City of Brevard Green Growth Audit

Building Brevard 2030 Comprehensive Land Use Plan Addendum DRAFT FEBRUARY 2026





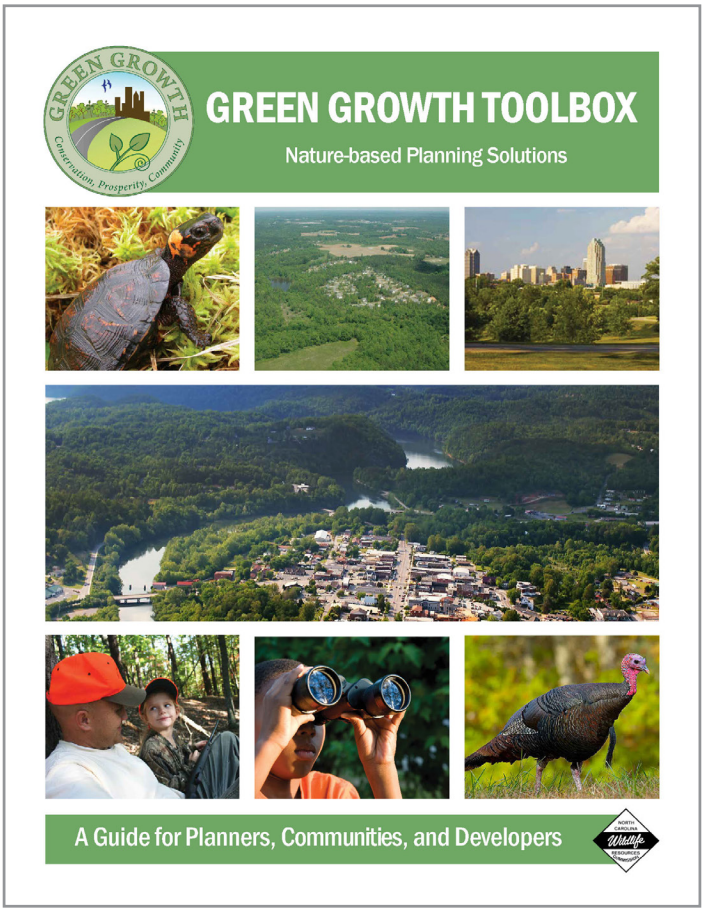
SECTION 01
INTRODUCTION

Background & Purpose

With the French Broad River to the east and Pisgah National Forest to the west, Brevard is surrounded by many valuable natural resources. Brevard's unique geography and natural environment contribute greatly to its desirability as a place to live and visit, yet these resources are continually threatened in different ways. The French Broad River suffers from intermittent water quality issues due to runoff, agriculture, and impacted riparian habitat. Popular recreation sites, such as those in nearby Pisgah National Forest become overcrowded during the summer and are increasingly grappling with how to accommodate large numbers of visitors and their vehicles. Viewsheds and wildlife migration corridors are under threat of development, and non-native invasive species have gained a foothold in some areas.

In recent years, Brevard has experienced steady growth as people continue to move to the area, in large part because of the myriad of benefits – social, economic, physical, etc. – derived from surrounding oneself with nature. However, a large percentage of lands within the City limits and extraterritorial jurisdiction are environmentally sensitive and/or difficult to develop and pose additional threats to the area's native habitats. The City's land use and development regulations are a critical tool in ensuring new development respects and protects Brevard's natural resources and character as "Beautiful Brevard."

"Green growth" means conserving wildlife, habitat, and other valuable natural resources as communities continue to grow. This principle strives to balance new development and economic opportunity with environmental goals, proving development can be both environmentally sustainable and economically beneficial by integrating conservation practices into planning and zoning. In 2023, the City of Brevard requested technical and financial support from the North Carolina Wildlife Resource Commission (NCWRC) as part of their Partners for Green Growth program to audit the City's Unified Development Ordinance (UDO) and provide recommendations for how to better align development regulations with green growth principles. In collaboration with NCWRC, the City has completed a comprehensive review of the UDO to identify opportunities to reduce regulatory barriers to conservation and update regulations to reflect best practices in conservation design.



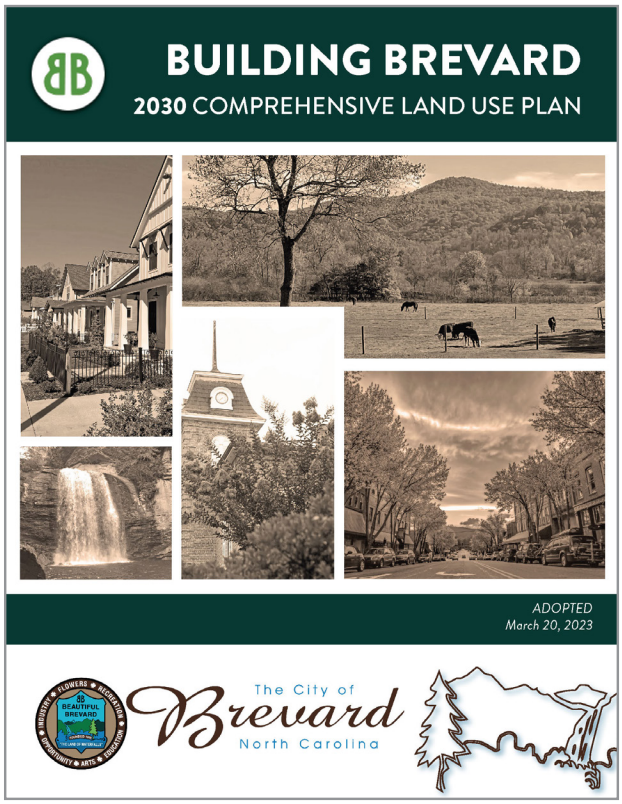
This work was supported by the North Carolina Wildlife Resource Commission as part of the Green Growth Toolbox program.

Policy Analysis

On March 20, 2023, Brevard City Council adopted a new Comprehensive Land Use Plan, **Building Brevard 2030**. The Plan, which can be found at www.cityofbrevard.com/clup, will be used to guide all planning and development decisions over the next decade. The Plan enumerates eight goals for the future of Brevard – many of which are directly related to ensuring the City continues to grow and develop, but in a manner that respects the natural environment and preserve's Brevard's character.

In adopting the Comprehensive Land Use Plan, City Council has effectively charged the Planning staff with seeking out best practices in conservation design and land use planning. These goals are then followed with recommendations, an entire section of which is centered around Parks, Natural Resources & Cultural Resources (PNRC). These include:

- PNRC-5: Require conservation design in areas with sensitive cultural resources.
- PNRC-6: Encourage natural amenities to be preserved as open space in new development.
- PNRC-10: Preserve steep slopes and natural areas adjacent to Pisgah Forest.



BUILDING BREVARD 2030 GOALS

1. Expand housing opportunities for all residents while preserving the character of Brevard and its neighborhoods.
2. Encourage a development pattern that respects Brevard's sense of place and prioritizes livable communities.
3. Ensure fairness and equity in providing for the health, safety, and welfare of all citizens and groups.
4. Create a built environment that prioritizes a safe, active, multi-modal transportation system and community health and wellness.
5. Celebrate Brevard's natural resources through conservation of environmentally sensitive areas, improving access to recreation, and restoration of native ecosystems.
6. Integrate arts, culture, diversity, and history into everyday life and build on Brevard's identity as a dynamic community to live, work, play, and create.
7. Support economic vitality and grow the tax base, cultivate local businesses, and attract sustainable industry.
8. Plan for efficient, equitable, and resilient infrastructure and services that maintain and improve quality of life throughout the city.

- PNRC-11: Preserve and restore natural areas adjacent to the French Broad River.
- PNRC-13: Encourage the use of native species in public projects and private development.
- PNRC-16: Maintain and improve diversity (age and species) of the urban tree canopy.

Upon formal adoption, this document shall serve as an addendum to the Building Brevard 2030 Comprehensive Land Use Plan, providing updated guidance, technical analysis, and recommended regulatory strategies that support green growth.

Purpose and Objectives

Conducting a Green Growth Audit of Brevard's Unified Development Ordinance (UDO) serves as a critical step in ensuring that urban development aligns with sustainability, environmental preservation, and climate resilience goals. The UDO is the foundational regulatory framework that governs land use, building design, infrastructure, and environmental protections within the city. By auditing these standards, we can assess how well they promote sustainable growth, reduce environmental impacts, and improve the quality of life for all residents.

Building off the existing goals and recommendations from the City's Comprehensive Land Use Plan, this plan seeks to accomplish the following objectives:

- Analyze the UDO's effectiveness in promoting sustainable development, reducing environmental impact, and enhancing resilience to climate change.
- Identify opportunities to reduce regulatory barriers to conservation; align ordinance requirements with best practices in conservation design and sustainability goals; enhance requirements for native plantings and vegetation preservation; and incentivize greater wildlife habitat protections in sensitive areas.
- Develop actionable recommendations to strengthen the UDO's alignment with green growth principles and ensure that future growth does not compromise environmental health or exacerbate inequities.



Pedestrian bridge over Davidson River. Image Source: City of Brevard

Environmental Context

Nestled amongst thousands of acres of pristine forests and iconic natural vistas, Brevard occupies a unique geographical position that makes it both ecologically rich and sensitive to environmental changes. Transylvania County's landscape is a dynamic mix of dense forests, luscious native vegetation, and picturesque mountain streams, all of which support a wide variety of wildlife and plant species. These natural habitats provide essential ecosystem services, including clean water filtration, carbon sequestration, and soil stabilization. However, the region's environmental diversity also means it is particularly vulnerable to disruptions caused by climate change, deforestation, and urban expansion. Rising temperatures, changing precipitation patterns, and increased human activity put pressure on these delicate ecosystems, creating an urgent need for responsible stewardship.

Biodiversity and Wildlife Habitats

Transylvania County is home to a diverse range of habitats, from lush hardwood forests and rolling hills to pristine streams and waterfalls, creating an ideal environment for numerous plant and animal species. It is part of the Southern Appalachian biozone, which supports unique species of flora and fauna. The region boasts an array of bird species, including the peregrine falcon and Carolina chickadee, while also providing shelter for mammals like black bears, deer, squirrels, and foxes. The rich variety of wildflowers, such as trillium and mountain laurel, further emphasizes the area's ecological significance. This extensive biodiversity is nurtured by the area's diverse elevation changes, climate, and preservation efforts, making Transylvania County a vital part of North Carolina's natural heritage.

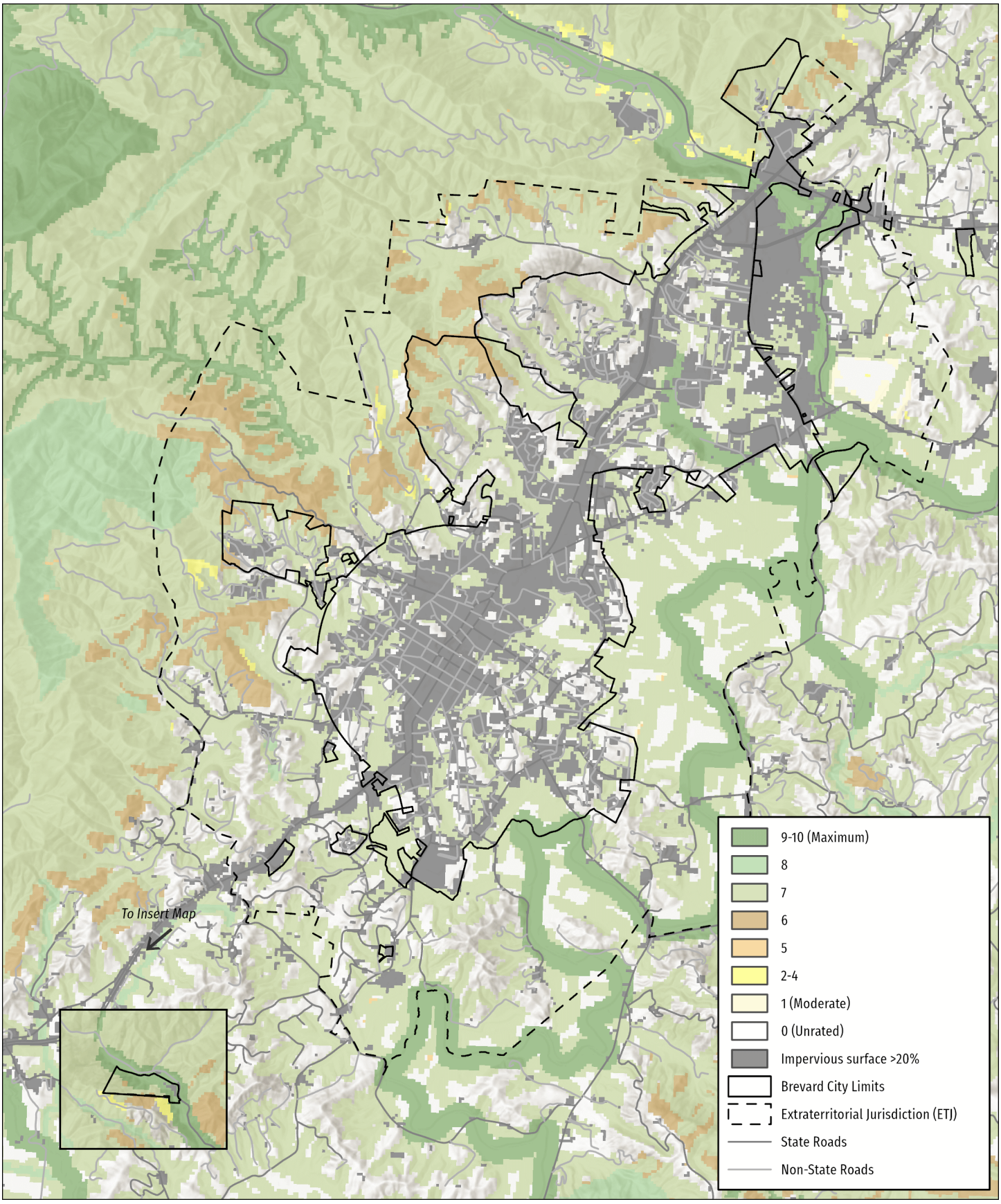
The Biodiversity and Wildlife Habitat Assessment, developed by the North Carolina Natural Heritage Program (NCNHP) represents the highest priority areas for conservation of wildlife habitat and biodiversity within the state. The assessment concluded that much of the City's jurisdiction is highly prioritized for conservation (ranked 7 to 10 in the BWHA) and are home to the rarest species and habitats. These high-priority areas are concentrated on the outer edges of the City's corporate limits and within the extraterritorial jurisdiction (ETJ). A large portion of the City's corporate limits appear as grey within the assessment as they are deemed to be developed areas with an impervious surface coverage greater than 20%. Concentrating development in and around already developed areas will preserve the environmentally sensitive areas and wildlife habitat connections that exist on the outer edges of the city limits.

Many of the species that make up the diverse ecosystem of Transylvania County are rare, threatened, or endangered. These species are at risk of becoming extinct due to factors such as habitat loss, climate change, and pollution. The area is known to have several federally protected wildlife and plant species, including the Bog Turtle, along with other state protected flora and fauna. Conservation efforts are crucial to protect these species. If these species are not preserved, it can lead to the loss of biodiversity, disrupting ecosystems and affecting the balance of nature. A full list of the rare, threatened and endangered species found within a one-mile radius of Brevard is included in the Appendix.



Bog tutle. Image Source: Jeff Hall via North Carolina Wildlife Resource Commission

Biodiversity and Wildlife Habitat Assessment



Data Sources: North Carolina Natural Heritage Program

Managed and Natural Areas

Brevard has multiple Managed Areas and Natural Areas, as identified by North Carolina Natural Heritage Program (NCNHP), within the City's planning Jurisdiction:

- **Natural Areas** are terrestrial and aquatic sites that are of special biodiversity significance. The significance may be due to the presence of rare species, high-quality natural communities, or important animal assemblages, or other ecological features. These areas were identified by NCNHP staff based on field survey and ecological characteristics.
- **Managed Areas** are properties and easements where natural resource conservation is one of the primary management goals. It also includes some areas that have value as conserved lands because it could support rare species and protect intact, high-quality natural areas were open space is scarce. Over half of Transylvania County is designated as public land that is protected from development and preserved for recreation. Brevard's jurisdiction abuts Pisgah National Forest, but the County is also home to Dupont State Recreational Forest, Gorges State Park, Headwaters State Forest, and the Blue Ridge Parkway. *[See list on following page]*

Natural Areas within Brevard's Jurisdiction

Name	Owner	Rating
French Broad River / Upper French Broad Aquatic Habitat	Public Waters	Exceptional
Bracken Mountain / Wolfpen Cove	City of Brevard / Private	High

Source: North Carolina Natural Heritage Program

Topography

Brevard's topography is defined by its location within the foothills of the Blue Ridge Mountains, where steep slopes, narrow floodplain valleys, and abrupt elevation changes strongly influence land use patterns. Hillsides and sloping terrain surround much of the city, creating natural limits on where development can safely occur. These steep slope areas are prone to erosion, soil movement and landslide activity when disturbed, particularly during heavy rainfall events that are common in Western North



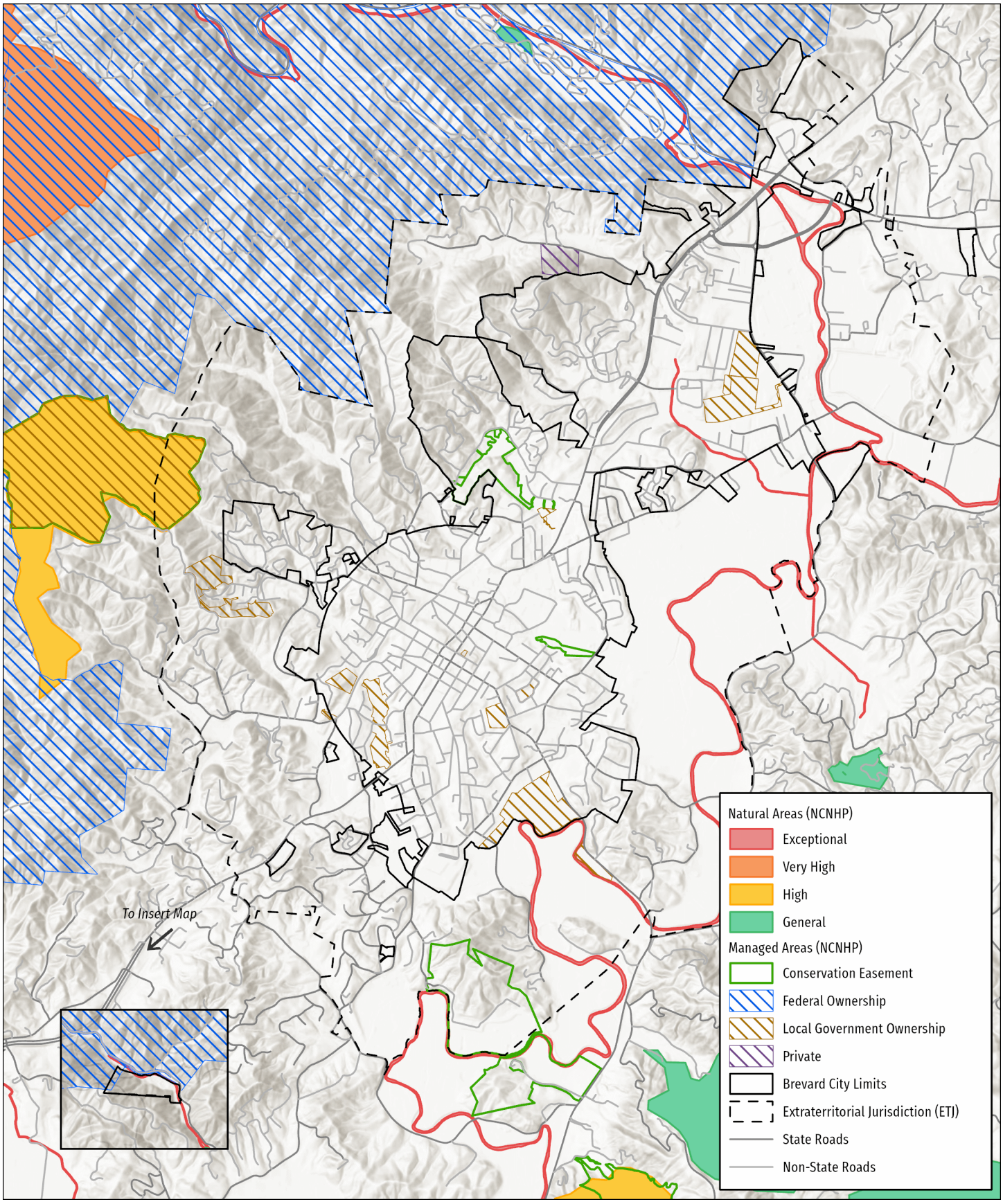
Bracken Preserve trail. Image Source: Conserving Carolina.

Managed Areas within Brevard's Jurisdiction

Name	Owner	Acres	Category	Status / Use
Bracken Preserve	City of Brevard	399.45	Fee Simple Ownership / NC Land and Water Fund Agreement	Managed Open Space
Bracken Preserve Extension	City of Brevard	33.27	Fee simple Ownership	Managed Open Space
Brevard Sports Complex	City of Brevard	19.88	Fee Simple Ownership	Managed Open Space
Tannery Park – North	City of Brevard	12.84	Fee Simple Ownership	Managed Open Space
Tannery Park – South	City of Brevard	12.19	Fee Simple Ownership	Managed Open Space
Hap Simpson Park	City of Brevard	8.8	Fee Simple Ownership	Managed Open Space, Floodway
Franklin Park	City of Brevard	4.22	Fee Simple Ownership	Managed Open Space
Dog Park	City of Brevard	2.64	Fee Simple Ownership	Managed Open Space
Poplar Street Extension	City of Brevard	2.5	Fee Simple Ownership	Managed Open Space, Floodway
Deerwoode Reserve	Conserving Carolina	166.65	Easement	Managed for biodiversity, Disturbance events suppressed
Deerlake Village Lake and Conservation Area	Conserving Carolina	40.38	Easement	Managed for biodiversity, Disturbance events suppressed
Elk Lodge Mountain	Conserving Carolina	20.3	Fee Simple Ownership	Managed for biodiversity, Disturbance events suppressed
Conserving Carolina Easement	Conserving Carolina	0.82	Easement	Managed for biodiversity, Disturbance events suppressed
Kings Creek	NCDEQ Stewardship Program	7.08	Easement	Managed for biodiversity, Disturbance events suppressed
Transylvania County Sports Complex	Transylvania County	35.67	Fee Simple Ownership	Managed Open Space
Silvermont Park	Transylvania County	8.27	Fee Simple Ownership	Managed Open Space
East Probart Street Property	Transylvania County	0.46	Fee Simple Ownership	Unmanaged Vacant Land, Available for Disposition / Development

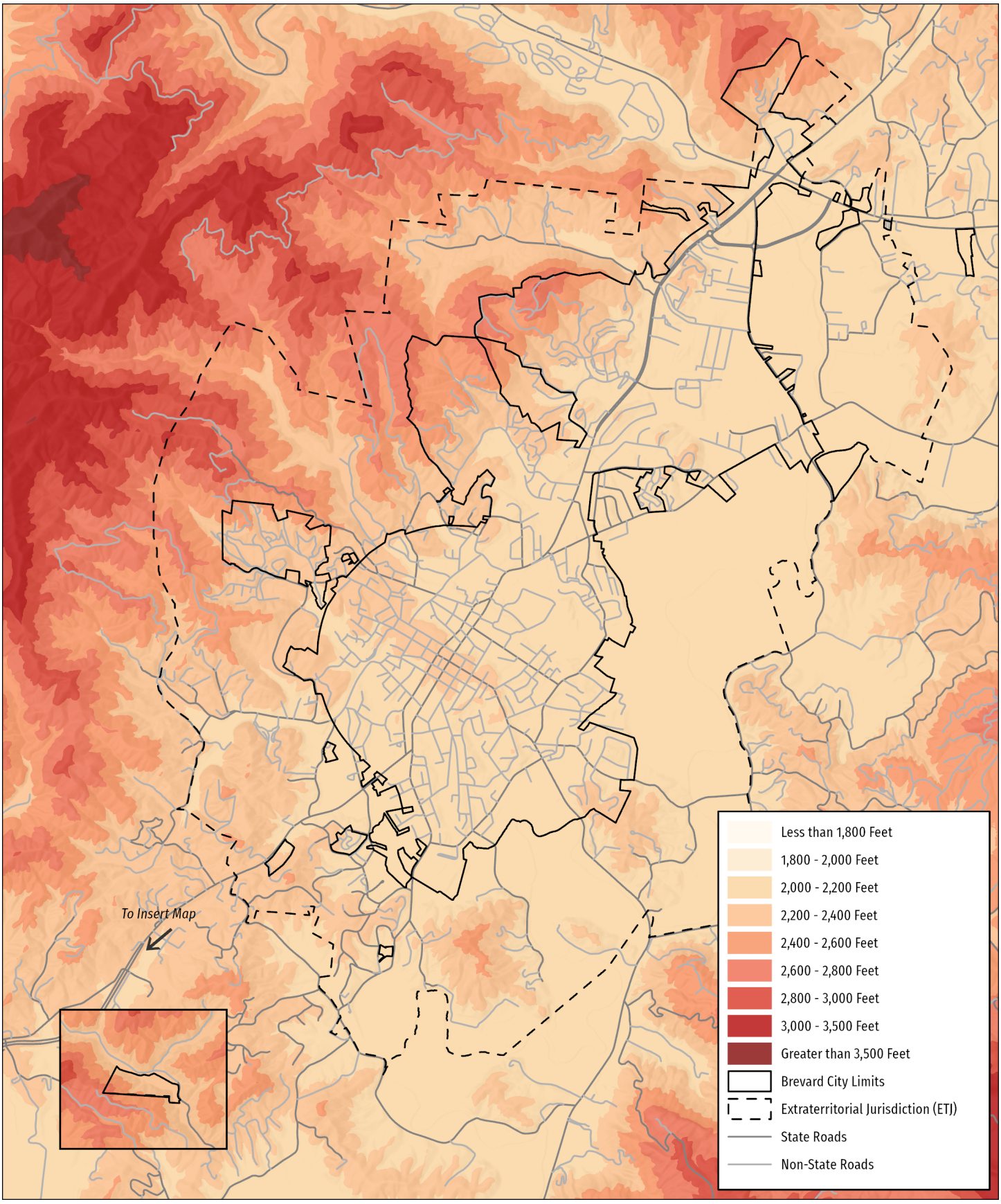
Source: North Carolina Natural Heritage Program

Natural and Managed Areas



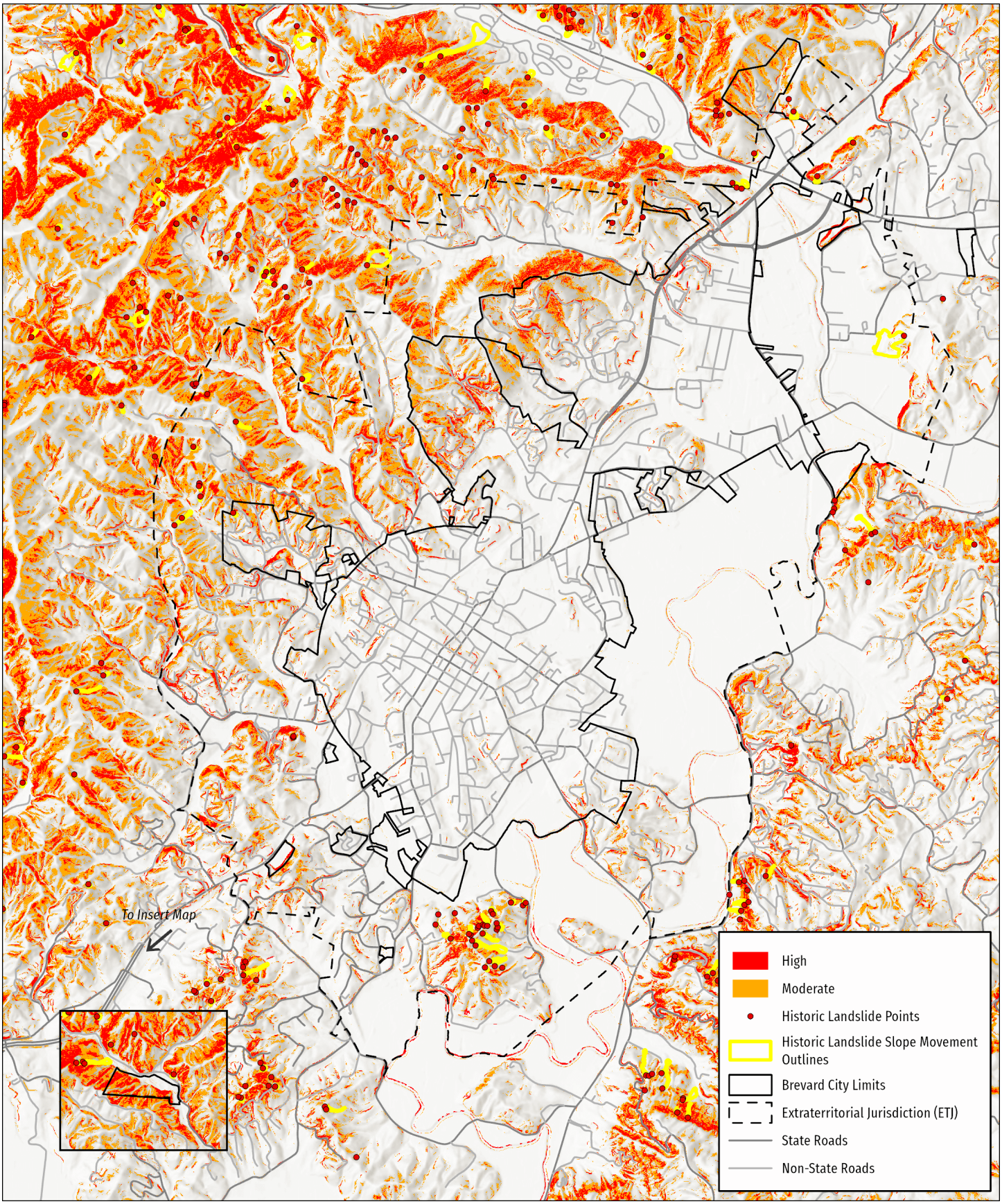
Data Sources: North Carolina Natural Heritage Program

Elevation



Data Source: NC OneMap

Landslide Susceptibility



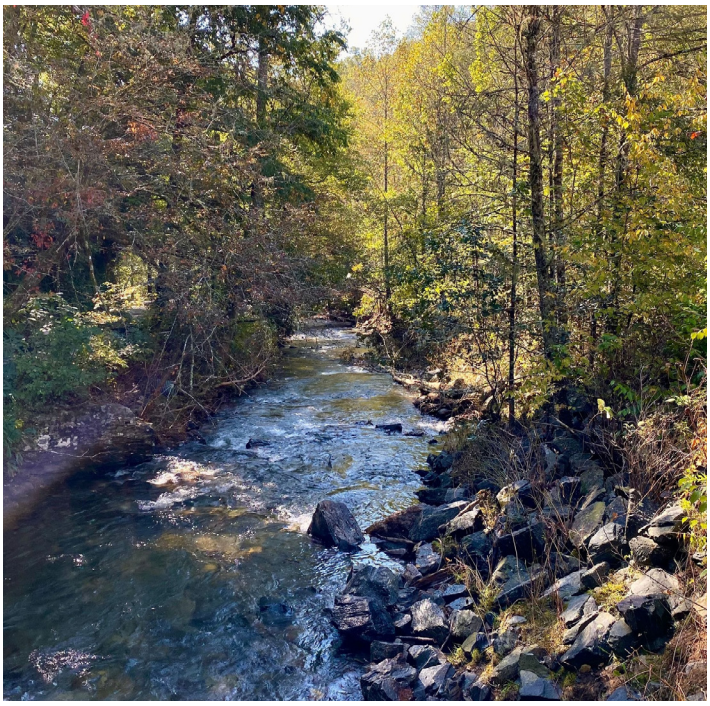
Data Sources: North Carolina Department of Environmental Quality and North Carolina Geological Survey

Carolina. Much of the area has moderate to high landslide susceptibility, especially on steep hillsides with shallow soils or where vegetation has been removed. Excessive grading or vegetation removal can destabilize slopes, damage downstream waterways through sedimentation, and increase the likelihood of slope failures and localized flooding in lower elevations.

The presence of steep slopes and landslide-prone terrain also affects infrastructure and long-term resilience. Road construction, utility installation, and building foundations become more complex and costly on sloping land, often requiring retaining walls, specialized drainage systems, geotechnical analysis, and enhanced erosion control measures. Stormwater moves rapidly downhill, increasing runoff volumes and velocities that can overwhelm drainage systems and futher destabilize slopes if not carefully designed. For these reasons, protecting steep slopes and landslide-susceptible areas through development limits, slope-based standards, and preservation of natural vegetation is critical to reducing hazards, maintaining water quality, and preserving the scenic mountain character that defines Brevard.

Hydrology

Brevard is located within the French Broad River Basin, near the river's headwaters, , and experiences some of the highest rainfall totals in North Carolina due to its position along the eastern escarpment of the Blue Ridge Mountains. This high rainfall, combined with Brevard's hydric and saturated soils pose a significant challenge for denser forms of development due to their limited bearing capacity and persistently high groundwater levels. These soils are commonly found in floodplain and valley areas and often remain wet for extended periods, especially during the region's frequent and intense rainfall events. Prolonged soil saturation reduces soil stability, complicates building foundations, and limits on-site stormwater infiltration, increasing the risk of flooding, erosion, and structural damage when development intensity increases. As density rises, these constraints become more pronounced, making site design more complex and costly and often necessitating additional

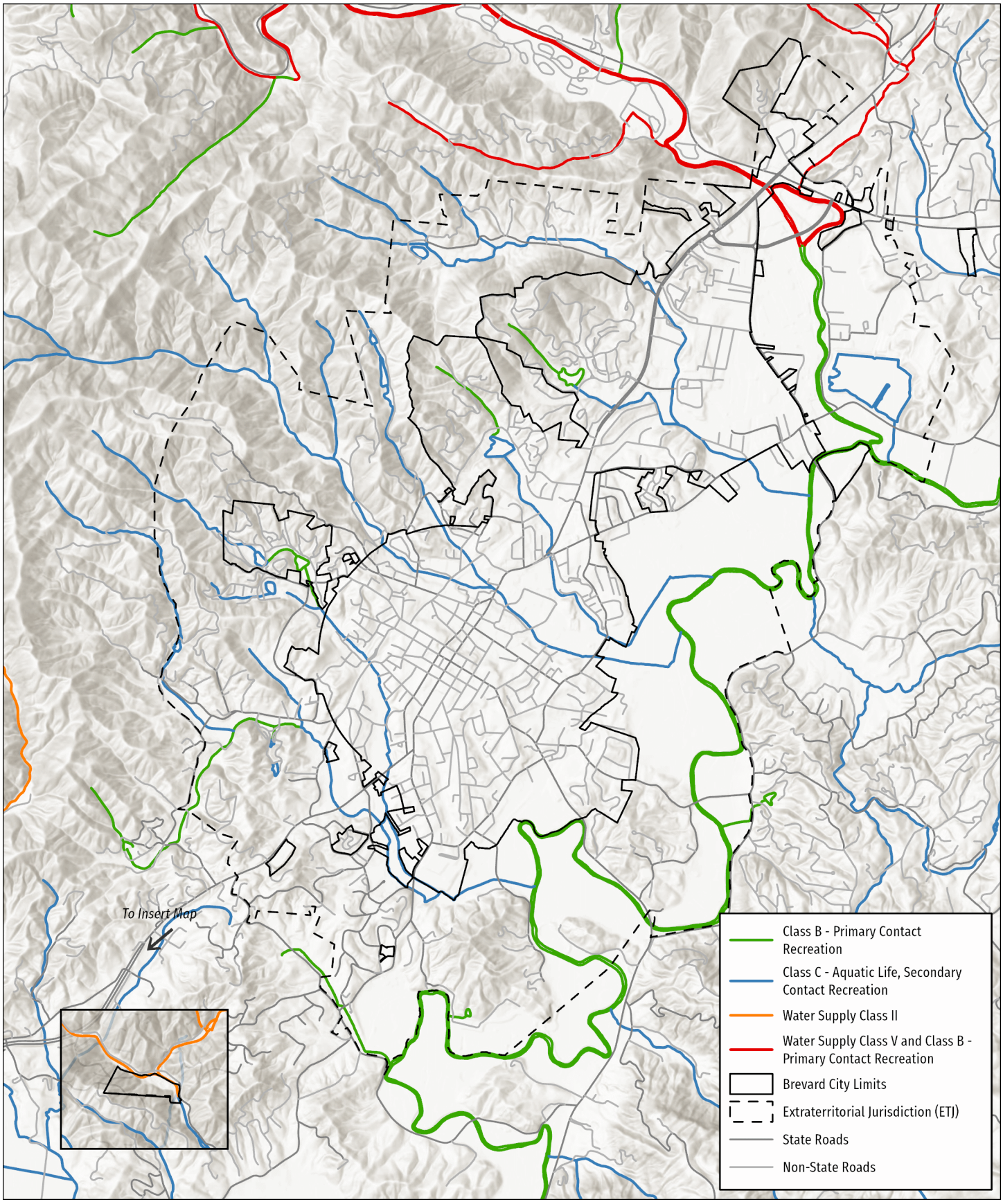


Cathey's Creek, the City of Brevard's municipal water intake. Image Source: City of Brevard.

engineering measures to ensure safe, resilient development while protecting surrounding properties and natural hydrologic functions. The high water tables also impact buried infrastructure by causing that infrastructure to move or degrade faster than in unsaturated soils, adding to the long-term maintenance costs borne by both the property owner and the City.

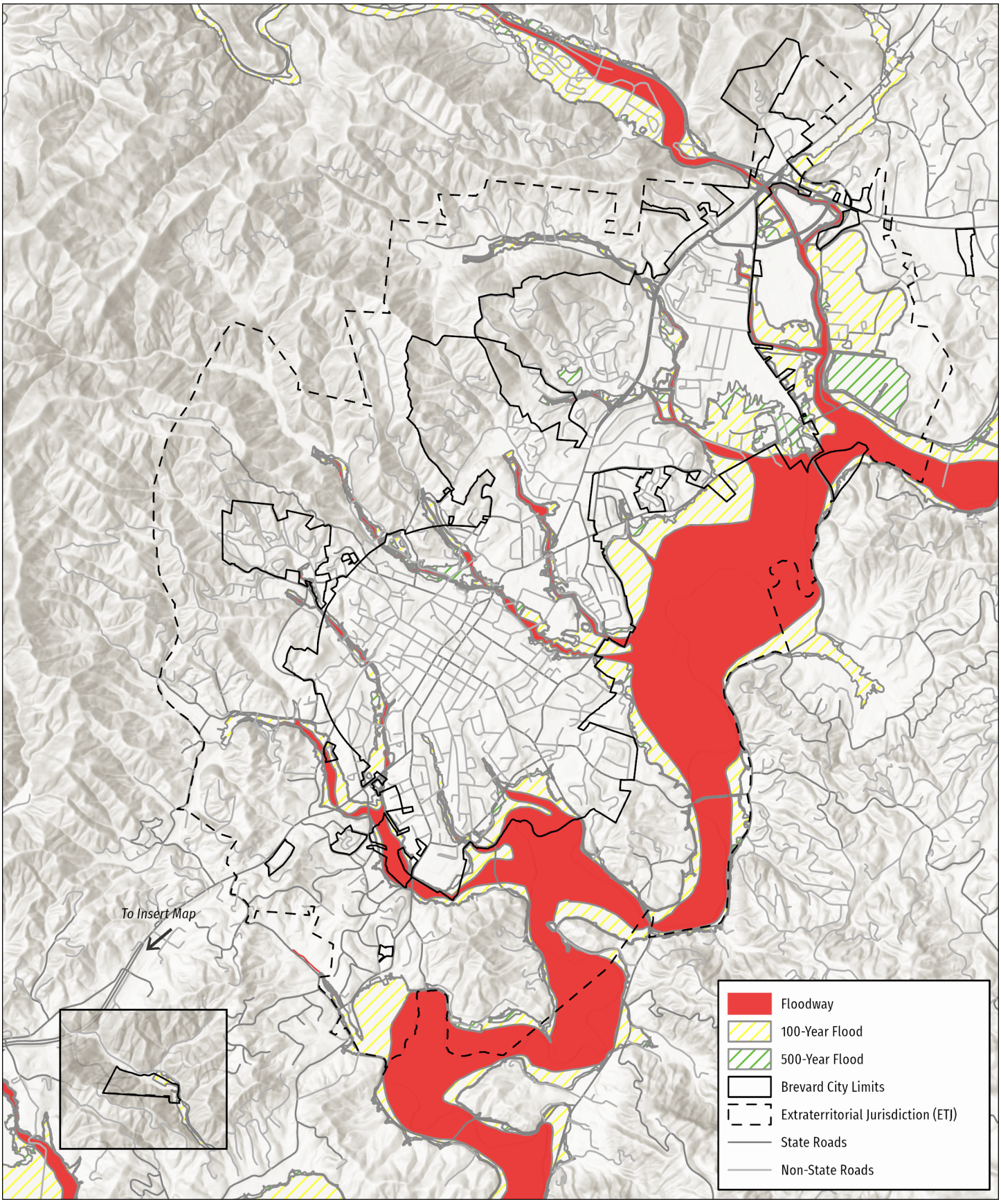
In and around Brevard, small creeks play important roles in local water supply and ecosystem function, especially in the context for high rainfall and rapid runoff. Cathey's Creek, a tributary of the French Broad, has been the focus of restoration efforts to stabilize streambanks and reduce sedimentation that can impact water quality and municipal intake structures. These surface waters also support a network of wetlands and riparian habitats that provide critical ecological services — from slowing and filtering runoff to sustaining fish and wildlife — while helping alleviate downstream impacts during heavy rainfall events, even as they face pressures from development and changing land use. Rehabilitation, stabilization, and restoration are essential for Brevard's streams because these practices directly protect sensitive riparian habitats, create accessible corridors

Surface Waters



Data Source: North Carolina Department of Environmental Quality Division of Water Resources

Flood Hazard Areas



Data Source: FEMA Flood Risk Information System

for Brevard's keystone species along restored waterways, and re-establish native plant and aquatic communities that form the foundation of Brevard's natural ecosystems.

The City and its extraterritorial jurisdiction have many flood hazard areas which is primarily associated with the city's proximity to the French Broad River and numerous local creeks that flow from the surrounding Blue Ridge Mountains. These waterways can overflow their banks during periods of heavy rainfall creating zones that are prone to inundation. The Federal Emergency Management Agency (FEMA) designates certain lands around these water bodies as Special Flood Hazard Areas, which are depicted on the community's Flood Insurance Rate Maps (FIRMs). Properties within these high-risk flood zones face a 1% or greater annual chance of flooding (often referred to as the 100-year floodplain) and are subject to strict development standards and, in many cases, higher flood insurance requirements. Even outside designated special flood hazard areas, localized flash flooding can occur due to the steep terrain and high annual precipitation typical of the region, making awareness of flood risk important for all residents.

Recent flooding events associated with Tropical Storm Fred (2021) and Tropical Storm Helene (2024) have underscored the vulnerability of Brevard and Transylvania County to extreme rainfall and flood hazards. When Fred moved through the region in August 2021, heavy, prolonged rains fell over the headwaters of several Western North Carolina rivers, including those feeding into the French Broad. Near Brevard, radar estimates showed more than ten inches of rain over several days. The saturated soils and mountainous terrain contributed to rapid runoff and elevated river levels, leading to localized flooding, washed-out roads, and damaged infrastructure across the area.

In late September 2024, Tropical Storm Helene brought an even more dramatic flooding event to Western North Carolina. Before Helene arrived, a stationary front had already saturated soils and raised stream levels, setting the stage for disaster. As Helene passed over the Blue Ridge Mountains, extraordinary rainfall totals, with measurements above 18 inches in parts



Barn on Old Hendersonville Highway during Tropical Storm Helene. Image Source: Nick Haseloff, Transylvania Times.

of Transylvania County, led to historic flooding and flash flood emergencies across the region, with life-threatening water rises and widespread inundation. The storm's impacts included flooded homes, road washouts, downed trees and power lines, and extensive community disruption. In Transylvania County, rainfall totals exceeded previous records, and river gauges in the broader region recorded crest levels well above historic marks.

Trees and Green Infrastructure

The urban environment is made up of both the built and natural elements that shape people's daily surroundings. Trees and vegetation planted throughout cities (whether in forested parks, private yards, or along public rights-of-way) collectively form the urban forest that envelops a community. This urban forest and its tree canopy provide essential cooling and environmental services in developed areas. Trees function as natural shade structures that block solar radiation, filter and absorb air pollutants, reduce heat through evapotranspiration, and capture and store carbon. Beyond these environmental benefits, access to trees and green spaces offers



Children plant trees with the City's Public Works Department at 2025 Arbor Day Celebration. Image Source: City of Brevard

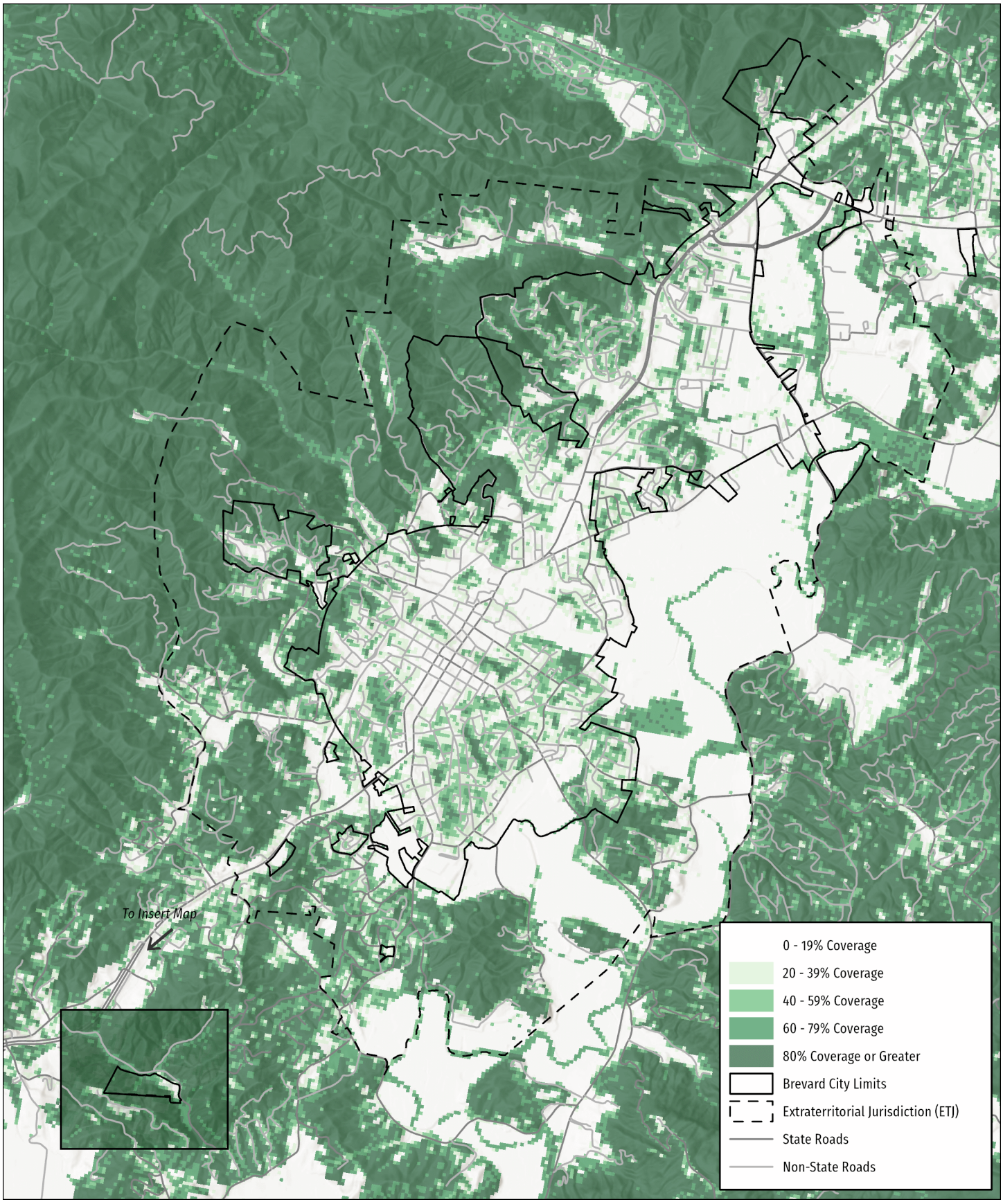
significant physical and mental health benefits for people who spend time in nature.

A growing body of scholarly research demonstrates a strong connection between exposure to nature and improved human health. A landmark 1984 study by Roger Ulrich and colleagues at the University of Delaware found that hospital patients recovering from surgery experienced measurably better outcomes when they had views of natural landscapes rather than built environments. Patients with views of nature had shorter hospital stays, required fewer pain medications, and received fewer negative evaluations in clinical notes. Since that time, numerous studies have confirmed that time spent in natural environments can reduce stress, enhance cognitive function, lower blood pressure, improve respiratory and immune function, and support healthy childhood development.

Despite these well-documented benefits, urban areas often lose trees and green space as development intensifies. Expanding and maintaining green infrastructure, including the urban forest, helps restore natural processes that are essential for creating healthier, more resilient cities. However, trees are not always treated as critical urban infrastructure. Like roads, utilities, and stormwater systems, the urban forest requires deliberate planning, regulation, monitoring, and ongoing maintenance to preserve and maximize its long-term benefits for the community.

The City of Brevard has been recognized as a Tree City USA by the Arbor Day Foundation for more than 45 years. Being recognized as a Tree City USA means that a community has demonstrated a strong and ongoing commitment to responsible urban forestry management, and Brevard exemplifies this commitment through its day-to-day practices. To earn and maintain this designation, a city must meet four core standards: establish a tree board or department, adopt a public tree care ordinance, maintain a community forestry program with an annual budget of at least $2 per capita, and celebrate Arbor Day each year. Together, these efforts show that Brevard invests meaningfully in the health, safety, and sustainability of its urban forest, strengthening neighborhood character and improving environmental resilience.

Tree Canopy Cover



Data Source: National Land Cover Database



SECTION 02
GREEN GROWTH AUDIT

Strategy 1: Conservation of Land with Efficient Development Strategies

Land use patterns play a critical role in conservation efforts by regulating how land is developed and utilized, ensuring that areas that are important for wildlife, natural resources, and ecosystems are protected. However, many conventional development practices – such as minimum lot sizes, predominately single-family zoning districts, and excessive parking requirements – separate land uses, extend infrastructure outward, and alter natural landscapes in ways that break up habitat, reduce ecological connectivity, and induce sprawling patterns.

Sustainable development code regulations ultimately strike a balance between accommodating growth and preserving the natural assets that make communities healthy, livable, and resilient. By applying certain lower-density zoning districts in sensitive areas, local governments can limit the amount and type of development that occurs. Conversely, increasing density and encouraging development in already established areas can limit sprawl, offer cost savings for developers, and preserve undisturbed natural land.

Strategy 1.1: Limit Development in Sensitive Areas

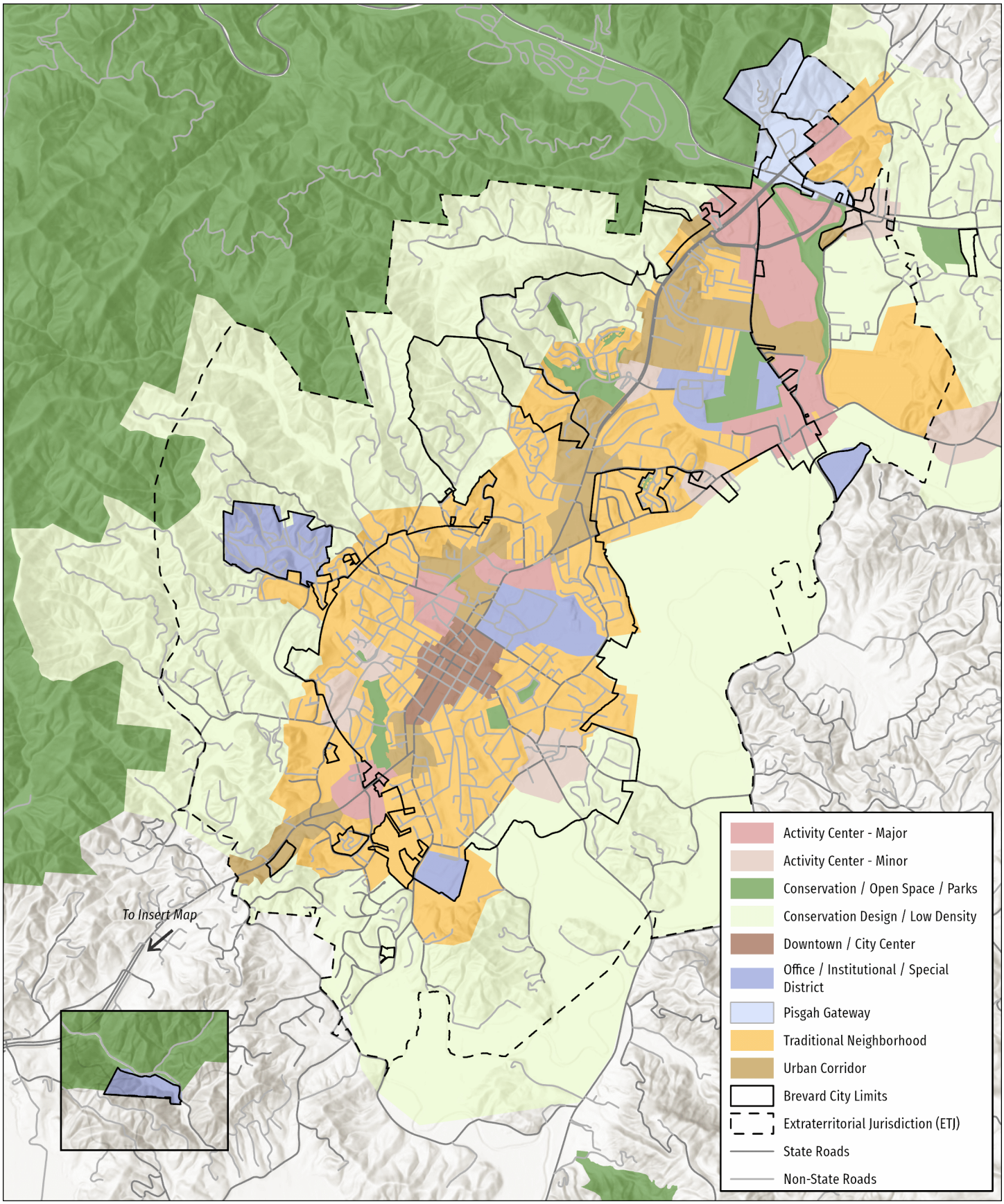
Conservation design is a type of development that clusters structures and site improvements together on a portion of a site while reserving the remainder of the site for open space. Smaller lots are typically used in the developed portion of the site and density transfers from constrained areas of the site are encouraged in zoning regulations. This alternative type of neighborhood design provides flexibility, particularly in areas with challenging topography. There are also cost savings in

POLICY ANALYSIS DEEP DIVE: CITY OF BREVARD FUTURE LAND USE MAP

As part of the Building Brevard 2030 Comprehensive Land Use Plan, the City reviewed development patterns and identified areas for future development. The Future Land Use Map shows the intended land use pattern in Brevard. It is intended to guide development, manage growth, and inform land use decision-making. Character areas identify the anticipated development intensity and variation of land uses. The majority of the City's jurisdiction that is restricted by steep slopes or flood hazard areas were identified as "Conservation Design / Low Density." The typical uses for this character areas are single-family and low-density multi-family residential, agriculture, outdoor recreation, and lodging. Other character areas, such as the Downtown / City Center, Urban Corridor, and Activity Centers, are identified as much higher density and are typically clustered around major transportation thoroughfares, infrastructure, and/or public facilities. Many of the recommendations encourage a growth pattern that takes advantage of existing infrastructure, redevelopment of underutilized parcels, and preservation of existing lower density areas.

- LUH-4: Identify areas across the City that are best positioned to accommodate future growth.
- LUH-5: Consider adjustments to the development approval process and other incentives that meet defined criteria in growth opportunity areas.
- LUH-9: Evaluate and amend development ordinances to facilitate infill development on vacant and underdeveloped parcels, as well as revitalization of developed parcels.
- LUH-24: Refine zoning districts and slope regulations in constrained areas.
- LUH-25: Limit the scale and footprint of new development in Conservation Design / Low Density areas identified on the Future Land Use Map.

Future Land Use Map



Data Source: Building Brevard 2030: Comprehensive Land Use Plan, City of Brevard



Equipment before construction. Image Source: City of Brevard

development costs due to less road surface, shorter utility runs, and reduced grading and site preparation. The preserved land may be owned and managed by a homeowner's association or a land trust.

The City considered the creation of a conservation subdivision type as part of a recent amendment to the subdivision and lot requirements (Chapter 4); however, the ordinance already allows for the flexibility that is typically offered in exchange for environmental conservation – no minimum lot size, variety in types of residential development (townhomes, quadraplexes, etc.), and reduced road frontages.

> *"There is no minimum lot size for any newly established lots... no subdivision (exempt, minor, or major) of land shall create more lots than the underlying zoning district's residential density... Additional lots may be created above this threshold, provided they are protected from any future development, such as lots reserved for the provision of open space, shared infrastructure, or conservation of environmentally sensitive areas." (UDO Section 4.2.2)*

Instead, the amendment increased options for development options that allow for a more creative site design by allowing developments with more than one principal building by-right ("group developments").

The Future Land Use Map identifies the areas on the outer edges of Brevard's jurisdiction, that are characterized by higher elevation areas with steep slopes and low-lying flood hazard areas, as "Conservation Design / Low-Density." Much of these areas are zoned General Residential-4 (GR4), a low-density, predominately residential district. This zoning district could be reframed as a "Conservation Zoning District" with the stated purpose of the district being to conserve sensitive areas and limit sprawled development. The new "Conservation Zoning District" would incorporate stricter setback requirements, restrict allowed uses, require extra environmental review, and implement other recommendations from this document.

RECOMMENDATIONS:

A. Maintain the City's no minimum lot size and associated flexibility in calculating development density on the parent parcel, allowing the clustering of development in less sensitive areas and accommodating unique environmental conditions (UDO Section 4.2.2)
B. Reframe the General Residential–4 (GR-4) zoning district as a "Conservation Zoning District" with the stated purpose of the zoning district being to conserve sensitive areas and limit sprawled development

CASE STUDY: CHAPEL HILL, NC RESOURCE CONSERVATION DISTRICT

Chapel Hill's Resource Conservation District (RCD) is an overlay zoning district established to protect environmentally sensitive features – specifically stream corridors, waterbodies, and associated floodplains – by placing additional development restrictions on top of the underlying zoning. The RCD is intended to preserve water quality, reduce flood risk and property damage, prevent erosion and sedimentation, and maintain wildlife habitat and vegetated corridors along perennial and intermittent streams. Within RCD, limits are placed on impervious surfaces, land disturbance, and allowable development to ensure that natural hydrology and ecological integrity are conserved; many structures and significant land disturbances simply are not permitted without special review or exemptions.

Strategy 1.2: Prioritize Infill Development in Regulations

Infill development is a crucial strategy for fostering sustainable urban growth. By focusing on underutilized or vacant land within existing city boundaries, infill development helps minimize urban sprawl and reduces the need to expand infrastructure into rural areas. This approach makes better use of existing resources, such as roads, utilities, and public transit systems, which are already in place, thus decreasing costs and environmental impact. Additionally, infill development can revitalize neighborhoods, bringing in new housing, businesses, and amenities, while preserving green spaces and promoting walkability. Ultimately, it contributes to building more resilient, vibrant cities with reduced ecological footprints.

The City of Brevard's zoning regulations lay the groundwork for denser development to occur as infill. At a foundational level, the higher density zoning districts, such as Downtown Mixed-Use and Corridor Mixed-Use, are concentrated around existing infrastructure and away from sensitive areas. Furthermore, changes to the development ordinance in recent years have focused on removing the regulatory barriers to infill development. This includes:

- Accessory dwelling units allowed by-right on residential parcels;
- Missing middle housing types, such as triplexes and quadraplexes, allowed by-right in all residential zoning districts, provided the number of dwelling units complies with the density restrictions; and
- Irregular (also known as "flag") lots allowed with reduced road frontage to facilitate better utilization of land.

In addition to the cost savings associated with utilizing existing infrastructure, the current development regulations offer some incentives for developers that pursue infill development, including:

- Residential infill development and redevelopment that results in no net increase of impervious surface area on a property are exempt from stormwater management requirements (see Strategy 2.3);
- Variations in setbacks are permitted for infill developments (average setback on already-built-upon lots fronting on the same street); and
- Reduced parking requirements in certain zoning districts (denser, mixed-use), near on-street and/or public parking options.

A common way for municipalities in other states to incentivize infill development is to offer waivers or reductions of permitting fees or impact fees. In North Carolina, municipalities are not allowed to offer fee waivers or reductions to certain types of developments. Instead, any incentives will likely need to be regulatory in nature like adding height allowances, decreasing dimensional requirements (i.e., setbacks), and establishing density bonuses.

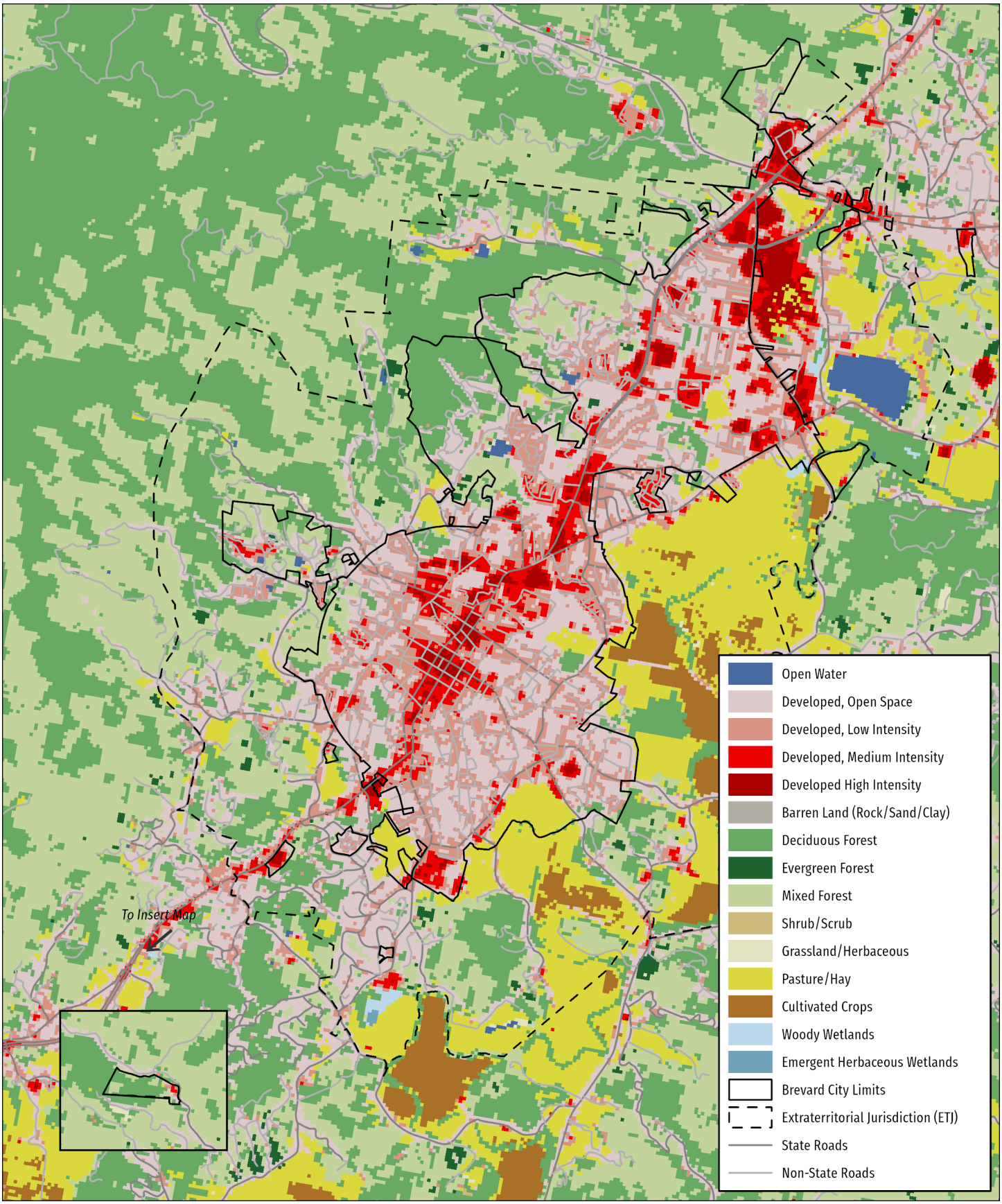
RECOMMENDATIONS:

A. Consider additional incentives for infill development, such as adding height allowances, decreasing dimensional requirements (i.e., setbacks), and establishing density bonuses.
B. Upzone any areas of the existing GR-4 that are suitable for development and do not require additional environmental protections (consider as part of Action 1.1(B))



Infill development near Downtown Brevard. Image Source: City of Brevard.

Land Cover



Data Sources: National Land Cover Database

Strategy 2: Mitigation of the Negative Impacts of Development

The mitigation of negative impacts of development is essential for green growth as it ensures that economic expansion does not come at the expense of environmental health. By implementing effective mitigation strategies, such as protecting green spaces and reducing pollution, we can create a growth model that supports long-term prosperity without compromising natural resources. Ultimately, it demonstrates that a thriving economy and a healthy environment are not mutually exclusive, but rather, they can be mutually reinforcing.

Strategy 2.1: Require Environmental Assessments Prior to Large-Scale Construction

Including environmental assessments early in the development review process provides significant value by informing site design before major investments are made. Early identification of natural features (such as streams, wetlands, steep slopes, flood hazard areas, tree canopy, sensitive habitats, and wildlife corridors)

POLICY ANALYSIS DEEP DIVE: SOUTH MOUNTAINS REGIONAL HAZARD MITIGATION PLAN

Initially adopted in 2014 and most recently amended in 2025, the South Mountains Regional Hazard Mitigation Plan is a multi-county effort developed by Henderson, Polk, Rutherford, and Transylvania Counties — along with their municipalities — to reduce long-term risks from natural hazards. Updated on a five-year cycle in coordination with FEMA and North Carolina Emergency Management, the plan provides a detailed assessment of regional vulnerabilities, including flooding, landslides, winter storms, severe thunderstorms, drought, extreme heat, and wildfires. It analyzes past hazard events, maps areas of high exposure, and evaluates future risk trends, such as the increasing likelihood of drought and heat events. This risk assessment forms the foundation for identifying which communities, infrastructure, and environmental resources require the greatest protection. Building on that analysis, the plan outlines a comprehensive strategy for mitigation, emphasizing prevention, property protection, resource conservation, public education, emergency preparedness, and targeted capital improvements. The plan also calls for local governments to integrate mitigation principles into zoning, land-use planning, building codes, and green infrastructure development.

By adopting and implementing the plan, participating jurisdictions remain eligible for federal mitigation grants and position themselves to reduce disaster impacts, protect lives and property, and strengthen long-term community resilience. The City of Brevard adopted the updated plan in June 2025 and, with it, the following steps in the Mitigation Action Plan:

- Update components of existing stormwater management plan
- Seek grant funding for mitigation opportunities eligible under the UHMA Guidance and Public Assistance 406 mitigation Guidance at the time of the application
- Provide new home and property buyers with information on quality redevelopment, safe housing development, and FireWise Communities
- Publish the Multi-Jurisdictional Hazard Mitigation Plan for Transylvania County and promote relevant mitigation measures that the public can take.

POLICY ANALYSIS DEEP DIVE: FRENCH BROAD MPO & LAND OF SKY RPO REPORT ON POTENTIAL WILDLIFE CROSSINGS

In 2023, the French Broad Metropolitan Planning Organization (MPO) and the Land of Sky Rural Planning Organization (RPO) conducted a study of potential wildlife crossings across Madison, Buncombe, Henderson, Transylvania and Haywood Counties. The report identifies and maps 67 potential wildlife crossing locations to improve habitat connectivity and reduce wildlife–vehicle collisions. The study evaluated animal crash data, traffic volumes, transportation plans, and priority wildlife corridors to recommend specific crossing types—like underpasses, overpasses, deflection fencing, and signage—to fit landscape conditions and key species needs. It outlines top priority crossing recommendations (e.g., overpasses and larger culverts on Interstate 40) and additional county-level suggestions, with information on existing conditions, alternative scenarios, and target species at each site. The goal is to integrate wildlife considerations early into transportation planning and investment processes so that transportation projects better support ecological connectivity and safety outcomes.

The study identified 10 locations for Transylvania County; however, none of them were within Brevard's jurisdiction. Regardless, the report identifies various types of wildlife crossings and provides alternatives based on the type of road. This report provides important guidance in how crossings in Western North Carolina can be designed to protect wildlife and allow for safe passage across thoroughfares.

allows development to be shaped around environmental constraints rather than forcing costly mitigation later. Proactive environmental review reduces project delays, minimizes redesign, and improves environmental outcomes. From a community perspective, early assessments help to align private development decisions with broader public goals for resilience, sustainability, and quality of life.

Section 17.3 of the City's UDO grants the administrator the ability to require an environmental survey as part of the overall development plan submission.

> *"This requirement provides the city and the applicant the ability to evaluate the proposed development in order to preserve vegetation, to improve the appearance of the development proposed and to encourage the use of the existing forest and tree canopy, specimen trees, and significant vegetation to satisfy the requirements of this chapter" (UDO Section 17.3)*

This survey must identify existing natural features such as trees and understory vegetation, known endangered species, sensitive habitats, wetlands, perennial streams, and other critical environmental resources on a site, along with existing topography and finish grading, typically shown with detailed contours. The purpose of this requirement is to ensure that the developers and planning staff understand the ecological and physical context of a property before design and construction decisions are finalized, helping to minimize impacts to sensitive areas and guide more informed site layout and mitigation decisions.



Development in Brevard. Image Source: City of Brevard.



Native eastern box turtle. Image Source: City of Brevard.

While early awareness of environmental sensitivities is valuable, the ordinance does not ensure that information is used to improve environmental outcomes. The effectiveness of these assessments in driving meaningful environmental outcomes is limited without performance-based standards or benchmarks (e.g., required percentages of canopy retained, maximum amount of land disturbance, protection of high-value habitat, or wildlife crossing interventions) tied to the survey results.

Environmental surveys can vary widely in quality and scope depending on who conducts them and the required level of detail. Detailed environmental surveys can be costly, which may pose barriers for small-scale developments. Clear criteria and scalable requirements based on project size or type will ensure the broadest application without overly onerous requirements.

In short, Section 17.3's environmental survey requirement is a valuable procedural tool that promotes early identification of natural features in development review and supports environmentally informed decisions, but its effectiveness depends on how the data is applied, the presence of clear performance expectations, and consistent administrative review and enforcement.

RECOMMENDATIONS:

A. Maintain procedures for a sketch plan review and environmental assessments for commercial development projects and major subdivisions prior to the development of detailed, expensive design plans
B. Introduce scalable submittal requirements based on project size and scope (e.g., small projects required to inventory large trees and identify streams, while large projects require a full assessment of habitats, etc.)
C. Prepare guidance for environmental assessments that outlines the information needed to fulfill this requirement and additional sources
D. Establish performance-based standards (e.g., required percentages of canopy retained, wildlife crossing interventions or specific outcomes for habitat protection) tied to the survey results

Strategy 2.2: Control Sedimentation and Erosion from Development

In North Carolina, the Sedimentation Pollution Control Act (SPCA) is the governing law that regulates and aims to prevent pollution from sedimentation, primarily through regulations on land-disturbing activities. The responsibilities of enforcing the regulations falls to NC Department of Environmental Quality (NCDEQ) under the Land Quality Section (LQS) and overseen by the Sedimentation Control Commission (SCC). The SCC may delegate this authority to individual cities and counties that adopt a local erosion and sediment control ordinance in compliance with North Carolina state requirements. Some large Western North Carolina jurisdictions, such as the City of Asheville, Buncombe County, and Henderson County, have chosen this alternative.

In accordance with the SPCA, the City of Brevard requires that all land-disturbing activities proposing to disturb more than one acre submit



Landslide on Becky Mountain Road outside of Brevard following Tropical Storm Helene. Image Source: City of Brevard

a sedimentation and erosion control plan to NCDEQ for review. No permit shall be issued for any project that cannot provide a final copy of this plan as approved by NCDEQ. The City of Brevard does not have the Staff capacity or expertise to adequately administer a local erosion and sediment control ordinance without NCDEQ assistance. The procedure of working with NCDEQ ensures that all development is in full compliance with these vital regulations, protecting our natural resources and ensuring safe development.

To improve efficiency and streamline procedures, amendments should be made to Section 6.5 of the City's UDO to more closely algin with state requirements. For example, state law requires that any slope generated or disturbed may not be so steep that it is impossible to prevent erosion by providing natural groundcover or other adequate erosion-control devices and that these measures must be in place within 21 calendar day after completion of any phase of grading. Section 6.5 states that slopes shall be stabilized at all times and shall have a grade of no greater than 40%. The exposed slopes shall be planted or otherwise provided with ground cover, devices, or structures sufficient to restrain erosion within 30 calendar days. These discrepancies create challenges in review and administration of regulations.

For all land-disturbing activities, regardless of size, the City requires sedimentation and erosion control precautions be taken. This includes installing erosion control measures and stabilizing slopes. However, the City's development review procedure does not include an assessment of these measures and precautions during the review process.

RECOMMENDATIONS:

A. Maintain the City's existing procedure to delegate the sedimentation and erosion control elements to NCDEQ
B. Grant the administrator the authority to require an NCDEQ-approved erosion and sedimentation control plan for projects disturbing less than one acre but are within sensitive areas (e.g., development subject to steep slope requirements)
C. Bolster procedures for the review of sedimentation and erosion control measures for smaller projects (e.g., formal review of the control measures during the preliminary inspection process)
D. Update UDO Section 6.5 to more closely match the language in state law

Strategy 2.3: Improve Stormwater Management

Effective stormwater management is essential for mitigating the environmental impacts of development. As land is cleared and replaced with roads, rooftops, and other impervious surfaces, the natural ability of soil and vegetation to absorb rainfall is lost. This leads to increased runoff volumes and higher flow speeds, which can quickly overwhelm drainage systems, damage properties, cause infrastructure failures, erode streambanks, deteriorate water quality, and reduce groundwater storage. Without proper stormwater controls, debris, sediment, trash, and other pollutants are washed into neighboring properties and nearby waterways. By requiring thoughtful stormwater design, communities can reduce peak flows, slow down runoff, and preserve more natural hydrologic functions even as development expands.



Permeable pavers in Clemson Plaza in Downtown Brevard. Image Source: City of Brevard.

Brevard's stormwater infrastructure is aging, and the terrain often makes it challenging for curbing and gutters to be installed, especially for infill projects. The City is undergoing a comprehensive inventory of the stormwater infrastructure inventory project that seeks to identify vulnerable areas and preventative measures to address them. A recently adopted annual stormwater fee based on the impervious surface coverage of existing developments will help facilitate drainage system maintenance, but new developments are required to comply with stormwater management standards.

Section 6.6 establishes the City's stormwater requirements to protect life and property from flooding, improve water quality by filtering pollutants, and limit additional impervious surface. Currently, the standards apply to new large non-residential or mixed-use projects, residential developments with 8 or more dwelling units, and any project where stormwater controls are required by a review board. Smaller residential projects, bona fide agriculture, redevelopment with no increase in impervious area, small accessory structures, and development in the Heart of Brevard Municipal Services District (MSD) are exempt. These exemptions should be granted sparingly and strategically. Amendments are likely necessary to ensure environmental outcomes are achieved and certain types of development are incentivized.

A recommended revision is to restructure the applicability standards so that stormwater requirements are triggered by the amount of built-upon area or new impervious surface created, rather than by the number of residential dwelling units. An area-based approach is a more equitable and effective regulatory tool because stormwater impacts are directly related to the extent of disturbed soil and impervious coverage – not the number of units constructed. For example, a single large home with extensive driveway and patio coverage may generate significantly more runoff than a multifamily structure on a smaller footprint. A disturbance-based trigger better aligns with regulatory oversight with actual hydrologic impact, ensures proportional mitigation, and closes gaps where smaller-scale projects cumulatively contribute to runoff and

water quality degradation. It also creates a clearer, more objective standards that are easier to administer and defend.

In addition, development in environmentally sensitive areas — such as sites with steep slopes, proximity to surface waters, or flood hazard areas — could be required to manage stormwater regardless of project size. Steep slopes in particular increase runoff velocity, erosion potential, and downstream sedimentation, compounding flood and water quality impacts. Requiring stormwater controls in these areas ensures that risk is addressed at its source and reflects Brevard's mountainous topography and associated landslide susceptibility. A sensitive-area trigger would provide an added layer of protection where the consequences of unmanaged runoff are greatest.

With respect to the Heart of Brevard MSD, all development in this area is currently exempt because it is not feasible for individual properties to install on-site stormwater infrastructure. Instead, the City has invested millions of dollars in centralized stormwater improvements (e.g., the Times Arcade Alley stormwater management project and Main Street streetscape improvement project). Rather than maintaining a blanket exemption, the UDO could be revised to require developments in the MSD that exceed the disturbance threshold to pay the necessary stormwater fee-in-lieu. This approach would maintain flexibility where on-site stormwater management controls are impractical while ensuring that redevelopment contributes proportionately to the City's capital improvements. The fee-in-lieu would support continued investment in area-wide infrastructure, align cost responsibility with impact, and strengthen the long-term financial sustainability of the City's stormwater program.



Alternative curbing that directs runoff water to a bioretention landscape. Image Source: Center for Neighborhood Technology

The current ordinance requires affected projects to manage stormwater using best practices that mimic natural hydrology and prioritize low-impact development (LID). Instead of channeling all rainwater into pipes, LID encourages infiltration, filtration, and evaporation through practices like bioretention cells, permeable pavers, and green roofs, which manage stormwater close to its source. The ordinance does not define, or even provide examples, for what does or does not qualify.

Furthermore, structural methods for stormwater management are to be used "only when it is absolutely necessary." Additional guidelines for what constitutes "necessary" and which methods are allowable would remove the subjectivity and ambiguity for these regulations.

Given Brevard's high frequency and volume of rain events, LID practices are likely most effective when used in conjunction with engineered stormwater management systems that are designed to meet defined treatment, storage, or peak flow reduction criteria. The ordinance can allow for specific LID techniques that have measurable stormwater performance

KEY TERMS

Gray infrastructure uses conventional, human-engineered systems to move and manage stormwater. Examples include gutters, drains, pipes, culverts, retention basins, and stormwater ponds designed to contain large values of water.

Green infrastructure or ***Low-Impact Development*** mimics natural processes by using vegetation and soil to manage stormwater where it falls. Examples include rain gardens, green roofs, permeable pavements, bioswales, rainwater cisterns, and stormwater ponds that feature natural vegetation and soil.

CASE STUDY: HUNTERSVILLE HYBRID LID APPROACH

The Town of Huntersville's stormwater regulations and Water Quality Design Manual implement what the town calls a hybrid Low Impact Development (LID) approach — a framework that blends natural site planning techniques with engineered stormwater controls to protect water quality and replicate pre-development hydrology. At its core, the hybrid approach shifts the focus from traditional detention to managing stormwater where it falls through a combination of decentralized LID practices and conventional best management practices when necessary. This means designers must integrate stormwater solutions early in the site planning process rather than as an afterthought.

Under the ordinance, development and redevelopment projects must meet specific performance targets established in the Water Quality Design Manual. Key requirements include treating the first inch of rainfall, achieving an average annual 85 % total suspended solids (TSS) reduction, and controlling post-development peak discharge rates. The standards require the use of approved LID stormwater control measures or a combination of approved LID and conventional stormwater control measures. If a combination is used, then at a minimum the first 50% of the runoff from the one-inch storm event must be treated using LID measures. The remaining 50% shall be treated using conventional measures that are capability of achieving the required pollutant removal efficiency. The Manual supports the requirements with technical criteria and design guidance for a range of approved practices (e.g., infiltration systems, bioretention cells, permeable pavements) and points to the specifications of the NCDEQ Stormwater Design Manual. It also includes guidance for non-structural site planning measures — preserving natural drainage, minimizing impervious surfaces, and maintaining pre-development soil and vegetation conditions — that can maintain the pre-development runoff characteristics and minimize the need for structural stormwater control measures.

Furthermore, a "buy-down LID mitigation" option is available for certain developments that wish to only use conventional stormwater control measures. The cost is estimated based on the cost for construction, maintenance, and administration of the most costly LID measure (a bioretention system) over its anticipated 20-year life space that meets the requirements set forth in the ordinance based on land use type. Projects in the Town Center zoning district are allowed to forego the stormwater requirements, provided the mitigation requirements are fulfilled.

By embedding detailed criteria into both the ordinance and the Manual, Huntersville's hybrid LID approach provides a comprehensive, performance-based framework that guides designers and developers toward sustainable stormwater solutions tailored to local conditions.

standards. The NCDEQ Stormwater Design Manual provides detailed design standards and volume estimates for engineered bioretention cells, infiltration systems, permeable pavement, and sand filters. These stormwater control measures could be required in addition to conventional methods for high-volume projects or projects in environmentally sensitive areas. In areas where traditional stormwater facilities are determined to be impractical due to site constraints, such as within the Heart of Brevard MSD or in dense urban redevelopment contexts, LID measures may also be required as part of a broader compliance approach. In such cases, these practices could be implemented alongside a stormwater fee-in-lieu program to ensure that overall watershed-level stormwater management objectives are still achieved. This approach maintains flexibility while preserving accountability for measurable stormwater outcomes.

Beyond management, the ordinance should encourage stormwater volume reduction prior to detention measures. This approach addresses runoff at the source rather than simply slowing

it downstream. Ordinances can facilitate this by requiring the developer to demonstrate how volume reduction has been maximized with site design, limiting the amount of impervious surface coverage, and encouraging pervious materials whenever possible. The UDO does allow for the use of porous or semi-porous paving materials in parking areas, but the rest of the ordinance (including the street design, driveways, and stormwater management requirements) are silent on this topic. Though developers are allowed to utilize these materials, it should be explicitly stated and encouraged throughout the ordinance.

RECOMMENDATIONS:

A. Review and revise the City's stormwater management requirements to align with modern best practices
B. Add definitions and illustrations of low-impact development techniques (such as green roofs, vegetated swales, rain gardens, bioretention landscapes and cisterns) to ensure it is clear that they are allowed and encouraged (see also Strategy 4.3)
C. Refine the types of development activities that are required to comply with the stormwater management provisions, including instituting an impervious surface or built-upon area threshold and all development in sensitive areas (likely as part of a conservation zoning district - see Strategy 1.1)
D. Consider amendments to the types of development activities that are exempt from stormwater management provisions.
E. Establish incentives for small developments that are exempt from stormwater management requirements to implement low-impact development techniques
F. Allow for and encourage the use of porous and semi-porous materials throughout the ordinance (e.g., street design, driveway materials, roof design standards)
G. Provide guidance and incentives for developers to use LID and site design to supplement stormwater management requirements by reducing stormwater runoff close to the source, requiring less structured treatment
H. Amend the infrastructure and street design standards to utilize existing curb and gutter systems where available, and establish alternative street designs that reduce stormwater channelization
I. Consider allowing variation to certain architectural standards for green infrastructure and LID techniques (e.g., alternative roof pitches to allow for green roofs or rain cisterns)



American Sycamore Tree. Image Source: City of Brevard.

Strategy 2.4: Preserve and Expand Tree Canopy and Conservation Landscaping

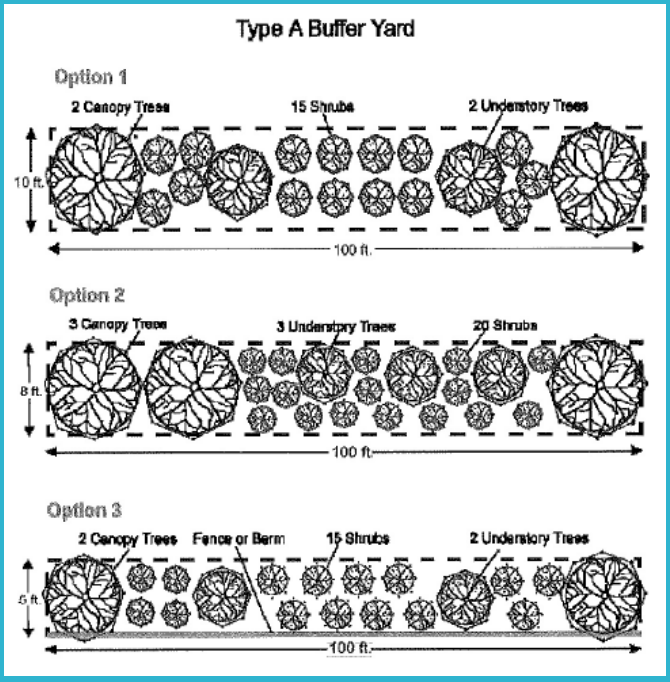
Tree protection and landscaping requirements are essential elements of a development ordinance because they support the ecological and aesthetic goals of the community. Mature trees and thoughtfully designed landscaping provide shade, reduce urban heat, filter air pollutants, and manage stormwater. Preserving trees during development maintains wildlife habitat, supports biodiversity, and strengthens the community's overall green infrastructure. Landscaping requirements further ensure that new developments contribute to visual quality, neighborhood character, and a sense of place, enhancing both property values and community livability.

Best practices in tree protection include requiring pre-development tree surveys, establishing minimum preservation thresholds, and safeguarding significant trees through protective fencing and careful grading around critical root zones (see also Strategy 2.1). Ordinances, including Brevard's, often give additional protection to certain species, specimen trees, or large-caliper trees, and limit removal to situations where trees pose safety hazards or conflict with essential infrastructure. Developers should provide replacement plantings or mitigation with native species when trees are removed. Integrating tree protection with grading, stormwater management, and erosion control plans ensures the long-term survival of both preserved and newly planted trees. Additional best practices include requiring performance bonds or warranties to guarantee tree survival after construction and limiting tree removal to defined building envelopes, driveways, and utility routes. Ordinances can further strengthen sustainability by incorporating tree canopy coverage targets, soil volume standards, and long-term maintenance requirements to ensure trees reach maturity.

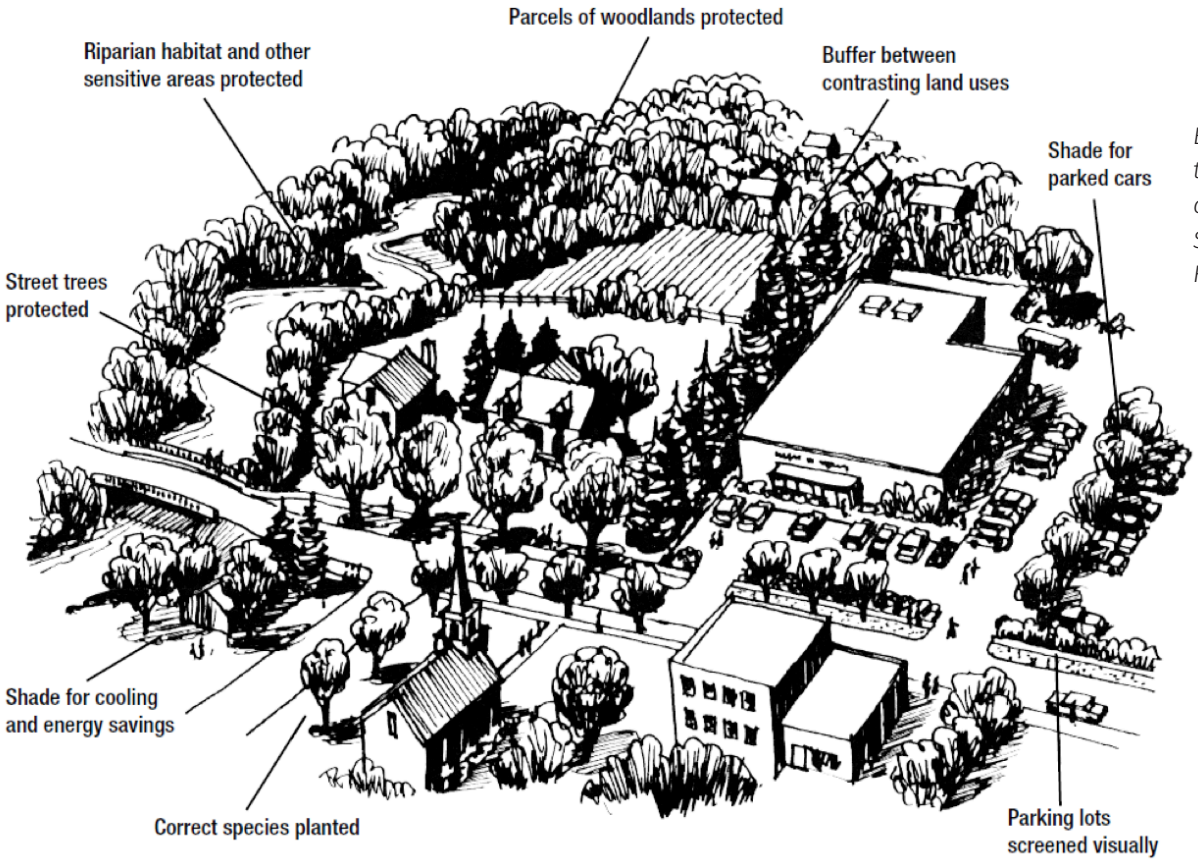
Relatedly, the regulations need to establish clear, measurable, and consistently applied standards for when tree removal is appropriate. Objective thresholds—such as documented health or hazard assessments, canopy coverage metrics, or preservation percentages—would reduce subjectivity in determining whether removal is necessary or based primarily on aesthetic preference. Clear standards can better balance private property rights with environmental protection by distinguishing between reasonable site development needs and avoidable tree loss. Transparent decision-making criteria, written findings, and documented review procedures would ensure that permit decisions are defensible, predictable, and equitable for applicants, while

CASE STUDY: MOUNT HOLLY LANDSCAPING AND BUFFER YARDS

Mount Holly's Chapter 10 – Landscaping and Tree Protection – incorporates many best practices in conservation landscaping. The ordinance provides clear definitions for key terminology and adopts lists of species by reference to the NC Forest Service's Piedmont region resources. The required landscaping buffers have options for developers to select, ranging from a large buffer with less vegetation to a small buffer with denser vegetation and/or a fence or berm. These requirements are applied on a per 100 linear feet basis to ensure the desired density and variety is achieved. The ordinance also requires that 50% or more of the new trees be native species, and sites with more than required 20 trees must install multiple species to achieve biodiversity goals. Finally, all new plant material must meet the standards set forth in the American National Standards Institute (ANSI) A300 and must be warranted for one year from the time of installation. While the details of Mount Holly's tree and landscaping requirements have not been significantly updated since its adoption in 1996, the structure of the chapter exemplifies how regulations can allow for flexibility of design, provide clear guidance for implementation, and promote long-term viability.



Example variation in buffer yard composition and width. Image Source: Mount Holly Unified Development Ordinance



Elements of a tree protection ordinance. Image Source: Arbor Day Foundation.

also reinforcing the City's environmental goals.

For landscaping, effective ordinances define minimum landscape area ratios, require native and drought-tolerant species, and establish screening or buffer standards for sensitive edges, such as parking lots, roads, or industrial areas. Policies can also promote species diversity, and encourage connectivity between green spaces to enhance ecological and recreational benefits. Professional design review by a landscape architect or certified arborist helps ensure plantings are viable, functional, and complementary to the natural and built environment.

Chapter 8 of Brevard's UDO provides a solid foundation for supporting greener, more sustainable development through tree protection and landscaping. However, compared to best practices, it functions more like a traditional landscaping ordinance than a comprehensive green growth tool. The chapter could be improved by incorporating canopy-based metrics and performance standards, differentiating between ornamental and ecological/conservation landscaping, and providing flexibility to support innovative designs. Because neither the City of Brevard nor Transylvania County currently has an arborist or forester on staff, the need for clear, objective standards and defined review procedures is particularly important to ensure consistent application, reduce administrative burden, and achieve long-term environmental sustainability.

RECOMMENDATIONS:

A. Clarify eligibility criteria, standards, and submittal requirements for landscaping and tree protection plans
B. Differentiate between ornamental landscaping and ecological / conservation landscaping to ensure standards are applied appropriately in certain areas and to allow for flexibility when achieving other green development goals
C. Integrate stormwater and performance standards to link vegetation with environmental outcomes
D. Incorporate canopy-based metrics based on zoning district and/or land use to strengthen tree protection as a green growth tool
E. Revise screening and buffer standards to

mitigate the impact of high-intensity areas (e.g., parking lots, roads, industrial uses) but prioritizing environmental function (see also Strategy 4.3)

F. Require all landscaping plans be sealed by a qualified design professional
G. Include guidance for long-term maintenance and monitoring of trees and landscaping
H. Require bonds for certain types of developments (e.g., major subdivisions, development in the conservation zoning district) to guarantee the protected trees will remain after construction is completed and the guaranteed survival of new trees within a given period
I. Limit removal of trees to a defined building envelope, driveways and utility routes in conservation zoning district
J. Grant administrators the ability to require staked markings of preservation areas and/or limits to the area of disturbance on sites
K. Refine the tree removal permit provisions to establish clear, measurable and consistently applied standards

Strategy 2.5: Manage Urban Heat

The urban heat island (UHI) effect occurs when developed areas become significantly warmer than nearby rural or natural landscapes. This temperature difference is primarily caused by large expanses of dark, impervious surfaces (i.e., pavement, rooftops, and parking lots) that have a high capacity for storing heat during the day, increasing surface temperatures. After the sun goes down, the heat is released, increasing surface temperatures at night. Reduced tree canopy, loss of natural vegetation, and heat from vehicles and buildings further intensify the problem. As a result, UHIs contribute to higher energy consumption, poorer air quality, and increased heat-related illnesses. The effect also exacerbates stormwater runoff and degrades environmental quality by altering local microclimates.

Local governments can use development regulations to manage urban heat by focusing on reducing heat absorption and increasing shade across both public and private sites. Ordinances can require or strongly incentivize tree canopy preservation and expansion. Requirements for shade in pedestrian areas (sidewalks, plazas, parking lots, etc.) are especially effective, whether provided by trees, shade structures, or building overhangs. In addition, development codes can limit large expanses of dark, heat-absorbing materials by setting maximum percentages for impervious surfaces, encouraging pervious pavements, and requiring high-albedo or “cool” roofing and paving materials that reflect rather than absorb solar radiation. Ordinances should coordinate urban heat mitigation with stormwater, open space, and environmental protection provisions by prioritizing green infrastructure such as bioswales, rain gardens, and connected open spaces that provide both cooling and water management benefits.

The City of Brevard’s ordinance includes some of these best practices but can make changes to improve their effectiveness in reducing urban



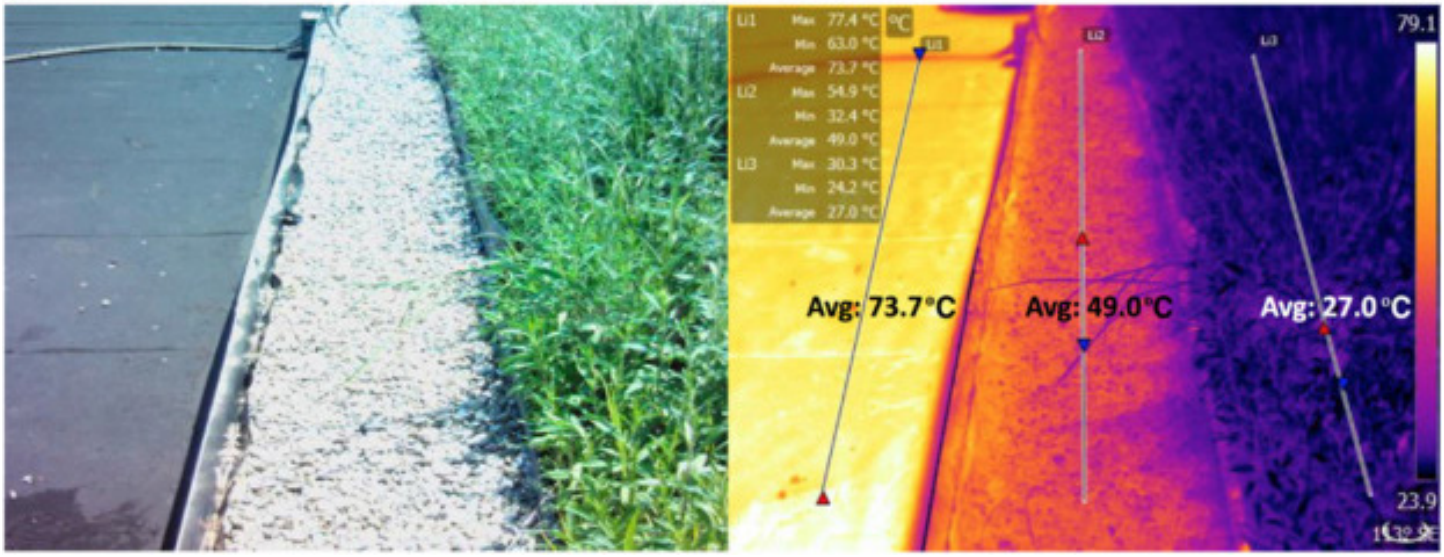
In the spring of 2024, the City of Brevard - along with volunteers from Conserving Carolina and help from the American Chestnut Foundation - planted over 100 chestnut trees in Bracken Preserve as part of a native ecosystem restoration project. The chestnut trees will help protect genetic diversity and preserve this species into the future. Image Source: City of Brevard.

heat. Section 5.6.8 has some requirements for very large buildings (100,000 square feet in gross floor area or greater) to utilize “cool roofs” or “green roofs,” but this should be applied to and/or incentivized for smaller buildings or certain roof types. Other successes include the provision of street trees and canopy coverage for parking areas – both of which provide vital shade for vehicular and pedestrian areas. The parking area landscaping (Section 8.7) goes further by establishing performance standards for the plantings Additionally, the parking standards were recently amended to establish a maximum number of parking spaces in dense areas, allowing for shared parking agreements, and establishing more compact design standards, among other things. These improvements strive to allow for more efficient usage of land and limit expansive paved areas.

By integrating additional UHI mitigation into development projects and continuing to limit impervious surfaces, Brevard can create more resilient, livable environments that protect public health and reduce the long-term impacts of rising urban temperatures.

RECOMMENDATIONS:

A. Update urban heat island code language to reflect modern terminology and best practices
B. Amend the applicability of the heat island effect mitigation requirements to include smaller buildings and/or any flat roof building types
C. Set performance measures for tree canopy coverage of sidewalks and other pedestrian areas (similar to the existing parking area canopy coverage requirements in Section 8.7)
D. Allow for and incentivize cool pavements (light-colored pavements, permeable paving, or reflective coatings) for interior sidewalks and plazas



Standard (left) and Infra-red (right) photographs of an NYC rooftop comprising black, white and green surfaces. Image source: Stuart Gaffin, Columbia University

Strategy 3: Preservation of Sensitive Areas

Preserving sensitive areas within development regulations is essential for protecting the ecological systems that sustain clean water, healthy soils, and biodiversity. Wetlands, floodplains, steep slopes, riparian buffers, and habitat corridors perform vital natural functions that built infrastructure cannot easily replicate. When these areas are disturbed or fragmented, communities face increased flooding, erosion, water quality degradation, and the loss of native species. These consequences often require costly engineered solutions that typically fail to fully restore the ecological services these natural areas. By identifying and safeguarding sensitive natural features, local governments can maintain the ecological integrity of their landscapes while reducing long-term public costs associated with stormwater management and environmental remediation.

Strategy 3.1: Protect Steep Slopes

Protecting steep slopes is crucial for maintaining environmental stability and preventing erosion, landslides, and habitat destruction. Steep slopes are particularly vulnerable to soil degradation because the natural vegetation that helps anchor the soil can be disturbed by construction or development activities. Development regulations around steep slopes generally strive are related to safety and aesthetics that provide economic value and promote quality of life.

Over the course of many years, the City of Brevard contemplated changes to the steep slope development regulations, especially as land becomes scarce and construction costs become more expensive. In 2023, City Council adopted amendments to the UDO that



Buildings in Brevard Music Center along the Brushy Creek swimming pond. Image Source: Brevard Music Center.



Development on sloped terrain in Brevard. Image Source: Pilot Cove.

overhauled the steep slope regulations. The purpose of these amendments was to:

- Protect the natural land conditions and respecting existing topography
- Prevent inappropriate and/or unsafe development
- Preserve the aesthetic and scenic qualities
- Ensure development doesn't lead to extensive grading and disturbance while still allowing reasonable use of a property owner's land
- Ensure consistent and fair application that is easier to administer

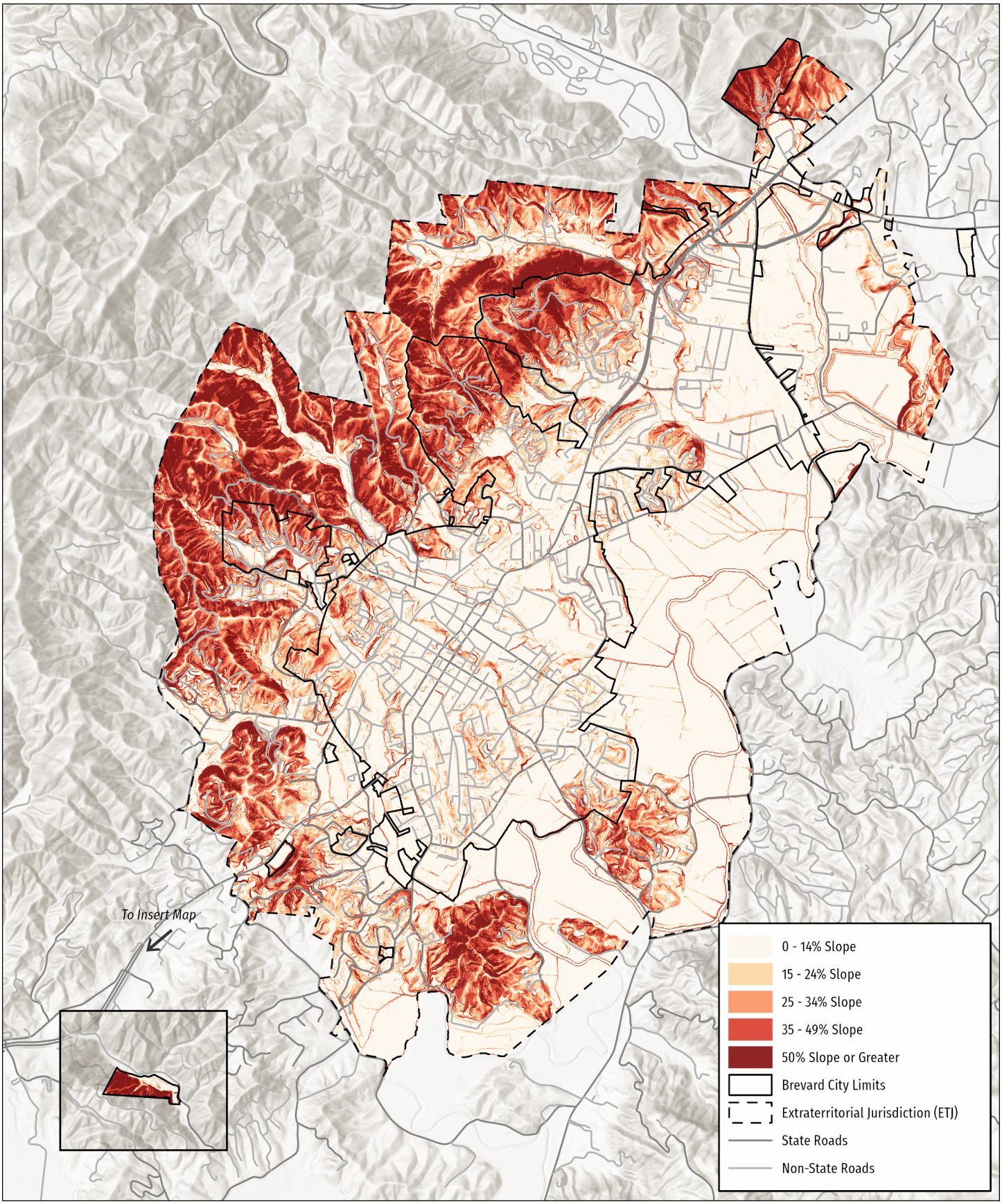
Staff conducted a thorough review of the slope regulations throughout Western North Carolina and in other mountainous areas of the country. Many other jurisdictions use an elevation trigger in order to protect slopes that are most sensitive. The City's new regulations amend the applicability of steep slope regulations to pertain to only properties located at or above 2,250 feet in elevation. By applying this elevation condition in Brevard, the parcels with significant slope, more sensitive habitats and more scenic viewsheds have higher protections and regulations and allowing more activity in lower-lying areas that are more equipped for denser, infill development.

Furthermore, all of the jurisdictions reviewed vary regulations at different slope percentages. However, Brevard's ordinance at the time did not impose regulations, but rather granted the administrator the authority to impose conditions on development that is moderately steep and outright prohibits any development on slopes greater than 25% on average. Very few other jurisdictions strictly prohibit development because it precludes property owners from reasonable use of their land, which is necessitated by North Carolina law. Instead, jurisdictions typically impose regulations that increase in severity as the slope increases, with most of these requirements becoming stricter at 35% or greater. This tiered model was used in the new regulations, with additional restrictions on the height, bulk, density, and amount of site work that can be done. The new regulations also incentivize properties to put permanent protections on the steepest and most sensitive areas through a conservation easement, restrictive covenants, public dedication, or otherwise permanently protected in a natural state with prohibition on vegetation removal and land disturbing activities. In exchange for doing so, property owners are able to recalculate the slope for the parcel without that area and follow the regulations are the lower percentage.

Lastly, the previous regulations did not require any kind of engineering or technical specifications to ensure that the development is safe and does not contribute to further erosion and sedimentation. Many other municipalities require geotechnical engineering be completed prior to issuance of a permit. Requiring geotechnical assessments for development on steep or unstable slopes can further ensure that site design accounts for underlying soil and slope conditions. The ordinance now requires geotechnical analysis prepared by a registered, professional engineer to determine the stability of the underlying geology and soils to support the proposed project. The zoning administrator can review the results and recommendations of the report and impose additional conditions on the project as appropriate.

To date, the steep slope regulations have successfully protected the more sensitive slopes by steering development towards infill opportunities and ensured that development that does occur has the appropriate geotechnical analysis to ensure it is safe and does not further compromise the land.

Percent Slope



Data Source: City of Brevard Analysis of digital elevation models



Panoramic view of a flooded Wilson Road. Image Source: City of Brevard.

RECOMMENDATIONS:

A. Maintain the City's recently amended steep slope regulations and monitor its effectiveness
B. Consider adding other provisions to the steep slope regulations pertaining to higher erosion control and stormwater measures (see also Strategy 2.2 and Strategy 2.3)

Strategy 3.2: Prevent Flood Damage

Flood damage prevention regulations are intended to promote public health, safety and general welfare and to minimize public and private losses due to flood conditions within flood prone areas. Chapter 34 of the City's Code of Ordinances pertains to the flood damage prevention within the corporate limits and its ETJ. The Planning Director, or his designee, is the Floodplain Manager for the City responsible for enforcing these provisions and maintaining the City's participation in the National Flood Insurance Program (NFIP). Staff coordinates with the North Carolina Department of Public Services Emergency Management (NCEM) on floodplain regulations and our participation in NFIP.

The City of Brevard has higher standards that exceed the minimum requirements of NFIP. The Community Rating System (CRS) is a voluntary program that incentivizes communities to have higher standards in exchange for a reducing of insurance premiums for residents. The City of Brevard is classified as a Level 8 Community where citizens who need flood insurance are eligible to purchase it for a 10% discount on their premium.

With help from NCEM, the flood development regulations were recently amended in its entirety to:

- Better align our ordinance with the model ordinance provided by NCEM and reflect best practices in floodplain management;
- Improve the usability of the floodplain management regulations;
- Consolidate all floodplain enforcement and variance procedures to the Code of Ordinances (instead of the Unified Development Ordinance); and
- Ensure we retain our CRS rating and achieve additional points where possible.

In September 2024, Western North Carolina was hit by Tropical Storm Helene. Soon thereafter, President Biden approved a major disaster declaration for many Western North Carolina counties, including Transylvania County. The full extent of the damage is still unknown, but the County experienced flash flooding, high winds, landslides, fallen trees, and debris flow. Communications and power outages were widespread across the County. Dozens of roads were impassable due to high waters, fallen trees, landslides, and other hazardous conditions. Weeks after the storm thousands of households and businesses remained without power or reliable cell service, and hundreds of structures were damaged.

Following Tropical Storm Helene, 39 homes in the flood hazard area were substantially damaged (repairs would exceed 50% of the value of the structure). Only one home that complied with the current elevation requirements was substantially damaged, despite historic flooding. The City is working with the property owners to return the property to safe, habitable conditions and to elevate the homes to two feet above base flood elevation. However, the historic flooding had a profound impact on the course of the French Broad River and other waterways in the area. These alterations will have lasting effects on local

ecosystems, infrastructure, and recreational activities. It is likely that the properties most susceptible to flood damage have changed, as well. Following Helene, the Federal Emergency Management Agency (FEMA) is scheduled to update the Flood Insurance Rate Maps (FIRMs) which use geotechnical modeling to determine the flood hazard areas within the community. The City will need to codify the amended FIRMs for the area and work to educate property owners about their flood damage risk.

RECOMMENDATIONS:

A. Maintain the City's high standards for flood damage prevention and retain (or improve) the standing as a Level 8 community in the CRS program
B. Codify incentives to set aside the floodplain as preserved open space, similar to the steep slope ordinance
C. Monitor the remapping process being undertaken by FEMA to update the FIRMs in the wake of Tropical Storm Helene and proactively educate community members about their flood damage risk

Strategy 3.3: Enhance Surface Water Protection

The City of Brevard's surface water protection requirements in Section 6.7 of the Unified Development Ordinance are designed to safeguard water quality, natural stream functions, and associated ecosystems by establishing protection areas around streams, lakes, floodways, wetlands, and other surface waters. These protections apply to all surface waters and floodway/non-encroachment areas within the city's planning jurisdiction. Protection areas are determined based on distances from stream banks or water bodies and must generally be maintained in a naturally vegetated state. New development within these areas is highly restricted, and activities such as grading, excavation, installation of impervious surfaces, and channel modification are prohibited unless specifically allowed (e.g., utility crossings or minimal public infrastructure), with concentrated runoff required to be converted to diffuse flow before entering the protection area to reduce erosion and pollutant transport.

In practice, Brevard's surface water protection regulations have helped limit harmful development practices, such as channelization and unrestricted land disturbance, that can degrade stream systems and increase stormwater impacts. By requiring preservation of vegetated buffers and managing runoff, the city aligns local regulations with broader water quality goals and state riparian buffer protections. The emphasis on diffuse flow and minimal disturbance helps maintain natural hydrology and reduces erosion, which benefits aquatic habitats, reduces sediment and pollutants from entering waterways, and furthers the city's green growth priorities.

However, improvements could be made to increase effectiveness and clarity. The City requires a 30-foot buffer of land protected as natural vegetation. Other ordinances, however, utilize a two-zone approach for protection. For example, some municipalities require a 50-foot riparian buffer, measured from the top of the stream bank, with an inner undisturbed zone closest to the water (30 feet) and an outer zone that allows limited, low-impact uses, managed vegetation and/or stormwater management (20 feet). An alternative approach is to increase the buffer requirements for different stream classifications or types (e.g., perennial streams require 50 feet buffer and intermittent streams require 30 feet). Determination of flow frequency for stream types will require additional research and assessment.



Stream in Bracken Preserve. Image source: City of Brevard

Relatedly, the City's ordinance is silent on streambank restoration efforts. Well-designed streambank restoration projects not only stabilize erosion but also help meet broader goals for water quality protection, flood resilience, and habitat restoration, making them a valuable tool for both municipalities and private landowners. While the ordinance does not need to impose requirements for these efforts, as they require close coordination with NCDEQ Division of Water Resources, incentives to encourage streambank enhancement and procedural guidance would clarify and encourage these activities.

RECOMMENDATIONS:

A. Assess surface waters to determine type (perennial, intermittent, or ephemeral) for greatest protection
B. Apply surface water protection regulations to identified wetlands
C. Consider requiring an additional buffer for low-impact use / managed vegetation beyond the 30-foot protected riparian buffer for perennial streams and incentivize for others
D. Codify procedures for permitting streambank restoration efforts
E. Adopt incentives to encourage streambank restoration, particularly for perennial streams and floodplains



Native Red Eft (red-spotted newt). Image Source: City of Brevard.

Strategy 4: Restoration of Natural Ecosystems & Wildlife Habitats

Restoring natural ecosystems and wildlife habitats within development regulations is essential for repairing the ecological functions that have been lost through decades of conventional land use practices. Many development sites contain degraded streams, compacted soils, invasive species, or fragmented habitat networks that no longer support healthy ecological processes. Integrating restoration requirements helps rebuild these systems so they can once again filter pollutants, moderate stormwater flows, and support diverse plant and animal communities. By embedding restoration in development standards, communities ensure that growth does not merely minimize harm but actively contributes to the long-term health and resilience of their natural resources.

Restoration-oriented regulations also enhance community livability, climate resilience, and economic value. Revitalized habitats create functional green infrastructure that reduces flooding, improves water quality, and moderates extreme temperatures. They provide essential wildlife corridors that allow species to move, adapt, and thrive even as development occurs. Restored natural areas also produce social benefits—such as improved aesthetics, recreational opportunities, and increased property values near high-quality open space. By requiring restoration as part of the development process, local governments can transform degraded lands into assets that strengthen environmental health, support biodiversity, and create more attractive and sustainable places to live.



Grape hyacinths and other early spring bulbs support native pollinators. Image Source: City of Brevard

Strategy 4.1: Integrate Restorative Open Spaces in Development

Not all open spaces are created equal, and development regulations should recognize the substantial difference between functional natural open space and purely ornamental or residual areas. Natural open spaces provide far greater benefits for water quality, air quality, wildlife habitat, and climate resilience than manicured lawns or fragmented green strips. These landscapes function as green infrastructure, slowing and filtering stormwater, reducing heat, sequestering carbon, and maintaining ecological connectivity. When ordinances focus only on meeting acreage requirements without regard to function, developments can technically comply while failing to deliver meaningful environmental or public benefits.

Best practices in open space regulation therefore prioritize quality and function over quantity by establishing purpose-based categories such as conservation areas, passive recreation, active recreation, stormwater management, and greenways. Developers

should explain how each open space area supports both the project and broader public objectives. To avoid “leftover” or unusable spaces, ordinances should define minimum standards for size, shape, slope, access, and usability, require that a significant portion of required open space be contiguous, and prioritize areas that are visible and accessible rather than hidden behind lots or infrastructure. Aligning open space with natural features such as streams, ridgelines, scenic views, and existing greenway corridors further enhances ecological function and community value.

Clear eligibility and non-eligibility criteria are essential to prevent gaming the system and to ensure consistency in implementation. Eligible open space typically includes parks and playgrounds, greenways and trails, conservation lands, naturalized stormwater features, and historic or cultural landscapes. In contrast, road rights-of-way, utility easements, conventional stormwater basins without naturalized vegetation, private yards, impervious-dominated areas, and areas with slopes greater than 25 percent (unless specifically preserved for conservation) should generally not count. Requiring site-level open spaces to connect to adjacent developments or planned municipal greenway networks further ensures that individual projects contribute to a coherent, community-wide open space system.

Brevard’s open space requirements in Chapter 7 of the UDO could be improved by more explicitly incorporating these best practices. While the chapter establishes minimum open space percentages, it would benefit from clearer distinctions between functional and non-functional open space and from adding purpose-based categories tied to conservation, recreation, and stormwater outcomes. Strengthening standards for contiguity, usability, and ecological alignment would reduce fragmented or residual open space and encourage designs that reinforce Brevard’s environmental and greenway goals. Additionally, clearer eligibility criteria and enhanced submittal requirements (such as a detailed open space plan, natural resources inventory, connectivity map, and long-term management agreements) would give staff and decision-makers better tools to ensure that required open space delivers lasting environmental, recreational, and community benefits rather than simply meeting minimum acreage thresholds.



Open spaces in private development can augment the existing green network by connecting to existing parks and greenways, such as the Estatoe Trail. Image Source: City of Brevard

RECOMMENDATIONS:

A. Establish purpose-based open space categories (e.g., conservation areas, passive recreation, active recreation, stormwater management, greenways)
B. Refine minimum design standards (e.g., size, shape, slope, access and usability)
C. Require a significant portion of open space to be contiguous
D. Set clear eligibility and non-eligibility criteria for fulfilling the open space requirements
E. Enhance submittal requirements to ensure compliance with environmental goals and community benefit



Transylvania County is home to the Pisgah Astronomical Research Institute (PARI), an official Dark Sky Park certified by the International Dark Sky Association. Image Source: PARI.

Strategy 4.2: Reduce Light Pollution

Dark sky protections and the reduction of light pollution are important for preserving the natural night-time environment and supporting the area's ecological health. Excessive or poorly directed artificial light disrupts natural circadian rhythms for both humans and wildlife, affecting sleep patterns, migration, reproduction, and overall ecosystem stability. Many species (such as birds, bats, insects, and amphibians) rely on natural darkness to navigate, forage, and avoid predators. By implementing lighting standards that minimize glare, limit blue-rich light, and direct illumination downward where it is needed, communities can protect sensitive habitats and maintain the integrity of local biodiversity.

In addition to ecological benefits, dark sky protections offer practical and economic advantages. Reducing unnecessary lighting lowers energy consumption and utility costs, helping communities advance sustainability and carbon-reduction goals. Properly designed lighting also improves public safety by reducing glare, increasing visibility, and preventing over-illumination that can create deep shadows. Communities that embrace dark sky principles can enhance their rural character, preserve views of the night sky, and support tourism. By adopting thoughtful lighting regulations, Brevard can balance safety, functionality, and environmental stewardship. The current lighting provisions (Chapter 11 of the UDO) include dark-sky-friendly elements (like full cutoff fixtures, required light shielding, and lumen limits for signs) to limit nuisances like glare and excessive brightness, but it does not yet include comprehensive metrics like lumen limits for different uses or zones, color temperature limits (to remove blue-rich lighting) or maximum light spillover at property lines.

CASE STUDY: MOAB, UTAH OUTDOOR LIGHTING ORDINANCE

Recognizing the ecological, scenic, and economic value of its night skies, the City of Moab, Utah, adopted a comprehensive outdoor lighting ordinance in 2019, later strengthened in 2023, that requires fully shielded fixtures, limits light output, and favors warm-color lighting to minimize glare and sky glow. The City paired these regulatory changes with municipal leadership by retrofitting streetlights, public outreach to educate residents and businesses, and incentive programs to encourage early voluntary compliance. These efforts demonstrated that updated lighting can maintain safety and visibility by keeping light focused on the streets and sidewalks rather than spilling into the night sky. Moab balanced environmental protection with practical implementation by requiring all new lighting to comply and all preexisting lighting is required to be brought into compliance by 2029. These efforts culminated in Moab's designation as an International Dark Sky Community in 2024, demonstrating measurable reductions in uplight and increased visibility of the night sky while maintaining public safety and reinforcing Moab's identity as a gateway to dark-sky landscapes.

RECOMMENDATIONS:

A. Update lighting code language to reflect modern terminology and best practices
B. Establish a dark sky zone with higher requirements or lighting zones that vary regulations based on nighttime activity (likely as part of a conservation zoning district - see Strategy 1.1)
C. Incorporate illustrations and examples of the types of light fixtures that would be prohibited versus allowed
D. Require downward-aiming, shields, louvers, and glare reduction techniques for all fixtures on certain projects or in certain zoning districts
E. Require photometric plans for certain types of projects (commercial new construction, etc.) and clarify submittal requirements for smaller projects (likely to include a review of fixture types)
F. Prepare guidance that outline the lighting requirements and direct applicants to resources (DarkSky International, Illuminating Engineering Society of North America, etc.) and pre-approved products

Strategy 4.3: Incorporate Native Species in Landscaping

The provision of native landscaping in new development provides a wide range of ecological, economic, and community benefits. Native plants are adapted to local soil, climate, and rainfall patterns, which means they generally require less irrigation, fertilizer, and maintenance than non-native species. This reduces long-term infrastructure strain and maintenance costs for both the city and property owners. Native vegetation also supports local biodiversity by providing habitat for pollinators, birds, and other wildlife that depend on region-specific plant communities. Additionally, native landscapes improve stormwater management by enhancing soil infiltration and reducing erosion. Inclusion of native vegetation can also strengthen a community's sense of place by preserving the natural character of the region and creating cohesive, attractive streetscapes and developments.

The City of Brevard utilizes native species in landscaping projects – most recently in the landscaping plans for the new NCDOT roundabouts and the completed Main Street improvements. This practice provides significant environmental, economic, and community benefits. A native-only landscaping policy can lower municipal maintenance costs, improve urban biodiversity, and reinforce a city's commitment to sustainable land stewardship and environmental leadership. Formally codifying this practice will memorialize the City's commitment to its environmental goals and set a precedence for other developments to do the same.

For other developments, there is no requirement or incentive to incorporate native species into landscaping in the City's UDO. Section 8.2 encourages the inclusion of the native vegetation that complements existing native habitats and prohibits invasive species in required landscaping and buffers.



Native Redmond American Linden tree planted in the City's new streetscape vegetation on Main St. Image Source: City of Brevard



Native plantings along the bike path at Jimmy Harris Railroad Depot Park. Image Source: Transylvania County Tourism Development Authority.

> *"New plant material should complement existing vegetation native to the site… The use of indigenous, native and/or regionally grown species of trees, shrubs, vines, groundcovers and perennials is* ***encouraged*** *in order to make planted areas compatible with existing native habitats." (UDO Section 8.2)*

While some developers choose to incorporate native species for the cost-efficiency benefits described above, many do not. Other municipalities require native species in landscaping and open space development standards, but it is virtually impossible to identify all possible native plants suitable for planting in residential landscapes in Brevard and to maintain its accuracy in the text of the ordinance. Similarly, the non-native and invasive species list in the ordinance has not been updated since 2015. Many cities will refer to lists of suitable plants provided by a research institution or allied organization (e.g., North Carolina State Extension, North Carolina Native Plant Society, North Carolina Forest Service, USDA Plants Database).

Effective ordinances allow flexibility and alternatives, rather than mandating 100 percent native plantings, such as requiring a minimum percentage of native species by plant count, allowing preservation of existing native vegetation in lieu of new plantings, or using biodiversity targets (for example, a minimum number of native tree and shrub species) instead of rigid ratios. Native vegetation requirements are most successful when they are aligned with related environmental regulations, including erosion and sedimentation control, stormwater management, and steep slope development standards. Finally, well-crafted policies outline reasonable exemptions to avoid unnecessary impacts on existing vegetation (e.g., single-family lots or undisturbed landscaped areas) and require landscape plans to be prepared or certified by a qualified professional, such as a landscape architect or arborist, to ensure proper species selection and long-term success.

Lastly, the City's Code of Ordinances regulates nuisance grass and vegetation within the corporate; however, it does not clearly



Native southern lady ferns. Image Source: City of Brevard.

distinguish nuisance vegetation from “natural area lots” which are exempt. In order to balance neighborhood aesthetics, public safety, and environmental sustainability, the exemption should only apply intentional native plantings, gardens, or managed natural landscapes. Nuisance vegetation would apply to unmanaged grass exceeding 18 inches in height, noxious weeds that harbor pests, and vegetation that obstructs public infrastructure.

RECOMMENDATIONS:

A. Memorialize the City’s usage of native vegetation in public landscaping projects through an adopted City policy
B. Add definitions of native vegetation and other key terminology
C. Adopt official lists of native and non-native species by reference and allow the list to be updated administratively
D. Amend regulations in the Code for nuisance grass and clearly define exemptions for intentional natural areas



SECTION 03
IMPLEMENTATION GUIDE

Implementation Considerations

This implementation section provides a suggested roadmap for revising the Unified Development Ordinance, establishing clear priorities and realistic timelines for integrating sustainable development practices. By clearly outlining potential policy adjustments and how they can be executed, the guide ensures that the green growth principles are not only conceptualized but effectively put into practice, fostering long-term sustainability, resilience, and quality of life. Ultimately, City Council will thoughtfully consider each recommended action prior to adoption, grounding decisions in a clear understanding of community impacts, environmental outcomes, and the city's shared goals for the future.

Implementing the recommendations of this green growth audit is an intentional and incremental process that reflects the complexity of aligning development regulations with environmental stewardship. "Greening" the UDO will take time, coordination, and sustained commitment. These recommendations are intended as guidance for staff, Planning Board, and City Council to consider, not a list of required actions. Furthermore, not every improvement must be comprehensive or immediate to be meaningful. Even modest updates, like clarifying standards and introducing performance-based measures, can move the ordinance closer to supporting long-term environmental goals and community resilience. This implementation section recognizes local capacity and legal constraints and that progress toward green growth will occur in phases. Any step that reduces environmental impacts, protects sensitive areas, or integrates natural systems more effectively into development review represents a tangible improvement and builds momentum for future, more transformative changes.



The City of Brevard is designated as a sanctuary for all species of squirrels, and in particular the Brevard White Squirrel. According to the White Squirrel Institute, these white squirrels are a leucistic color variant of the native Eastern Gray Squirrel. Image Source: Transylvania County Tourism Development Authority

Legislative Authority

On December 11, 2024, the North Carolina General Assembly amended state law to significantly restrict local governments' ability to modify zoning ordinances. Enacted through the Disaster Recovery Act of 2024 – Part III, Session Law 2024-57 (S.B. 382), the legislation sharply broadens the definition of "down-zoning" and now prohibits any local government from adopting a down-zoning without the written consent of all affected property owners. While North Carolina has long barred third parties from requesting down-zonings that would reduce development rights on another person's property, local governments themselves historically retained the authority to rezone land or adjust zoning standards in response to community priorities. Session Law 2024-57 removes that authority by prohibiting municipalities and counties from initiating any action that would reduce permitted uses, decrease allowable density, or otherwise impose more restrictive standards without unanimous owner approval.

The new statute also expands the concept of down-zoning beyond traditional reductions in intensity or density. Whereas down-zoning was once understood as shifting from a more intense to a less intense district, Session Law 2024-57 now defines a down-zoning to include any amendment that creates any form of nonconformity on land outside residential zoning districts. This sweeping definition dramatically broadens the reach of the law, and, as a result, many routine ordinance updates that previously would not have been considered down-zonings may now qualify, triggering the requirement for unanimous owner consent. In effect, these changes make proactive land use planning far more difficult, and in some cases impossible, for municipalities.

The implementation matrix includes a column assessing the feasibility of recommendation under the current legislation:

- **"Possible"** – allowable under current legislative authority
- **"Proceed with caution"** – possibly allowable under current legislative authority if implemented strategically (e.g., only in certain zoning districts, only to new development projects) but the full impact will not be achieved
- **"Impossible"** – not allowable under current legislative authority or the limitations significantly hinder the action's ability to achieve green growth objectives

Time Frame

The scope of these actions can require varying amounts of staff time. Each action is categorized by the amount of time it would take for staff to implement the changes, given the amount of research required or engagement necessary for effectiveness.

- **"Short-term"** – can be completed with minor changes (potentially 6 months or less)
- **"Medium-term"** – requires higher levels of research and potentially input from other experts (approximately one year)
- **"Long-term"** – requires more significant research, analysis, vetting, and engagement (likely more than one year)
- **"Ongoing"** – maintaining existing regulations and/or continuing efforts already underway

Resources

The recommended actions in this document are intended to be completed in-house using staff resources. Some items require supplemental require additional assessments from an outside expert to assess and prepare recommendations beyond City Staff expertise.

- **"Staff time"** – can be completed in-house using staff resources
- **"Staff time with outside consultant"** – requires expertise from outside engineers or other consultants to complete *(note: these actions will likely require additional funding to hire engineers or other consultants)*
- **"Staff time with outside experts"** – can be completed in-house using staff resources and guidance from other expert organizations (e.g., NCDEQ, Brevard Sustainability Council, International DarkSky Association)



Leaves of a black gum tree, a native deciduous tree. Image Source: City of Brevard.

Implementation Matrix

STRATEGY	ACTION	IMPACT	TIME FRAME	RESOURCES	VIABILITY
1. Conservation of Land with Efficient Development Strategies					
1.1 Limit development in sensitive areas	A. Maintain the City's no minimum lot size and associated flexibility in calculating development density on the parent parcel, allowing the clustering of development in less sensitive areas and accommodating unique environmental conditions	Low	Ongoing	Staff time	Possible
	B. Reframe the General Residential–4 (GR-4) zoning district as a "Conservation Zoning District" with the stated purpose of the zoning district being to conserve sensitive areas and limit sprawled development	High	Long-Term	Staff time	Impossible with associated regulations
1.2 Prioritize infill development in regulations	A. Consider additional incentives for infill development, such as adding height allowances, decreasing dimensional requirements (i.e., setbacks), and establishing density bonuses	Moderate	Medium-Term	Staff time	Possible
	B. Upzone any areas of the existing GR-4 that are suitable for development and do not require additional environmental protections	High	Medium-Term	Staff time	Possible
2. Mitigation of Negative Impacts of Development					
2.1 Require environmental assessments prior to large-scale construction	A. Maintain procedures for a sketch plan review and environmental assessments for commercial development projects and major subdivisions prior to detailed design plans	Low	Ongoing	Staff time	Possible
	B. Introduce scalable submittal requirements based on project size and scope (e.g., small projects required to inventory large trees and identify streams, while large projects require a full assessment of habitats, etc.)	Moderate	Medium-Term	Staff time	Proceed with caution
	C. Prepare guidance for environmental assessments that outlines the information needed to fulfill this requirement and additional sources	High	Medium-Term	Staff time with outside experts	Possible
	D. Establish performance-based standards (e.g., required percentages of canopy retained or specific outcomes for habitat protection) tied to the survey results	High	Medium-Term	Staff time	Proceed with caution
2.2 Control sedimentation and erosion from development	A. Maintain the City's existing procedure to delegate the sedimentation and erosion control elements to NCDEQ	Low	Ongoing	Staff time	Possible
	B. Grant the administrator the authority to require an NCDEQ-approved erosion and sedimentation control plan for projects disturbing less than one acre but are within sensitive areas (e.g., development subject to steep slope requirements)	Low	Short-Term	Staff time	Possible
	C. Bolster procedures for the review of sedimentation and erosion control measures for smaller projects (e.g., formal review of the control measures during the preliminary inspection process)	Moderate	Medium-Term	Staff time	Possible

STRATEGY	ACTION	IMPACT	TIME FRAME	RESOURCES	VIABILITY
(continued)	D. Update UDO Section 6.5 to more closely match the language in state law	Low	Short-Term	Staff time	Possible
2.3. Improve stormwater management	A. Review and revise the City's stormwater management requirements to align with modern best practices	High	Long-Term	Staff time with outside consultant	Proceed with caution
	B. Add definitions and illustrations of low-impact development techniques (such as green roofs, vegetated swales, rain gardens, bioretention landscapes and cisterns) to ensure it is clear that they are allowed and encouraged	Low	Short-Term	Staff time	Possible
	C. Refine the types of development activities that are required to comply with the stormwater management provisions, including instituting an impervious surface-based threshold and all development in sensitive areas	High	Medium-Term	Staff time	Proceed with caution
	D. Consider amendments to the types of development activities that are exempt from stormwater management provisions	High	Medium-Term	Staff time	Possible
	E. Establish incentives for small developments that are exempt from stormwater management requirements to implement low-impact development techniques	Low	Medium-Term	Staff time	Possible
	F. Allow for and encourage the use of porous and semi-porous materials throughout the ordinance (e.g., street design, driveways materials, roof design standards)	Moderate	Short-Term	Staff time	Possible
	G. Provide guidance and incentives for developers to use LID and site design to supplement stormwater management requirements by reducing stormwater runoff close to the source, requiring less structured treatment	Moderate	Medium-Term	Staff time	Possible
	G. Amend the infrastructure and street design standards to utilize existing curb and gutter systems where available, and establish alternative street designs that reduce stormwater channelization	High	Long-Term	Staff time with outside consultant	Proceed with caution
	H. Consider allowing variation to certain architectural standards for green infrastructure and LID techniques (e.g., alternative roof pitches to allow for green roofs or rain cisterns)	Low	Medium-Term	Staff time with outside experts	Possible
2.4 Preserve and expand tree canopy and conservation landscaping	A. Clarify eligibility criteria, standards, and submittal requirements for landscaping and tree protection plans	Moderate	Medium-Term	Staff time	Proceed with caution
	B. Differentiate between ornamental landscaping and ecological / conservation landscaping to ensure standards are applied appropriately in certain areas and to allow for flexibility when achieving other green development goals	Moderate	Medium-Term	Staff time	Proceed with caution
	C. Incorporate canopy-based metrics based on zoning district and/or land use to strengthen tree protection as a green growth tool	Moderate	Long-Term	Staff time	Proceed with caution

STRATEGY	ACTION	IMPACT	TIME FRAME	RESOURCES	VIABILITY
(continued)	D. Integrate stormwater and performance standards to link vegetation with environmental outcomes	Moderate	Long-Term	Staff time with outside consultant	Proceed with caution
	E. Revise screening and buffer standards to mitigate the impact of high-intensity areas (e.g., parking lots, roads, industrial uses) but prioritizing environmental function	High	Long-Term	Staff time	Proceed with caution
	F. Require all landscaping plans be sealed by a qualified design professional	High	Short-Term	Staff time	Possible
	G. Include guidance for long-term maintenance and monitoring of trees and landscaping	Low	Medium-Term	Staff time	Possible
	H. Require bonds for certain types of developments (e.g., major subdivisions, development in the conservation zoning district) to guarantee the protected trees will remain after construction is completed and the guaranteed survival of new trees within a given period	High	Short-Term	Staff time	Possible
	I. Limit removal of trees to a defined building envelope, driveways and utility routes in conservation zoning district	Moderate	Short-Term	Staff time	Proceed with caution
	J. Grant administrators the ability to require staked markings of preservation areas and/or limits to the area of disturbance on sites	Low	Short-Term	Staff time	Possible
	K. Refine the tree removal permit provisions to establish clear, measurable and consistently applied standards to reduce subjectivity in determine necessity and aesthetic values, balance private property rights with environmental protection, and ensure decisions are transparent, defensible and predictable for applicants	Moderate	Medium-Term	Staff time with outside experts	Possible
2.5 Manage urban heat	A. Update urban heat island code language to reflect modern terminology and best practices	Low	Short-Term	Staff time	Proceed with caution
	B. Amend the applicability of the heat island effect mitigation requirements to include smaller buildings and/or any flat roof building types	Low	Medium-Term	Staff time	Proceed with caution
	C. Set performance measures for tree canopy coverage of sidewalks and other pedestrian areas (similar to the existing parking area canopy coverage requirements)	High	Medium-Term	Staff time	Proceed with caution
	D. Allow for cool pavements (light-colored pavements, permeable paving, or reflective coatings) for interior sidewalks and plazas	Low	Short-Term	Staff time	Possible
3. Preservation of Sensitive Areas					
3.1. Protect steep slopes	A. Maintain the City's recently amended steep slope regulations and monitor its effectiveness	Low	Ongoing	Staff time	Possible
	B. Consider adding other provisions to the steep slope regulations pertaining to higher erosion control and stormwater measures	Moderate	Medium-Term	Staff time	Proceed with caution

STRATEGY	ACTION	IMPACT	TIME FRAME	RESOURCES	VIABILITY
3.2 Prevent flood damage (continued)	A. Maintain the City's high standards for flood damage prevention and retain (or improve) the standing as a Level 8 community in the CRS program	Low - High	Ongoing	Staff time	Possible
	B. Codify incentives to set aside the floodplain as preserved open space, similar to the steep slope ordinance	Moderate	Medium-Term	Staff time	Possible
	C. Monitor the remapping process being undertaken by FEMA to update the FIRMs in the wake of Tropical Storm Helene and proactively educate community members about their flood damage risk	Low	Ongoing	Staff time	Possible
3.3 Enhance surface water protection	A. Assess surface waters to determine type (perennial, intermittent, or ephemeral) for greatest protection	Low	Medium-Term	Staff time with outside experts	Possible
	B. Apply surface water protection regulations to identified wetlands	Low	Short-Term	Staff time	Proceed with caution
	B. Consider requiring an additional buffer for low-impact use / managed vegetation beyond the 30-foot protected riparian buffer for perennial streams and incentivize for others	High	Short-Term	Staff time	Impossible
	C. Codify procedures for permitting streambank restoration efforts	High	Medium-Term	Staff time	Possible
	D. Adopt incentives to encourage streambank restoration, particularly for perennial streams and floodplains	Moderate	Medium-Term	Staff time	Possible
4. Restoration of Natural Ecosystems and WIldlife Habitats					
4.1 Integrate resorative open spaces in development	A. Establish purpose-based open space categories (e.g., conservation areas, passive recreation, active recreation, stormwater management, greenways)	Low	Medium-Term	Staff time	Possible
	B. Refine minimum design standards (e.g., size, shape, slope, access and usability)	Moderate	Medium-Term	Staff time	Proceed with caution
	C. Require a significant portion of open space to be contiguous	Moderate	Medium-Term	Staff time	Proceed with caution
	D. Set clear eligibility and non-eligibility criteria for fulfilling the open space requirements	Moderate	Medium-Term	Staff time	Proceed with caution
	E. Enhance submittal requirements to ensure compliance with environmental goals and community benefit	Low	Short-Term	Staff time	Possible
4.2 Reduce light pollution	A. Update lighting code language to reflect modern terminology and best practices	Low	Short-Term	Staff time	Proceed with caution
	B. Establish a dark sky zone with higher requirements or lighting zones that vary regulations based on nighttime activity (likely as part of the conservation district)	High	Long-Term	Staff time	Proceed with caution
	C. Incorporate illustrations and examples of the types of light fixtures that would be prohibited versus allowed	Moderate	Medium-Term	Staff time	Possible

STRATEGY	ACTION	IMPACT	TIME FRAME	RESOURCES	VIABILITY
(continued)	D. Require downward-aiming, shields, louvers, and glare reduction techniques for all fixtures on certain projects or in certain zoning districts	High	Medium-Term	Staff time	Proceed with caution
	E. Require photometric plans for certain types of projects (commercial new construction, etc.) and clarify submittal requirements for smaller projects (likely including a review of fixture types)	Low	Short-Term	Staff time	Possible
	F. Prepare guidance that outline the lighting requirements and direct applicants to resources (DarkSky International, Illuminating Engineering Society of North America, etc.) and pre-approved products	Low	Medium-Term	Staff time with outside experts	Possible
4.3 Incorproate native species in landscaping	A. Memorialize the City's usage of native vegetation in public landscaping projects through an adopted City policy	Low	Short-Term	Staff time	Possible
	B. Add definitions of native vegetation and other key terminology	Low	Short-Term	Staff time	Possible
	C. Adopt official lists of native and non-native species by reference and allow the list to be updated administratively	Moderate	Short-Term	Staff time with outside experts	Possible
	D. Require landscape plans for projects of a certain size to be stamped by a qualified profession (e.g., landscape architect, arborist)	High	Short-Term	Staff time	Possible
	E. Amend regulations in the Code for nuisance grass and clearly define exemptions for intentional natural areas	Low	Short-Term	Staff time	Possible



Fawn Lake in DuPont State Forest. Image Source: Transylvania County Tourism Development Authority.

Next Steps

The next steps of the green growth audit should focus on an incremental, legally defensible strategy that aligns near-term ordinance refinements with longer-term policy goals. This includes advocating for targeted legislative changes to expand the City's zoning authority, while concurrently advancing modest amendments with clearly "possible" changes that can be adopted under current law.

As part of this approach, changes can also be made to position the ordinance for large-scale changes in the future. For example, the GR-4 zoning district could be renamed as a conservation district, with the express limitation that no changes create nonconformities, impose stricter standards, or result in downzoning. In parallel, the City could evaluate opportunities to upzone portions of the existing GR-4 area that are not environmentally sensitive and are well suited for development, thereby maintaining development capacity while reinforcing conservation priorities. If and when state law is amended to allow greater local authority, the conservation zoning district can then serve as the framework for implementing more robust environmental standards, including enhanced requirements for lighting, tree preservation, landscaping, open space, and related green growth objectives.



Honey Fungus, common around the base of trees in Western North Carolina. Image Source: City of Brevard.



SECTION 04
APPENDIX

Rare, Threatened and Endangered Species

TAXONOMIC GROUP	SCIENTIFIC NAME	COMMON NAME	STATUS	HABITAT
Amphibian	Necturus maculosus	Mudpuppy	Special Concern	rivers and large streams in New, French Broad, and Little Tennessee drainages
Amphibian	Cryptobranchus alleganiensis alleganiensis	Eastern Hellbender	Special Concern and Federal Proposal as Endangered	large and clear fast-flowing streams
Bird	Haliaeetus leucocephalus	Bald Eagle	State Threatened and Federal Bald and Golden Eagle Protection Act	mature forests near large bodies of water (nesting); rivers, lakes, and sounds (foraging)
Butterfly	Satyrium edwardsii	Edwards' Hairstreak	Significantly Rare	scrubby or xeric oak woods; host plants -- mainly oaks
Crustacean	Cambarus reburrus	French Broad Crayfish	State Threatened	streams in the French Broad, Little Tennessee, and Savannah drainages (endemic to North Carolina)
Freshwater Bivalve	Alasmidonta raveneliana	Appalachian Elktoe	State and Federal Endangered	Tennessee drainages
Freshwater Bivalve	Strophitus undulatus	Creeper	State Threatened	Roanoke, Tar, Neuse, Cape Fear, Yadkin-Pee Dee, Catawba, Broad, and French Broad drainages
Freshwater Fish	Polyodon spathula	Paddlefish	State Endangered	French Broad River
Freshwater Fish	Cottus carolinae	Banded Sculpin	Special Concern	French Broad and Pigeon drainages
Freshwater Fish	Salvelinus fontinalis	Brook Trout	Significantly Rare	isolated, high-elevation headwater streams
Freshwater Fish	Erimystax insignis	Blotched Chub	State Threatened	primarily French Broad drainage
Mammal	Microtus chrotorrhinus carolinensis	Southern Rock Vole	Special Concern	rocky areas at high elevations, forests or fields
Mammal	Spilogale putorius	Eastern Spotted Skunk	Significantly Rare	forests with rocks, cliffs, and other den sites
Reptile	Crotalus horridus	Timber Rattlesnake	Special Concern	wetland forests in the Coastal Plain; rocky, upland forests elsewhere

Found within a one-mile radius of Brevard. Source: North Carolina Natural Heritage Program

TAXONOMIC GROUP	SCIENTIFIC NAME	COMMON NAME	STATUS	HABITAT
Reptile	Plestiodon anthracinus	Coal Skink	Significantly Rare	rocky slopes, wooded hillsides, roadbanks
Reptile	Glyptemys muhlenbergii	Bog Turtle	State and Federal Threatened	bogs, wet pastures, wet thickets
Sawfly, Wasp, Bee, or Ant	Bombus affinis	Rusty-patched Bumble Bee	Federal Endangered	nests in abandoned mammal burrows, gathers nectar and pollen from a variety of flowering plants found in or near woodlands
Vascular Plant	Hasteola suaveolens	Sweet Indian-plantain	State Endangered	bottomlands
Vascular Plant	Liparis loeselii	Fen Orchid	State Endangered	seeps, bay swamps
Vascular Plant	Phegopteris connectilis	Northern Beech Fern	State Endangered	spray zone of waterfalls, spruce-fir forests, high elevation seepage bogs
Vascular Plant	Shortia galacifolia	Oconee Bells	Special Concern	moist slopes, creekbanks, and rock outcrops in humid escarpment gorges
Vascular Plant	Hexastylis rhombiformis	French Broad Heartleaf	Significantly Rare	cove forests
Vascular Plant	Aconitum reclinatum	Trailing Wolfsbane	Significantly Rare	rich coves, seepage slopes, boulderfields, rocky stream banks, mainly associated with mafic rocks
Vascular Plant	Spiraea virginiana	Virginia Spiraea	State and Federal Threatened	riverbanks

Found within a one-mile radius of Brevard. Source: North Carolina Natural Heritage Program

Acknowledgements

This report was prepared by the City of Brevard Planning Department with input and guidance from Brevard officials, citizen representatives, and subject-matter experts.

The Brevard Planning Department would like to offer special thanks to the North Carolina Wildlife Resource Commission for providing funding and technical assistance in preparing this report.

Planning Department
Emily Brewer, Senior Planner
Paul Ray, Planning Director
Aaron Bland, Assistant Planning Director
Stephanie Holland, Planner
Katherine Poe, Planner
Madalin Baker, Administrative Services Manager

North Carolina Wildlife Resource Commission
Brook Massa, Northern Fish & Wildlife Conservation Planner
Alisa Davis, Southern Fish & Wildlife Conservation Planner

Brevard Sustainability Council
Destini Petitt, PhD, Co-Chair
Joellen Risacher, Co-Chair

Brevard City Council
Maureen Copelof, Mayor
Aaron Baker, Mayor Pro-Tempore
Gary Daniel
Pamela Holder
Dean Lytle
Lauren Wise

Brevard Planning Board
Greg Hunter, Chair
Reid Wood, Vice-Chair
Peter Chaveas
Karen Darity
Michael Hinds
Alan Mercaldo
Gerald Yunker



Sunrise over the Blue Ridge Mountains. Image Source: City of Brevard.

Reference Materials

Colorado Plateau Dark Sky Cooperative & Utah Community Development Office. (2020). *Dark Sky planning: Guidance & best practices — An introduction for local leaders* [PDF guide]. State of Utah's Rural Planning Group. https://cpdarkskies.wordpress.com/wp-content/uploads/2020/02/dark-sky-web-_2-7-2020-2.pdf

DarkSky International. (2025, June 30). *DarkSky recognized codes and statutes* [Web page]. Retrieved February 9, 2026, from https://darksky.org/what-we-do/advancing-responsible-outdoor-lighting/darksky-recognized-codes-and-statutes

Fazio, J. R. (1997). *Tree protection ordinances* (Tree City USA Bulletin No. 31). The Arbor Day Foundation. https://www.arborday.org/tree-resources/tree-protection-ordinances

Federal Emergency Management Agency. (2021, June). *Building community resilience with nature-based solutions: A guide for local communities*. U.S. Department of Homeland Security. https://www.fema.gov/sites/default/files/documents/fema_riskmap-nature-based-solutions-guide_2021.pdf

Fink, T., & Svenson, E. (2022). C*reating conservation overlay zoning: A guide for communities in the Hudson River Estuary Watershed*. Hudson River Estuary Program, New York State Department of Environmental Conservation & Cornell University. Retrieved from https://extapps.dec.ny.gov/docs/remediation_hudson_pdf/overlayzones.pdf

McBride, K. A., CFLC. (2025, February). *Modernizing outdoor lighting regulations* (Zoning Practice, Vol. 42, No. 2). American Planning Association. https://planning org uploaded media.s3.amazonaws.com/publication/download_pdf/Zoning Practice 2025 02.pdf

North Carolina Department of Environmental Quality. (2025). *NC surface water classifications* [GIS dataset]. https://data-ncdenr.opendata.arcgis.com/datasets/nc-surface-water-classifications-3

North Carolina Geological Survey. (2024). *Landslide susceptibility* [GIS dataset]. North Carolina Department of Environmental Quality. https://maps.deq.nc.gov/arcgis/rest/services/DEMLR/North_Carolina_Landslide_Inventory/FeatureServer

North Carolina Natural Heritage Program. (2025, July 25). *Biodiversity/Wildlife Habitat Assessment* [GIS dataset]. North Carolina Department of Natural and Cultural Resources. https://ncnhde.natureserve.org/content/data-download

North Carolina Natural Heritage Program. (2025, October 27). *Managed areas* [GIS dataset]. North Carolina Department of Natural and Cultural Resources. https://ncnhde.natureserve.org/content/data-download

North Carolina Natural Heritage Program. (2025, October 27). *Natural areas* [GIS dataset]. North Carolina Department of Natural and Cultural Resources. https://ncnhde.natureserve.org/content/data-download

North Carolina Natural Heritage Program. (n.d.). *Rare, threatened, and endangered species* [Online species/community search]. North Carolina Department of Natural and Cultural Resources. Retrieved February 9, 2026, from https://www.ncnhp.org/data/speciescommunity-search

North Carolina Wildlife Resources Commission. (2025). *Green Growth Toolbox Handbook*. North Carolina Wildlife Resources Commission. Retrieved from https://www.ncwildlife.gov/wildlife-habitat/conservation-restoration-programs/green-growth-toolbox/handbook-other-planning-resources

Philadelphia Water Department. (2020). *Green Stormwater Infrastructure Landscape Design Guidebook*. City of Philadelphia. https://water.phila.gov/wp-content/uploads/files/gsi-landscape-design-guidebook.pdf

Purdy, B. (2023, February 17). *A practical guide to updating local regulations for climate resilience*. American Planning Association. https://www.planning.org/planning/2023/winter/a-practical-guide-to-updating-local-regulations-for-climate-resilience/

Rhees, S., AICP. (2020, April). *Native landscapes in the neighborhood and beyond (Issue 4)*. Zoning Practice. American Planning Association. https://www.planning.org/publications/document/9198190/

U.S. Environmental Protection Agency. (2023). *Bioretention* design handbook: Designing holistic bioretention for performance and longevity (EPA 841 B 23 002) [PDF]. U.S. EPA Office of Water. https://www.epa.gov/system/files/documents/2023 11/bioretentiondesignhandbook_plainnov2023.pdf

U.S. Environmental Protection Agency. (2021, December). *NPDES: Stormwater best management practice — Eliminating curbs and gutters* (EPA-832-F-21-031O). U.S. Environmental Protection Agency. https://www.epa.gov/system/files/documents/2021-11/bmp-eliminating-curbs-and-gutters.pdf

U.S. Geological Survey. (2024). *Annual NLCD Collection 1 science products* [Data release]. U.S. Geological Survey. https://doi.org/10.5066/P94UXNTS

University of Wisconsin Sea Grant. (2017). *Tackling barriers to green infrastructure: An audit of local codes and ordinances* (WISCU-H-17-001). NOAA (National Oceanic and Atmospheric Administration) Sea Grant Program. https://www.seagrant.wisc.edu/our-work/focus-areas/coastal-communities/green-infrastructure/policy/