



10.15.19

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CITY OF CHATTANOOGA

# NATURAL RESOURCES ASSESSMENT

**Chattanooga City Council**

Chip Henderson  
Jerry Mitchell  
Ken Smith  
Darrin Ledford  
Russell Gilbert  
Carol B. Berz  
Erskine Oglesby Jr.  
Anthony Byrd  
Demetrus Coonrod

**Chattanooga-Hamilton County Regional Planning Commission**

City Mayor Andy Berke, represented by Blythe Bailey  
City Councilman Darrin Ledford

Thomas Palmer  
Mark K. Hiatt  
Adam Veron  
Jason T. Farmer  
Velma Wilson

County Mayor Jim Coppinger, represented by Todd Leamon or  
Alan Knowles

Hamilton County Commissioner Chester Bankston  
Y.L. Coker

David Matthews  
Chris Mabee  
Jim Parks  
Barry Payne  
Ethan Collier  
John Bridger

**Staff Team**

Bryan Shults, Director Development Services  
Emily Wood, Principal Planner, AICP  
John Bridger, Executive Director  
Joseph Beeler, Senior Planner  
Lisa Thompson, Subdivision Coordinator  
Melony Collins, Graphics & Technology Specialist  
Randolph Pullen, Planning Analyst II  
Winsetta Ford, Communication Design Supervisor  
Yuen Lee, Director Research and Analysis

**Advisory Committee**

Bob Geier  
Charles Adamson  
Chris Mabee  
Christy Auld  
Donna Shepherd  
James Havron  
Jim Johnson  
Micah Duffey  
Michael Mallen  
Mike Croxall  
Phillip Clay  
Tim McDonald

**Technical Committee**

Ariel Soriano, Senior Engineer  
Charles Young, Assistant Director Land Development Office  
Clea Klagstad, Circadian Consulting, LLC  
Jeremy Swilley, Development Inspector  
Maria Price, Engineering Manager  
Marty Hawkins, Senior Engineer  
Tony Kinder, Engineering Manager  
Jejal Reddy Bathi, P.E., University of Tennessee Chattanooga

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## EXECUTIVE SUMMARY

The City of Chattanooga is blessed with an abundance of natural resources, including ridges, mountains, rivers, wildlife, and natural beauty. This abundance of natural resources has become one of the many defining characteristics of the Scenic City. Population growth and increased development in recent years has led to more zoning requests, building permits, and land disturbing permits being issued in areas or sites with sensitive natural resources such as slopes and floodplains. More particularly, these development activities neighborhoods like North Chattanooga and St. Elmo led citizens to contact their City Council representatives and attend public meetings voicing concerns or issues with the intensity of development occurring in these natural resource areas.

Therefore, the Chattanooga City Council held a public hearing on Tuesday, October 30, 2018, to determine the public's issues and concerns and to gauge the public's interest in developing standards or other regulations to address development and construction activity in natural resource areas. Following this public hearing, City Council passed Resolution Number 29784 on December 18, 2018, directing RPA staff to analyze the City's steep slopes and floodplain challenges, compare Chattanooga's regulations with other peer cities, and to recommend appropriate regulations to address the identified issues. RPA considered the following question during the assessment writing process which helped frame the recommendations, ***"How do we accommodate growth without compromising the City's scenic assets and natural amenities?"***

This Executive Summary provides a synopsis of the entire Assessment, including the methodology, the core issues and concerns, key findings from the analysis, findings from the peer review, and staff recommendations. The remainder of the Assessment contains the following sections: Background, Characteristics of Steep Slopes and Floodplains, Economic Impacts of Development and Preservation of Natural Resource Areas, Existing Plans and Policies, Existing

Environmental Regulations, Current Zoning Process of Natural Resources Areas, Gap Analysis, and Implementation and Action Steps.

### APPROACH

RPA staff utilized the following resources to inform the recommendations in this Assessment:

- 1) To understand building permit and land disturbance trends, RPA staff analyzed the building permit and land disturbing permit data from the Land Development Office.
- 2) RPA staff utilized GIS mapping software to classify and analyze slope and floodplain information across the City to get a better understanding of how and where development activities were impacting sensitive areas.
- 3) RPA staff formed an Advisory Committee consisting of residents, development interests, engineers and legal experts to serve as a sounding board and a forum to discuss the underlying issues and opportunities for solving them.
- 4) RPA staff also consulted with a working technical team consisting of City engineer staff, UTC faculty, and independent engineers in the field to help with the methodology.
- 5) RPA staff consulted multiple sources including Hamilton County Natural Hazards Mitigation Plan, Federal Emergency Management Agency, Tennessee Emergency Management Agency, American Planning Association, Land of Sky Mountain Ridge and Steep Slope Protection Strategies, Conservation Tools Steep Slope Ordinance, Knoxville and Knox County Hillside and Ridgetop Protection Plan, and Natural Resources Conservation Service. These reference documents are listed in Appendix B.

This process was also shaped by the following principles:

1. Protecting the Health, Safety, and Welfare of the City of Chattanooga Residents



2. Protecting the Environment
3. Protecting Scenic Beauty
4. Balancing Protection with Meeting Housing Needs
5. Balancing Protection with Protection of Private Property Rights

## CORE ISSUES AND CONCERNS

Based on the information gathered from the October public hearing, and discussions with both the Advisory Committee and Land Development Office staff, RPA staff have identified the following as the key issues and concerns related to development in steep slopes and floodplains:

### 1. Inadequate zoning standards that address development on sensitive sites.

A lack of appropriate zoning regulation standards or other tools that are necessary to appropriately regulate development and construction activity occurring in natural resource areas has led to inconsistency in the rezoning process. While current regulations do address filling in the floodplain, they do not address excessive site clearing, grading or limiting development in natural resource areas. In some instances, current regulations (such as setbacks and right-of-way standards) can increase impacts to these sensitive sites.

Without zoning standards, RPA staff is reacting to rezoning requests by creating conditions “on the fly” to provide protections of natural resources. The Land Development Office (LDO) has to track conditions on the back end of development review as opposed to a codified regulation or development standard. This results in less predictability and consistency in defining appropriate site design and best management practices for development or construction activity in natural resource areas.

### 2. Site Review/Enforcement

Prior permitting procedures did not clearly indicate the timing for slope stabilization or enforce sufficient penalties to ensure good site development practices. A site tour with the Advisory Committee indicated the following site management issues: premature clearing of

lots with no stabilization or pending construction, and infill vacant lot development in established neighborhoods was impacting adjacent properties (debris/runoff).

### 3. Public Complaints

During rezoning hearings, and at the October public hearing, the public have noted the following concerns:

- How proposed development concepts impact slopes/floodplains
- Increase in stormwater run-off onto streets and adjacent property during the site development process
- Loss of trees/vegetation and wildlife habitat
- Mass grading of entire site
- Loss of scenic views
- Sites prematurely cleared without proper stabilization or timely start of construction

## KEY FINDINGS FROM DATA/POLICY ANALYSIS

Development trends were analyzed from a ten year period (2009-2018) using building permit, land disturbing permit, and zoning case data to see where development or construction activity is occurring in relation to existing natural resource areas.

### What does the Data Indicate?

The following is a brief overall summary of the development trends from 2009 thru 2018.

- Acreage of vacant land with slopes 25% or greater accounts for 54% of the vacant acres of land.
- The majority of building permits issued for construction activity are located on sites in the 0-15% slope class; however, the permits in the over 25% slope class increased by 45% during the 10-year period, while overall permits increased by only 6%.
- The majority of the land disturbing permits issued for construction activity are located in the 0-15% slope class; however, the

permits in the over 25% slope class increased by 91% during the 10- year period. Overall permits increased by 83%.

- Seventy-percent (70%) of the zoning requests and special permits for Residential Planned Unit Developments are located in natural resource areas.
- There are areas in the City that are at high risk for soil erodibility based on the “K” factor. These areas include steep slope areas on Missionary Ridge, Lookout Mountain, and Big Ridge. High soil erodibility can also be found along the floodplain areas. A recent example of this issue is the slope failure along Lake Resort Drive that collapsed earlier this year. The repairs will cost the City approximately 5 to 11 million dollars.
- Over 80% of the floodplain has been developed. This heightens the concerns for protecting the remaining floodplain areas.
- The number of land disturbing and building permits issued for sites within the floodplain have declined during the 10-year period.
- There has been high risk and documented property damage associated with major flood events through the issuance of insurance claims.

**87 PROPERTY  
LOSSES AND  
\$5,739,568 IN 2018**  
Source: TEMA

## PEER REVIEW/GAPS ANALYSIS

Many jurisdictions have adopted natural resource protection ordinances because of the unique challenges topography and the floodplain have for the development of land. In investigating these peer jurisdictions, RPA limited the review to jurisdictions in the southeast that are very similar to the City of Chattanooga. The jurisdictions included Knoxville, TN, Nashville, TN, Williamson County, TN, Asheville, NC, Durham, SC, and Huntsville, AL.

Many of the ordinances and regulations RPA reviewed had common approaches for reducing the impact of development and construction activity on slopes and floodplains. These approaches all had a goal of limiting disturbance in these sensitive areas.

Most ordinances contain regulations that permit narrower road standards and reduced setbacks to limit disturbance on slopes. Heights of buildings are also reduced to a height of not less than the average height of the tree canopy. Reductions in density and limitations on building footprints were used to limit disturbance. Standards limiting grading, clearing, and disturbance as it relates to slope of the land are used in most of the ordinances reviewed.

### How did Chattanooga Regulations Compare to Peer Jurisdictions?

The analysis indicates the City lacks certain standards or tools in the zoning or subdivision regulations that could be effective at addressing public concerns and issues and provides suggestions on how to alleviate the concerns based on best management practices from the peer review jurisdictions.

### **Zoning and Subdivision Regulations**

RPA grouped the natural resources standards found in the zoning and subdivision regulations of the peer review jurisdictions into a total of 22 overall requirement categories. Of the 22 requirement categories, the City of Chattanooga had only 2 similar regulations of the peer review jurisdictions.

**CHATTANOOGA HAS 2  
OUT OF 22 SIMILAR  
REGULATIONS TO PEER  
REVIEW JURISDICTIONS**

### **Stormwater and Land Disturbance Permits**

RPA grouped the standards and regulations into a total of 29 overall requirement categories. Of the 29 requirement categories, the City of Chattanooga had 19 similar regulations of the peer review jurisdictions.

## RECOMMENDATION

Based on the analysis of the data trends, public comments received including land use plan recommendations, comments from the Advisory and Technical Committee, and best management practices, RPA is recommending for City Council's consideration the adoption of a Natural Resource Protection Ordinance that accommodates growth and at the

same time offers protection of the City's scenic assets and natural amenities. The ordinance includes changes to codes that add more flexibility (density bonuses) and modifications to existing standards that currently make it more difficult to minimize the impacts of development on these sites. The recommendations also include new standards that limit grading, clearing, and filling of slopes and floodplains to protect Chattanooga's scenic natural landscapes.

HOW DO WE  
ACCOMMODATE GROWTH  
WITHOUT COMPROMISING  
THE CITY'S SCENIC  
ASSETS AND NATURAL  
AMENITIES?

The Natural Resource Protection Ordinance would apply to all properties meeting the criteria city-wide. The ordinance will help fulfill the goals of protecting the City's natural resources as identified in the adopted Comprehensive Plan Update 2030 and Land Use Plans. An Ordinance is enforceable, consistent, and will address the gaps and public concerns identified through this assessment.

### **Recommended Standards in the Natural Resources Ordinance**

RPA is recommending the following amendments and standards that regulate the following topics. Please note that any reference to a specific quantitative standard is for illustrative purposes only.

#### **1. Definition of Steep Slope**

Define a percentage grade of a "steep slope" that will serve as a baseline for the Natural Resources Ordinance. For illustration purposes only, slopes could be categorized as "Moderate Slopes: 15-25%" and "Very Steep Slopes: 25% or greater."

#### **2. Land Use Restrictions**

Establish a special permit process for intensive land use activities (such as hospitals, public assembly uses, and intensive non-residential uses) that may occur in high hazard areas such as documented slope hazard areas or flood-prone areas. The main objective is to ensure the use would not present accessibility issues

or pose safety concerns for less mobile residents such as a nursing home.

#### **3. Limitations on Clearing, Grading or Disturbance**

Establish restrictions that limit the amount of clearing, grading, and disturbance permitted on a site during construction. For example, for sites with slopes of 15% to 25% the amount of disturbance permitted in the sloped area could be limited to no more than 50% clearing, grading, or disturbance. For sites with slopes of 25% or greater the amount of disturbance permitted in the sloped areas could be limited to no more than 25% of clearing, grading, or disturbance.

#### **4. Tree Canopy Protection Standards**

Explore options of requiring a certain percentage of existing tree canopy on the development site to be retained and protected during construction for sensitive natural resource sites. Existing tree canopy retained could be used as credits towards any open space or landscape yard requirements.

#### **5. Limit Amount of Impervious Surface**

Establish standards or regulations limiting or reducing the amount of impervious surfaces for non-residential uses such as minimizing parking space stall dimensions, required number of compact car stalls, using porous surfaces, encourage shared parking, and encourage structured parking decks.

For residential uses limiting the amount of driveway and building footprint to a certain percentage of the total lot area.

#### **6. Establish a "Zero Net Increase" in Floodplain Fill**

Establish standards that require compensatory storage to off-set fill. This is often referred to as a 1:1 fill ratio. The basic concept is an equal volume of fill shall be removed for a site to compensate for the same volume of fill that is placed in the floodplain.

**7. Density Bonus**

Establish a density bonus in residential density if a certain percentage of a site or lots with natural resources is preserved and set aside from development. For example, Asheville, North Carolina permits a residential density bonus of 30% if 30% to 40% of the site with natural resources is preserved. The density bonus increases as the amount of land preserved increases up to a maximum of a 60% density bonus.

For non-residential uses the density bonus could be an increase in building height or reduced parking requirements.

**8. Flexibility in Required Setbacks**

Establish a staff approval process for reductions in front and rear setbacks if a portion of the site containing natural resources is preserved and site grading is limited.

**9. Lots of Record**

Existing lots legally recorded prior to the adoption of the Natural Resources Ordinance should be analyzed more thoroughly to determine their requirements of the Natural Resource Ordinance and if there would be any unintended consequences or undue hardship created for lots of records by being required to comply with the Natural Resources Ordinance. However, lots of record could be eligible for reduced setbacks if the natural resource area on the site is preserved and no grading occurs in this area. Special standards could be developed that factor in different home construction techniques (such as slab construction versus pier construction). Additional flexibility will be needed to address the unique site conditions for each lot of record. The overall objective is to establish some basic parameters on clearing and grading on a lot of record.

**10. Planned Unit Development (PUD)**

Amend the PUD tool with new and up-to-date standards and criteria that can be used as a tool to protect natural resource areas and provide incentives for developers such as an increase in the permitted density in exchange for preserving sensitive areas or providing useable open space for residents.

**OTHER RECOMMENDED TOOLS**

As part of this assessment RPA determined that other regulations or tools will need to be amended or created and are briefly described below.

**City of Chattanooga Subdivision Regulations**

RPA is recommending amendments to the Chattanooga Subdivision Regulations as additional tools of protection of our scenic assets and natural amenities.

**1. Road Reductions on Hillsides**

Allow an opportunity in the subdivision regulations to reduce the required minimum right-of-way in hillsides or sloped areas to reduce the amount of impervious surface and land clearing necessary for the construction of streets. This will require coordination and discussions with other partners such as Chattanooga Department of Transportation (CDOT) and the Fire Marshall's Office.

**2. Critical Lot**

Lots that contain steep slopes, soil conditions/high erodibility, and floodplains should be identified on the subdivision plat as a critical lot and should be evaluated by a geotechnical engineer/report as to the feasibility of construction and methods of construction that will address the stabilization and stormwater run-off associated with a critical lot.

**3. Slope Map**

Staff is recommending that slope maps be provided by applicants during permit review showing the delineation of existing slope categories. Slope maps are available through a free website from Hamilton County GIS.

**4. Site Assessment Map**

Staff is recommending a site assessment map be provided by applicants during permit review that shows the approximate location and indication of size and condition of all natural hazards and sensitive environmental features found within boundaries of the proposed

subdivision. Such items include sinkholes, soil classifications, springs, wetlands, bluffs, streams, etc.

**5. Conservation Based Design Subdivision Standards**

Create a conservation based design subdivision tool that provides clear standards for natural resource protection. This tool will establish regulations that require a certain percentage of the area to be permanently protected as open space. In return the developer is provided with flexibility in required minimum lot size, setbacks, lot frontage, and street widths. Density bonuses could also be part of the requirements for conservation based design subdivisions.

**6. R-1 Open Space Option**

The R-1 Open Space Option was adopted by City Council in 1995 and has rarely been utilized. This tool should be evaluated to determine why it is not being used and if possible amendments are required.

This option may need to be removed from the Chattanooga Zoning Regulations as this is not a zoning classification; it is a subdivision design option that provides alternative design standards for development of a single-family residential subdivision.

**7. Promote more opportunities for infill development in less sensitive areas**

RPA is in the process of creating area plans for the City of Chattanooga. One goal or policy of the area plans is to encourage infill development in established neighborhoods and supports various housing forms and types to meet the housing demand and opportunities to provide affordable housing for the residents of Chattanooga. Opportunities to promote more housing infill options should be identified and established with each area plan.

**Improvements to Permitting Process/Code**

Based on the peer view, Gaps Analysis, and best management practices from city staff and stakeholders, there may be additional opportunities for the Land Development Office to explore options for possible amendments to Municipal Code Section 31, Stormwater Management to address

concerns and issues voiced by the public. RPA has contacted the Land Development Office, and they are aware of these recommendations and are supportive of the following:

**1. Landscaping and Material Facing of Retaining Walls**

Explore options of requiring landscaping or material facing for landscape retaining walls of a certain size.

**2. Timing of Retaining Wall Construction**

Explore options of requiring that retaining walls be constructed onsite prior to the start of construction of the building or structure.

**3. Limitations on the Amount of Land Disturbance of Grading Permitted at One Time**

Explore options of limiting the amount of clearing, grading, or disturbance permitted at any one time on a site. For example, a maximum of 10 acres of clearing, grading, and disturbance should be permitted only with the 10 acres being stabilized and revegetated prior to applying for additional clearing, grading, or disturbance for other areas on the same development site.

**4. Security Bond for Revegetation/Stabilization**

Explore options of requiring a security bond or letter of credit for sites of a certain size to provide the city required revegetation and stabilization.

**5. Slope Stability Certifications**

Explore option of requiring a geo-technical engineering report or certificate for slopes sites that the site or slope is free of failures, and that temporary or permanent ground cover is provided.

**6. Site Plan Review or Geo-Technical Report for Critical Lots**

Explore option of requiring detailed site plans for lots identified as critical lots. A critical lot would be a lot with slopes, floodplains, and high soil erodibility. Additional measures should be required by applicants such as a geotechnical engineer/report as to the feasibility



of construction and methods of construction that will address the stabilization and stormwater run-off associated with a critical lot.

## **7. Timing of Land Disturbing Permit and Start of Construction**

Explore options of requiring that the start or beginning of building construction be noted on the application for a land disturbing permit, and the beginning of building construction to begin within so many days after permanent clearing, grading, and disturbance has ended.

## **SUMMARY**

RPA's recommendations are not intended to limit or prohibit growth and development on steep slopes or floodplains. The recommended Natural Resource Ordinance is meant to provide standards that allow for the appropriate and wise development of sites containing slopes and floodplains.

As noted earlier in this summary, 54% of the remaining vacant land is on steep slopes, and permit trends have indicated that development activities will continue to increase in these sensitive areas as the City grows. Currently Chattanooga only regulates two of twenty-two common zoning standards found among the six peer cities. The increase in citizen concerns and complaints about loss of tree cover, mass grading, stormwater run-off and impacts to the City's scenic character has served as an indicator that the current standards for sensitive site development are inadequate. It is also important to note that many of the current standards actually make the problem worse by offering limited flexibility in setbacks, right-of-way widths, and density incentives to promote protection of sensitive areas.

As stated earlier in this Executive Summary, during the creation of this assessment RPA would adhere to five key values or principles during this assessment as well as suggesting recommendations.

1. Protecting the Health, Safety and Welfare of the City of Chattanooga Resident
2. Protecting the Environment
3. Protecting Scenic Beauty
4. Balancing Protection with Meeting Housing Needs
5. Balancing Protection with Protection of Private Property Rights

To address the identified issues, and to balance the key values listed above, RPA has provided a list of recommended changes that accomplishes the following:

- Better definitions of the sensitive resources to be protected
- Clear standards for how these sites are developed through grading, clearing and filling limits
- Density bonuses for leaving sensitive areas undisturbed
- New zoning/subdivision tools that provide added flexibility for setbacks, and right-of-way widths
- Improved land disturbing permit standards to provide more "due diligence" safeguards when developing in sensitive areas

The number of recommended standards and changes in this report is substantial. Nonetheless, staff advises that these standards are needed based on our assessment of the issues, review of best planning practices and other City ordinances. The Zoning Ordinance has not received a comprehensive update in over twenty years which may partially explain the lack of standards and the low score in the Gaps Analysis. Given the amount of changes proposed, staff would recommend a "grace period" for any new ordinances to provide an opportunity for the local market to adjust to these new requirements. While these changes are substantial, they are not, in staff's opinion, impractical given that they are already in practice among the six peer Cities studied (Knoxville, Nashville, Williamson County, Asheville, Durham, and Huntsville). RPA staff is ready to begin developing the specific ordinance tools and standards, once City Council has provided direction to staff concerning the recommended approaches

## SECTION 1: BACKGROUND



Downtown Chattanooga with Lookout Mountain & Tennessee River  
Source: chattanooga4fun.com

### A. Introduction

The City of Chattanooga is known as the “Scenic City” due to its mountain vistas, the Tennessee River and an abundance of outdoor recreation opportunities (see Figure 1 Natural Resources Map on page 3). Chattanooga is also known as the “Gig City” because it became the first city in 2010 to roll out a city-wide gigabit network. These two factors have led to an increase in population and employment growth over the last ten years with the addition of companies like Amazon and Volkswagen.

From 2010 to 2017, Chattanooga experienced steady population growth from approximately 170,000 residents in 2010 to approximately 179,000 residents in 2017. Livability.com named Chattanooga one of the top 100 best places to live. In 2017, the Chattanooga Times Free Press published an article that Chattanooga’s population growth was

among the best of the four largest cities. A Times Free Press report in March 2018, noted that Chattanooga’s job growth outpaced the nation.

Because of this population and employment growth, the housing market has also increased. Chattanooga was named as the top housing market to watch in 2018 by Realtor.com. The increase in residential units has led to more development related permits including building permits, land distributing permits and rezoning cases. The data shows that more of these permits are being located in the scenic natural resource areas likely because more of the vacant parcels located in flat areas are already developed. This data will be described in more detail in Section 2 and 3.

### B. Project Initiation

Citizens of Chattanooga have identified, through public planning processes, the need to protect the City’s natural resources by the creation and adoption of land use plan policies. Adopted land use plans such as Lookout Valley, Hixson-North River, St. Elmo, Hill City, Wolftever Creek, and East Brainerd Corridor plans recommend a steep slope ordinance or other resource conservation methods to protect the natural resources.

The Comprehensive Plan 2030 states that the number one issue or priority of citizens who participated in the public planning process was that **regulations or policies were needed for the preservation of natural resources.**

Unfortunately, the land use and Comprehensive Plan recommendations have been applied inconsistently to rezoning cases throughout the years. Therefore, the push for the need to study and provide recommendations for development and protection stemmed from recent rezoning requests to intensify the development potential of properties in natural resource areas. Other recent developments,

primarily in the North Chattanooga and St. Elmo communities, have resulted in properties being cleared for months with no development on the site resulting in hillside scarring, significant tree loss, and increased stormwater runoff on those sites.

These issues led to citizens to contact their City Council representatives and attend City Council or Chattanooga-Hamilton County Regional Planning Commission meetings voicing opposition to the intensity of development proposed on steep slopes, increased stormwater runoff, and loss of trees and vegetation.

Therefore, the Chattanooga City Council held a public hearing on Tuesday, October 30, 2018, to gauge the public's interest in developing standards to address development and construction activity in natural resource areas such as steep slopes and floodplains.

The comments received at the public hearing supported the need to adopt clear and consistent development standards for development occurring on steep hillsides and floodplains so as to protect the natural and scenic integrity, and to minimize associated impacts from stormwater runoff.

### **C. City Council Authorization**

The Chattanooga City Council adopted Resolution Number 29748 on December 18, 2018, directing staff of the Regional Planning Agency (RPA) to analyze the City's steep slopes and floodplain challenges. Based on this analysis, the Natural Resources Assessment will include separate recommendations for steep slopes and floodplains for Council's consideration based on best management practices, peer review, and public input.

### **D. Advisory Committee & Technical Committee**

In January 2019 the Regional Planning Agency created an Advisory Committee, comprised of twelve citizens of Chattanooga and Hamilton County representing a wide variety of interests and professions in the

community such as local residents, home builders, engineers, and real estate professionals.

The Advisory Committee served as a sounding board to facilitate discussion across interest groups and provide feedback to staff. The Advisory Committee was not tasked with making decisions or providing a recommendation of support for the Assessment.

The Advisory Committee attended several meetings where they toured problematic sites to understand the problem, examined existing regulations, reviewed and provided comments on the report data.

RPA staff also worked with a Technical Committee comprised of staff from the City of Chattanooga Land Development Office, Engineering Department, and Public Works Department, as well as a professional environmental engineer, and engineering professor from the University of Tennessee Chattanooga to provide assistance with data analysis and best management practice recommendations.

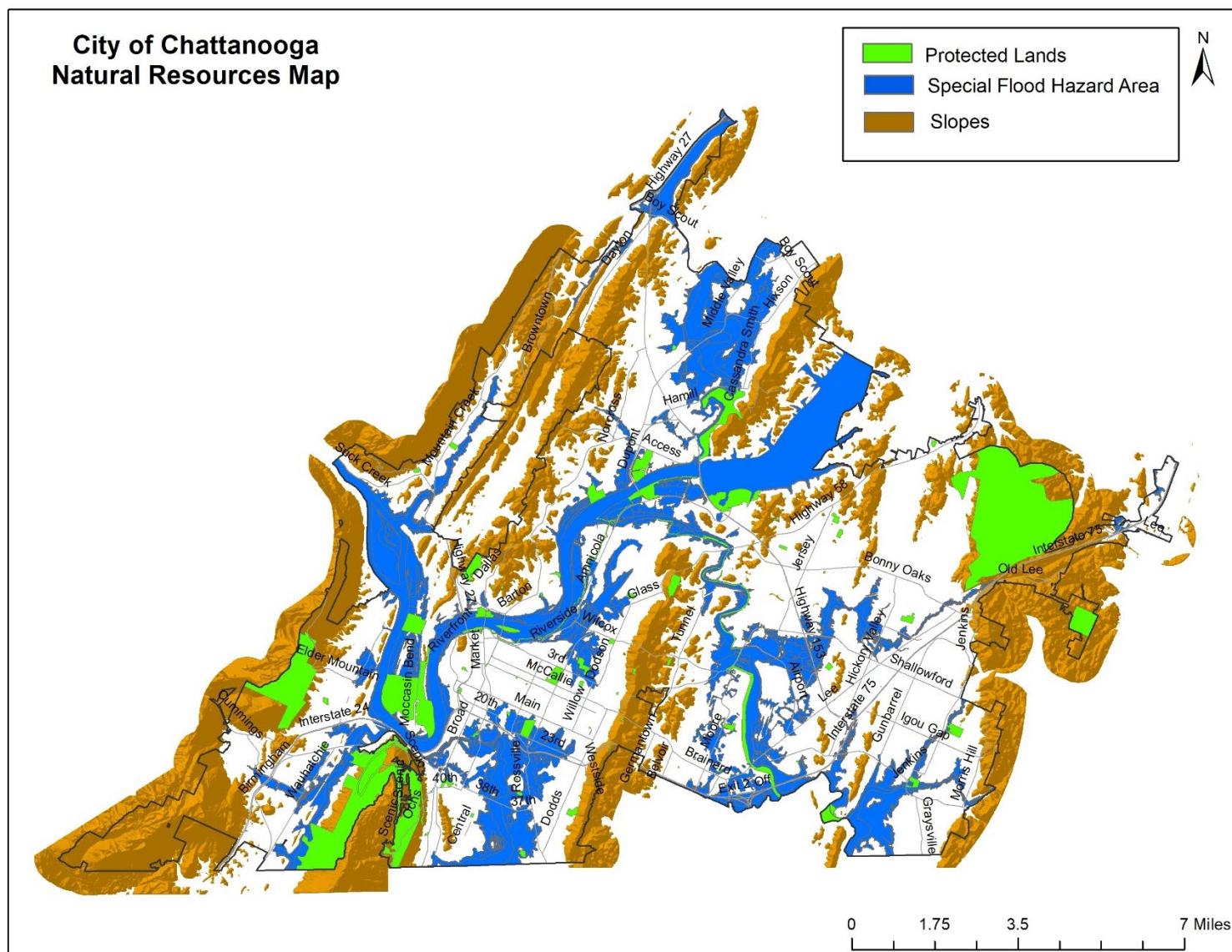
### **E. Guiding Key Values and Principles to Inform Study**

During the creation of this Assessment, RPA established five key values or principles that staff should adhere to when creating the report and suggesting recommendations. These five key values or principles are as follows:

1. Protecting the Health, Safety, and Welfare of the City of Chattanooga Residents
2. Protecting the Environment
3. Protecting Scenic Beauty
4. Balancing Protection with Meeting Housing Needs
5. Balancing Protection with Protection of Private Property Rights



### Figure 1. Natural Resources Map



## SECTION 2: CHARACTERISTICS OF STEEP SLOPES



Raccoon Mountain  
Source: reddit.com

### A. Definition of a Slope

A slope is the inclination or pitch of the land's surface and is measured as rise over run. There are several ways a slope can be measured including using degrees, topographic maps, or a percentage. Municipalities generally measure slopes in the form of percentage." The range of what is defined as a steep slope in municipalities across the U.S. include a broad range anywhere from 10-30% or more. The county soil surveys, produced by the U.S. Department of Agriculture's Natural Resource Conservation Service, categorize soil types, in part, based on slope, with typical classifications occurring in the following ranges:

- 0-3%
- 3-8%
- 8-15%
- 15-25%
- 25-50%

For the purposes of this Assessment, the slopes in Chattanooga are measured by percent and are broken down into the following categories:

- 0-15%
- 15-25%
- Over 25%

The slope categories were chosen using the Chattanooga Hamilton County Comprehensive Plan (adopted March 14, 2016), NRCS soil categories, and current City of Chattanooga subdivision regulations related to public road standards.

The slope classifications listed above were assigned to each parcel of land. If 20% or more of the total parcel area was represented by a single slope class, then the parcel was assigned that profile. Since sloped areas are cause for more concern than flat areas, the assignment began with the highest slope class and worked its way to the lowest.

### B. Factors Affecting Slopes

The following facts about slopes was taken from information in the Hamilton County *Natural Hazards Mitigation Plan*, Lehigh Valley Planning Commission *Steep Slopes Model Regulations*, Knoxville and Knox County *Hillside and Ridgetop Protection Plan*, and Conservation Tools *Steep Slope Ordinance*. All sources used in this Assessment are located in Appendix B.

Steep slopes are among the most sensitive environmental features in our landscapes. Ridges and hillsides are critical components of the area's scenic beauty and environmental vitality, comprising one-third of Hamilton County's total land area. However, according to the 2030 Comprehensive Plan, only 16% of that ridge and hillside land is protected.



Steep slopes are naturally unstable. Gravity, wind, climate, vegetation, water or disturbance, either natural or man-made, can influence the process of the natural slope system and cause mass movement, erosion, slippage or slide. The characteristics that influence the stability of slope include geology, slope drainage, slope topography (shape and steepness), soil type and changes to the slope (placing soil or removing soil from the slope).

Slopes are vulnerable to damage resulting from site disruption, primarily related to soil erosion. Damage is likely to spread to areas which were not originally disturbed. Development of steep slopes, especially adjacent to stream corridors, can increase erosion of stream banks resulting in decreased water quality.

Steep slopes, when improperly developed, can significantly increase stormwater runoff and erosion because water movement is the most common mechanism of slope instability. The greater the steepness of the slope, the more likely it is that rain will run off rather than infiltrate. In addition, the steeper the slope, the faster the water will travel. This runoff can cause severe erosion and stream channel degradation. Such increases in velocity and volume also carry soil down the slopes and into streams causing siltation and damage to aquatic life and habitat.

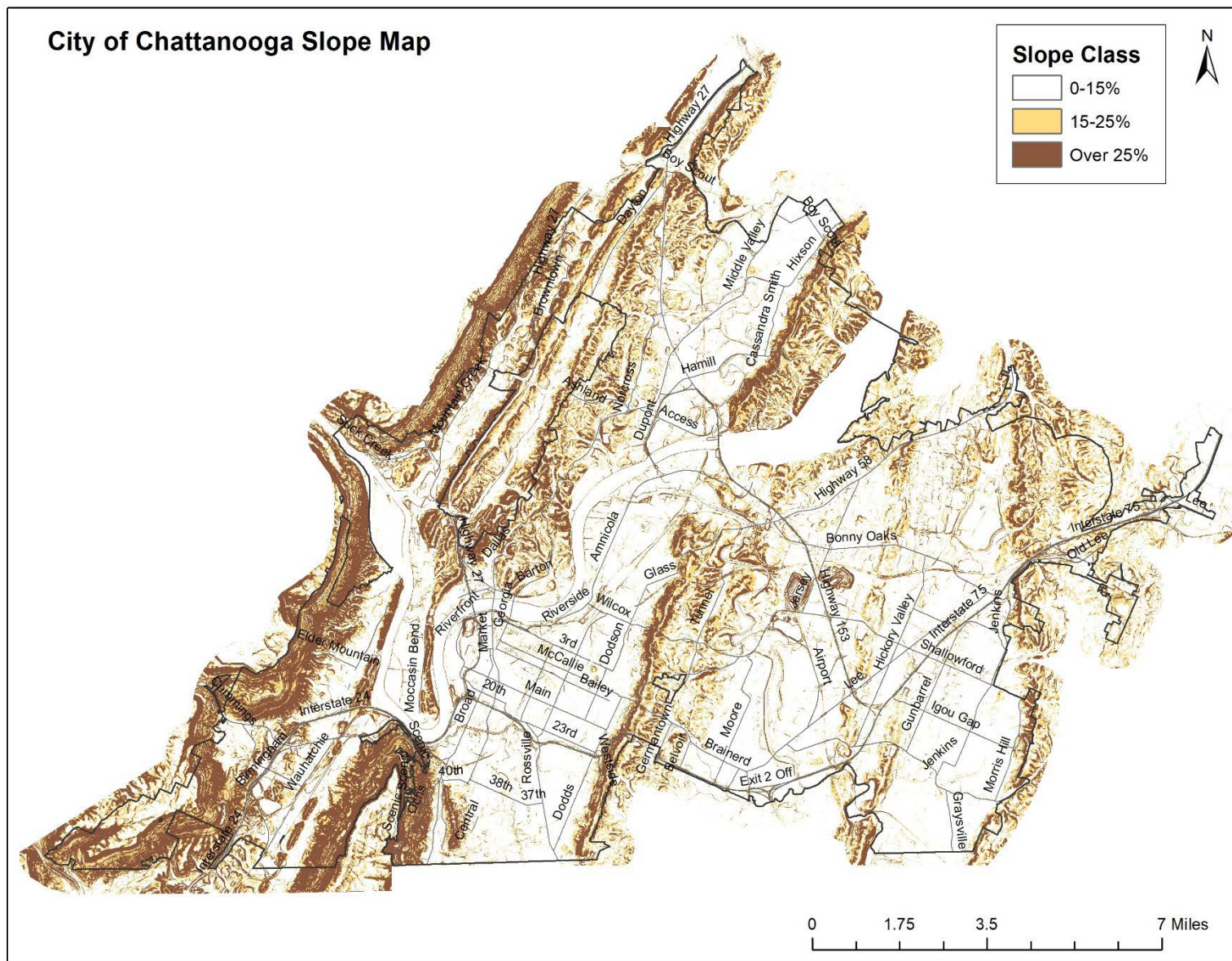
**SUMMARY:** Slopes are one of the most sensitive environmental features in the landscape. Ridges and hillsides comprise 1/3 of Hamilton County's land area but only 16% of the land is protected.

## **C. Slope Location and Data Analysis**

### **I. Slope Location**

Chattanooga and Hamilton County is located in the Appalachian Mountains and contain many ridges including, but not limited to, Lookout Mountain, Signal Mountain, Raccoon Mountain, Hawkin's Ridge, Stringer's Ridge, and Big Ridge. Figure 2 on the next page shows the location of the slopes broken down by the slope classes listed above.

Figure 2. Slope Map



## II. Slope Data Analysis

The Regional Planning Agency analyzed a variety of data sets to examine development trends in the City's sloped areas. The following is a detailed description of the city-wide analysis. Appendix A has more data specific to each City Council District.

### Parcel Data

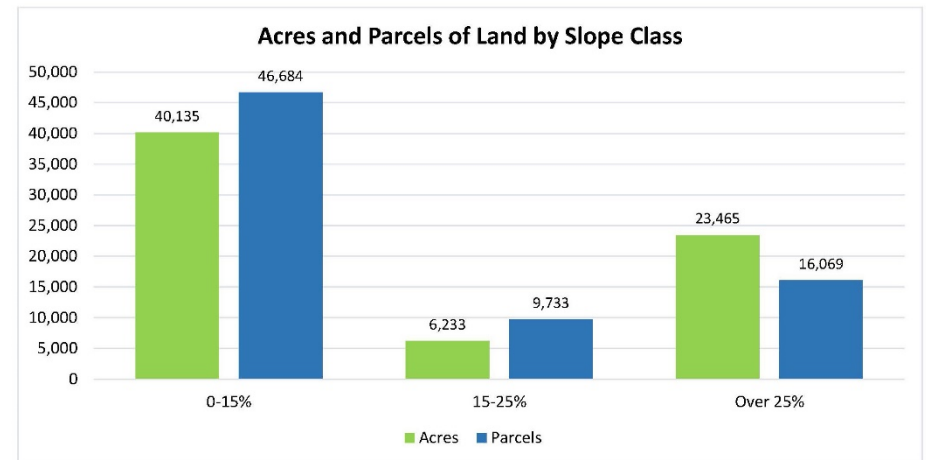
There are approximately 69,833 acres and 72,486 parcels of land in the City of Chattanooga that were evaluated for this Assessment. The parcel data was obtained from the Hamilton County Tax Assessor's Office. Similar to the methodology used in the Comprehensive Plan, protected lands such as those owned by the U.S. National Park Service, State Parks, National Military Parks, City Parks, and Wildlife Refuges were excluded from the data analysis. These areas were excluded because the assumption is that these areas are protected by federal, state, or local law and development is not likely to occur in these areas. This same assumption has been made with the floodplain data in Section 3 and any other data in this Report (Figure 1 on page 3 shows a map of the protected lands).

Vacant parcel data was also obtained from the Hamilton County Tax Assessor's Office based on their land use classifications. The classifications include criteria such as undeveloped land, unused land, vacant land suitable for development, vacant land commercial and industrial, and vacant condominiums. This same assumption has been made with the floodplain data in Section 3 and any other data in this Assessment.

Lot data was not available during this analysis because it is not maintained by the Hamilton County Tax Assessor or Regional Planning Agency. While often used interchangeably, there is a difference between lot and parcel. Simply stated, a parcel is an identification for taxation purposes, while a lot is a recognized subdivision of property with a written legal description that addresses permissions or

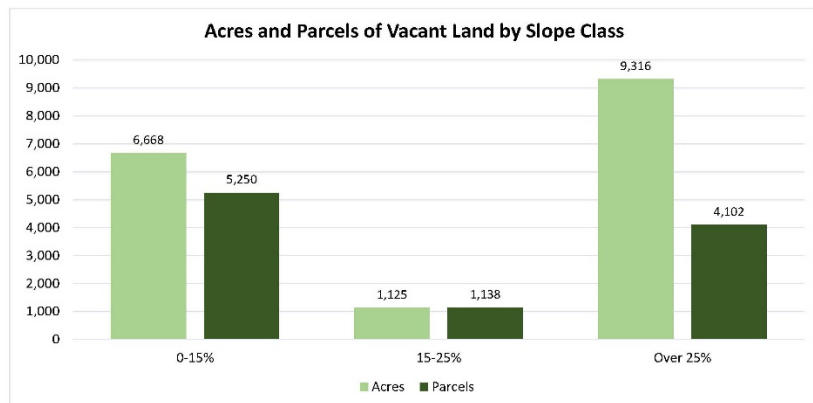
constraints upon its development. Therefore, it is likely that there are more lots than parcels in the city, and the data should be interpreted with this assumption. This same assumption has been made with the floodplain data in Section 3 and any other data in this Assessment. The following figures show the parcel data by slope class.

**Figure 3. Acres and Parcels of Land by Slope Class**



- Although Chattanooga is surrounded by mountain ridges, 57% of the acreage of land and 64% of the parcels are located in the 0-15% slope class.
- Because of those mountain ridge, 34% of the acreage of land and 22% of the parcels are located in the over 25% slope class

**Figure 4. Acres and Parcels of Vacant Land by Slope Class**



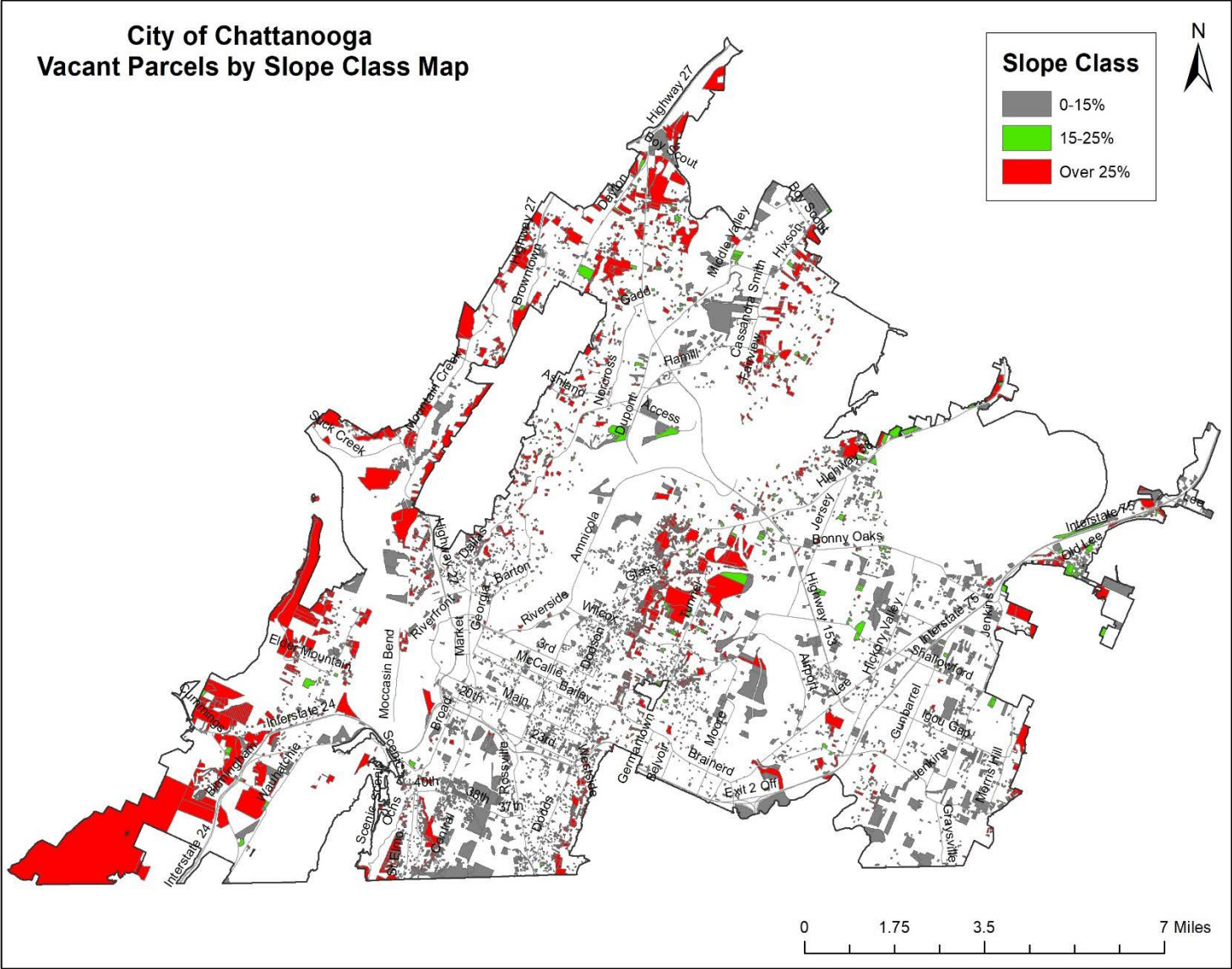
**SUMMARY:** 57% of the overall acreage of land is located in the 0-15% slope class (low to moderately steep), and 54% of the vacant land is located in the over 25% slope class (very steep) indicating additional protection methods are necessary to ensure the Scenic City remains scenic.

There are approximately 17,109 acres and 10,490 parcels of vacant land.

- 39% of the acres and 50% of the parcels are located in the 0-15% slope class. These areas are scattered across the city in many of the established neighborhoods like East Chattanooga and Brainerd.
- 54% of the acres and 39% of the parcels are located in the over 25% slope class. These areas are located on larger parcels on the mountain ridges and smaller lots of records in areas such as St. Elmo as indicated by the red parcels in Figure 5.



Figure 5. Vacant Parcels by Slope Class Map





### **Soil Erodibility Data**

Soil erosion is one of the major causes and variables used to assess and understand land degradation. Erosion often occurs as a consequence of land disturbing activities such as fire, mining, agriculture, and construction. Factors such as soil type, precipitation, vegetation, and topography can affect how much erosion and runoff will occur on a site. Larger, bare areas will contribute larger volumes of runoff because there is no vegetation to retain the soil and reduce the runoff. Topography also affects erosion by increasing the speed of water runoff. Doubling the slope length increases erosion potential by four times, and doubling the slope gradient increases erosion potential by 5 times.

Soil erodibility was analyzed using the K factor (Kf) from the U.S. Department of Agriculture, Natural Resources Conservation Service. K factor variables are used by most practicing geotechnical engineers to calculate soil erodibility. K factor represents both susceptibility of soil to erosion and the rate of runoff. Soils high in clay have low K values, about 0.05 to 0.15, because they are resistant to detachment. Coarse textured soils, such as sandy soils, have low K values, about 0.05 to 0.2, because of low runoff. Medium textured soils, such as silt loam soils, have a moderate K values, about 0.25 to 0.4, because they are moderately susceptible to detachment and they produce moderate runoff. Soils having a high silt content are most erodible of all soils. They are easily detached and produce high rates of runoff. Values of K for these soils tend to be greater than 0.4.

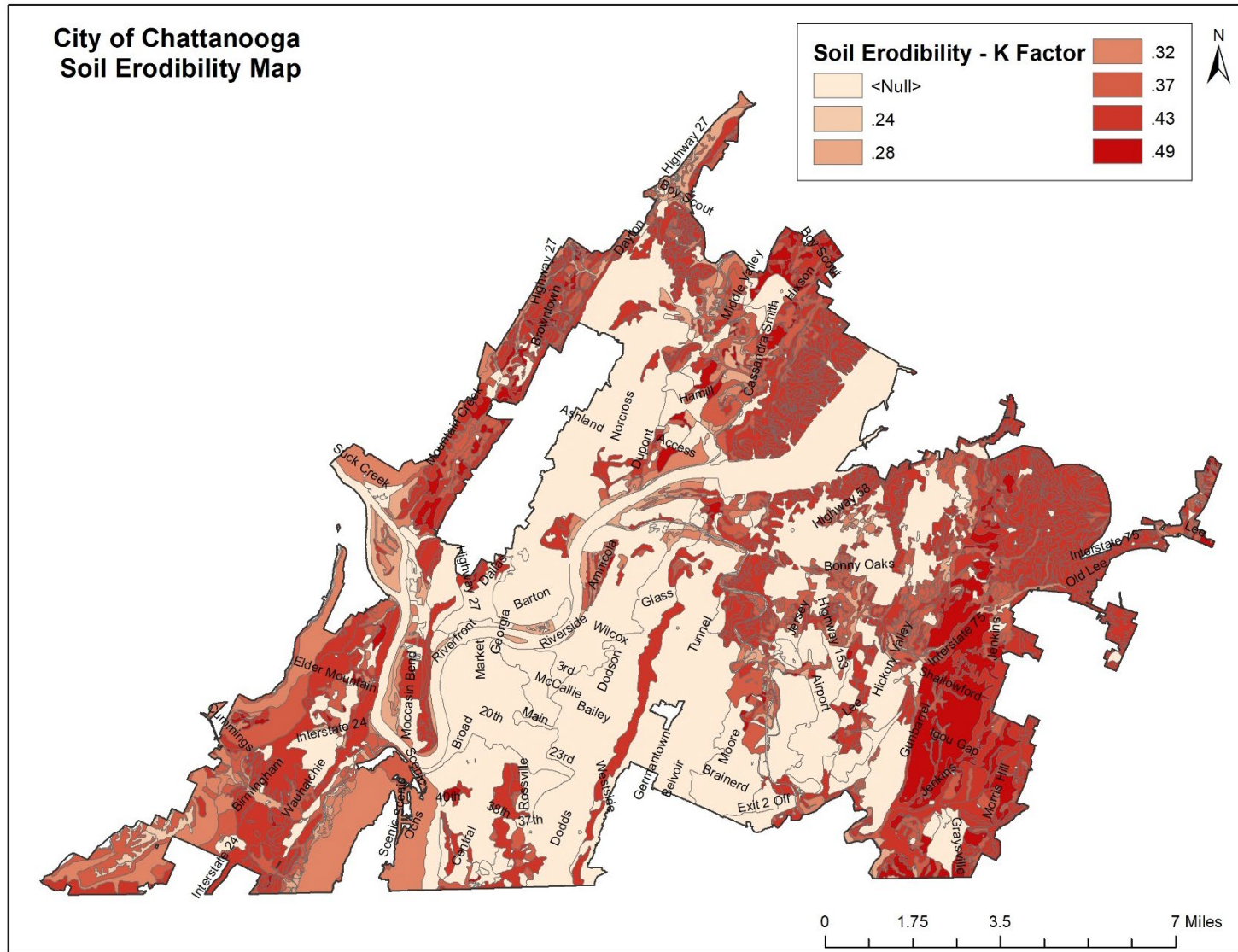
Simply put, the higher the K factor the more mud and sediment that will run off a site downstream. According to the Land Development Office staff with the expertise of Dr. Daniel Yoder, a Biosystems Engineering and Soil Science professional, approximately 800 tons of soil sediment per acre per year can run off one site with highly erodible soils if the site is entirely graded and cleared with no erosion control measures. This soil will eventually make its way into the City's waterways contaminating the water and impacting the health of the ecosystem.

The dark red on Figure 6 on the next page shows the areas with the highest amount of soil erodibility. These areas are scattered throughout the city and include some of the steeper areas such as Missionary Ridge, Lookout Mountain, Elder Mountain, and Big Ridge; as well as some areas located along the Tennessee River. The high K factor areas are likely in the steeper areas because topography can contribute to how erosion impacts an area. Similarly, floodplains of river valleys are much more prone to erosion than other areas.

The light area labeled "null" indicates there is no K factor or soil data. This is likely because the soil data from the NRCS was originally developed for agricultural land. A majority of the "null" areas are in urbanized areas of the city or in the river which would not have had farmland soil characteristics when the soil data was originated.

**SUMMARY: Topography is one factor that can affect soil erosion. The areas with the highest amount of soil erodibility in Chattanooga include steep areas on Missionary Ridge, Lookout Mountain, and Elder Mountain and along the floodplain areas of the Tennessee River.**

Figure 6. Soil Erodibility Map



### **Building Permit Data**

The RPA examined the number of building permits issued by the City Land Development Office from 2009-2018 to understand where development is happening in the city. The following figures show the building permit data in relation to the sloped areas.

According to the City of Chattanooga Land Development Office data, 4,202 building permits were issued from 2009-2018. This data includes all types of permits including residential and non-residential. The building permits are scattered throughout the city with some concentrations in the North Shore, St. Elmo, East Brainerd, Lookout Valley, and East Chattanooga areas.

The calculations for each slope class are listed below:

a. **0-15%**

- Average annual number of permits is 282
- Increased by 35% from 2009 to 2016
- Decreased by 48% from 2016 to 2018

b. **15-25%**

- Average annual number of permits is 40
- Increased by 24% from 2009 to 2018

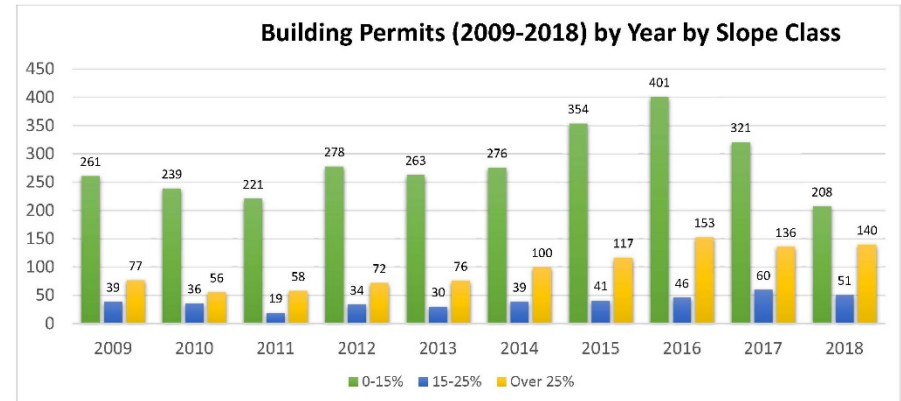
c. **Over 25%**

- Average annual number of permits is 99
- Increased by 45% from 2009 to 2018

d. **Overall Permits**

- All permits increased by 6% from 2009 to 2018
- According to the Market Edge, Chattanooga job growth increased 28% in 2016 from 2015 and home starts increased by 9% which is likely the reason for the increase in building permits for all slope classes from 2015-2016.

**Figure 7. Building Permits by Year by Slope Class**



**SUMMARY:** The majority of the building permits are located in the 0-15% slope class; however, the permits in the over 25% slope class increased by 45% during the 10-year period.

Figure 8. Map of Building Permits

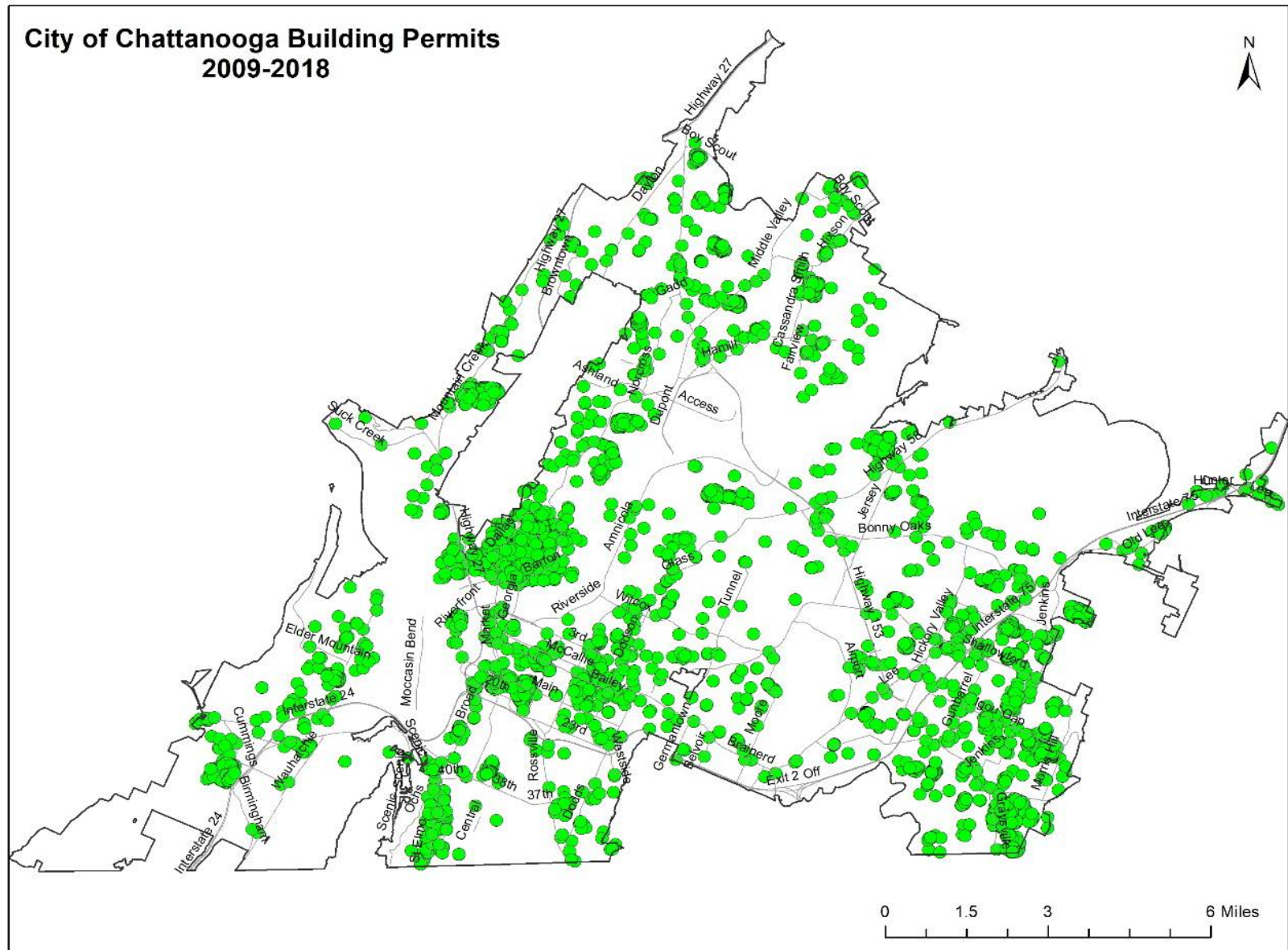
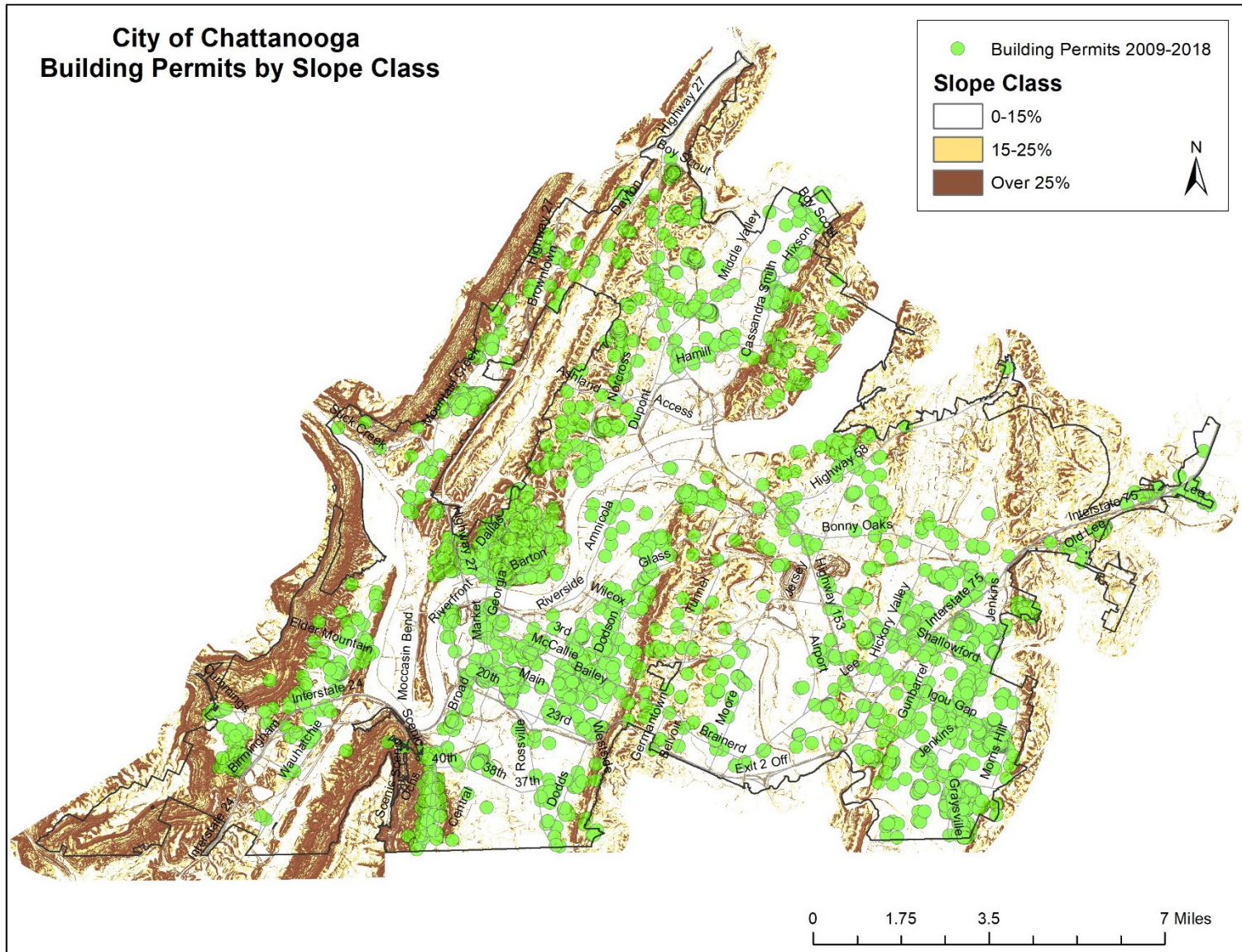




Figure 9. Map of Building Permits by Slope Class





### Land Disturbing Permit Data

The RPA examined the number of land disturbing permits issued by the City Land Development Office from 2009-2018. The following figures show the land disturbing permit data in relation to the sloped areas.

According to the City of Chattanooga Land Development Office data, 5,183 land disturbing permits were issued from 2009-2018. This data includes all types of permits including residential, non-residential, new construction and alterations. The permits are scattered throughout the city with some concentrations in the North Shore, St. Elmo, Lookout Valley, East Brainerd, and East Chattanooga areas.

The calculations for each slope class is listed below:

a. 0-15%

- Average annual number of permits is 360
- Increased by 91% from 2009 to 2016
- Decreased by 55% from 2016 to 2018

b. 15-25%

- Average annual number of permits is 43
- Increased by 89% from 2009 to 2018

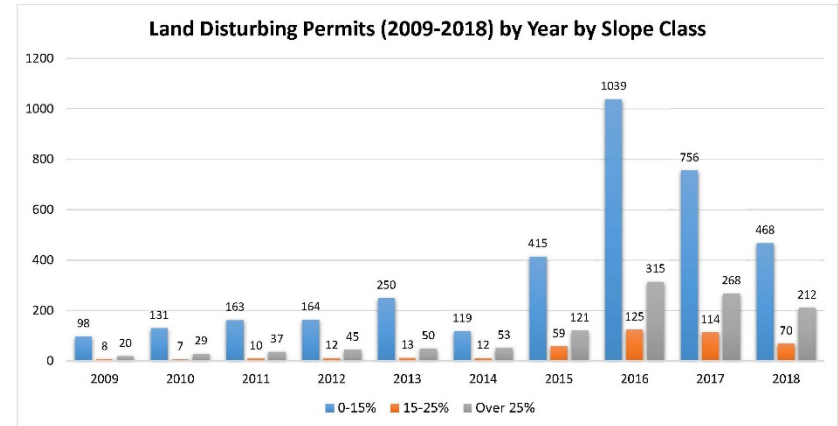
c. Over 25%

- Average annual number of permits is 115
- Increased by 91% from 2009 to 2018

d. Overall Permits

- Overall permits increased by 83% from 2009 to 2018
- The increase in permits is likely due to the increase in job growth and housing listed in the building permit section.

**Figure 10. Land Disturbing Permits by Year by Slope Class**



**SUMMARY:** The majority of the land disturbing permits are located in the 0-15% slope class; however, the permits in the over 15% slope class increased by 90% during the 10- year period.

Figure 11. Map of Land Disturbing Permits

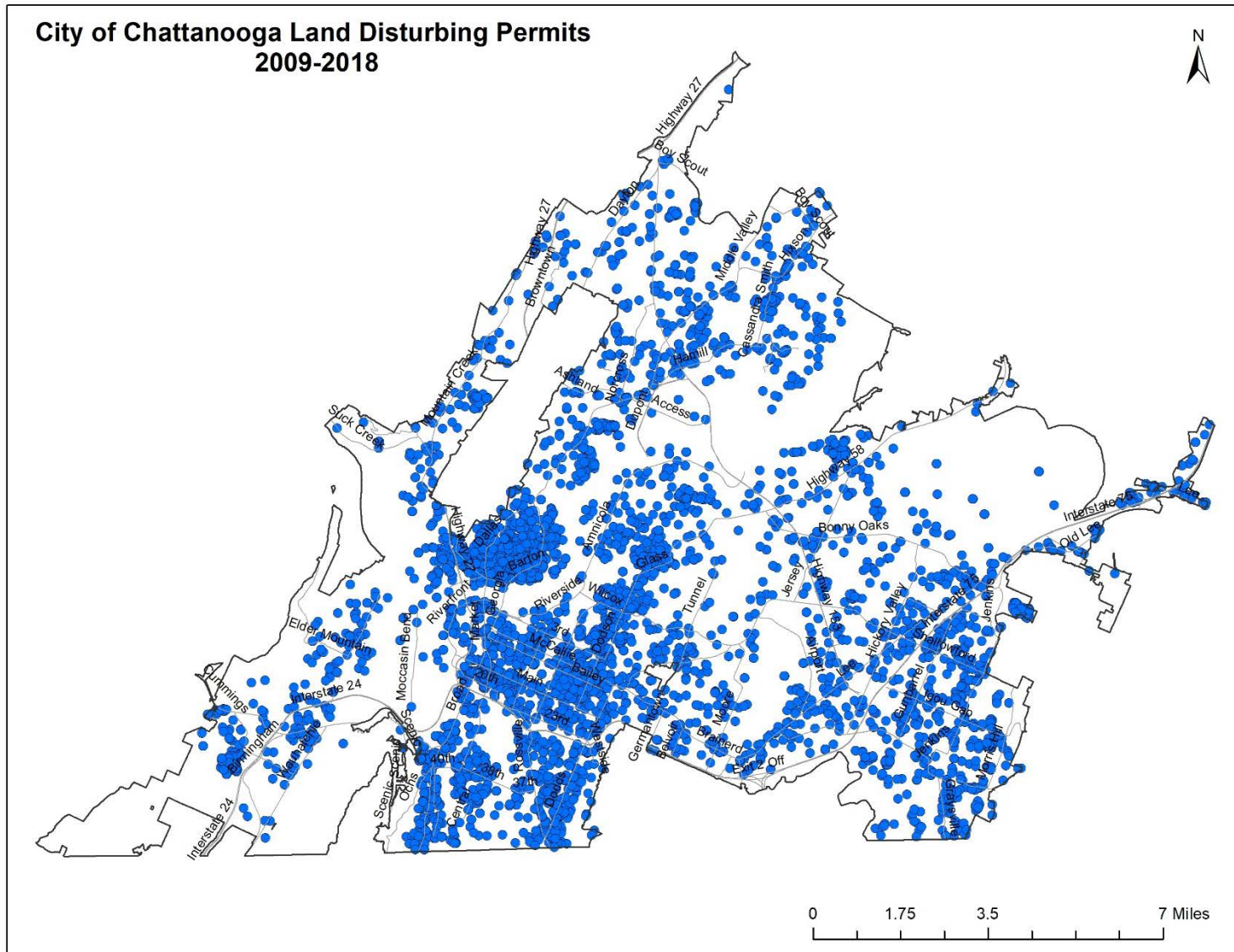
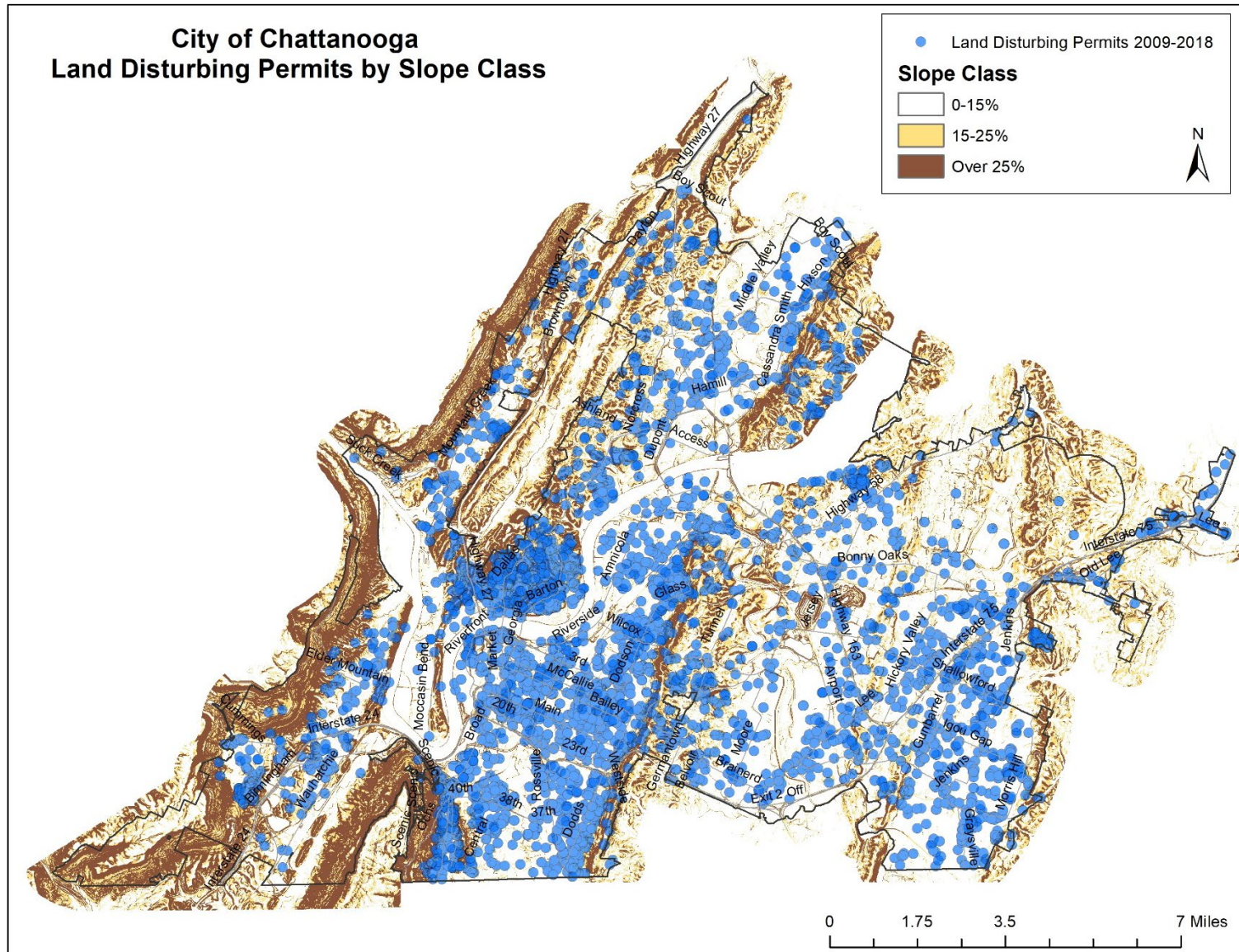


Figure 12. Map of Land Disturbing Permits by Slope Class





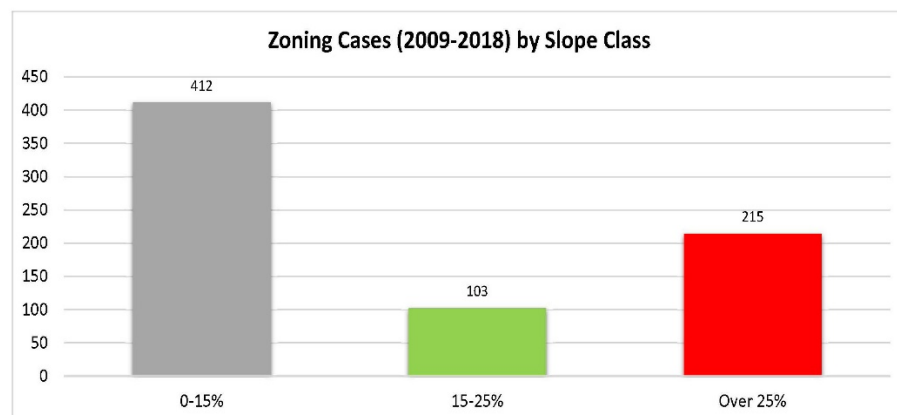
### Zoning Case Data

The RPA examined the number of zoning cases and Special Exceptions Permits for Residential Planned Unit Developments in sloped areas from 2009 to 2018. Other Special Permits, Lift Conditions, and Mandatory Referrals were not included in the analysis.

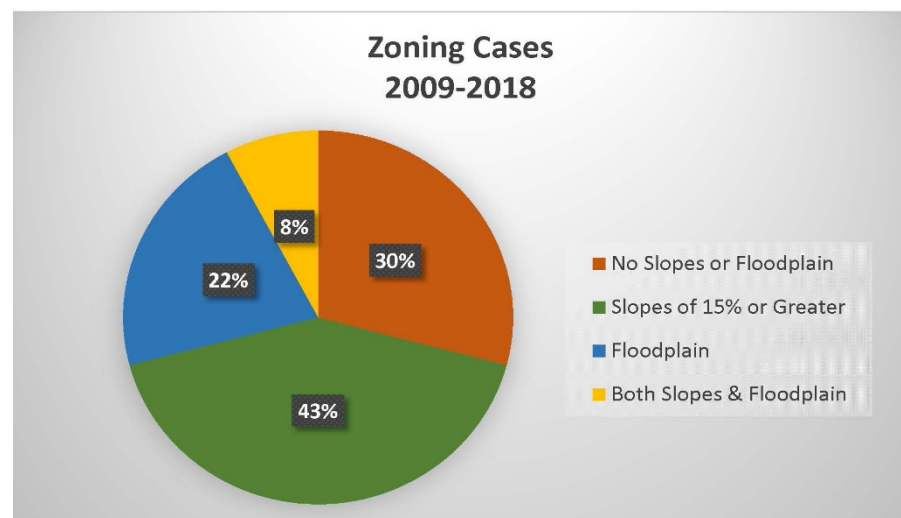
The slope zoning case data is listed below:

- 730 zoning cases
- 56% of the cases are located in the 0-15% slopes class
- 44% of the cases are located in areas of slopes of 15% or greater
- 30% of cases do not contain natural resource areas like slopes or floodplain

**Figure 13. Zoning Cases by Slope Class**



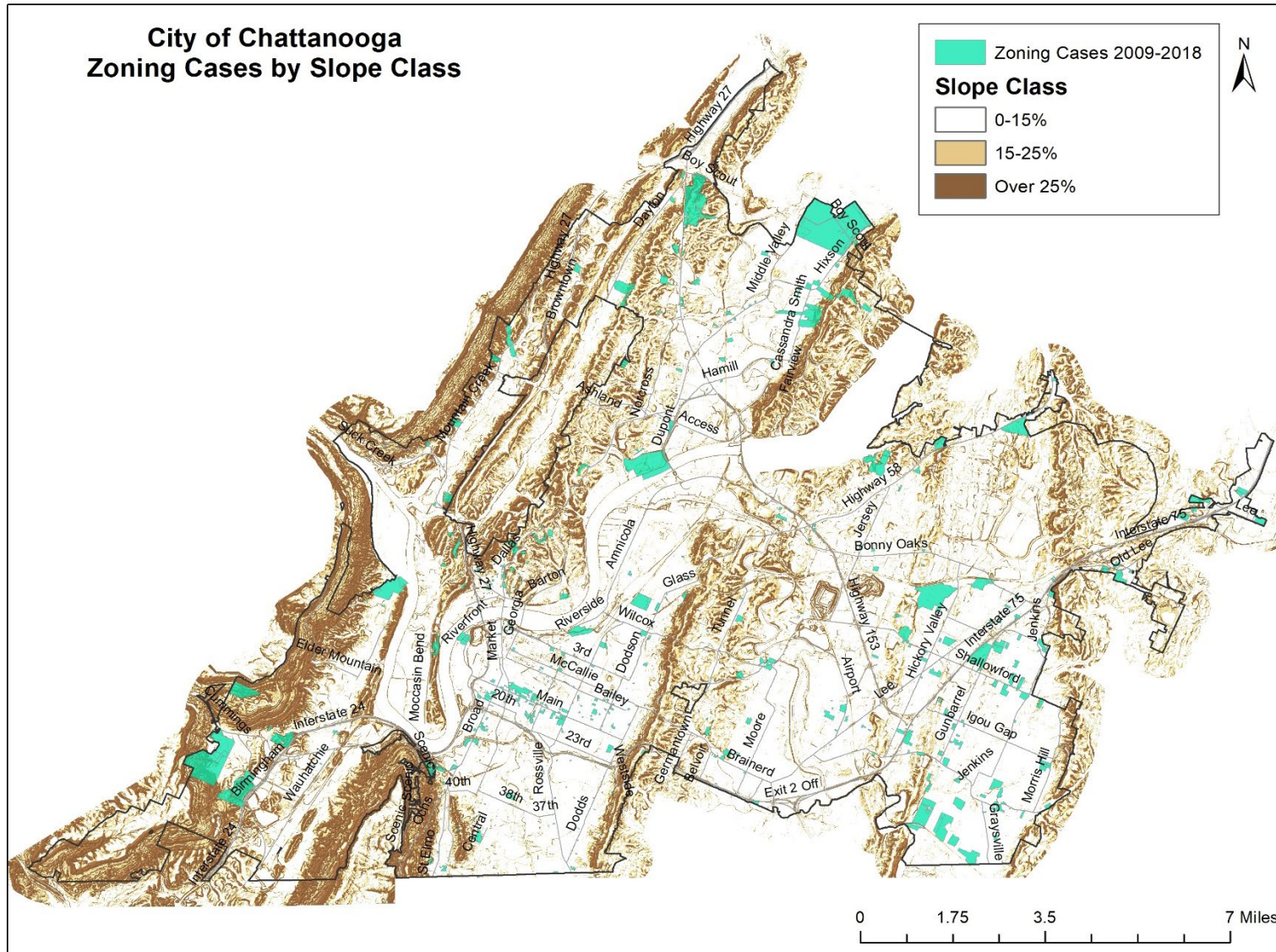
**Figure 14. Zoning Cases in Natural Resource Areas**



**SUMMARY:** The zoning cases are split with approximately half in the 0-15% slope class and half in the over 15% slope class. 70% of the zoning cases are located in natural resource areas.

**OVERALL SUMMARY:** Most of the building permit and land disturbing permit activity has been in the 0-15% slope areas of the City. However, the development activity in the 25% and greater steep slope areas has also increased. The permit data trends are generally aligned with the zoning case information which shows a similar pattern of higher levels of activity in both the 0-15% and over 25% categories. When looking at the citywide map of these activities, the primary concentrations of this activity near steep slopes are in North Chattanooga and St. Elmo.

Figure 15. Zoning Cases by Slope Class Map



## D. Issues with Steep Slope Development

Below is a list of issues related to steep slope development. The information was obtained from the following sources: 2004 and 2019 Hamilton County Tennessee Multijurisdictional *Natural Hazards Mitigation Plan*, Lehigh Valley Planning Commission *Steep Slopes Model Regulations*, American Society of Planning *Hillside Development*, Land of Sky *Mountain Ridge and Steep Slope Protection Strategies*, Knoxville and Knox County *Hillside and Ridgetop Protection Plan*, and Conservation Tools *Steep Slope Ordinance*. A full list of sources for the entire report can be found in Appendix B.

### 1. Landslides (Soil Slippage) and Erosion

The Hamilton County Natural Hazards Mitigation Plan notes, “common throughout the mountainous Appalachian region, landslides occur when masses of rock, earth, or debris move down a slope. Therefore, gravity acting on an overly steep slope is the primary cause of a landslide. They are activated by storms, fires, and by human modifications to the land. New landslides occur as a result of rainstorms, earthquakes, and various human activities such as clear-cutting and filling.”

The following conditions may exacerbate the effects of landslides:

- Erosion: Erosion caused by rivers creates overly steep slopes.
- Unstable Slopes: Rock and soil slopes are weakened through saturation by snowmelt or heavy rains.
- Earthquakes: The shaking from earthquakes create stress that make weak slopes fail.
- Vibrations: Machinery, traffic, blasting and even thunder may cause vibrations that trigger failure of weak slopes.
- Increase of Load: Weight of rain/snow, fills, vegetation, stockpiling of rock or ore from waste piles, or from man-made structures may cause weak slopes to fail.
- Hydrologic Factors: Rain, high water, little or no ground cover, numerous freeze/thaw cycles may cause weak slopes to fail.

- Human Activity: These include development activities such as cutting and filling along roads and removal of forest vegetation. Such activities are capable of greatly altering slope form and ground water conditions, which can cause weak slopes to fail.
- Removal of Lateral and Underlying Support: Erosion, previous slides, road cuts and quarries can trigger failure of weak slopes.

According to the Hamilton County Natural Hazards Mitigation Plan, areas of Hamilton County with slopes of 35% or greater are potentially vulnerable to a landslide. There is a moderate probability of occurrence (between 5 and 10% probability in the next year, and at least one chance in the next 10 years) and moderate magnitude (some injuries, property damage, and disruption of area for more than 24 hours) of landslides and erosion occurring in Chattanooga. Residential development occurring on steep slopes may increase the potential for slope destabilization and landslides. Continuing development of property near area streams with highly erodible banks could increase the number of vulnerable structures.

Recent examples of landslides and erosion in the Chattanooga area include the following:

- On December 12, 2009, a rockslide closed one of the two main routes up Lookout Mountain. Two large boulders came down by Scenic Highway near the Winterview condominiums. According to examining officials two boulders fell to the road's edge but not across the roadway.
- On January 28, 2012, a muddy rockslide shutdown Signal Mountain's W Road, blocking one of the mountain's main thoroughfares.
- In February 2019, long duration heavy rain led to numerous slope failures in the County. A large amount of mud, debris, and trees washed down from the steep hillside and flattened a Subway restaurant on Signal Mountain Blvd and one home was completely destroyed.



- Also in February 2019, long duration heavy rain caused severe erosion problems throughout the county. Numerous roads were damaged and stream bank erosion was severe.



February 2019 landslide on Signal Mountain Blvd  
Source: WTVN

## 2. Intensity of Development on Sensitive Sites

Development intensity is defined as a measure of the degree of development or impact that a land use has on a site or surrounding land uses, transportation network, and supporting community facilities. Typically, a small office building has much less impact on surrounding uses than a heavy industrial facility. Particular uses may be more intense due to one or more characteristics, such as traffic generated, amount of impervious surface, bulk of structures, density, or other factors such as noise and light. It can be measured in a variety of ways including, but not limited to, a floor area ratio (usually for non-residential uses), building coverage ratio, impervious surface ratio, or dwelling units per acre (residential uses).

When a site is mass graded and cleared for a high intense development, it can lead to other problems including increased stormwater runoff, flooding downstream, and landslides. This can be caused by an increase in impervious surfaces and removal of existing vegetation. Intense development, especially if constructed with tall buildings, can also affect the scenic views of the hillside where the development is built. Therefore, best management practices suggest that low density development, like low density residential, is more appropriate for steep, hilly areas.



Hotel at Pigeon Forge, TN  
Source: rooms101.com

## 3. Height of Structures/Scenic Views

In many settings including Chattanooga, steep slopes provide scenic views for neighboring areas. Thus the reason Chattanooga is often referred to as the “Scenic City.” Protecting steep slopes preserves the natural scenic beauty, which protects property values. Once the viewshed of hillsides has been deteriorated by clearing, grading or construction of tall structures, property values may not increase or may even decline. One study by the Journal

of Real Estate Finance and Economics indicated that an ocean view can increase the value of a home by up to 60%. While the effect may not be as great, views of mountains or a natural landscape can also increase property value. Just being near and within view of parks, forest or other open space can increase property value.



Homes in Marin County, CA  
Source: firesafemarin.org

#### 4. Stormwater Control

Steep slope development has the potential to start a cycle of erosion and increased stormwater runoff. Water movement is the most common mechanism of slope instability. The greater the steepness of the slope, the more likely it is that rain will run off rather than infiltrate. In addition, the steeper the slope, the faster the water will travel. Water with more speed has greater erosive power. Roofs, concrete, pavement and other impervious surfaces increase the amount of rainwater that runs off the land surface. On a developed slope, this runoff is often placed onto areas below the development.



Knickerbocker Avenue  
Source: RPA

#### 5. Mass Land Grading and Clearing/Loss of Tree Coverage

The roots of shrubs and trees keep soil in place. Removing vegetation by land clearing and extensive earthwork can lead to a decrease in the overall forest canopy increasing the amount of sediment traveling down the slope by a factor of 1,000 to 10,000. It also can transform a steep slope into a visible eyesore, degrade the water quality of streams and water bodies, degrade or reduce wildlife habitat, and encourage the growth of invasive plant species if not regulated correctly. It can take several years for the effects of tree removal to show up because the tree roots can still provide support for many years. Once the roots die, failure is more likely.





Residential Subdivision on Cassandra Smith Road  
Source: RPA

6. Sites Being Cleared without Clear Plan for Stabilization

Sometimes sites are cleared prematurely before the proper zoning, permits, financing, or other factors are in place. The sites then become an excavated construction site with no stabilization methods in place. When the sites are cleared with no vegetation, there is an increase of stormwater runoff onto adjacent properties, increase of invasive weed species, and increase of dirt and sediment that washes off the site. In recent years, the Land Development Office has increased their staff, increased their fines for negligent construction activities, and implemented a new policy in 2017 to attempt to prevent this from happening in the future.



309 Tremont St  
Land Disturbing Permit issued 7/11/2016 and Grading Only Permit issued 10/21/2016  
Picture taken April 2018  
Source: RPA



Same site with no development or slope stabilization in March 2019  
Source: RPA

7. Fire

Both urban and rural areas of Chattanooga are vulnerable to drought or prolonged periods without rainfall. Drought affects the urban water supply and causes dry conditions in forested areas, which increases the risk of wildfires. The entire state of Tennessee including Hamilton County has the potential for a significant drought every 15 years.

Fire is a particular hazard to structures on steep slopes as fire suppression on steep slopes and bluff lines is especially difficult. The slope and shape of terrain can change the rate of speed at which the fire travels. In general terms, the steeper the slope of the land, the faster a fire can spread up the slope.

Hamilton County was subject to wildfires in 2016. The Kimball Complex, Mowbray, Poe Road and Flippers Bend forest fires occurred from October 8th to November 25th, 2016. This incident was a woods/brush/forest fire that involved over 2,000 acres at three different geographical locations. The County experienced a severe drought in December 2016 and 2017 which led to dry conditions prior to the start of the fire.



Chattanooga Wildfires in 2016  
Source: Times Free Press

8. Landscaping or Design Requirements for Retaining Walls

The design of retaining walls is not regulated by local ordinances in Chattanooga. RPA staff has received comments from the public that some of the larger and taller walls in the city are unsightly and detract from the scenic views of the hillsides. Requiring design standards of the walls can assist with a more natural aesthetic, help the wall blend in to the natural environment, and ensure the design is constructed in a safe manner.



Knickerbocker Ave.  
Source: RPA



## SECTION 3: CHARACTERISTICS OF FLOODPLAINS



Tennessee River  
Source: <https://thedyrt.com>

### A. Definition of Floodplain

The following sources were used to understand floodplains: 2004 and 2019 Hamilton County *Natural Hazards Mitigation Plan*, Washington County, TN *Floodplain Management Appendix*, Georgia Dept. of Natural Resource *Floodplain Management Quick Guide*, State of Tennessee Department of Environment and Conservation *Tennessee Floodplain Management*, and Federal Emergency Management Agency *National Flood Insurance Program*. Appendix B has a complete list of sources.

A flood is a natural event for rivers and streams. It is part of the Earth's natural hydrologic cycle. Excess water from snowmelt and rainfall accumulates and overflows onto the banks and adjacent floodplains. Flooding is the most common and costly hazard in Hamilton County, and thousands of households are located within floodplains. Floods can occur at any time of the year, and at any time of day or night. Most injuries and deaths occur when people are swept away by flood

currents, often when attempting to traverse floodwaters in a vehicle. Most property damage results from inundation by sediment-filled water, or by debris in floodwaters.

Major flood events generally fall into two categories: flash floods, the product of heavy localized precipitation in a short period over a given location, or caused by a dam break or levee failure; and general floods, which can occur in riverine and urban settings.

A floodway is the channel of a river or stream and the parts of the floodplain adjoining the channel which are reasonably required to efficiently carry and discharge the flood water or flood flow of a river or stream. A floodplain is the area adjoining a river or stream that has been or may be covered by the 100-year flood.

The term 100-year flood does not refer to a flood that will occur once every 100 years. A 100-year flood has a one percent chance of being equaled or exceeded in any given year. An area can experience a 100-year flood two times in one year, two years in a row, or four times over the course of 100 years. Similarly, an area could also not experience a 100-year flood over the course of 200 or more years.

To avoid confusion, the National Flood Insurance Program (NFIP) uses the term “base flood” instead of “100-year flood” to refer to a flood that has a one-percent chance of occurring in any given year.

Throughout time, floods have altered the floodplain landscape. These areas are continuously shaped by the forces of water - either eroded or built up through deposit of sediment. More recently, the landscape has been altered by human development, affecting both the immediate floodplain and events downstream.

Floodplains account for only 7% of the nation's total land area. However, they contain a tremendous amount of property value. It is estimated that there are 8-10 million households in the floodplains.

Because floodplains have attracted people and industry, a substantial portion of Hamilton County's development is now subject to flooding. Waterways, floodplains, and wetlands make up over 20% of Hamilton County's total land area.

## **B. Factors Affecting Floodplains**

The floodplain serves as storage for flood water. If storage space is blocked by fill material, future flooding may be worsened. Floodplain fill can alter valuable floodplain functions, including wildlife habitat and wetlands.

Flooding causes the most significant amount of recurring damage in Hamilton County. Flooding primarily affects properties located in the Tennessee Valley, although mountaintop communities are susceptible to flash flood events. Since 2000, the National Climatic Data Center (NCDC) has documented 34 flood events in Hamilton County producing an annual average of 1.3 million dollars of property damage.

According to the Hamilton County Hazards Mitigation Plan, urban flooding occurs where there has been development within stream floodplains. Floodplains are often considered attractive for development since they provide flat areas for building. The price of this accessibility and convenience has been increased flooding of the ensuing urban areas. Urbanization increases the magnitude and frequency of floods by increasing impermeable surfaces, increasing the speed of drainage collection, reducing the carrying capacity of the land, and occasionally, overwhelming sanitary sewer systems.

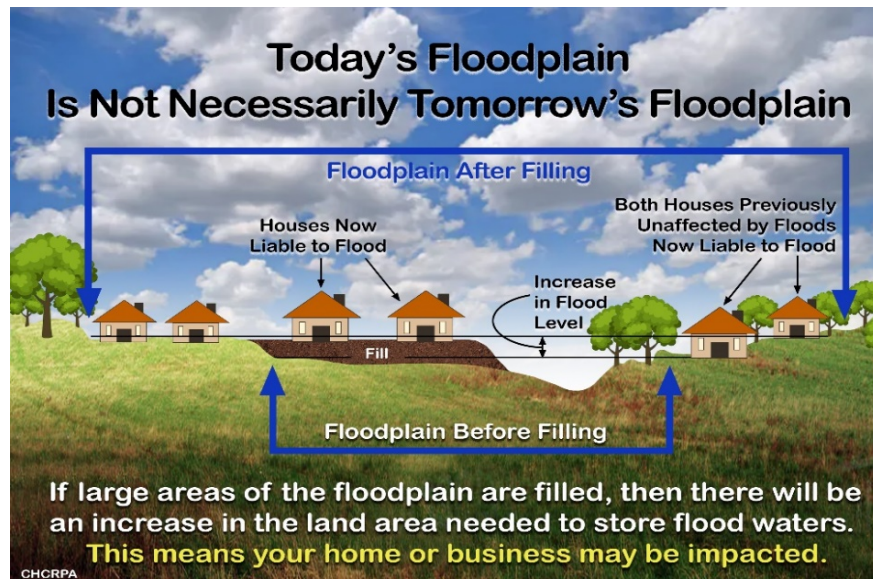
The following conditions may exacerbate the effects of floods especially in urban areas: impermeable surfaces, steeply sloped watersheds, constrictions, obstructions, debris, contamination, soil saturation, and velocity.

1. Impermeable surfaces: Excessive amounts of paved areas or other surfaces upstream or in the community can increase the amount and rate of water runoff. Development affects the runoff of

stormwater when buildings and parking lots replace the natural vegetation, which normally would absorb water. When rain falls in an undeveloped area, as much as 90% of it will infiltrate the ground; in a highly developed area, as much as 90% of rainfall will run off potentially impacting neighboring properties.

2. Steeply sloped watersheds: In hilly and mountainous areas, a flood may occur minutes after a heavy rain. These flash floods allow little or no warning time, and are characterized by high velocities.
3. Constrictions: Re-grading or filling within or on the edge of floodplain obstructs flood flows, backing up floodwaters onto upstream and adjacent properties. It also reduces the floodplain's ability to store excess water, sending more water downstream and causing floods to rise to higher levels. This also increases floodwater's velocity downstream of the constriction.
4. Obstructions: Bridges, culverts and other obstructions can block flood flow and trap debris, causing increased flooding upstream and increased velocity downstream
5. Debris: Debris from the watershed, such as trees, rocks, and parts of damaged buildings, increases the hazard posed by moving water. Moving water will float, drag or roll objects, which then act as battering rams that can knock holes in walls and further exacerbate the effects of debris.
6. Contamination: Few floods have clear floodwater, and the water will pick up whatever was on the ground within the floodplain, such as soil, road oil, farm and lawn chemicals, and animal waste. In addition, if a wastewater treatment plant was inundated, the floodwaters will likely include untreated sewage. Contamination is also caused by the presence of hazardous material storage in the floodplain and in the community, as well as upstream from the community.
7. Soil saturation: Rainfall in areas already saturated with water will increase the runoff.
8. Velocity: Flood velocity is the speed of moving water, measured in feet per second. Velocity is determined by slope, waves, and

several other factors. The damage potential of flood waters increases dramatically, sometimes exponentially, with velocity. High velocities (greater than 5 feet per second) can erode stream banks, lift buildings off their foundations, and scour away soils around bridge supports and buildings.



If local regulations prevent or limit fill, then existing development is kept safer than the graphic above.

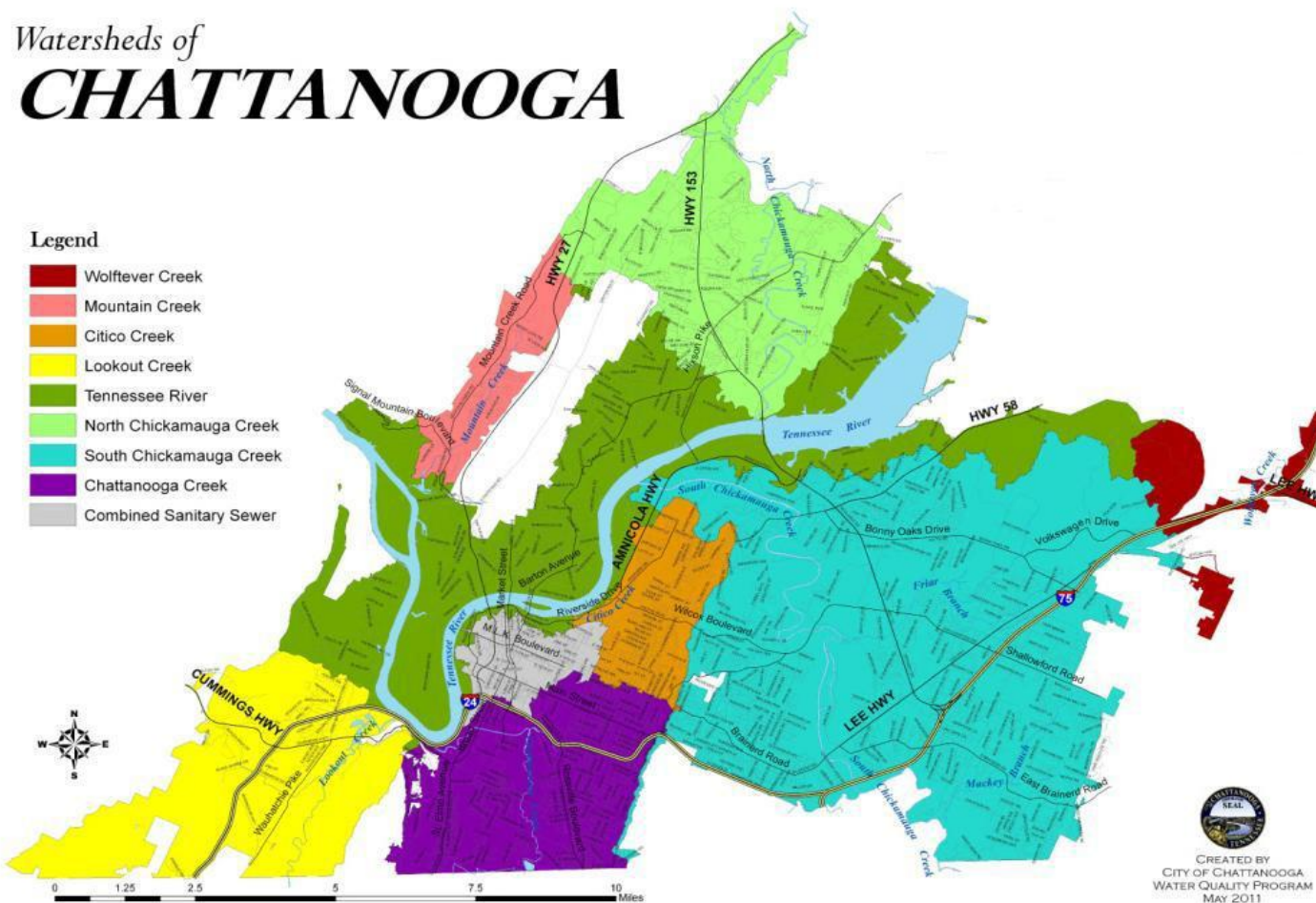
## C. Floodplain Location and Data Analysis

### I. Floodplain Location

Chattanooga and Hamilton County is located in the Lower Tennessee watershed. The Lower Tennessee Watershed itself is comprised of several smaller watersheds, often identified with the name of the stream that flows into the Tennessee River. Chattanooga has eight watersheds and one area referred to as the combined sewer area. There is the North Chickamauga Creek watershed, the South Chickamauga Creek Watershed, the Chattanooga Creek Watershed, Lookout Creek Watershed, Citico Creek Watershed, Mountain Creek Watershed, Tennessee River Watershed, and Wolfcreek Creek watershed.



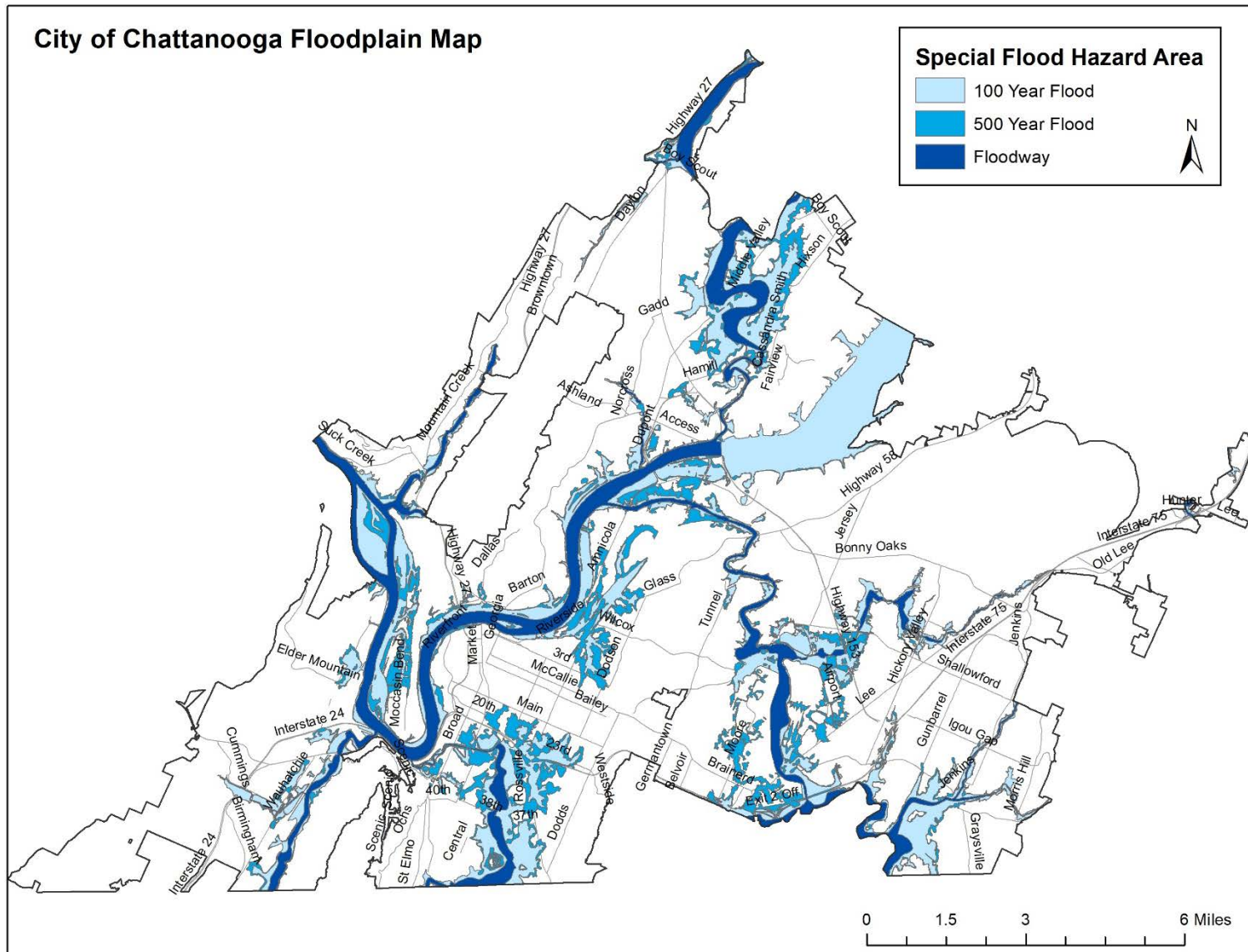
Figure 16. Map of Chattanooga Watersheds



The Tennessee River is located in Chattanooga and in the Lower Tennessee watershed and contains a floodplain area. The Federal Emergency Management Agency refers to this area as the Special Flood Hazard Area (SFHA). For the purposes of this analysis, SFHA is used to describe the floodplain (floodway, 100-year flood and 500-year flood).



Figure 17. Floodplain Map



## II. Floodplain Data Analysis

The RPA analyzed a variety of data sets to examine development trends in the City's floodplain areas. The following is a detailed description of the city-wide analysis. Appendix A has more data specific to each City Council District.

### Parcel Data

The parcels that contain the floodplain were used in the analysis below. The acres of land in the calculation includes the entire parcel, even if only a portion of the parcel is located in the floodplain.

**SUMMARY:** A majority of the land in the floodplain is developed (84% of the acres). According to the Technical Committee, filling in the floodplain is irreversible so it is essential to protect the remaining land in the floodplain.

**Figure 18. Acreage of Developed and Vacant Land in the Special Flood Hazard Area**

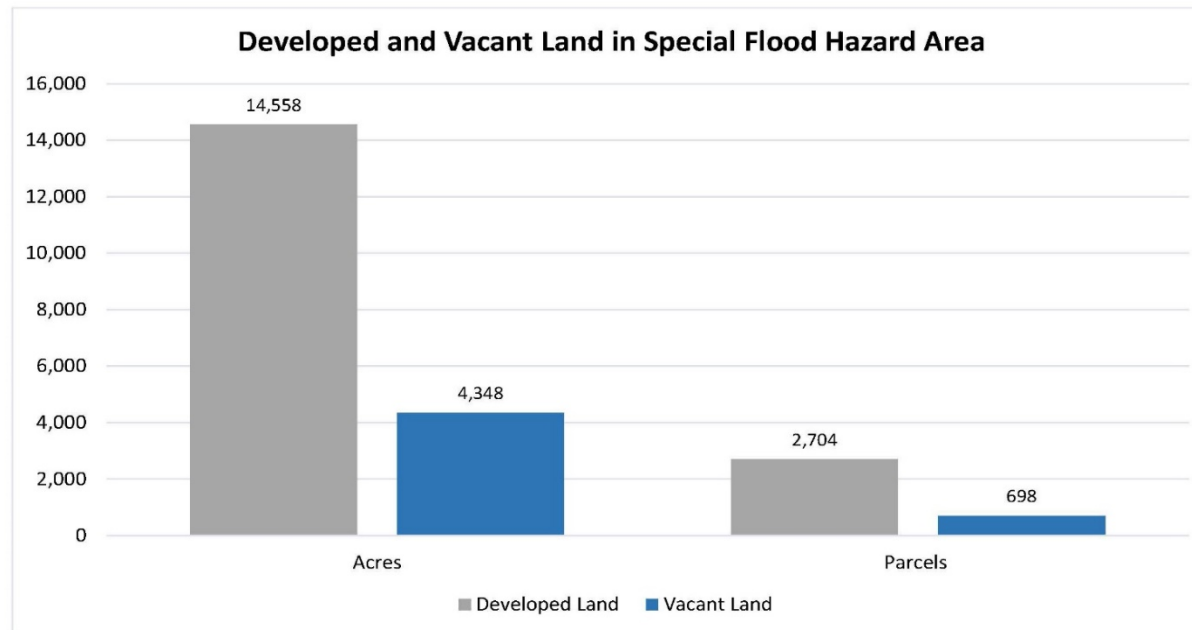
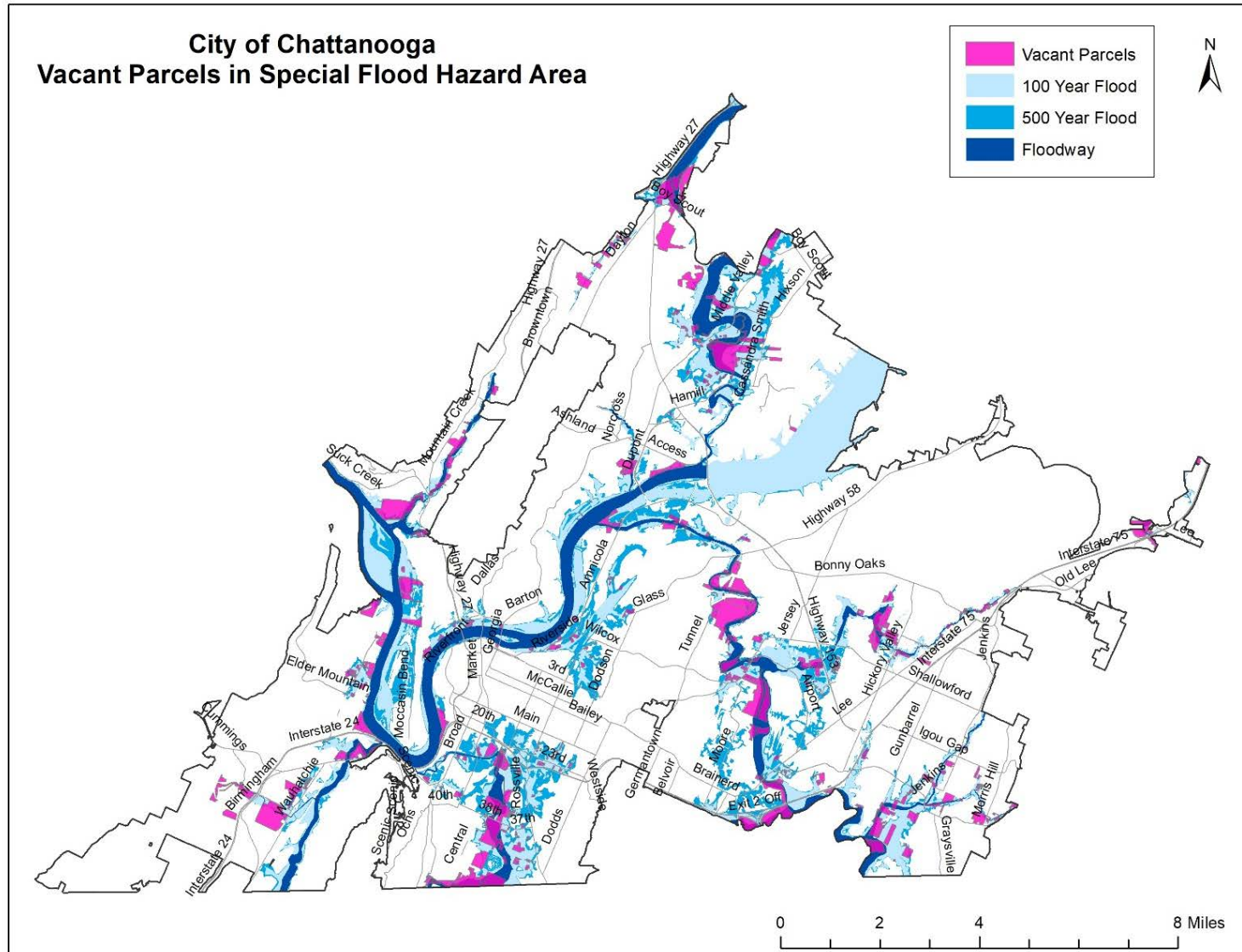


Figure 19. Vacant Parcels in Special Flood Hazard Area Map



### **Building Permit Data**

As referenced in section C. Slope Location and Data Analysis, the RPA examined the number of building permits issued by the City Land Development Office from 2009-2018. There were 4,202 building permits issued for all residential and non-residential permits. The building permits are scattered throughout the city with some concentrations in the North Shore, St. Elmo, East Brainerd, Lookout Valley, and East Chattanooga areas. Figure 20 shows the number of building permits that were issued for parcels that contain the floodplain (floodway, 100-year flood, and 500-year flood).

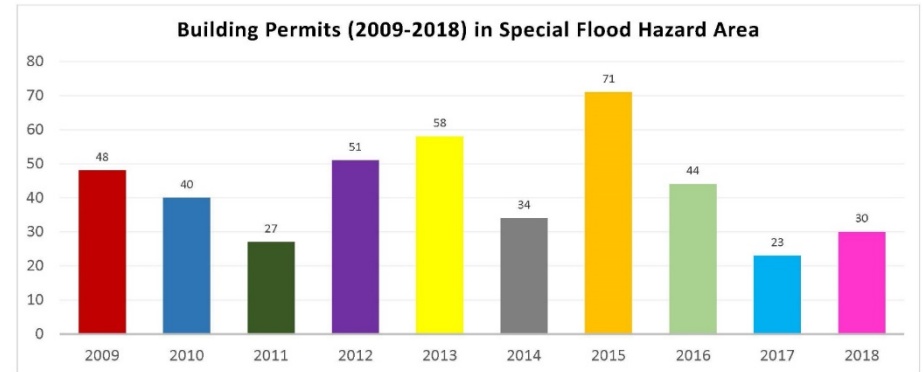
The following calculations for the building permits in the floodplain is below:

- Average annual number of building permits issued from 2009 to 2018 is 43.
- The data shows that the building permits issued in the floodplain increased by 32% in 2015 and then decreased by 58% from 2015- 2018.

The cause of the decline could be linked to the decreasing amount of land available for development in the floodplain. It can also be linked to the Land Development Office stormwater regulations (Section 31) that were adopted on Dec. 1, 2014, which require 30-60 foot stream buffers, prohibiting development in the buffers.

According to the Land Development Office, there likely was a surge of permits in 2015 while the LDO staff began implementing the new regulations, and grandfathered sites received permits. Then the permits declined as the new regulations were enforced. This is an example of how a regulation can be used to protect natural resources without prohibiting development because the data indicates that real estate development and job growth continued to increase in the City after the adoption of the regulations.

**Figure 20. Building Permits in Special Flood Hazard Area**



**SUMMARY:** Building permits issued in the floodplain decreased by 38% during the 10-year period. The decline in permits could be linked to the decreasing amount of land in the floodplain or the new stormwater regulations that were adopted in 2014.





### **Land Disturbing Permit Data**

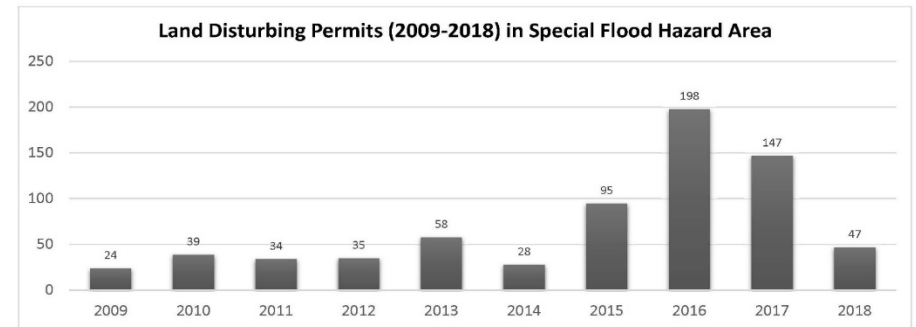
As referenced in section C. Slope Location and Data Analysis, the RPA examined the number of land disturbing permits issued by the City Land Development Office from 2009-2018. There were 5,183 permits issued including residential, non-residential, new construction and alterations. The permits are scattered throughout the city with some concentrations in the North Shore, St. Elmo, Lookout Valley, East Brainerd, and East Chattanooga areas. Figure 22 shows the number of land disturbing permits that were issued for parcels that contain the floodplain (floodway, 100-year flood, and 500-year flood).

The following calculations for the building permits in the floodplain is below:

- 705 total land disturbing permits issued in the SFHA from 2009-2018
- The average annual number of land disturbing permits issued from 2009 to 2018 is 71.
- The data shows that the permits increased by 84% from 2009 to 2017 and decreased by 68% from 2017 to 2018.

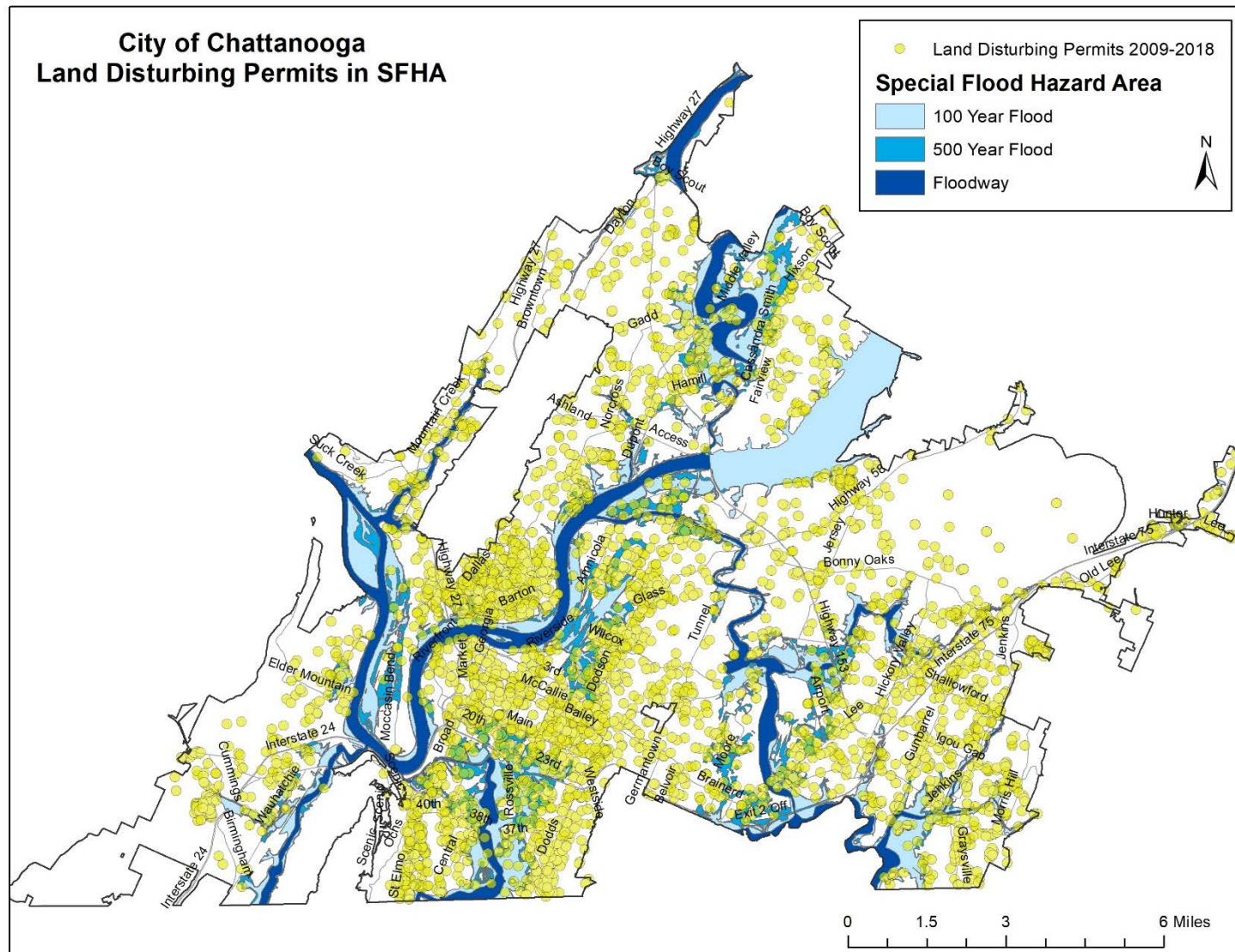
The cause of the increase from 2015-2017 could be linked to the job and housing growth the City experienced. The decrease could be linked to the stormwater buffer requirements as indicated by the Land Development Office.

**Figure 22. Land Disturbing Permits in Special Flood Hazard Area**



**SUMMARY:** Land disturbing permits issued in the floodplain increased by 84% from 2009 to 2017. The decline in permits could be linked to the decreasing amount of land in the floodplain or the new stormwater regulations that were adopted in 2014.

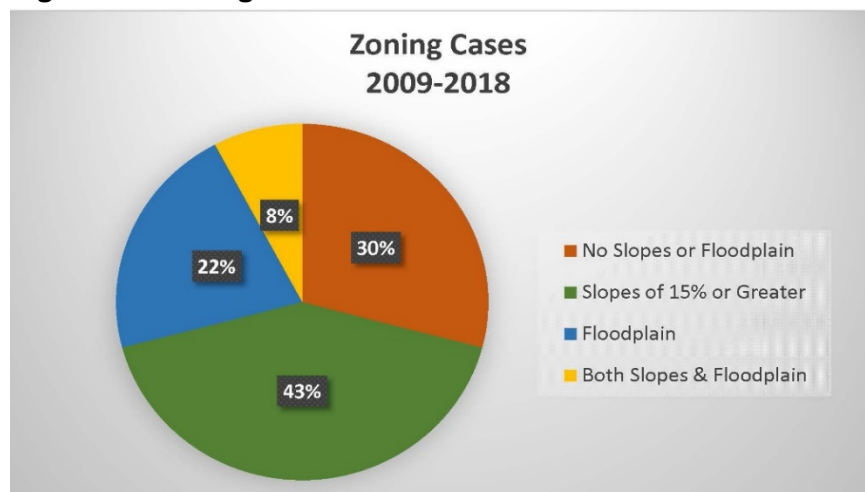
Figure 23. Map of Land Disturbing Permits in Special Flood Hazard Area



### **Zoning Case Data**

The RPA examined the number of zoning cases and Residential Planned Unit Developments from 2009 to 2018. Other Special Permits, Lift Conditions, and Mandatory Referrals were not included in the analysis. There are 730 cases and 22% of the cases are located in the floodplain.

**Figure 24. Zoning Cases in Natural Resource Areas**



**SUMMARY:** 22% of zoning cases are located in the floodplain.

The number of building permits, land disturbing permits, and zoning cases are much lower in the floodplain than compared to the steep slope areas. When looking at the citywide map of these activities, the primary concentrations of this activity in floodplains are in East Chattanooga, Brainerd, East Brainerd and Hixson.



[illegible]

#### **D. Issues with Development in the Floodplain**

According to the Hamilton County Hazards Mitigation Plan, Hamilton County and all of its jurisdictions are affected by flooding. However, the most frequently and severely affected jurisdictions include East Ridge, Chattanooga, and Unincorporated Hamilton County. The following are a few examples of local floods that have occurred in Hamilton County in the last ten years.

- Sept. 17-24, 2009: Widespread minor street flooding began, and eventually escalated into river flooding. The West Chickamauga Creek also contributed to flooding along the South Chickamauga, and areas of East Ridge. The South Chickamauga stage reached 28.54' which is the second highest recorded stage on that river. Numerous businesses and roads were affected by the high waters, with several drivers having to be rescued after driving into flooded streets. Creeks flowing off the Cumberland Plateau in northern Hamilton County also caused flooding in the Soddy Daisy areas, closing roads. One fatality occurred on 9/20/2009, when a 46 year old man, on a wager, tried to swim across a drainage ditch full of rushing water, and was swept into the aqueduct system.
- Sept. 26, 2018: The National Weather Service estimated that up to 12 inches of rain fell in northern Hamilton County on Sept. 26, 2018. Heavy rain and saturated soil led to widespread flooding in Soddy Daisy. The Little Soddy Creek broke out of its bank leading to one fatality. Flash flooding damaged 85 properties in the area with losses estimated at 1.3 million dollars. (2019 Hazard Mitigation Plan)
- 2018 was the wettest year on record, dating back 129 years, for the Tennessee River Valley with a total of 67.01 inches of rain. The rain continued throughout 2019 totaling 9.7 inches for the month of February, more than double the usual 4.84 inches of rain for the month. Because of the rainfall, flash flooding has caused problems for the City including road closures, delayed or shut down a number of area schools, and flooding private property.

The following is a list of additional problems that can occur when the city is flooded:

- Tributaries of the Tennessee River are prone to backwater flooding.
- Flooding continues to damage properties both inside and outside of the 100-year floodplain.
- Residents often drive through standing floodwater.
- Flooding repeatedly damages some structures in the 100-year floodplain.
- Inadequate infrastructure is unable to handle stormwater in some areas of Hamilton County.
- Flood and flash flood events exacerbate stream bank erosion.
- Power failure may shut down sanitary and stormwater pump stations without backup power, increasing the magnitude of flood events."



Flooding on Brainerd Road  
Source: Times Free Press

## SECTION 4. ECONOMIC IMPACTS OF DEVELOPMENT AND PRESERVATION OF NATURAL RESOURCE AREAS



South Chickamauga Creek  
Source: Outdoor Chattanooga

There are costs and benefits associated with the development and preservation of steep slopes, mountain ridges, floodplains and other sensitive areas. Below are some examples:

### Benefits

- Increased tax value of land, resulting in increased tax revenues to local governments. Since it typically costs more to develop on steep slope areas, resulting development may have a higher sales price than similar development on flatter land. A related point is that people are generally willing to pay more for property that has a scenic view. The value of properties adjacent to and/or within view of a protected property are higher than they would otherwise be, thus adding tax revenues that the community receives from those properties.
- Design and construction jobs related to development.
- When compared to homes built on flat land surrounded by several other buildings, homes constructed on hillsides are relatively more energy efficient. This is because of the natural

ventilation and because they have better access to natural light.

- The land in the floodplain is usually rich and fertile so living in one is beneficial for farmers or other people in the agricultural sector.
- According to the Chattanooga Visitors Bureau, Chattanooga/Hamilton County has a \$1.1B annual tourism economy. From surveys of 2,050+ past/potential visitors, Natural Beauty and Outdoor attraction was a top association among visitors (57%).

### Costs

There also are costs related to developing in natural resource areas, some of which are financial and result in increased costs for residents, taxpayers and local municipalities. Other costs are more intrinsic and difficult to calculate; however, these costs may be more detrimental to the long term health of the community.

- Need for additional emergency vehicles capable of climbing steep slopes.
- Road repair costs when runoff issues cause roads to wash out.
- Additional maintenance of roadside culverts and ditches due to runoff issues.
- Increased stream maintenance costs.
- High costs for extending and maintaining infrastructure. Sewer and water systems are especially difficult and expensive to engineer on steep slopes. It is likely that some roads located on steep slopes are functionally classified as local roads and therefore not eligible for federal funding for transportation improvements. So, the costs for maintaining and servicing the road would have to be funded entirely with local money.
- Increased cost of public service delivery related to the high costs for extending infrastructure. If more structures are built in sloped areas, then there will be a need for more garbage/recycling and mail delivery trucks. This can cause



increased time to routes for the trucks to navigate steep streets adding to the cost of the city to pay (i.e. wages, gas, etc.) related to the delivery of service.

- Development on steep slopes can lead to erosion and landslides that pose a public safety threat to citizens and structures (i.e. Subway on Signal Mountain Blvd).
- The loss of scenic views can lead to a loss of tourism and related income since much of the region's tourism is dependent on visitors' and residents' appreciation of our scenic beauty and distinct mountain character.
- Major flood events have been, and continue to be, a destructive natural hazard in terms of economic loss to the citizens of Tennessee. Since 1978, federal flood insurance policyholders in Tennessee have received over \$343 million in claim payments. Though that figure represents many insurance payments, most of the state's flood-prone properties do not have flood insurance. As of November 2017, only about 29,000 buildings located in high-risk floodplain areas in Tennessee had a flood insurance policy.

#### Costs - Local Examples

- Hamilton County has 185 repetitive loss (RL) and 33 severe repetitive loss (SRL) structures, according to FEMA Region IV records provided by TEMA in 2018. Repetitive loss is a term associated with the National Flood Insurance Program (NFIP). Chattanooga and East Ridge have the largest number of repetitive loss structures and associated payments. For Flood Mitigation Assistance (FMA) program purposes, a repetitive loss structure is one that is covered by a flood insurance contract under the NFIP that has suffered flood damage on two or more occasions over a 10-year period, ending on the date when a second claim is made, in which the cost to repair the flood damage, on average, equals or exceeds 25% of the market value of the structure at the time of each flood loss event. A repetitive loss structure is important to the NFIP, since

structures that flood frequently put a strain on the flood insurance fund. It should also be important to a community because of the disruption and threat to residents' lives by the continual flooding. The following table contains the number of repetitive loss properties by jurisdiction.

**Figure 26. Repetitive Loss Properties**

Repetitive Loss Properties		
Jurisdiction	Number	Sum of Total Paid
CHATTANOOGA, CITY OF	87	\$5,739,568
EAST RIDGE, CITY OF	75	\$2,531,700
HAMILTON COUNTY *	15	\$1,602,966
RED BANK, CITY OF	4	\$277,620
SODDY-DAISY, CITY OF	4	\$108,466
Grand Total	185	\$10,260,321

Source: TEMA November 2018

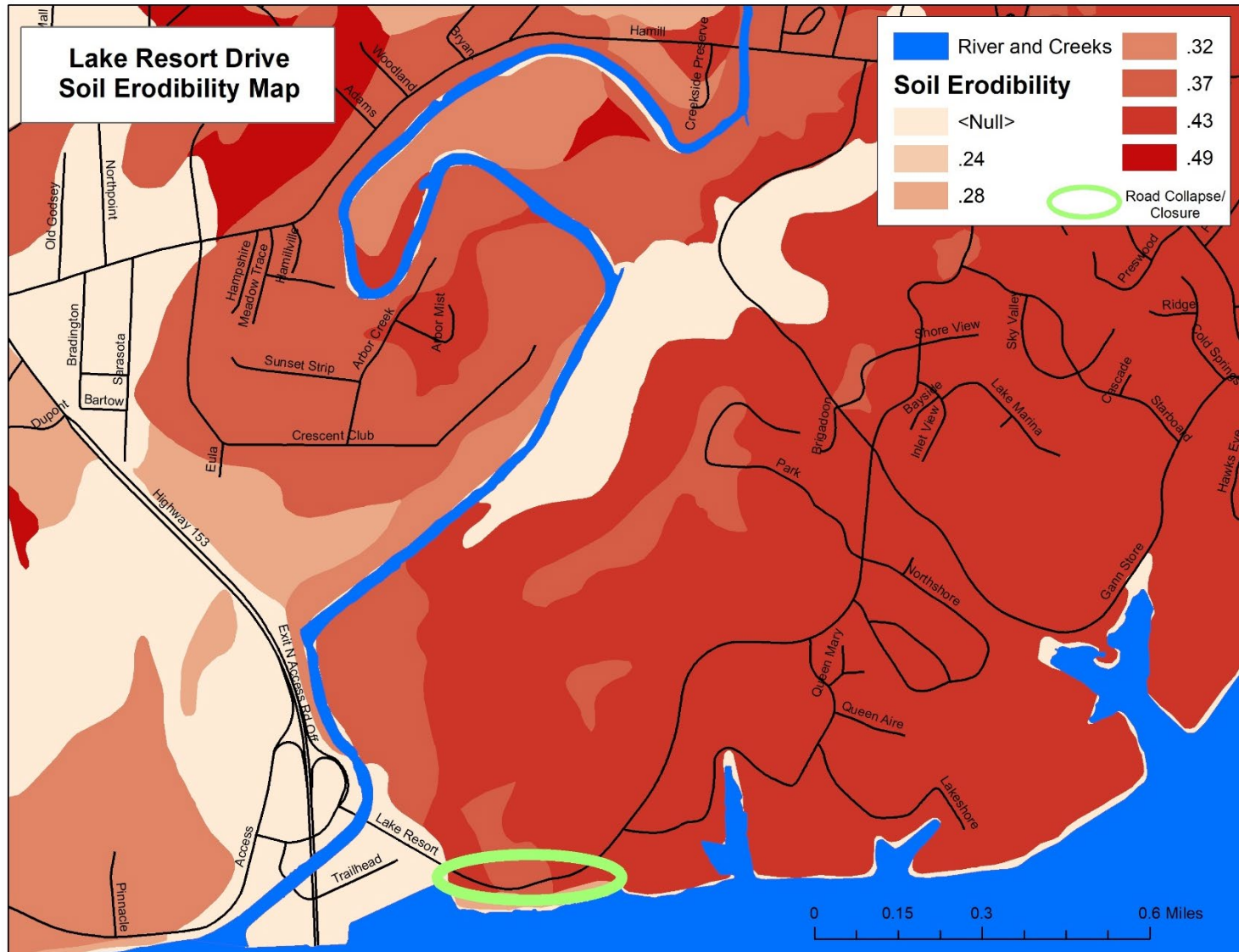
**Figure 27. NFIP Claim Information**

NFIP Claim Information 1978 to 9/30/2018					
Community	Total Losses	Closed Losses (paid)	Open (not paid in full)	Closed w/o payment	Total Payments
Chattanooga	776	639	3	134	\$ 14,032,593.04
Collegedale	2	2	0	0	\$ 42,844.89
East Ridge	504	436	0	68	\$ 7,263,824.10
Hamilton County*	190	150	1	39	\$ 3,123,600.48
Red Bank	77	66	0	11	\$ 1,049,049.80
Soddy Daisy	48	27	12	9	\$ 167,884.04
Total	1597	1320	16	261	\$ 25,679,796.35
Source	<a href="https://www.fema.gov/policy-claim-statistics-flood-insurance">https://www.fema.gov/policy-claim-statistics-flood-insurance</a>				
*Unincorporated					



- In February 2019, an approximate 800 foot portion of Lake Resort Drive collapsed 8 inches due to erosion and slope failure. The soil is made up of a bentonite layer which has a high K factor for soil erodibility. On June 25, 2019, the Chattanooga Department of Transportation presented to the City Council various road improvement alternatives in order to alleviate the problem. The cost range for the road improvement project ranges from \$5 million to \$11 million. This is one local example where developing on steep slopes and highly erodible soils is going to cost the City millions of dollars. The map on the next page shows the soil erodibility for this road and the area in green is the approximate location of the area where the road collapsed.

Figure 26. Lake Resort Drive Soil Erodibility



## SECTION 5: EXISTING PLANS AND POLICIES



Wolftever Creek Area Plan Cover  
Source: RPA

The RPA develops area and land use plans by working with the public, Planning Commission and elected officials. The plans guide how, when, and where new growth, redevelopment and preservation should occur in a particular area. The land use plans provide future recommendations on the community's vision and assist the RPA with making recommendations for rezoning requests.

There are currently 26 plans and policies that have been adopted by the Chattanooga-Hamilton County Regional Planning Commission and City Council since 1998 that include some sort of recommendation, whether it be a policy, ordinance, or other tool, to preserve environmentally sensitive areas including steep slopes and floodplains. The following is a brief synopsis of a few of the plan recommendations.

### A. Comprehensive Plan, Renewing Our Vision (adopted in 2016)

The 2006 Comprehensive Plan was updated in 2016 with a new document called "Renewing Our Vision." Its purpose is to provide guidance for responsible and proactive development decisions. The plan focuses on physical development at a broad, countywide level. The plan's recommendations and development policy are based on the unique context of the area, previous planning efforts, professional planning principles, current and projected socioeconomic data, public input, and an analysis of transportation infrastructure and natural resources.

The following survey results were received during the planning process:

- Approximately 76% of respondents felt development in the floodplain should be in some way discouraged.
- Approximately 56% of respondents felt development on prime agricultural land should be in some way discouraged.
- Approximately 74% of respondents felt development on forested land should be in some way discouraged.

The number one priority of citizens who participated in the public planning process was that additional or stronger **regulations and policies were needed for the preservation of natural resources.**

The Comprehensive Plan also created a development policy that is meant to be a guide to encourage development in or near areas with existing or planned infrastructure and discourage it in or near areas with sensitive natural resources. It should be noted that during the analysis of the development policy, 64% of Hamilton County's total acreage is considered the "Land in Between". This land is located between the protected lands and lands supported by the transportation system. This land has limited transportation service and farmland alongside large lot houses, and rural countryside communities. In

addition, it contains natural resources such as steep slopes, contiguous forests, and floodplains. Nonetheless, development is allowable anywhere in this area. The Land in Between map in the Comprehensive Plan helps pinpoint where the potential challenges of balancing preservation, development, and future public services will be within Hamilton County.

## **B. Land Use Plans**

Many of the adopted land use plans identify goals and objectives for protecting natural resources. Some examples are identified below:

- Preserve the forested steep slopes by prohibiting development with a grade of 25% or steeper and develop guidelines for development on steep slopes between 15% - 25%.
- Adopt a hillside protection ordinance that addresses issues of topography, slope stability, drainage and erosion, infrastructure, aesthetics, access, natural qualities, and recreation & open space.
- Limit excessive grading and flattening of steep slopes while promoting responsible hillside development flexibility, including clustering options.
- Encourage sensitive low-impact development and, where appropriate, protection of steep slopes.
- Create a minimum standard for retaining existing tree cover on steep slopes.
- Ensure that all future development creates a minimum of 15% tree cover for the city, including interstate rights-of-way, parking lots, and neighborhood tree planting.
- Promote the scenic quality of the community.

**Recommend local governments define environmentally sensitive areas and adopt protection standards to maintain the area's natural topography and drainage patterns,**

- Recommend local governments define and adopt riparian buffer standards as part of an environmentally sensitive areas specification.
- Provide incentives for developers willing to use environmentally friendly development practices (such as preserving open space, landscaping with native vegetation, providing abundance of trees, and reduction of environmental impact).
- Preserve wetlands and their flood buffering and water filtering benefits
- Create riparian protection zones.
- Encourage retention of existing tree canopy cover buffering creeks and streams.
- Encourage protection of the 100-year floodplain through cluster development, reductions in impervious coverage, comprehensive stormwater management, and other means.
- Create a site review policy for a new resource conservation land use code.
- Encourage a "Conservation-Based" subdivision approach when developing areas that include, or are adjacent to, sensitive natural resources. Conservation-Based subdivisions have smaller lots clustered in a portion of the property in order to preserve the sensitive resources in other parts. Include options for preserving a percentage of open space.

## **C. Hamilton County Natural Hazards Mitigation Plan**

The Hamilton County Natural Hazards Mitigation Plan was written in 2004 and a revised draft is still under review for 2019. It was written by Hamilton County and adopted by the local jurisdictions in the region including the City of Chattanooga, Hamilton County, Collegedale, East Ridge, Lakesite, Lookout Mountain, Red Bank, Signal Mountain, Soddy-Daisy, and Walden.



The following are excerpts from the plan that relate to steep slopes, floodplains and other sensitive environmental areas in Hamilton County:

Goal - protect lives and property by reducing the occurrence and severity of flood events in Hamilton County.

Landslide/Erosion: Stream banks, steep slopes and slopes cut for roads have the potential for failure.

- Removal of heavy vegetation in hazard areas increases the potential for landslides.
- Heavy rain increases the probability of slope failure.
- Residents may be unaware of the potential hazard of landslides.
- Severe stream bank erosion in several areas, particularly along North Chickamauga Creek, is threatening property and structures.

Goal - identify high hazard areas and identify techniques to minimize risk.

Wildfire is the main threat associated with drought conditions.

- There is lack of public awareness of how droughts increase the potential for wildfire.
- No public education exists on how to minimize fire risk to property located in the wildland/urban interface.
- Fire suppression on steep slopes and bluff lines is especially difficult.
- Water capacity of Lookout Mountain, Signal Mountain and Walden is not sufficient to fight a major fire.

Goal - reduce the threat of wildfire.

Earthquakes are common in the East Tennessee Seismic Zone, but rarely noticeable. A major earthquake could result in significant loss of property and life.

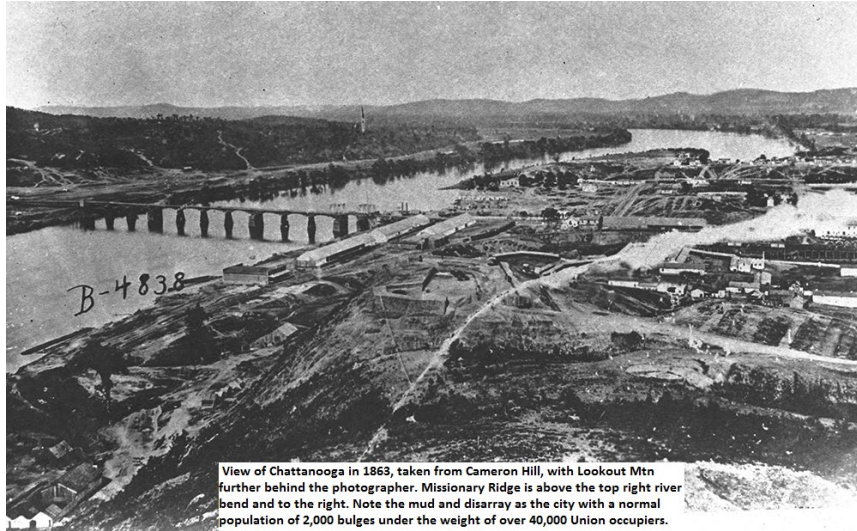
- There is lack of public education on earthquake hazards and preparedness.
- Older buildings and infrastructure may be severely damaged in the event of a significant earthquake.
- Hamilton County contains several critical features that increase the potential danger of a major earthquake.
- Steep slopes and hillsides could become unstable in the event of a major earthquake.

Goal - save lives, reduce potential property damage and increase public awareness.

Preferred actions from the Planning Committee

- Evaluate the potential for uniform countywide stormwater and floodplain regulation.
- Evaluate the potential for a countywide stream buffer ordinance.
- Develop a countywide map of high risk areas for landslide/erosion.
- Evaluate regulation of vegetation removal and development on steep slopes.
- Development restrictions in areas susceptible to landslide/erosion.
- Evaluate and map urban/wildland interface.

## SECTION 6: EXISTING ENVIRONMENTAL REGULATIONS



Source: Missionary Ridge Neighborhood Association

The City of Chattanooga for purposes of protecting, maintaining, and enhancing the environment and for the protection of the public health, safety, and general welfare of the citizens, adopted stormwater management, land disturbance and grading permits, timber removal permit, and flood hazard requirements. These environmental regulations may be found in City Code, Chapter 31. Sewers, Mains, and Drainage, Article VIII. Stormwater Management, Division 1 through Division 5 and City of Chattanooga Zoning Regulations in Article V. Division 23 and Division 24. This section will provide a very brief overview of each of the existing environmental regulations.

Section 9: Gaps Analysis examines the existing regulations and provides a comparison to peer review cities' best management practices to identify if the regulations are adequate to address public concerns. It also identifies if there are gaps or missing regulations that may be necessary to implement in the future.

### A. STORMWATER MANAGEMENT

[City Code Chapter 31, Sewers, Mains, and Drainage, Article VIII. Stormwater Management Division 2](#) was adopted to control the discharge of pollutants to the Chattanooga Stormwater System and to maintain and improve the quality of the waters into which the stormwater outflows discharge to, including without limitation to lakes, rivers, streams, ponds, wetlands, sinkholes, and groundwater.

The stormwater management program imposes requirements for new and redevelopment projects to manage stormwater management runoff for volume, water quality treatment, and peak rate of control.

Low Impact Design (LID) practices such as conservation, preservation, restoration, and green infrastructure measures are recommended as a method to meet stormwater management requirements as identified in the adopted Rainwater Management Guide (RMG). Stormwater facilities that are designed, constructed and maintained in conformance with the RMG is presumed to be in compliance with the **minimum** water quality performance standards.

Projects proposing land disturbances must implement stormwater management measures to mitigate the post-development peak runoff rates to no greater than the existing development peak run-off rates for the two (2), five (5), ten (10), and twenty-five (25) year, twenty-four (24) hour storm event.

### B. LAND CLEARING AND GRADING

[City Code Chapter 31, Sewers, Mains, and Drainage, Article VIII. Stormwater Management Division 3, Section 31-321](#) requires for any land disturbing activity, such as clearing, dredging, grading, excavating, transporting, and filling of land to apply for and receive a Land Disturbing Permit.

Land Disturbing Permits are **not required** for the following activities:

- Surface mining as defined in Tennessee Code Annotated Section 59-8-202;
- Home gardens, individual landscaping, home repairs and maintenance work, and other related activities which result in negligible soil erosion;
- Single-family dwellings when built separately on subdivision lots which have been issued a permit as part of a larger common plan of development that has been approved and recorded in the Hamilton County Register of Deeds Office, provided that excavation is limited to foundation, trenches, basements, service and sewer connections, and minor grading for driveways, yards, and sidewalks. The construction of a single-family dwelling on individual lots, which are not part of a permitted subdivision are not exempt from the Land Disturbing Permit requirements (exempt from stormwater detention requirements);
- Individual service and sewer connections for single-family or two-family dwellings;
- Agricultural practices - cultivation and harvesting of products if the field or orchard, preparing and planting of pasture land, farm ponds, dairy operations, and livestock and poultry management;
- Installation, maintenance, and repair of underground public utility lines when such activity occurs on an existing hard surface road, street or sidewalk, provided the activity is confined to the area of the road, street or sidewalk;
- Construction, repair or rebuilding of tracks or other related facilities of a railroad company;
- Maintenance and repair to any stormwater BMP as deemed necessary by the City; and
- An emergency project that is necessary for the protection of life, property, or natural resources as determined by the City.

Any project that consists of a total land disturbance at and above one (1) acre, are also requires the submittal of a SWPPP and a National Pollutant Discharge Elimination System (NPDES) Permit.

#### [Stream Buffer Requirements - Section 31-323.2](#)

Streams located on a property proposed to be developed or where land disturbing activities are proposed shall be designated as such on EPSC or SWPP Plans. The construction stream buffers shall be delineated on the site with a single row of high visibility safety construction fencing before any land disturbance proceeds.

Streams shall be protected from land disturbance activities by placing the following natural riparian construction stream buffer zone along the stream:

- Thirty (30) foot natural riparian construction stream buffer zone shall be left undisturbed adjacent to all streams.
- Sites adjacent to a receiving stream designated as having unavailable parameters or Exceptional Tennessee waters shall have a sixty (60) foot natural riparian construction stream buffer zone adjacent to the receiving stream.

These construction stream buffers applies to all construction sites. No construction activities or land disturbing activities shall occur within these buffers zones.

#### [Erosion Prevention and Sediment Controls Inspections - Sec. 31-324.1](#)

Erosion prevention and sediment controls shall be designed to minimize erosion and sediment transport resulting from a two (2) year, twenty-four (24) hour storm at a minimum (or five (5) year twenty-four (24) hour storm associated with waters having unavailable parameters or Exceptional Tennessee Waters), either from total rainfall in the designated period or the equivalent intensity.

#### Water Quality Buffers - Sec. 31-324.2

A Water Quality Buffer Zone is a strip of undisturbed native vegetation and soil that includes trees, shrubs, and herbaceous vegetation either in an original state or re-established that borders the waters of the state.

Water quality buffers are applied to “waters of the state” including but not limited to streams, rivers, wetlands, springs, reservoirs or lakes, and ponds with hydrologic connectivity (streams leading into and out of the pond or spring input) and sinkholes.

Buffer widths shall be measured from the edge of the water resource to be protected as defined below:

A. Streams:

- a. For drainage basins less than one (1) square mile:
  - i. Thirty (30') feet
  - ii. Sixty (60') feet when adjacent to streams designated as having unavailable parameters or Exceptional Tennessee waters
- b. For drainage basins greater than one (1) square mile:
  - i. Sixty (60') feet

B. Lakes and Ponds with Hydrologic Connectivity:

The water quality buffer shall be thirty (30') feet from normal pool.

C. Wetlands:

The water quality buffer shall be thirty (30') feet with no disturbance.

Water Quality Buffers shall be permanently preserved during and after development. During development, the buffers shall be clearly marked on plans and on-site and protected from construction activities. The width and parameters of the Water Quality Buffer shall be clearly

indicated on the following: landscape management plans, preliminary and final plats, permits and official maps.

During construction the Water Quality Buffers shall be protected on site with adequate fencing and flagging. Signs shall be posted throughout the construction process to prevent entry of equipment, materials storage, etc.

Water Quality Buffers shall be placed in recorded easements and recorded with the deed in the Register of Deeds Office before a Certificate of Occupancy is issued.

#### Fill Requirements in Certain Residential Zones - Sec. 31-325

A land disturbing permit is required for any property owner who wishes to fill land on any property which is within one hundred (100) feet of any R-1 Residential Zone, RT-1 Residential Townhouse Zone, RZ-1 Residential Zero Lot Line Zone, R-T/Z Residential Townhouse Zero Lot Line Zone, or R-2 Residential Zone, or the property of where the fill is to be located is itself zoned in one of the categories noted above. Filling is defined to be any site where raising the elevation shall require seventy-five percent (75%) or more of the materials used for filling the land to be hauled over surface roads from non-contiguous parcels of land.

Filling on property must be completed, including capping the fill with a minimum of four (4) inches of topsoil and stable perennial vegetation within one (1) year of the permit issue date.

Slopes that are created by fill shall adhere to the following requirements:

1. Slopes created by fill of 3:1 (three horizontal to one vertical) (33%) or flatter may be placed no closer than two (2) feet to the adjoining property line and/or easements.



2. Slopes created by fill that are greater than 3:1 must be designed by a professional soil engineer registered to practice in the State of Tennessee and shall be placed no closer than five (5) feet to the adjoining property line and/or easements.
3. Slopes utilizing retaining walls, the face of the retaining wall may be placed no closer than one (1) foot to the adjoining property line and/or easement.
4. Any combination of retaining wall height plus the slope height exceeds the building code requirements for a non-engineered wall shall be designed by a professional engineer register to practice in the State of Tennessee.
  - a. 4' or less not reviewed
  - b. 4' or greater are reviewed

#### Timber Removal Permit- Sec. 31-325.1.

This section states that the site clearing for any use except for forestry without approved plans and/or land disturbing permits is not permitted.

The harvesting of timber for forestry purposes is permitted in the City of Chattanooga subject to the following requirements:

1. Site will not be developed with the subsequent three (3) years after such timber removal; and,
2. Requirements are applicable to sites one (1) acre in size or larger and where 5,000 square feet or more of the tree canopy is going to be harvested, cut, or removed within a one (1) period, or,
3. Site is having timber harvested, cut, or removed for the purpose of conducting Forestry Land Management Practices.

### **C. SUBDIVISION REGULATIONS**

During the development process, the following minimum design standards must be followed for subdivision development proposals in

the City of Chattanooga. These standards are found in the [City of Chattanooga Subdivision Regulations](#).

#### **Street Standards**

##### Local Streets

- Minimum Pavement Width: twenty-six feet (26')
- Minimum Right-of-Way: fifty feet (50')
- Maximum Grade: fifteen percent (15%) with provisions for a variance in extreme and unusual circumstances. Steep grades shall be avoided at intersections.

#### **Limiting Factors of Development**

Physical characteristics of the land, may inhibit development. The Planning Commission shall not approve a subdivision of land if it has determined from adequate review that the development would be detrimental to the public.

Such factors include the following:

- Flooding
- Adverse Drainage Problems
- Unsuitable Soils
- Excessive Slope of the Land
- Surface or Sub-Surface Rock Formations
- Other Features that May Endanger Public Health, Safety, Life or Property

#### **National Pollutant Discharge Elimination System Permit (N.P.D.E.S)**

Proposed subdivisions that involves one (1) acre or more, or development that is less than one (1) acre if it is part of a larger common plan of development will require a permit from the State of Tennessee and enforced by the City of Chattanooga Stormwater Management Division.

### **Aquatic Resource Alteration Permit (A.R.A.P)**

Proposed work that involves the alteration or any work in a water of the state requires a permit from the State of Tennessee. This permit is enforced by the State of Tennessee.

### **D. ZONING REGULATIONS**

The [Chattanooga Zoning Regulations](#) were adopted in order to regulate and limit the height and size of buildings, intensity of the use of lot areas, and to classify, regulate, and restrict the location of land uses in order to promote and protect the public health, life, and safety of the citizens of Chattanooga.

#### **Typical Residential Setbacks**

- Front and Rear Setback: twenty-five feet (25')
- Side Setback: ten feet (10')
- Other: Reduced Setbacks Permitted "lot of record", Planned Unit Development, and RZ-1, RT-1, and R-T/Z Zones

#### **Typical Residential Lot Size**

- R-1, R-2, and R-3 Residential Zones: seven thousand five hundred square feet (7,500 sq. ft.)
- Other: Reduced Lot Sizes Permitted "lot of record", Planned Unit Development, and RZ-1, RT-1, and R-T/Z Zones

#### **Building Height**

- Two and one-half stories (2 ½) or thirty-five feet (35')
- Building height may be increased by one foot (1') for each additional one foot (1') setback from property lines

#### **R-1 Open Space Option**

The R-1 Open Space Option is located in the Chattanooga Zoning Regulations; however, the R-1 Open Space Option is not a zoning district/classification.

The intent of the R-1 Open Space Option is to provide alternative development standards for the development of single-family residential neighborhoods in the R-1 Residential Zone.

#### **Permitted Uses**

- All Permitted Uses in the R-1 Residential Zone: Single-Family Detached Residential

#### **Typical Setbacks**

- Front Setback: fifteen feet (15')
- Rear Setback: twenty-five feet (25') front entering driveway. Rear entering driveways and using alleys for access the rear setback is eighteen feet (18')
- Side Setback: ten feet (10') - Maybe reduced to five feet (5') In Certain Situations

#### **Minimum Lot Size**

- Five thousand square feet (5,000 sq. ft.)

#### **Minimum Open Space Requirement**

- Thirty percent (30%) of the gross site-in addition to areas which are in a designated floodway zone

#### **Residential Planned Unit Development**

The Planned Unit Development (PUD) tool is intended to encourage creative master planning by not requiring adherence to rigid land use, setback, height, parking, and similar restrictions. It is further intended that PUDs be designed by collaboration between the applicant and the community, rather than the strict limits of zoning. The PUD tool also requires a portion of a site be dedicated as open space.

#### Permitted Residential Uses

- Single-family dwellings, excluding factory manufactured mobile homes constructed as a single self-contained unit and mounted on a single chassis;
- Two-family dwellings;
- Townhouses;
- Multi-family dwellings;
- All Permitted Uses in the Underlying Zone: Single-Family Detached Residential

#### Typical Setbacks

- Minimum twenty-five feet (25') from the exterior PUD boundary line and ten feet (10') between free standing structures

#### Minimum Lot Size

- No Minimum Lot Size

#### Minimum Open Space Requirement

- No Minimum Percentage Required

#### Flood Hazard Management

In 1968, the National Flood Insurance Program (NFIP) was created to protect property, lives, and to provide financial assistance during flood disasters. The flood hazard management program consists of the following:

1. Flood Insurance - Property owners are eligible to purchase flood insurance.
2. Flood Hazard Maps - FEMA, and other partners produce flood maps in accordance with adopted FEMA standards.
3. Regulations - Communities must adopt and enforce minimum floodplain management regulations to ensure that methods of development are taken to reduce flooding exposure.

The NFIP provides a framework for identifying areas subject to a one percent annual chance of flooding, often inaccurately called the “100 year flood.” While this may seem like a rare event, it actually has a one in four chance of occurring during the life of a 30-year mortgage. For comparison, the same structure has only a 1% probability of being damaged by fire in that same time period. **Many experts agree that limiting regulations to the 100-year flood area is inadequate and that a higher level of protection is preferable.** The management of the floodway and floodplain is currently regulated through the City of Chattanooga Zoning Regulations in Article V. Division 23 and Division 24.

The City of Chattanooga is a participant in the National Flood Insurance Program and has *adopted the minimum regulations for development in flood hazard areas.*

FEMA in cooperation with local officials have produced Community Flood Insurance Rate Maps (FIRM's). The FIRM allows you to identify the SFHA, determine the location of a specific piece of property in relation to the SFHA, determine the Base Flood Elevation at as specific site, and locate regulatory floodways. The City of Chattanooga adopted revised Community FEMA Flood Insurance Rates Maps on February 3, 2016.

#### Floodway

The regulatory floodway, as defined by FEMA, is generally considered to be the “channel of a river or other water course and the adjacent land areas that must be reserved in order to pass base flood discharge without cumulatively increasing flood levels by more than one foot.”

Section 38-352 of the Chattanooga Zoning Regulations states that “***no fill, structure, development, encroachment or substantial improvements shall be permitted within the floodway.***” This is not to

say that no development can occur in the floodway; however, before a permit will be granted for development in the floodway, a “No Rise/No Impact” certification must be submitted by a registered land surveyor and professional engineer stating that the proposed project will not increase flood levels in the floodway.

The current flood hazard regulations do not limit the amount of fill, encroachment, improvements, or development permitted to occur in the flood hazard area.

#### Flood Hazard (Floodplain)

The regulatory flood hazard/floodplain (Special Flood Hazard Area/SFHA), as defined by FEMA, “is that portion of the floodplain subject to inundation by the base flood (1% annual chance) and/or flood-related erosion hazards.”

Prior to development occurring in areas located in the flood hazard area a development permit is required. The development permit is required to assure that the proposed development takes place in conformance with the provisions of the flood hazard regulations.

For residential construction where Base Flood Elevation data (B.F.E.) have been provided include standards such that all new construction and improvements shall have the lowest floor, including basement elevated to no lower than two (2) feet above the Base Flood Elevation, if constructed of wood, or one (1) foot about Base Flood Elevation if constructed of concrete.

Non-residential construction where Base Flood Elevation data is available, new construction and improvement of any commercial,

industrial, or non-residential building shall have the lowest floor, including basement elevated or flood proofed to no lower than one (1) foot above the Base Flood Elevation.

#### **E. OTHER JURISDICTIONAL REGULATIONS**

The natural resource areas of Chattanooga are also regulated by other jurisdictions including, but not limited to, the Tennessee Department of Environment and Conservation (TDEC), Environmental Protection Agency (EPA), the Tennessee Emergency Management Agency (TEMA), and Federal Emergency Management Agency (FEMA).



## SECTION 7: CURRENT ZONING PROCESS OF NATURAL RESOURCE DEVELOPMENT



Aerial View of 1105 Mountain Creek Road  
Source: RPA, Google Earth

Currently, there are minimal standards in the City of Chattanooga Zoning Ordinance regulating development in sensitive areas like steep slopes and floodplains except for Division 23. - F/W Floodway Zone and Division 24. - F/H Flood Hazard Zone Regulations as listed above in Section 6: Existing Environmental Regulations.

In many rezoning requests, a Planned Unit Development (PUD) is used. The PUD is intended to encourage creative master planning by not requiring adherence to land use, setback, height, parking, and similar restrictions. It is further intended that PUDs be designed by collaboration between the applicant and the community, rather than the strict limits of zoning. The PUD tool also requires a portion of a site be dedicated as open space.

Typically, most developments that utilize the PUD tool only do so to get variances to setbacks and lot sizes. Very few of the PUD designs provide adequate open space, natural resource protection, or other public benefits to justify the need for the flexibility in standards. The PUD designs get approved without meeting the intent of the PUD tool

because the PUD standards are out dated and have very minimal standards.

The main method for restricting or limiting development in sensitive areas through zoning is if the City Council requires conditions of approval with rezoning cases. Property owners and applicants have the ability to apply to rezone their property in Chattanooga. The Council has the authority to require special conditions of approval of zoning cases. This conditional zoning power was granted to the Council by the State of Tennessee Public Acts of 1984. The Act authorizes a municipality to rezone properties conditionally, where the agreed conditions are designed to ameliorate injuries created by the rezoning to surrounding property interests or to municipal interests.

Below is a list of recent zoning cases that have been approved by the City Council with conditions that restrict development in sensitive areas.

1. In 2015, a 7.5 acre site located at 3100 St. Elmo Ave was rezoned from M-1 Manufacturing Zone to R-T/Z Residential Townhouse/Zero Lot Line Zone and UGC Urban General Commercial Zone for a mixed-use project with townhomes, single-family homes, and a mixed-use building (Case 2015-0038, Ordinance #12936). The property is partially located in the 100-year floodplain and near Chattanooga Creek. Staff recommended to approve the zoning with a condition to limit development in the 100-year floodplain because the South Broad Redevelopment Plan recommends “conserving the creek areas with tree buffers and green space.” The City Council approved the rezoning request and required a condition that “impervious surfaces shall not be permitted within the 100-year floodplain.”
2. In 2016, a 14.6 acre site located at 1105 Mountain Creek Road was rezoned from R-1 Residential Zone to R-3 Residential Zone for a 250 unit apartment complex with a clubhouse (Case 2016-0103, Ordinance #13107). The site is positioned on a series of

knolls at the base of Walden's Ridge and Signal Mountain and contains steep slopes. Staff recommended to approve the zoning with a series of conditions to protect the slopes, reduce the density of development, and restrict the building height for compatibility with adjacent development. Staff recommended these restrictions because the Comprehensive Plan recommended the portion of the site with slopes be developed with low density development because of the sensitive features, and the remaining portion be developed with moderate density development due to the location of infrastructure. The City Council approved the rezoning request and required seven conditions. The conditions that apply to the sensitive areas include the following:

- No mass grading or clearing above the 780' topo line as identified on the Hamilton County GIS map;
- Maximum building height shall be 4 stories; and
- Maximum density shall be 14 dwelling units per acre.

3. In 2017, a 17.06 acre site located at 5565 Cassandra Smith Road received approval for a Special Exceptions Permit for a Residential Planned Unit Development for a 39 lot single-family subdivision (Case 2017-0031, Resolution #28958). A large portion of the site is located in the floodway and 100-year floodplain (13.6 acres) and near Chickamauga Creek. The approved PUD plan showed a cluster development where a large portion of the site being preserved as open space including a wetland area. The City Council approved the permit with three conditions. One condition required 9.9 acres on parcel to remain open space in order to protect the floodway and wetlands.

4. In 2017, a 19 acre site located at 6038 Hixson Pike was rezoned from R-1 Residential Zone to R-3 Residential Zone for 250 garden-style apartment development (Case 2017-0184, Ordinance #13269). There are steep slopes on a majority of the site. The City Council approved the zoning subject to conditions in order to protect the slopes, reduce the density of development,

and restrict the building height for compatibility with adjacent development in order to be in conformance with the recommendations of the Hixson North River Plan. The Hixson Plan identifies goals and strategies for addressing the quality of life and protection of the natural environment for the residents within the plan boundary. One goal and strategy to protect the natural environment is the protection of steep slopes. The following are the conditions of approval:

- A 10' Type C landscape buffer located along the northern and southern property boundaries. Further east of this point, applicant shall install Type B landscape buffers or maintain equivalent buffers along the northern and southern boundaries of the area to be developed;
- Building #9 limited to a maximum of 2 stories in height;
- Maximum density of 250 units; and
- A minimum of 400' to the west of the eastern R-3 zoning boundary be reserved for greenspace area that is left undisturbed with no clearing or grading, except for pedestrian trails, removal of dead or diseased trees or invasive overgrowth.

After a property is rezoned by Council, the owner or developer can then apply for construction permits through the City Land Development Office (LDO). Conditions then get enforced by the Land

Development Office during the construction process, although implementation of the conditions following the rezoning has not been consistent.

**Conditional zoning can be inconsistent and hard to enforce; therefore, additional ordinances and regulations are recommended in order to ensure the sensitive natural resources areas of Chattanooga are protected.**

## SECTION 8: GAPS ANALYSIS



Enterprise South Nature Park  
Source: Roots Rated

### A. Public Concerns

The RPA reviewed the existing regulations listed in Section 6 and compared them to public concerns to identify the gaps where there is missing regulations that would alleviate the concerns. The Gaps Analysis showed the following information:

- 9 major categories were identified including the following:
  1. Landslides and soil erosion
  2. Intensity of development on sensitive sites
  3. Height of Structures/Scenic Views
  4. Stormwater control
  5. Mass land clearing and grading/loss of tree coverage
  6. Sites being cleared without a clear plan for stabilization
  7. Fire
  8. Flood hazard protection- major flood events
  9. Landscaping design requirements for retaining walls

- 3 of the categories (intensity of development, sites being cleared with no plan for stabilization, and landscaping or design requirements for retaining walls) do not have an ordinance to protect the land or alleviate concerns.
- A majority of the existing regulations that address community concerns are in Section 31 of the Municipal Code.
- There are only 2 sections of the Zoning Ordinance that address community concerns (building height and flood hazard protection).
- All of the categories, except for stormwater control, were determined to have inadequate regulations or enforcement policies that address the public concerns.

Figure 27 on page 57 shows the categories, the gaps, and recommended solutions. Staff's full recommendation is listed in Section 10 of this Assessment.

### B. Peer Review

The RPA conducted a peer review of many cities and counties to see what types of ordinances or other zoning tools are used to protect natural resource areas. Six jurisdictions were chosen based on their similar characteristics to Chattanooga in terms of population size, median income, housing costs, natural resource features, and proximity to Chattanooga. The six jurisdictions include the following:

1. Knoxville, TN
2. Nashville, TN
3. Williamson County, TN
4. Asheville, NC
5. Durham, NC
6. Huntsville, AL

The RPA compared the natural resource regulations of the jurisdictions to Chattanooga's regulations to identify if there are any gaps or missing regulations that address community concerns or best management practices. The Gaps Analysis showed the following information:

- 22 zoning categories were identified.
- Only 2 out of the 22 categories matched, clearly showing there is a significant gap in the City's natural resource protection zoning regulations.
- For example, intensity of development was identified as a concern. There are no regulations that limit the type of use or development in a natural resource area. A large industrial plant can be located on a hillside with a 30% grade slope as long as the site has the correct manufacturing zone and meets all applicable zoning, building and fire code standards.

Some of the tools used by other jurisdictions include the following:

- Overlay zone
- Tree protection/conservation regulations during development
- Limiting the amount of disturbance on slopes
- Cluster lot design/conservation subdivision
- Flexibility in reduced setbacks
- Height restrictions
- Limiting the amount of fill in Special Flood Hazard Area

Figure 28 on page 58 shows the summarized list of zoning regulations.

The Land Disturbing Permit (LDP) regulations were also compared to similar regulations of the peer review jurisdictions and showed the following information:

- 29 categories were identified.
- 19 out of the 29 categories matched.

- Based on the analysis, it appears the LDP regulations are more adequate than the zoning regulations to address community concerns and best management practices
- It appears there are issues with enforcement inconsistencies of the LDP regulations based on the public comments.

Figure 29 on page 59 shows the summarized list of land disturbing permit regulations.

**SUMMARY: Chattanooga's Zoning Ordinance *severely* lacks regulations that protect natural resources and address public concerns. Section 31 of the Municipal Code is more adequate but enforcement is *inconsistent*. Compared to peer cities, Chattanooga has gaps in the zoning standards that address development in steep slopes and floodplains.**



**Figure 27. Gaps with Current Regulations that Address Community Concerns**

<b>NATURAL RESOURCE PROTECTION - PUBLIC CONCERNS OR ISSUES</b>			
<u>CONCERNS AND ISSUES</u>	<u>CURRENT REGULATION THAT ADDRESSES COMMUNITY CONCERNS</u>	<u>ADEQUACY OF REGULATIONS</u>	<u>POSSIBLE TOOL OR REGULATION TO ADDRESS CONCERNS</u>
Increased Potential for Landslides and Soil Erosion	Yes - Section 31, Land Disturbing Permit requires soil stabilization for disturbed areas	<b>No</b> - This regulation does not fully address the concerns of the public. Sites can still be developed in landslide or flood prone areas with sensitive soil types. There are no limits to the amount of disturbance on a site.	Identify soils with high erodibility and high slippage potential, minimize development on porous or erodible soils, critical lot option, & slope stability certifications
Intensity of Development on Sensitive Sites	<b>No</b>	<b>No</b> - Zoning allows any use in natural resource areas as long as the site has the appropriate zoning. For example, industrial uses can be located in the floodway or on sites with 30% grade as long as the site meets applicable zoning standards like setbacks and building height, and building, fire, and road standards. The only other tool that limits development intensity is if a rezoning case gets conditions placed on it by Council restricting development	Use restrictions, Special Exceptions Permit for Critical Facilities that are reviewed on a case-by-case basis
Height of Structures/Scenic Views	Yes - Zoning Districts	<b>No</b> - Most Zone Districts restrict building height to 2.5 stories or 35' but there are no requirements that designate scenic viewshed corridors to protect scenic views	Tree canopy protection standards
Stormwater Control	Yes - Section 31 Stormwater	<b>Yes</b> - Regulations provide stream protection with buffers, water quality control, sediment control, runoff onto adjacent property. Enforcement of regulations has been inconsistent which may part of the concern from the public.	More consistent enforcement
Mass Land Clearing and Grading / Loss of Tree Coverage	Yes - Section 31, Timber Removal Permit and Land Disturbing Permit	<b>No</b> - Timber Removal Permit regulations state that site clearing for any use except for forestry without approved plans or land disturbing permit is not permitted. City Council also has adopted zoning conditions on rezoning requests limiting the amount of land clearing. The Land Disturbing Permit regulations require revegetating disturbed areas. Enforcement has been inconsistent for mass land clearing and grading.	Limit amount of disturbance on a site, limit amount of impervious surface, limit fill in floodplain, density bonus, flexibility in setbacks, tree canopy protection standards, right-of-way reductions, & more consistent enforcement of LDP regulations
Sites Being Cleared without Clear Plan for Stabilization	<b>No</b>	<b>No</b> - Section 31 Land Disturbing Permit requires soil stabilization and replanting vegetation on cleared sites but there are no regulations that prohibit prematurely clearing a site or no timing requirements that restrict clearing until proper zoning is in place or for building construction once land disturbance has started.	Limit amount of disturbance on a site at any one time - phasing, & security bond for revegetation/stabilization
Fire	Yes - Fire Code and Building Code	<b>Yes</b> - codes require building separation, sprinklering, and other safety standards	Conservation subdivision, critical lots, & use restriction standards will enhance the existing regulations
Flood Hazard Protection - Major Flood Events	Yes - Floodhazard Requirements in the Zoning Regulations	<b>No</b> - No regulations that limit filling in the 100 and 500 year floodplain or altering the natural floodplain. Hazard Mitigation Plan has goals on how to protect against major flood events but it is a policy and not codified.	Limit amount of fill in floodplain, limit amount of impervious surface, conservation subdivisions, & critical lots
Landscaping or Design Requirements for Retaining Walls	<b>No</b>	<b>No</b> - There are no landscape design requirements for retaining walls such as requiring certain building materials or limiting height of walls.	Timing of retaining wall construction & landscaping/material facing of retaining walls standards

Figure 28. Identified Gaps in Regulations Based on Peer Review

NATURAL RESOURCE PROTECTION							
IDENTIFIED GAPS IN REGULATIONS BASED ON PEER REVIEW							
REQUIREMENTS OR REGULATIONS	Chattanooga	KNOXVILLE	NASHVILLE	WILLIAMSON COUNTY, TN	ASHEVILLE, NC	DURHAM, NC	HUNTSVILLE, AL
SOILS USED TO IDENTIFY ERODIBILITY/UNSTABLE SOILS & EARTH MOVEMENT OF SITES	No	No	Yes	Yes	Yes	No	No
TREE PROTECTION/CONSERVATION REGULATIONS - DURING DEVELOPMENT	No	Yes	Yes	Yes	Yes	Yes	No
ADDITIONAL DEVELOPMENT STANDARDS							
Flexibility in Required Setbacks	No	Yes	Yes-Cluster & Critical Lot	No	Yes	Yes	Yes
Residential Density Bonuses	No	Yes	No	No	Yes	Yes	Yes
Residential Density Reductions/Limitations - In addnt to Base Zone	No	Yes	No	No	Yes	No	Yes
Non-Residential Development Intensity Limitations	No	Yes	No	No	Yes	No	Yes
Non-Residential Development Intensity Bonuses	No	No	No	No	Yes	No	Yes
Off-Street Parking-On Street May Count	No	Yes	No	No	N/A	No	No
Height Restrictions	No	Yes	No	No	Yes	No	Yes
Recommends Terrain Adaptive Architecture or Construction Methods	No	Yes	No	No	No	Yes	
SUBDIVISION REGULATIONS							
Conservation Subdivision Regulations	No	No - Recommended	Yes	Yes	No	No	No
Flexibility to Permit Reduction in Street ROW/Pavement Standards to Limit Disturbance of Hillsides	No	Yes	Yes	Yes	Yes	No	Yes
FLOOD (Floodplain) HAZARD PROTECTION							
Permits Development with Fill above Base Flood Elevation	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Limit Amount of Fill in Floodhazard Area	No	Yes	Yes (1 to 1 Offset)	Yes (1 to 1 Offset)	Yes - Without BFE Only	No	No
Prohibits Development, Fill, & Encroachment	No	No	No	No	No	No	No
PROHIBITS DEVELOPMENT/CLEARING ON SLOPES							
Limit % Amount of Disturbance on Slopes	No	Yes	Yes	Yes	Yes	Yes	Yes
Prohibits Disturbance/Development	No	Yes	No	Yes	No	No	Yes
Regulations Protecting Scenic Views or View Sheds	No	No	No	No	No	No	No
OTHER TOOLS							
Cluster Lot Option	Yes - R-1 Open Space & PUD	Yes - PUD	Yes	Yes -PUD	Yes - PUD	Yes - PUD	Yes - PUD
Critical Lot Option	No	No	Yes	No	No	No	No
Impervious Surface Ratios (IRS)	No	No	Yes	No	No	No	Yes
LOTS OF RECORD (EXEMPT FROM REGULATIONS)	No	Does not State	Yes	Does Not State	Yes	No	Yes

**Figure 29. Identified Gaps in Land Disturbing Permit Regulations Based on Peer Review**

NATURAL RESOURCE PROTECTION - LAND DISTURBANCE							
IDENTIFIED GAPS IN REGULATIONS BASED ON PEER REVIEW							
CONCERNS/ISSUES	CHATTANOOGA	KNOXVILLE	NASHVILLE	WILLIAMSON.CO	ASHEVILLE.NC	DURHAM.NC	HUNTSVILLE.AL
<b>GRADING/DRAINAGE/EROSION CONTROL PLANS</b>							
Protection of Streams and Creeks to Maintain Water Quality	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Limit Time of Exposure of Disturbed Areas	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Control Sedimentation (Mud & Sediment in Streets/Adjacent Property)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Limit Amount of Disturbed Areas at One Time	No	Yes	Yes	No	Yes	No	Yes
Stabilization of Soils Stockpiles	Yes	Yes	Yes	No	Yes	No	No
Addnt Requirements for Cut & Fill Slopes	No	Yes	Yes	Yes	Yes	No	Yes
Stabilization of Steep Slopes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Timing of Retaining Wall Construction	No	No	No	No	No	No	No
Landscape Around Retaining Walls	No	No	No	No	Yes	No	No
Preservation of Existing Vegetation & Trees	Yes	Yes	Yes	Yes	No	N/A	Yes
Sites Cleared without Clear Plan for Stabilization and Construction	No	No	No	No	No	No	No
Pre-Construction Conference Required	Certain Circumstances	Yes - Certain Circumstances	Not Mandatory	Not Mandatory	Yes	When Deemed Necessary	No
State Date of Land Disturbance to Start	Yes	No	Yes	No	No	Yes	No
Inspection of Initial Erosion Controls for Compliance with Regulations	Yes If preconstruction inspection required	No	Yes	Yes	Yes - Only Over 25,000 sq ft of Disturbance	No	Yes
Security Bond for Revegetation	Sometimes	Yes	No	No	Yes -Over 5 Acres of Disturbance	Maybe	Yes
Timeline for Review of Plans	Yes (10 Days)	Yes	Yes	Yes	Yes	Yes	Yes
Slope Stability Certificate	No	No	No	No	No	No	--
Final Inspection for Stabilization and Permanent Erosion Controls Installed	Yes	No	Yes	Yes	Yes	Yes	Yes
Permits or Limits Grading in Landscape Buffer Zones	Yes	Sometimes	Yes	Yes	Yes	N/A	Yes
Prohibit Grading along Property Line	No	No	Yes	No	No	No	No
Clean-Up of Streets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Graded Slopes and Fill Standards							
Angle	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gradient Benches/Terraces	Yes		Yes	Yes	Yes	Yes	Yes
Compaction Requirement	Yes - Only Where Buildings Will Be Built	Yes - New Roads	N/A	Yes	Yes	Yes	Yes
Geotechnical Report	Yes	Yes	Yes	Yes	Yes (2:1)	Yes	Yes
Slope Setback Requirement Retaining Walls	No	No	No	No	Yes	No	No
Stability Certificate Findings	No	Yes-Somewhat	No	No	Yes	No	No
Limits Number of Tree's Removed from Site	No	Yes	Yes	Yes	Yes	Yes	Yes

## SECTION 9: NATURAL RESOURCE REGULATORY CONCEPTS FOR CITY COUNCIL CONSIDERATION



Williams Island

Source: Tennessee River Gorge Trust

Based on the review of the existing natural resources and land development trends in Chattanooga, existing regulations, land use plan recommendations, and community concerns, staff is recommending the following concepts for City Council's consideration. These concepts have not been refined to the point that they would be ready to implement, because their purpose is to illustrate choices at a higher level. Once the Council provides guidance on how staff should proceed with the project staff will then be able to draft any new regulations, policies, or other zoning tools at a later stage.

### 1. Natural Resource Protection Overlay District

**Description:** A Natural Resource Protection Overlay District can be used to apply area-specific standards. A base zoning district (such as residential or commercial) determines the types of uses permitted and the minimum dimensional requirements of lots and buildings. Similar to a Planned Unit Development or Short-Term Vacation Rental Boundary, an Overlay District applies an additional layer of standards

to all areas within a defined boundary, regardless of the underlying base zoning district. For example, an area with single-family homes that is zoned R-1 Residential Zone might also be located within the Overlay District. In this example, the permitted uses might allow construction of a single-family home according to the R-1 standards; however, the Overlay District might prevent construction on slopes over a certain percent grade or limit the amount of fill in the floodplain.

#### Advantages:

- It can apply a unique set of standards to a specified area without having to amend all other relevant sections of the code.
- It can provide additional protection for defined natural resource areas without negotiating on a case-by-case basis like with rezoning cases.
- Allows existing zoning regulations to be superseded or complemented to solve a known problem.
- Can implement Comprehensive Plan and Land Use Plan policies and strategies associated with future land use and the environment.
- Relatively easy to maintain over time following initial adoption.

#### Disadvantages:

- Determining an overlay district boundary may be difficult because there are steep slopes and floodplains scattered across the city.
- Can require subject matter experts to develop the initial maps and standards to administer. For example, enforcement of a floodplain overlay requires detailed knowledge of technical FEMA and NFIP requirements and other local building and engineering requirements.
- It may require additional staff time to permit and enforce projects located within the boundary because staff will have to refer to an additional boundary map and different set of regulations. For example, the FEMA floodplain maps get



revised which would require updates to the Overlay District maps as well.

- Adds an additional layer of requirements to the development review process which increases time for review and costs for site development.
- Similar to the Short-Term Vacation Rental Boundary, an Overlay may be viewed by the public as unfair or inconsistent because additional regulations will apply to certain properties but not to others.

## 2. Adoption of a Natural Resource Protection Ordinance

**Description:** A Natural Resource Protection Ordinance is similar to the Overlay District listed above, but the regulations would apply to potentially all property within the City of Chattanooga that meets the Ordinance criteria. The Ordinance will help fulfill the goals of protecting the City's natural resources as identified in the adopted Comprehensive and Land Use Plans.

The Ordinance will provide standards that regulate the intensity or use in natural resource areas to minimize the impact of building construction and land disturbance activities, address unsafe geologic disturbance, soil erosion and excessive stormwater runoff, excessive removal of trees and other vegetative cover, and filling in the floodplain.

The following is a list of examples of zoning standards that may limit development and examples that may provide incentives for preserving natural resource areas that can be included in the Ordinance. This list is illustrative and does not provide all the possible zoning standards that could be included in an Ordinance. This list was developed using the peer review and Technical Committee's advice based on best and current management practices.

## I. Development Restrictions

### Use Restrictions

Use restrictions that limit or prohibit the activities that may occur in natural resource or high hazard areas. For example, permitting low density residential development in very steep areas is more appropriate than allowing large industrial uses.

Some municipalities select a slope class (i.e. 15-25%, 25-30%, etc.) which then allows a series of permitted, prohibited or conditional uses. Prohibiting development entirely in high hazard areas may also be appropriate in order to protect people from life-threatening situations even though the building could be protected from damage.

If the City Council did not want to prohibit development entirely in these high hazard areas, they could consider allowing a Special Exceptions Permit where they have the opportunity to review applications on a case-by-case basis. The following activities are examples of the types of critical facilities that should be given special attention:

- Structures or facilities that produce, use, or store highly volatile, flammable, explosive, toxic and/or water-reactive materials.
- Hospitals, nursing homes and housing likely to have occupants who may not be sufficiently mobile to avoid injury or death during a major event like a flood or landslide.
- Police stations, fire stations, vehicle and equipment storage facilities, and emergency operations centers.
- Public and private utility facilities that are vital to maintaining or restoring normal services to high hazard areas before, during and after a major event like a flood or landslide.

### **Clearing and Grading/Limit Amount of Disturbance**

Erosion and aesthetic problems increase when irresponsible site clearing and land disturbance is combined with slope and hillside issues. Limiting the amount of disturbance on slopes can help reduce the amount of runoff, erosion, and the potential for slope destabilization, and preserve the visual quality of the City.

For example, Durham, NC limits the amount of grading in steep slope areas to no more than 15%, and Huntsville, AL restricts the amount of disturbed area per lot to 30% of the lot area for Lower Slope Zone and 20% of the lot area for Upper Slope Zone. For reference, the Upper Slope Zone is for land with 20% slope or greater and Lower Slope Zone is anything less than for land located in their Slope Development District. Williamson County, TN, identifies very steep slope areas as areas with slopes in excess of 25%. Land disturbing activities such as clearing, grading, excavating, and construction is prohibited in the very steep slope areas except for passive recreation uses and minor utilities.

### **Limit Amount of Impervious Surface**

Impervious surfaces are primarily artificial structures or land surfaces that repel rainwater and do not permit it to infiltrate (soak into) the ground. Surfaces commonly found in urban and suburban landscapes such as roads, parking lots, driveways, sidewalks and roofs are considered impervious. Adding more of these surfaces to natural resource areas can alter the flow of rain water and streams and increase stormwater runoff and sediment. For example, Huntsville, AL restricts the amount of impervious surface in their Slope Development District to 25% of the total subdivision area. Nashville, TN exempts repairs or replacement to existing structures or buildings that do not increase impervious surface area of the site by more than 25% of the lot area. This exemption is applicable to lots that have a 15% or greater slope.

### **Permit Development with Fill above Base Flood Elevation**

In addition to the FEMA regulations, some jurisdictions adopt additional standards to further govern development within the Special Flood Hazard Area in order to minimize flood risk. Hundreds of communities and as many as 22 states require new construction be elevated higher than federal requirements in the high-risk 100-year floodplain. Floods have been worsening and the damages have been increasing across the U.S. so some cities and counties are also extending the additional fill standards to the wider 500-year floodplain. Knoxville, TN defines the regulatory floodway as the 500-year floodway, which is stricter than the national FEMA requirement of a 100-year floodway, and it has a minimum floor elevation of 1 Foot above Base Flood Elevation. Durham, NC requires a minimum of 2 feet above Base Flood Elevation.

### **Limit the Amount of Fill in Floodplain**

Similar to the section above, some jurisdictions adopt additional standards that go beyond the minimum regulations required by FEMA in order to protect the 100 and 500-year floodplain.

Nashville, TN requires all development proposed on property that contains natural floodplain or floodway to leave a minimum of 50% of the natural floodplain area, including all of the floodway area, or all of the floodway area plus 50 feet on each side of the waterway, whichever is greater, in its original, natural state. Knoxville, TN does not allow fill to be permitted halfway between the 100 year floodway and the 100 year flood fringe. Williamson County, TN requires any fill or other encroachment must be offset by an equivalent amount of qualified cut on a one to one basis.

### **Floodplain and Floodway Acreage Not Counted Toward Minimum Lot Size Requirements**

For example, single-family and two-family lots may include land area designated as natural floodplain or floodway; however, if the floodplain is manipulated it shall not count towards satisfying the minimum lot size requirements of the zoning district.

### **Soils Used to Identify Erodibility**

By placing restrictions on development sites with soil types that are susceptible to erodibility and soil slippage, it can help prevent landslides and protect the public from a potentially disastrous situation. Williamson County, TN identified slippage soils that are prone to landslides and restricts development. These soils are identified as those where the parent material is Colluvium as classified by the Natural Resources Conservation Service. If a site has this type of soil, then that portion of the site cannot be used for building area or subject to land disturbing activities.

### **Tree Canopy Protection**

Tree protection and reforestation zoning requirements can enhance the Scenic City's natural beauty, reduce air pollution, stabilize soil, and reduce stormwater runoff. Williamson County, TN has tree protection standards during construction and requires additional tree plantings if trees are removed during construction. Asheville, NC requires trees and vegetation be preserved in steep slope and ridgetop areas except for areas approved for grading or within 10 feet of building footprints. The Chattanooga-Hamilton County Area Water Quality Program's Steep Slope Management Guidelines suggest revegetating slopes as part of the development process.

### **Height of Structures**

Restricting the height of structures in slope areas can protect scenic and aesthetic views. Asheville, NC restricts building height to 2 stories or 30 feet on the uphill side of the structure and 3 stories or 40 feet on the downhill side of the structure. Accessory structures cannot exceed 20 feet on any side.

### **Density Restrictions**

Restricting the density in natural resource areas can limit the negative impacts on the City's stormwater and infrastructure system, limit the visibility of structures on hillsides and ridgetops, and protect the health and safety of the public by limiting the amount of structures near high

hazard areas. Asheville, NC restricts density of residential development in steep slope and ridgetop areas. The density restriction is based on the grade of the lot and the residential zone. For example, a lot with a 20-24% grade in an RS-2 Zone is limited to 1.4 dwelling units per acre. The Chattanooga-Hamilton County Area Water Quality Program's Steep Slope Management Guidelines suggest limiting development of slopes exceeding 25% grades to residential uses with a maximum density of 1 dwelling unit per 2 acres. Residential development on slopes between 16% and 25% is recommended at a maximum density of 1-3 dwelling units per acre.

## **II. Development Incentives**

### **Density Bonus or Transfer**

A density bonus can be used to allow additional density if a portion of a site containing natural resources is preserved. Knoxville, TN allows a density bonus up to 10% of the total units allowed in the base density when a conservation easement is placed on an undisturbed steep hillside or ridgetop portion of a parcel. An additional bonus density of 10% of that allowed by the base density may be approved when public access, such as a trail easement, is provided within the conservation easement. Durham, NC allows a density bonus up to 15% of that allowed by zoning. Asheville, NC allows a density bonus up to 60% if more than 60% of the site is preserved.

A density transfer can be used to trade development rights with a natural resource free site. Credits or bonuses can be given to increase the allowable density if the developer puts buildings on high ground or does not disturb a wetland or sloped area.

### **Flexibility in Required Setbacks**

The placement of structures on hillsides or in floodplains is very important when trying to limit the amount of disturbance. In order to provide the most flexibility, setbacks can be reduced to allow structures in the most appropriate location without encroaching into necessary setbacks for fire protection. For example, Knoxville, TN allows front

setbacks to be reduced to limit overall site disturbance when approved by a Use-on-Review. Asheville, NC allows the Planning Director to approve reductions of front setback from 35 feet to 20 feet in the RS-2 Zone and from 25 feet to 15 feet in the RS-4 Zone if the setback reduction results in reducing site grading and enhances protection of existing trees and other vegetation.

### **Reduction in Road Width**

Allowing the reduction in pavement width of roads can reduce the amount of impervious surface and stormwater runoff, the amount of grading, and removal of trees. The roads still need to be wide enough to allow access for emergency vehicles. Knoxville, TN allows a reduction of pavement width to 20 feet and 40 feet for right-of-way for low residential development. Huntsville, AL allows a reduced pavement width of 22 feet and reduced right-of-way width of 40 feet in the Slope Development District.

### **Lots of Record**

Lots of record are lots that were lawfully recorded at the time of the passage of the Zoning Ordinance on June 20, 1961, or on any lot legally platted on or before June 20, 1961. These lots hold certain rights for continued use and development. Some of the jurisdictions studied during the peer review do not apply their natural resource standards to lots of record because they were established prior to the adoption of the ordinance (Durham, NC and Williamson County, TN). Other jurisdictions require some standards while allowing some exemptions to the regulations in order to protect the city's natural resources while protecting property rights.

For example, Huntsville AL allows lots of record in the Slope Development District to be exempt from all the standards except the building height and certification that the building and site can meet a safety factor for soil stability. Asheville, NC allows for construction on single-family dwelling lots of record, but the dwelling must meet the

grading, height, and tree preservation requirements. The lot is allowed an exemption from the density requirements.

### **Advantages:**

- An ordinance can protect and enhance property values.
- An ordinance can help to implement the community goals and objectives of the adopted Comprehensive Plan and Land Use Plans.
- It can provide additional protection for defined natural resource areas without negotiating on a case-by-case basis like with rezoning cases.
- It is relatively easy to maintain over time following initial adoption.
- It applies city-wide so it is fair and consistent for all areas of the City.
- It is enforceable unlike a policy.

### **Disadvantages:**

- As with all zoning regulations, an ordinance requires that all involved property owners relinquish some of their individual property freedoms for the common good.
- An ordinance can increase the cost of building new structures.
- Successful implementation also requires easily understood administrative procedures.
- Can require subject matter experts to review standards and administer. For example, enforcement of floodplain regulations require detailed knowledge of technical FEMA and NFIP requirements and other local building and engineering requirements.



### 3. Natural Resource Protection Policy

**Description:** Similar to the Comprehensive Plan and Land Use Plans, a Natural Resource Protection Policy will provide goals, objectives, and guidance on how to manage and preserve the City's natural resources. It can assist staff, Planning Commission and City Council with making recommendations and decisions for approving or denying rezoning cases for property that contains natural resources.

#### **Advantages:**

- Depict areas that are appropriate for less intense uses, particularly residential uses.
- Enable the Planning Commission and City Council to have a process to consider rezoning requests for natural resource areas.

#### **Disadvantages:**

- A policy is not enforceable by local law so there are no guarantees that the recommendations from the policy will be implemented.
- Policies can be inconsistently interpreted and applied.
- Communities or neighborhoods may feel that the enforcement of policies are often politically based when they are applied or not applied to final zoning case and Special Permit decisions.
- The Comprehensive Plan and Land Use Plans already provide policy on protecting and natural resources. Another policy is not necessary.

### 4. No Change - Keep Existing Regulations and Policies

**Description:** The last concept staff is proposing for steep slope areas is that there are no changes made to the existing regulations. The Land Development Office will continue using the existing regulations during permit review, and the Planning Commission and City Council will continue to use existing policies to review zoning cases on a case-by-case basis.

#### **Advantages:**

- No additional staff time required.
- No additional money from the City's budget is spent on continuing the project.

#### **Disadvantages:**

- No additional protection methods for natural resource areas could result in additional infrastructure problems, public safety issues like more landslides, floods, and loss of the scenic views that are valued by the City.
- Public concerns will not be addressed.
- Potential for additional costs to the City and taxpayers if damage to infrastructure and private property is increased due to more development in natural resource areas.
- Loss in economic revenue generated from outdoor tourism if the City's landscape and scenic views are severely altered.
- Additional staff time, including Councilmembers' time, spent addressing community concerns of continuing problems related to development in natural resource areas.

## SECTION 10: STAFF RECOMMENDATIONS



Glen Falls

Source: Lookout Mountain Riverview Inn

In order to implement the policies in the Comprehensive Plan and Land Use Plans and to address community concerns, staff is recommending a Natural Resource Protection Ordinance.

An ordinance is enforceable, consistent, and will address the gaps identified through this analysis. An Overlay District may also be appropriate to accompany the ordinance if the Council does not want the ordinance standards to apply city-wide to all properties.

A policy, like an adopted plan, is a document that expresses intent, but it is not considered a law or an enforceable document. The Zoning Ordinance is a law with penalties and consequences for not following it. Also, based on the public comments received, peer review, and review of existing regulations, it appears that concept 4, “no change” is the least desirable option. There are many gaps in the current regulations that can be addressed through the ordinance that will address the public’s concerns and ensure the future development of Chattanooga is done in a way that protects the City’s natural assets.

The Ordinance will establish a set of development standards that will help shape the design and placement of future development in a manner which minimizes its impact on the natural environment and mitigates any potentially damaging activity while still accommodating growth. Staff is recommending amendments and additions to the following codes: (1) Zoning Ordinance, (2) Subdivision Regulations, and (3) Municipal Code. The recommendations are conceptual at this time. The specific details of the proposed Ordinance, such as the amount of disturbance that can occur on a site, will be finalized after the Ordinance has been drafted and vetted through a public process.

### Zoning Ordinance

#### 1. Definition of Steep Slope

Define a percent grade of a “steep slope” which will serve as a baseline for any policy, ordinance or zoning tool that City Council adopts. According to the Chattanooga-Hamilton County Area Water Quality Program’s Steep Slope Management Guidelines, “25% grade slopes are referenced as “steep” and “unbuildable”, “unsuitable for development”, or “recommended for recreation and/or conservation” in many past and current plans.” Some of the adopted land use plans recommend, “Preserving the forested steep slopes by prohibiting development with a grade of 25% or steeper and develop guidelines for development on steep slopes between 15% - 25%.”

Staff’s recommendation for the definition of steep slope would be to use a two tiered approach similar to what Williamson County, TN has listed in their regulations. Moderate to steep slopes would be considered slopes of 15-25% grade and very steep slopes would be anything over 25% grade.

## 2. Land Use Restrictions

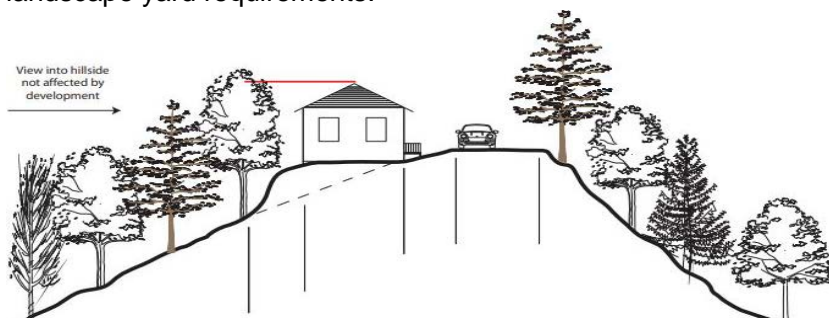
Establish a Special Permit process for intensive land use activities (such as hospitals, public assembly uses, and intensive non-residential uses) that may occur in high hazard areas such as documented slope hazard areas or flash flood areas. The main objective is to ensure the use would not present accessibility issues or pose safety concerns for less mobile residents such as a nursing home.

## 3. Limit Amount of Disturbance on Slopes

Establish restrictions that limit the amount of clearing, grading, and disturbance permitted on a site during construction. For example, for sites with slopes of 15% to 25% the amount of disturbance permitted in the sloped area should be limited to no more than 50% clearing, grading, or disturbance. For sites with slopes of 25% or greater the amount of disturbance permitted in the sloped areas should be limited to no more than 25% clearing, grading, or disturbance.

## 4. Tree Canopy Protection Standards

Explore options of requiring a certain percentage of existing tree canopy on the development site to be retained and protected during construction for sensitive natural resource sites. Existing tree canopy retained could be used as credits towards any open space or landscape yard requirements.



Example of Preserving Trees on a Ridgeline with a Residential Development  
Source: Knoxville, TN

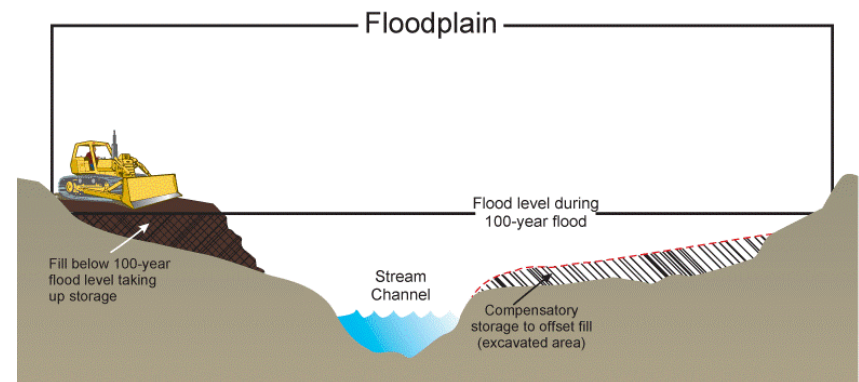
## 5. Limit the Amount of Impervious Surface

Establish standards or regulations limiting or reducing the amount of impervious surfaces for non-residential uses such as minimizing parking space stall dimensions, required number of compact car stalls, using porous surfaces, encourage shared parking, and encourage structured parking decks.

For residential uses, staff recommends limiting the amount of driveway and building footprint to a certain percentage of the total lot area to ensure an entire site is not cleared and replaced with building and pavement in a sensitive natural resource area.

## 6. Limit the Amount of Fill in Floodplain/Zero Net Increase

Establish standards that require compensatory storage to off-set fill. This is often referred to as a 1:1 fill ratio. The basic concept is an equal volume of fill shall be removed for a site to compensate for the same volume of fill that is placed in the floodplain. Limiting the amount of fill in the floodplain is intended to reduce risks to people and property. According to the American Planning Association, "each new flood, even of the same height as the previous one, results in higher damages consequent upon these successive failures to restrain expansion of floodplain use."



Example of 1:1 Fill Ratio  
Source: Oregon Dept. of Land Conservation & Development

## 7. Density Bonus

Establish a density bonus in residential density if a certain percentage of a site or lots with natural resources is preserved and set aside from development.

For non-residential uses the density bonus could be an increase in building height or reduced parking requirements.

## 8. Flexibility in Required Setbacks

Establish a staff approval process for reductions in setbacks if a portion of the site containing natural resources is preserved and site grading is limited.

## 9. Lots of Record

Existing lots legally recorded prior to the adoption of the Natural Resources Protection Ordinance should be analyzed more thoroughly to determine if the Ordinance requirements will produce any unintended consequences or undue hardship by being required to comply with the regulations. However, lots of record could be eligible for reduced setbacks if the natural resources on the site are preserved and no grading occurs in this area. Special standards could be developed that factor in different home construction techniques (such as slab construction versus pier construction). Additional flexibility will be needed to address the unique site conditions for each lot of record. The overall objective is to establish some basic parameters on clearing and grading on a lot of record without taking away all the development rights.

## 10. Planned Unit Development

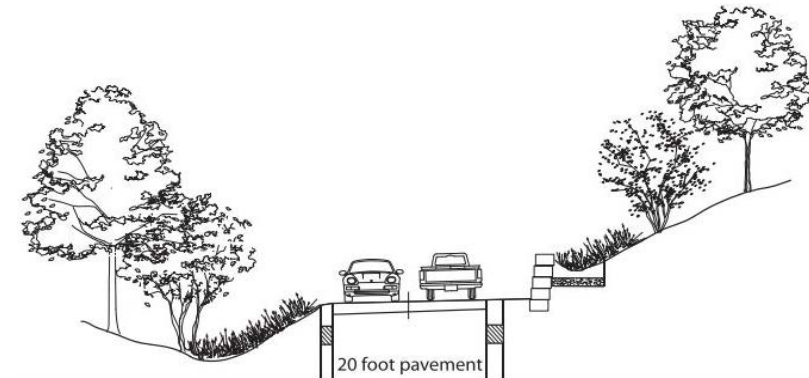
The Planned Unit Development (PUD) tool was originally adopted by City Council in 1995 and has received a few amendments, but it has not had a comprehensive review in 20 years. Staff recommends to amend the PUD tool with new and up-to-date standards and criteria

that can be used as a tool to protect natural resource areas and provide incentives for developers such as an increase in the permitted density.

## Subdivision Regulations

### 1. Road Reductions on Hillside

Allow an opportunity in the subdivision regulations to reduce the required minimum road width in hillside or sloped areas to reduce the amount of impervious surface and land clearing necessary for the construction of streets. This will require coordination and discussion with other partners such as Chattanooga Department of Transportation (CDOT) and the Fire Marshall's Office.



Example of Road Reductions on a Hillside Road from Knoxville, TN

### 2. Critical Lot

Lots that contain steep slopes, soil conditions/high erodibility, and floodplains should be identified on the subdivision plat as a critical lot and should be evaluated by a geotechnical engineer/report as to the feasibility of construction and methods of construction that will address the stabilization and stormwater run-off associated with a critical lot.



### 3. Slope Map

Staff is recommending that slope maps be provided by applicants during permit review showing the delineation of existing slope categories. Included on the slope map is the approximate location of all proposed areas of excavation and fill for proposed roads. Slope maps are available through a free website from Hamilton County GIS.

### 4. Site Assessment Map

Staff is recommending a site assessment map be provided by applicants during permit review that shows the approximate location and indication of size and condition of all natural hazards and sensitive environmental features found within the boundaries of the proposed subdivision. Such items include sinkholes, soil classifications, springs, wetlands, bluffs, streams, etc.

### 5. Conservation Based Design Subdivision Standards

A conservation subdivision is a residential subdivision that devotes at least half of its potentially buildable area to undivided, permanently protected open space. Typically, regulations for these types of subdivisions allow deviations from zoning and subdivision standards that specify lot sizes, setbacks, frontages, and street widths. These regulations generally allow developers to create the same number of buildable lots as conventional subdivision.

Establish regulations that require a certain percentage of the area to be permanently protected as open space. In return the developer is provided with flexibility in required minimum lot size, setbacks, lot frontage, and street widths. Density bonuses could also be part of the requirements for conservation based design subdivisions.



Example of a Conservation Subdivision from Knoxville, TN

### 6. R-1 Open Space Option

The R-1 Open Space Subdivision Design Option was adopted by City Council in 1995 and has rarely been utilized. This tool should be evaluated to determine why it is not being used and if possible amendments are required. This option may need to be removed from the Zoning Ordinance as this is not a zoning classification; it is a subdivision design option that provides alternative design standards for development of single-family residential subdivisions.

#### Municipal Code

Based on the Gap Analysis, it appears there may need to be amendments to Section 31, Article VIII- Stormwater Management to address the public's concerns. The RPA is not an expert in engineering and stormwater management so staff is suggesting that the City Land Development Office, Public Works, and Engineering Departments examine their policies and development standard regulations to address the public concerns. Some options are identified below:

### **1. Landscaping and Material Facing of Retaining Walls**

Explore options of requiring landscaping or material facing for landscape retaining walls of a certain size.

### **2. Timing of Retaining Wall Construction**

Require prior to obtaining a land disturbing permit, drawings for retaining walls equal to or greater than 4 feet in height must be approved. Also, explore a requirement that retaining walls should be constructed on-site prior to the start of building/structure construction.

### **3. Limit Amount of Disturbance at Any One Time**

Explore options of limiting the amount of clearing, grading, or disturbance permitted at any one time on a site. For example, a maximum of 10 acres of clearing, grading, and disturbance should be permitted only with the 10 acre being stabilized and revegetated prior to applying for additional clearing, grading, or disturbance for other areas on the same development site.

### **4. Timing of Land Disturbing Permit and Start of Construction**

Explore options of requiring that the start or beginning of building construction be noted on the application for a land disturbing permit, and the start of building construction to begin within so many days after permanent clearing, grading, and disturbance has ended.

### **5. Security Bond for Revegetation/Stabilization**

Explore options of requiring a security bond or letter of credit for site of a certain size to provide the city with a security bond or a letter of credit for required revegetation and stabilization of sites.

### **6. Site Plan Review or Geo-Technical Report for Critical Lots**

Explore option of requiring detailed site plans for lots identified as critical lots. A critical lot would be a lot with slopes, floodplains, and high soil erodibility. Additional measures should be required by applicants such as a geotechnical engineer/report as to the feasibility

of construction and methods of construction that will address the stabilization and stormwater run-off associated with a critical lot.

### **7. Critical Lots**

Require lots with slopes, floodplains, or high erodibility potential to submit a geo-technical report and site plan by a licensed professional engineer that demonstrates the construction techniques proposed adequately mitigate any potential hazard identified by the report.

### **8. Soil Erosion Modeling**

Require applicants to submit RUSLE soil erosion loss calculations for construction sites prior to receiving a land disturbing permit. The Revised Universal Soil Loss Equation (RUSLE) is the most widely applied model in the U.S. The RUSLE model measures variables such as annual soil loss due, rainfall impact, soil erodibility, and topography derived from slope length and slope gradient in order to understand soil loss rates and erosion. Understanding soil types and erodibility can help the City staff to estimate annual soil loss to water erosion and understand how the construction phase of land development impacts water quality. At the time of writing this Assessment, the Land Development Office is considering amending their 2017 enforcement policy to require applicants to submit RUSLE calculations with permit applications.

### **9. Stormwater Requirements**

Consider including additional peak flow stormwater requirements and stormwater detention for steep sites during post-construction 2, 5, 10, and 25-year storm events. Peak flow rates for disturbed, unvegetated conditions must also be considered by the design engineer, with the greater flowrate of the two conditions (disturbed or post-developed) governing.

## **SECTION 11: IMPLEMENTATION AND ACTION STEPS**

This section identifies how to implement the proposed Ordinance, essentially becoming a “to-do” list with the next steps and proposed timeline for the City Council and Regional Planning Agency.

### **Action Step 1. Draft Ordinance – Dec. 2019**

If the City Council instructs staff to move forward with a Natural Resource Protection Ordinance, staff will begin drafting the ordinance using the information from the Assessment as a guide.

### **Action Step 2. Draft Ordinance Review by Stakeholders – Jan. 2020**

Once the draft Ordinance has been developed, staff will share the draft with various stakeholders including other city staff, Advisory and Technical Committees, development and real estate groups, and the public.

### **Action Step 3. Public Input – Feb. 2020**

Staff will conduct a public input period where the various stakeholders and public will have an opportunity to comment on the draft Ordinance. Staff envisions there being a series of public meetings, online survey, newspaper and social media advertisements and email/mail letters to various community groups such as homeowner/neighborhood associations and frequent zoning case applicants.

### **Action Step 4. Planning Commission Review – Feb. 2020**

After staff has received public comment and revised the draft Ordinance based on those comments, the Ordinance will be presented to the Planning Commission for their input. The public will be invited to attend this meeting for another opportunity to provide comments.

### **Action Step 5. City Council Planning and Zoning Review – March 2020**

After Planning Commission, staff will present the proposed Ordinance to the City Council Planning and Zoning Committee for their input.

### **Action Step 6. City Council Adoption – March 2020**

Once staff receives comments from the City Planning and Zoning Committee, the final Ordinance will be presented to City Council at a regularly scheduled meeting for final adoption.

### **Action Step 7. Training with City Staff and Public/Grace Period of Enforcement of New Regulations – June 2020 – Sept 2020**

Once the Ordinance gets adopted, staff will work with the City staff to train them on how to use the new zoning tools. Similarly, staff will host a series of workshops with stakeholders such as developers, architects, and the public to instruct them on how to use the new ordinance ensuring they are familiar with the new requirements. Staff would recommend a 6 month grace period after Ordinance adoption where certain new permits/developments may not be subject to all the new Ordinance regulations until the training with City staff and the Public has occurred.

### **Action Step 8. Final Implementation and Enforcement of New Regulations – Sept. 2020**

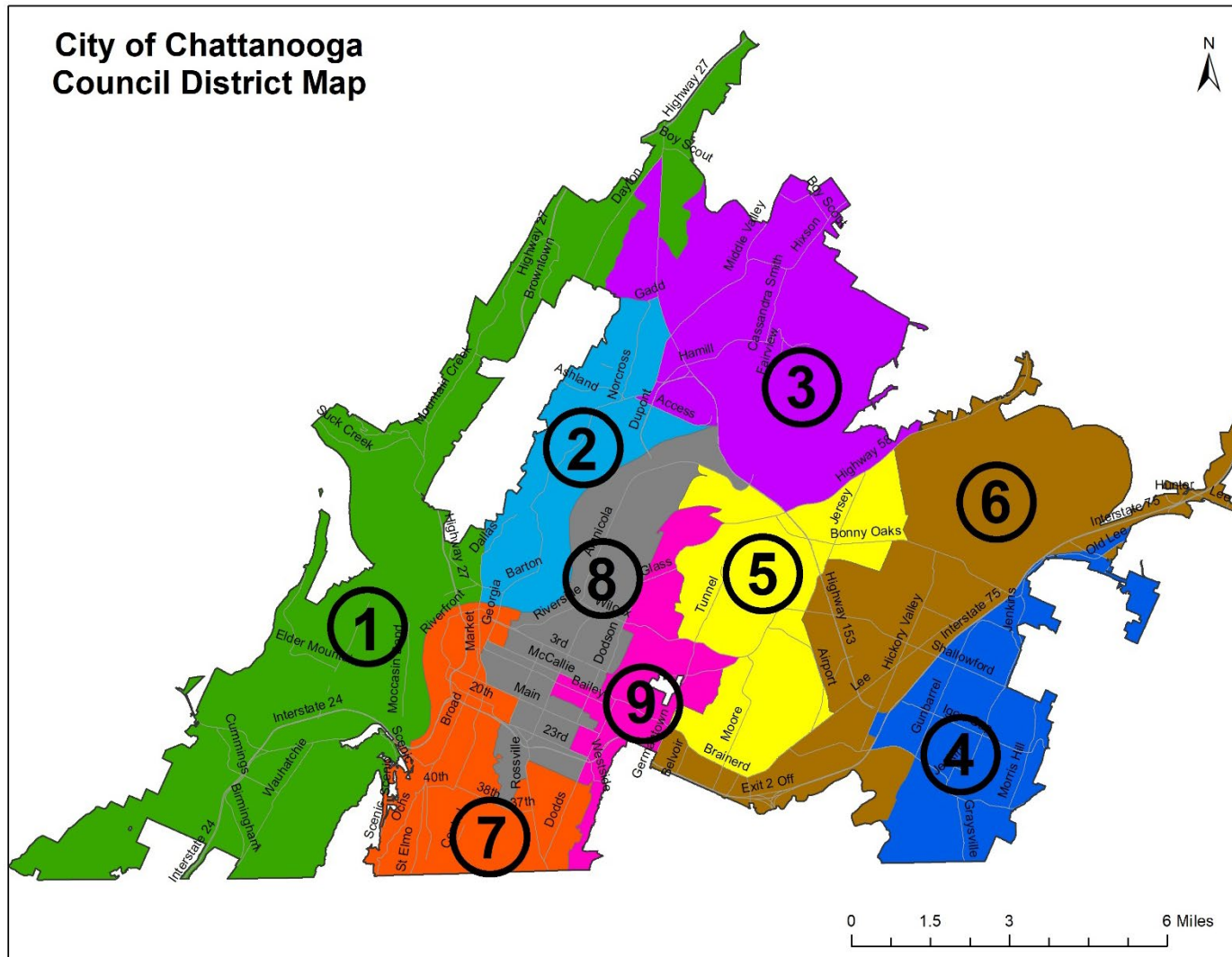
After the grace period has expired, any new developments/permits will then be subject to complying with the new Ordinance regulations and will be subject to any enforcement procedures when not in compliance with the regulations.

### **Action Step 9. 1 Year Review – June 2021**

Similar to the Form Based Code, staff recommends that the RPA conduct a one year review of the new regulations to ensure they are working appropriately and identify any regulations that may need to be revised, removed, or added to the existing Ordinance.

## APPENDIX A - CITY COUNCIL DATA

The following map shows the boundaries for each City Council District.

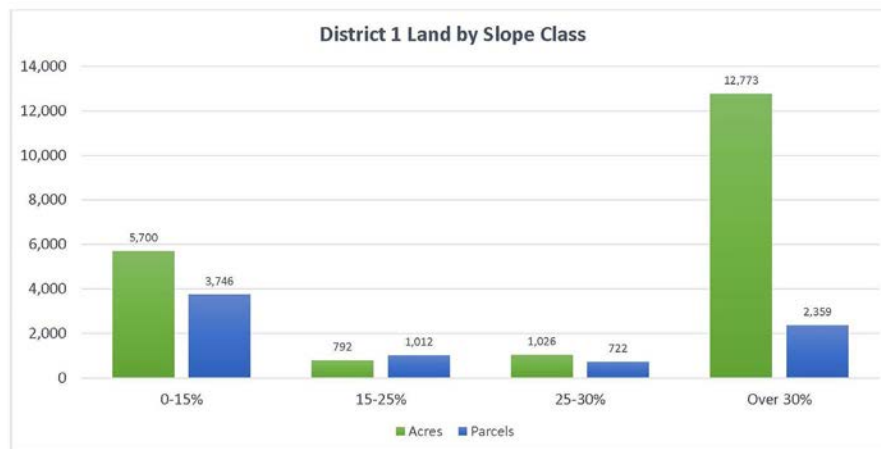




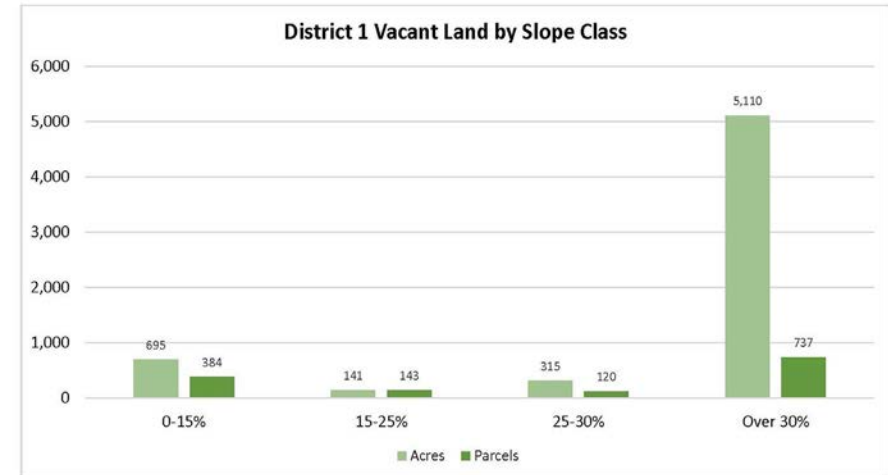
## A. Council District 1 - Data Analysis

- ❑ Representative: Chip Henderson
- ❑ Location: District 1 consists of the following precincts:
  - Hixson 1
  - Lookout Valley 1
  - Moccasin Bend
  - Mountain Creek 1 & 3
  - Northwoods 2

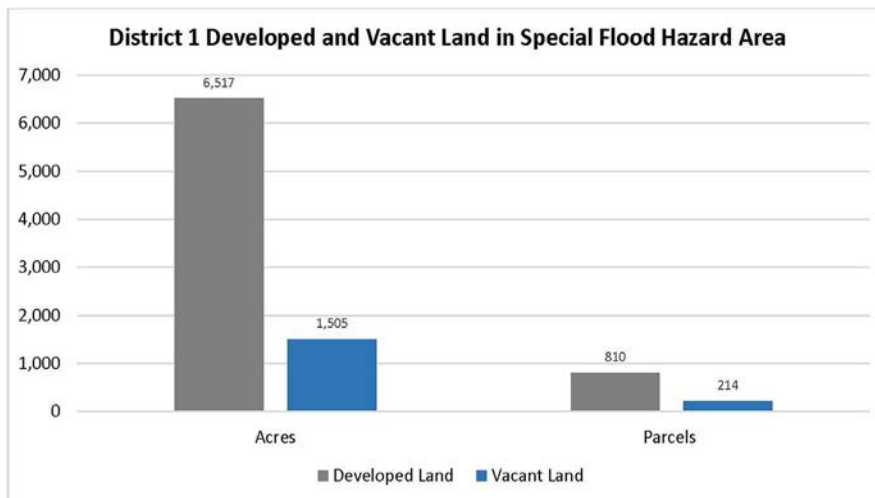
### Parcel Data



A majority of the land (63%) in Council District 1 contains slopes over 30% because this area contains mountain ridges of Raccoon Mountain, Elder Mountain and Aetna Mountain.

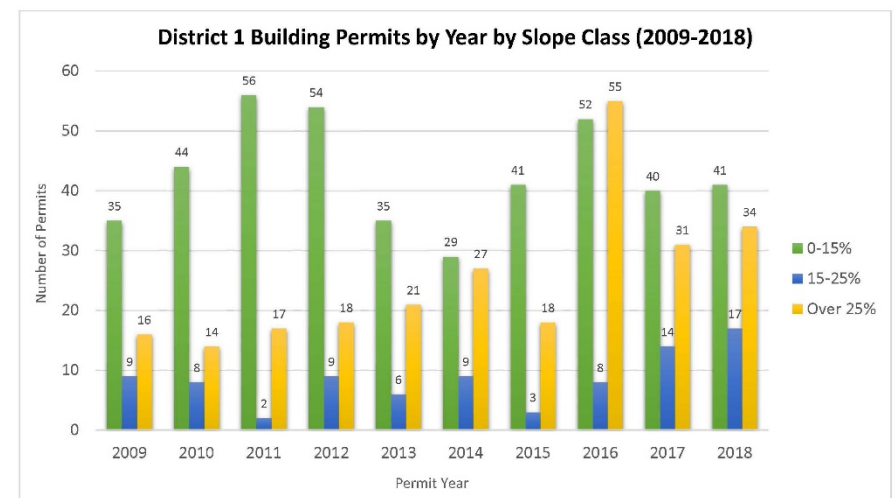
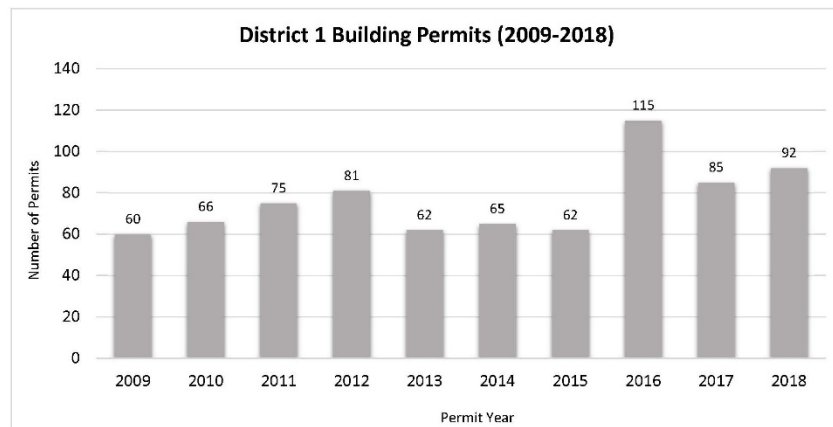


Approximately 31% of the land in Council District 1 is vacant. Of that 31%, 82% of the land is located in the over 30% slope class. This is likely because parcels of land on the mountains listed above are not developed. Some of the parcels are protected from development, but those parcels were excluded from this analysis.

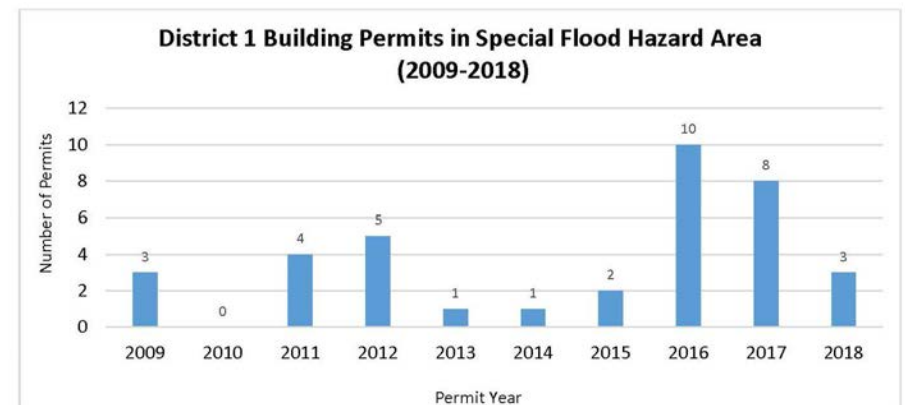


A majority of the land (81%) in the Special Flood Hazard Area has already been developed.

#### Building Permit Data

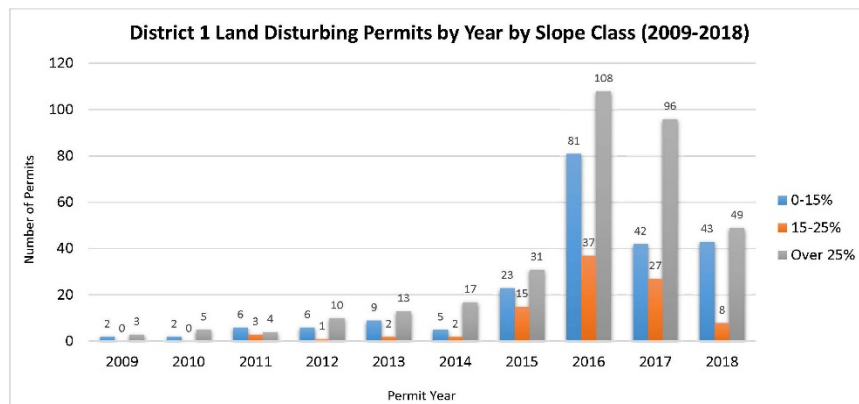
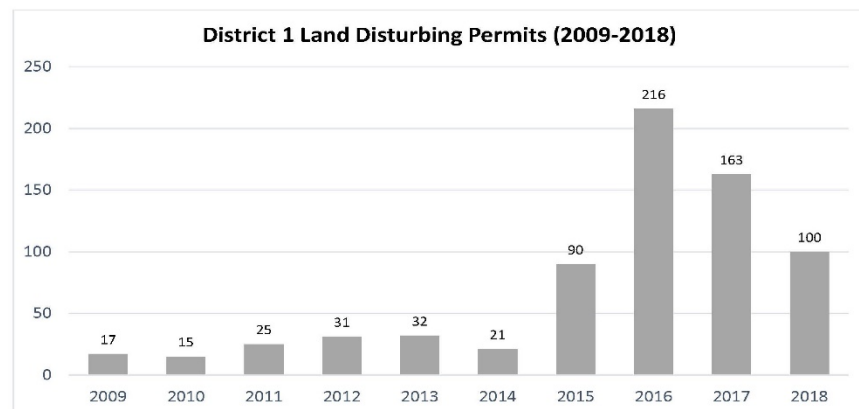


The building permits in the 0-15% slope class remained relatively consistent throughout the 10-year time period with an average of 43 permits issued. The building permits in the over 25% slope class increased by 53% from 2009 to 2018 with an average of 25 permits.

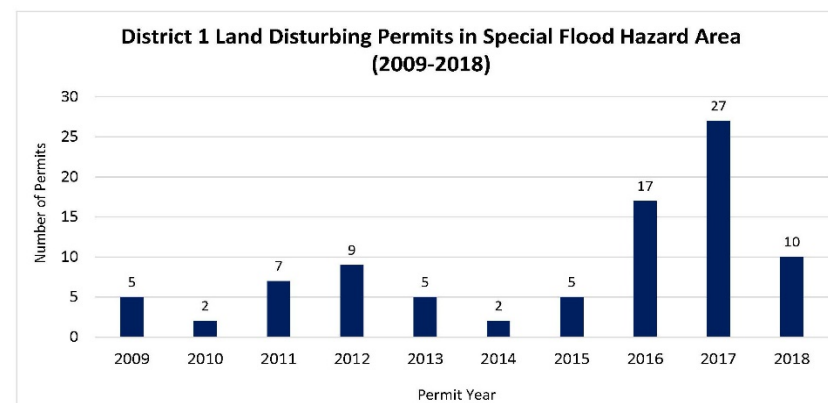


Building permits in the Special Flood Hazard Area increased by 70% from 2009 to 2016. The average number of permits in the SFHA is 4

## Land Disturbing Permit Data

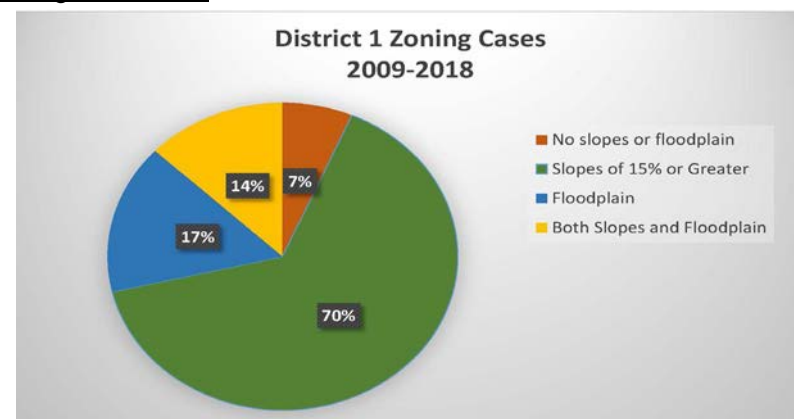


Land disturbing permits in the 0-15% slope class increased by 95% from 2009 to 2018 with an average of 22 permits. Similarly, permits in the over 25% slope class increased by 94% from 2009 to 2018 with an average of 34 permits.



Land disturbing permits in the Special Flood Hazard Area increased by 50% from 2009 to 2018 with an average of 9 permits.

## Zoning Case Data

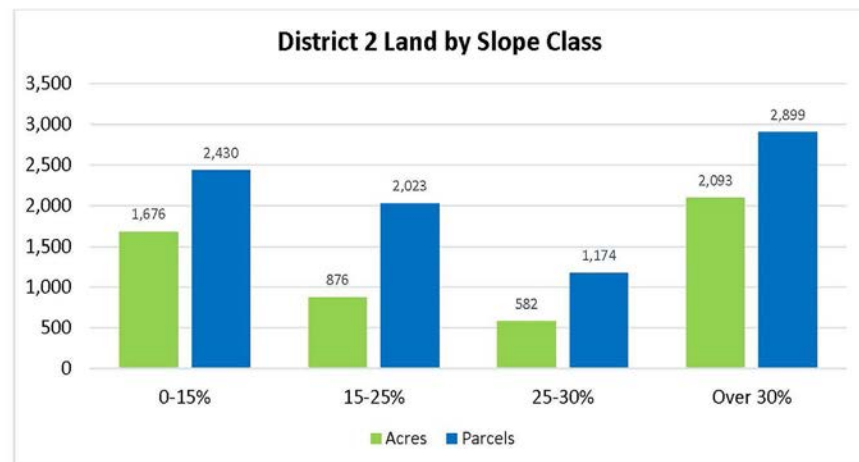


Due to the topography and the Tennessee River in District 1, 70% of the zoning cases are located in areas with slopes of 15% or greater and 17% located in the floodplain, leaving only 7% of cases located outside these areas.

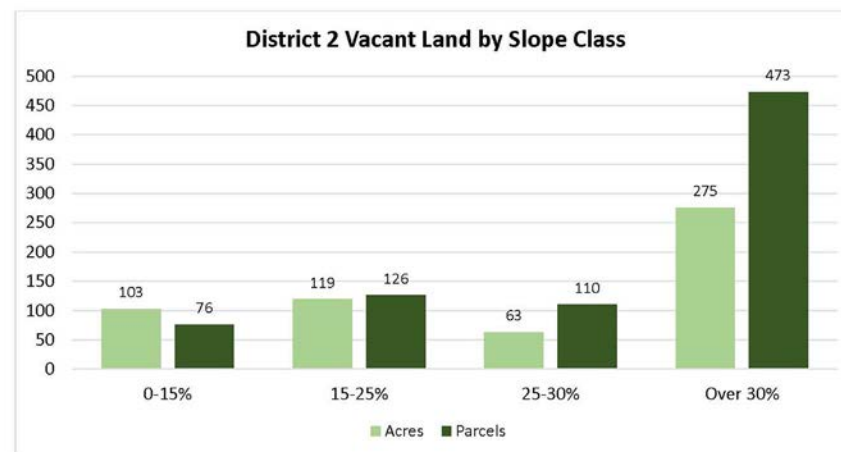
## B. Council District 2

- ❑ Representative: Jerry Mitchell
- ❑ Location: District 2 consists of the following precincts:
  - Lupton City
  - North Chattanooga 1 & 2
  - Northgate 1 & 2
  - Riverview
  - Stuart Heights

### Parcel Data

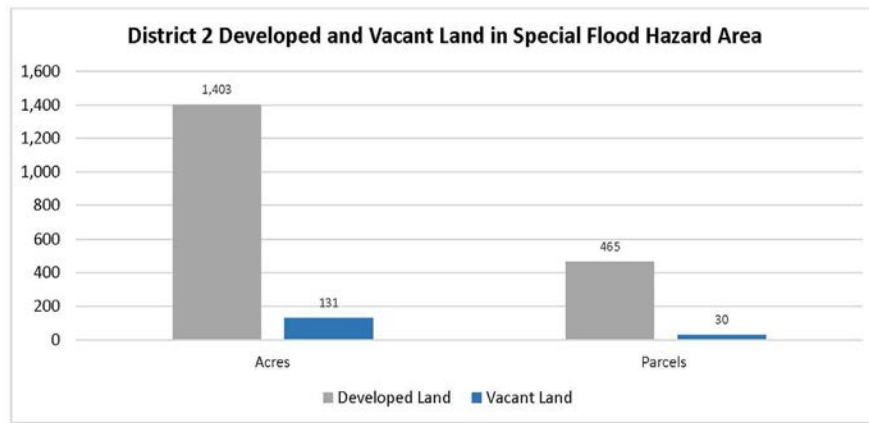


A majority of the land in Council District 2 contains slopes greater than 15% (68%) and 40% are located in the over 30% slope class.



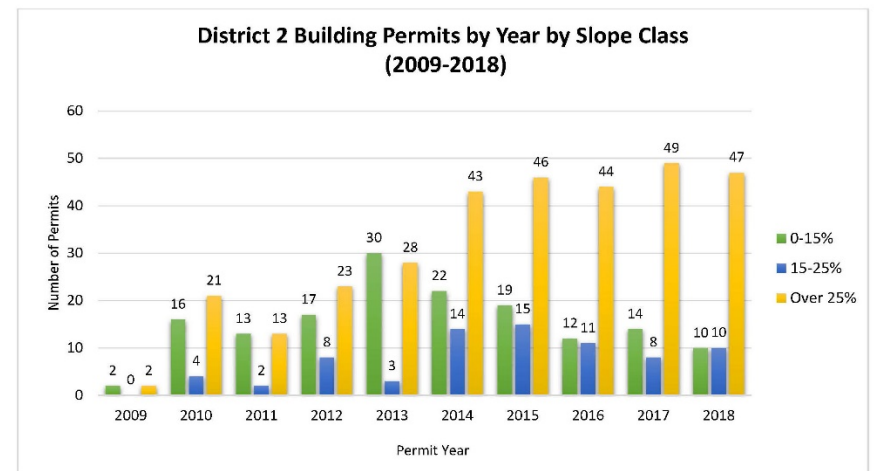
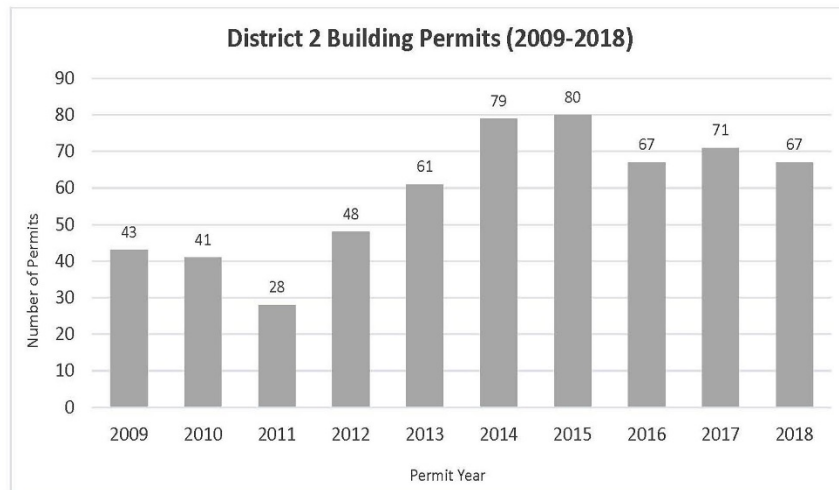
Approximately 11% of the land in Council District 2 is vacant. Of that 10%, 60% is located in the over 30% slope class. The number of parcels exceed the acreage of land likely because there are many vacant lots of record scattered throughout the district.



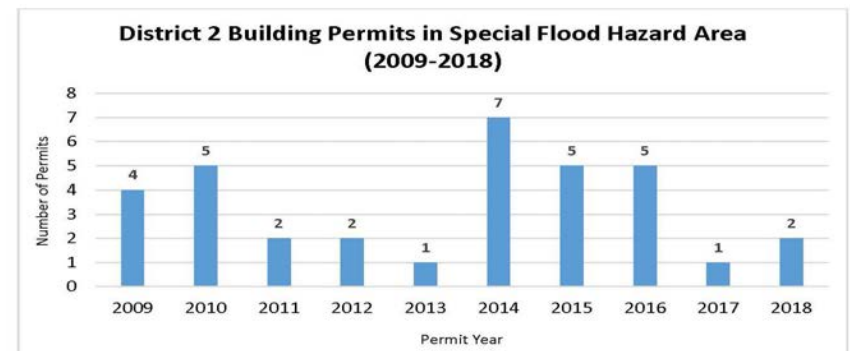


A majority of the land (75%) in the Special Flood Hazard Area has already been developed.

#### Building Permit Data

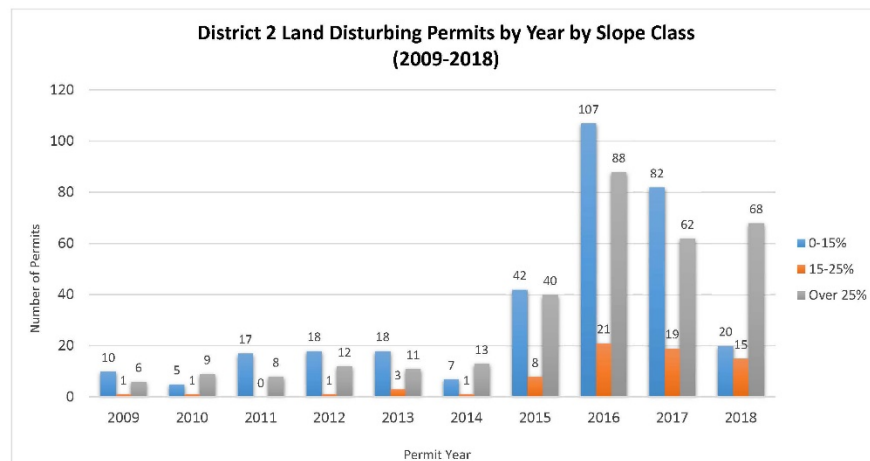
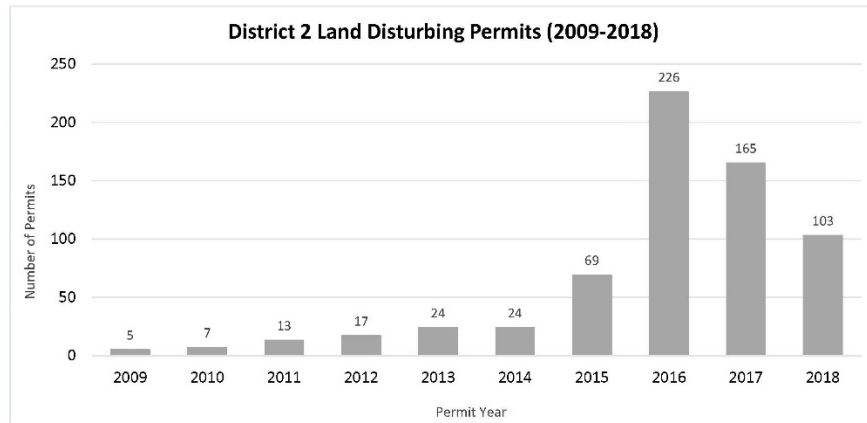


The building permits in the 0-15% slope class increased by 93% from 2009 to 2013 and then decreased by 66% from 2013 to 2018, with an average of 16 permits. The permits in the 15-25% slope class increased by 100% throughout the 10-year period with an average of 8 permits. The permits in the over 25% slope class increased by 96% throughout the 10-year period with an average of 32 permits.

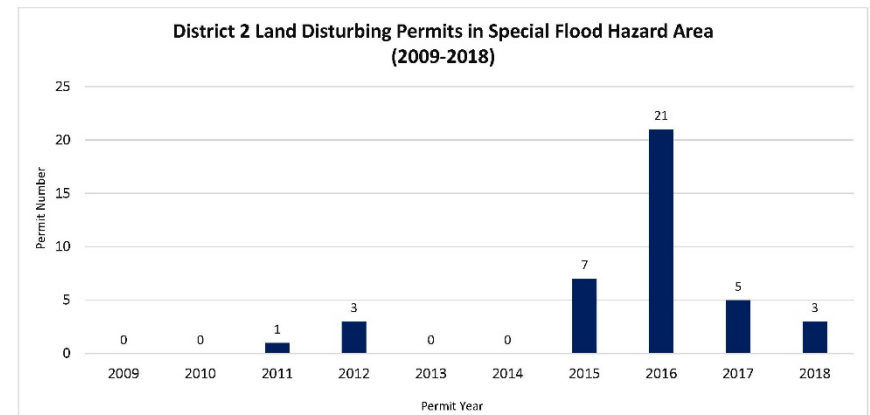


Building permits in the Special Flood Hazard Area remained relatively constant throughout the 10 year period. The average number of permits in the SFHA is 3

## Land Disturbing Permit Data

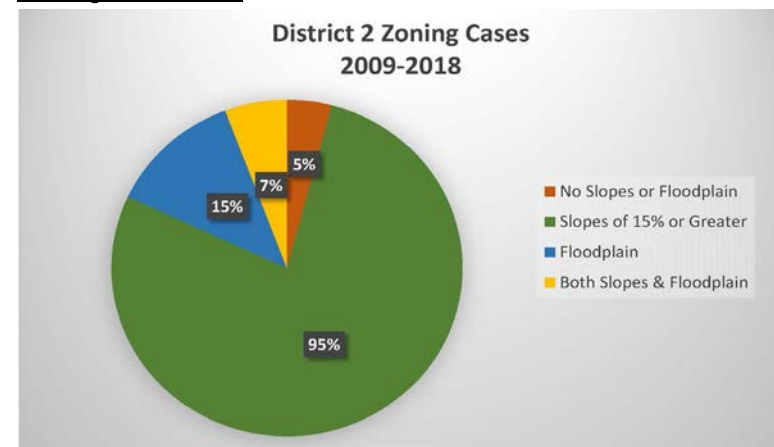


Land disturbing permits in the 0-15% slope class increased by 50% from 2009 to 2018 with an average of 33. The permits in the 15-25% slope class increased by 93% during the 10-year period with an average of 7 permits. The permits in the over 25% slope class increased by 92% with an average of 32 permits.



Land disturbing permits in the Special Flood Hazard Area increased by 100% from 2009 to 2018 with an average of 4 permits.

## Zoning Case Data

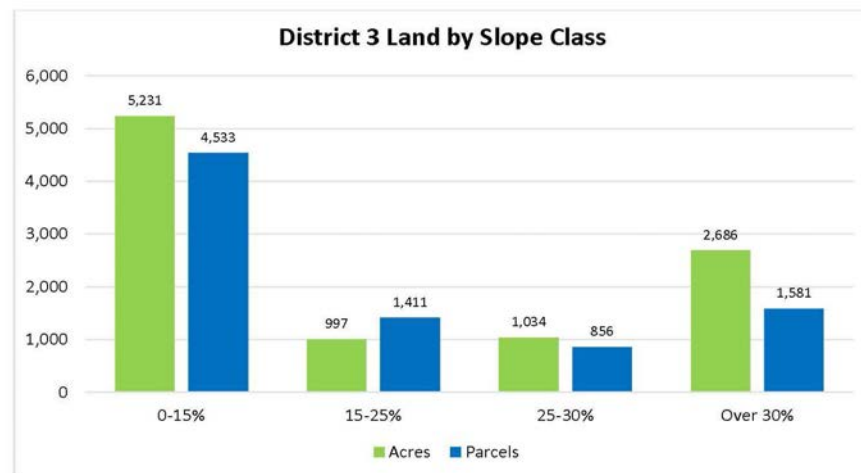


Due to the topography and riparian areas of the Tennessee River in District 2, 95% of the zoning cases are located in areas with slopes of 15% or greater and 15% located in the floodplain leaving only 5% of zoning cases located outside these areas.

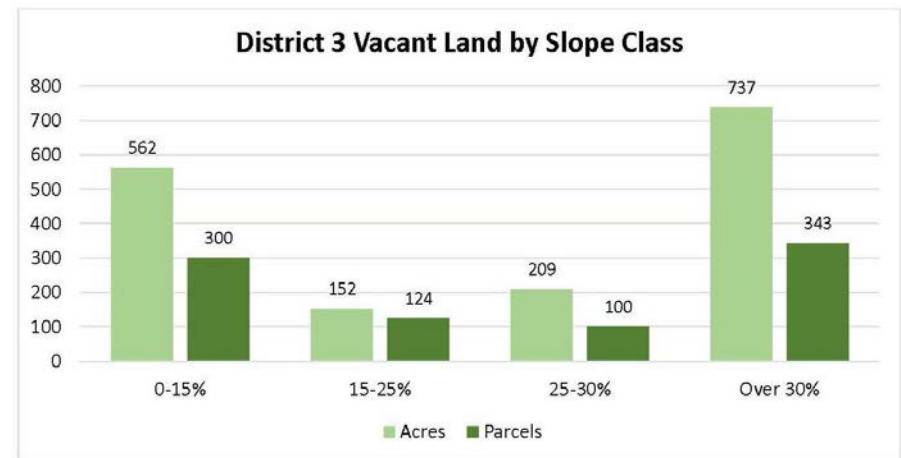
### C. Council District 3

- ☐ Representative: Ken Smith
- ☐ Location: District 3 consists of the following precincts:
  - Dupont
  - Hixson 2 & 3
  - Murray Hills 1 & 2
  - Northwoods 1

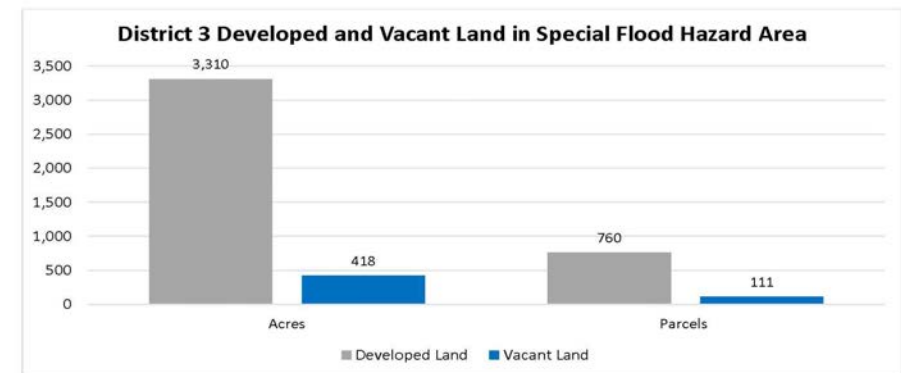
#### Parcel Data



Approximately half of the land in Council District 3 is located in the 0-15% slope class (53%) and 47% of the land contains slopes of 15% or greater. The over 30% slope class contains 27% of the land likely because of the topography of Big Ridge.

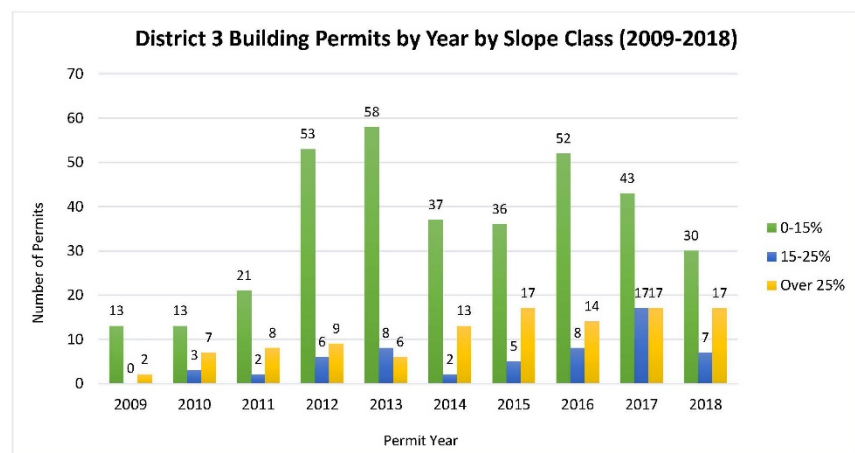
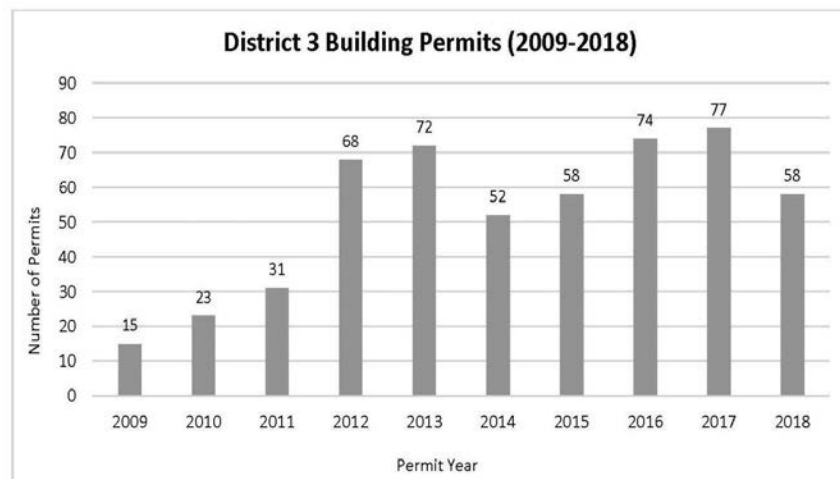


Approximately 17% of the land in Council District 3 is vacant. Of that 17%, 66% of the land is located in slopes of 15% or greater and 44% of the vacant land is in the over 30% slope class. There are many large parcels of vacant land in the over 30% slope range located in the Big Ridge area.

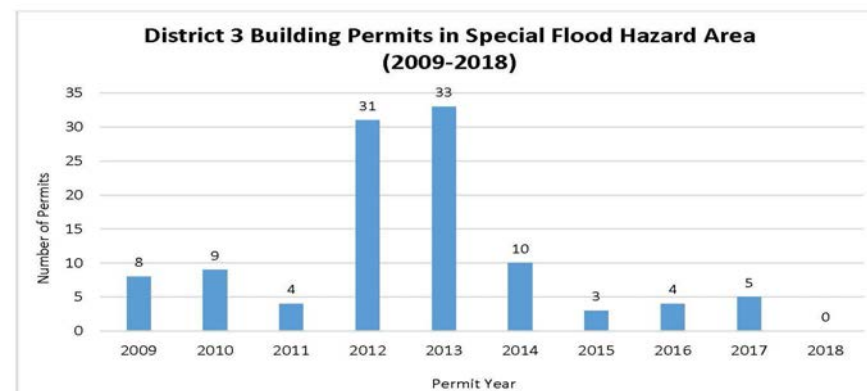


A majority of the land (89%) in the Special Flood Hazard Area has already been developed.

## Building Permit Data

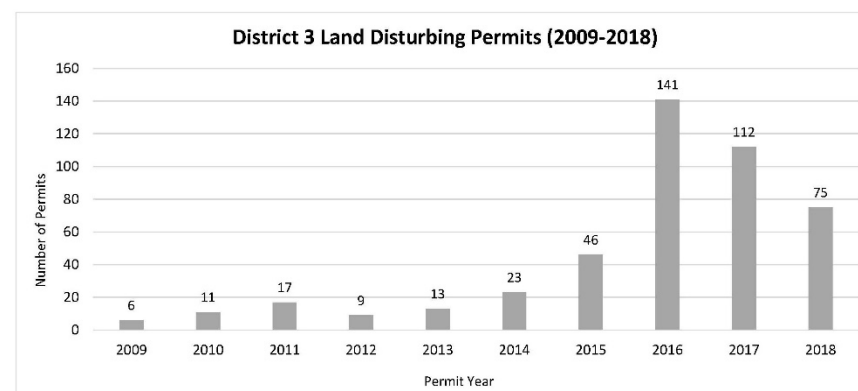


The majority of the building permits issued throughout the 2009 to 2018 period have been issued in the 0-15% slope class (67%) with an average 36 permits. The building permits in the over 25% slope class increased by 88% from 2009 to 2018 with an average of 11 permits.

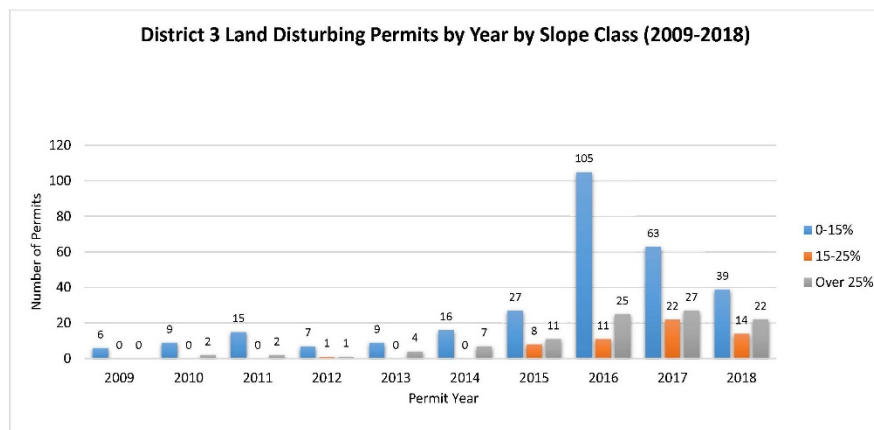


Building permits in the Special Flood Hazard Area remained relatively constant except for a spike in 2012 and 2013. The average number of permits in the SFHA is 11.

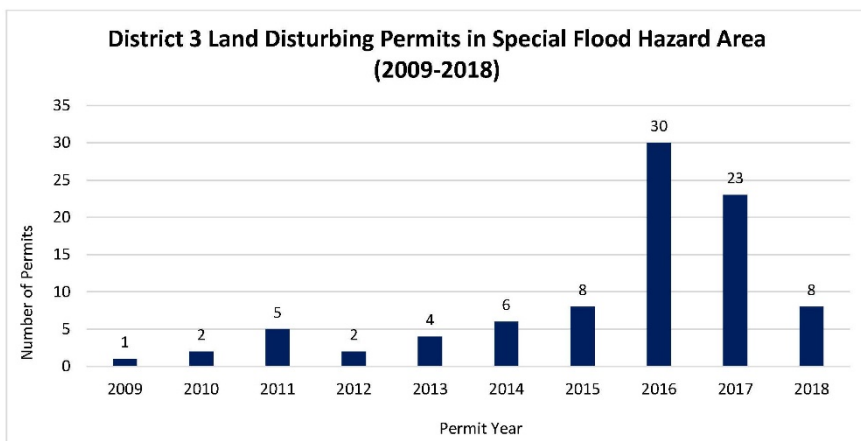
## Land Disturbing Permit Data





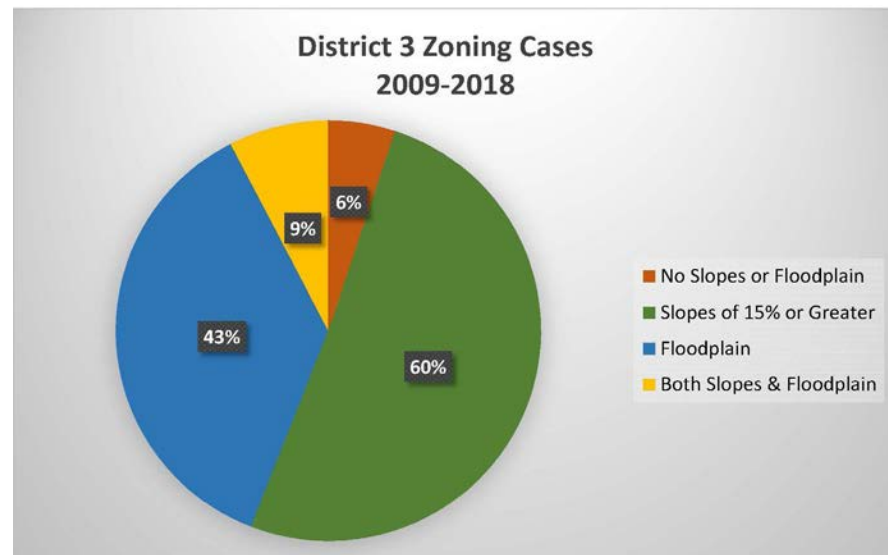


Land disturbing permits increased by 87% from 2009 to 2018 in the 0-15% slope class with an average of 30 permits. Permits in the over 25% slope class increased by 100% from 2009 to 2018 with an average of 10 permits.



Land disturbing permits in the Special Flood Hazard Area increased by 88% from 2009 to 2018 with an average of 9 permits.

## Zoning Case Data

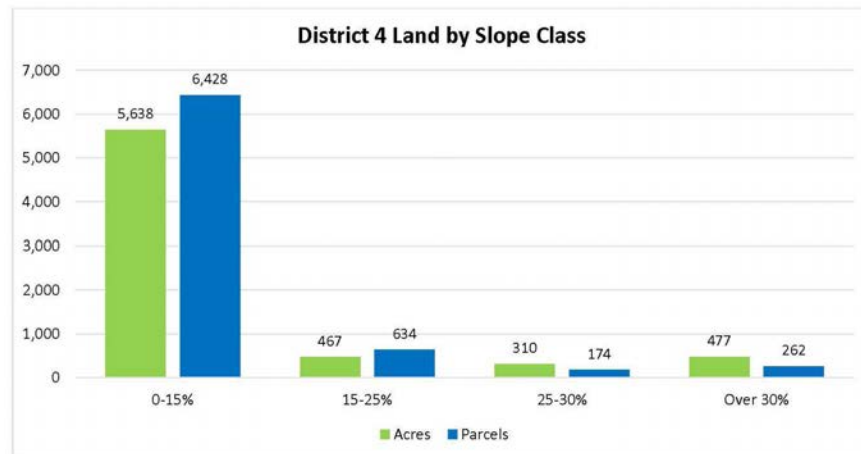


Due to Chickamauga Lake and topography of Big Ridge, 60% of the zoning cases are located in areas with slopes of 15% or greater and 43% located in the floodplain leaving only 6% of zoning cases located outside these areas.

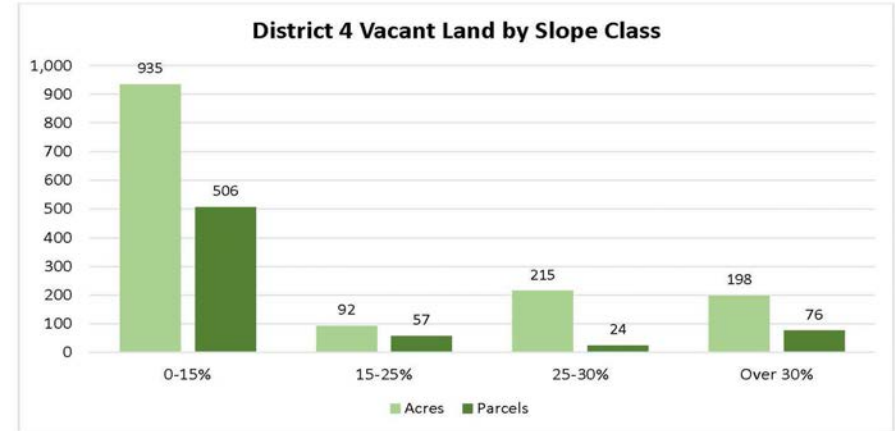
## D. Council District 4

- Representative: Darrin Ledford
- Location: District 4 consists of the following precincts:
  - Concord 2, 4, 5
  - East Brainerd 1 & 2
  - Summit 4

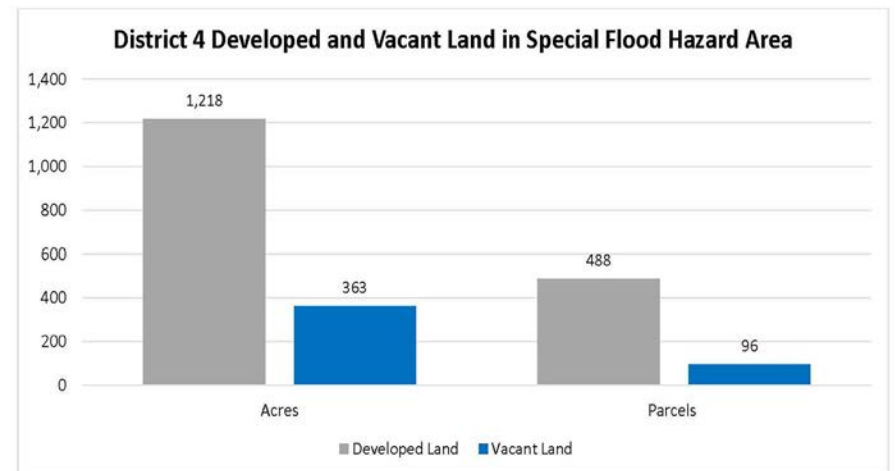
### Parcel Data



A majority of the land (82%) in Council District 4 is located in the 0-15% slope class.

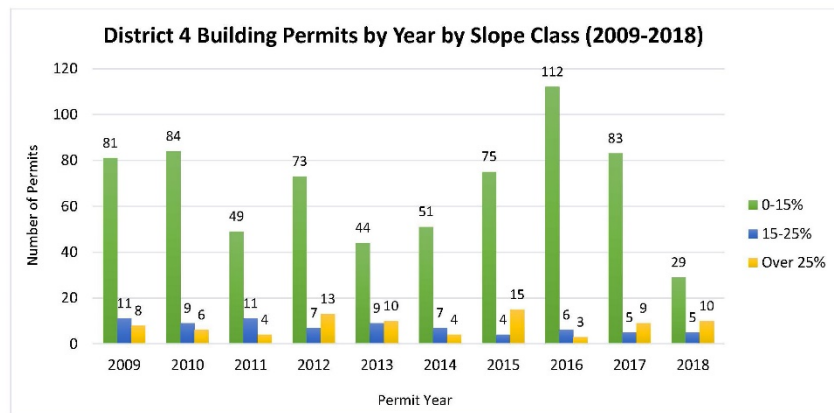
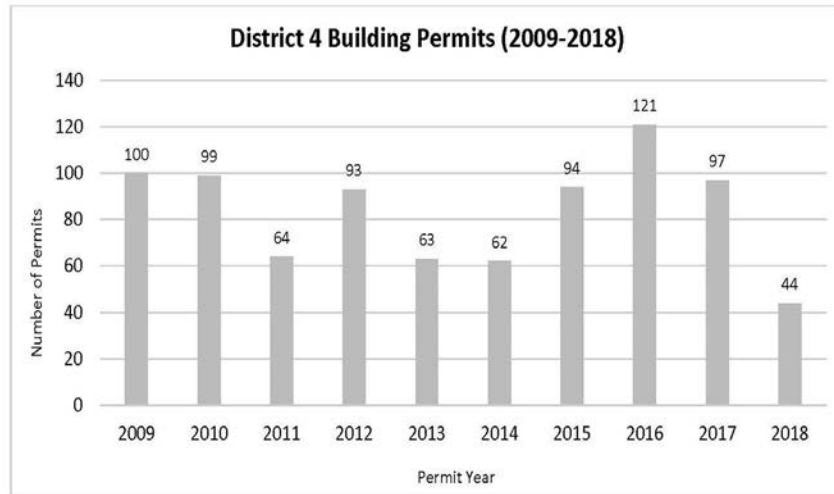


A majority of the land in Council District 4 is developed with only 17% of vacant land. Of that 17%, 65% of the vacant land is located in the 0-15% slope class. The vacant land is scattered throughout the district.

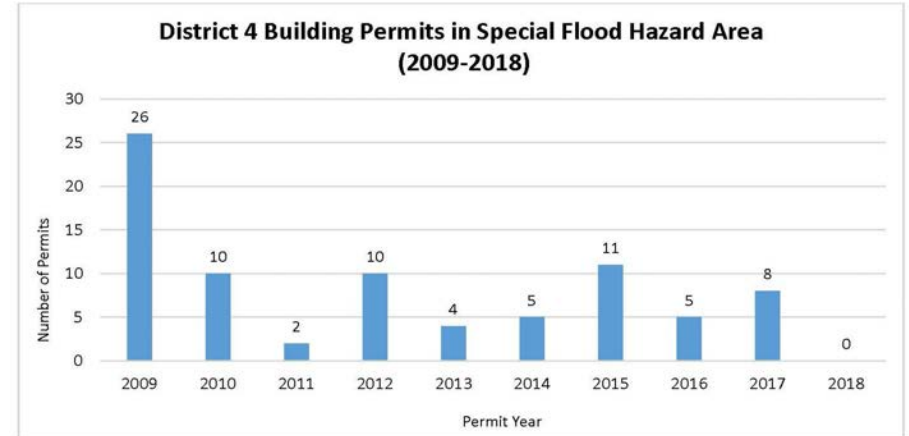


A majority of the land (77%) in the Special Flood Hazard Area has already been developed.

## Building Permit Data

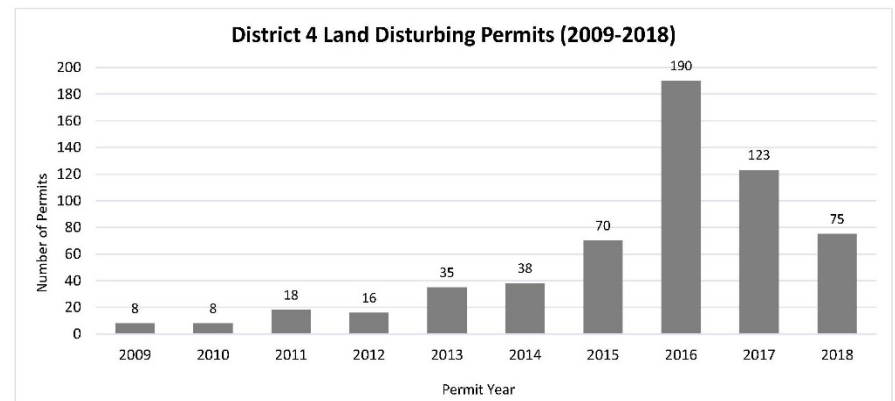


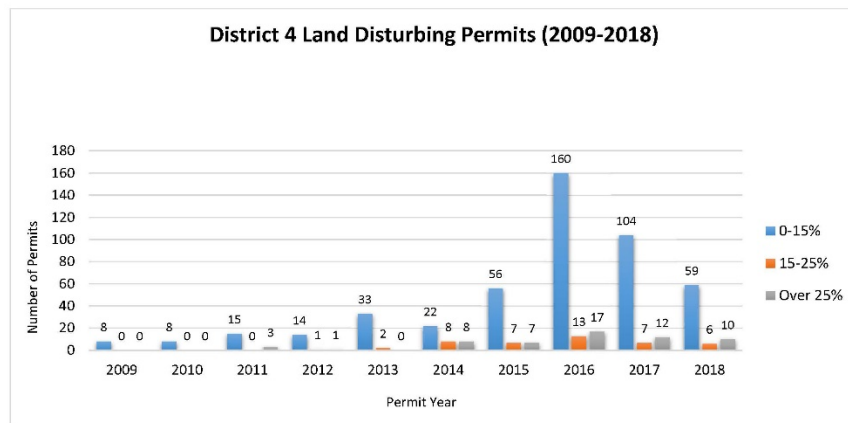
The majority of the building permits are located in the 0-15% slope class with an average of 68 permits. The building permits in the 15% or greater slope class make up only 18% of all the permits issued throughout the 10-year period.



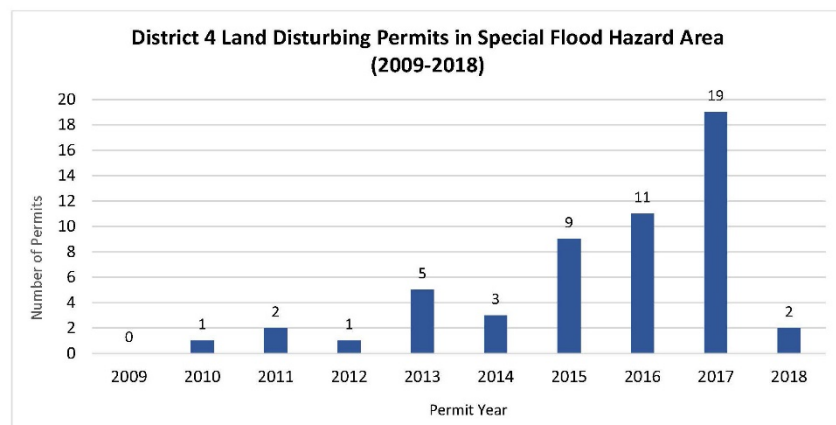
Building permits in the Special Flood Hazard Area remained decreased by 100% from 2009 to 2018. The average number of permits in the SFHA is 8.

## Land Disturbing Permit Data



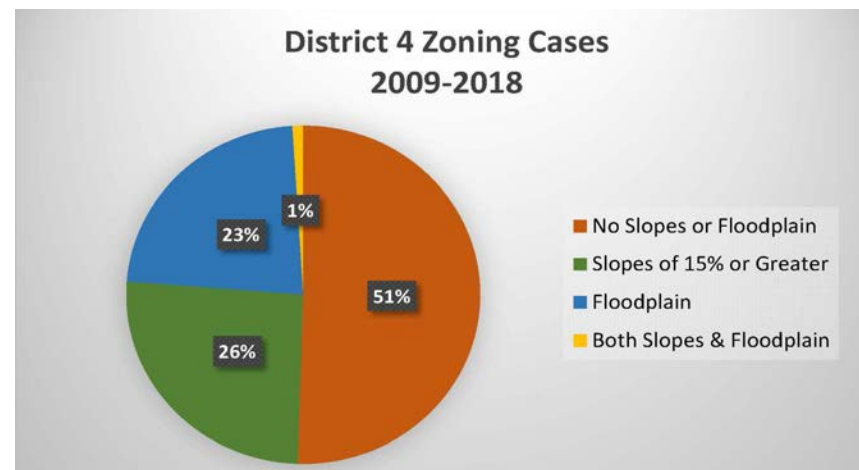


The majority of the land disturbing permits are located in the 0-15% slope class with an average of 48 permits and the permits increased by 86% from 2009 to 2018. Although the number permits in the over 25% slope class are much less than the 0-15% slope class, the permits increased by 100% from 2009 to 2018 with an average of 6 permits.



Land disturbing permits in the Special Flood Hazard Area remained relatively low during the 10-year period with an average of 5 permits.

## Zoning Case Data



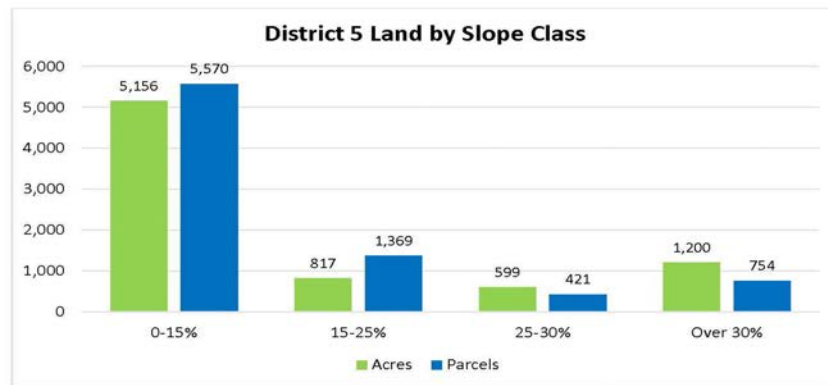
Approximately half of the zoning cases in Council District 4 are located outside the natural resource areas and half are located inside these areas.



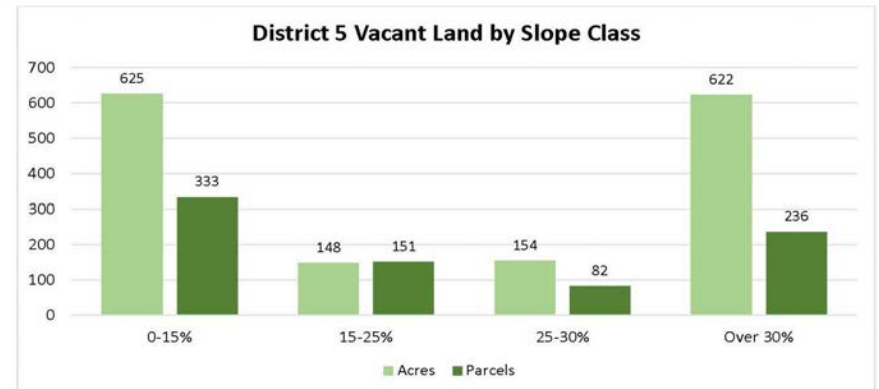
## E. Council District 5

- ☐ Representative: Russell Gilbert
- ☐ Location: District 5 consists of the following precincts:
  - Bonny Oaks
  - Dalewood
  - Eastgate 1 & 2
  - Kingspoint 1, 2 & 3
  - Lake Hills
  - Woodmore 1 & 2

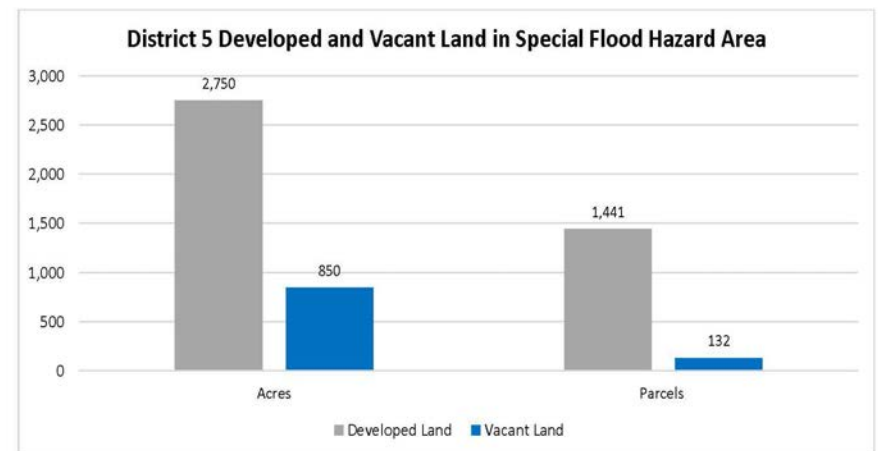
### Parcel Data



A majority of the land (66%) in Council District 5 is located in the 0-15% slope class. Council District 5 contains portions of Missionary Ridge so 15% of the land is located in the over 30% slope class.

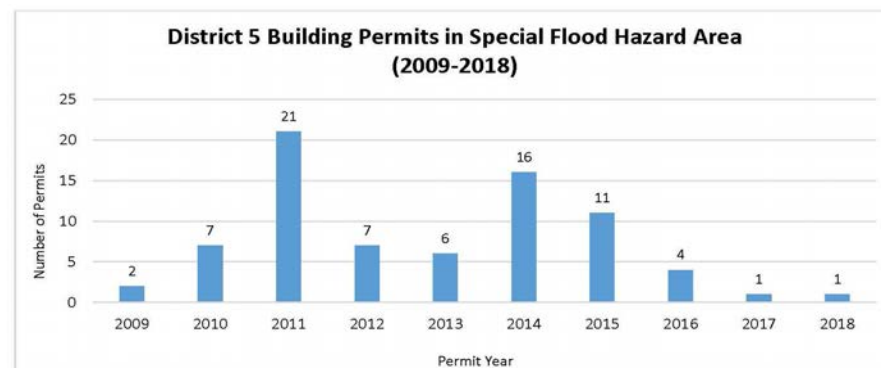
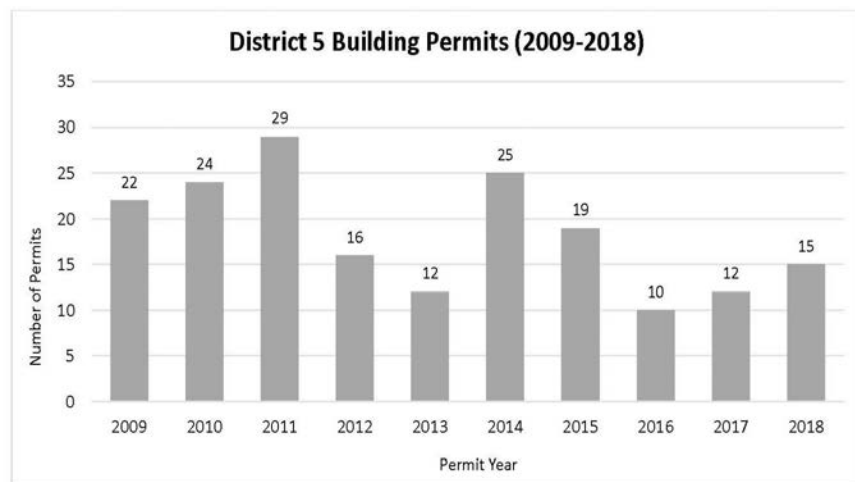


Approximately 19% of the land in Council District 5 is vacant. Of that 19%, 60% of the land is located in the slopes of 15% or greater and 40% of the vacant land is in the over 30% slope class. There are many vacant parcels in the Missionary Ridge, North Brainerd and East Chattanooga areas.



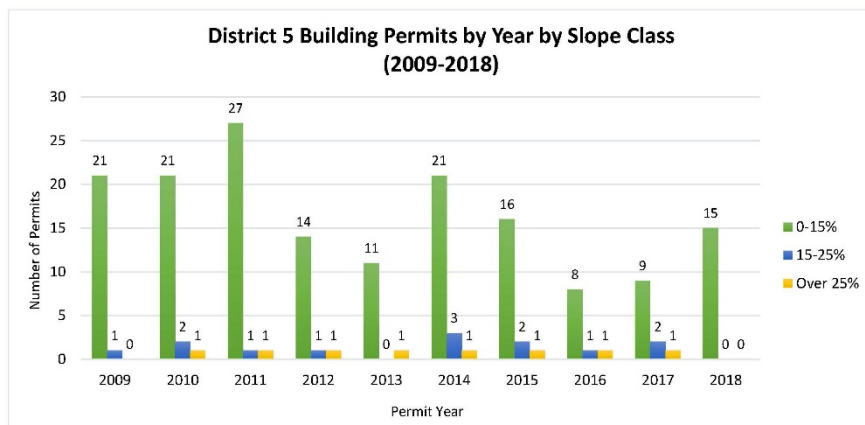
A majority of the land (76%) in the Special Flood Hazard Area has already been developed.

## Building Permit Data

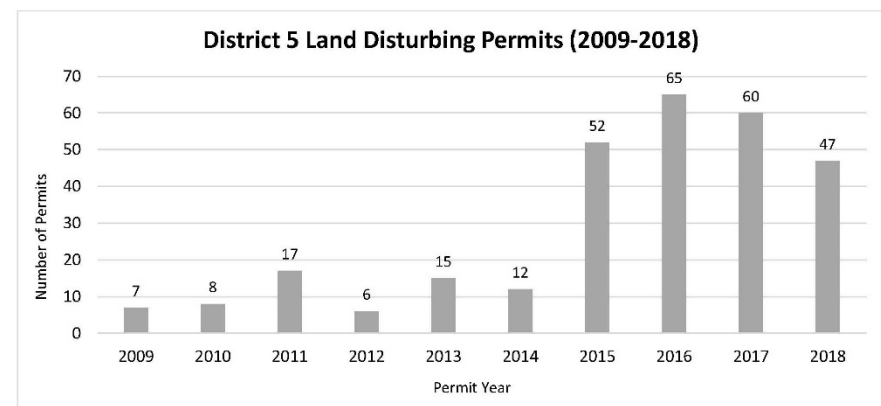


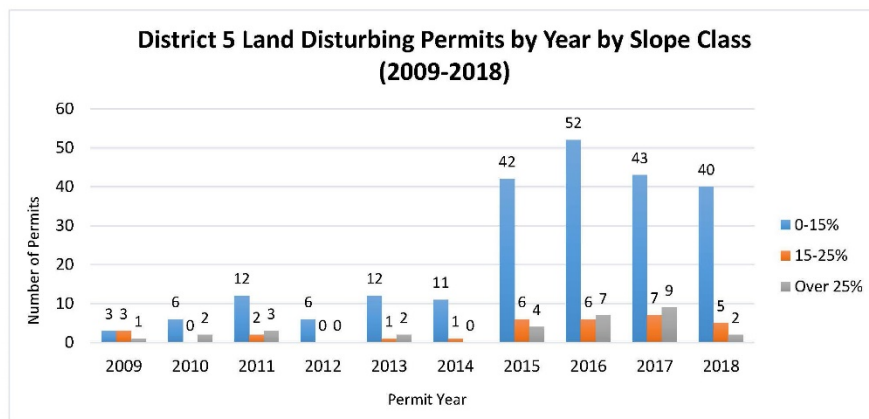
Building permits in the Special Flood Hazard Area remained relatively low with an average of 8 permits.

## Land Disturbing Permit Data

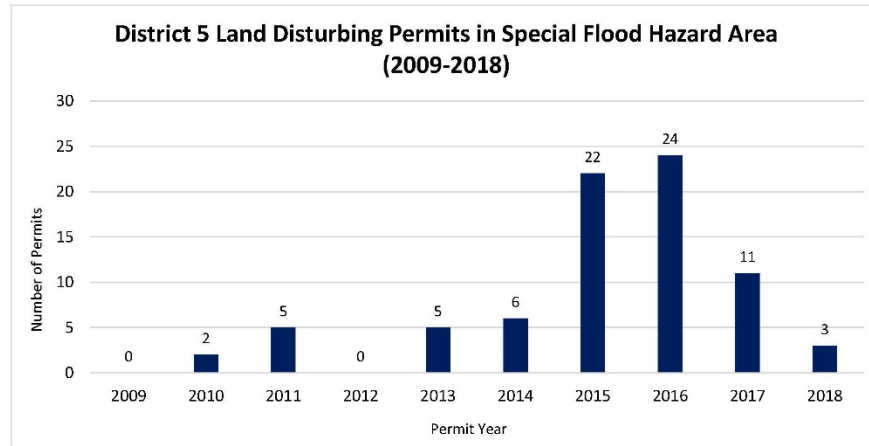


The majority of the building permits issued throughout the 2009 to 2018 period have been issued in the 0-15% slope class (74%) and remained relatively consistent. The average number of permits in the 0-15% slope class is 16.



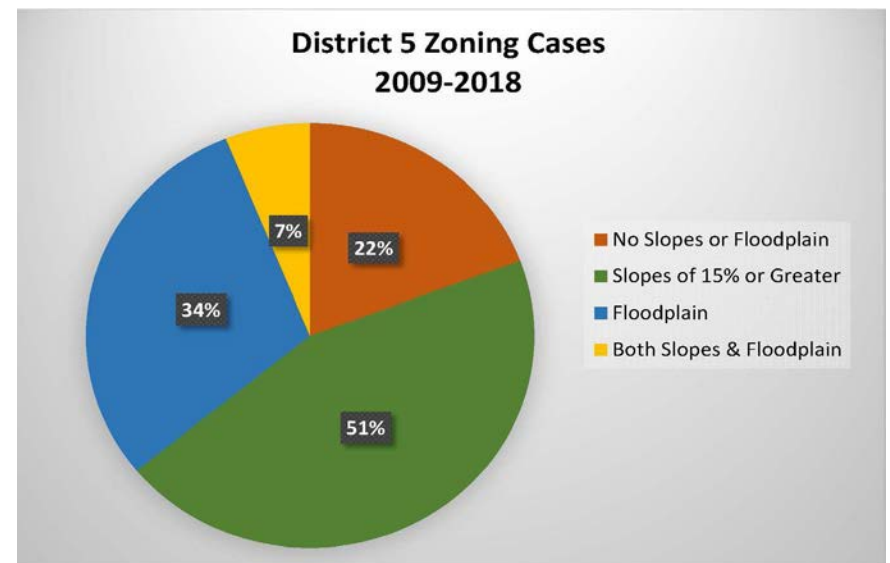


Land disturbing permits increased by 93% from 2009 to 2018 in the 0-15% slope class with an average of 23 permits. Permits in the 15-25% slope class increased by 40% during the 10-year period with an average of 3 permits.



Land disturbing permits in the Special Flood Hazard Area remained relatively low compared with an average of 8 permits.

## Zoning Case Data

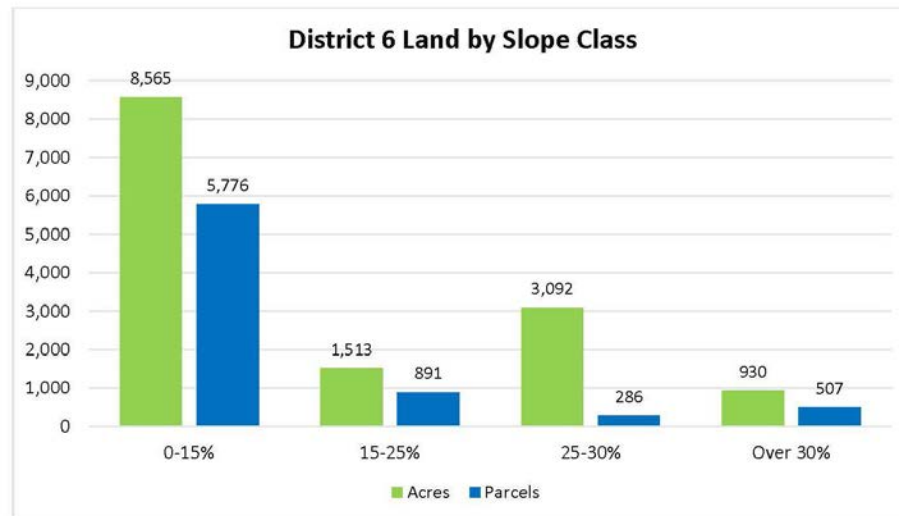


Due to South Chickamauga Creek and the topography of Missionary Ridge, 51% of the zoning cases are located in areas with slopes of 15% or greater and 34% located in the floodplain leaving only 7% of zoning cases located outside these areas.

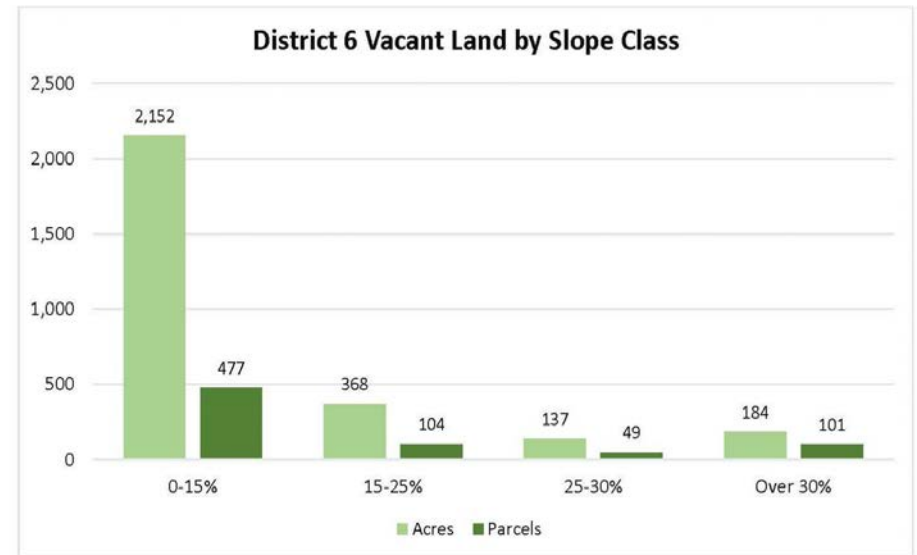
## F. Council District 6

- ❑ Representative: Carol B. Berz
- ❑ Location: District 6 consists of the following precincts:
  - Airport
  - Brainerd
  - Brainerd Hills
  - Concord 1, 3 & 6
  - Ooltewah 3
  - Summit 1
  - Tyner 1 & 2

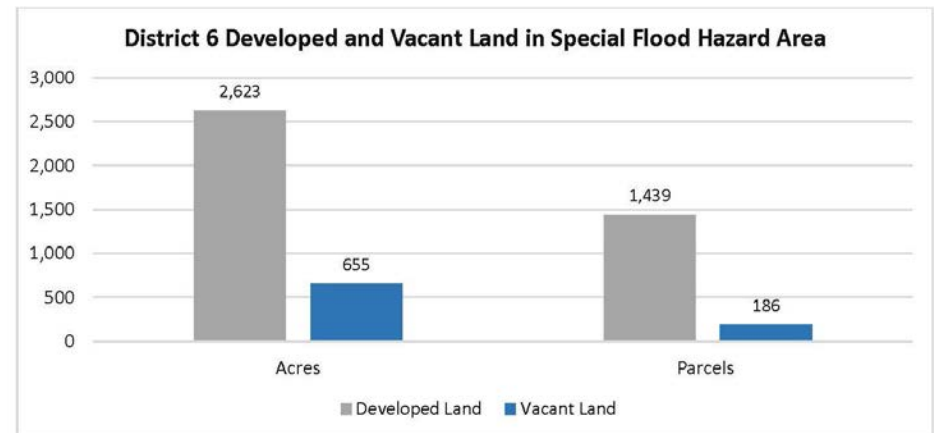
### Parcel Data



A majority of the land (61%) in Council District 6 is located in the 0-15% slope class. Council District 6 contains portions of White Oak Mountain so 22% of the land is located in the 25-30% slope class.



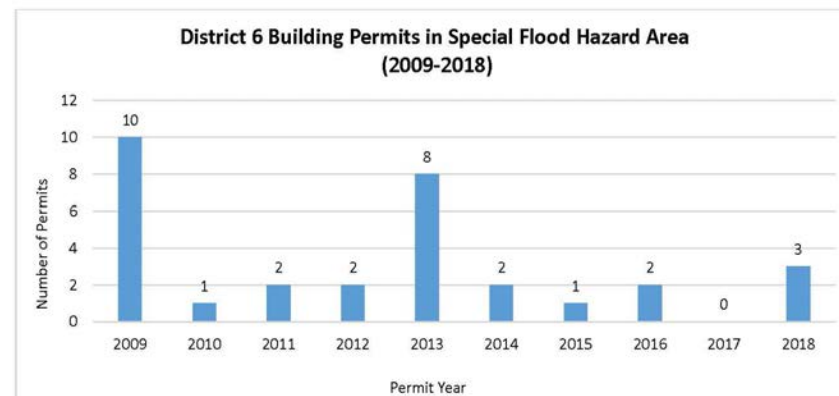
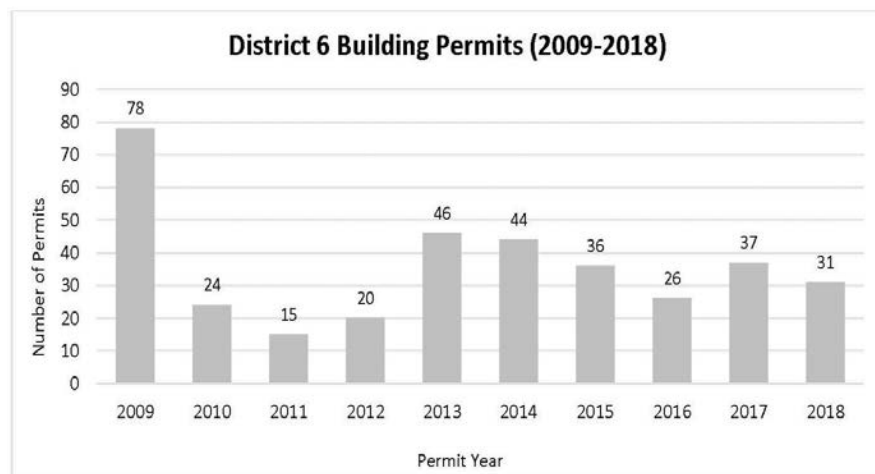
Approximately 20% of the land in Council District 6 is vacant. Of that 20%, 76% of the land is located in the 0-15% slope class. The vacant parcels are scattered across the district.



A majority of the land (80%) in the Special Flood Hazard Area has already been developed.

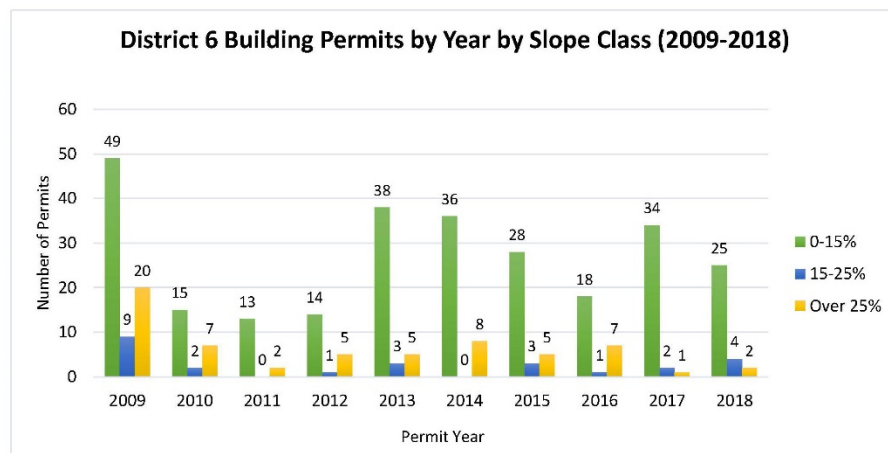


## Building Permit Data

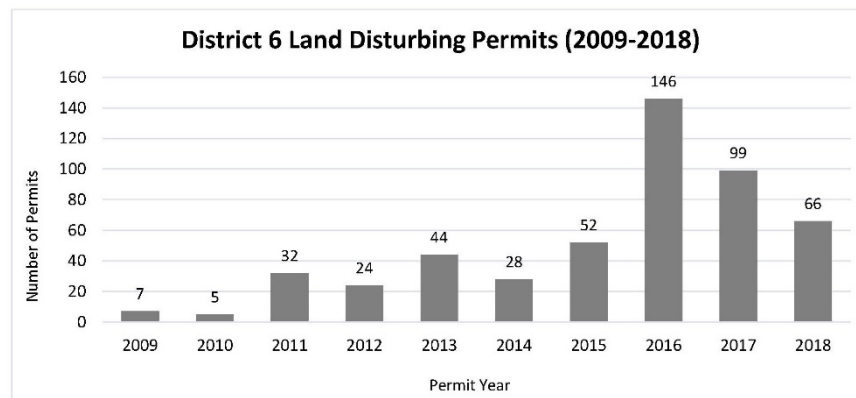


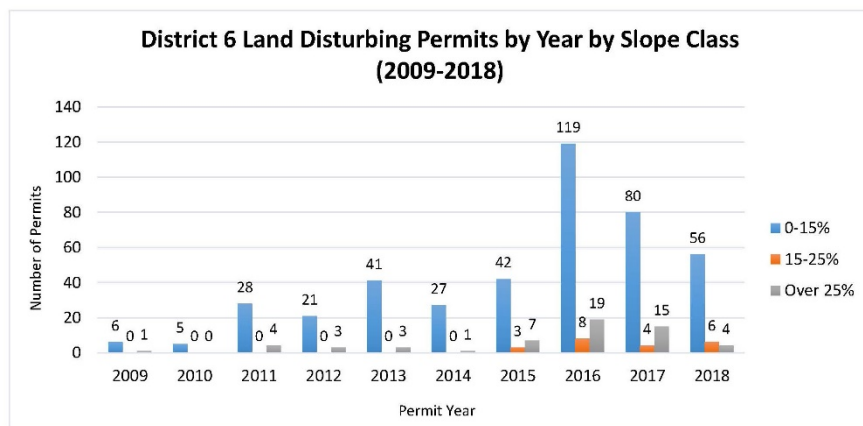
Building permits in the Special Flood Hazard are relatively low and decreased by 70% from 2009 to 2018 with an average of 3 permits.

## Land Disturbing Permit Data

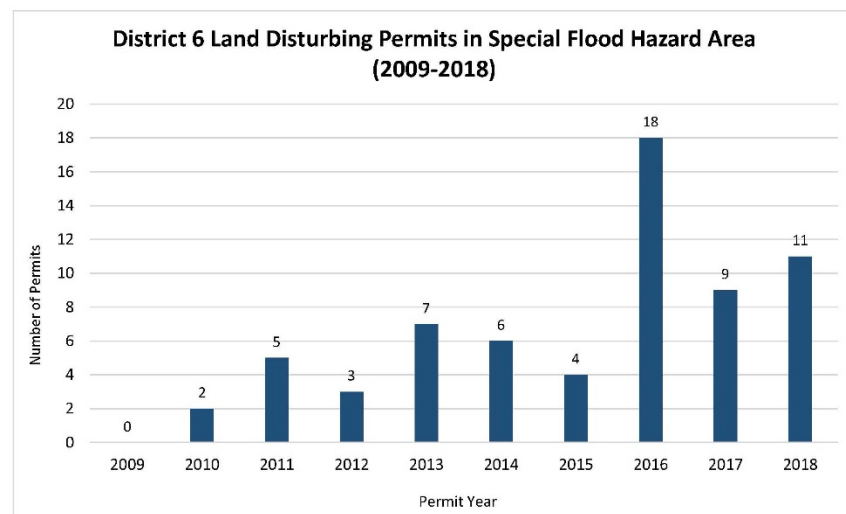


The majority of the building permits issued throughout the 2009 to 2018 period have been issued in the 0-15% slope class (76%), and the permits declined by 49% from 2009 to 2018, with an average of 27 permits. Permits in the over 25% slope class decreased by 90% during the 10-year period with an average of 6 permits.



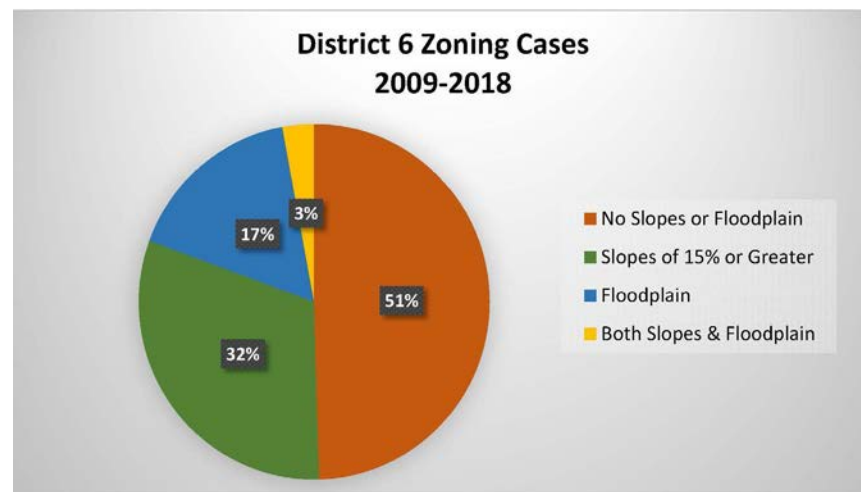


Land disturbing permits in the 0-15% slope class increased by 89% from 2009 to 2018 with an average of 43 permits. Permits in the 15% or greater slope class remained low with an average of 8 permits.



Land disturbing permits in the Special Flood Hazard Area increased by 100% from 2009 to 2018 with an average of 6 permits.

## Zoning Case Data

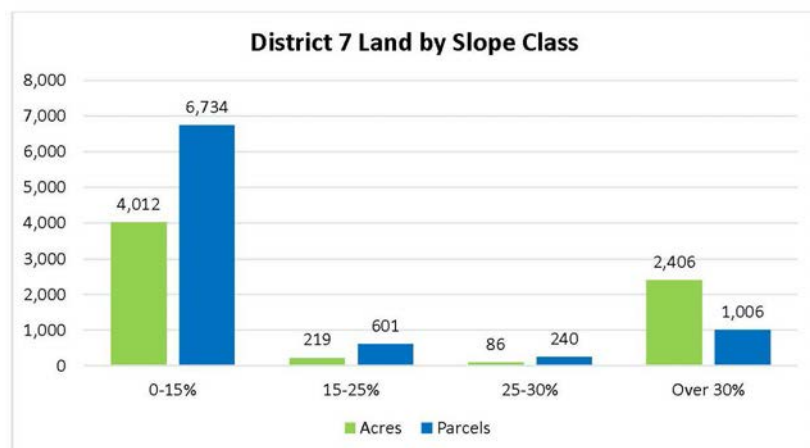


Approximately half of the zoning cases are located in areas with no natural resources and half contain natural resources.

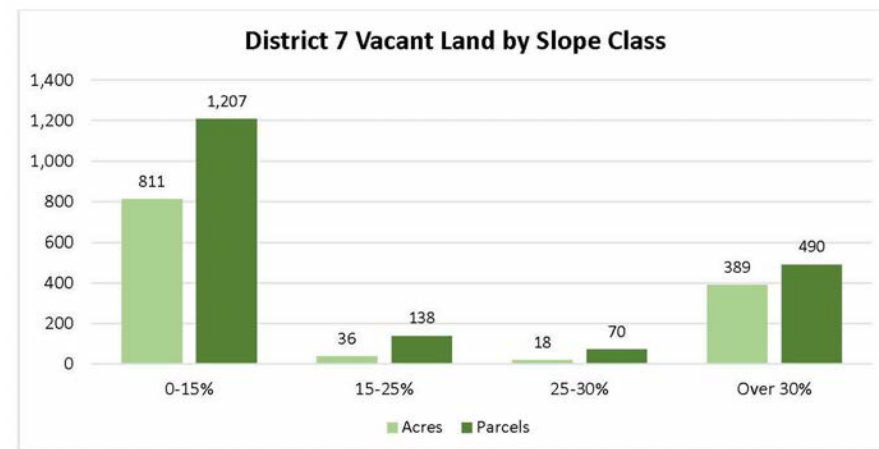
## G. Council District 7

- ❑ Representative: Erskine Oglesby Jr.
- ❑ Location: District 7 consists of the following precincts:
  - Alton Park 1 & 2
  - Downtown 1 & 2
  - East Lake
  - St. Elmo 1

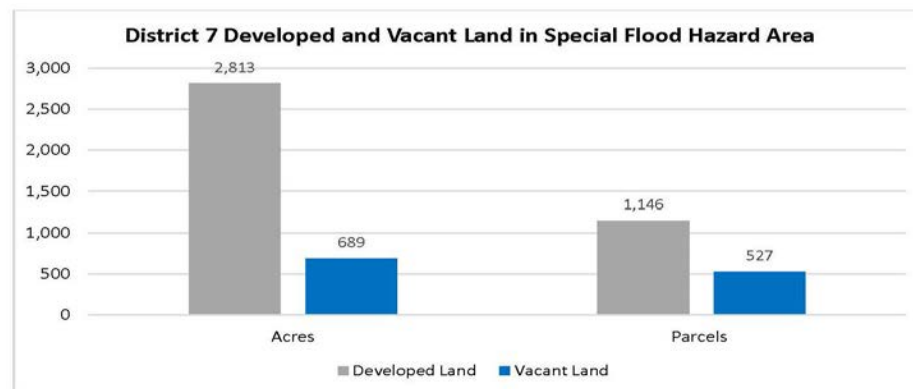
### Parcel Data



A majority of the land (60%) in Council District 7 is located in the 0-15% slope class. The over 30% slope class contains 31% of the land likely because of the topography of Lookout Mountain and Missionary Ridge.

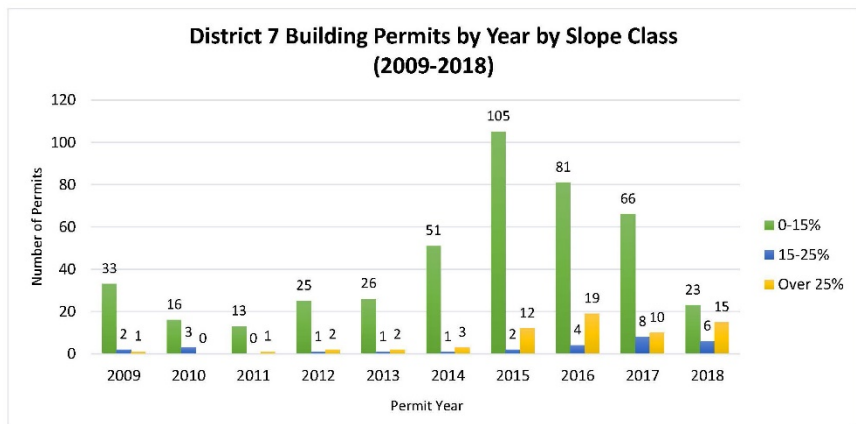
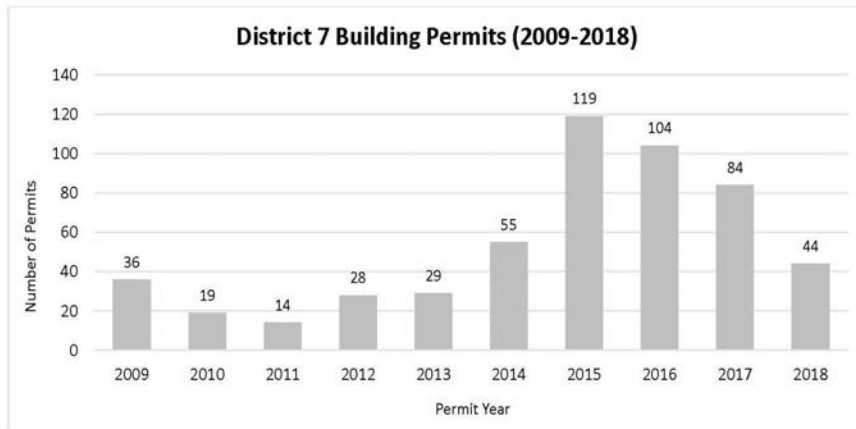


Approximately 19% of the land in Council District 7 is vacant. Of that 19%, 65% of the land is located in the 0-15% slope class and 31% in the over 30% slope class. The number of parcels exceed the amount of acres for all slope classes likely because there are many small, vacant lots of record.

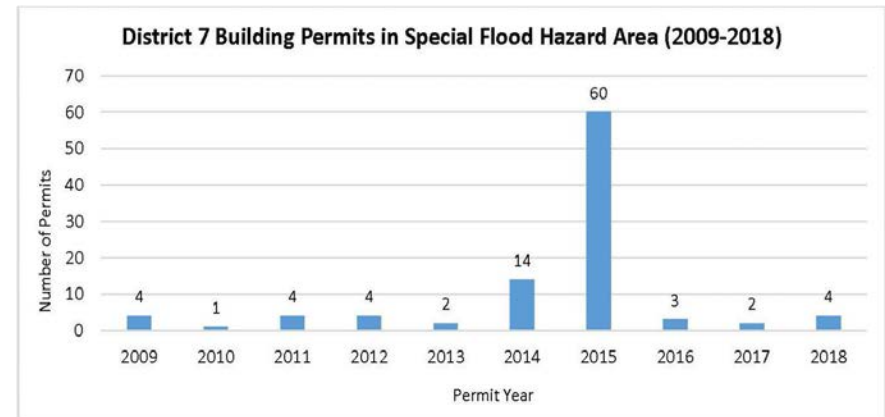


A majority of the land (80%) in the Special Flood Hazard Area has already been developed.

## Building Permit Data

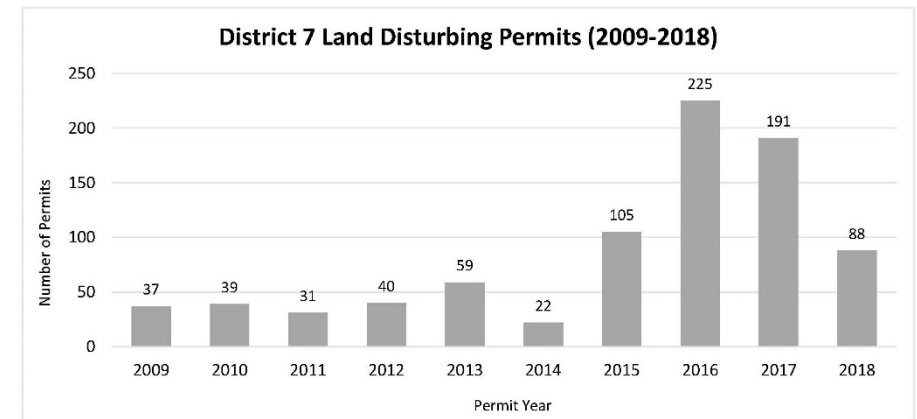


The majority of the building permits issued throughout the 2009 to 2018 time period have been issued in the 0-15% slope class (83%), and the average number of permits issued is 44. The building permits in the 0-15% slope class remained relatively consistent throughout the 10-year period except for a spike in 2015. Although the number of permits in the over 25% slope class are low compared to the 0-15% slope class, the number of permits increased by 93% from 2009 to 2018 with an average of 7 permits.

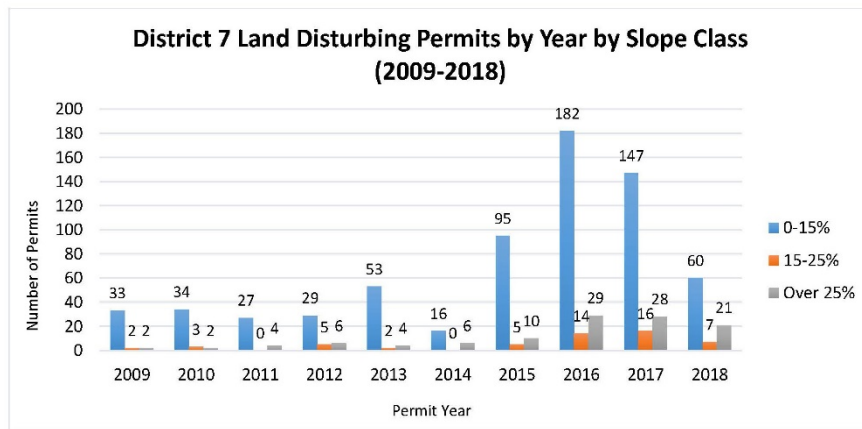


Building permits in the Special Flood Hazard Area remained relatively low except for a 93% increase in 2015 with an average of 10 permits.

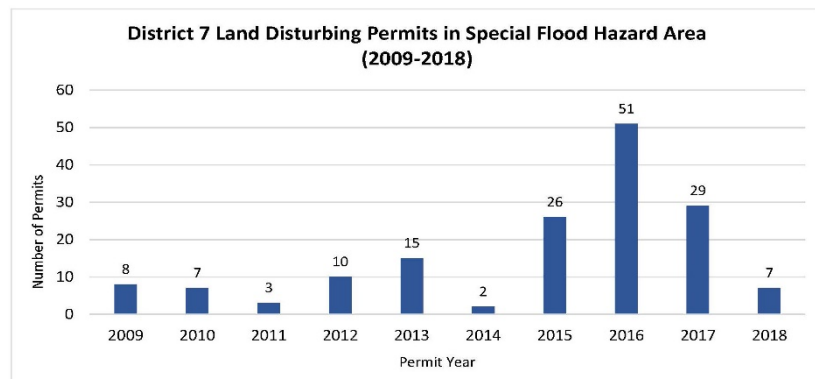
## Land Disturbing Permit Data





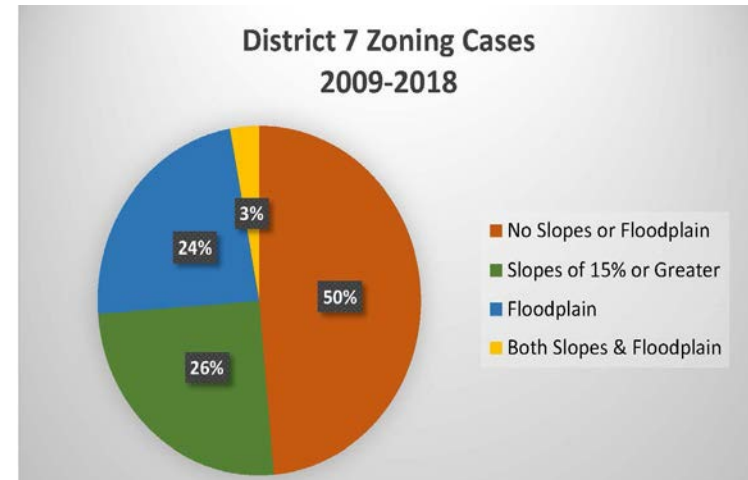


The majority of land disturbing permits (80%) were issued in the 0-15% slope class with an average of 68 permits. Permits in the over 25% slope class increased by 90% from 2009 to 2018 with an average of 11 permits.



Land disturbing permits in the Special Flood Hazard Area are higher in District 7 compared to other council districts with an average of 16 permits. There was an 84% increase in permits from 2009 to 2015.

### Zoning Case Data

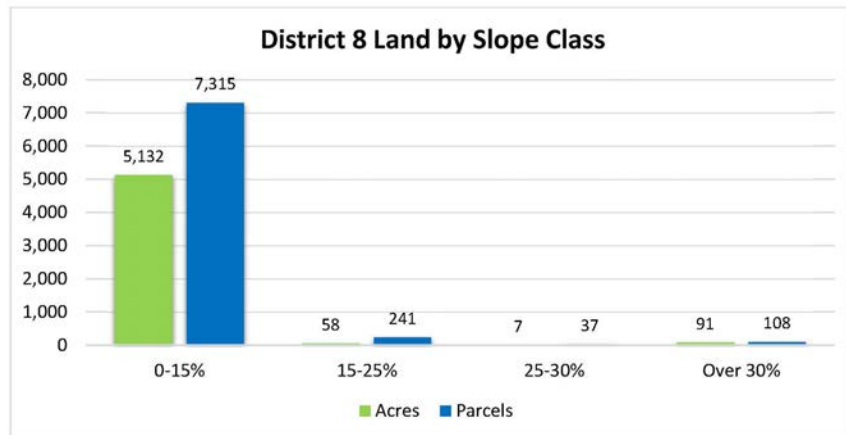


Half of the zoning cases in Council District 7 are located in areas with no natural resources and half are located in areas with natural resources. This is likely because a portion of the district is located in Lookout Mountain and Missionary Ridge.

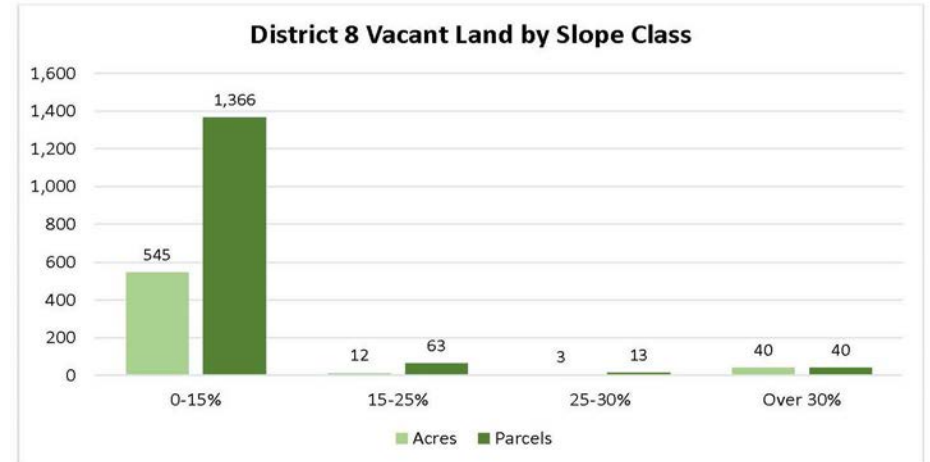
## H. Council District 8

- ❑ Representative: Anthony Byrd
- ❑ Location: District 8 consists of the following precincts:
  - Amnicola
  - Avondale
  - Bushtown
  - Courthouse 1 & 2
  - Eastside 1 & 2

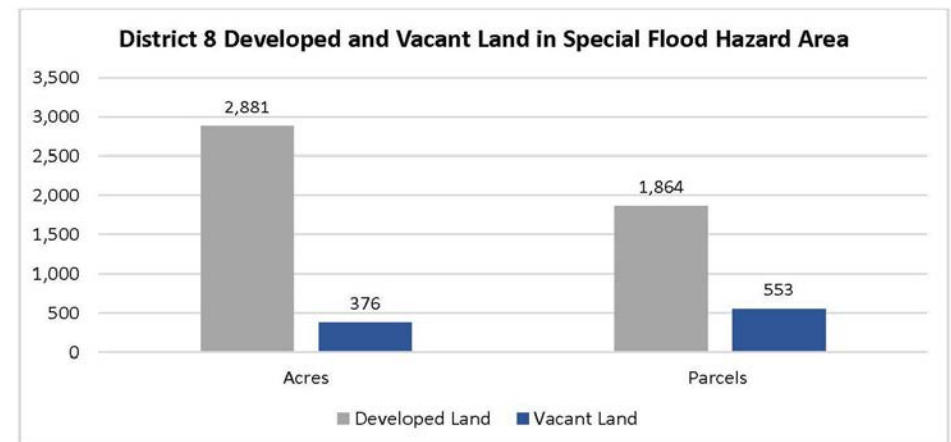
### Parcel Data



Council District 8 is one of the flattest districts in the city with 97% of the land located in the 0-15% slope class.

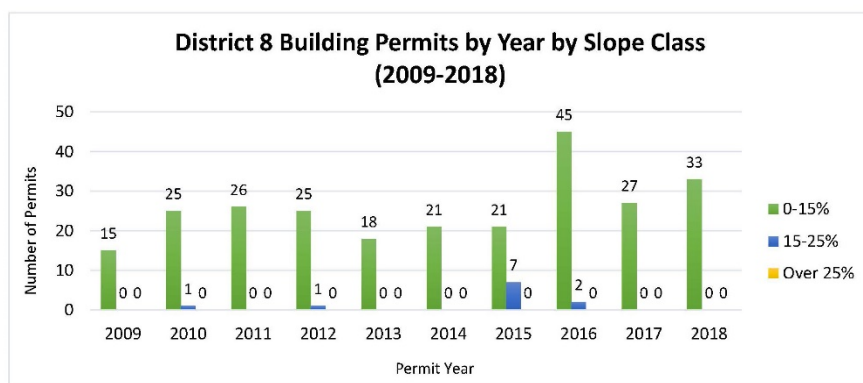
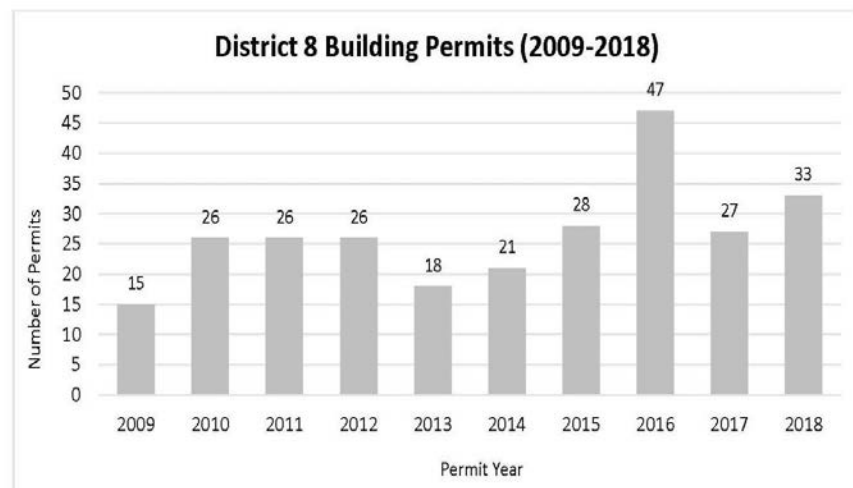


Approximately 19% of the land in Council District 8 is vacant. Of that 19%, 91% of the land is located in 0-15% slope class. The number of parcels exceed the amount of acres likely because there are many small, vacant lots of record.

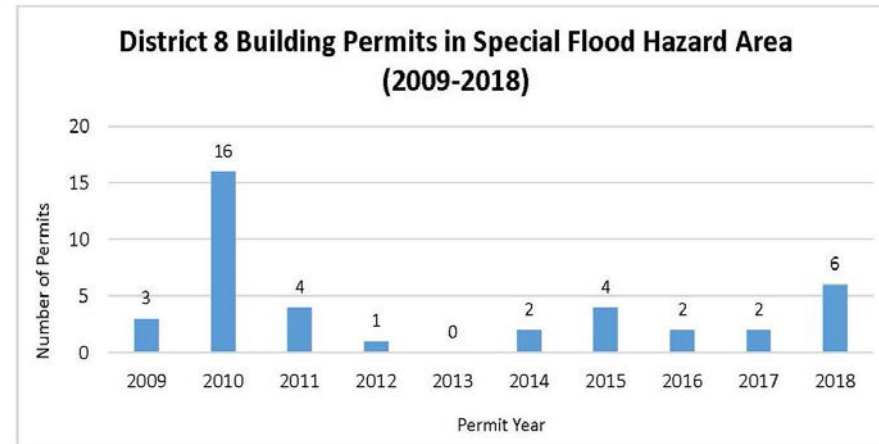


A majority of the land (88%) in the Special Flood Hazard Area has already been developed.

## Building Permit Data

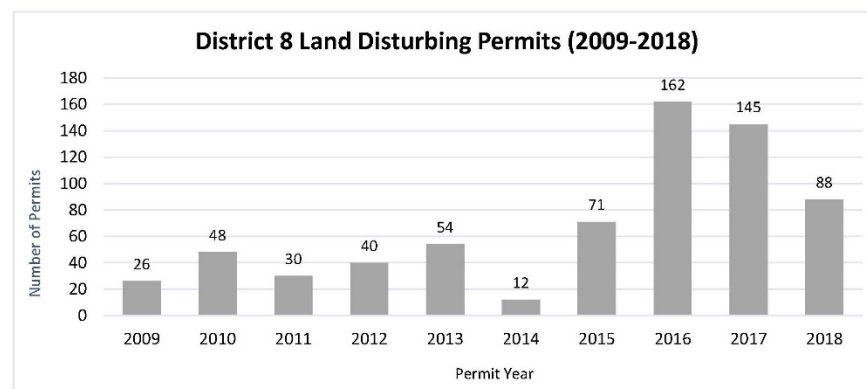


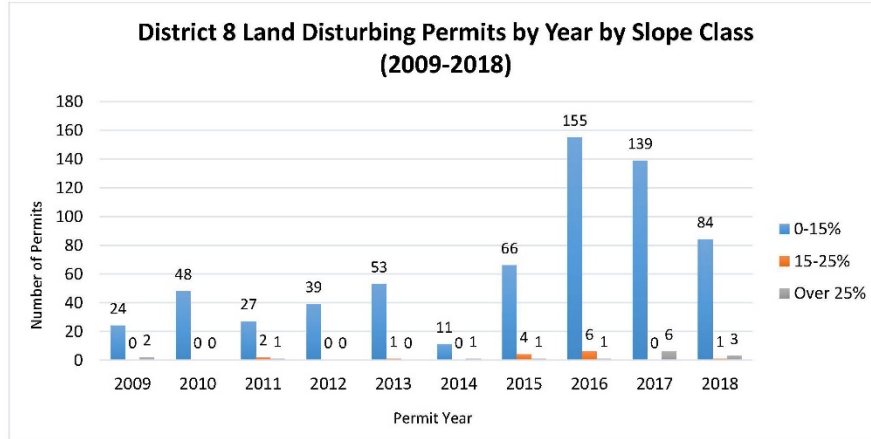
The majority of the building permits issued throughout the 2009 to 2018 time period have been issued in the 0-15% slope class (96%), and the average number of permits issued is 26.



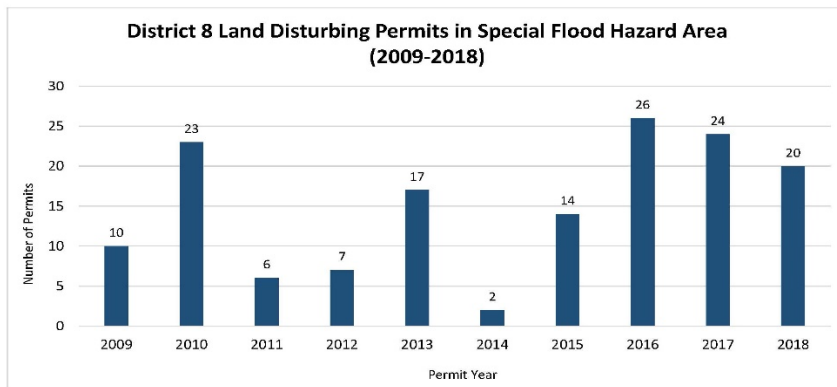
Building permits in the Special Flood Hazard Area remained relatively consistent except for an increase in 2010. The average number of permits is 4.

## Land Disturbing Permit Data



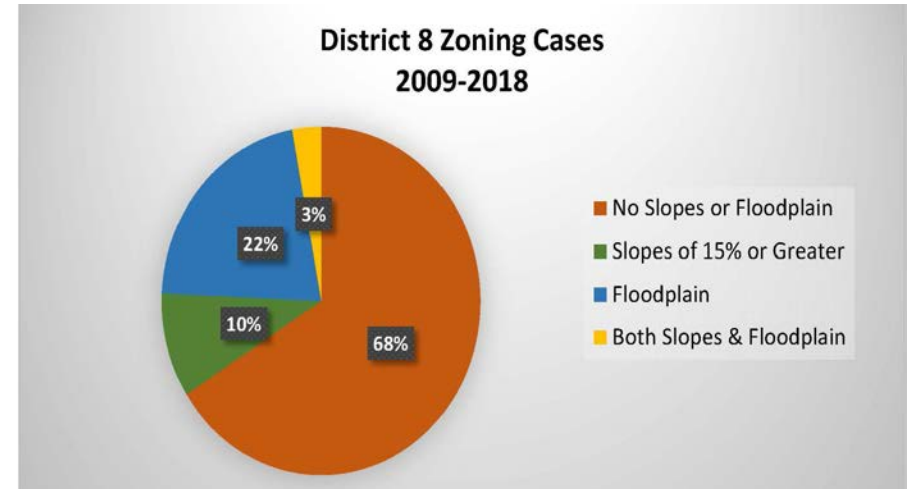


The majority of land disturbing permits have been issued in the 0-15% slope class. The permits increased by 71% from 2009 to 2018 with an average of 65 permits.



Land disturbing permits in the Special Flood Hazard Area increased by 50% from 2009 to 2018 with an average of 15 permits.

### Zoning Case Data



Due to the urban environment of District 8, 68% of the zoning cases do not contain natural resources. A portion of Council District 8 is located near the Tennessee River so that is likely why 22% of the zoning cases are located in the floodplain.



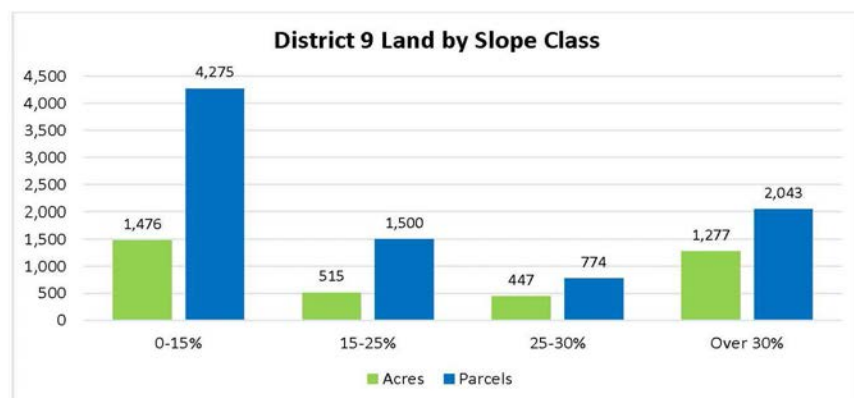
## I. Council District 9

☐ Representative: Demetrus Coonrod

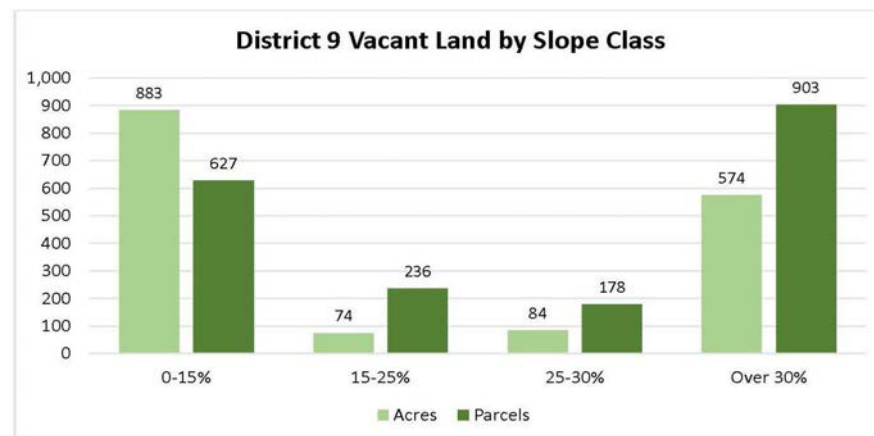
☐ Location: District 9 consists of the following precincts:

- East Chattanooga 1 & 2
- Eastdale
- Glenwood
- Missionary Ridge
- Ridgedale 1 & 2

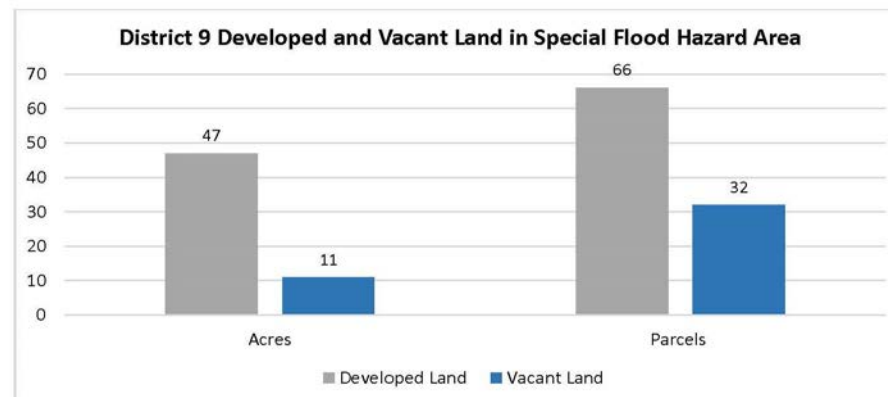
### Parcel Data



Approximately 60% of the land in Council District 9 contains slopes of 15% or greater and 34% of the land is in the over 30% slope class likely because of the topography of Missionary Ridge. The number of parcels exceeds the number of acres likely because there are smaller lots of record.

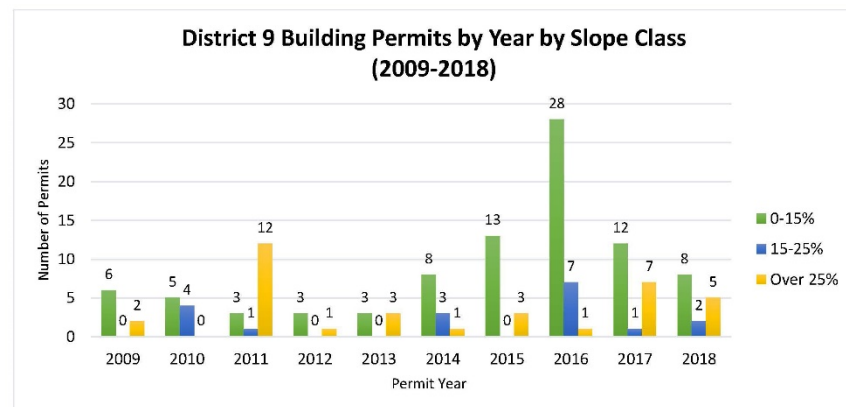
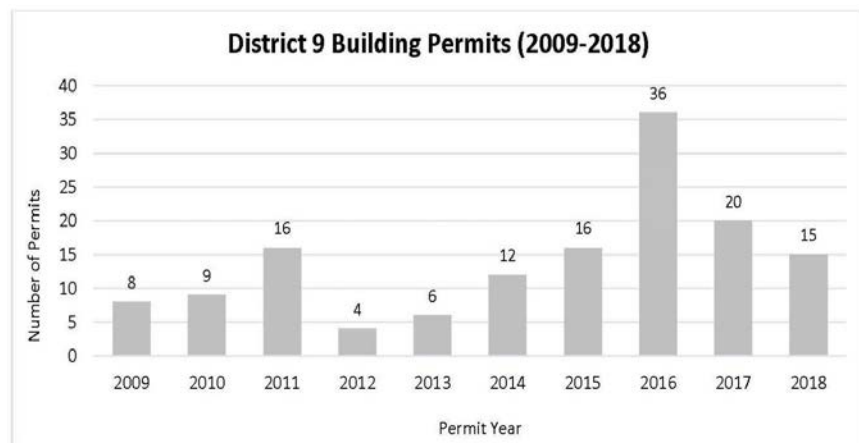


Approximately 45% of the land in Council District 9 is vacant. Of that 45%, 55% of the acreage of land is located in the 0-15% slope class and 36% is located in the over 30% slope class. However, 46% of the parcels are located in the 0-30% slope class. As mentioned above, this is likely because there are more small lots of record in historic neighborhoods like Highland Park, Brainerd and East Chattanooga. Many of the large vacant tracts of land are located along Missionary Ridge.



There is very little land area in District 9 located in the Special Flood Hazard Area and 81% of the land in the SFHA has been developed.

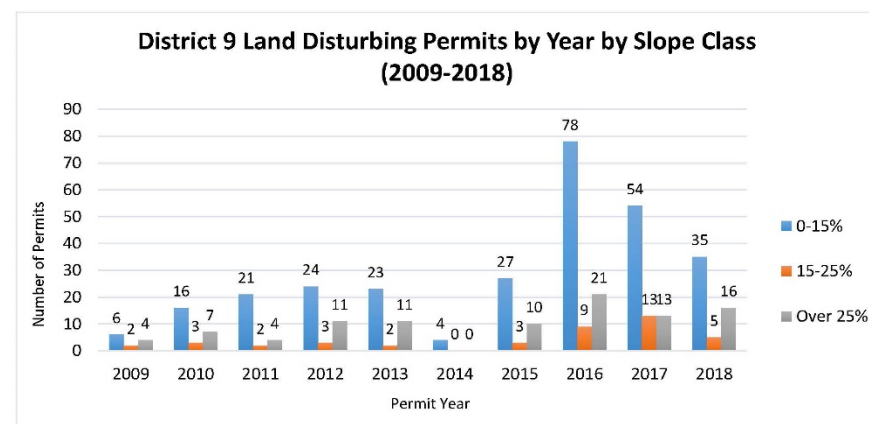
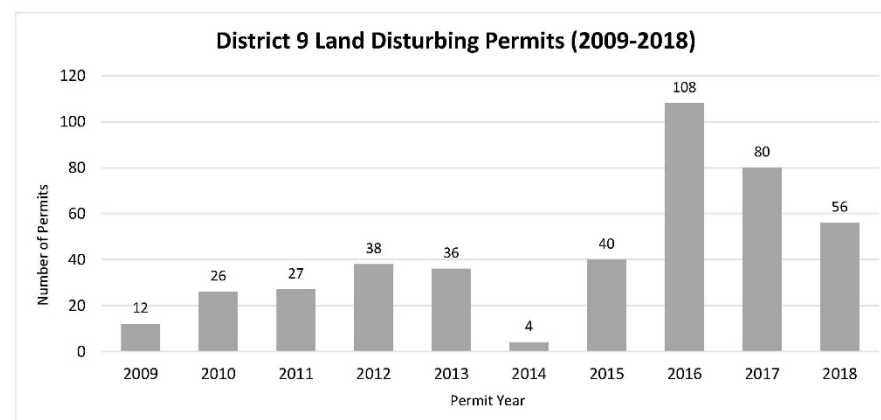
## Building Permit Data



The majority of the building permits issued throughout the 2009 to 2018 period have been in the 0-15% slope class (63%) and remained relatively consistent throughout the 10-year period except for a spike in 2016. The building permits in the over 25% slope class increased in 2012 but otherwise remained relatively low with an average of 4 permits.

Building permits in the Special Flood Hazard Area are minimal in District 9 with only one permit issued in 2009.

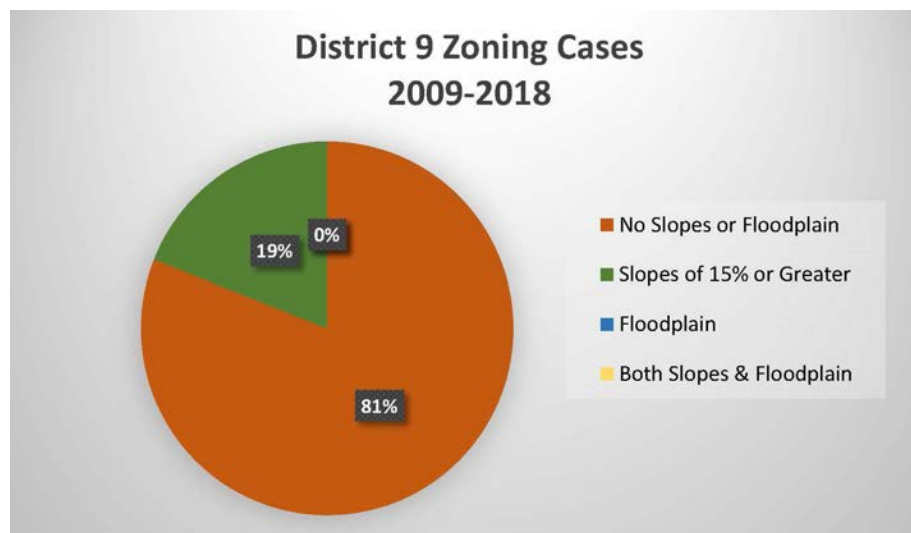
## Land Disturbing Permit Data



Land disturbing permits in the 0-15% slope class increased by 86% with an average of 29 permits. Permits in the over 25% slope class increased by 75% with an average of 10 permits.

No land disturbing permits were issued in the Special Flood Hazard Area.

#### Zoning Case Data



A majority of the zoning cases in Council District 9 are located in areas with no natural resources (81%).

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