that might someday become open space. Moreover, following only the criteria from 2012 limited the City's options for dealing with surplus properties in these neighborhoods, strongly influencing the City to sell properties that might best become small shady groves or community gardens. Hence, the need for vegetative cover to meet the challenges of climate change, and the preferences of neighborhood associations for how unused parcels of land even as small as a single lot might best be employed to the neighborhood's benefit, are factors that should be part of the decision process for dealing with these surplus properties. These factors will likely modify this map by adding small pockets of vegetative cover in unforeseen areas.

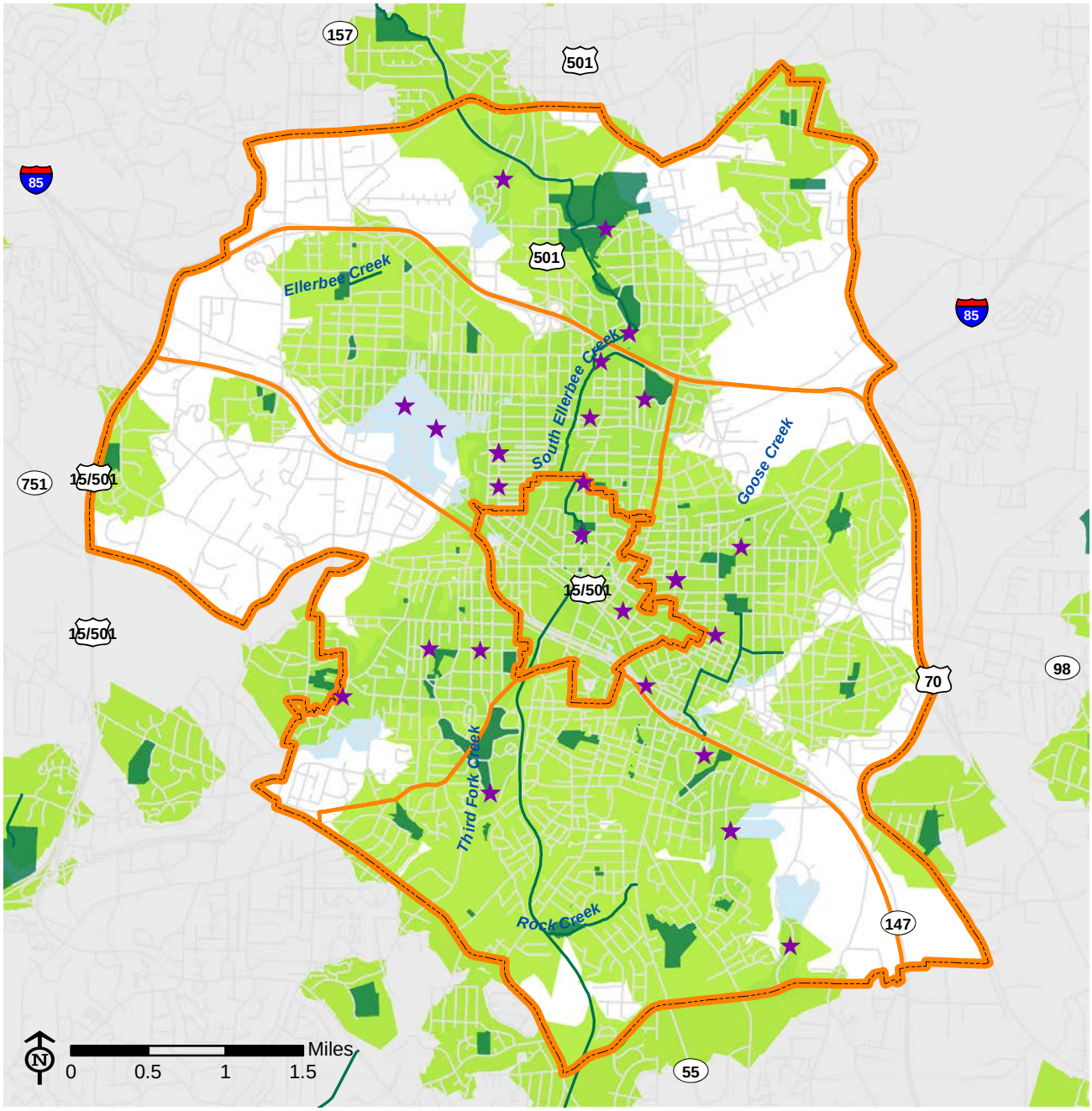
Ultimately, access to open space and the availability of shade are issues of environmental justice and equity. A healthy city cannot confine these green features to a particular class or particular neighborhoods. So, while Figure 10 likely anticipates locations of the great parks and other green amenities in the Durham of the future, it does not represent the sum total of all that will, or should, exist. A future Durham will see more community gardens, more small lots with trees, the steady replacement of dying street trees throughout the city, increased tree canopy on public property such as parks, cemeteries, schools, and public facilities, as well as a program to plant trees on residential properties, initially targeting districts 3 and 5 where tree canopy is most deficient.

B. Park Proximity and Gap Analysis

The City's Strategic Plan Goal 3 for "Thriving, Livable Neighborhoods," measures the percentage of city residents that live within a half-mile (or approximately 10 minute walk) from a public park. Current data from DPR suggests that only 55.26% of the City's population currently live within that distance to a park. In the Urban Tier, where population density is higher, and parks are smaller but more evenly dispersed, the percentage of residents in proximity to a park is likely higher.

The Network Analyst tool of ArcMap GIS was used to create Figure 11. The half-mile "service area" represents all of the places within a half-mile of a park or trail access point, following the existing roadway network. This analysis shows that residents in approximately 38 percent of the Urban Tier are not within a half-mile distance of a public park or trail access. According to Figure 11, it appears the largest underserved area is Duke University and the area immediately surrounding the campuses, which in many ways act as parks for students, staff and nearby residents.

Figure 11. Park Proximity and Gap Analysis



Source: City and County of Durham

C. Environmental Justice Analysis

As discussed in Chapter 2, open spaces serve vital ecosystem functions and human needs. While access to open space is important for everyone, it is especially important for communities that historically live in places where there is a nature deficit. This analysis will examine Environmental Justice populations, identify communities of concern, and look more in depth at access to open spaces in those areas.

I. Environmental Justice Populations

Following methodology used by the Durham Chapel Hill Carborro Metropolitan Planning Organization (DCHC MPO), this analysis relied on data from the five-year estimates of the American Community Survey from the US Census Bureau to analyze five environmental justice populations:

- **Minority race populations:** Racial minority populations include any non-white individual, inclusive Black, Asian, American Indian and Alaskan Native, Native Hawaiian or Other Pacific Islander.
- **Hispanic/Latino ethnicity origins:** Any person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.
- **Elderly populations:** Elderly populations include any individual 65 and over.
- **Limited English Proficiency (LEP) households:** Persons with Limited English Proficiency were those with a primary or home language other than English and reported to the US Census Bureau that "no one 14 and over speaks English only or speaks English 'very well'," in the household.
- **Low-income households:** A household whose annual median household income was less than 60 percent of the average median household income level for Durham County. The average median household income reported by the US Census Bureau is $52,038. Applying a 60 percent income factor to the median income results in a low-income limit of $31,222 for households in Durham County.

Environmental Justice Block Groups are defined as those where the percentage of any Environmental Justice population is greater than the County threshold for the particular population. County thresholds were developed and used as benchmarks for comparison (Table 8). Any Block Group with a concentration of an EJ population that exceeded the County threshold for the population was identified (Figures 12-16).

II. Communities of Concern

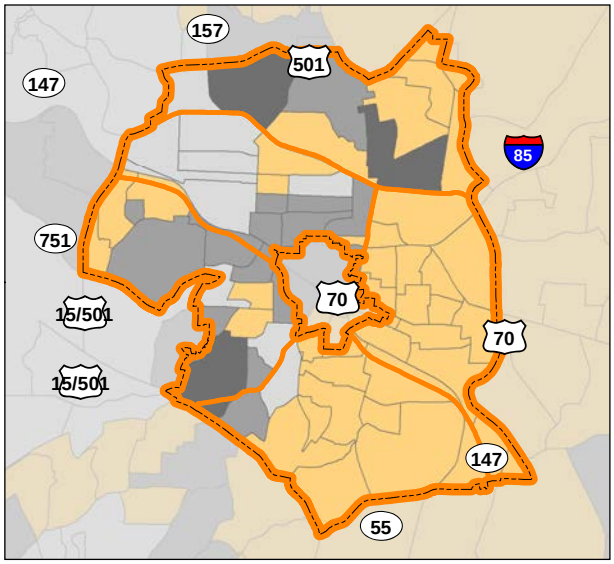
Block groups with multiple overlapping Environmental Justice populations are shown in Figure 17. Block Groups with an occurrence of four or five Environmental Justice populations are identified as Communities of Concern, and are analyzed further. Fifteen Block Groups had high representation of four environmental justice populations, while three Block Groups had a high representation of all five. Figures 18-24 look in more depth at the proximity and access to open space completed in Section B for each of these each of these areas to see where access to open space is limited.

Table 8. County Thresholds for Environmental Justice Block Groups

	POPULATION	COUNTY THRESHOLD
Total Population	**267,587**	--
Minority Population	143,313	53.5%
Hispanic/Latino Population	36,077	13.5%
Elderly Population	26,111	9.8%
Total Households	**113,564**	--
Limited English Proficiency Households	5,994	5.3%
Low Income Limit for Households	--	$31,222

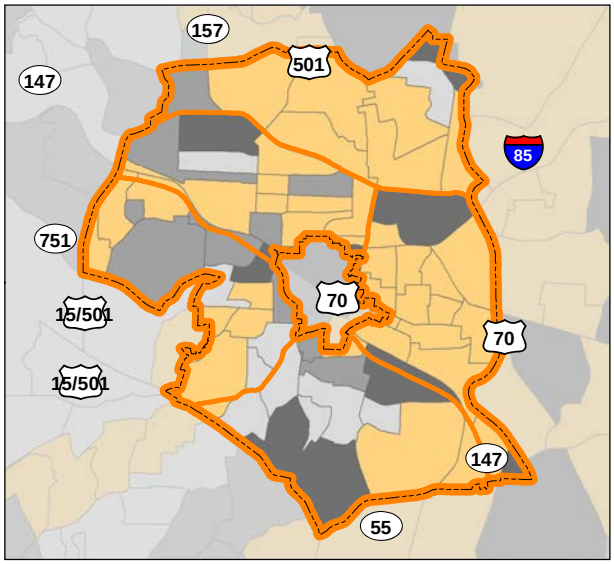
Source: US Census Bureau

Figures 12-14. Percent of Population: Racial Minority, Hispanic/Latino, Elderly



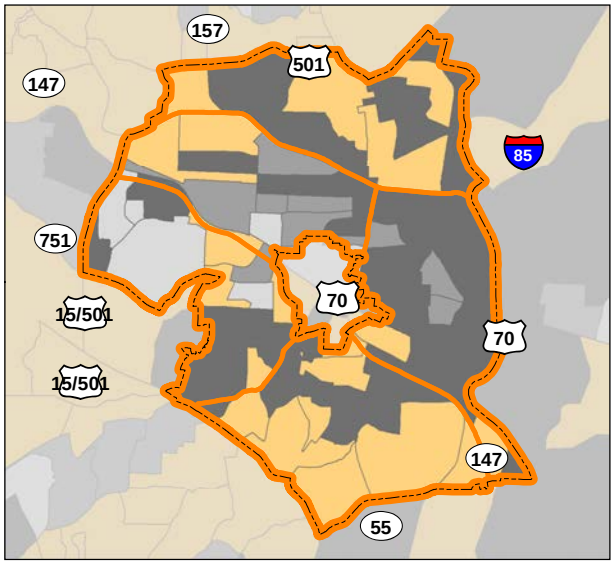
% Population Racial Minority

- 6.7% - 28.4%
- 28.5% - 51%
- 51.1% - 53.4%
- 53.5% - 100%
- Project Boundary



% Population Hispanic/Latino Ethnicity

- 2.2% - 5.8%
- 5.9% - 10.6%
- 10.7% - 13.4%
- 13.6% - 75%
- Project Boundary

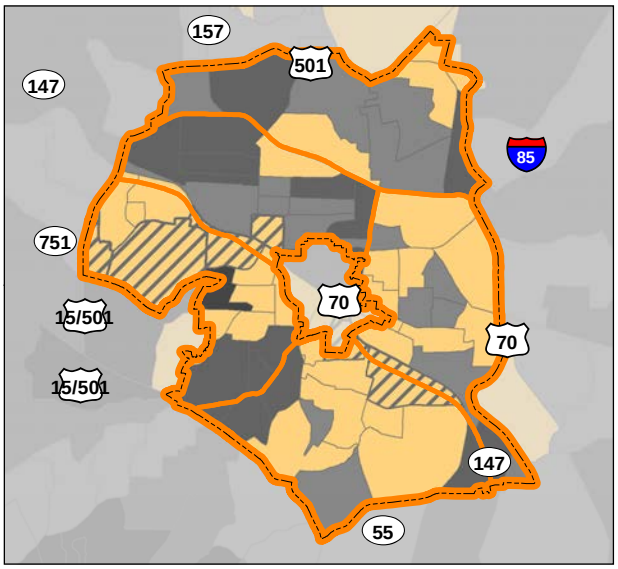


% Population Elderly

- 0% - 4%
- 4.1% - 6%
- 6.1% - 9.7%
- 9.8% - 57.2%
- Project Boundary

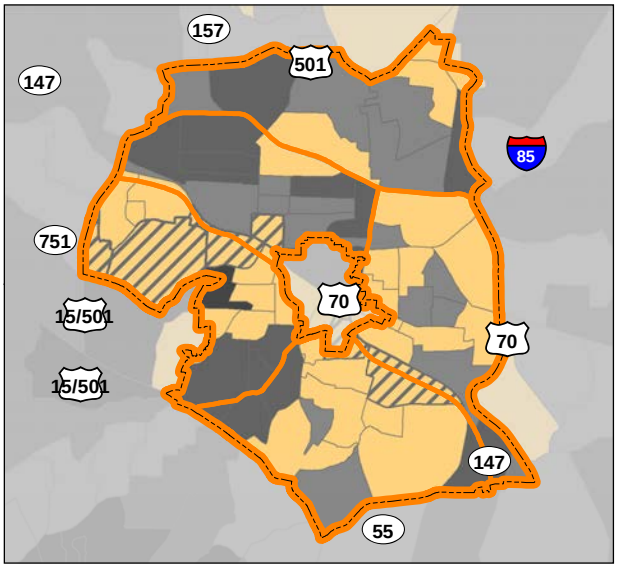
Source: US Census Bureau

Figures 15-16. Percent of Households: Limited English Proficiency and Median Income



% Households LEP (Do Not Speak English Only, Or Very Well)

- 0% - 1%
- 1.1% - 3.3%
- 3.4% - 5.3%
- 5.4% - 42.6%
- Project Boundary

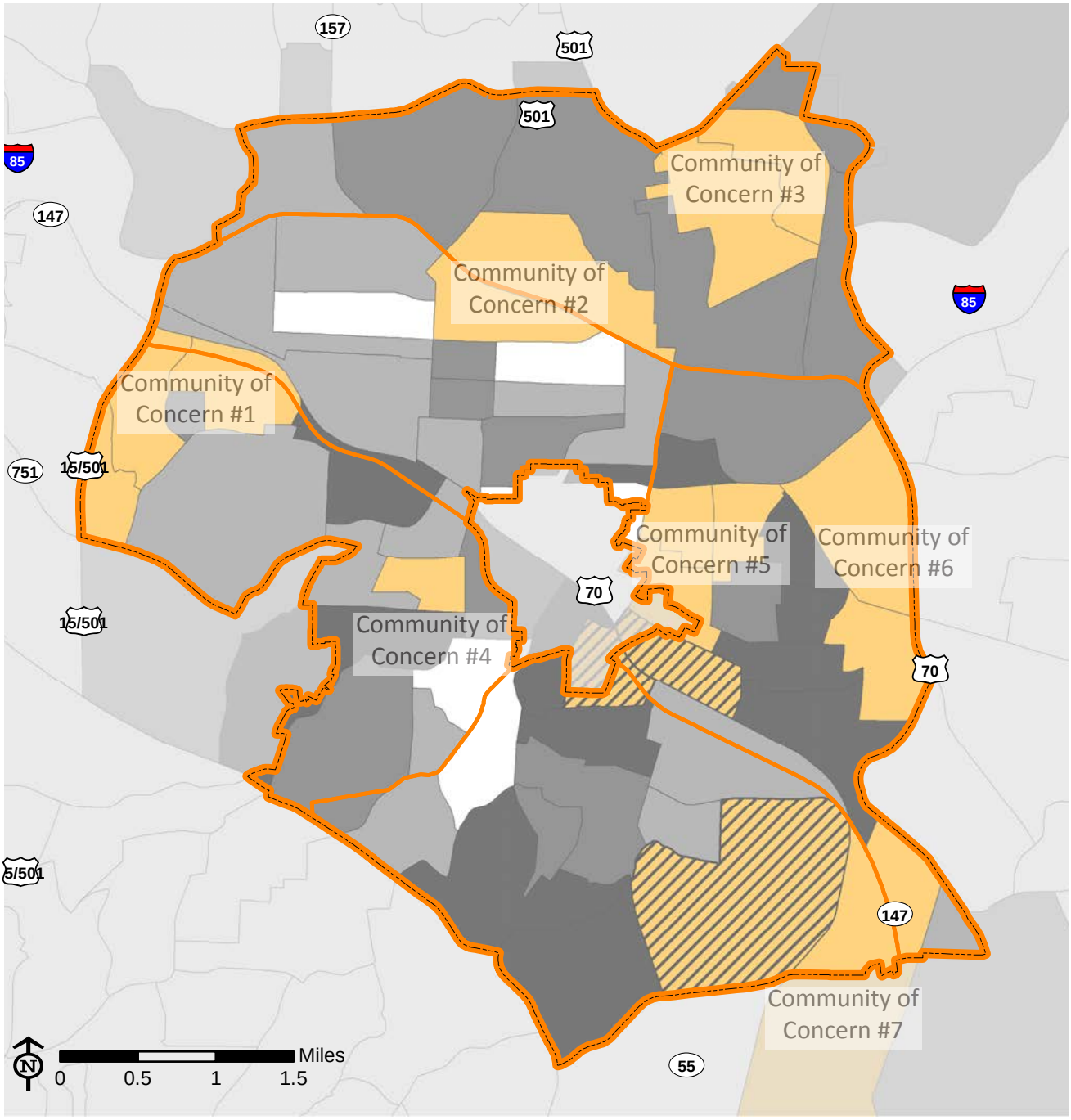


Median Household Income

- $0.00 - $15,611.00 Extremely Low Income
- $15,611.01 - $31,222.00 Low Income
- $31,222.01 - $52,038.00
- $52,038.01 - $96,891.00
- $96,891.01 - $163,472.00
- Project Boundary

Source: US Census Bureau

Figure 17. Communities of Concern Summary



Community of Concern 1

Block Groups on the north side of Erwin Road and east of US Highway 15-501 had representation of four environmental justice populations (minority, Latino, LEP, and low income). This area is generally well served by public parks, including Crest Street Park and Morreene Road Park. Apartment complexes on either side of LaSalle Street (Duke Manor and The Heights) are outside of a half-mile walking distance of a public park, however, Duke University's campus acts as a publicly accessible private open space. For instance, the stormwater reclamation pond at Erwin Road and Towerview has a walking trail that is open to the public during daylight hours.

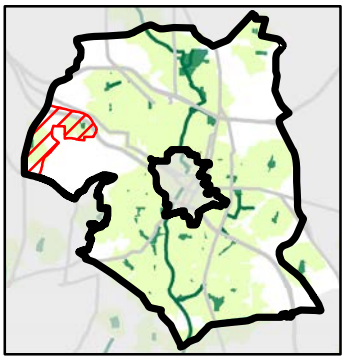
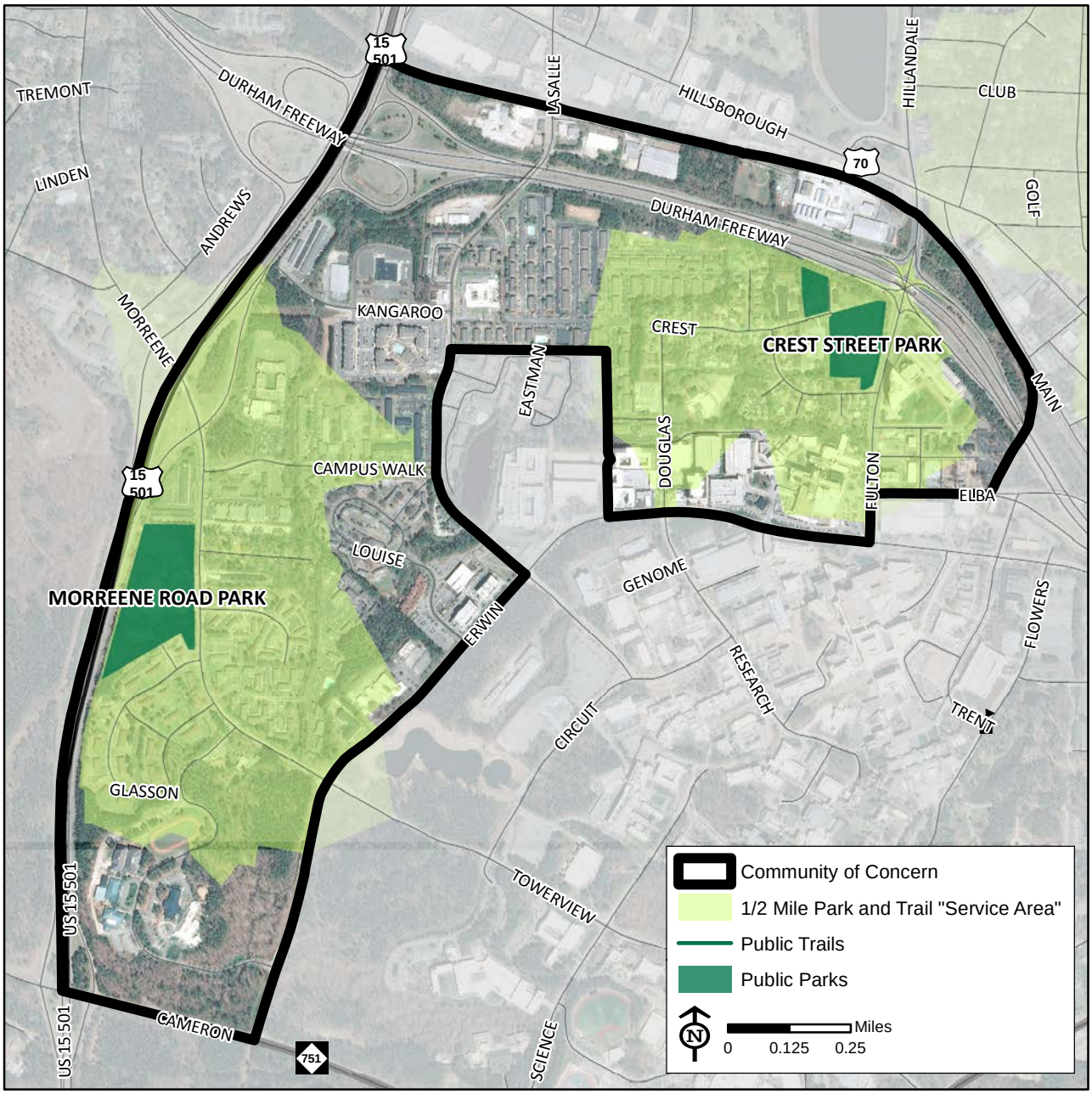


Figure 18. Community of Concern 1



Community of Concern 2

Block Groups on either side of Interstate 85 near Roxboro Road had representation of four environmental justice populations (minority, Latino, LEP, and low income). In general, this area is well served by public parks, including Walltown Park and Recreation Center, as well as a string of linear parks tracing the Ellerbe Creek. Only a small area of residential development near Broad Street and Leon Street is outside of a half-mile walk from a public open space. This area is, however, adjacent to Brogden Middle School. If the Joint Use Agreement between Durham Public Schools and Parks and Recreation were implemented, this could become a recreational resource for those neighborhoods. However, recent state legislation that affects playround inspections is a potential impediment.

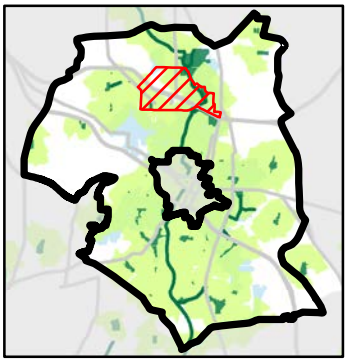
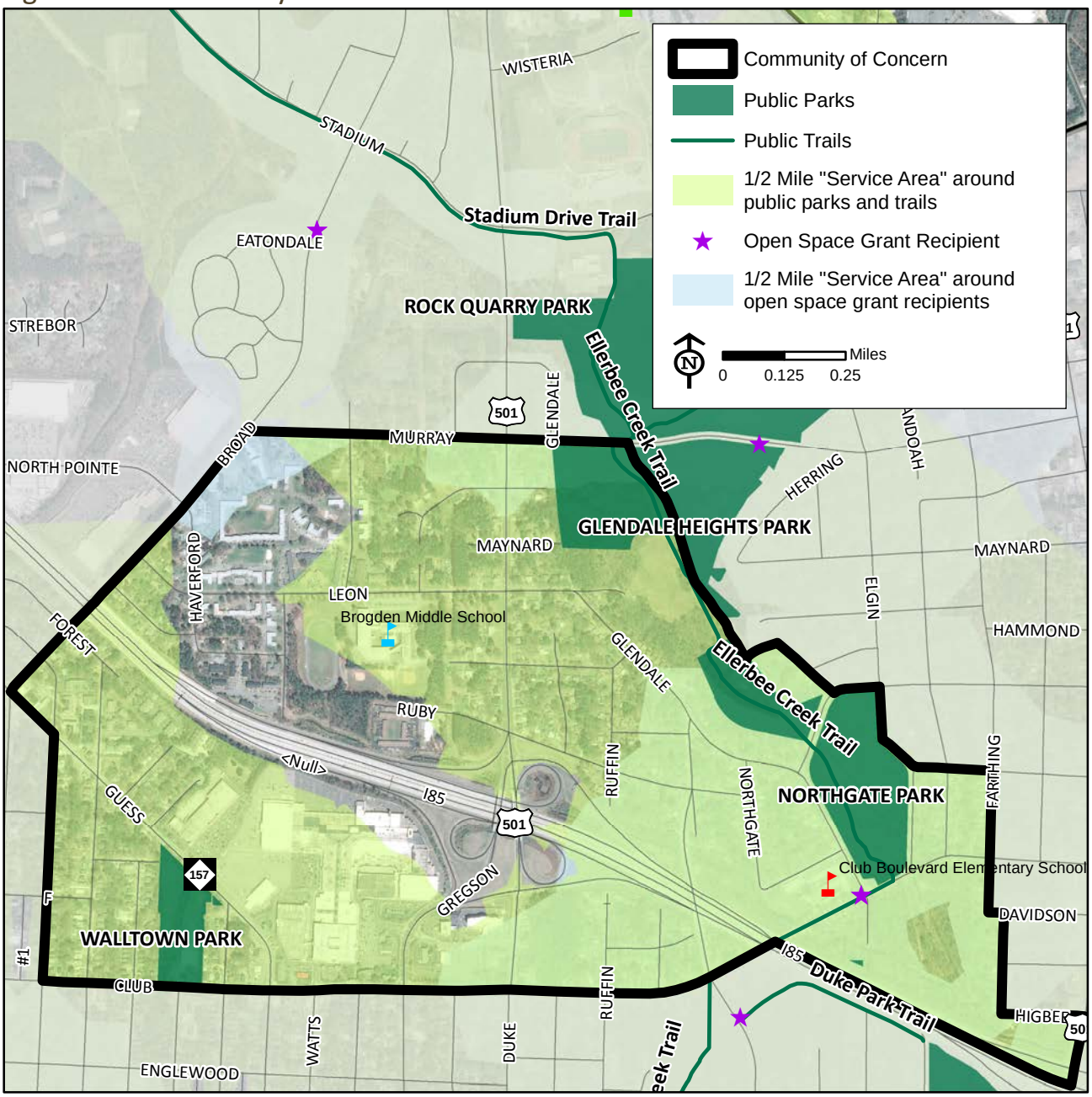


Figure 19. Community of Concern 2



Community of Concern 3

Block Groups on north of East Club Boulevard and east of Roxboro Road had representation of four environmental justice populations (minority, elderly, LEP, and low income). Red Maple Park is the only public park in these Block Groups, so at a quick glance it does appear that residential neighborhoods are without access to open space. South of Club Boulevard, however, the Ellerbe Creek Watershed Association holds conservation easements on several properties, including one known as the Beaver Marsh Preserve. According to the open space suitability analysis, these are some of the most valuable open spaces in the Urban Tier. Looking ahead, the City could work with the Ellerbe Creek Watershed Association to allow more access to these properties without degrading their environmental significance.

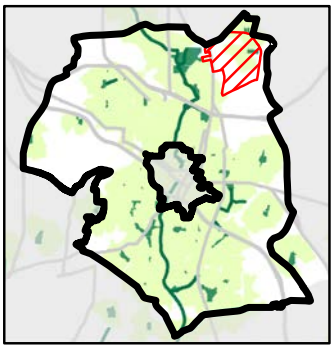
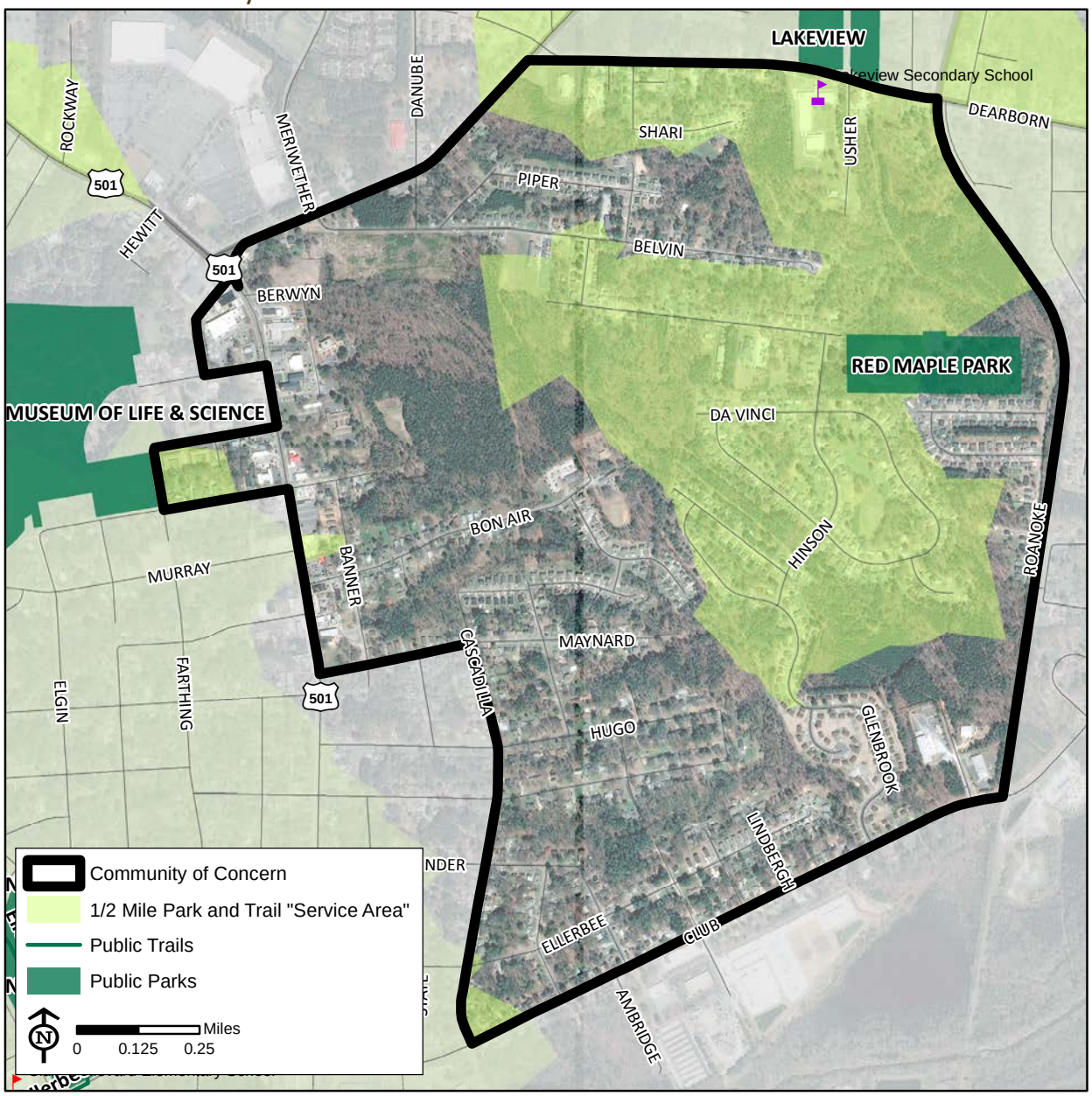


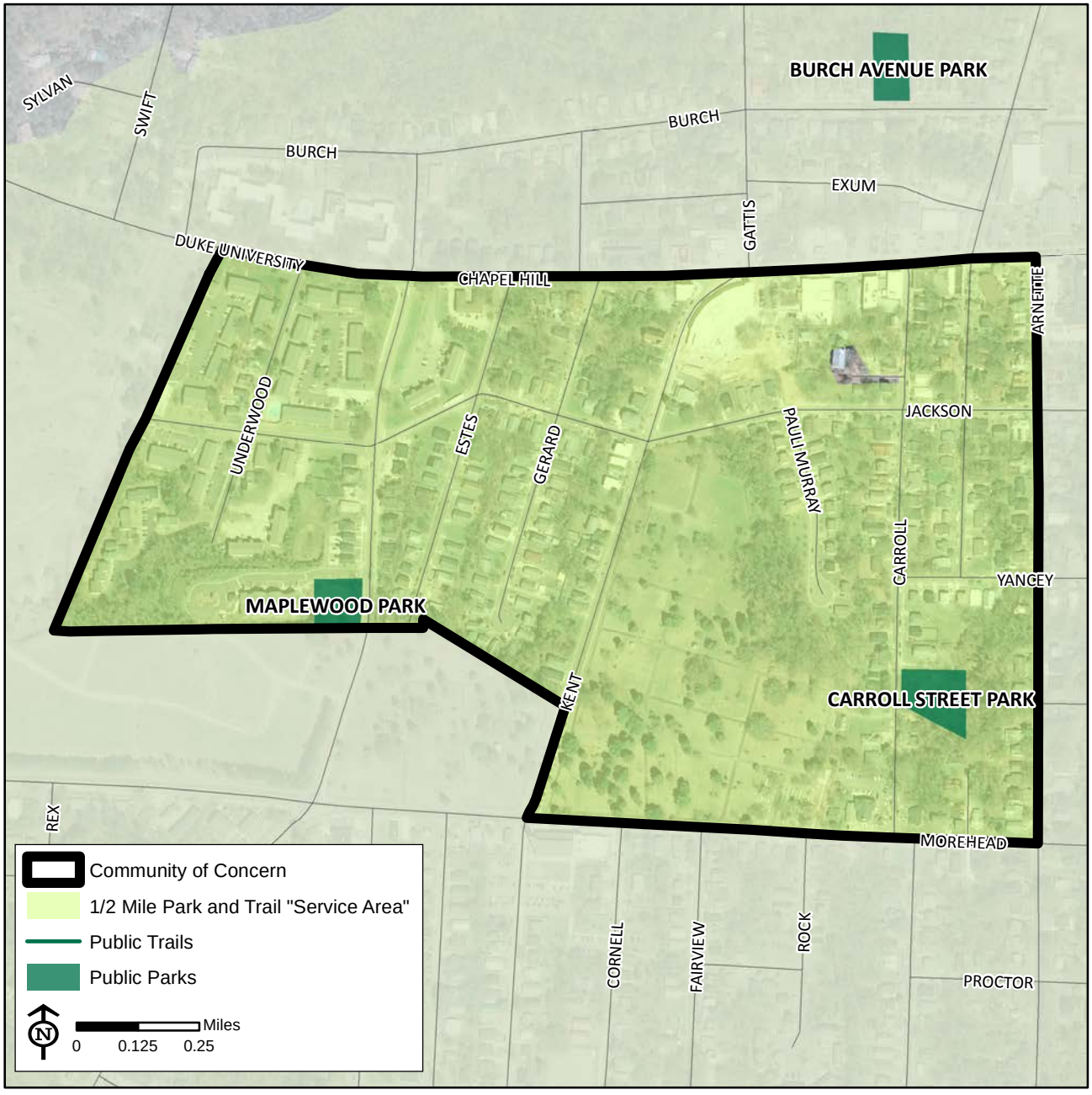
Figure 20. Community of Concern 3



Community of Concern 4

A Block Group south of Chapel Hill Road and east of Arnette Avenue had representation of four environmental justice populations (minority, Latino, LEP, and low income). Residents in this Block Group are able to access a number of small neighborhood parks including Carroll Street, Maplewood and Burch Avenue. In addition to parks, Maplewood Cemetery (and the future Pauli Murray Center) is at the center of the Block Group. Investments in this public cemetery could make it into an open space amenity for the neighborhood.

Figure 21. Community of Concern 4



Community of Concern 5

This area is made up of five Block Groups on either side of the Durham Freeway, generally east of Downtown Durham. Two of the five Block Groups had representation of all environmental justice populations, while the other three had four. A majority of the area is within a half-mile distance of a public park or trail, including East End Park, Long Meadow Park, Grant Park, Hillside Park, and several others.

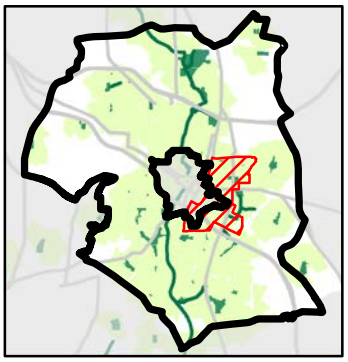
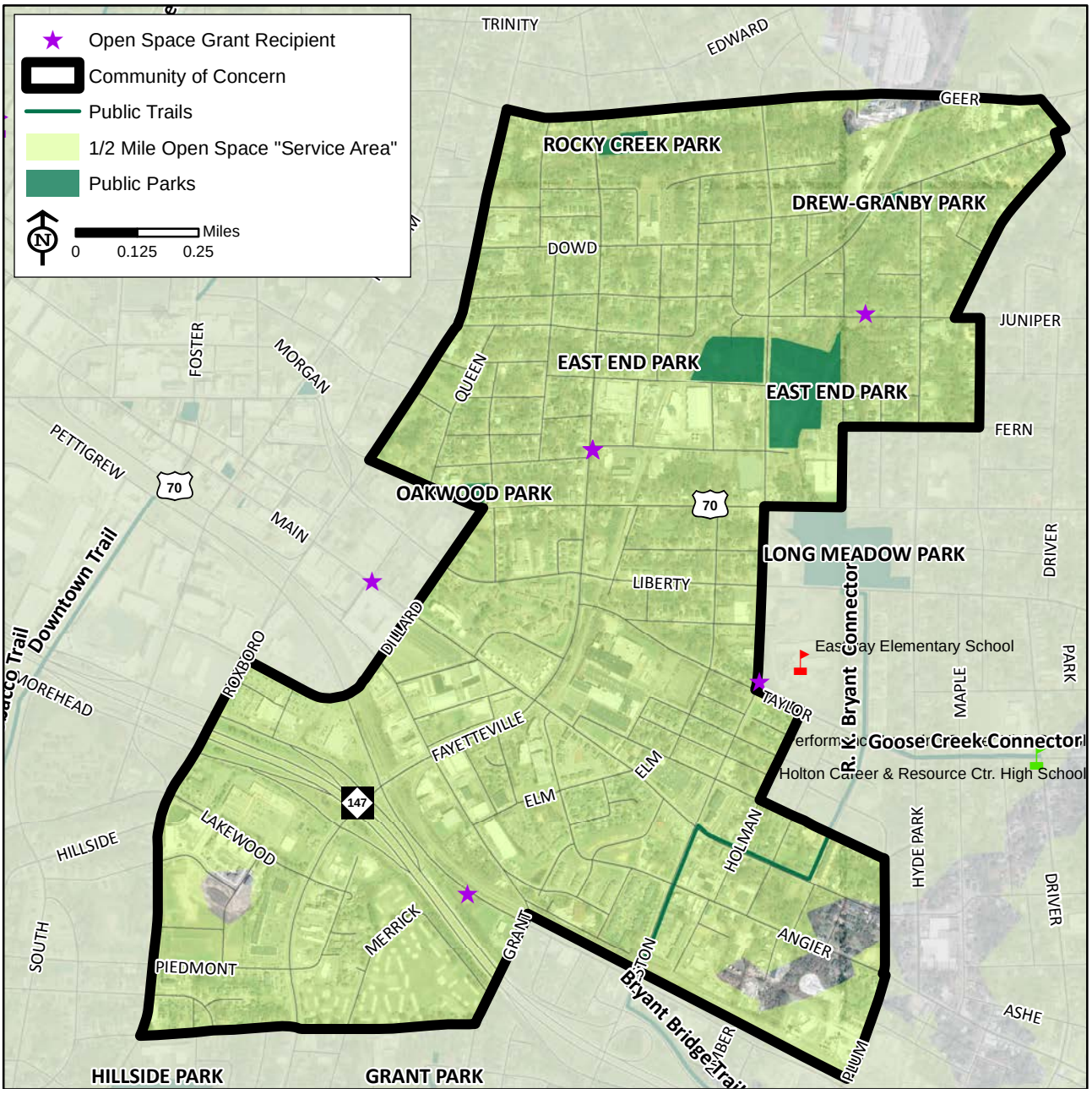


Figure 22. Community of Concern 5



Community of Concern 6

Block Groups west of the US Highway 70 Bypass and south of Geer Street had representation of four environmental justice populations (minority, Latino, LEP, and low income). A majority of the underserved area is non-residential (The Village Shopping Center) at the intersection of Holloway Street (US 70) and Miami Boulevard. However, a neighborhood to the north of the shopping center, Wellons Village, is not within a half-mile of a public park or trail.

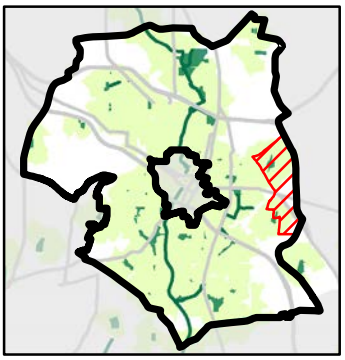
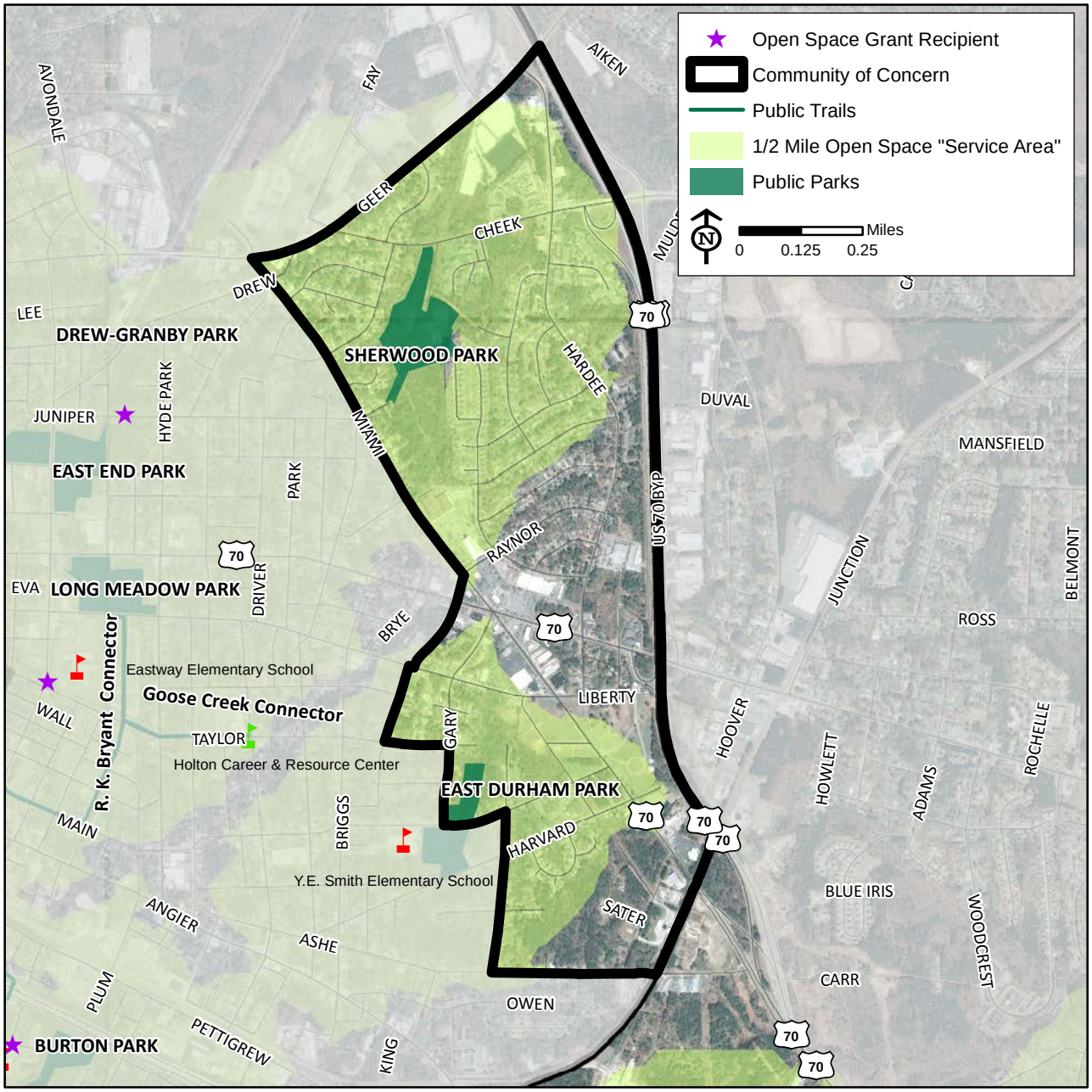


Figure 23. Community of Concern 6



Community of Concern 7

Block Groups in the southeast corner of the Urban Tier had representation of four and five environmental justice populations. While it appears that only half of these communities of concern have access within a half-mile to a public park or trail, the other half of the study area is industrial or non-residential land uses.

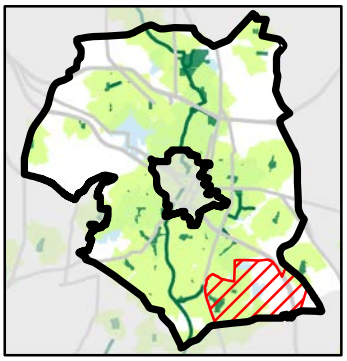
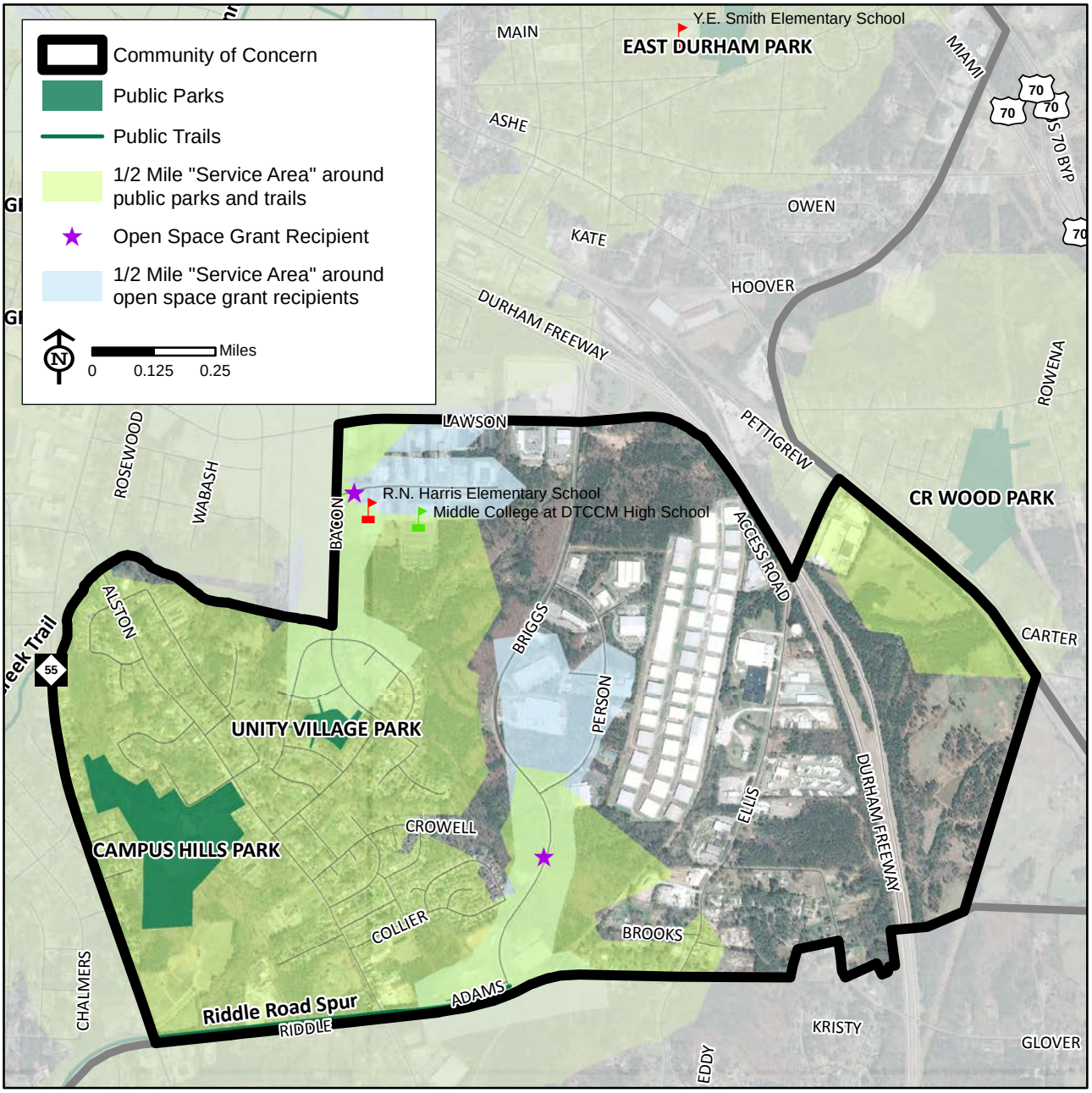


Figure 24. Community of Concern 7



D. District Analysis

In order to better analyze the Urban Tier, it is further divided into five districts that have several distinct neighborhoods and identities. The boundaries for these districts were defined using the highways, railroad tracks, watersheds, and trails. These districts have focal points such as a university, community center, library, school, and parks within a one mile walking distance (Table 9 and Figure 25).

Table 9. Summary of Open Space by District

DISTRICT 1	
Total Acres	3,140
Total Parks Acres	219
Number of Rec. Centers	2
Tree Cover in Acres	1,100
Duke Homestead in Acres	45
Existing Trails, Linear Feet	13,812
Planned Trails, Linear Feet	28,029

DISTRICT 2	
Total Acres	2,439
Total Parks Acres	45
Number of Rec. Centers	1
Tree Cover in Acres	567
Duke University in Acres	113
Existing Trails, Linear Feet	6,866
Planned Trails, Linear Feet	33,017

DISTRICT 3	
Total Acres	2,826
Total Parks Acres	48
Number of Rec. Centers	3
Tree Cover in Acres	649
Existing Trails, Linear Feet	0
Planned Trails, Linear Feet	47,523

DISTRICT 4	
Total Acres	2,680
Total Parks Acres	52
Number of Rec. Centers	1
Tree Cover in Acres	841
Duke Homestead in Acres	1,007
Existing Trails, Linear Feet	0
Planned Trails, Linear Feet	34,970

DISTRICT 5	
Total Acres	3,324
Total Parks Acres	128
Number of Rec. Centers	5
Tree Cover in Acres	708
NCCU in Acres	109
Existing Trails, Linear Feet	19,619
Planned Trails, Linear Feet	63,164

Figure 25. Urban Tier Open Space Districts

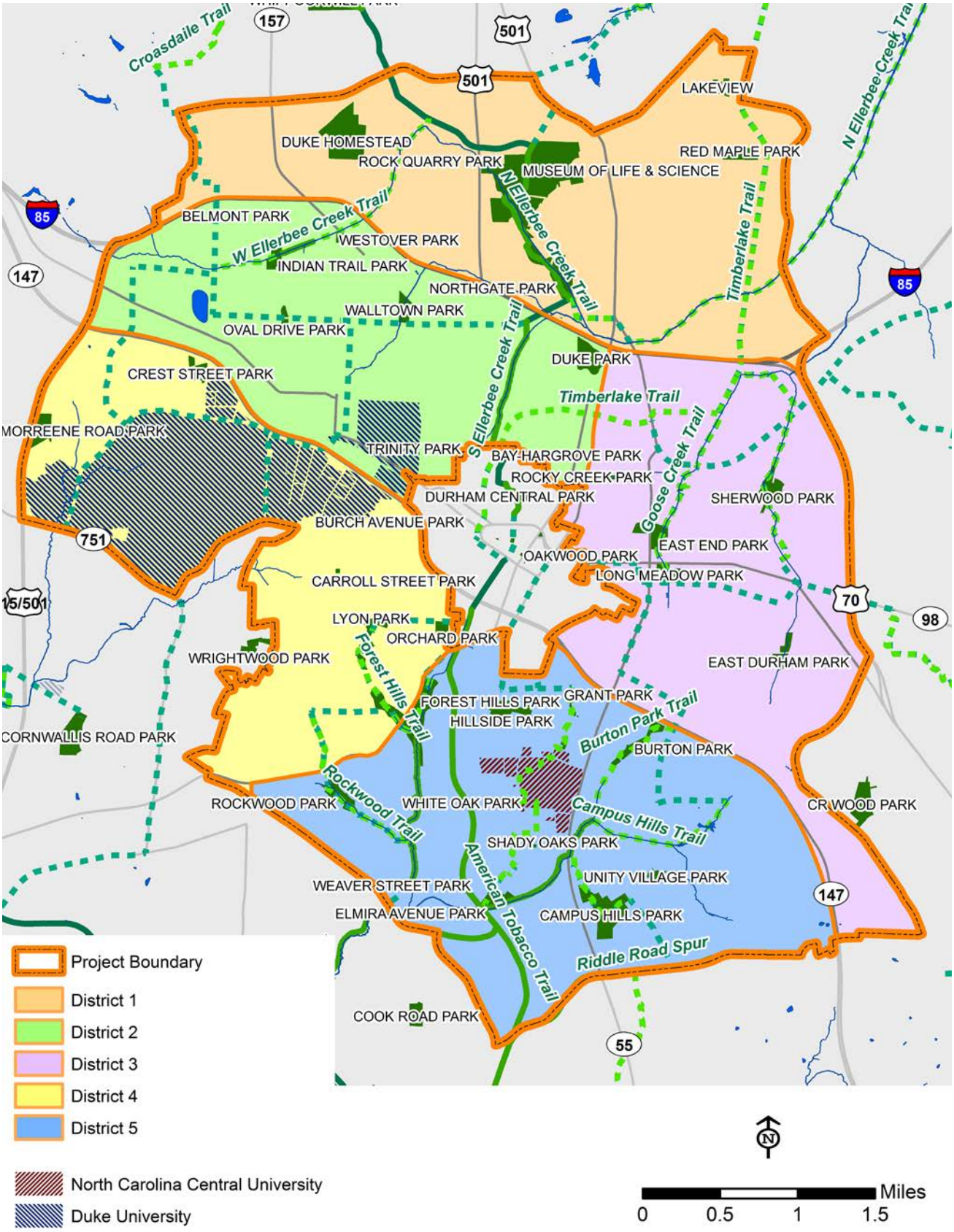
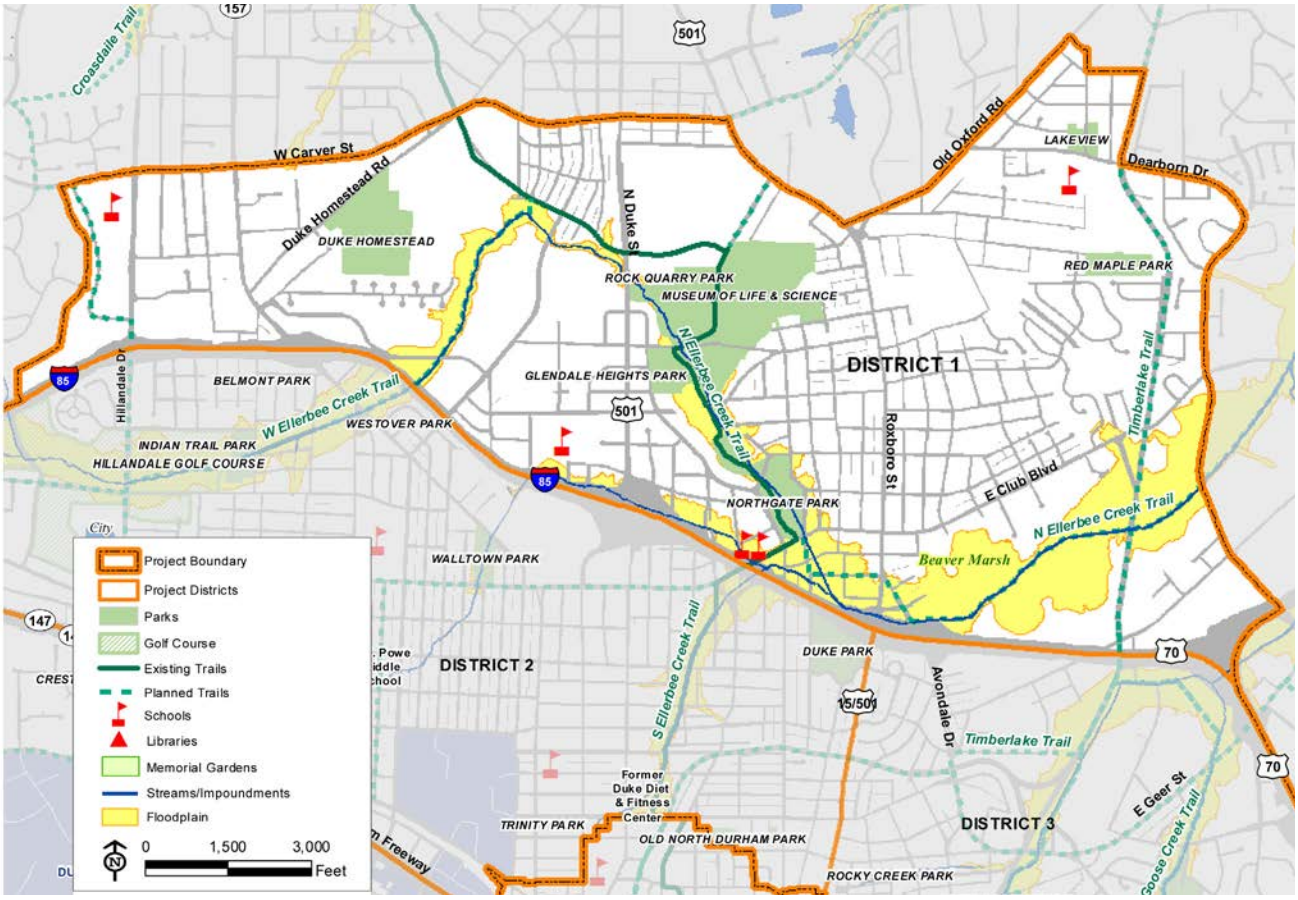


Figure 26. District 1 Analysis



Assets:

- The Ellerbe Creek Greenway forms a pedestrian route to the Museum of Life and Science and Rock Quarry Park.

Key Points of Interest:

- Duke Homestead
- Durham County Stadium
- Museum of Life and Science
- Rock Quarry Park
- ECWA Beaver Marsh Preserve
- Ellerbe Creek Trail
- Northgate Dog Park

Challenges:

- Pedestrian travel to the east and west is restricted by large roads and private property.
- I-85 prevents pedestrian movement.
- In certain areas accessibility to open space is limited.

Opportunities:

- Riparian corridors run east to west and could be utilized as large open space greenways.
- Acquisition of additional lands by the City, County or other entities could create larger contiguous corridors, more conducive to wildlife and additional access points.
- Creation of larger open space corridors could contribute to flood control and stream restorations.

Figure 27. District 2 Analysis

Assets:

- Duke East Campus forms a private, but accessible, walking trail and features mature trees.
- Duke Park is a large, historic, and popular park.
- Ellerbe Creek Trail traverses the area and provides a connection to north and the south.
- Hillandale Golf Course serves as a large open space.
- The Williams City Reservoir is a visual amenity.
- Northgate Mall is a major destination point.

Key Points of Interest:

- Duke Park
- Walltown Community Center
- Hillandale Golf Course
- Duke East Campus
- Northgate Mall
- Ellerbe Creek Trail
- Historic Districts

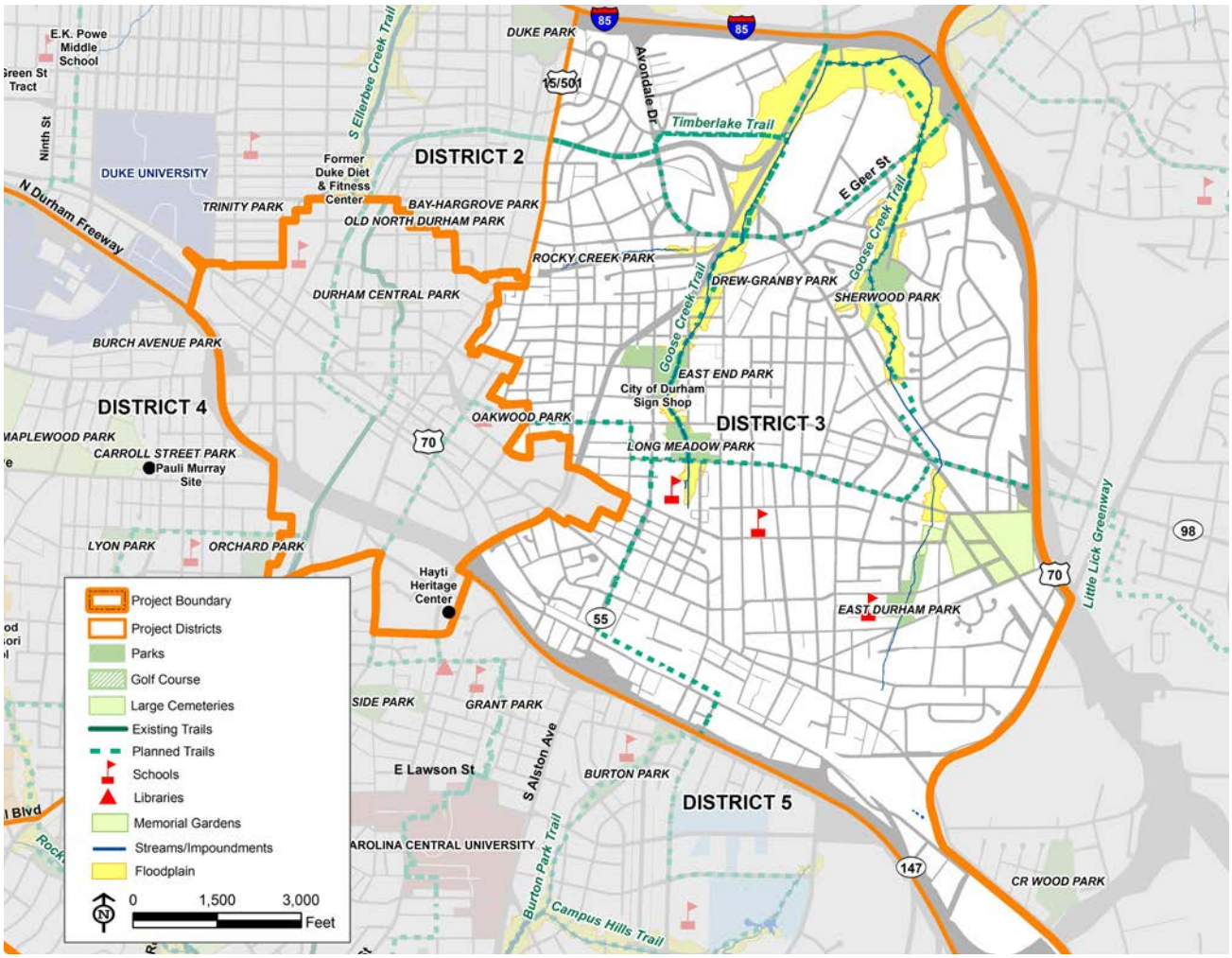
Challenges:

- Pedestrian travel to the east and west is restricted by large roads and private property.
- I-85 forms a large barrier to the north and west.

Opportunities:

- Acquisition of the Duke Beltline, a crucial component of the adopted Downtown Open Space Plan and the DOST Trails and Greenways Master Plan, presents an opportunity for east -west travel and linear open space preservation.
- The Williams City Reservoir could provide publicly accessible open space.
- Acquisition and preservation of the old Duke Diet and fitness center site, serving as storm water mitigation and open space in Pearl Mill Village area.
- Acquisition and preservation of the Green Street tract.

Figure 28. District 3 Analysis



Assets:

- Goose Creek trail connects major points of interest such as the Holton Career Resource Center and Long Meadow and East End Durham Parks and Recreation Centers.
- Sherwood Park

Key Points of Interest:

- Holton Career Center
- Rocky Creek Park
- Long Meadow and East End Durham Parks and Recreation Centers
- SEEDS

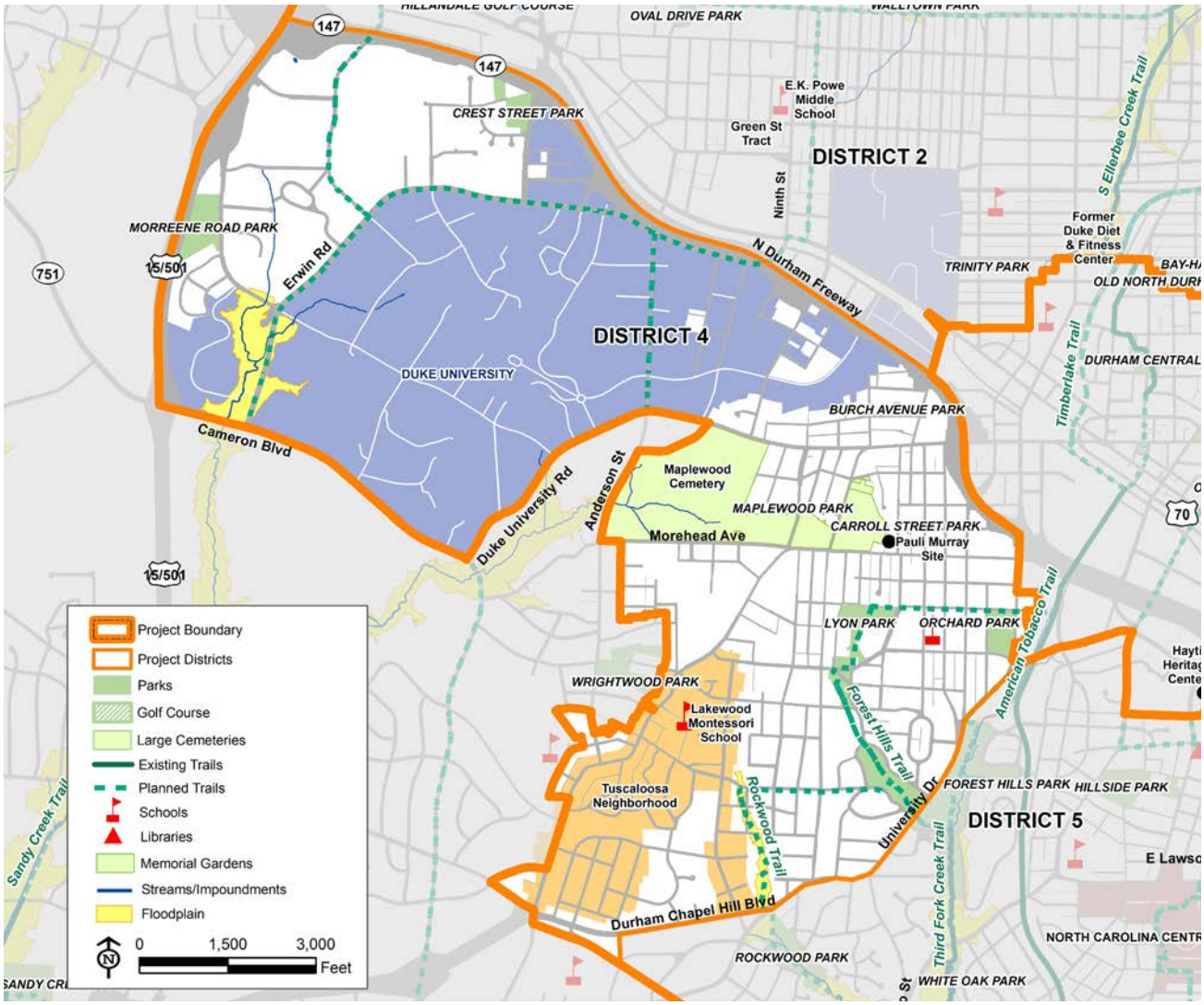
Challenges:

- US-70 and NC-147 are major barriers to pedestrian travel.
- Better pedestrian facilities are needed to connect open spaces.
- Lack of tree canopy in this area.
- Brownfield sites are evident and prevalent.
- The community expressed interest in walkable neighborhoods, parks and community gardens.

Opportunities:

- Several trails are planned for the area including a Beltline Trail Connector.
- There is a larger stream valley to the north east.
- The R. Kelly Bryant Bridge connector to Burton Creek.
- Many neighborhood initiatives have been started such as the walk to school and health mile trails.
- Vacant parcels throughout the neighborhood could serve as neighborhood gardens.

Figure 29. District 4 Analysis



Assets:

- Duke University's West Campus is a visual amenity to this district and features many publicly accessible and privately held open spaces.
- Forest Hills Park is an older park with mature trees.
- Maplewood Cemetery offers visual relief and has historic monuments and mature trees.

Key Points of Interest:

- Duke West Campus
- Forest Hills Park
- Pauli Murray House
- Lyon Park
- Maplewood Cemetery

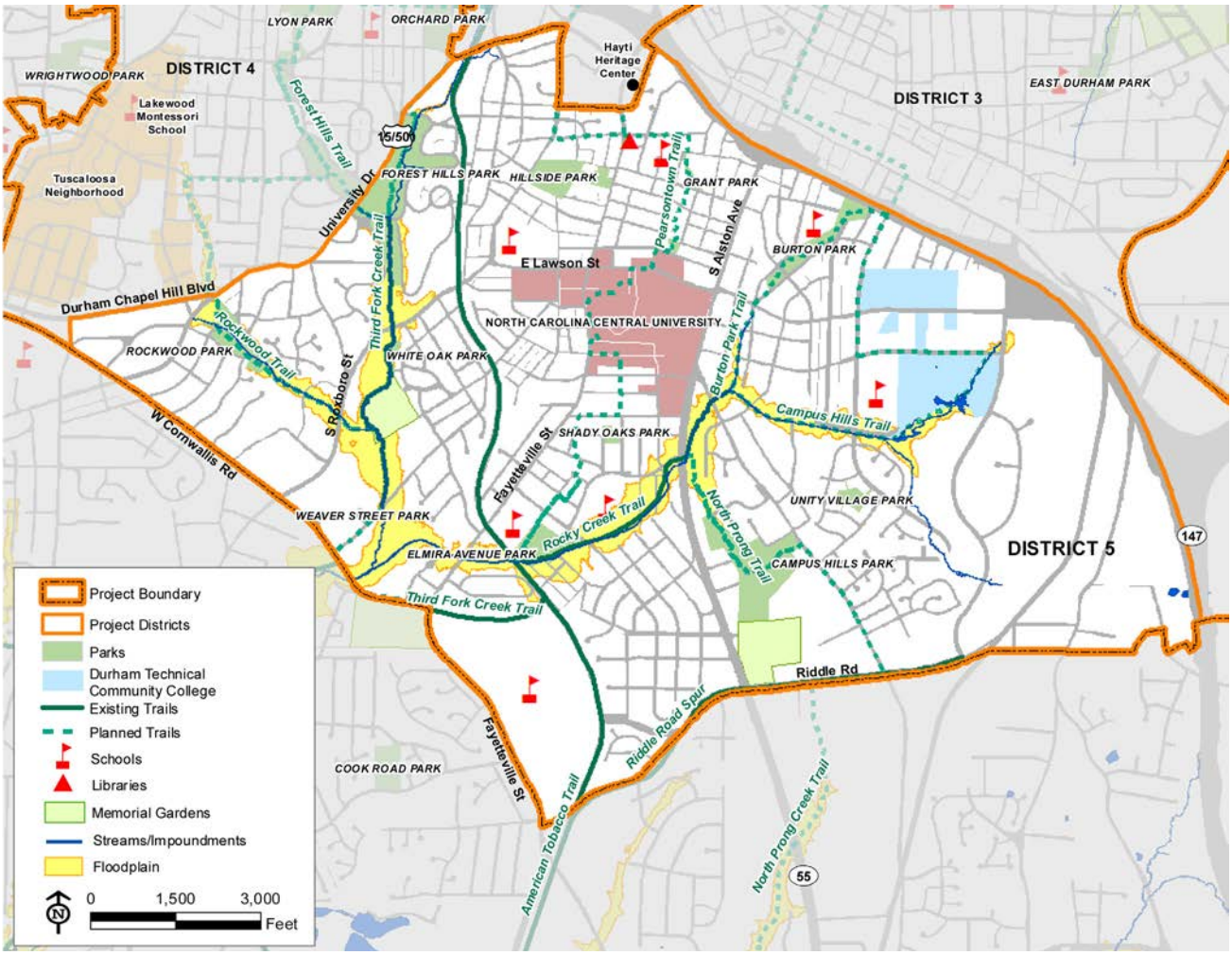
Challenges:

- US 15-501 and NC-147 are barriers to pedestrian travel.
- District needs better connections to accessible open space.

Opportunities:

- Better connectivity between planned trails, riparian corridors and the American Tobacco Trail.
- The possibility of larger connected open spaces for urban wildlife and birds.

Figure 30. District 5 Analysis



Assets:

- American Tobacco Trail, Forest Hills Park and Campus Hills Park
- Good connections to Burden Park and Briggs Avenue
- Larger Floodplain corridors connect wildlife habitats
- Briggs Community Garden

Key Points of Interest:

- North Carolina Central University
- Forest Hills Park
- Durham Tech

Challenges:

- US15-501 and NC-147 are barriers to pedestrian travel.
- Connections between North Carolina Central University (NCCU) and Durham Tech and Neighboring communities.

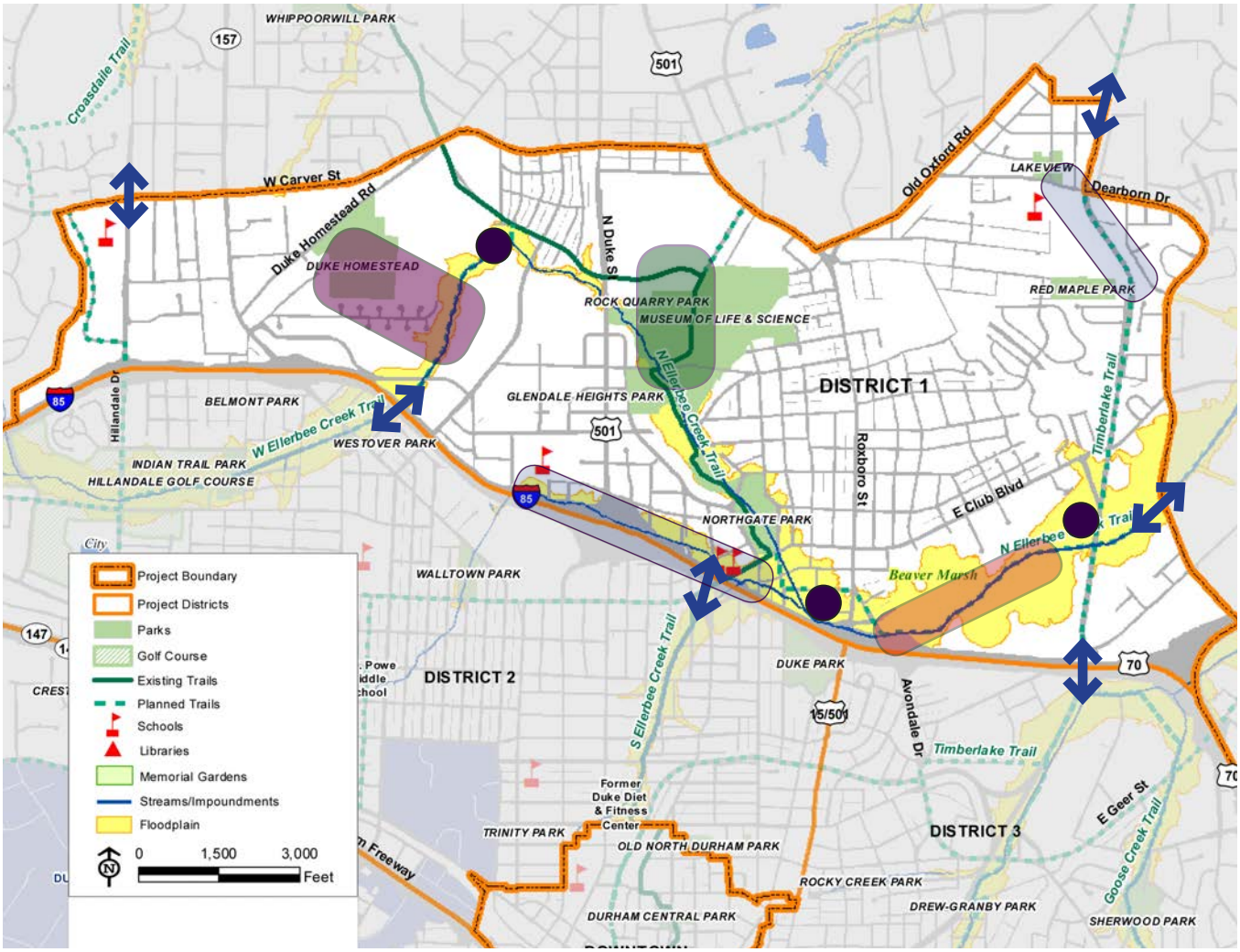
Opportunities:

- Preservation and enhancement of larger tracts of forests in stream valley areas.
- Larger corridors can be created to connect Burden Creek and Campus Hills Park.
- Green Connectors could be made to North Carolina Central University and Durham Tech that would allow for flexible use of open space.

IV. POLICY RECOMMENDATIONS

In addition to describing the inventory and analyzing the various benefits and challenges related to developing open space in Durham's Urban Tier, this Plan also includes general and site-specific policy recommendations, including policy and program changes needed to facilitate implementation. General recommendations can be applied across all urban open spaces and range from broad policy statements to additional recommendations regarding design and function. Site-specific recommendations will address particular needs in certain locations throughout Urban Tier for both existing open spaces and planned new spaces.

Figure 31. District 1 Policy Recommendations



Develop an access program for open space and walking trails that connect the Duke Homestead site to the surrounding neighborhood and the North Ellerbe Creek Trail.

Partner with the Ellerbe Creek Association to acquire additional properties in conjunction with the Ellerbe Creek Association's "Priority Lands Analysis" and finish the greenway from Avondale Avenue to Beaver Marsh to the Timberlake Trail.

Develop better pedestrian links and linear open space between The Museum of Life and Science and Rock Quarry Park; develop a parking solution for the attractions of the area, through the use of linear open space.

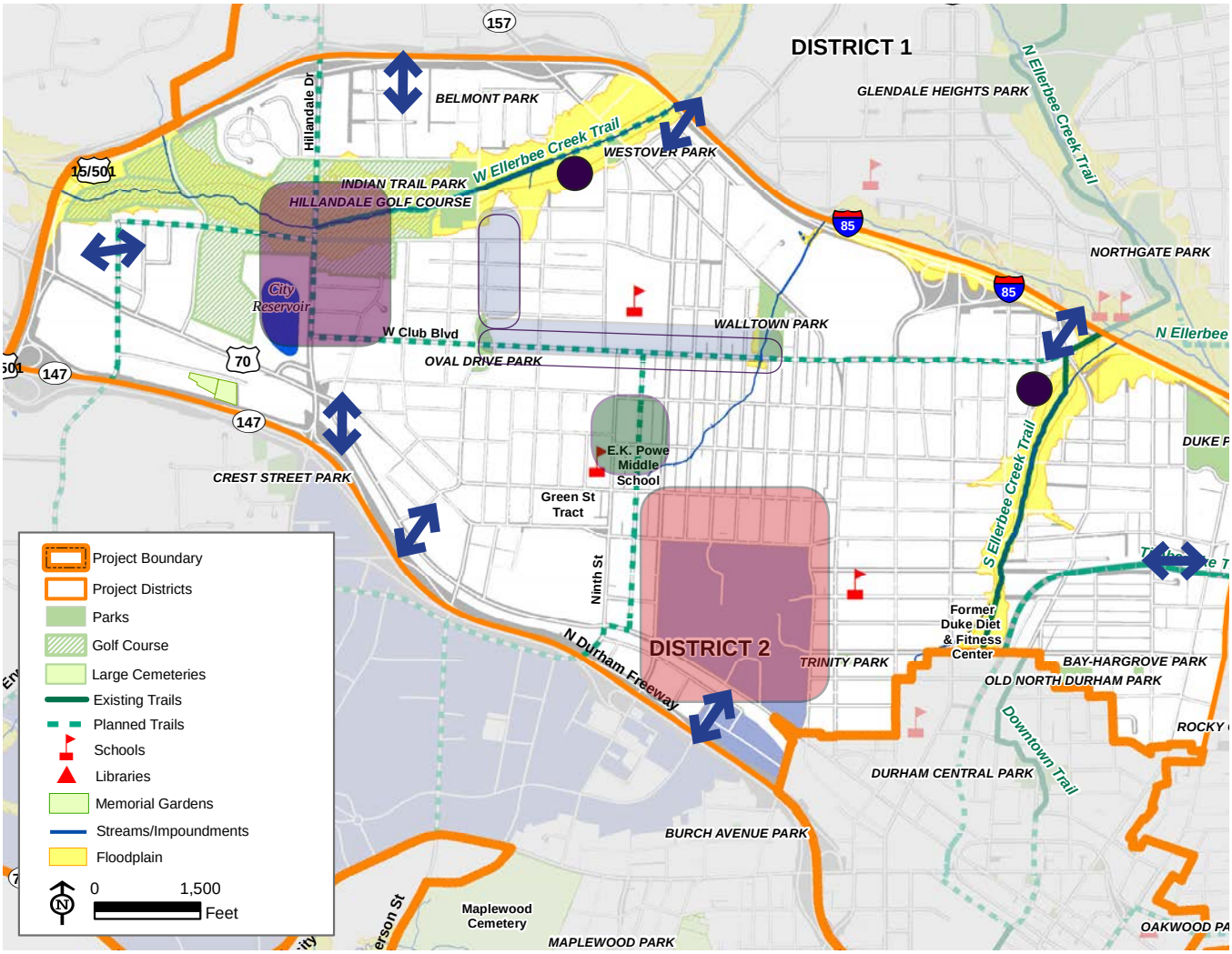
Establish and implement a network of green connections that increases access to parks, open spaces.

When flood plain properties are already developed, encourage their redevelopment to integrate stormwater management and open space amenities.

Crossings and Connections

Promote pedestrian and bicycle friendly crossings that facilitate connections to open space corridors in other districts using complete streets and green infrastructure construction.

Figure 32. District 2 Policy Recommendations



Open the Williams City Reservoir to the public for limited open space access to develop a walking trail loop; develop meadow and wetland plantings to increase water quality and continue to support Hillandale golf course as a publicly accessible open space.

Maintain public accessibility to Duke University's East Campus walking trail by continuing to foster ties with Duke University and neighborhoods.

Consider developing Green Street tract as a brownfield and riparian restoration area, small park and outdoor classroom for EK. Powe Elementary School.

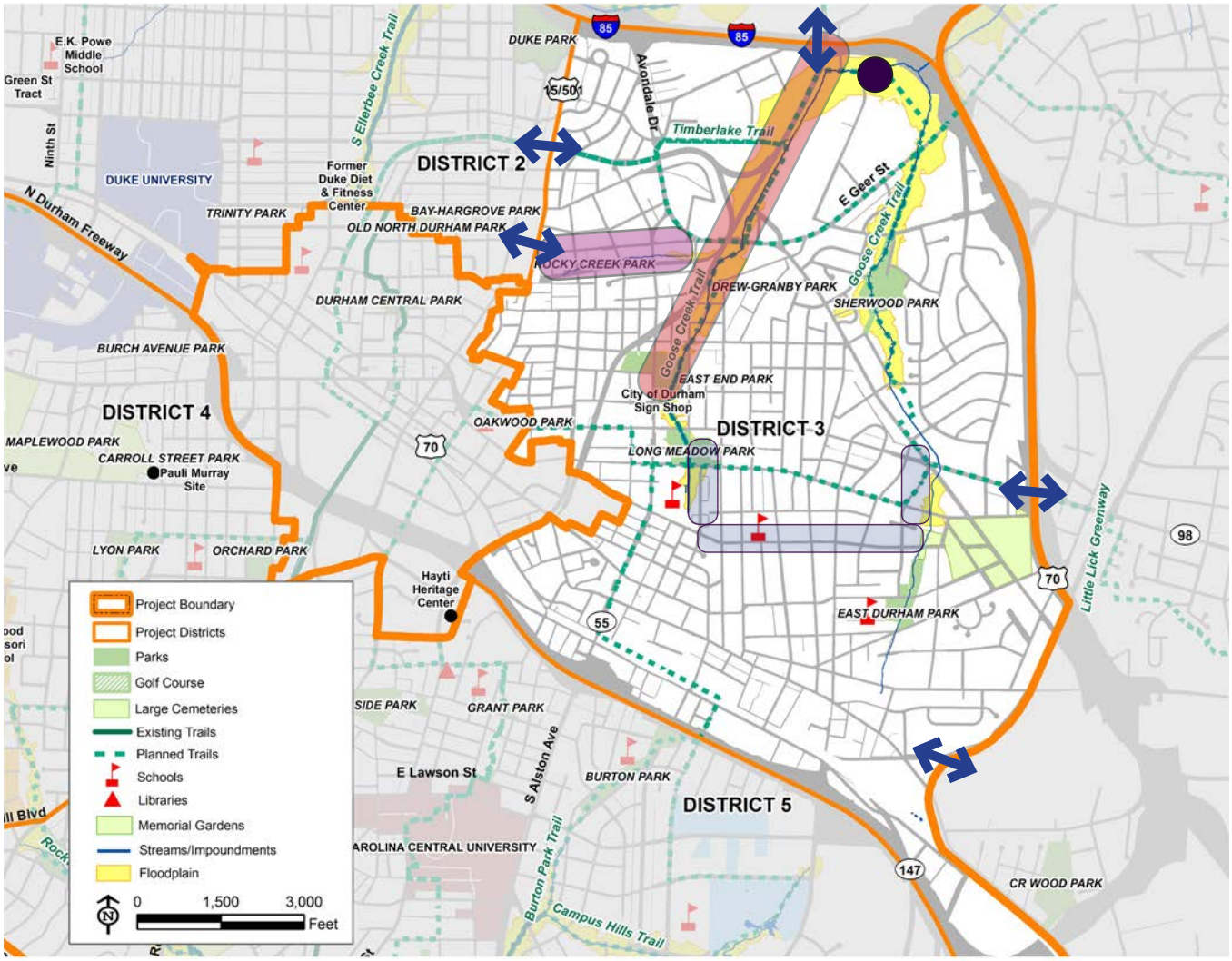
Establish and implement a network of green connections that increases access to parks, open spaces.

When flood plain properties are already developed, encourage their redevelopment to integrate stormwater management and open space amenities.

Crossings and Connections

Promote pedestrian and bicycle friendly crossings that facilitate connections to open space corridors in other districts using complete streets and green infrastructure construction.

Figure 33. District 3 Policy Recommendations



Improve streetscapes and develop more east/west trail connections to create loops with the north south greenways and acquire right of way to the south of Rocky Creek Park.

Enhance pedestrian connections to community centers through additional acquisitions on Goose Creek.

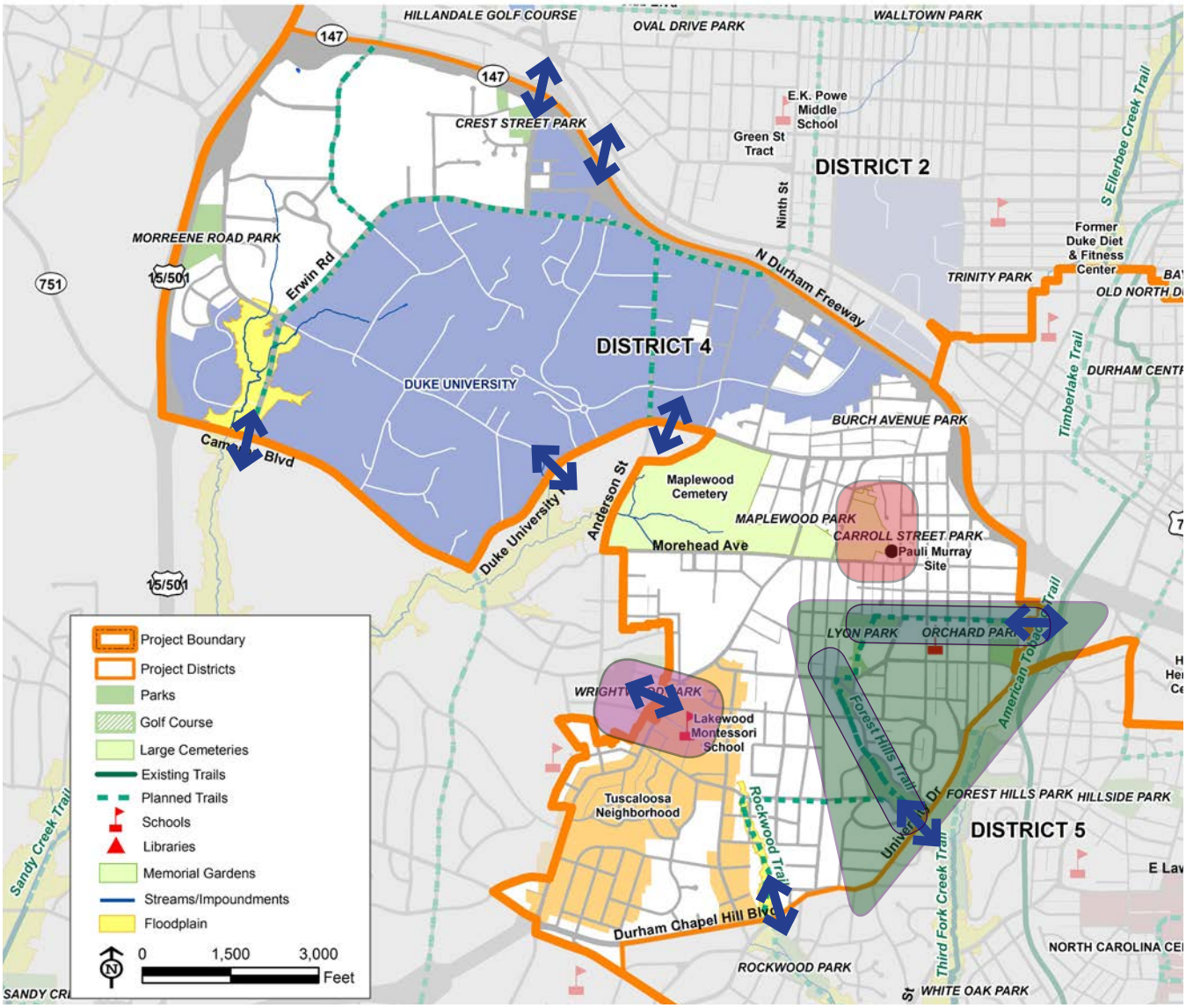
Establish and implement a network of green connections that increases access to parks, open spaces.

When flood plain properties are already developed, encourage their redevelopment to integrate stormwater management and open space amenities.

Crossings and Connections

Promote pedestrian and bicycle friendly crossings that facilitate connections to open space corridors in other districts using complete streets and green infrastructure construction.

Figure 34. District 4 Policy Recommendations



Develop greenways connecting the Lakewood Montessori School to the Tuscaloosa neighborhood and to Wrightwood Park.

Create better walking connections to the Pauli Murray site on Carroll Street and preserve and restore land on the east side of the Maplewood Cemetery for additional open space access.

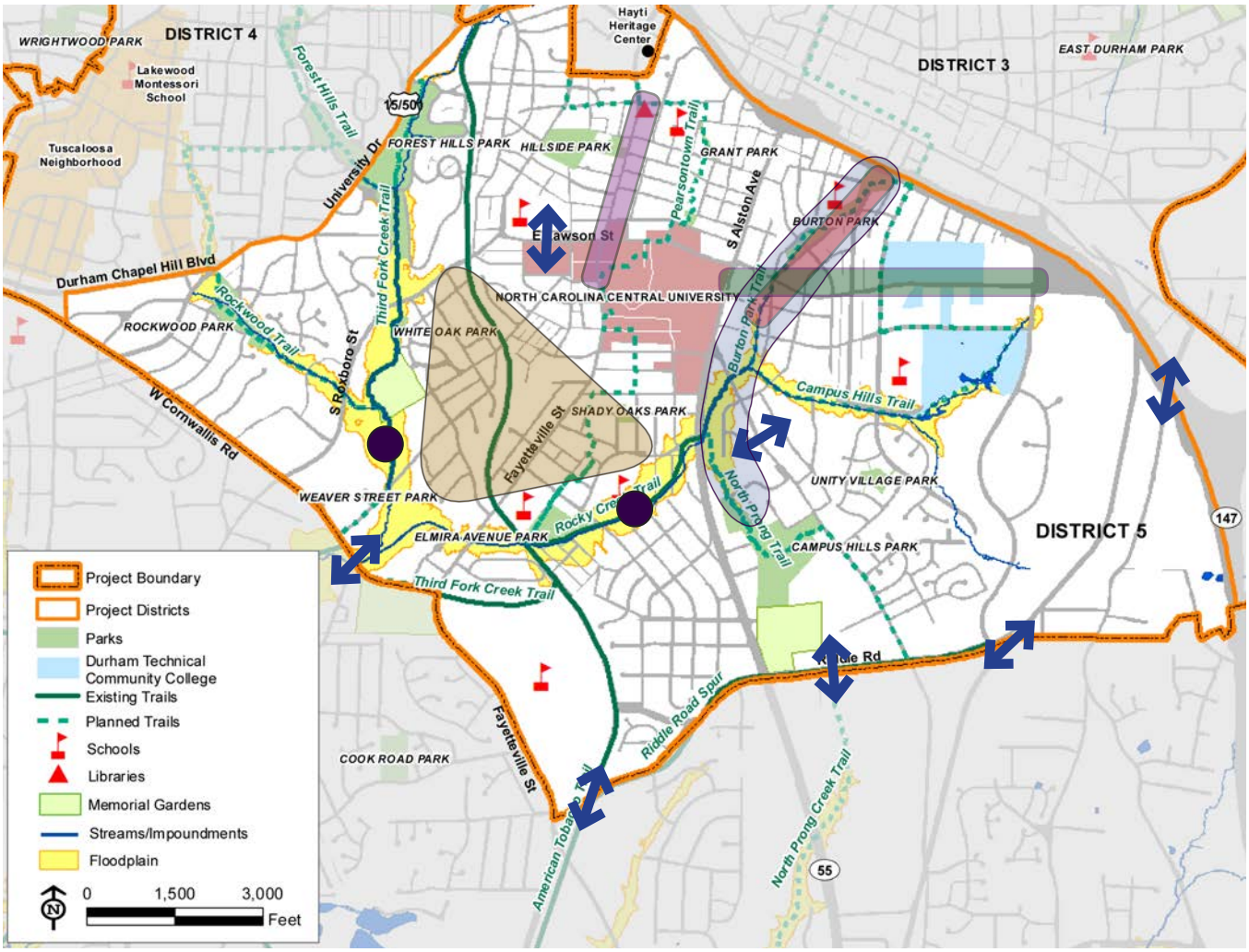
Better connectivity between planned trails, riparian corridors and the American Tobacco Trail.

Establish and implement a network of green connections that increases access to parks, open spaces.

Crossings and Connections

↔ Promote pedestrian and bicycle friendly crossings that facilitate connections to open space corridors in other districts using complete streets and green infrastructure construction.

Figure 35. District 5 Policy Recommendations



Develop greenways with linear open space connecting North Carolina Central University, the Hyati Heritage Center, and Downtown.

Foster linear open space connections to Burton Park including stream restoration and tree canopy along the proposed Burton Creek Trail.

Preserve and enhance larger tracts of forests in stream valley areas.

Create larger corridors to connect Burton Creek and Campus Hills Park.

Green connectors could be made to North Carolina Central University and Durham Tech that would allow for flexible use of open space.

When flood plain properties are already developed, encourage their redevelopment to integrate stormwater management and open space amenities.

Crossings and Connections

↔ Promote pedestrian and bicycle friendly crossings that facilitate connections to open space corridors in other districts using complete streets and green infrastructure construction.

V. IMPLEMENTATION

The Implementation Plan is a critical piece of any truly effective plan. It is through implementation that the community must come together to move the recommendations and strategies forward from concepts to reality. The implementation plan is a series of action steps that outlines what is necessary to accomplish the goals, objectives and strategies outlined in this Plan.

The following implementation plan provides the "next steps" for implementation of the objectives. Each objective contains a set of actions which represent steps in the implementation process. This structure provides each implementing group with a clear and well-defined path to begin executing the Plan's objectives. Each policy has been assigned a timeframe for completion. Short term means the first five years after adoption of the plan, mid term is between six to 10 years, and long term is beyond 10 years. The successful implementation of the following objectives will rely on the determined coordination and collaboration of the various public and private sector entities outlined in the table alongside each objective and subsequent actions steps.

OBJECTIVE 1

ENSURE A WELL-MAINTAINED, HIGHLY UTILIZED, AND INTEGRATED OPEN SPACE SYSTEM

	Timing	Responsibility
1. Prioritize updating highly-utilized open spaces and recreational facilities and in communities of concern.	Short Term	Parks and Recreation; General Services
2. Preserve existing open space by restricting its conversion to other uses and limiting encroachment from other uses, assuring no loss of quantity or quality of open space.	Short Term	Parks and Recreation; City General Services
3. Maintain and repair recreational facilities and open spaces to modern maintenance standards.	Short Term	Parks and Recreation
4. Support public art as an essential component of open space design.	Long Term	Parks and Recreation
5. Ensure that open space is safe and secure for Durham's entire population. Explore a Park Ranger program.	Mid Term	Parks and Recreation; Police Department
6. Encourage private recreational facilities on private land that provide a community benefit, particularly within communities of concern.	Long Term	Private Sector
7. Consistent with the Historic Resources Management Plan, preserve historic and culturally significant landscapes, sites, structures, buildings and objects.	Mid Term	Parks and Recreation, Historic Preservation Commission
8. Preserve and protect character-defining features of historic resources in City parks, when it is necessary to make alterations to accommodate new needs or uses.	Mid Term	Parks and Recreation, Historic Preservation Commission
9. Pursue and develop innovative long-term funding mechanisms for maintenance, operation, renovation and acquisition of open space and recreation.	Long Term	Multi Agency, Durham County Open Space Matching Grants Program

OBJECTIVE 2

INCREASE RECREATION AND OPEN SPACE TO MEET THE LONG-TERM NEEDS OF THE CITY

	Timing	Responsibility
1. Expand partnerships among open space agencies, transit agencies, private sector and nonprofit institutions to acquire, develop and/or manage existing open spaces.	Long Term	Multi Agency
2. Encourage and maintain the shared use of public and semi-public facilities as active open spaces. Initial priorities should be Duke East Campus, Brogden Middle School, and the Williams Water Treatment Plant.	Short Term	Durham Public Schools, Water Management, Duke University, Parks and Recreation
3. Examine and identify potential for using known brownfields in neighborhoods as open space restoration projects.	Long Term	Office of Economic and Workforce Development, Public Works
4. Study the potential of former or underutilized shopping centers as open space restoration projects.	Long Term	City-County Planning, Public Works

OBJECTIVE 3

IMPROVE ACCESS AND CONNECTIVITY TO OPEN SPACE

	Timing	Responsibility
1. Creatively develop existing publicly-owned right-of-ways and streets into open space.	Long Term	City General Services
2. Prioritize, fund and construct urban trails recommended in the Durham Trails and Greenways plan that improve access to parks and open spaces in underserved areas.	Short Term	Parks and Recreation
3. Encourage non-automobile modes of transportation – transit, bicycle and pedestrian access—to and from parks and open spaces while reducing automobile traffic and parking in public open spaces. Encourage greenway connections between public parks and to transit stations.	Long Term	Parks and Recreation, Transportation
4. Ensure that, where feasible, recreational facilities and open spaces are physically accessible, especially for those with limited mobility.	Long Term	Parks and Recreation

OBJECTIVE 4

PROTECT AND ENHANCE THE BIODIVERSITY, HABITAT VALUE, AND ECOLOGICAL INTEGRITY OF OPEN SPACES AND ENCOURAGE SUSTAINABLE PRACTICES IN THE DESIGN AND MANAGEMENT OF OUR OPEN SPACE SYSTEM

	Timing	Responsibility
1. Acquire or retain property with high suitability ratings based on the Suitability analysis or area identified in Watershed Management Improvement Plans. This may include purchase, retention of City and County owned properties and rights-of-way, or impervious surface transfers.	Short Term	City General Services, County Real Estate, Public Works
2. Continue to monitor, analyze, and update the results of the suitability analysis. Periodically provide new maps and publicly-accessible data.	Short Term	DOST; City-County Planning
3. Include protection and restoration of local biodiversity in construction, renovation, management and maintenance of open space and recreation facilities consistent with the Natural Resources Management Plan.	Long Term	Parks and Recreation
4. Restore stream corridors and riparian buffers in urbanized areas.	Mid Term	Public Works
5. Consider repurposing underutilized publicly-owned properties as open space and recreational facilities.	Mid Term	City General Services
6. When flood plain properties are already developed, encourage their redevelopment to integrate stormwater management and open space amenities, with a particular focus on shopping centers.	Mid Term	Public Works; Private Sector

OBJECTIVE 5

ENGAGE COMMUNITIES IN THE STEWARDSHIP OF THEIR OPEN SPACES

	Timing	Responsibility
1. Engage communities in the design, programming and improvement of their local open spaces, and in the development of recreational programs, with a particular emphasis in East Durham.	Short Term	Parks and Recreation
2. Increase awareness of the City and County open space systems and the Open Space Matching Grants program, with a particular emphasis in East Durham.	Short Term	Parks and Recreation, Durham County Open Space
3. Facilitate the development of community-initiated or supported open spaces.	Short Term	Non- Profits
4. Reduce governmental barriers to community-initiated recreation and open space efforts.	Short Term	City-County Planning
5. Encourage and foster stewardship of open spaces through well-run, active volunteer programs including the Parks Foundation, with a particular emphasis in East Durham.	Mid Term	Parks and Recreation, Parks Foundation
6. Work toward identifying and securing sites of neighborhood community gardens using Open Space Matching Grants, with a particular emphasis in East Durham.	Mid Term	Durham County Open Space, City General Services

OBJECTIVE 6

INCREASE TREE CANOPY IN THE URBAN TIER TO MITIGATE THE EFFECT OF CLIMATE CHANGE AND URBAN HEAT ISLANDS.

	Timing	Responsibility
1. Prioritize and fund replacement street trees on public streets.	Short Term	City General Services
2. Increase urban tree canopy by planting trees on public property, such as parks, cemeteries, schools, and public facilities.	Short Term	City General Services
3. Develop a program to plant new trees on residential properties, initially targeting open space districts 3 and 5 where tree canopy is most deficient.	Short Term	City General Services, Keep Durham Beautiful, Trees Across Durham

VI. Conclusion

City and County of Durham are blessed with both a vital economy and an abundance of natural resources, amenities, and recreational opportunities. These assets make City and County of Durham a particularly attractive place to live, work, and play. Unless we manage growth and plan open spaces into our future, we risk losing the very qualities that attracted us here. Local actions to designate and protect open space areas will play a key role in ensuring the continued high quality of life as City and County of Durham communities grow.

This plan describes the many different types and purposes of open space. It describes how to go about selecting and protecting open space areas. It recommends employing a variety of tools and resources to fully accomplish the job.

To be effective, the plan emphasizes that open space must be an integral part of the overall planning effort. Equally important is the concept of linking together a variety of open space types into a coherent system of open space. Such a system of open space takes on a greater value than just the sum of its individual parts. The open space system will succeed in meeting the needs of community residents when it is based on a vision that they helped to shape. Acquiring or protecting open space areas and constructing facilities represent only the first step in the conservation and protection of land and resources. It is a community's ongoing commitment to land stewardship that ensures its continued enjoyment of open space benefits.