Regional Natural Hazard Mitigation Plan

Prepared By the:
Thomas Jefferson Planning District Commission

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2018 Update

Thomas Jefferson Planning District Commission

Regional Natural Hazard Mitigation Plan | Thomas Jefferson District
2018 Plan Approved by FEMA & Adopted by Localities

Executive Summary

Background

The purpose of the Regional Natural Hazard Mitigation Plan is to prepare for natural disasters before they occur, thus reducing loss of life, property damage, and disruption of commerce. The Federal Emergency Management Agency (FEMA) requires such a plan as a condition for eligibility in certain mitigation grant programs. The plan applies to all jurisdictions in the Thomas Jefferson Planning District – Albemarle County, the City of Charlottesville, Greene County, Louisa County, Fluvanna County, Nelson County, and the Towns of Stanardsville, Louisa, Mineral, Scottsville, and Columbia. The original plan was adopted by all jurisdictions in 2006; the plan was updated in 2012, with FEMA approval on July 30, 2012 and formal adoption by all localities completed in December 2012. This is the five-year update, with a formal adoption date of March 23, 2018.

Sections of Plan

The following sections are included in the plan:

1. Introduction – overview of hazard mitigation generally.
2. Planning Process – the process through which the plan was developed, including public input.
3. Community Profile – general information about communities in the planning district.
4. Hazard Identification and Analysis – general information about potential hazards in the planning district, the historic record of hazard events, and the probability of future events.
5. Vulnerability Assessment – analysis of the impact hazards could cause, with estimated potential losses for various hazard scenarios.
6. Capabilities Assessment – survey of current local capacity to prepare for natural hazards.
7. Mitigation Strategies – goals, objectives, and action items selected to mitigate hazards identified.

Planning Process

The lead agency in the preparation of this plan is the Thomas Jefferson Planning District Commission. A Hazard Mitigation Working Group guided the preparation of this plan and will assume responsibility for monitoring the progress of implementation on an annual basis. The Working Group consisted of at least one representative from each locality. Working Group members represented the planning department, emergency management department, and/or Administration from each locality.

The following sources of stakeholder input were used:

- Regular meetings of the Hazard Mitigation Working Group.
- One public workshop
- An online survey

- Presentations to Local Emergency Planning Committees, Plan Review Committees, and work with local staff
- Recommendations from existing plans and documents.
- Public comment period of entire draft plan

Hazard Identification and Analysis/Vulnerability Assessment

All hazards in the region are ranked by this plan according to overall relative threat, which combines the probability of occurrence with the impact of an event. The Working Group reviewed the HIRA data and assigned values for each hazard at their meeting on October 5, 2016.

EVENT	PROBABILITY	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	RISK
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interruption of services*	*Relative threat**
SCORE	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 = N/A 1 = Low 2 = Moderate 3 = High*	*0 - 100%*
Hurricane/high wind/windstorms	3	3	3	3	**100%**
Flooding	3	1	3	2	**67%**
Winter storms/weather	3	1	1	3	**56%**
Wildfire	2	1	1	1	**22%**
Lightning	2	1	1	1	**22%**
Drought and extreme heat	2	1	1	1	**22%**
Dam failure	1	2	2	2	**22%**
Tornado	1	1	2	2	**19%**
Earthquake	1	1	2	2	**19%**
Landslide	1	1	1	1	**11%**
AVERAGE SCORE	**1.90**	**1.30**	**1.70**	**1.80**	**34%**

**Threat increases with percentage.*

RISK = PROBABILITY * SEVERITY		
0.34	**0.63**	**0.53**

The Hazard Identification section includes a description of all natural hazards that affect the region and provides analysis on their location, extent, severity, and probability of occurrence. The impact of a hazard can be thought of as the intersection between natural events and human settlement. Therefore, the Vulnerability Assessment considers both hazard patterns and current and future development patterns in the region, in order to fully measure vulnerability of human life and property to natural disasters. Mapping software developed by FEMA is used to quantify financial losses of various events deemed probable by the most current scientific consensus. Special attention is paid to critical facilities and infrastructure essential to disaster response and the continuity of crucial community services after a disaster.

Most data on hazards are derived from federal and state government sources, and data on development and critical facilities are derived primarily from local government sources. Results are presented in a series of maps and charts.

Mitigation Strategy

The following goals and objectives, grouped into five broad categories, are recommended by the plan:

Education and Outreach (E)

- GOAL: Increase awareness of hazards and encourage action to mitigate the impacts
    - OBJECTIVE: Educate families and individuals on disaster mitigation and preparedness
    - OBJECTIVE: Train key agency staff and volunteer groups in disaster mitigation and preparedness
    - OBJECTIVE: Train staff at schools and residential facilities in disaster mitigation and preparedness
    - OBJECTIVE: Encourage and equip employers to develop emergency action plans
    - OBJECTIVE: Protect sensitive areas through conservation practices

Infrastructure and Buildings (I)

- GOAL: Reduce the short and long-term impact of hazard events on buildings and infrastructure
    - OBJECTIVE: Diversify the energy system to provide multiple power source and fuel supply options
    - OBJECTIVE: Diversity the communications system to provide alternative lines for use during loss of capacity
    - OBJECTIVE: Diversify the transportation system by increasing connectivity and providing modal options
    - OBJECTIVE: Elevate, retrofit and relocate existing structures and facilities in vulnerable locations
    - OBJECTIVE: Construct or upgrade drainage, retention, and diversion elements to lessen the impact of a hazard

Whole Community (C)

- GOAL: Prepare to meet the immediate needs of the population during natural hazards
    - OBJECTIVE: Train staff to effectively communicate with and transport people regardless of their language proficiency and physical needs.

- OBJECTIVE: Ensure that the population can access emergency shelters in a timely manner and have functional needs met, in the event of a natural hazard

Mitigation Capacity (M)

- GOAL: Increase mitigation capacity through planning and project implementation
  - OBJECTIVE: Reduce property risks through planning, zoning, ordinances and regulations
  - OBJECTIVE: Incorporate mitigation planning concepts into local plans and ordinances
  - OBJECTIVE: Pursue funding to implement identified mitigation strategies

Information and Data Development (D)

- GOAL: Build capacity with information and data development to refine hazard identification and assessment, mitigation targeting and funding identification
  - OBJECTIVE: Identify data and information needs and develop methods to meet these needs
  - OBJECTIVE: Ensure that each critical facility has a disaster plan in place

Mitigation Action Items

A set of mitigation action items are designated for each locality to substantively further the objectives of the plan. The detailed list of action items includes the supporting goal, hazard to be mitigation, party responsible for implementation, timeframe of implementation, estimated cost, and potential funding sources. Furthermore, all action items are prioritized and listed in order from high, moderate, to low priority.

The following is an abridged list of action items for each jurisdiction and the Thomas Jefferson region:

Activity Code	Activity Description
Thomas Jefferson Region	
RHE1	Provide a copy of the Regional Hazard Mitigation Plan to each library in the Jefferson-Madison Regional Library system
RME1	Conduct a public education program on disaster preparedness, leveraging existing materials and sharing resources regionally
RMD1	Identify locations for deposit of debris after a hazard
Albemarle County	
AHE1	Develop a Comprehensive fire safety communications/education strategy, addressing open space protection, the burn permit process, and "Ready, Set, Go Program" (Fire Wise workshops), and residential and business preparedness
AHE2	Increase the number of trained emergency responders, both staff and volunteers
AHI1	Implement recommendations from the Community Water Supply Plan, including water demand management/conservation and drought monitoring and management

AHM1	Incorporate this Regional Hazard Mitigation Plan into local comprehensive plans and Emergency Operations Plans
AHM2	Install fire mitigation measures, including dry hydrants, fire breaks, and fire rings.
AHD1	Continue to assess resistance of existing critical facilities to natural hazards
AHC1	Continue and expand the use of citizen alert systems
AME1	Ensure that all schools have regular disaster response drills
AME2	Continue to pursue conservation practices in sensitive areas, including flood-prone areas.
AMI1	Build or repair bridges so as not to impede floodways
AMI2	Upgrade bridges to support emergency vehicles
AMI3	Carry out physical security improvements to water and wastewater systems, which may include fencing, door hardening, window hardening, locks, bollards, cameras, signage, lighting, access control and intrusion detection.
AMI4	Procure technology equipment for Water/Wastewater system component inspections.
AMM1	Implement recommendations from Drought Plan
AMM2	Through the development process, discourage or disallow development in flood-prone areas
AMM3	Provide planning support for water and wastewater systems operational and integrated security management
AMM4	Seek financial support for an integrated regional cameral and monitoring system, including research, planning, procurement, implementation, management and maintenance.
AMD1	Expand GIS data for use in mitigation planning, preparedness planning, and response activities
ALE1	Encourage property owners and residents to clear creek beds, storm drain inlets, ditches and channels, and to remove debris where flooding has increased.
ALE2	Ensure all houses and businesses have clear address signs that are visible during snowstorms and other emergencies
ALE3	Continue educational campaign about the benefits of open space and sensitive area protection.
ALC1	Increase the capacity to shelter in place in public buildings.
ALI1	Improve the maintenance of stormwater conveyance system.
ALI2	Implement Stormwater Management Plan to reduce floodwater and pollution discharge via stormwater systems.
ALI3	Maintain and Retrofit stormwater management basins/facilities including dam maintenance and upgrades
ALI4	Partner with utility companies to keep power lines free of vegetation
ALI5	Reduce pollution discharge via stormwater systems
ALI1	Reduce pollution discharge via stormwater systems
ALC1	Increase the capacity to shelter in place in public buildings.

ALE1	Continue educational campaign about the benefits of open space and sensitive area protection.
ALI1	Improve the maintenance of stormwater conveyance system.
ALI2	Implement Stormwater Management Plan to reduce floodwater and pollution discharge via stormwater systems.
ALI3	Maintain and Retrofit stormwater management basins/facilities including dam maintenance and upgrades
ALI4	Partner with utility companies to keep power lines free of vegetation

Town of Scottsville	
ASMM1	Ensure all houses and businesses have clear address signs that are visible during snowstorms and other emergencies
ASMM2	Enforce removal of debris from the bank of the James River on a periodic basis, to comply with flood zone ordinance
ASLM1	Install a cameral to gauge the level of the creed at the pump station
ASLM2	Incorporate hazard mitigation plan into community plans

City of Charlottesville	
CHE1	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant buildings.
CHE2	Ensure that all schools have regular disaster response drills.
CHI1	Implement recommendations from the Community Water Supply Plan.
CHM1	Incorporate hazard mitigation plan into community plans.
CHM2	Conduct Community Emergency Response Team (CERT) classes to equip individuals and groups to assist in the event of a disaster.
CHM3	Provide incentives to institutions and homeowners for use of low-flow appliances.
CHM4	Continue to expand use of citizen alert system.
CHM5	Implement recommendations from Drought Management Plan.
CHM6	Ensure that all shelters and public buildings have a battery-powered emergency radio and flashlight.
CME1	Support purchase of rain barrels
CMI1	Build or repair bridges so as not to impede floodwaters
CMI2	Add signage to roads in locations that frequently flood.
CMI3	Retrofit emergency service buildings for hazard resistance.
CMM1	Support volunteer groups and encourage collaboration on public outreach and education programs on hazard mitigation.
CMM2	Create a strategy for using existing media outlets for communications during a hazard event.
CLE1	Provide citizens with literature about flood and drought-smart landscaping.
CLE2	Create educational campaign about the benefits of open space and sensitive area protection.

CLI1	Improve the maintenance of stormwater conveyance system.
CLI2	Reduce pollution discharge via stormwater systems.
CLI3	Retrofit stormwater management basins

Fluvanna County	
FHE1	Ensure all houses and businesses have clear address signs that are visible during snowstorms and other emergencies
FHE2	Carry out an educational campaign for businesses to develop emergency procedures and shelter-in-place plans
FHI1	Install warning signs and develop alternate routes for roads that flood briefly during heavy rains (e.g. Slaters Fork Road, Carysbrook, farm pond dam locations)
FHI2	Install new fire hydrants along new JRWA water line on east side of County
FHC1	Implement community notification protocols before, during, and after a disaster event
FHC2	Conduct regular disaster response drills in schools, and with staff at Assisted Living Facilities and Nursing Homes
FHC3	Continue and expand the use of citizen alert systems
FHM1	Develop a comprehensive fire safety communication strategy, addressing open space, burn permit, FireWise, and dry hydrants
FHM2	Adopt fire code
FHM3	Develop protocols and enforcement mechanisms for a burn ban
FHM4	Incorporate this Regional Hazard Mitigation Plan into local comprehensive plans and Emergency Operations Plans
FHD1	Develop a disaster plan for the Fork Union Sanitary District (FUSD)
FME1	Carry out a targeted educational campaign in subdivisions at high risk for fire impacts
FME2	Conduct tabletop exercises for damage assessments
FME3	Bring in experts to conduct in-house staff training in best management practices in hazard mitigation and preparedness
FME4	Offer training on post-event inspection and develop a protocol to serve as a mechanism for prioritization
FME5	Increase the number of trained emergency responders, both staff and volunteers
FME6	Conduct FireWise workshops
FME7	Provide educational information about burn laws permit process
FMI1	Identify vulnerable structures and apply for funding to implement acquisition and demolition, relocation, floodproofing, or structural retrofit projects
FMI2	Demolish and Remove remains of old surface water treatment plant located on TM 58 A 26 & 27(County-owned property)
FMI3	Remove +/-20,000 gallon water storage tank from James River.
FMC1	Continue campaigns like “Five-Dog Nights” in the county to distribute emergency kits/supplies to low-income and vulnerable populations
FMC2	Develop protocols and applications to communicate with individuals and households about emergency planning and shelter information (utilize Meals on Wheels lists and/or welfare check lists)
FMM1	Identify areas to receive debris from post-event clean-up efforts

FMM2	Develop evacuation plans for dam breaches from Charlottesville-area dams
FMD1	Expand GIS data for us in mitigation planning, preparedness planning, and response activities
FLE1	Promote CERT training opportunities available in the region to equip individuals and groups to assist in the event of a disaster
FLE2	Cross-train current volunteers across other County functional areas
FLI1	Identify repetitive loss properties, develop appropriate mitigation action, and apply for funding
FLC1	Develop County agreements (possibly with women's prison) for food services for county-supported shelters (including high school and Lake Monticello clubhouse)
FLM1	Develop Continuity of Operations Plans (COOP) for locality departments and update the plans annually
FLM2	Develop county-wide evacuation plans for catastrophic incidents

Greene County	
GHI1	Partner with utility companies to keep power lines free of vegetation
GHI2	Conduct structural evaluations of current and proposed shelters
GHI3	Install backup generators in shelters and critical facilities
GHI4	Enhance public safety emergency communications to provide reliable, dependable coverage
GHI5	Enhance access to broadband county-wide
GHC1	Assist the schools with regular disaster response drills and disaster planning
GHM1	Continue and expand use of citizen alert systems
GHM2	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant buildings
GHM3	Ensure all critical facilities have updated shelter-in-place plans
GHM4	Update driveway codes to allow access for emergency vehicles
GHM5	Routinely inspect fire hydrants
GHM6	Update local stormwater ordinances to be in compliance with statewide regulations
GHM7	Increase number of trained emergency responders
GHM8	Ensure that all shelters and public buildings have a battery-powered emergency radio and flashlight
GME1	Develop cooperative agreements between all agencies involved in emergency management, provide methods of communication between agencies responsible for being present at the Emergency Operations Center following a disaster, and conduct joint exercises
GME2	Conduct FireWise workshops (in conjunction with the Virginia Department of Forestry)
GMI1	Add signage to roads in locations that frequently flood
GMM1	Incorporate hazard mitigation plan into other applicable community plans
GMM2	Conduct Community Emergency Response Team (CERT) classes to equip individuals and citizens to assist one another in the event of a disaster
GMM3	Investigate safety and maintenance of roads in private communities
GMM4	Develop and implement a Drought Management Plan

GMD1	Standardize GIS data for use in mitigation planning
GMD2	Conduct channel improvement study
GMD3	Create a needs survey that identifies special needs population and residences and/or facilities needing attention in the event of emergencies or evacuations
GMD4	Ensure evacuation routes are upgraded to proper standards
GLE1	Develop an all-hazard resource center
GLI1	Retrofit emergency services buildings for hazard resistance
GLI2	Build and repair bridges so as not to impede floodwaters
GLI3	Ensure culverts, streams, channels, storm drains, and gutters remain clear of debris
GLI4	Install more dry hydrants in high wildfire risk areas
GLC1	Update the Greene County Emergency Operations Plan
GLM1	Adopt more stringent policy to discourage floodplain development
GLM2	Provide paid fire and rescue staff
GLM3	Ensure all structures have clear address signs that are visible during snowstorms

Town of Stanardsville	
GSHM1	Increase water capacity and pressure for the Town of Stanardsville to enable optimal emergency response
GSMC1	Partner with Greene County to provide a mobile pet shelter for use during hazard events
GSMM1	Ensure all houses have clear address signs that are visible during snowstorms
GSLM1	Incorporate hazard mitigation plan into community plans

Louisa County	
LHI1	Enhance access to broadband internet in rural areas
LHI2	Install backup generators in shelters and critical facilities
LHI3	Implement recommendations from Water Supply Plan
LHI4	Ensure all shelters and public buildings have a battery-powered emergency radio & flashlight
LHC1	Ensure that all schools have regular disaster response drills
LHM1	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
LHM2	Continue and expand use of citizen alert systems countywide, including within Towns
LHM3	Increase number of trained emergency responders
LHM4	Develop driveway codes to allow emergency vehicle access
LHM5	Improve local capabilities to perform earthquake building safety evaluations and enforce building codes in high seismic hazard areas
LMI1	Put high water marks on bridges
LMC1	Create a needs survey that identifies special need homes or facilities needing attention in case of emergencies or evacuations
LMM1	Investigate safety and maintenance of roads in private communities

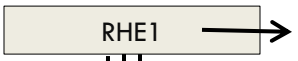
LMM2	Conduct Community Emergency Response Team (CERT) classes to equip individuals and groups to assist in the event of a disaster
LMM3	Ensure all houses have clear address signs that are visible during snowstorms
LMM4	Incorporate hazard mitigation plans into community plans
LMM5	Incorporate special needs populations into Hazard Mitigation and Emergency Operations Plans
LLE1	Provide more education about the burn permit process
LLE2	Create an educational program to help residents understand the benefits and costs of earthquake insurance
LLI1	Equip owners of historic properties that may be more susceptible to earthquake damage with information about retrofitting structures to improve earthquake resistance
LLI2	Add signage to roads in locations that frequently flood
LLD1	Track and map space available for pets at local SPCA and other animal shelters

Town of Louisa	
LLHM1	Incorporate hazard mitigation plans into community plans
LLMM1	Ensure all houses have clear address signs that are visible during snowstorms
LLLI1	Bury utilities underground in town of Louisa

Town of Mineral	
LMHM1	Incorporate hazard mitigation plans into community plans
LMMM1	Ensure all houses have clear address signs that are visible during snowstorms
LMLI1	Bury utilities underground in town of Mineral

Nelson County	
NHI1	Install backup generators in shelters and critical facilities
NHM1	Continue and expand use of citizen alert systems
NHM2	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
NHM3	Conduct Community Emergency Response Team (CERT) classes to equip individuals and groups to assist in the event of a disaster
NME1	Conduct Firewise Workshops
NME2	Provide educational instruction and materials to school age youth and their teachers on proper procedures for responding to natural disasters
NMI1	Investigate safety and maintenance of roads in private communities
NMM1	Ensure all houses have clear address signs that are visible during snowstorms
NLE1	Ensure that all homeowners and businesses located in areas prone to landslides are aware of the risks and appropriate responses to an event
NLI2	Maintain and add more fire rings in camping areas for controlled fires

Activity Code Key



Sequential number within group

Goal: E = Education and Outreach
I = Infrastructure and Buildings
C = Whole Communities
M = Mitigation Capacity
D = Information and Data Development

Priority: H = High
M= Moderate
L = Low

Place: R = Thomas Jefferson Region
A= Albemarle County
AS = Town of Scottsville (Albemarle)
C = City of Charlottesville
F = Fluvanna County
G = Greene County
GS= Town of Stanardsville (Greene)
L = Louisa County
LL = Town of Louisa (Louisa)
LM = Town of Mineral (Louisa)
N = Nelson County

Introduction

Hazard: An event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, agricultural loss, damage to the environment, interruption of business, or other types of harm or loss.

Mitigation: Sustained action taken to reduce or eliminate the long-term risk to human life and property from natural hazards and their effects. Note that this emphasis on long-term risk distinguishes mitigation from actions geared primarily to emergency preparedness and short-term recovery.

Natural hazards tend to be low-probability, high-impact events. One year could be mild with natural events scarcely interrupting communities, while the next could be literally disastrous. The purpose of hazard mitigation is to make an effort to minimize the damage and loss of life caused by disasters when they do occur. Hazard mitigation is one component, along with emergency response and post-disaster recovery, to the larger strategy of dealing with the human impacts of natural hazard

With more people living in areas susceptible to natural hazards, the costs associated with such hazards have been steadily increasing over time. The localities of the Thomas Jefferson Planning District (the Counties of Albemarle, Greene, Fluvanna, Louisa, and Nelson, the City of Charlottesville, and the Towns of Scottsville, Stanardsville, Louisa, and Mineral) are impacted by variety of different hazards. In order to lessen the growing cost of disaster recovery on the localities and minimize the disruption of business during a disaster, there is a growing need to mitigate the impact of known hazards. Through proper planning and the implementation of policies and projects identified in this Hazard Mitigation Plan, the region and the localities can reduce the likelihood that these events will result in costly disasters.

Hazard mitigation is any sustained action taken to reduce or eliminate the long-term risk to human life and property from natural hazards. It includes both structural measures, such as protecting buildings and infrastructure from the forces of nature and non-structural measures, such as natural resource protection and wise floodplain management. Actions may be targeted to protect existing development or could be designed to protect future development as well. It is widely accepted that the most effective mitigation measures are implemented at the local government level, where decisions on the regulation and control of development are ultimately made.

The **benefits of hazard mitigation** are numerous, including:

- Saving lives and reducing property damage
- Protecting critical community facilities
- Reducing exposure to liability
- Minimizing community disruption
- Reducing long-term hazard vulnerability
- Contributing to sustainable communities

More importantly, mitigation planning has the potential to produce long-term benefits by breaking the repetitive cycle of disaster loss. A core assumption of hazard mitigation is that a pre-disaster investment significantly reduces the demand for post-disaster assistance. Further, the adoption of mitigation practices enables local residents, businesses, and industries to more quickly recover from a disaster, getting the economy back on track sooner and with less interruption.

This plan systematically identifies potential hazards and sets goals for implementation over the long-term that will result in a reduction in risk. Unlike emergency operations plans or disaster preparedness, this plan seeks to develop ways to lessen the impact of natural disasters on the region's resources through strategic, long range planning. The overall goal of hazard mitigation is to save lives and reduce property damage.

Sections of the Plan

This Plan is designed to meet the requirements of the Disaster Mitigation Act of 2000. The Hazard Mitigation Plan includes the following sections:

1. Planning Process
2. Community Profile
3. Hazard Identification and Analysis
4. Vulnerability Assessment
5. Capabilities Assessment
6. Mitigation Strategies

The **Planning Process** section describes the process by which this plan was developed including a description of the planning team, and overall stakeholder involvement. It also outlines the ongoing process for maintaining and updating the plan.

The **Community Profile** is a narrative description of general community characteristics, such as the region's geographical, economic and demographic profiles. Future development trends and implications for hazard vulnerability are discussed.

The **Hazard Identification and Analysis** section describes natural hazards in the order in which they pose the greatest threat to the Thomas Jefferson Planning District. Hazards are profiled in terms of prevalence, intensity, and geographical scope. The section includes a description of the hazard as well as analysis based upon historical and scientific data.

The **Vulnerability Assessment** combines the identification of hazards with both present and projected human settlement patterns to measure their human impact. Potential losses are estimated quantitatively based upon historic events scenarios or the probability of future events.

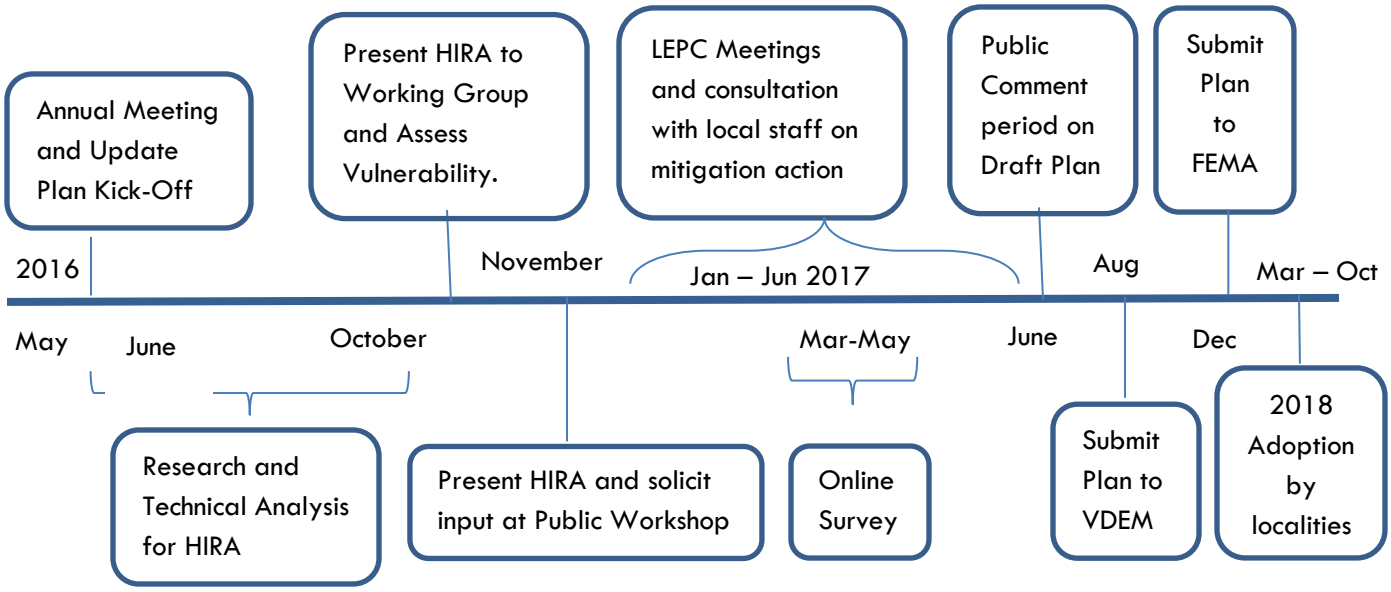
The **Capabilities Assessment** provides an examination of the region's capacity to implement meaningful mitigation actions and identify existing opportunities for program enhancement. Capabilities addressed in this section include staff and organizational capability, technical capability, policy and program capability, fiscal capability, legal authority and political will. The purpose of this assessment is to identify any existing gaps that may hinder mitigation efforts, and to identify those activities that can facilitate risk reduction efforts.

The **Mitigation Action Plan** forms the basis for action — identifying broad policy goal statements, more specific policy objectives and specific action-oriented hazard mitigation actions. Hazard mitigation actions include both policies and projects designed to reduce the impacts of hazardous events. The section also describes four overarching strategies for mitigating high and moderate risk hazards.

Planning Process and Public Involvement

This section describes the planning process undertaken by the Thomas Jefferson Planning District Commission in preparation of the Regional Hazard Mitigation Plan, as well as the means for monitoring the plan between 2018 and 2023. An emphasis is placed on the engagement of a broad range of community stakeholders and the substantive inclusion of public input into the plan.

The following timeline depicts the major points along the process of the plan update:



Following approval from VDEM and FEMA, the elected body of each of the 11 localities formally passed a resolution of adoption for the final plan.

A key feature of the development of the plan has been achieving participation and input from stakeholders throughout the Planning District. Documentation of the planning process including meeting notes, sign-in sheets, and complete survey results are included in the appendices.

201.6(b) and §201.6(c)(1): An open public involvement process is essential to the development of an effective plan. In order to develop a more comprehensive approach to reducing the effects of natural disasters, the planning process shall include:

> (1) an opportunity for the public to comment on the plan during the drafting stage and prior to plan approval;

(2) an opportunity for neighboring communities, local and regional agencies involved in hazard mitigation activities, and agencies that have the authority to regulate development, as well as businesses, academia and other private and non-profit interests to be involved in the planning process; and
(3) review and incorporation, if appropriate, of existing plans, studies, reports, and technical information.

Because of the multi-jurisdictional nature of this Hazard Mitigation Plan, comprehensive and balanced representation from each jurisdiction has been practiced consistently.

44 CFR 201.6(a)(3): Multi-jurisdictional plans may be accepted, as appropriate, as long as each jurisdiction has participated in the process.

There have been six primary methods for obtaining input for the plan:

1. Regular meetings of the Hazard Mitigation Working Group.
2. One public workshop
3. An online survey and solicitation of public input from website.
4. Presentations to Local Emergency Planning Committees and work with locality staff
5. Recommendations from existing plans and documents.
6. Public comment period of entire draft plan.

44 CFR 201.6(c)(1): The plan must document the planning process used to develop the plan, including how it was prepared, who was involved in the process, and how the public was involved.

1. Hazard Mitigation Working Group

The Working Group, consisting primarily of planners and emergency operations coordinators in the City and each County, served as the primary decision-making body guiding the plan. The Working Group as a body also provided technical input on the content of the plan at multiple points along the timeline of the update. Locality staff also completed the list of actions for their respective jurisdiction and filled out the Capabilities Assessment. There are four towns in the Planning District: Scottsville in Albemarle County, Mineral and Louisa in Louisa County, and Stanardsville in Greene County. The Town of Columbia in Fluvanna County was dissolved as an incorporated town, effective July 1, 2016. Towns were represented on the Working Group by their respective Counties. County representatives reached out to Towns during the process through invitations to meetings and contact by e-mail and phone. TJPDC also followed up with the Towns to confirm actions to be included in the HMP.

The Working Group was originally formed during the creation of the 2006 Regional Hazard Mitigation Plan, and the group has reconvened on an annual basis to monitor progress toward the adopted action items in the initial plan. A roster of the Working Group is included in the appendix. There have been a number of staff changes during the development of this regional plan, which are noted on the roster. An

article about the update of the Hazard Mitigation Plan and the May 2016 Kick-off meeting was included in the TJPDC News Brief issued in early May.

2. Public Workshops

A public event was held on November 14, 2016. The event was widely advertised both through the TJPDC News Brief, e-mails to individuals with a special interest in hazard mitigation and emergency response and a press release was issued to local media outlets. An article was published in the ***Daily Progress*** November 4, 2016.

A broad range of stakeholders, from foresters to administrators in the public-school system, participated in the workshop. The purpose of the first part of the meeting was to present a draft of the Hazard Identification and Risk Assessment, in order to provide an objective basis for any mitigation response and solicit feedback to improve the HIRA. In addition to this information, participants were provided the goals and objectives from the 2012 plan and worked in small groups to develop recommendations for additions, deletions, and revisions. The small groups also considered possible actions and reported out to the full group.

3. Online Survey and Website

The TJPDC website was updated early in the planning process to announce the initiation of the plan and probe for interest among residents in the region. The website was updated regularly with drafts of various components as they were completed, along with requests for comment. Updates on the process were also included in TJPDC's News Briefs.

Throughout February and March 2017, an online survey was used to assess familiarity with hazard mitigation concepts, weigh the relative concern over various hazards, prioritize the goals and objectives of the plan, gauge the political will for mitigation policies, and find new ideas for effective action items. The survey received 74 responses, with participants from every locality in the Planning District.

Because of its self-selecting nature and marketing through the Hazard Mitigation Working Group, the survey should not be considered representative of the opinions of the whole population. Nevertheless, it proved to be a useful tool for gathering input from informed and enthusiastic members of the public, and several action items were revised or added based on the results.

4. Presentations to Local Committees

Visits were paid to local committees to make them aware of the hazard mitigation plan update and incorporate the specific expertise of the group into the plan. The Working Group developed the goals and objectives for the regional plan, and incorporated a list of potential actions organized under each objective. The Plans Review Group for Albemarle-Charlottesville-UVA met October 31, 2016 to review an update recommended actions, and the Local Emergency Planning Committee (LEPC) for that geographic area met November 30, 2016. Fluvanna's LEPC, met January 19, 2017, with TJPDC staff attending to provide an update on the Hazard Mitigation Plan and to facilitate input on potential actions.

5. Recommendations from Existing Plans and Documents

Locality staff reviewed various plans for their jurisdiction, to incorporate strategies and specific actions set forth in those plans into the Regional Hazard Mitigation Plan. Some specific relevant projects were taken directly from these plans and included as action items in the regional plan.

6. Public comment period

The entire draft Hazard Mitigation Plan was made available to the public for comment between June 1 and June 30, 2017. The comment period was advertised in local media on May 31, 2017. Notification of the draft plan was also included in TJPDC's News Brief on June 13. This on-line publication has a distribution of over 1,300 contacts, including adjacent PDCs and localities.

7. Neighboring Communities

In addition to general distribution of the draft plan via the public comment process and TJPDC's News Brief, TJPDC has been contacted by two other regions during the update process. The Richmond Regional Planning District Commission began their update process before TJPDC commenced its work, with their update scheduled for completion in mid-2017. Region 2000 began their process in the Spring of 2018, and reached out to TJPDC in December 2017, indicating that staff may be in contact to learn about our process.

Method of Update

The 2017 Regional Hazard Mitigation Plan is an update of the 2012 Plan. The original plan Regional Hazard Mitigation Plan was adopted in 2006. As such, TJPDC staff has made efforts to maintain continuity with the original plan while making substantive revisions to reflect new data on hazards, new ideas for mitigation, and progress made toward the completion of previous action items. The Hazard Identification section kept most of the original material broadly profiling hazards, but the majority of the analysis of the impact hazards exert in the region is either updated or new.

Goals and objectives from the 2012 Plan were reviewed in the public workshop. Comments from that workshop were presented to the Working Group, which further modified the goals and objectives. Input on potential actions was also solicited at the public workshop and from the Working Group. TJPDC Staff then developed a listing of goals and objectives, with suggested actions for inclusion under each objective. The draft was then reviewed with the Working Group, to ensure that the goals and objectives were inclusive of suggested actions. The final product was used to facilitate input from local committees, and to facilitate the review and incorporation of actions from other local plans.

Action items were developed from the master list and pulled from other local plans. The Working Group found that many actions from the 2006 and 2012 plans were ambiguous and difficult to track. Notes from annual meetings also suggested some potential actions to include. The action items were further revised through LEPC meetings, Working Group meetings, and input from locality staff and other stakeholders. Some new action items were generated by the online survey.

Action items that were removed from the plan are documented in a table in the appendices. Changes to priority levels are also noted.

Monitoring and Maintenance

§201.6(c)(4)(i): [The plan maintenance process shall include a] section describing the method and schedule of monitoring, evaluating, and updating the mitigation plan within a five-year cycle.

The monitoring policy set forth in the original 2006 plan remains in place. The Hazard Mitigation Working Group, supported by TJPDC staff, will meet annually in May or following a major disaster to evaluate progress and review annual impacts or actions which may necessitate changes in the plan.

Regular evaluation of the plan will address whether:

1. goals and objectives address current and expected conditions;
2. the nature, magnitude, or type of hazard affecting the region has changed;
3. current resources are appropriate for implementing the plan;
4. important problems such as technical, political, legal, or coordination issues with other agencies have occurred;
5. agencies and other partners are participating as originally proposed.

The plan will undergo a comprehensive review and evaluation every five years by the Working Group and the TJPDC under the authority of the Board of Supervisors and City Council. The next update is anticipated to be submitted to VDEM in calendar year 2022 with formal adoption in 2023.

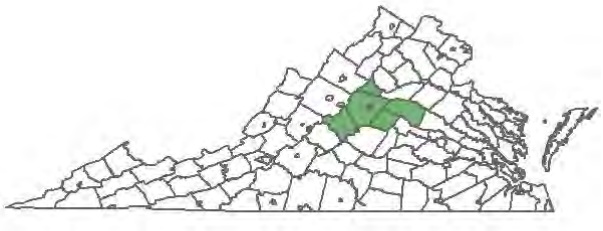
Ongoing public involvement will be critical to ensure the most accurate and up-to-date plan. Significant amendments to the plan will require a public hearing and other efforts to involve the public will be made as necessary.

Community Profile

The Thomas Jefferson Planning District is located roughly in the geographic center of the Commonwealth of Virginia. The Planning District is made up of the counties of Albemarle, Fluvanna, Greene, Louisa and Nelson, the City of Charlottesville and the incorporated towns of Scottsville, Louisa, Mineral and Stanardsville. The Planning District is home to historic resources such as Monticello and Highland, as well as the University of Virginia.

This section includes several features of the Thomas Jefferson Planning District Commission including:

1. Geography
2. Population and Demographics
3. Economic Growth and Development
4. Transportation
5. Housing
6. Disaster Declarations
7. Historic Properties and Districts



Geography

The Thomas Jefferson Planning District is in the Piedmont region of Virginia. It is bounded by the Blue Ridge Mountains on the west with ridges and foothills and hollows rolling down to the James River in the east. Elevations range from more than 2,500 feet above sea level in the mountains to roughly 200 feet at Columbia on the James River. Areas of relatively flat land are found in larger river valleys and floodplains. Most of the land has a slope of some kind. Total land area is 2,155 square miles.

The area drains west to east by six major rivers: the Tye, Rockfish, Hardware, Rivanna, Anna, and Rapidan. The headwaters of area rivers are generally located in the mountains and flow to the James River, which provides major drainage and flow east to the Chesapeake Bay. The Rapidan and Anna Rivers drain into the Rappahannock and York Rivers respectively, which also reach the Bay.

The area has a moderate climate. Average temperatures are approximately 50 degrees, and range from January lows in the mid-20s to July highs in the high 80s. Annual rainfall averages above 40 inches, supplemented with approximately 14 inches of snow.

There are a few large river dams in the district: one on the Rivanna for drinking water and one at Lake Anna for the nuclear power plant. Smaller streams have been dammed to create resort lakes, such as Lake Monticello, Twin Lakes, Lake Nelson, Ruritan Lake, and Lake Louisa.

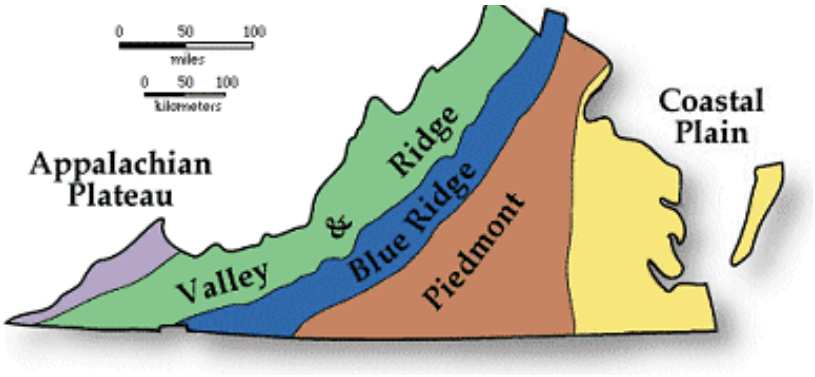
The vast majority of land is either field or forest, with development occupying the remainder. Crop farming is found in larger scale to the south and east, away from the mountains, where land is flatter. Hay and grains are the majority crops, with some corn and other row crops. Orchards and vineyards are prevalent in the high hills. Livestock fields are also common for cattle, horses, sheep, and a variety of other animals. Timberland can be found in all parts of the district, with large tracts in the east and James River areas. For the Rivanna Watershed, which encompasses 35% of the Planning District, tree canopies account for approximately 72% of the basin, open lands 22.8%, impervious surfaces 3.2%, and the remaining 2% is water, orchards, or golf courses. The Rivanna River Basin Commission determined these land cover classes through an analysis of 2009 aerial images.

Soils in the district are generally moderately- to well-drained, with a surface layer moderately low in organic content, and usually consisting of gravelly silt or fine sandy loam about 9-12" deep. The soils also generally have a low to moderate shrink-swell potential. Soils differ across the geographic spectrum in their slope, total depth, and permeability. Soils of Fluvanna County are predominantly silt loam and contain high clay content.

Parts of the Thomas Jefferson Planning District lie in the Blue Ridge province, while most of it is in the Piedmont province (see above). The Blue Ridge province forms a basement massif with Mesoproterozoic crystalline rock in its core and Late Neoproterozoic to Early Paleozoic cover rock on its flanks. The Blue Ridge province is allochthonous (formed in a place other than where it is found) and has been thrust to the northwest over Paleozoic rocks of the Valley and Ridge province. Although earlier deformation events are recorded in the older igneous and metamorphic rocks, the Blue Ridge is a contractional structure that experienced deformation and crustal shortening during the Paleozoic.

The Piedmont is the largest physiographic province in Virginia. It is bounded on the east by the Fall Zone, which separates the province from the Coastal Plain, and on the west by the mountains of the Blue Ridge province. The province is characterized by gently rolling topography, deeply weathered bedrock, and a relative paucity of solid outcrop. Rocks are strongly weathered in the Piedmont's humid climate and bedrock is generally buried under a thick (2-20 m) blanket of saprolite. Outcrops are commonly restricted to stream valleys, where saprolite has been removed by erosion. The topography becomes somewhat more rugged with proximity to the Blue Ridge, where local monadnocks of more resistant rock occur.

Geological Provenances in Virginia



Most of the ridges of the Blue Ridge are either part of the Shenandoah National Park or the Washington/Jefferson National Forest. Regulations of the federal Department of Interior or Department of Agriculture control land use in these areas

Population and Growth

The region grew by approximately 18% from 2000 to 2010, and an estimated 5.9% between 2010 and 2015, based on population projections. Relative to other regions in Virginia, this growth rate is high, although it has slowed slightly from the 19% growth rate experienced between 1990 and 2000. The City of Charlottesville's population decreased slightly between 1980 and 2000, but then grew by 8% between 2000 and 2010, and an estimated10.9% between 2010 and 2015. The City has been encouraging infill development, since its supply of developable land is constrained.

Population Change

Locality	1990	2000	2010	2000-2010 % Change	2015 (Est)	2010-2015 % Change
Charlottesville	40,341	40,099	43,475	8.4%	48,210	10.9%
Albemarle	68,040	84,186	98,970	17.6%	105,051	6.1%
Fluvanna	12,429	20,047	25,691	28.2%	26,162	1.8%
Greene	10,297	15,244	18,403	20.7%	19,840	7.8%
Louisa	20,325	25,627	33,153	29.4%	34,244	3.3%
Nelson	12,778	14,445	15,020	4.0%	14,993	-0.2%
Region	164,210	199,648	234,712	17.6%	248,500	5.9%

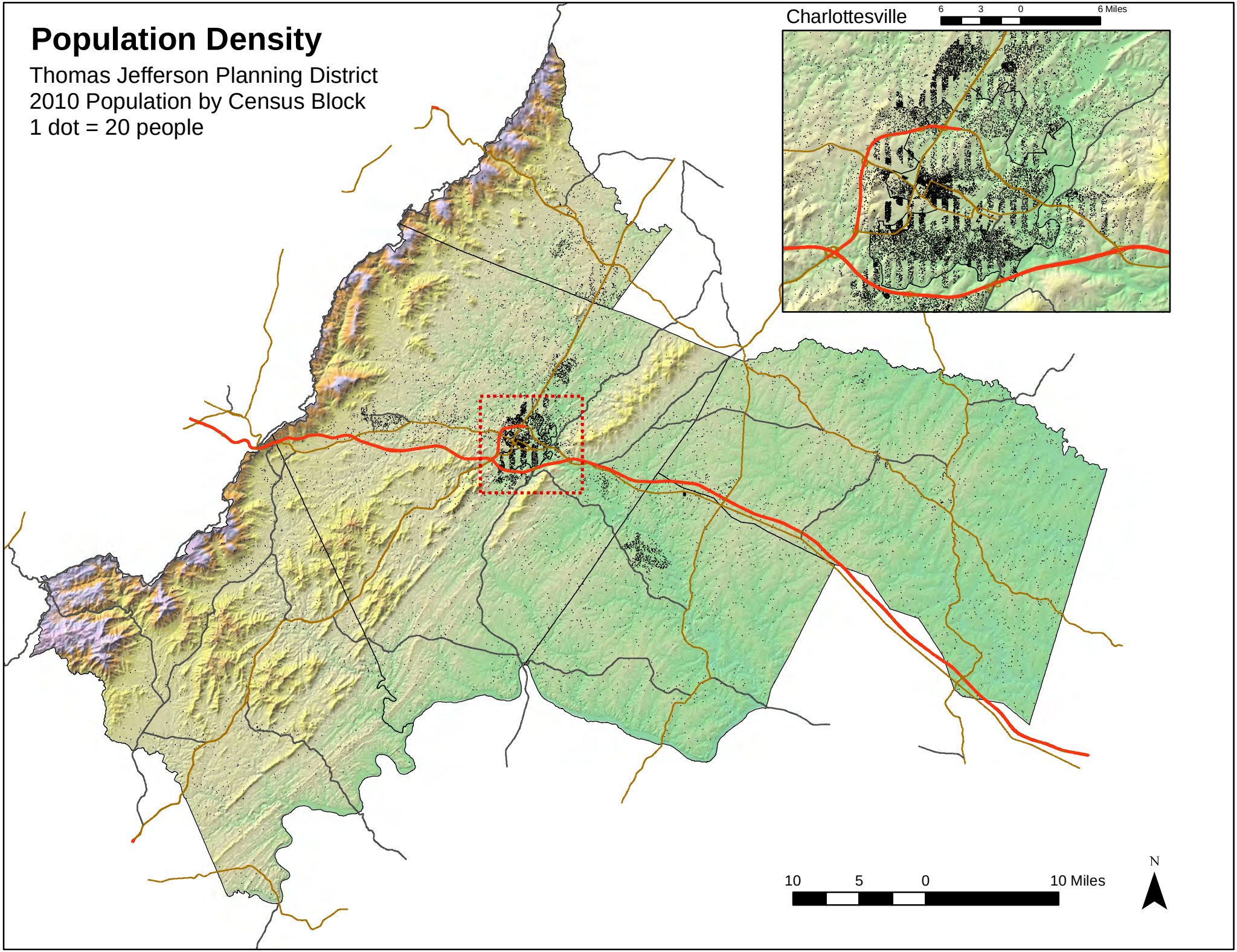
Source: US Census (1990, 2000, 2010), 2015 Weldon Cooper Center Population Estimates

Major population centers and growth areas can be identified using census data and local comprehensive planning information. In 2010, The City of Charlottesville and the surrounding urban ring in Albemarle County was home to 41% of the region's population, down from around half of the population in 2000. Growth in Louisa, Fluvanna, and Greene has slowed slightly since the 1990s, but growth in these counties continues to outpace the rest of the region. The Route 29 corridor and the I-64/250 corridor, otherwise known as Pantops, are the major commercial and industrial areas outside of the City. Most localities have stated in their Comprehensive Plans the goal of encouraging growth around existing centers to reduce the potential for sprawling development over time.

On the following page, a population dot density map (1 dot symbolizes 20 people) shows concentrated population around Charlottesville and Rt. 29N – as well as significant density just over the border into Fluvanna and Greene Counties. Although Louisa and Fluvanna counties have experienced high levels of growth over the last decade, the density map shows that the new growth is highly dispersed across the counties.

Population Density

Thomas Jefferson Planning District
2010 Population by Census Block
1 dot = 20 people



Land Use and Development Trends

Central Virginia is an attractive place to live and work, and the localities in the Thomas Jefferson Planning District are growing in population. Higher costs of living in the urban core and in Albemarle County have made growth in the rural counties attractive. Local comprehensive plans generally intend to keep denser growth limited to the city and town areas, but major roadway corridors are seeing rapid growth as well. The result is growing populations in areas lacking many services that support modern needs.

As growth occurs, more houses, roads, commercial services, communications, fire and rescue, and public facilities will be built to service the growing population. Schools are often used as shelters, and should be built to meet applicable standards. New water and sewer treatment plants and infrastructure are expected, and are required to be built to hazard-proof standards. There are a number of transportation infrastructure improvements underway, with other planned projects awaiting funding. Solid waste services and collection points may also change and grow in all areas. Fluvanna and Louisa Counties are jointly undertaking the James River Water Project to provide to supply both counties with the projected 50-year water need as identified in their respective Long Range Water Supply Plans.

Residential: The primary change of use for most land in the region is into some form of residential use. Construction of both single-family and multi-family units dropped off sharply following the national housing downturn in 2007 and 2008. Development is now picking up, with building permits in 2016 the highest since 2007 levels. Albemarle County is seeing greater development within its designated growth areas. Development in the rural areas of the County accounted for a third of all residential units in 2007, but currently represents only 20% of units. Developments that were approved years ago are now being built out, including Belvedere, Cascadia, Old Trail, North Pointe and Whittington.

Agriculture and Forestry: Land in farms and forestry is slowly being converted to residential and estate uses across the region. There is a trend toward smaller farms, niche marketing, and direct sales, and an emphasis on sustainable agriculture. The George Washington National Forest is not expected to change in size, but may be more open to timber management, depending on economic and political forces.

Open Space: Open space is defined as any land left in a completely natural, recreational park or agricultural state. The growth in population leads to land being slowly converted to residential and commercial uses, although there are a growing number of properties entering into permanent protection with conservation easements. The state purchased land for the Biscuit Run State Park south of Charlottesville in 2010, but the park has not yet been developed. The Shenandoah National Park is not expected to change in area. Some developments in rural areas use conservation design techniques to preserve open space, especially as rural land converts into residential use.

Commercial: The primary commercial areas are the US 29 Corridor, downtown Charlottesville, Pantops, and the Corner near the University of Virginia. Commercial land uses are increasing, and generally newer developments occur in strip style near existing residential areas. In recent years, new large-scale retail has been built further from Charlottesville. The Zion Crossroads area is a major development focus for Fluvanna and Louisa Counties. The major areas of commercial and business growth in Greene County are along the US 29 corridor, between Ruckersville and Albemarle County, and the US 33 corridor between

Ruckersville and the County seat of Stanardsville. The Shops at Stonefield at Hydraulic and Route 29 opened in 2015. Additional development in the 29 corridor is underway. Fifth Street Station near I-64 and Fifth Street opened in November 2016, bringing 470,000 square feet of retail space just south of the City of Charlottesville.

Public Space: The primary public space for the region is the Downtown Mall in Charlottesville, although other commercial centers function as public gathering spaces, including those under private ownership. The IX warehouse property just south of the downtown mall is now an Art Park: a public, non-commercial, interactive space for residents and visitors. Each county has at least one park available for public use. For example, Pleasant Grove Park in Fluvanna features over 23 miles of hiking trails, several soccer and baseball fields, and a transportation museum. Roadways are the largest public land use by area. New subdivisions in each of the localities are required to provide some form of open space, although this space is not always open for public use. Growth and development trends specific to individual localities are discussed in the Vulnerability Assessment section.

Economic Growth and Development

Relative to other metropolitan regions in Virginia and around the county, the overall economic growth from the Planning District has been healthy. However, the region has not been immune from the national economic downturn that has occurred since 2008. The rate of unemployment more than doubled between 2007 and 2009 in the region. However, the regional rates remain lower than the national rate of 9.2% and the slightly lower than the Virginia rate of 6.3%.

Unemployment Rate

Locality	1994	2000	2011	2015
Charlottesville	3.3 %	1.7 %	6.1 %	3.7%
Albemarle	2.4 %	1.4 %	4.9 %	3.9%
Fluvanna	3.8 %	1.5 %	5.5 %	3.7%
Greene	3.9 %	1.5 %	5.2 %	3.7%
Louisa	8.2 %	3.0 %	7.8 %	4.3%
Nelson	4.0 %	2.3 %	5.9 %	4.0%
VA	4.9 %	2.2 %	6.3 %	4.4%
National	6.1 %	4.0 %	9.2 %	5.3%

Source: Virginia Employment Commission, Bureau of Labor Statistics, National: CPS Annual Average, Local: LAUS Annual Average

Reflecting national trends, the greatest increases in jobs in the Planning District have been in the service, retail, and government sectors, while farm and manufacturing jobs have been on the decline. The University of Virginia is the largest employer in the region. Other major employers in the area include, Sentara/Martha Jefferson Hospital, State Farm, Northrop Grumman, Piedmont Virginia Community College, Dominion Virginia Power, GE Intelligent Platform Systems, Wintergreen Resort, Lexis Publishing, Crutchfield Corporation, Piedmont Virginia Community College, Klockner-Pentaplast, and the Virginia Department of Corrections.

The following table shows the number of entities and employees in various non-farm employment sectors from the Virginia Employment Commission.

Top Industry Sectors in the Charlottesville MSA

Rank	Industry Sector – 2016 Q1	Establishments	Employees
	Total, all industries	7,869	106,013
1	Health Care and Social Assistance	1,463	19,724
2	Education Services	132	19,152
3	Retail Trade (44 & 45)	751	10,604
4	Accommodation and Food Services	553	10,561
5	Professional Scientific & Technical Svc	951	6,820
6	Admin., Support, Waste Management, Remediation	360	5,134
7	Construction	692	5,057
8	Public Administration	132	4,882
9	Other Services (except Public Admin.)	887	4,402

Source: Virginia Employment Commission Labor Market Information, derived from Quarterly Census of Employment and Wages

The Education and Health Care sectors are the largest in the region, comprising about a third of all employment. The University of Virginia and the UVa Health System are major drivers in the regional economy. Growth in the retail sector has occurred in the last decade, opening up more service-sector jobs. However, the wages for service-sector jobs have grown more slowly than any other sector, often matching or barely exceeding inflation.

Job placement and workforce training opportunities are available throughout the region from a number of public agencies and non-profit service providers. Piedmont Virginia Community College had 7,595 students enrolled in 2015-2016. The City of Charlottesville launched its Growing Opportunity (GO) programs in 2014, providing basic literacy & workplace readiness training through the PluggedIn Virginia (PIVA) program, assistance with transportation and child care, and jobs-driven workforce development training programs, including GO Driver, GO Clean, GO Electric, providing job-specific training and placement with local employers.

The industries that provide the majority of jobs in our region can be affected by natural disasters. For example, if a disaster were to cause temporary or permanent damage to any of the historical sites in the region, the tourism industry would be negatively impacted. Long power outages and road closures could be extremely detrimental to all employers in the region.

Transportation

Transportation within the planning district revolves around Interstate Route 64 on an east-west axis and Route 29, which is the primary north-south axis. Other major transportation corridors include Route 15, which travels roughly north-south through Fluvanna and Louisa counties, and Route 6, which passes through southern Fluvanna County and into northern Nelson County. Route 33 cuts through Greene County on an east-west axis and travels through Orange County into and through Louisa County. These other corridors do not have the capacity for heavier volumes of traffic as do Routes 64 and 29. Narrow roads and hilly conditions in rural areas may make it more difficult for larger trucks to travel, and occasional snow in winter can cause transportation delays of several days at times. Both freight and passenger rail service runs north-south and east-west through the region, including through Charlottesville and most small towns.

Within the narrowly defined urban area of Charlottesville and a portion of Route 29 north in Albemarle County, public transportation is available. The Charlottesville Area Transit (CAT) is the primary transit-provider, serving a large portion of the City of Charlottesville with additional stops along the U.S. Route 29 corridor and Pantops in Albemarle County. All CAT buses are accessible to people with disabilities and are wheelchair lift-equipped. Area youth are allowed to ride free every summer, and year-round for students of Charlottesville High School. In addition to CAT, demand-response and limited commuter transport services are available in the region through JAUNT or Greene County Transit. JAUNT discounts fares for people with disabilities. The University of Virginia runs its own University Transit System (UTS) on and around grounds for students, staff, and faculty of the university, although it is also available to the general public without charge. The regional RideShare program matches commuters who wish to carpool.

Transportation systems are key in providing effective emergency response, but can also influence the impact of natural disasters. As the region's population becomes more dispersed and commute distances increase, the function of the economy is more and more vulnerable in the event of a debilitating natural disaster. In addition to more immediate needs, businesses and employees suffer economic consequences when roads are closed or otherwise impeded.

Housing

According to the 2010 U.S. Census, there were 105,453 housing units in the Thomas Jefferson region, with 85% of units occupied year-round. Over two-thirds of units are single-family detached homes, and 65% include three or more bedrooms. New home construction fell sharply due to the housing crisis, but the number of permits in 2016 for new homes in the region was the highest since 2007.

Number of Housing Units

Locality	2000	2010	2010-2014 ACS	Growth rate: 2000 to 2014
Charlottesville	17,591	19,189	19,603	11.4%
Albemarle	33,720	42,112	43,128	27.9%
Fluvanna	8,018	10,383	10,541	31.5%
Greene	5,986	7,509	7,790	30.1%
Louisa	11,855	16,319	16,590	39.9%
Nelson	8,554	9,931	9,990	16.8%
Region	85,724	105,443	107,642	25.6%

Source: US Census Bureau

The following table outlines the increases in household income over a 24-year period. For most of the region, the increase in income is not keeping up with the increases in housing costs.

Median Household Income from 1990 to 2014

Locality	1990	2000	2005-2009	2010-2014	Change 2009-2014
Charlottesville	$24,190	$31,007	$38,369	$47,218	23.1%
Albemarle	$36,886	$50,749	$64,306	$67,958	5.7%
Fluvanna	$31,378	$46,372	$62,163	$64,641	4.0%
Greene	$29,799	$45,931	$54,153	$63,739	17.7%
Louisa	$26,169	$39,402	$51,775	$57,126	10.3%
Nelson	$23,705	$36,769	$44,326	$50,131	13.1%

Source: US Census Bureau

Self-reported median home values are highest in Charlottesville and Albemarle and lowest in Greene and Nelson, suggesting that lower wage earners must frequently seek affordable housing far from where they work. The following figures, from the U.S. Census and American Community Survey, are self-reported, meaning that the respondents reported the value of their homes based on their own judgment.

Median Home Values: From 1990 to 2015

Locality	2000*	2009**	2014**	% Change 2000-2009	% Change 2009-2014
Albemarle	$160,500	$336,100	$317,300	109%	-5.59%
Charlottesville	$117,800	$265,300	$283,100	125%	6.71%
Fluvanna	$113,200	$236,200	$214,000	109%	-9.40%
Greene	$108,200	$215,000	$244,400	99%	13.67%
Louisa	$96,100	$202,300	$194,500	111%	-3.86%
Nelson	$94,000	$161,200	$198,500	71%	23.14%

*Census 1990 and Census 2000 data
** American Community Survey 5-year Estimate data

Median self-reported figures for homes in the Planning District increased significantly from the self-reported figures essentially doubled from 2000 to 2009. This increase was not fully sustained throughout the region between 2009 and 2014, with half of the six localities seeing a decrease in the self-reported home values over that 5-year period. The following table shows that actual sale prices increased in some localities and decreased in others.

Median Sale Price: 2005- 2014

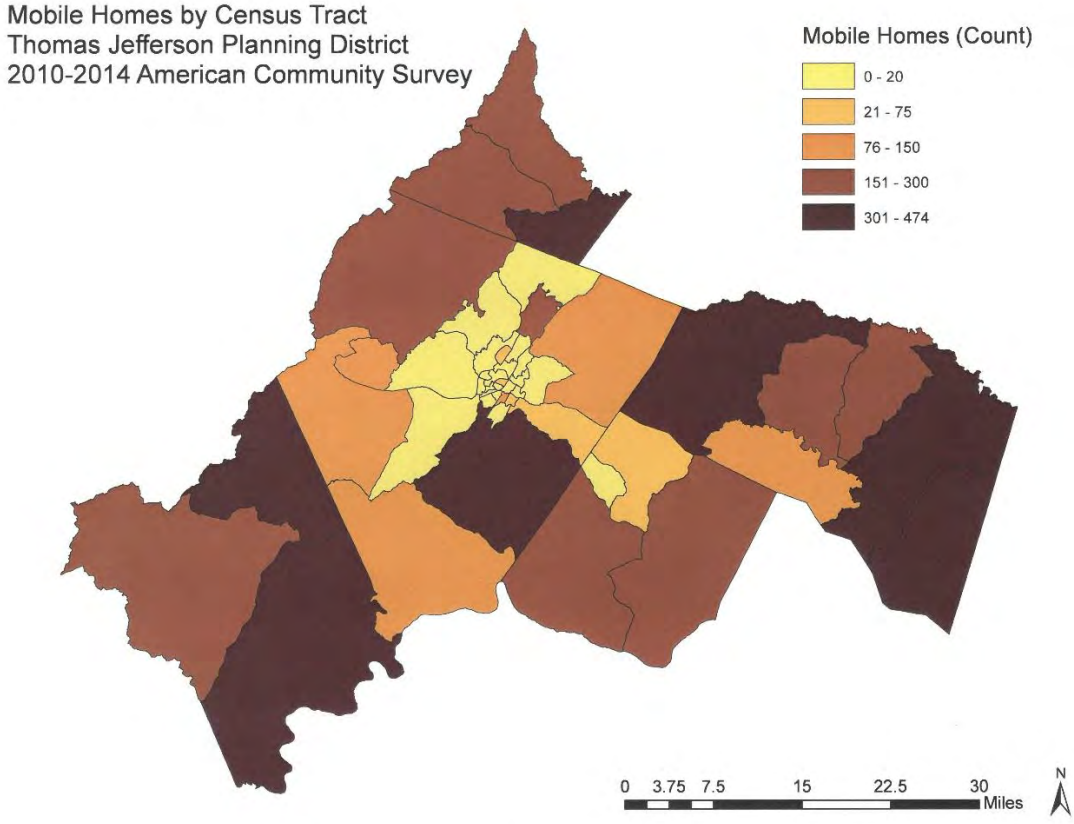
Locality	2005	2009	2014	% Change 2009 - 2014
Albemarle	$285,000	$320,000	$330,618	3%
Charlottesville	$249,000	$246,750	$262,500	6%
Fluvanna	$234,000	$201,978	$189,900	-6%
Greene	$234,900	$245,000	$225,000	-8%
Louisa	$205,900	$209,900	$198,950	-5%
Nelson	$300,000	$278,500	$238,875	-14%

Source: Charlottesville Area Association of Realtors

Low income residents are often disproportionately affected by natural disasters. Typically, the only land available to low income families is in less desirable locations, in or near high hazard risk areas, such as along flood plains. Affordable housing may not be as well constructed as other housing, and therefore is more susceptible to damage from natural hazards. Households living in mobile homes, especially those that were built before 1978, can be at significant risk from natural disasters. Low income families may also have less disposable income to make their homes more disaster resistant.

The map below illustrates the concentration of mobile homes in the Planning District. Mobile homes are often susceptible to extensive damage in flooding and high winds.

Mobile Home Map



Disaster Declarations

The following table lists presidential disaster declarations in the state, many of which included the localities in the Thomas Jefferson Planning District.

Presidential Disaster Declarations in Virginia Since 1969		
Aug.	1969	Hurricane Camille (flooding); 27 jurisdictions declared, All localities in PDC
June	1972	Hurricane Agnes (flooding); 106 jurisdictions declared, All localities in PDC
Sept.	1972	Storm/Flood; Hampton, Newport News, & Virginia Beach declared, None in PDC
Oct.	1972	Flood; Western, Central, Southeastern Virginia; 31 jurisdictions declared,
April	1977	Flash Flood; Southwestern Virginia; 16 jurisdictions declared, None in the PDC
Nov.	1977	Flood; Southwestern Virginia; 8 jurisdictions declared, None in the PDC
July	1979	Flood; Buchanan County declared
Sept.	1979	Flood; Patrick County declared
May	1984	Flood; Buchanan, Dickenson & Washington Counties declared
Nov.	1985	Flood; Western, Central Virginia; 52 jurisdictions declared
Oct.	1989	Flood; Buchanan County declared
April	1992	Flood; Western Virginia; 24 jurisdictions declared, None in the PDC
March	1993	Snowstorm; 43 jurisdictions declared
Aug.	1993	Tornado; Petersburg declared
Feb.	1994	Ice Storm; Central, Western Virginia; 71 jurisdictions declared, None in the PDC
March	1994	Ice Storm; Central, Western Virginia; 29 jurisdictions declared, None in the PDC
June	1995	Flood; Central & Western Virginia; 24 jurisdictions declared
Jan.	1996	Blizzard; All counties and cities in state declared, All localities in PDC declared
Jan.	1996	Flood; 27 jurisdictions declared
Sept.	1996	Hurricane Fran (flooding); 88 jurisdictions declared
Aug.	1998	Hurricane Bonnie (flooding); 5 jurisdictions declared, None in the PDC
Sept.	1999	Hurricane Dennis; Hampton declared, None in the PDC
Sept.	1999	Hurricane Floyd (flooding); 48 jurisdictions declared, None in the PDC
Feb.	2000	Winter Storms; 107 jurisdictions declared: all except Charlottesville and Nelson
July	2001	Flood; Southwestern Virginia; 10 jurisdictions declared, None in the PDC

Sept.	2001	Pentagon Attack; 1 jurisdiction declared, None in the PDC
March	2002	Flood; Southwestern Virginia; 10 jurisdictions declared, None in the PDC
April/May	2002	Flood; Southwestern Virginia; 9 jurisdictions declared, None in the PDC
Feb.	2003	Winter Storms/Flooding; 39 jurisdictions declared, None in the PDC
Sept.	2003	Hurricane Isabel (winds, flooding); 100 jurisdictions declared, All localities in the PDC were declared
Nov.	2003	Flood; Southwestern Virginia; 6 jurisdictions declared
May	2004	Flood; Southwestern Virginia; 3 jurisdictions declared
Sept	2004	Flood; Central Virginia; 12 jurisdictions declared, None in the PDC
October	2004	Severe Storms and Flooding from the remnants of Hurricane Jeanne, None in the PDC declared
Sept.	2005	Hurricane Katrina Evacuation
April	2006	Bull Mountain Fire
July	2006	Severe Storms, Tornadoes, and Flooding
Sept.	2006	Severe Storms and Flooding, Including Severe Storms and Flooding Associated with Tropical Depression Ernesto
Dec.	2009	Severe Storms and Flooding Associated with Tropical Depression Ida and a Nor'easter
Feb.	2010	Severe Winter Storm and Snowstorm
April	2010	Severe Winter Storms and Snowstorms
Feb.	2011	Smith Fire
Feb.	2011	Coffman Fire
Sep	2011	Hurricane Irene
Nov	2011	Earthquake
Nov	2011	Remnants of Tropical Storm Lee
July	2012	Severe Storms and Straight-line Winds
Nov	2012	Hurricane Sandy
Mar	2016	Severe Winter Storm and Snowstorm
Nov	2016	Hurricane Matthew

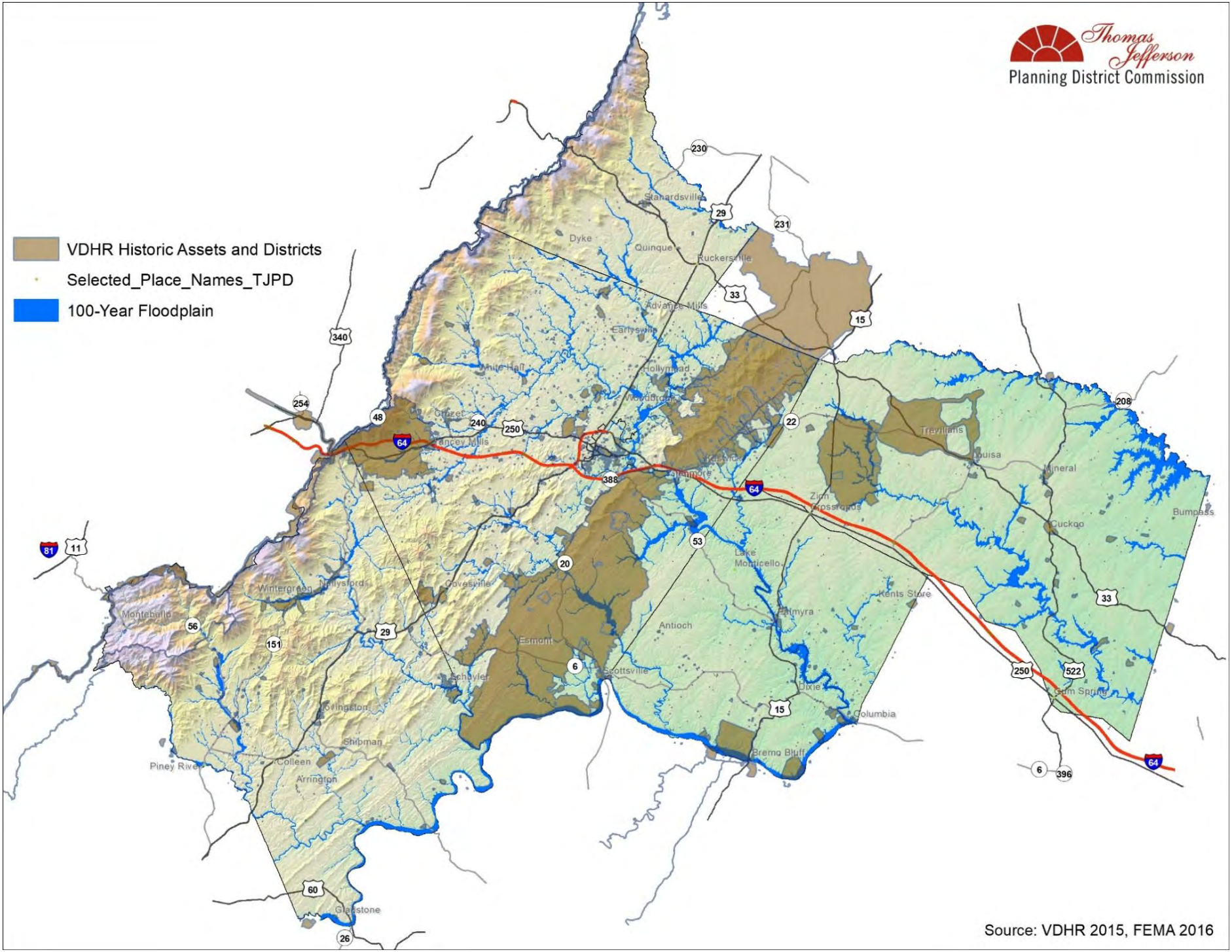
Source: FEMA, VDEM

Historic Districts

The Thomas Jefferson Planning District is home to a number of historic districts (HD) and properties, and the UNESCO World Heritage Site of Monticello and the University of Virginia's Academical Village. The region's history is a significant contributor to the area's character and supports a robust tourism industry. The Historic Downtown Mall in Charlottesville is considered one of the finest urban parks in the country. This pedestrian mall is home to a vibrant collection of more than 120 shops and 30 restaurants located in the historic buildings on and around old Main Street Charlottesville. Historic Districts in the region are:

- Advance Mills (Fray's Mill) HD (Albemarle County)
- Batesville HD (Albemarle County)
- Covesville HD (Albemarle County)
- Crozet HD (Albemarle County)
- Proffit HD (Albemarle County)
- Southern Albemarle Rural HD (Albemarle County)
- Southwest Mountain Rural HD (Albemarle County)
- UVA Area HD (Albemarle County and Charlottesville)
- Greenwood-Afton HD (Albemarle and Nelson Counties)
- Charlottesville and Albemarle County Courthouse HD (Charlottesville)
- Fifeville and Tonsler Neighborhoods HD (Charlottesville)
- Fry's Spring HD (Charlottesville)
- Oakhurst-Gildersleeve HD (Charlottesville)
- West Main Street HD(Charlottesville)
- Ridge Street HD (Charlottesville)
- Wertland Street HD (Charlottesville)
- Woolen Mills Village HD (Charlottesville)
- Rugby Road – University Corner – Venable Neighborhood HD (Charlottesville)
- Bremo Plantation HD (Fluvanna)
- Fluvanna County Courthouse HD (Fluvanna County)
- Scottsville HD (Albemarle and Fluvanna Counties)
- Stanardsville HD (Greene County)
- Green Springs HD - National Trust Landmark District (Louisa)
- Mineral HD (Louisa)

A map showing Virginia Department of Historic Resources (VDHR) Historic Assets and Districts overlain with the 100-year flood plain is included on the following page. The Town of Scottsville experienced twenty-one floods of 20 feet or more above mean low water level between 1870 and 1990. The impoundment on Mink Creek was completed in 1975, and the A. Raymon Thacker Levee was dedicated in 1990. Scottsville has not been flooded since the levee was constructed. A stone and earthwork dam protects Bremo Plantation structures in Fluvanna County. Land in the flood plains are generally in the rural historic districts.


Thomas Jefferson
Planning District Commission
VDHR Historic Assets and Districts
Selected_Place_Names_TJPD
100-Year Floodplain
Standardsville
Dyke
Quinque
Ruckersville
Advance Mills
Earlysville
White Hall
Hollymead
Woodbrook
Crozet
Ivy
Keene
Trevilians
Louisa
Mineral
Zion Crossroads
Bumpass
Cuckoo
Lake Monticello
Kents Store
Palmyra
Antioch
Esmont
Scottsville
Dixie
Columbia
Bremo Bluff
Gum Spring
Wintergreen
Nellysford
Covesville
Montebello
Schuyler
Lovingston
Shipman
Colleen
Arrington
Piney River
Glenstone
Source: VDHR 2015, FEMA 2016

Hazard Identification and Analysis

201.6(c)(2)(i): The risk assessment shall include a description of the…location and extent of all natural hazards that can affect the jurisdiction. The plan shall include information on previous occurrences of hazard events and on the probability of future hazard events.

201.6(c)(2)(ii): The risk assessment shall include a description of the jurisdiction's vulnerability to the hazards described in paragraph (c)(2)(i) of this section. This description shall include an overall summary of each hazard and its impact on the community.

Purpose

IThe purpose of the hazard identification process is to describe all natural hazards that affect the Thomas Jefferson Planning district and provide an analysis on their location, extent, severity, and probability of occurrence. Each individual hazard was identified, including a description of the hazard in general written from a national perspective, followed by an in-depth analysis based on the particular impact the hazard has on the Thomas Jefferson Planning District. Most of the general descriptions were updated in 2011 and have not significantly changed in the previous five years. However, new data and information on regional events that occurred between 20011 and 2015 were used to augment the analysis of hazards previously identified.

The hazards appear in the order of relative risk posed to the Planning District. The Working Group agreed on the rating for each parameter for all potential hazards, using a risk matrix developed by Kaiser Permanente. Based on the relative threat, as determined by the Working Group, hurricanes/high winds and windstorms, flooding and winter storms posed the greatest threat. Therefore, these hazards are analyzed in greater detail in this plan. Other hazards that appear on the list do not pose a significant risk, but are still accounted for in this plan. Hazards not listed are considered to have no potential for direct impact on the region. Some hazards are interrelated (i.e., hurricanes can cause flooding and tornadoes), and some consist of hazardous elements that are not listed separately (i.e., severe thunderstorms can cause lightning; hurricanes can cause coastal erosion). It should also be noted that some hazards, such as severe winter storms, may impact a large area yet cause little damage, while other hazards, such as a tornado, may impact a small area yet cause extensive damage.

There is an emerging scientific consensus that global climate change may alter the incidence and severity of disasters in the future. Changes in weather patterns, including hotter summers and winters with greater than average snowfall, will potentially impact all sectors of the community. Agriculture may be affected by drought conditions while stormwater infrastructure can become overwhelmed with unusually heavy rainfall. Severe storms can create vulnerabilities in the energy sector, threatening power supply to homes and businesses as well as to medical facilities.

The Hazard Assessment Tool was used to evaluate each identified hazard according to the probability of occurrence and the severity in terms of impact to human life, property, and business operations. The following table is a prioritized list of hazards for the region as determined by the Hazard Mitigation Working Group. The exercise took into account national and state-level data, the local experience of members of the group, and the results of a prior assessment made in 2011.

Hazard Assessment Tool Rankings

	PROBABILITY 2015	HUMAN IMPACT	PROPERTY IMPACT	BUSINESS IMPACT	RISK 2015
Event	*Likelihood this will occur*	*Possibility of death or injury*	*Physical losses and damages*	*Interruption of services*	*Relative threat (increases with Percentage)*
Hurricane/high wind/windstorm	3	3	3	3	100%
Flooding	3	1	3	2	67%
Winter Storms/ weather	3	1	1	3	56%
Wildfire	2	1	1	1	22%
Lightning	2	1	1	1	22%
Drought and extreme heat	2	1	1	1	22%
Dam Failure	1	2	2	2	22%
Tornado	1	1	2	2	19%
Earthquake	1	1	2	2	19%
Landslide	1	1	1	1	11%
AVERAGE SCORE	1.90	1.30	1.70	1.80	34%

Rankings:
0 = N/A
1 = Low
2 = Moderate
3 = High

Risk	Probability	Severity
0.34	0.63	0.53

Data Disclaimer: In all tables where the National Climate Data Center (NCDC) is listed as the primary source, it is possible that data is reported with other localities, resulting in a value that is neither different nor exclusive. NCDC, like the TJPDC uses best available data. NCDC provides this disclaimer:

Storm Data Disclaimer: Storm Data is an official publication of the National Oceanic and Atmospheric Administration (NOAA) which documents the occurrence of storms and other significant weather phenomena having sufficient intensity to cause loss of life, injuries, significant property damage, and/or disruption to commerce. In addition, it is a partial record of other significant meteorological events, such as record maximum or minimum temperatures or precipitation that occurs in connection with another event. Some information appearing in Storm Data may be provided by or gathered from sources outside the National Weather Service (NWS), such as the media, law enforcement and/or other government agencies, private companies, individuals, etc. An effort is made to use the best available information but because of time and resource constraints, information from these sources may be unverified by the NWS. Therefore, when using information from Storm Data, customers should be cautious as the NWS does not guarantee the accuracy or validity of the information. Further, when it is apparent information appearing in Storm Data originated from a source outside the NWS (frequently credit is provided), Storm Data customers requiring additional information should contact that source directly. In most cases, NWS employees will not have the knowledge to respond to such requests. In cases of legal proceedings, Federal regulations generally prohibit NWS employees from appearing as witnesses in litigation not involving the United States.

However, in many cases the National Weather Service NCDC (now National Centers for Environmental Information) combine Charlottesville and Albemarle observations into either one or the other jurisdiction. This is sometime referred to the Albemarle Charlottesville Zone in the database. When the data was analyzed many of these events were included in the Albemarle line item that affected both jurisdictions.

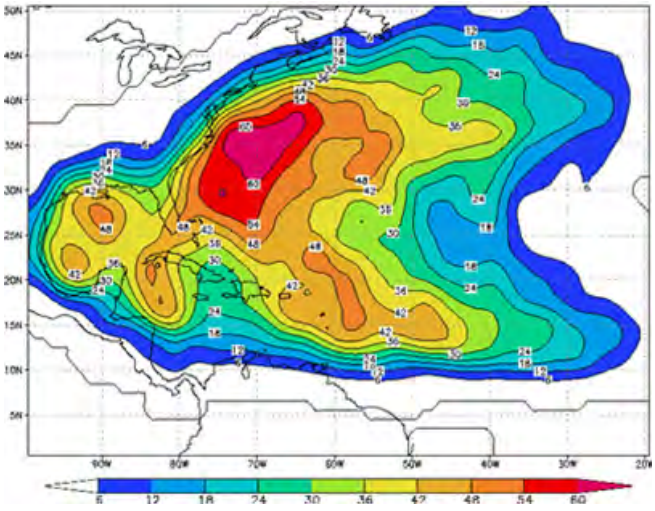
It is important to note that many types of weather events affect multiple jurisdictions and therefore the same event can either show up in one county or all 6 counties covered by the plan. Anecdotally, when there is no damage $$ reported the event location tends to be more vague.

For example, only 65 events were reported in Charlottesville in a 20 year period, where for the same period there were over 380 events reported in Albemarle, many of which impacted the whole county.

Hurricane

⏩ Identification

Hurricanes, tropical storms, nor'easters, and typhoons, also classified as cyclones, are any closed circulation developing around a low-pressure center in which the winds rotate counter-clockwise in the Northern Hemisphere (or clockwise in the Southern Hemisphere) and whose diameter averages 10 to 30 miles across. A tropical cyclone refers to any such circulation that develops over tropical waters. Tropical cyclones act as a "safety-valve," limiting the continued build-up of heat and energy in tropical regions by maintaining the atmospheric heat and moisture balance between the tropics and the pole-ward latitudes. The primary damaging forces associated with these storms are high-level sustained winds, heavy precipitation, and tornadoes. Coastal areas are also vulnerable to the additional forces of storm surge, wind-driven waves, and tidal flooding which can be more destructive than cyclone wind.



The key energy source for a tropical cyclone is the release of latent heat from the condensation of warm water. Their formation requires a low-pressure disturbance, warm sea surface temperature, rotational force from the spinning of the earth, and the absence of wind shear in the lowest 50,000 feet of the atmosphere. The majority of hurricanes and tropical storms form in the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico during the official Atlantic hurricane season, which encompasses the months of June through November. The peak of the Atlantic hurricane season is in early to mid-September and the average number of storms that reach hurricane intensity per year in this basin is about six (6).

As an incipient hurricane develops, barometric pressure (measured in Millibars or inches) at its center falls and winds increase. If the atmospheric and oceanic conditions are favorable, it can intensify into a tropical depression. When maximum sustained winds reach or exceed 39 miles per hour, the system is designated a tropical storm, given a name, and is closely monitored by the National Hurricane Center in Miami, Florida. When sustained winds reach or exceed 74 miles per hour the storm is deemed a hurricane. Hurricane intensity is further classified by the Saffir-Simpson Scale, which rates hurricane intensity on a scale of 1 to 5, with 5 being the most intense.

Saffir-Simpson Scale

The Saffir-Simpson Scale categorizes hurricane intensity linearly based upon maximum sustained winds, barometric pressure, and storm surge potential, which are combined to estimate potential damage. Categories 3, 4, and 5 are classified as "major" hurricanes, and while hurricanes within this range comprise only 20 percent of total tropical cyclone landfalls, they account for over 70 percent of the damage in the United States. The table below describes the damage that could be expected for each category of hurricane.

Category	Maximum Sustained Wind Speed (MPH)	Minimum Surface Pressure (Millibars)	Storm Surge (Feet)
1	74—95	>980	3—5
2	96—110	979—965	6—8

Hurricane Damage Classification

Category	Damage Level	Description
1	MINIMAL	No real damage to building structures. Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal flooding and minor pier damage.
2	MODERATE	Some roofing material, door, and window damage. Considerable damage to vegetation, mobile homes, etc. Flooding damages piers and small craft in unprotected moorings may break their moorings.
3	EXTENSIVE	Some structural damage to small residences and utility buildings, with a minor amount of curtain wall failures. Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain may be flooded well inland.
4	EXTREME	More extensive curtain wall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Terrain may be flooded well inland.
5	CATASTROPHIC	Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Flooding causes major damage to lower floors of all structures near the shoreline. Massive evacuation of residential areas may be required.

3	111—130	964—945	9—12
4	131—155	944—920	13—18
5	155+	<920	19+

A storm surge is a large dome of water often 50 to 100 miles wide and rising anywhere from four to five feet in a Category 1 hurricane up to 20 feet in a Category 5 storm. The storm surge arrives ahead of the storm's actual landfall and the more intense the hurricane is, the sooner the surge arrives. Water rise can be very rapid, posing a serious threat to those who have not yet evacuated flood-prone areas. A storm surge is a wave that has outrun its generating source and become a long period swell. The surge is always highest in the right-front quadrant of the direction in which the hurricane is moving. As the storm approaches shore, the greatest storm surge will be to the north of the hurricane eye. Such a surge of high water topped by waves driven by hurricane force winds can be devastating to coastal regions, causing severe beach erosion and property damage along the immediate coast.

Damage during hurricanes may also result from spawned tornadoes and inland flooding associated with heavy rainfall that usually accompanies these storms. Hurricane Floyd, as an example, was at one time a Category 4 hurricane racing towards the North Carolina coast. As far inland as Raleigh, the state capital located more than 100 miles from the coast, communities were preparing for extremely damaging winds exceeding 100 miles per hour. Floyd made landfall as a Category 2 hurricane and will be remembered for causing the worst inland flooding disaster in North Carolina's history. Rainfall amounts were as high as 20 inches in certain locales and 67 counties sustained damages.

Similar to hurricanes, nor'easters are ocean storms capable of causing substantial damage to coastal areas in the Eastern United States due to their associated strong winds and heavy surf. Nor'easters are named for the winds that blow in from the northeast and drive the storm up the East Coast along the Gulf Stream, a band of warm water that lies off the Atlantic coast. They are caused by the interaction of the jet stream with horizontal tempera-

ture gradients and generally occur during the fall and winter months when moisture and cold air are plentiful.

Analysis

Hurricanes have affected every locality in the planning district in many different forms over time. Hurricanes produce a variety of hazards, including flash flooding, riverine flooding, high winds, and sometimes spawn tornados and landslides. Modern communications make tracking and warning for these storms much easier, allowing people to prepare for the event in advance. However, spot damage can be quite extensive and sudden, with no opportunity for advance preparation.

The most severe and remembered was Hurricane Camille, which in 1969 devastated much of the planning district. Camille produced torrential rains in the remote mountains of Nelson County, Virginia. In just 12 hours, the mountain slopes between Charlottesville and Lynchburg received over 10 inches of rain. Nelson County recorded almost 30 inches of rainfall within 4 ½ hours. The flooding was so catastrophic that all communications were cut off. Although the eye of Hurricane Camille did not actually pass through Nelson County, the resulting rainfall proved to be devastating. As a result of the deluge of water flowing from the water-soaked mountainsides, massive landslides occurred which swept tons of soil, boulders, and thousands of trees onto farmlands, highways, floodplains and into the normal streambed and banks of almost every stream in the area. Over 150 people died in Virginia as a result of Hurricane Camille and another 100 were injured. Damage was estimated at 113 million dollars (1969 dollars)

Hurricane Ivan was the largest storm to pass through the planning district in the last ten years. The storm achieved category 5 status over the Gulf of Mexico, but had been degraded to a tropical depression before reaching Virginia. The storm impacted the region with high winds and heavy rain. It also produced at least one small tornado in the region.

Since 1871, 123 hurricanes and tropical storms have affected Virginia taking 228 lives and costing the Commonwealth over a billion dollars in damages. The eye or center of 69 tropical cyclones tracked directly across Virginia. Virginia averages one storm a year, with no storms some years and multiple storms in rapid succession in others. Maps on the following pages demonstrate the lack of pattern and predictability of the paths of historic hurricanes.

Hurricane Ivan (2014) Track

Source: Wikipedia

Hurricane and Tropical Storm Record 1995-2015

Locality	#	Deaths	Injuries	Property Loss	Crop Damage
Albemarle/Cville (reported with Nelson)	2			$ 5,000	
Fluvanna (reported with Louisa)	1			$ 36,000	
Greene	1			$ 1,000	
Louisa (reported with Fluvanna)	1				
Nelson (reported with Albemarle)	2			$ 1,000	

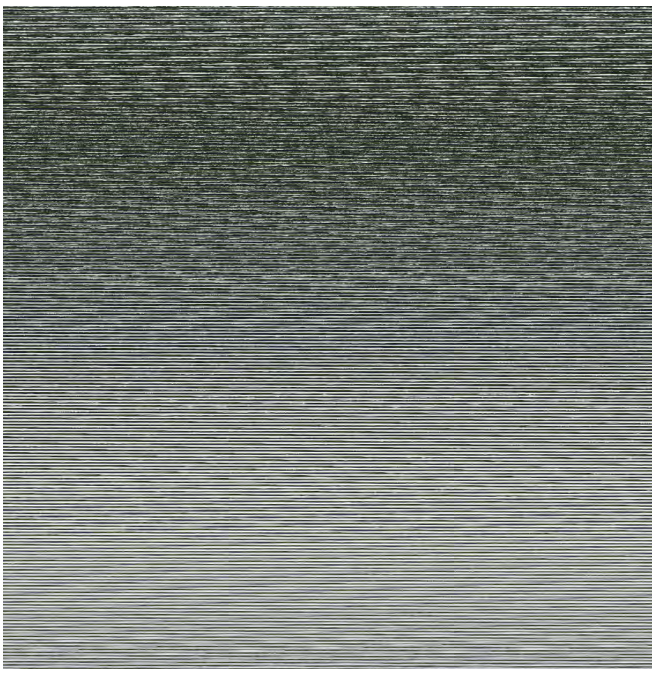
Source: National Climate Data Center

Notable Hurricanes in the Planning District

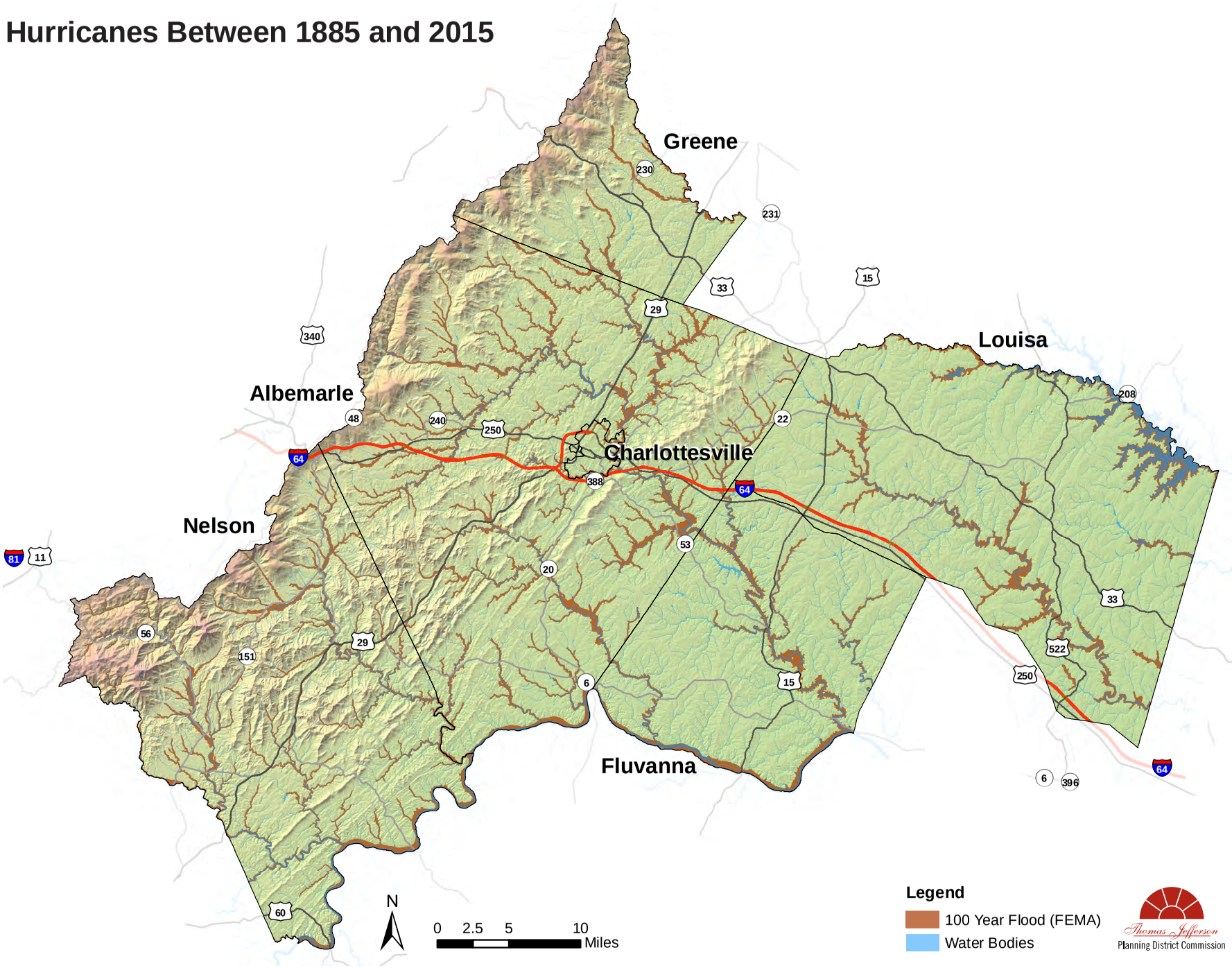
Note: Most of these storms were downgraded to tropical storms or tropical depressions by the time they reached the Planning District.

Hurricane	Specific Area	Damage	Year	Cat.
Joaquin	All	Rain, localized flooding	Oct 2, 2015	2
Arthur	Fluvanna, Louisa, Albemarle	Power outages, rain, flooding	July 4, 2014	2
Sandy	Nelson, Greene	Power outages, rain, flooding	Oct 29, 2012	3
Cindy	Fluvanna and Louisa Counties	3 deaths in U.S.	July 7, 2005	1
Ivan	Fluvanna and Louisa Counties	Estimated $18 billion in U.S. damages and 25 deaths	Sept. 18, 2004	5
Isabel		Preliminary estimate of over $4 billion in damages/costs; at least 40 deaths	Sept 18, 2003	5
Floyd				
		Flooding rains and high winds. 4 deaths; over 280,000 customers without electricity, 5,000 homes damaged.	Sept 14-18, 1999	4
Fran				
	Northwest Greene Co. was hardest hit.	$5.8 billion damage; 37 deaths, loss of electricity (state-wide)	Sept 5, 1996	3
Agnes	Scottsville (34 feet), Howardsville and Columbia	More than 210,000 people were forced to flee for their lives and 122 were killed.	June 19-24, 1972	1
Camille	Worst affected: Massie Mill, Davis Creek, Scottsville, Howardsville, Schuyler, Columbia, Piney River	114 deaths in Nelson Co alone. Flooding & landslides. $1.42 billion (unadjusted).	August 1969	5
Hazel		Flooding, barns leveled, roofs pulled off.	Oct 14-15, 1954	4

Source: National Weather Service, Albemarle County Historical Society



Hurricanes Between 1885 and 2015



High Wind Wind/Windstorm and Thunder

Identification

High Winds: The figure below shows how the frequency and strength of extreme windstorms vary across the United States. The map was produced by the Federal Emergency Management Agency and is based on 40 years of tornado history and over 100 years of hurricane history. Zone IV, the darkest area on the map, has experienced both the greatest number of tornadoes and the strongest tornadoes. As shown by the map key, wind speeds in Zone IV can be as high as 250 MPH.

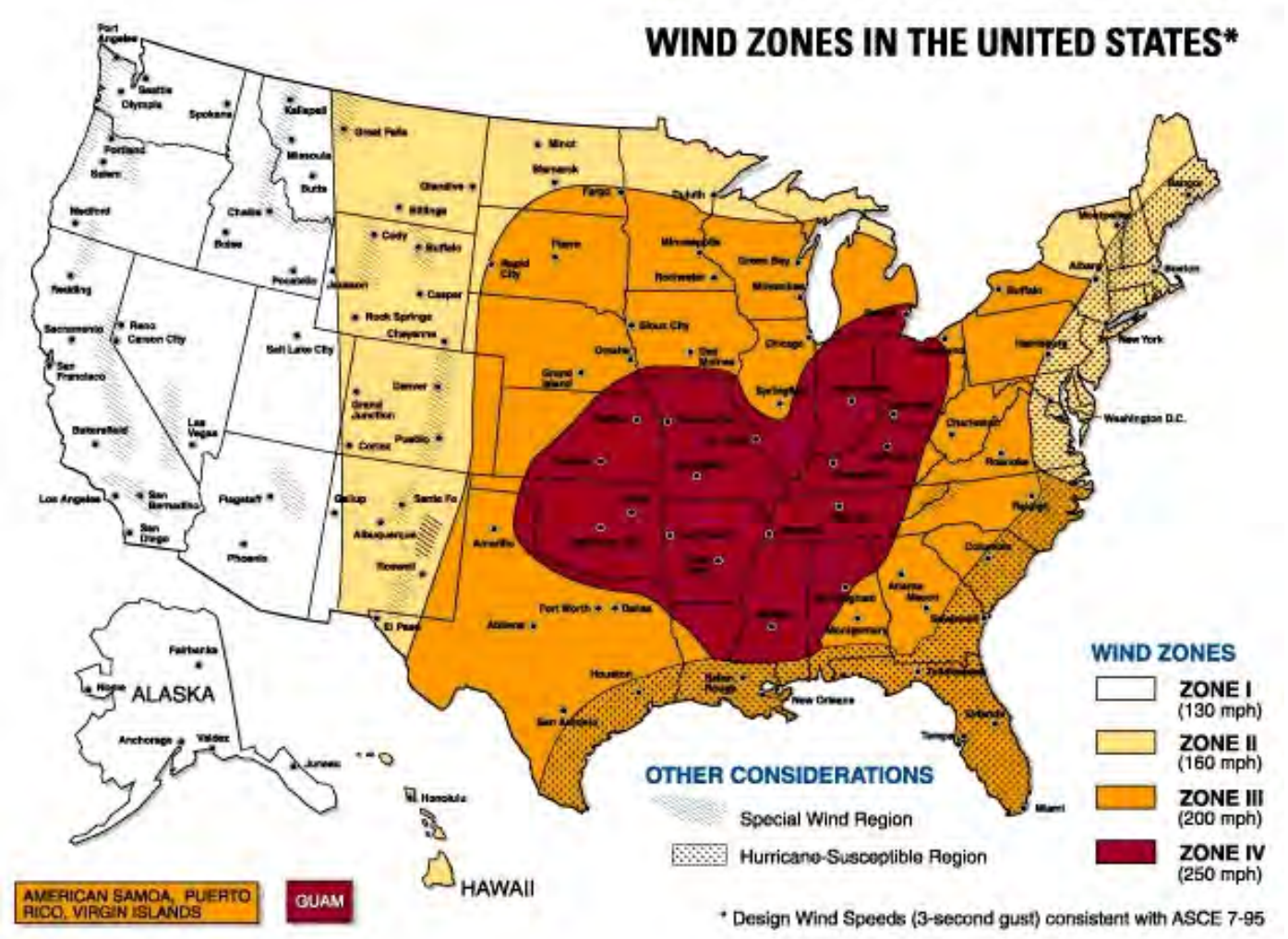


Figure I.2 Wind zones in the United States

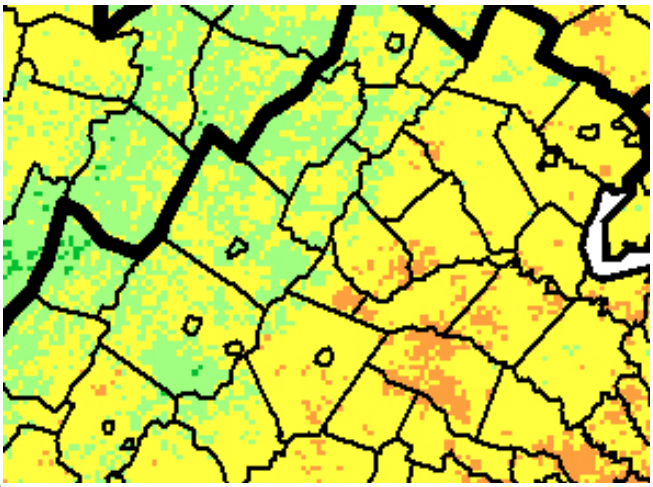
Source: Federal Emergency Management Agency

Thunderstorms: According to the National Weather Service, more than 100,000 thunderstorms occur each year, though only about 10 percent of these storms are classified as "severe." Although thunderstorms generally affect a small area when they occur, they're danger lies in their ability to generate tornadoes, hailstorms, strong winds, flash flooding, and damaging lightning. While thunderstorms can occur in all regions of the United States, they are most common in the central and southern states atmospheric conditions in those regions are most ideal for generating these powerful storms.

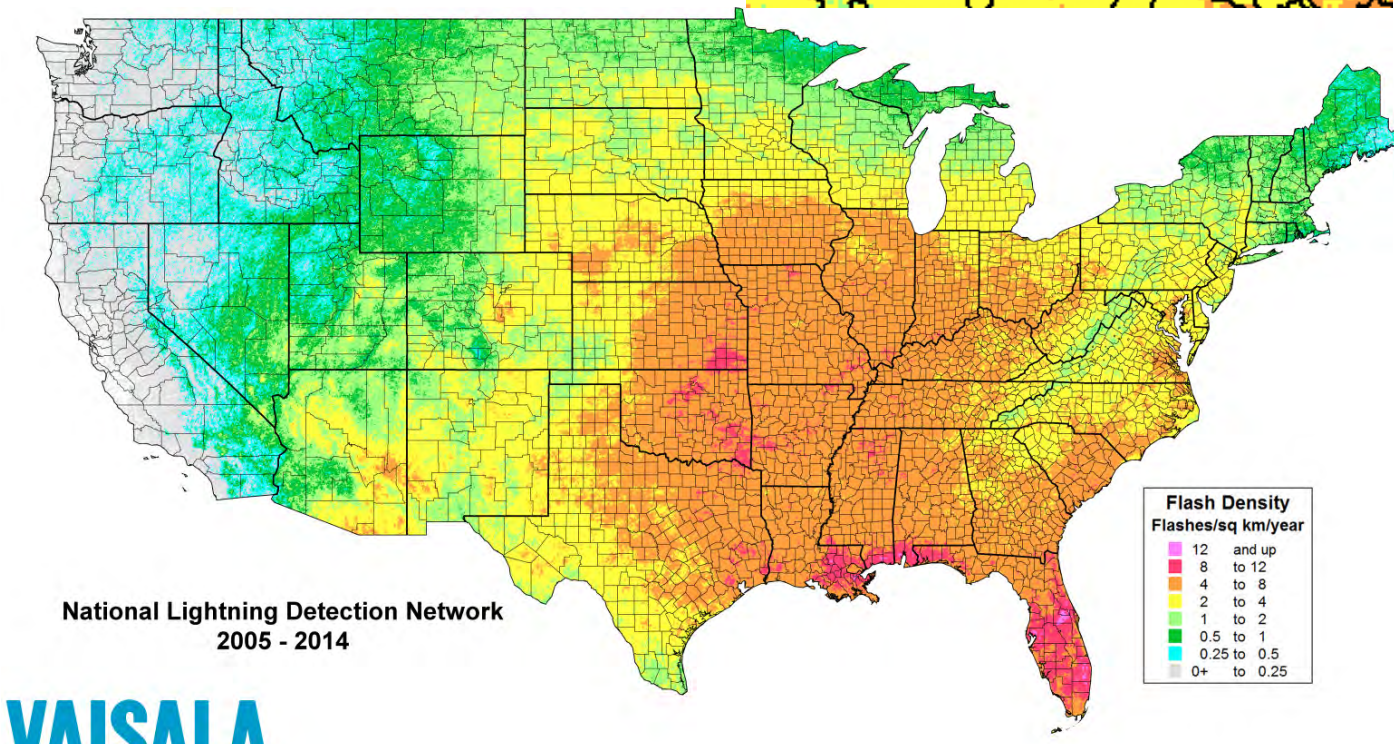
Thunderstorms are caused when air masses of varying temperatures meet. Rapidly rising warm moist air serves as the "engine" for thunderstorms. These storms can occur singularly, in lines, or in clusters. They can move through an area very quickly or linger for several hours.

The map below illustrates thunderstorm hazard severity based on the annual average number of thunder events from 2005-2014.

TJPDC Region Inset



Lightning Intensity

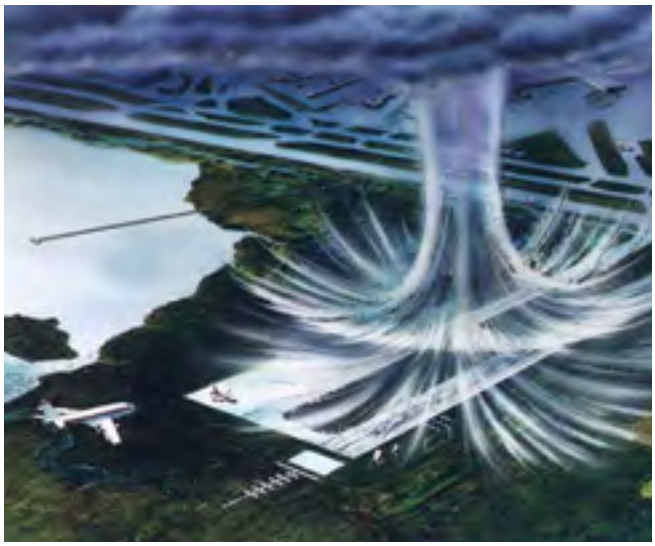


Source: VAISALA 2015

Microbursts: A microburst is defined as a small downburst with its outburst, damaging winds extending only 2.5 miles or less. In spite of its small horizontal scale, an intense microburst could induce damaging winds as high as 160 mph. A "dry microburst" is caused by evaporation cooling the air and causing it to descend downward abruptly. A "wet microburst" is triggered by a thunderstorm and are accompanied by a large amount of precipitation.

Microbursts are a considerable aviation concern. Their sudden and severe nature can push aircraft toward the ground, and in some cases, result in crashes. They have also caused very localized damage to trees and buildings.

A June 24, 2010 wind storm formed microbursts that caused extensive tree damage throughout Charlottesville and portions of Albemarle County north of the City. The event also resulted in extended power outages for 60,000 customers of Dominion Power.



Source: NASA

Derecho Straight-Line Winds: A Derecho is a widespread long-lived straight-line wind storm that is associated with a land based, fast moving group of severe thunderstorms. Derechos can produce hurricane force winds, tornados, heavy rains and trigger flash floods. Derechos are considered a warm weather phenomena and mostly occur during warmer months.

A June 29, 2012 derecho associated with a line of intense fast moving thunderstorms caused the loss of 15 lives in the State with two lives lost in Albemarle County. The event also brought down numerous trees and caused extensive power loss. Albemarle County spent an estimated $150,000 on cleaning up debris and overtime for staff.

Source: Wikipedia

⏩ Analysis

Each of the localities in the Planning District has been affected by windstorms that cause property damage. High winds often accompany thunderstorms, hurricanes or tornadoes; the latter two are discussed in more detail in other sections of this report. Most of the damage is a result of downed trees, road closures, and utility and communication outages. Structural damage may be sustained in poorly constructed buildings.

Wind damage during Hurricane Ivan
Source: TJPDC

Analysis

High Wind 1995 -2015

Locality	#	Death	Injuries	Property Loss	Crop Damage
Albemarle	26		66	$2,163,100	$900,000
Charlottesville					
Fluvanna	1			$2,000	
Greene	15			$573,100	$250,000
Louisa	4			$8,000	
Nelson	24			$226,600	$370,000
Region	70	0	66	$2,972,800	$1,520,000

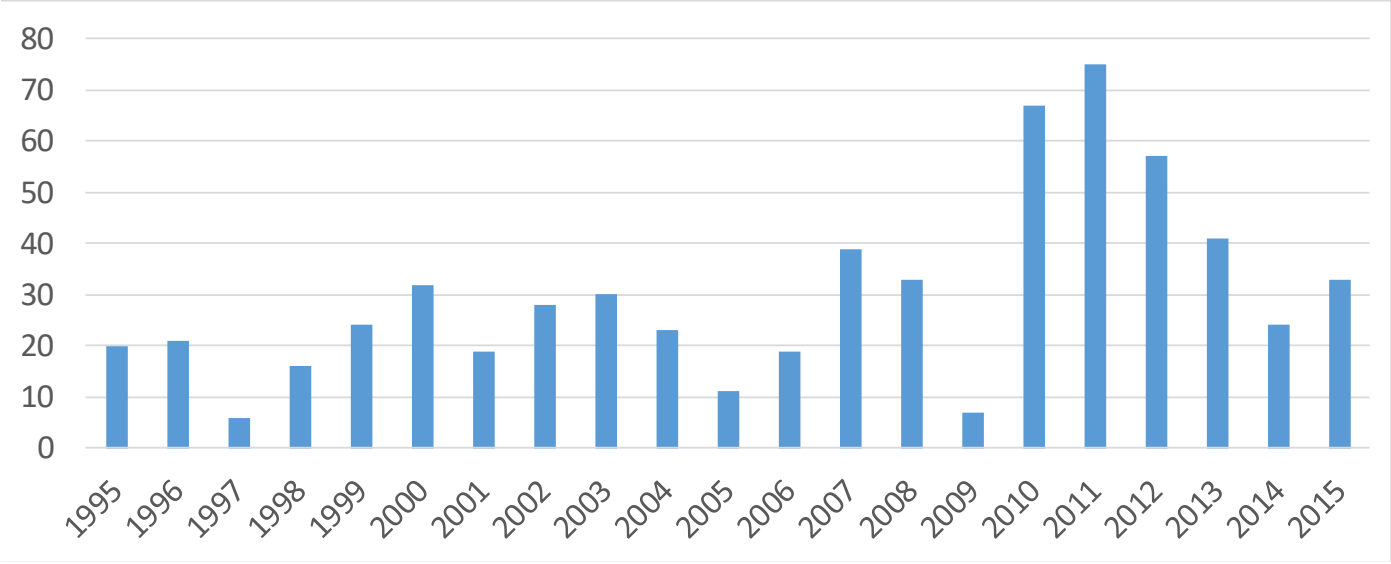
Source: National Climate Data Center (NOAA)

Thunderstorms with Wind 1995 -2015

Locality	#	Death	Injuries	Property Loss	Crop Damage
Albemarle	233	2	15	$1,128,800	$24,250
Charlottesville	39		4	284500	
Fluvanna	58			$650,000	
Greene	47			$170,500	$7,000
Louisa	100			$871,000	
Nelson	93			$585,100	$18,250
Region	570	2	19	$3,689,900	$49,500

Source: NCDC, Albemarle Historical Society archived newspapers, HMP working Group

Number of Wind Events 1995-2015



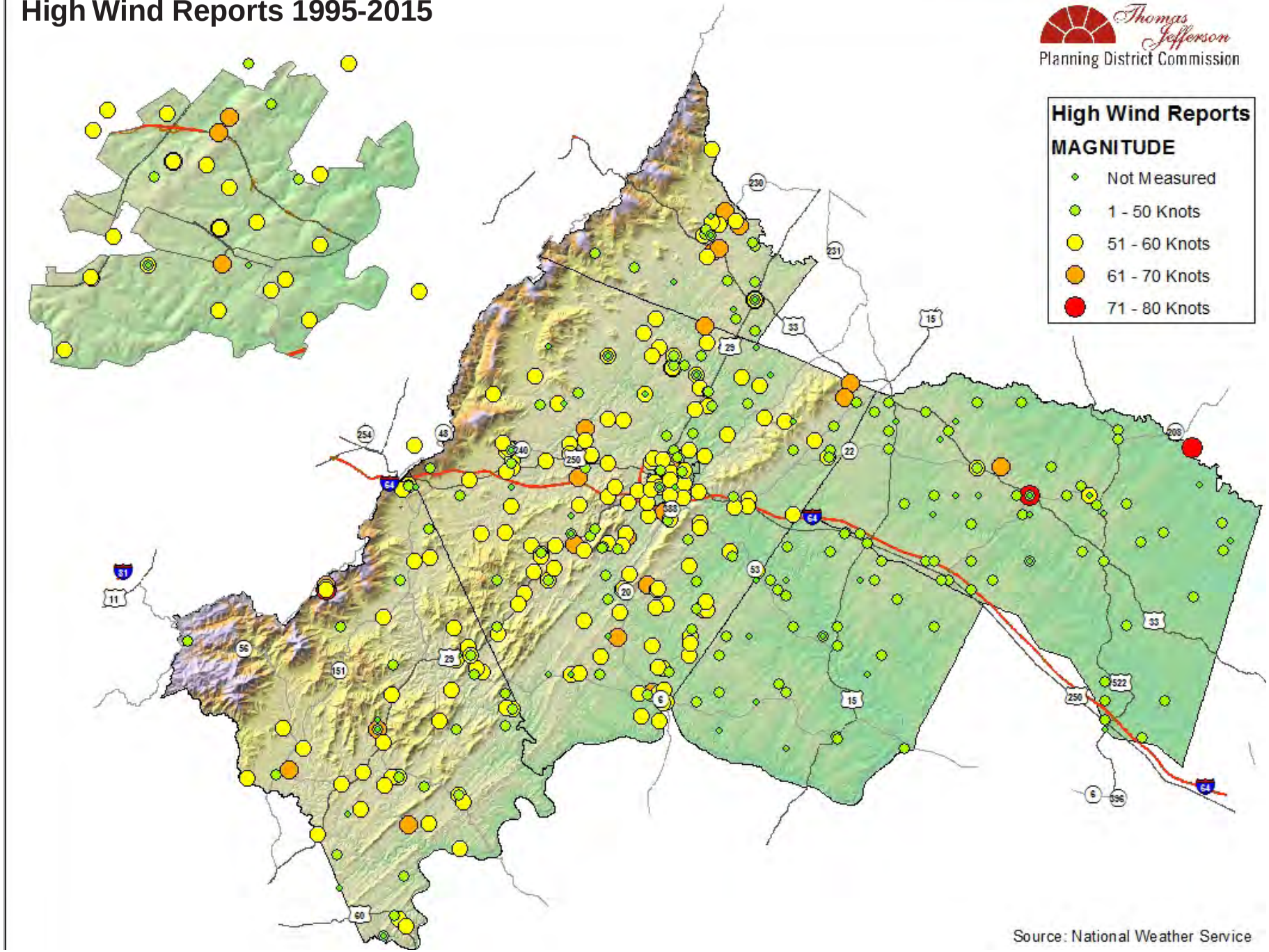
Source: National Climate Data Center (NOAA)

Notable Windstorms and Thunderstorms

Storm type	Damage	Date
Derecho	Numerous fallen trees, power lines and two lives lost	June 29, 2012
Microbursts	Numerous fallen trees	June 24, 2010
High Wind	$1.7 Million in property damage effecting Albemarle, Greene, and Nelson	Jan. 14, 2006
High wind	$229,000 property damage	July 13, 2000
Thunderstorm/Hail	$150,000 property damage (Boswells Tavern)	May 13, 2000
Gusty winds	$500,000 property damage, 1 injury	March 31, 1997
High wind	70	0
(Hurricane)	$265,000 property damage	
$7.6M crop damage (hurricane)	September 6, 1996	
High wind		Dec 5, 1993

Source: NCDC, Albemarle Historical Society archived newspapers, HMP working Group

High Wind Reports 1995-2015



Flood

Identification

Flooding is the most frequent and costly natural hazard in the United States, a hazard that has caused more than 10,000 deaths since 1900. Nearly 90 percent of presidential disaster declarations result from natural events in which flooding was a major component.

Floods are generally the result of excessive precipitation, and can be classified under two categories: general floods, precipitation over a given river basin for a long period of time; and flash floods, the product of heavy localized precipitation in a short time period over a given location. The severity of a flooding event is determined by the following: a combination of stream and river basin topography and physiography; precipitation and weather patterns; recent soil moisture conditions; and the degree of vegetative clearing.

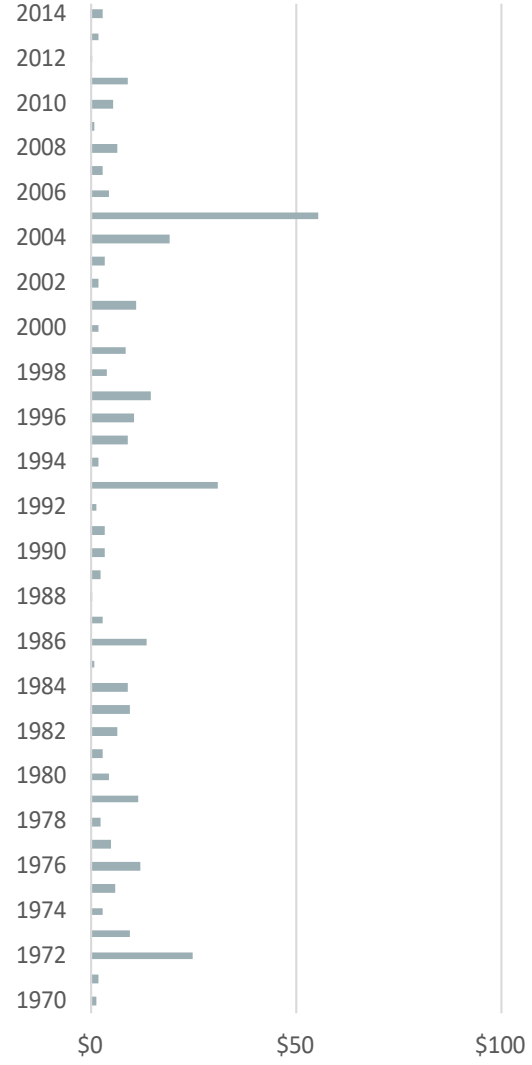
General floods are usually long-term events that may last for several days. The primary types of general flooding include riverine, coastal, and urban flooding. Riverine flooding is a function of excessive precipitation levels and water runoff volumes within the watershed of a stream or river. Coastal flooding is typically a result of storm surge, wind-driven waves, and heavy rainfall produced by hurricanes, tropical storms, nor'easters, and other large coastal storms. Urban flooding occurs where man-made development has obstructed the natural flow of water and decreased the ability of natural groundcover to absorb and retain surface water runoff.

Flash flooding events usually occur from a dam or levee failure within minutes or hours of heavy amounts of rainfall, or from a sudden release of water held by an ice jam. Most flash flooding is caused by slow-moving thunderstorms in a local area or by heavy rains associated with hurricanes and tropical storms. Although flash flooding occurs often along mountain streams, it is also common in urbanized areas where much of the ground is covered by impervious surfaces. Flash flood waters move at very high speeds. "Walls" of water can reach heights of 10 to 20 feet. Flash flood waters and the accompanying debris can uproot trees, roll boulders, destroy buildings, and obliterate bridges and roads.

The periodic flooding of lands adjacent to rivers, streams, and shorelines (land known as floodplain) is a natural and inevitable occurrence that can be expected to take place based upon established recurrence intervals. The recurrence interval of a flood is defined as the average time interval, in years, expected between a flood event of a particular magnitude and an equal or larger flood. Flood magnitude increases with increasing recurrence interval.

Floodplains have traditionally been designated by the average frequency of the flood that is large enough to cover them. For example, a 100-year floodplain is the area covered by a 100-year flood. Flood frequencies such as the 100-year flood are determined by plotting a graph of the size of all known floods for an area and determining how often floods of a particular size occur. However, hydrologists prefer to express flood frequency as the probability of flooding each year. For example, the 100-year flood has a 1 percent chance of occurring in any given year, and a 500-year flood as a 0.2% chance of occurring in any given year. The chart below shows flood damage values by fiscal year from a national perspective.

National Annual Flood Loss
in dollars adjusted for inflation



Source: National Climate Data Center (NOAA)

⏩ Analysis

Flooding is the most common hazard in the Thomas Jefferson Planning District, with all localities subject to risk from flash flooding associated with hurricanes and winter storms, as well as riverine flooding of the James, Rivanna, and Conway Rivers.

Albemarle County

The James River floods in some manner nearly every year. The areas most prone to flooding in Albemarle County are the James River corridors and tributaries, and the steep slopes of the Blue Ridge Mountains along the western edge of the county. Scottsville, Howardsville and Sugar Hollow have experienced frequent flooding. A levee was built in 1989 and effectively protects the Town of Scottsville from further flood damage. A flood in 1913 resulted in water depths of 25 feet in downtown Scottsville.

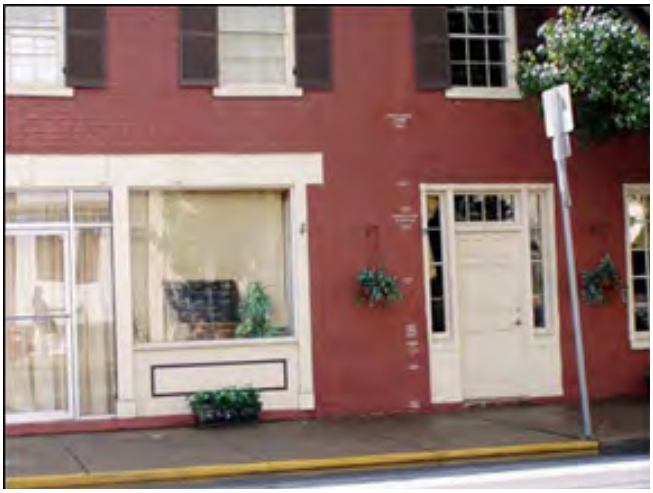


Photo 1 Marking in Scottsville showing heights of past floods

Photo 1 Flooding in Scottsville before Levee

Fluvanna County

The James River in Fluvanna County floods with some regularity, particularly in the Town of Columbia, located at the confluence of the Rivanna and James Rivers. At times, floods have covered 50% of the Town, including the St. James corridor running through the center of Town. The historic C&O depot was moved out of the floodplain in 1979. There are no levees protecting the Town of Columbia, and flood risks remain high. The small community of Bremo, located in the southern part of the county, is also at risk of flooding. Hurricane Camille in 1969 filled Lake Monticello, a 350-acre man-made lake, overnight, but the dam now protects residents from future floods. The portion of Scottsville in Fluvanna County is not behind the levee.

Greene County

Major rain events threaten the county annually, and hurricanes and their remnants can cause flooding in late summer. Winter storms also contribute to flooding. The slopes of the Blue Ridge Mountains are at the highest risk for flash floods. The town of Stanardsville is protected from flooding by its elevation.

Louisa County

Hurricane Camille in 1969 filled Lake Anna and destroyed the dam at Lake Louisa. The Towns of Louisa and Mineral sit on high ground and are generally not affected by flooding, other than flooding due to poor stormwater drainage. Dam controls protect residential development around Louisa's lakes.

Nelson County

The James River in Nelson County floods in some manner nearly every year. The slopes of the Blue Ridge Mountains are at the highest risk for flash floods. Howardsville, Wingina, Norwood, Gladstone, Schuyler, Nellysford and Woods Mill are populated areas experiencing frequent flooding. During Hurricane Camille in Nelson County, rocks, trees and landslides created temporary dams in the mountain hollows. When these dams broke, devastating flooding occurred, destroying everything in its path.

Summary of Floods

Flood Record 1995 -2015

Locality	#	Death	Injuries	Property Loss	Crop Damage
Albemarle	89	1		$240,000	$900,000
Charlottesville	9			$5,000	
Fluvanna	3				
Greene	44		1	$435,500	$80,000
Louisa	8				
Nelson	46			$1,135,000	$50,000
Region	199	1	1	$1,815,500	$1,030,000

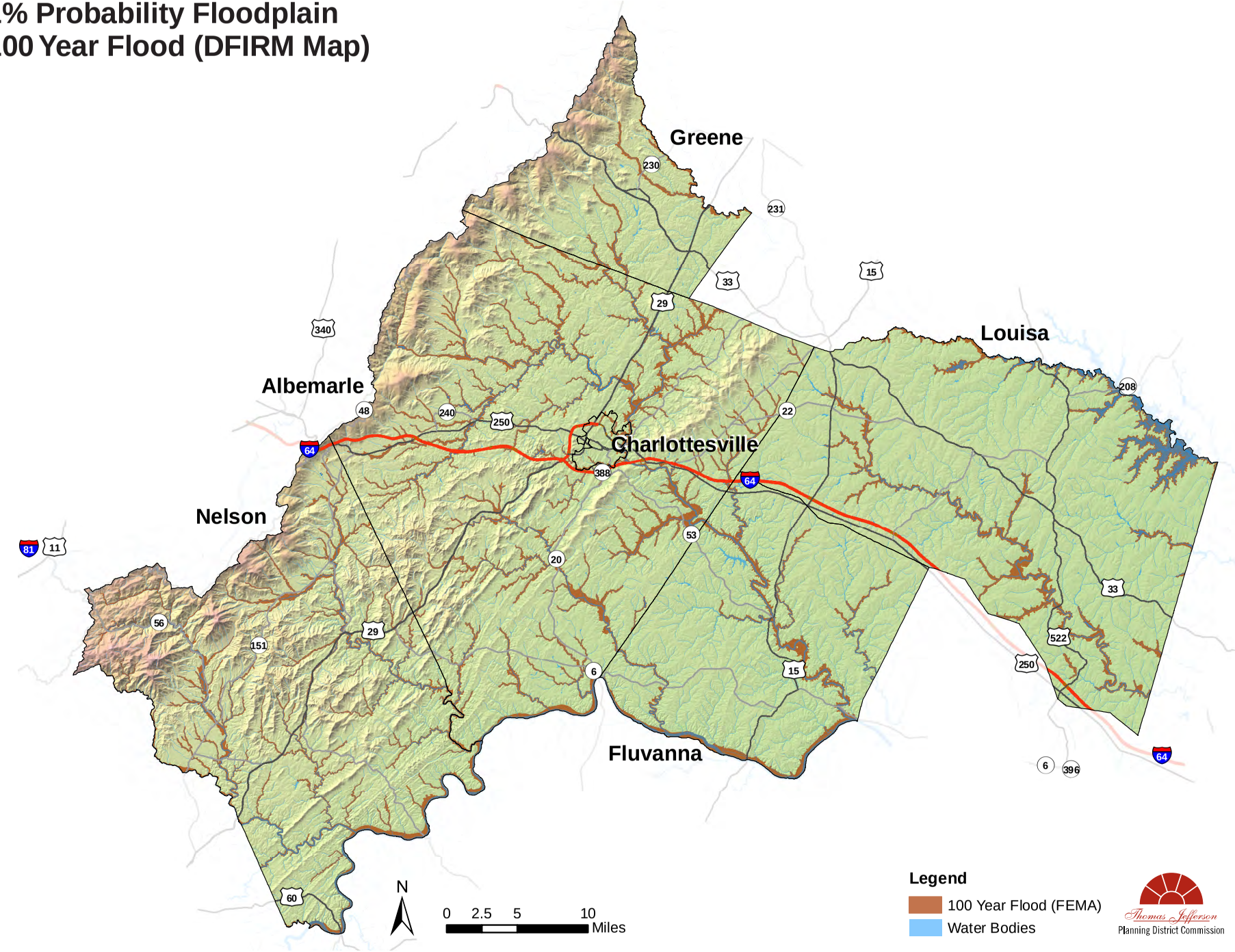
Source: National Climate Data Center (NOAA)

Notable Flood Events 1995-2501

Event	Location	Damage	Date
Albemarle			
Flash Flood	Batesville	$5,000 property damage	Nov. 19, 2009
Flood	Albemarle	$100,000 property damage	Feb 22, 2003
Flash Flood	Albemarle Northwest		Sept 3, 2000
Flash Flood	Albemarle		June 27, 2000
Flash Flood	Albemarle Free Union		Sept 29, 1999
Flood	Albemarle Western		March 20, 1998
Flash Flood	Albemarle Western		Jan 8, 1998
Flash flood (Hurricane Fran)	Albemarle, Greene, Nelson	$78,700,000 property damage	
$26,800,000 crop damage	Sept 6, 1996		
Flash Flood	Albemarle Southwest	$10,000 property damage	June 19, 1996
Flash Flood	Albemarle	1 death	Jan 19, 1996
Flood/flash flood	Rt. 614 Alb. Co. (Sugar Hollow).	$1,900,000 property damage $250,000 crop damage	June 27, 1995
Charlottesville			
Flash Flood	Charlottesville	$5,000 property damage	March 4, 2008
Flash Flood	Charlottesville		July 28, 2000
Flood	Charlottesville		May 8, 1998
Fluvanna			
Flood	Fluvanna		March 20, 2003
Flood	Fluvanna		Jan 19, 1996
Flash Flood	Fluvanna Central/East		June 27, 1995
River Flood	Fluvanna Bemo	$5,000 property damage	Jan 17, 1995
Greene			

Flash Flood	Greene	$100,000 property damage	May 27, 2006
Flash Flood	Greene	$5,000 property damage	March 4, 2003
Flood	Greene	$100,000 property damage	Feb 22, 2003
Flash Flood	Greene		Sept 9, 1999
Flood	Greene	$10,000 property damage	March 20, 1998
Flood	Greene	$2,000 property damage	Feb 17, 1998
Flood	Greene	$5,000 property damage	Feb 4, 1998
Flood	Greene		Jan 28, 1998
Flood	Greene	$3,000 property damage	Jan 23, 1998
Flash Flood	Greene	$10,000 property damage	Jan 8, 1998
Flash Flood	Greene	$5,000 property damage	July 1, 1997
Flash Flood	Greene	$20,000 property damage	Sept 8, 1996
Flash Flood	Greene	$10,000 property damage	Sept 4, 1996
Flood	Greene	$15,100,000 property damage $81,000 crop damage 4 Deaths	$81,000 crop damage
Flash Flood	Greene		Oct 5, 1995
Flash Flood	Greene (Dyke)	$250,000 property damage	Jun 27, 1995
Louisa			
Flash Flood	Bumpass		Sept. 6, 2008
Flash Flood	Louisa (Gum Spring)		Aug 16, 2003
Flash Flood	Louisa Mineral		Aug 4, 2000
Flash Flood	Louisa western	$65,000 property damage	June 27, 1995
Nelson			
Flash flood	Afton		Dec 1, 2010
Flood	Nellysford		June 23, 2006
Flash flood	Lovingston		June 11, 2003
Flood	Nelson	$100,000 property damage	Feb 22, 2003
Flash flood	Nelson		Sept 2, 2000
Flash flood	Nelson	$40,000 property damage	Sept 29, 1999
Flash flood	Nelson	$15,000 property damage	Sept 9, 1999
Flash flood	Nelson		Sept 5, 1999
Flash Flood	Nelson	$10,000 property damage	Jan 8, 1998
Flash Flood	Nelson Eastern		July 24, 1997
Flash Flood	Nelson	5,000 property damage	Oct 20, 1995
Flash Flood	Nelson	$50,000 property damage	Jan 15, 1995

1% Probability Floodplain
100 Year Flood (DFIRM Map)



Winter Weather

Identification

A winter storm can range from a moderate snow over a period of a few hours to blizzard conditions with blinding wind-driven snow that lasts for several days. Some winter storms may be large enough to affect several states, while others may affect only a single community. Many winter storms are accompanied by low temperatures and heavy and/or blowing snow, which can severely impair visibility.

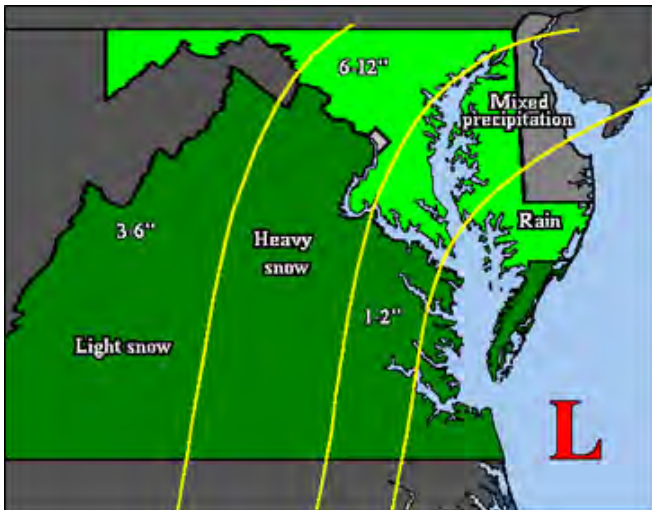
Identification

Winter storms may include snow, sleet, freezing rain, or a mix of these wintry forms of precipitation. Sleet—raindrops that freeze into ice pellets before reaching the ground—usually bounces when hitting a surface and does not stick to objects; however, sleet can accumulate like snow and cause a hazard to motorists. Freezing rain is rain that falls onto a surface with a temperature below freezing, forming a glaze of ice. Even small accumulations of ice can cause a significant hazard, especially on power lines and trees. An ice storm occurs when freezing rain falls and freezes immediately upon impact. Communications and power can be disrupted for days, and even small accumulations of ice may cause extreme hazards to motorists, pedestrians, and cyclists.

A freeze is weather marked by low temperatures, especially when below the freezing point (zero degrees Celsius or thirty-two degrees Fahrenheit). Agricultural production is seriously affected when temperatures remain below the freezing point.

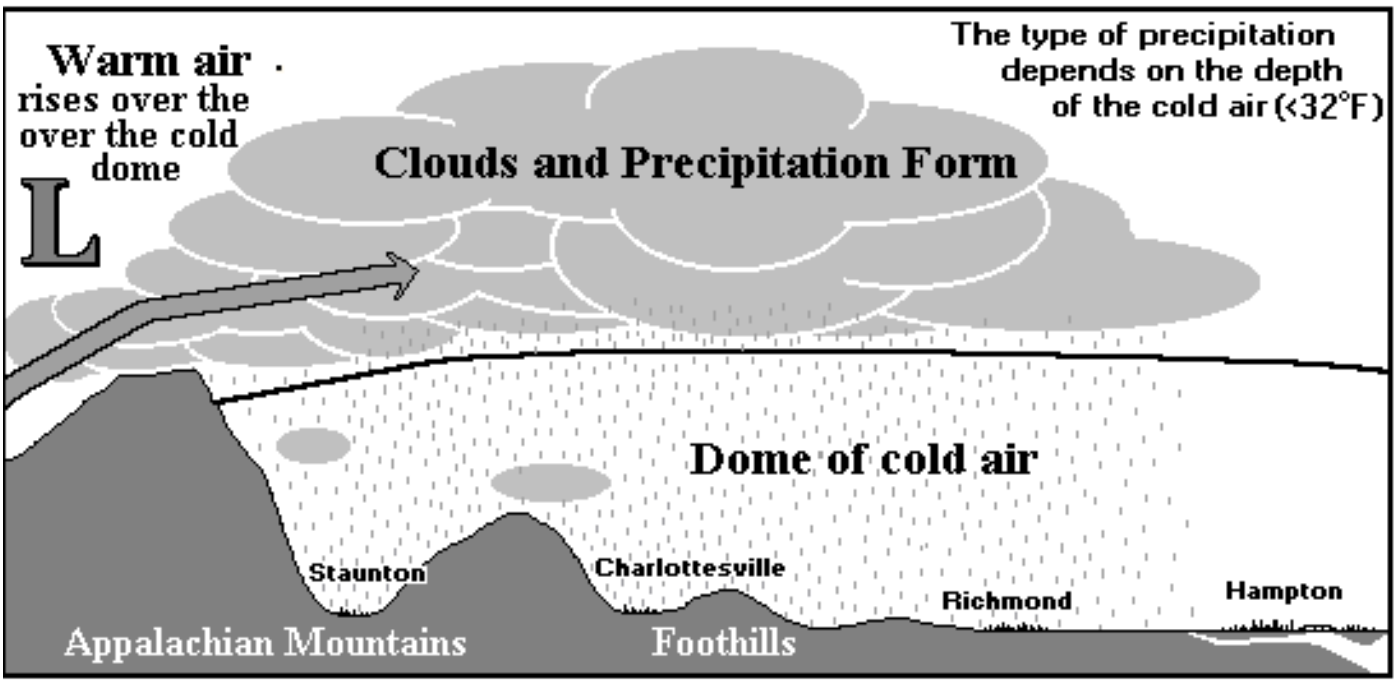
Heavy Snow: Virginia's biggest winter storms are labeled as "Nor'easters". These storms occur when arctic air flows from New England into Virginia. Cold dry air becomes trapped to the east of the Appalachian Mountains, funneling down the valleys and along the coastal plain toward North Carolina. When the cold air meets warm air over the Gulf Stream, storms can develop rapidly, creating "white hurricanes"

The storm's speed and exact track to the north are critical in properly forecasting and warning for heavy snow across Virginia. It is quite common for the rain-snow line to fall roughly 50 miles east of the Planning District. Heavy snow often falls in a narrow 50 mile wide



swath about 150 miles northwest of the low pressure center (see diagram above). Closer to the low center, the warmer ocean air changes the precipitation over to sleet, freezing rain, and eventually rain.

Analysis



Heavy snow can block roadways and waterways, cause tree and utility damage, and lead to structural damage, such as collapsed roofs on large buildings. The Thomas Jefferson Planning District was struck by a series of severe winter storms between December 2009 and February 2010, resulting in significant impairment of the roadways, disruption of business and services, some property damage, and high snow removal costs.

Ice Storms: Ice storms are a fairly common event in the valleys and foothills of the Appalachian Mountains, but are generally limited to one or two per year when they occur. During the winter of 1993-1994, Virginia was struck by an unprecedented series of ice storms. Utility company records show the frequency with which fallen wires need to be repaired. The set up is similar to that of a nor'easter (see diagram above).

Damage from ice storms can be extensive. Ice on roadways and walkways can lead to serious traffic accident and slip and fall injuries. Ice accumulated on trees and utility wires can cause them to break, knocking out power and communication lines. Structural damage can also

⏩ Summary of Winter Weather

Winter Storm Events 1995 -2015

Locality	#	Death	Injuries	Property Loss	Crop Damage
Albemarle	111			$35,000	$55,000
Charlottesville					
Fluvanna	78			$35,000	
Greene	110			$26,250	$50,000
Louisa	86			$35,000	
Nelson	90			$40,000	$150,000
Region	475	0	0	$171,250	$255,000

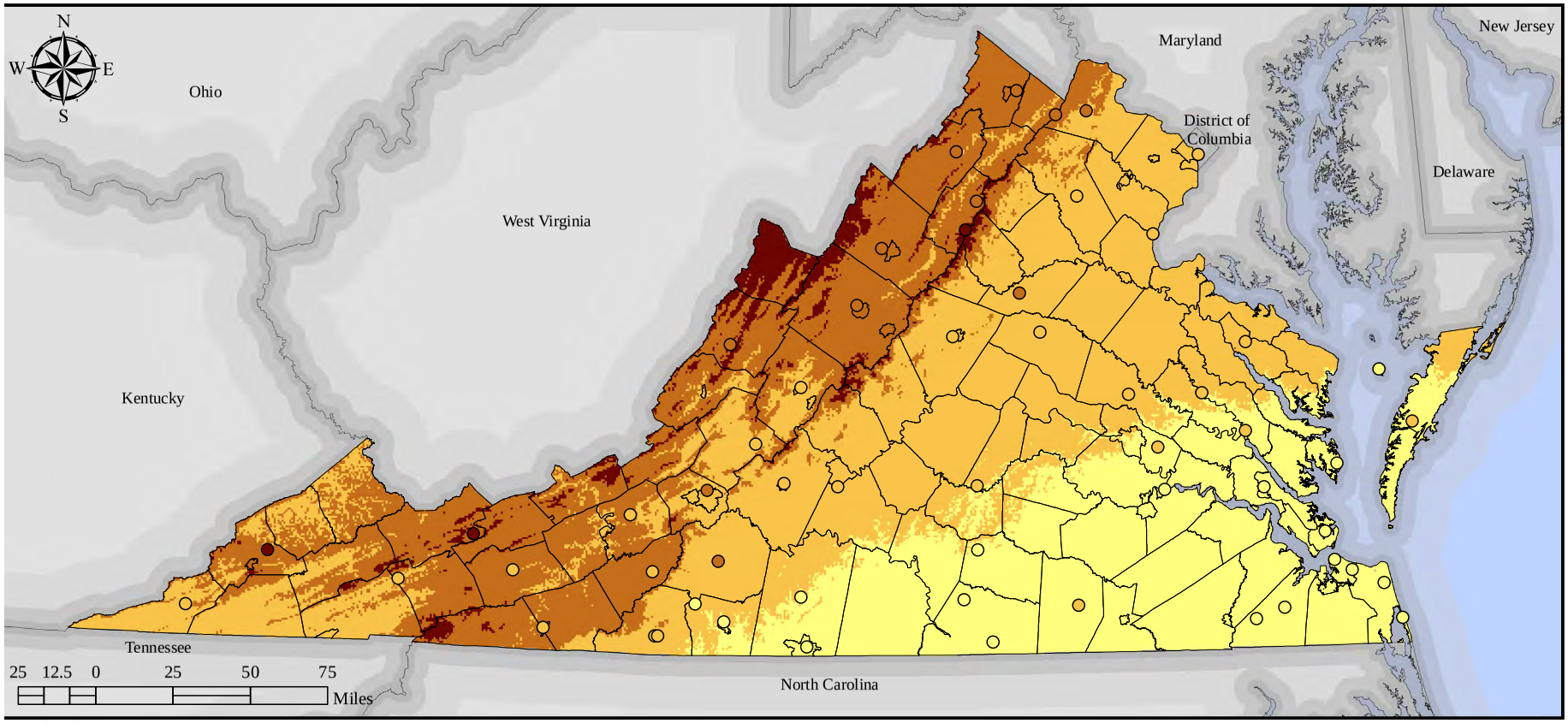
Source: National Climate Data Center (NOAA)

Winter Weather Events by Type 1995-2501

Locality	Blizard	Cold/Wind Chill	Freezing Fog	Heavy Snow	Ice Storm	Winter Storm	Winter Weather	Frost/ Freeze
Albemarle	2	1	1	5	6	30	65	21
Charlottesville								
Fluvanna				1	2	41	34	1
Greene	2	2		7	6	33	60	19
Louisa				1	2	44	39	1
Nelson	2	2		5	6	29	46	18
Region	6	5	1	19	22	177	244	60

Source: National Climate Data Center (NOAA)

Average Number of Days with 3+ Inches of Snow



DATA SOURCES:

CGIT analysis of NCDC data
VGIN Jurisdictional Boundaries
ESRI State Boundaries

LEGEND:

Avg. Annual Frequency

- 0 - 0.25
- 0.251 - 0.5
- 0.51 - 0.75
- 0.751 - 1

HAZARD IDENTIFICATION:

Winter weather statistics were estimated from daily NCDC weather station reports from 1960 - 2000; the values at the weather stations are symbolized with small round dots, and a statewide regression fit depicts the overall trend in the weather station statistics. Average annual frequency ranges from zero to one: zero means that the condition never occurs in a year, one means that it always occurs in a year. These results depict general trends, and local conditions may vary widely.

PROJECTION: *VA Lambert Conformal Conic*
North American Datum 1983

DISCLAIMER: Majority of available hazard data is intended to be used at national or regional scales. The purpose of the data sets are to give general indication of areas that may be susceptible to hazards. In order to identify potential risk in the Commonwealth available data has been used beyond the original intent.

Wildfire

Identification

A wildfire is any fire occurring in a wildland area (i.e. grassland, forest, brush land) except for fire under prescription. Wildfires are part of the natural management of the Earth's ecosystems, but may also be caused by natural or human factors. Over 80 percent of forest fires are started by negligent human behavior such as smoking in wooded areas or improperly extinguishing campfires. The second most common cause for wildfire is lightning.

There are three classes of wildland fires: surface fire, ground fire, and crown fire. A surface fire is the most common of these three classes and burns along the floor of a forest, moving slowly and killing or damaging trees. A ground fire (muck fire) is usually started by lightning or human carelessness and burns on or below the forest floor. Crown fires spread rapidly by wind and move quickly by jumping along the tops of trees. Wildland fires are usually signaled by dense smoke that fills the area for miles around.

State and local governments can impose fire safety regulations on home sites and developments to help curb wildfire. Land treatment measures such as fire access roads, water storage, helipads, safety zones, buffers, firebreaks, fuel breaks, and fuel management can be designed as part of an overall fire defense system to aid in fire control. Fuel management, prescribed burning, and cooperative land management planning can also be encouraged to reduce fire hazards.

Fire probability depends on local weather conditions, outdoor activities such as camping, debris burning, and construction, and the degree of public cooperation with fire prevention measures. Drought conditions and other natural disasters (tornadoes, hurricanes, etc.) increase the probability of wildfires by producing fuel in both urban and rural settings. Forest damage from hurricanes and tornadoes may block interior access roads and fire breaks, pull down overhead power lines, or damage pavement and underground utilities.

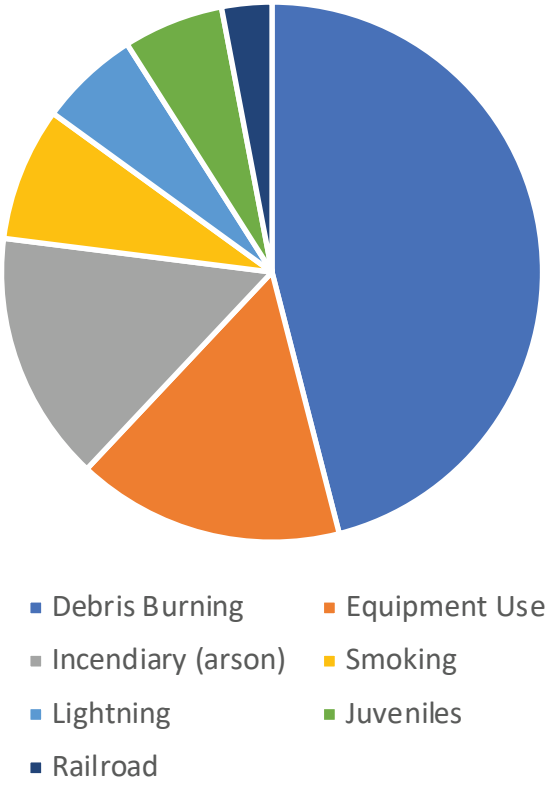
Many individual homes and cabins, subdivisions, resorts, recreational areas, organizational camps, businesses, and industries are located within high fire hazard areas. The term wildland-urban interface refers to the zone of transition between unoccupied land and human development. The increasing demand for outdoor recreation places more people in wildlands during holidays, weekends, and vacation periods. Unfortunately, wildland residents and visitors are rarely educated or prepared for the inferno that can sweep through the brush and timber and destroy property in minutes.

Analysis

Wildfires are common in the Planning District, but are usually small and quickly controlled, creating little danger or loss. Most fires occur in the western part of the region, in sparsely populated mountainous areas, but fires have occurred in each locality. The breakdown of known causes is shown in the table on the next page. Fires are more prevalent in periods after heavy winter storms due to dropped branches and debris being readily available as fuel, and also tend to follow summers with droughts.

Property losses due to wildfires have been minimal in the Planning District, and there have been few injuries or fatalities due to fire in the region. Timber or crop damage is the most common loss, ranging from a few thousand to tens of thousand of dollars. More people moving into the countryside and using parks, fields and forests for recreation creates a higher potential for people to be put at risk during wildfire events.

Causes of Wildfires



Source: VA Department of Forestry

Wildfire Events 2002-2016

Locality	# of Fires	Acres
Albemarle	1,665	387.0
Fluvanna	0	1.0
Greene	436	175.0
Louisa	89	74.0
Nelson	2,383	319.0
TJPDC	1,267	235.0

Source: National Climate Data Center (NOAA)

Notable Wildfires

County	Damage	Date
Greene	Rocky Mountain Fire complex contained within Shenandoah National park.	April,16-27, 2016
Louisa	$250,000 in damages over 414 acres, and $9,150,000 in property protected.	February 20, 2008
Albemarle	$25,000 in timber damage, $1,345,000 in property protected. $122,000 suppression cost, caused by arson.	November 19, 2001
Fluvanna	$139,000 in building damage, fire caused by hot ashes.	November 13, 2000
Nelson	$20,000 in timber damage, fire caused by arson.	May 3, 1999
Nelson	$10,000 in timber damage, $620,000 in property protected. Fire caused by lightning.	November 26,1998
Fluvanna	$10,000 in timber and property damage, after debris fire escaped. $500,000 in property protected.	May 8, 1997

Source: VA Department of Forestry

The maps on the following pages display wildfire data from the Southern Wildfire Risk Assessment toolset (SWRA) a product developed by the Southern Group of Foresters. The SWRA web portal allows a user to summarize wildfire related information and generate detailed risk summary reports. The summary reports and allocated mapping products provide a detailed picture about a communities risk and offers the ability to help prioritize areas for mitigation, interventions or other tactics to reduce the communities wildfire exposure risk.

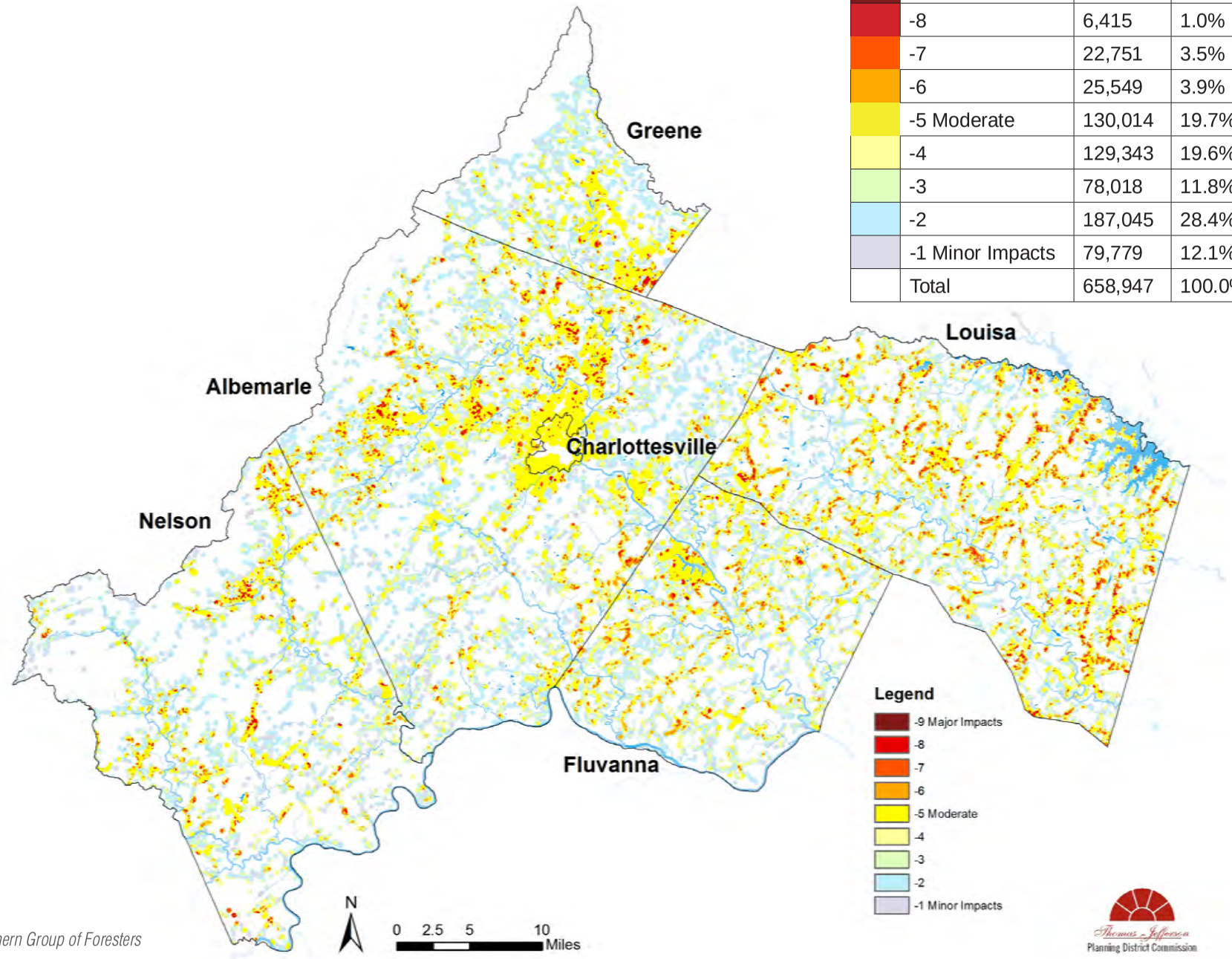
The first map highlights potential impacts of a wildfire on people and their homes using a scale called the Wildland Urban Interface (WUI) Risk Index. The key input, WUI, reflects housing density (houses per acre). The location of people living in the Wildland Urban Interface and rural areas is key information for defining potential wildfire impacts to people and homes.

The WUI Risk Rating is derived using a Response Function modeling approach. Response functions are a method of assigning a net change in the value to a resource or asset based on susceptibility to fire at different intensity levels, such as flame length. The range of values is from -1 to -9, with -1 representing the least negative impact and -9 representing the most negative impact. For example, areas with high housing density and high flame lengths are rated -9 while areas with low housing density and low flame lengths are rated -1.
To calculate the WUI Risk Rating, the WUI housing density data was combined with Flame Length data and response functions were defined to represent potential impacts. The response functions were defined by a team of experts based on values defined by the SWRA Update Project technical team. By combining flame length with the WUI housing density data, you can determine where the greatest potential impact to homes and people is likely to occur.

The risk index factors where people live and their proximity to the wildland urban interface. The second map is provide to show the location and economic impact of all wildfire incants between 2002 and 2016.

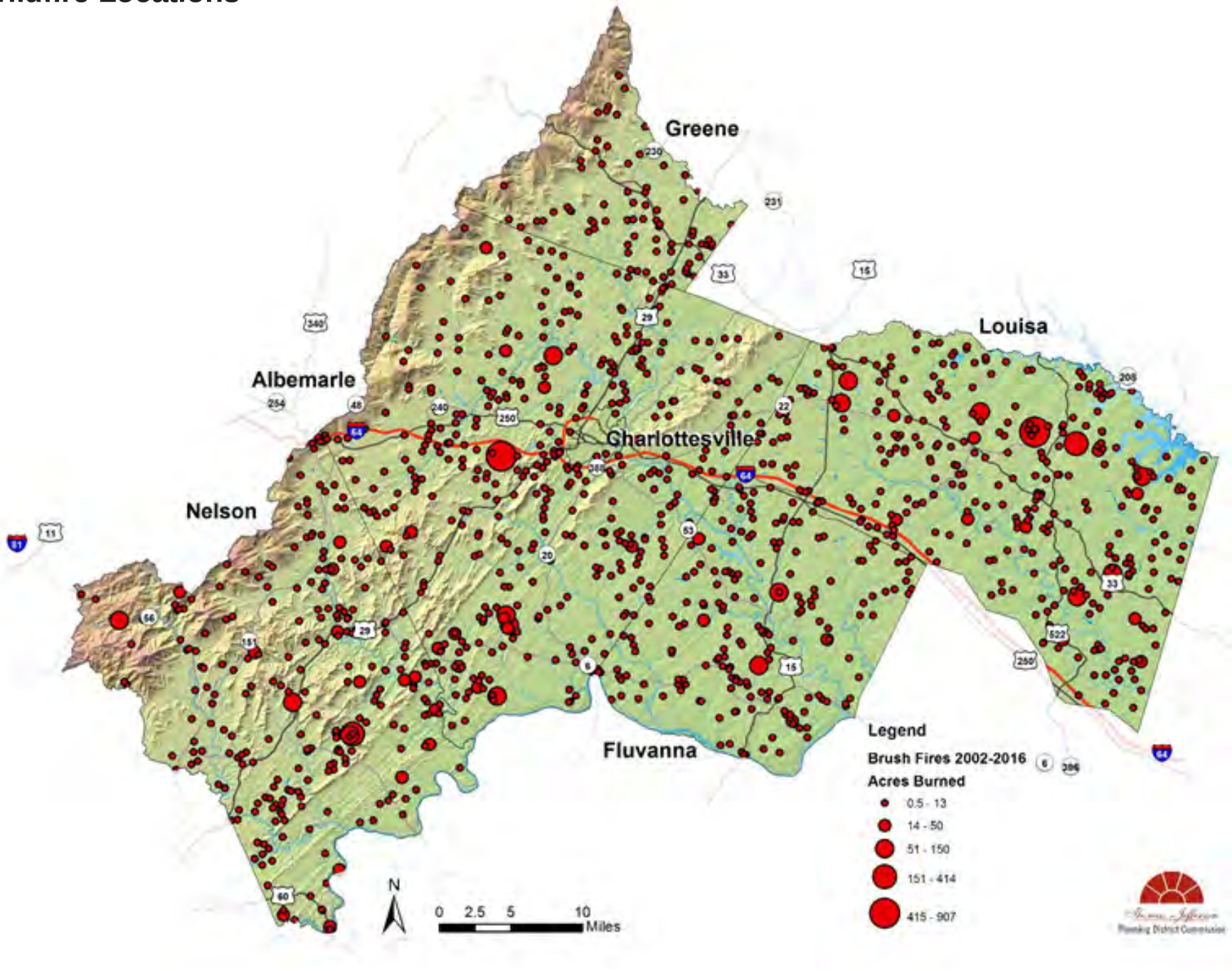
Wildland Urban Interface Risk Index

	Class	Acres	Percent
	-9 Major Impacts	33	0.0%
	-8	6,415	1.0%
	-7	22,751	3.5%
	-6	25,549	3.9%
	-5 Moderate	130,014	19.7%
	-4	129,343	19.6%
	-3	78,018	11.8%
	-2	187,045	28.4%
	-1 Minor Impacts	79,779	12.1%
	Total	658,947	100.0%



Source: Southern Group of Foresters

Wildfire Locations

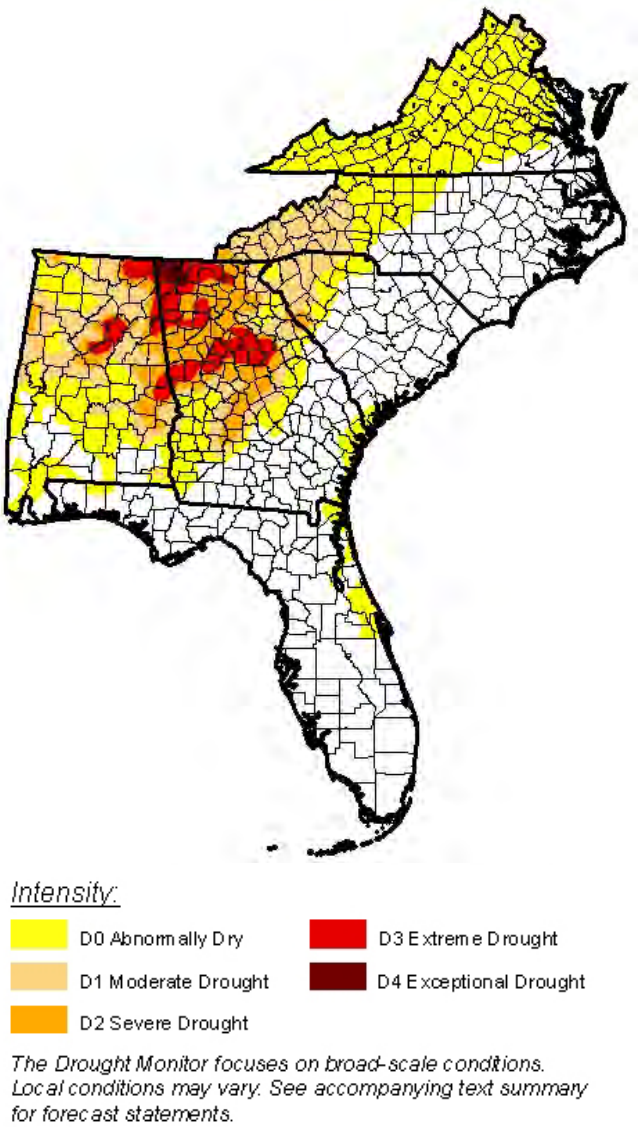


2.1 Drought and Extreme Heat

Identification

Droughts: Drought is a natural climatic condition caused by an extended period of limited rainfall beyond that which occurs naturally in a broad geographic area. High temperatures, high winds, and low humidity can worsen drought conditions and can make areas more susceptible to wildfire. Human demands and actions can alter susceptibility to droughts, and the human impacts of drought can vary widely depending on public and private water usage.

U.S Drought Monitor (Southeast) 9/27/16



Source: The National Drought Mitigation Center

Droughts are frequently classified as one of the following four types:

- **Meteorological:** low level of precipitation when compared to an average or normal amount of precipitation over a given period of time.
- **Agricultural:** Emphasis placed on factors such as soil water deficits, water needs based on differing stages of crop development, and water reservoir levels that impact agricultural production.
- **Hydrological:** directly related to the effect of precipitation shortfalls on surface and groundwater supplies. Human factors, particularly changes in land use, can alter the hydrologic characteristics of a basin.
- **Socio-Economic:** the result of water shortages that limit the ability to supply water-dependent products in the marketplace.

The primary impact of droughts is loss of agricultural production and disruption of business in water-related sectors, however a severe drought can also put strains on drinking water supply and lead to more serious human impacts. Droughts are considered more costly to the United States than any other type of disaster, with estimated losses of $6 to $8 billion every year

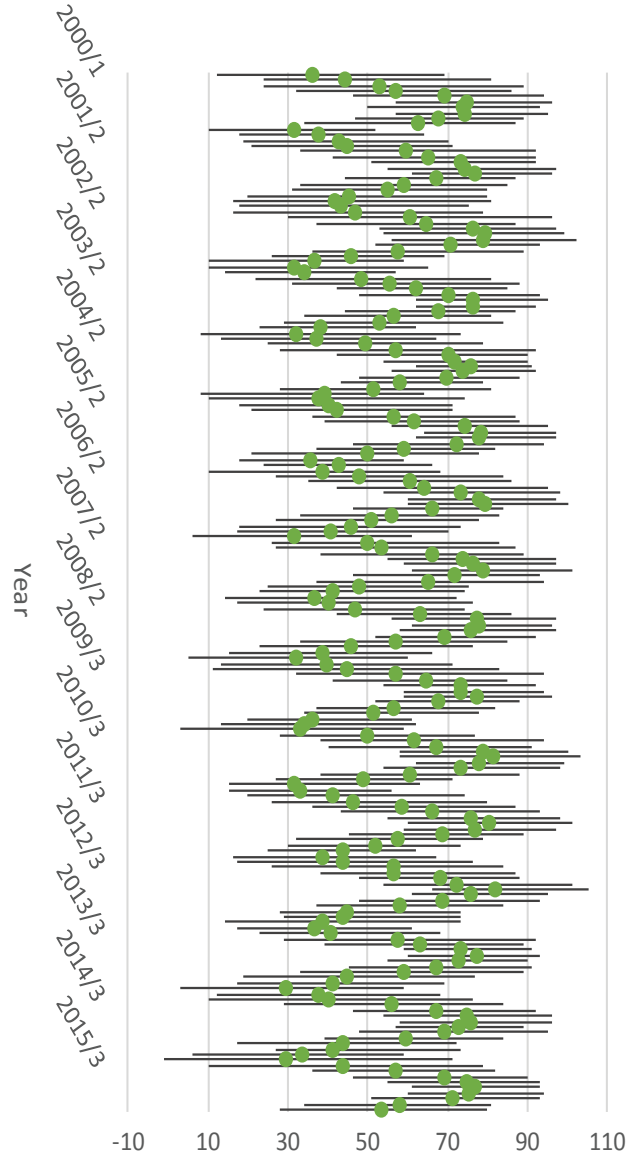
Extreme Heat: While drought mostly impacts land and water resources, extreme heat can pose a significant risk to humans. Extreme heat can be defined as temperatures that hover 10°F or more above the average high temperature for the region, last for prolonged periods of time, and are often accompanied by high humidity. Under normal conditions, the human body's internal thermostat produces perspiration that evaporates and cools the body. However, in extreme heat and high humidity, evaporation is slowed and the body must work much harder to maintain a normal temperature. Elderly persons, young children, persons with respiratory difficulties, and those who are sick or overweight are more likely to become victims of extreme heat. Because men sweat more than women, they are more susceptible to heat-related illness because they become dehydrated more quickly. Studies have shown that a significant rise in heat-related illness occurs when excessive heat persists for more than two days. Spending at least two hours per day in air conditioning can significantly reduce the number of heat-related illnesses.

On average, excessive heat exposure causes 358 deaths per year in the United States, more than floods, hurricanes, lightning, tornados and earthquakes combined. Extreme heat in urban areas can create health concerns when stagnant atmospheric conditions trap

pollutants, thus adding unhealthy air to excessively hot temperatures. In addition, an "urban heat island effect" can produce significantly higher nighttime temperatures because asphalt and concrete (which store heat longer) gradually release heat at night.

⏩ Analysis

High Low and Average Monthly Temperatures 2000-2015



Source: NOAA Climate Data Online

Drought: Although damage from a drought is rarely catastrophic, the region has experienced prolonged droughts that have impeded economic activity and quality of life for many residents. Crop damage is the primary type of damage resulting from droughts. In severe droughts, such as 2002, water usage restrictions have been put in place to preserve drinking supplies. Drought may also cause wells to go dry, causing problems for households and businesses left without running water.

Virginia Administrative Code 9 VAC 25-780 Section 120 defines the drought procedures system taken for the Commonwealth. A three-tiered warning system communicates the level of severity to the public.

- **Watch:** Public outreach, raise awareness, intensify water conservation activities.
- **Warning:** At least voluntary measures –5-10% conservation.
- **Emergency:** Mandatory measures –10-15% conservation.

Localities may impose additional restrictions upon water usage when warnings and emergencies are declared. State law requires all localities to have a Drought Contingency and Response Plan, and statewide montoring and drought-response planning is conducted by the Virginia Department of Environmental Quality.

Notable Historic Droughts

Damage	Date
Historically low water levels; considered "Drought of Record" for the TJPD region. Fluvanna, Greene, Nelson, Louisa declared disaster areas. Thousands of dry wells, businesses closed, extensive water restrictions on businesses and households	2002
$129.7M crop damage	08-09 1999
$58.8M crop damage	10-11 1998
Virginia Drought Emergency Declaration made on July 23, 2007	1976-1977
Nationwide – widespread damage	1931

Source: NCDC, Albemarle Historical Society archived newspapers

Extreme Heat: The region experiences high temperatures every year, but injuries and fatalities attributed directly to extreme heat are rare. However, these conditions can lead to health problems, since heat exacerbates asthma and air pollution related breathing problems. People may overexert themselves or dehydrate while exercising as well. Elderly people are particularly susceptible to injury or death from extreme heat. Utility failures can also be caused by heat, and when power is lost, most people lose air-conditioning and fans to keep cool, leading to possible heat stroke. Fires that occur during drought are harder to combat since water may be limited and under lower pressure than normal.

Tornado

Identification

A tornado is a violent windstorm characterized by a twisting, funnel-shaped cloud extending to the ground. Tornadoes are most often generated by thunderstorm activity (but sometimes result from hurricanes and other coastal storms) when cool, dry air intersects and overrides a layer of warm, moist air forcing the warm air to rise rapidly. The damage caused by a tornado is a result of the high wind velocity and wind-blown debris, also accompanied by lightning or large hail. According to the National Weather Service, tornado wind speeds normally range from 40 to more than 300 miles per hour. The most violent tornadoes have rotating winds of 250 miles per hour or more and are capable of causing extreme destruction and turning normally harmless objects into deadly missiles.

Each year, an average of over 800 tornadoes is reported nationwide, resulting in an average of 80 deaths and 1,500 injuries (NOAA, 2002). They are more likely to occur during the spring and early summer months of March through June and can occur at any time of day, but are likely to form in the late afternoon and early evening. Most tornadoes are a few dozen yards wide and touch down briefly, but even small short-lived tornadoes can inflict tremendous damage. Highly destructive tornadoes may carve out a path over a mile wide and several miles long.

The destruction caused by tornadoes ranges from light to incredible depending on the intensity, size, and duration of the storm. Typically, tornadoes cause the greatest damages to structures of light construction such as residential homes (particularly mobile homes), and tend to remain localized in impact. The Fujita-Pearson Scale for Tornadoes was developed in the 1970s to measure tornado strength and associated damages on a scale from F-0 to F-5. In the mid-2000s, the National Weather Service revised the scale to reflect better examinations of tornado damage surveys, so as to align wind speeds more closely with associated storm damage. Readings are taken from 28 different damage indicators, ranging from high-rise buildings to softwood trees, to determine the scale of a tornado. The “Enhanced Fujita Scale” became operational in 2007.

According to the NOAA Storm Prediction Center (SPC), the highest concentrations of tornadoes in the United States have been in Oklahoma, Texas, Kansas and Florida respectively. Although the Great Plains region of the Central United States does favor the development of the largest and most dangerous tornadoes (earning the designation of “tornado alley”), Florida experiences the greatest number of tornadoes per square mile of all U.S. states (SPC, 2002). The 2011 tornado season was the deadliest the United States has experienced since 1952, with major disasters recorded for Joplin, Missouri and Tuscaloosa, Alabama.

The figure below shows tornado activity in the United States based on the number of recorded tornadoes per 1,000 square miles.

Analysis

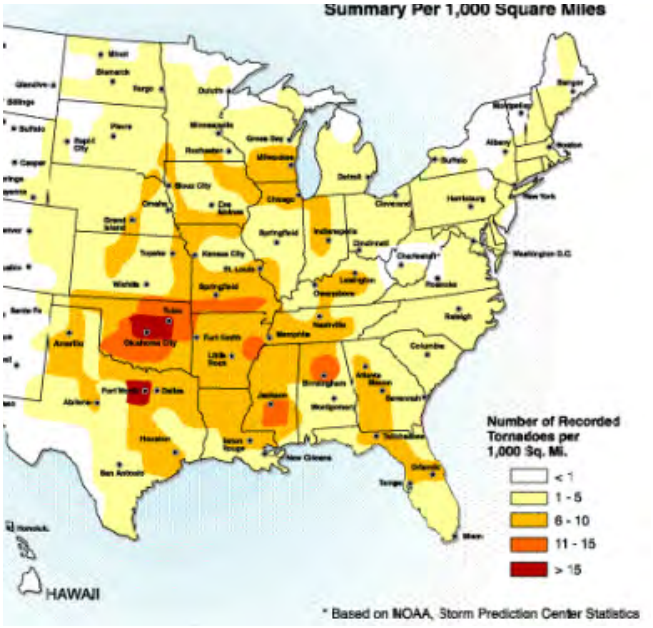
Virginia experiences an average of seven tornadoes per year. Many occur in unpopulated areas or cause little property damage and therefore are not reported to the National Weather Service. Since 1916 (when tornado-related fatality recordkeeping began) 65 people have died from tornadoes in Virginia. A third of these deaths occurred during a Virginia’s worst tornado outbreak on May 2, 1929. The 2004 tornado season was the most active in the states history with over 84 tornados reported. The 2011 tornado season was among the deadliest on record for the Commonwealth. One outbreak caused four fatalities in Washington County, and one in Halifax County. Another storm killed two in Gloucester County.

The Thomas Jefferson Planning District typically experiences EF0 or EF1 tornados. One such tornado touched down in Fluvanna County on Sept. 6, 2011. An exception was a major tornado produced by Tropical Storm Ivan. The tornado struck Stanardsville in Greene County in September of 2004, causing $3 Million in property damage. The most recent notable tornado touched down around White Hall in Albemarle County in 2005, causing $500,000 in property damage. Tornados in the region have increased in frequency and severity in the last decade.

July is the most active month for tornadoes in Virginia, since it has the most thunderstorms, but no tornado deaths have occurred in Virginia in July since tornadoes spawned by afternoon storms tend to be weak (89% are F0 or F1). Tornado deaths in Virginia peak in the late spring and fall, when tornadoes that occur tend to be stronger, spawned by severe winter storms and hurricanes. The Virginia Department of Emergency Management (VDEM) ranked each locality high, moderate, or low based on tornado risk in 2013. Albemarle, was ranked high. The City of Charlottesville, Fluvanna, Greene and Louisa were ranked medium high and Nelson was ranked low.

Scale	Wind Speed	Name	Example
EF0	65-85	Gale	
EF1	86-110	Weak	
EF2	111-135	Strong	
EF3	136-165	Severe	
EF4	166-200	Devastating	

Tornado Activity in the United States



Tornado Record 1995 -2015

Class	Damage	Date
EF1	Historic homes damaged in Louisa County	10/9/11
F1	$500,000 property damage	8/30/05
F2	$3 million in property damage to Greene County. Produced by Tropical Storm Ivan.	9/17/04
F1	$500,000 property damage	5/13/00
F1	$250,000 property damage	5/5/89
F3	$250,000 property damage	7/25/85
F1	$250,000 property damage	10/13/83
F2	$250,000 property damage	8/9/62
N/A	11 people died and 4 were injured in Ivy/Mechum's River	1959
N/A	Leveled trees, tore off roofs, smashed buildings in Ivy	1922

Source: NCDC, Albemarle Historical Society archived newspapers

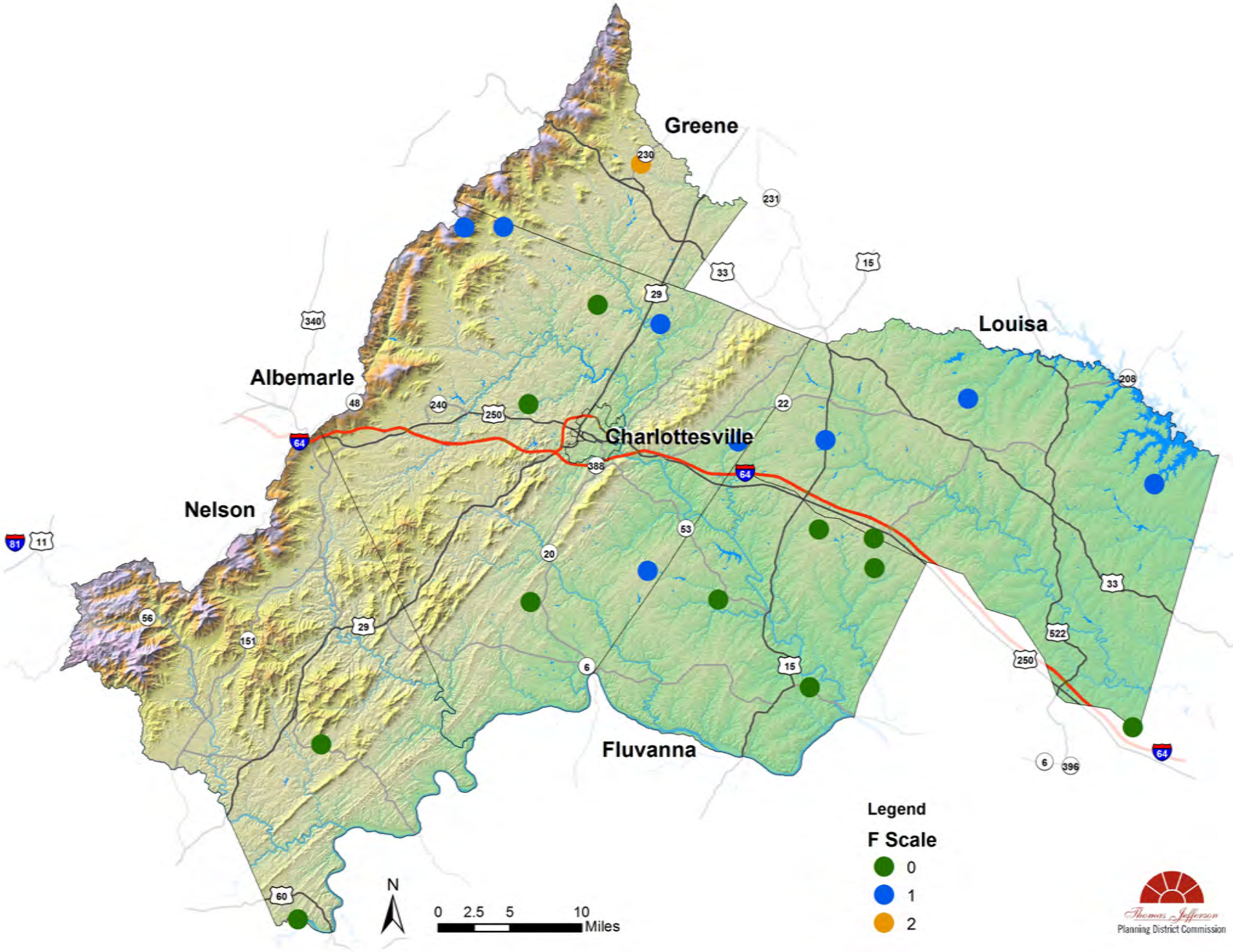
▸▸ Summary of Tornados

Tornado Record 1995 -2015

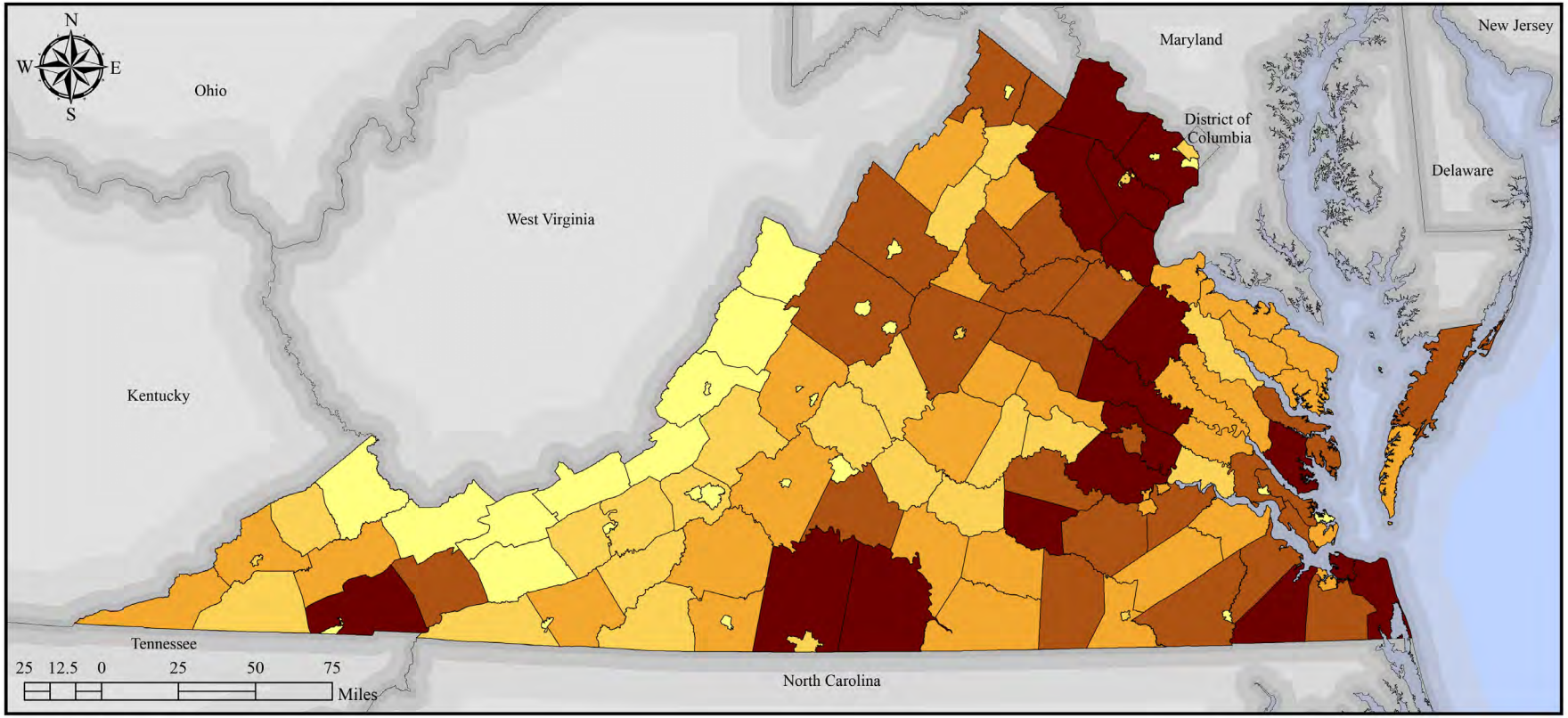
Locality	#	Death	Injuries	Property Loss	Crop Damage
Albemarle	7		1	$1,013,500	
Charlottesville	4			$33,000	
Fluvanna	2		3	$3,001,000	
Greene	5			$206,000	
Louisa	2			$4,311,500	
Nelson	20		4	$4,311,500	
Region	199	1	1	$1,815,500	$1,030,000

Source: National Climate Data Center (NOAA)

Tornado Touchdowns 1995-2015



NCDC Significant Tornado Events



CGIT Center for Geospatial Information Technology

VIRGINIA DEPARTMENT OF EMERGENCY MANAGEMENT

DATA SOURCES:

NCDC Storm Events Database
VGIN Jurisdictional Boundaries
ESRI State Boundaries

LEGEND:

Number of Occurrences (1951-2011)

- 0 - 1
- 2 - 3
- 4 - 7
- 8 - 12
- 13 - 27

DATA IDENTIFICATION:

This map represents the HIRA related tornado events, as recorded by NCDC, on a jurisdictional basis.

The NCDC period of record for this map varies based on each hazard type. See table 3.3-3 for hazard specific dates.

PROJECTION: *VA Lambert Conformal Conic North American Datum 1983*

DISCLAIMER: Majority of available hazard data is intended to be used at national or regional scales. The purpose of the data sets are to give general indication of areas that may be susceptible to hazards. In order to identify potential risk in the Commonwealth available data has been used beyond the original intent.

Earthquake

Identification

An earthquake is the motion or trembling of the ground produced by sudden displacement of rock in the Earth's crust. Earthquakes result from crustal strain, volcanism, landslides, or the collapse of caverns. Earthquakes can affect hundreds of thousands of square miles; cause damage to property measured in the tens of billions of dollars; result in loss of life and injury to hundreds of thousands of persons; and disrupt the social and economic functioning of the affected area.

Most property damage and earthquake-related deaths are caused by the failure and collapse of structures due to ground shaking. The level of damage depends upon the amplitude and duration of the shaking, which are directly related to the earthquake size, distance from the fault, and regional geology. Other damaging earthquake effects include landslides, the down-slope movement of soil and rock (mountain regions and along hillsides), and liquefaction, in which ground soil loses the ability to resist shear and flows much like quicksand. In the case of liquefaction, anything relying on the substrata for support can shift, tilt, rupture, or collapse.

Most earthquakes are caused by the release of stresses accumulated as a result of the rupture of rocks along opposing fault planes in the Earth's outer crust. These fault planes are typically found along borders of the Earth's ten tectonic plates. These plate borders generally follow the outlines of the continents, with the North American plate following the continental border with the Pacific Ocean in the west, but following the mid-Atlantic trench in the east. As earthquakes occurring in the mid-Atlantic trench usually pose little danger to humans, the greatest earthquake threat in North America is along the Pacific Coast.

The areas of greatest tectonic instability occur at the perimeters of the slowly moving plates, as these locations are subjected to the greatest strains from plates traveling in opposite directions and at different speeds. Deformation along plate boundaries causes strain in the rock and the consequent buildup of stored energy. When the built-up stress exceeds the rocks' strength, a rupture occurs. The rock on both sides of the fracture is snapped, releasing the stored energy and producing seismic waves, generating an earthquake.

Earthquakes are measured in terms of their magnitude and intensity. Magnitude is measured using the Richter Scale, an open-ended logarithmic scale that describes the energy release of an earthquake through a measure of shock wave amplitude (see Table below). Each unit increase in magnitude on the Richter Scale corresponds to a ten-fold increase in wave amplitude, or a 32-fold increase in energy. Intensity is most commonly measured using the Modified Mercalli Intensity (MMI) Scale based on direct and indirect measurements of seismic effects. The scale levels are typically described using Roman numerals, with a I corresponding to imperceptible (instrumental) events, IV corresponding to moderate (felt by people awake), to XII for catastrophic (total destruction). A detailed description of the Modified Mercalli Intensity Scale of earthquake intensity and its correspondence to the Richter Scale is given in the table below.

Richter Scale

Richter Magnitude	Earthquake Effects
<3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas up to about 100 kilometers across where people live.
7.0-7.9	Major earthquake. Can cause serious damage over larger areas.
>8	Great earthquake. Can cause serious damage in areas several hundred kilometers across.

Source: North Carolina Division of Emergency Management

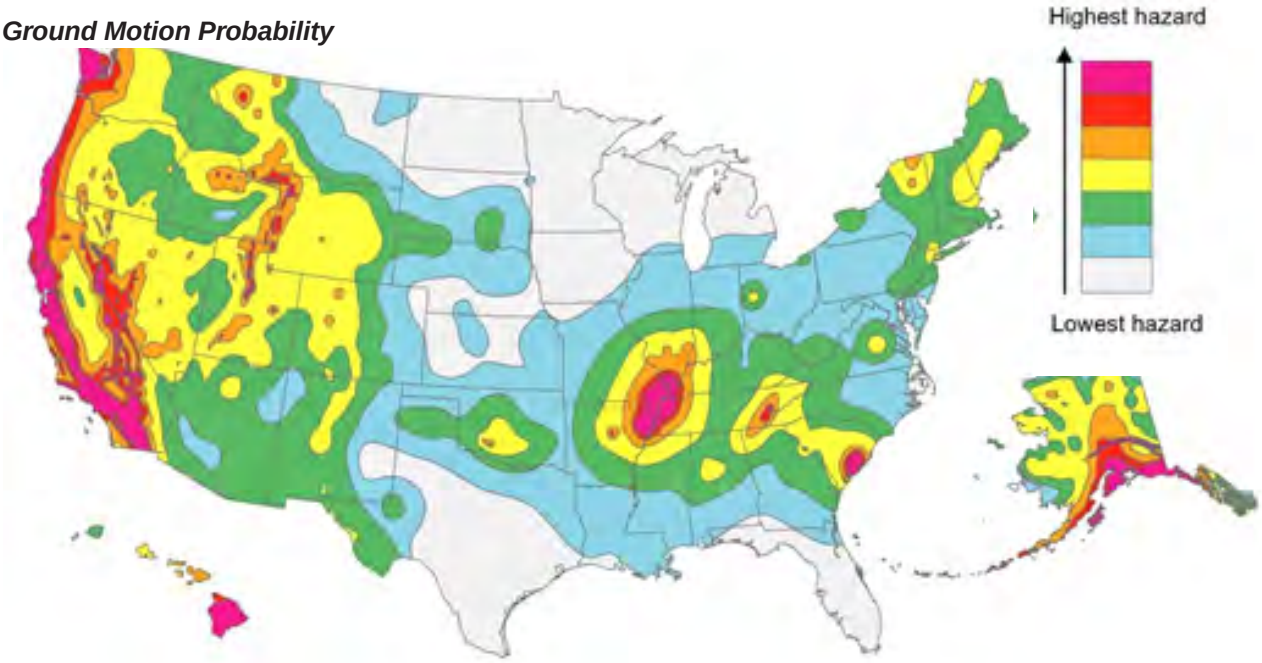
Richter Scale

Scale	Intensity	Description of Effects	Corresponding Richter Scale
I	Instrumental	Detected only on seismographs	
II	Feeble	Some people feel it	<4.2
III	Slight	Felt by people resting; like a truck rumbling by	
IV	Moderate	Felt by people walking	
V	Slightly Strong	Sleepers awake; church bells ring	<4.8
VI	Strong	Trees sway; suspended objects swing, objects fall off shelves	<5.4
VII	Very Strong	Mild Alarm; walls crack; plaster falls	<6.1
VIII	Destructive	Moving cars uncontrollable; masonry fractures, poorly constructed buildings damaged	
IX	Ruinous	Some houses collapse; ground cracks; pipes break open	<6.9
X	Disastrous	Ground cracks profusely; many buildings destroyed; liquefaction and landslides widespread	<7.3
XI	Very Disastrous	Most buildings and bridges collapse; roads, railways, pipes and cables destroyed; general triggering of other hazards	<8.1
XII	Catastrophic	Total destruction; trees fall; ground rises and falls in waves	>8.1

Source: North Carolina Division of Emergency Management

The figure below shows the probability that ground motion will reach a certain level during an earthquake. The data show peak horizontal ground acceleration (the fastest measured change in speed, for a particle at ground level that is moving horizontally due to an earthquake) with a 10 percent probability of exceedance in 50 years. The map was compiled by the U.S. Geological Survey (USGS) Geologic Hazards Team, which conducts global investigations of earthquake, geomagnetic, and landslide hazards.

Ground Motion Probability



Source: USGS

Analysis

Although earthquakes have not historically posed a significant risk to the Thomas Jefferson Planning District, there have been several recorded earthquake events, including a major earthquake in August of 2011. Virginia has had over 160 earthquakes since 1977 of which 16% were felt. This equates to an average of one earthquake occurring every month with two felt each year. The central Virginia seismic zone is an area of the Virginia Piedmont that has long been recognized as an area of seismic activity in the central Appalachians. The earthquakes occur at depths from near surface to approximately 20 km.

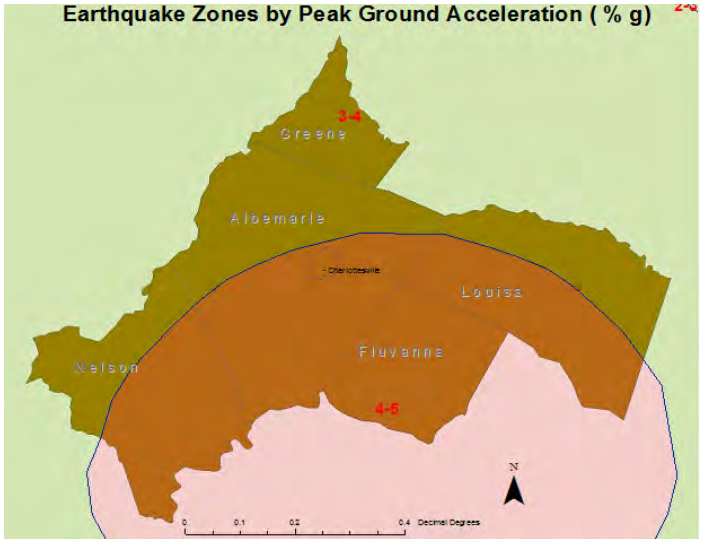
Tornado Record 1995 -2015

Location	Damage	Date
Mineral (Louisa County)	None, largest aftershock since the 5.8 Magnitude Mineral Earthquake	Mar 3, 2015
Mineral (Louisa County)	One of the largest earthquakes in Virginia history by intensity. Caused significant damage to many homes and two schools in Louisa County. Felt from North Carolina to Canada. Magnitude: 5.8	Aug 23, 2011
30 Miles West of Richmond	The focal depth was within a few kilometers of the surface, and this produced a strong acoustic signal that local officials attributed to an aircraft in transonic flight. Magnitude 4.5	Dec 9, 2003
Scottsville	It was felt from Washington, DC to the North Carolina border, and from Staunton, VA to Norfolk. Magnitude 4.0	Aug 17, 1984
Charlottesville	A moderate tremor at Charlottesville shook bricks from chimneys in some places. Also felt in other parts of Albemarle County.	Dec 26, 1929
Arvonia (Buckingham)	Chimneys were cracked at Ashby, about 20 km southeast of Arvonia, and a window was broken at a store at Buckingham. A “terrific” shock sent people rushing outdoors at Arvonia and displaced furniture. Felt strongly from Powhatan to Albemarle County.	Feb 11, 1907
Giles County, Va.	Very large in intensity and extent. The earthquake had a maximum Modified Mercalli Intensity of VIII, based on “many downed chimneys” and “changes in the flow of springs.” Aftershocks continued through June 6, 1897. Magnitude: 5.8	May 31, 1897
Central Va.	The highest intensities from this earthquake occurred mainly at towns near the James River waterfront in Goochland and Powhatan Counties, and in Louisa County. Magnitude 4.5	Dec 23, 1875
Central Va.	Chimney damage occurred at Buckingham. This earthquake was reported to be “quite strong” at Fredericksburg, Richmond, and Scottsville. At Scottsville, where every house in the village was shaken, water in the canal was “troubled,” and boats were tossed to and fro. Magnitude 4.3	Nov 2, 1852
Wytheville	A severe earthquake that was observed over a large area threw down a chimney near Wytheville, in southwest Virginia, and shook down tops of chimneys at Buckingham Courthouse,. Houses were shaken violently at Staunton. Magnitude 4.9	Apr. 29, 1852
Central Va.	A rather strong shock agitated walls of buildings at Lynchburg and rattled windows violently. It was described as “severe” at Charlottesville. Two miners were killed in a panic caused by the tremor at a mine near Richmond. Magnitude 4.5	Aug 27, 1833

Source: NCDC, Albemarle Historical Society archived newspapers

FEMA uses the indicator of Peak Ground Acceleration (PGA) (%g, where g = 9.8 m/s2) to show the probability of earthquakes in the U.S. The national map of Peak Ground Acceleration (%g) indicates that parts of the Planning District have a PGA rate of 3-4%g, while others (see map below) have a 4-5% PGA. Nationwide, these are relatively low PGA rates. The San Andreas fault in California induces PGA rates above 100 for a large extent of the fault line.

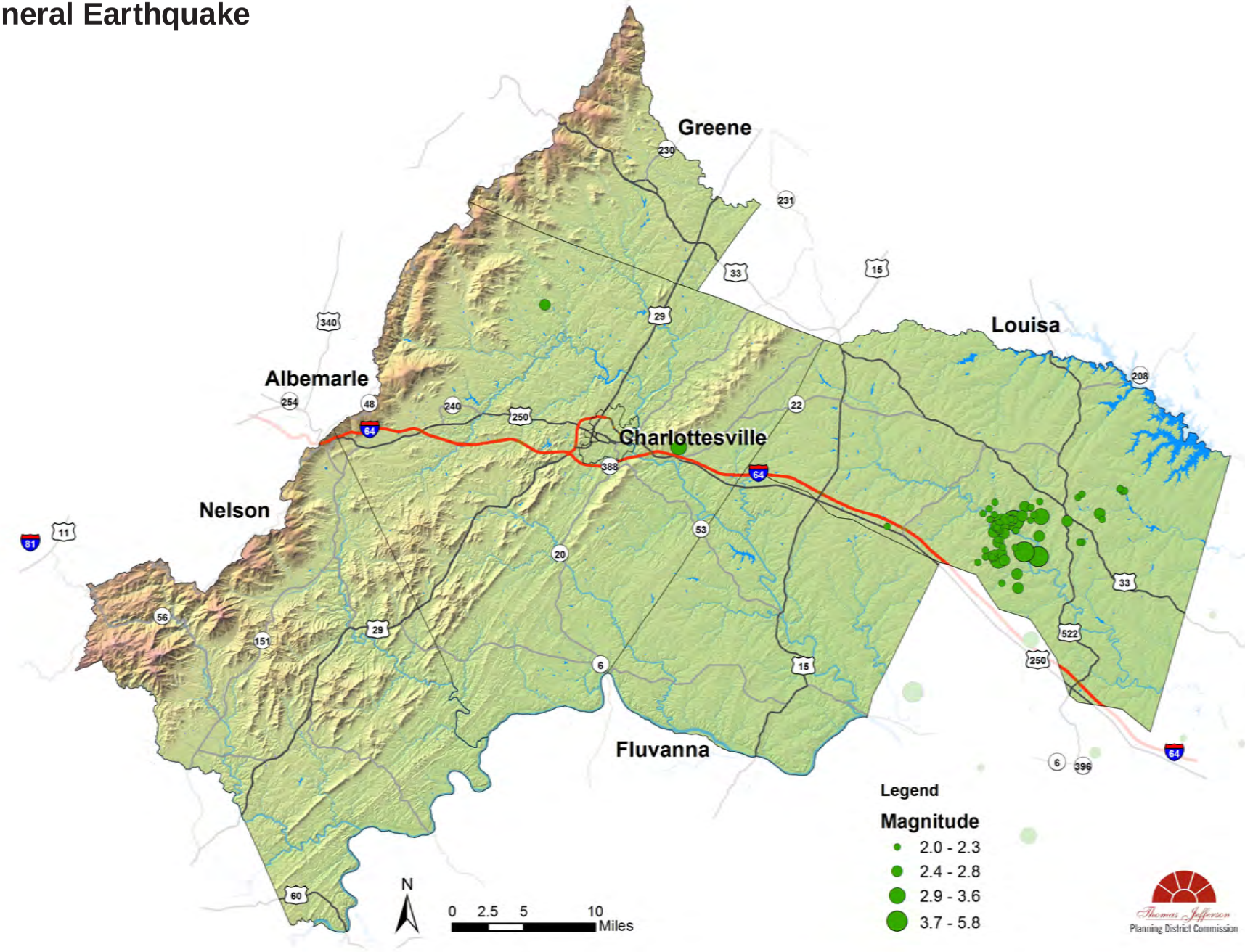
Ground Motion Probability of Ground Motion



Source: FEMA

The August 2011, 5.8 magnitude earthquake near the Town of Mineral was a major event for the region. Short term prediction of earthquakes continues to be impossible with current scientific knowledge, but the U.S Geological Survey is able to make long-term predictions of seismic activity by geographic area. In 2009, the USGS gave a 0.014% probability that an earthquake of magnitude 5.8 or greater would happen in the TJPD in any given year, which means it could be expected to occur every 7000 years. This event was extremely rare, but geologists will use the data to update models of seismic activity. While there is no clear evidence that seismic activity along the East Coast is increasing, there is a high degree of uncertainty at this time.

Aftershocks Associated with the Mineral Earthquake



Landslides

Identification

A landslide is the downward and outward movement of slope-forming soil, rock, and vegetation, which is driven by gravity. Landslides may be triggered by both natural and human-caused changes in the environment, including heavy rain, rapid snow melt, steepening of slopes due to construction or erosion, earthquakes, volcanic eruptions, and changes in groundwater levels.

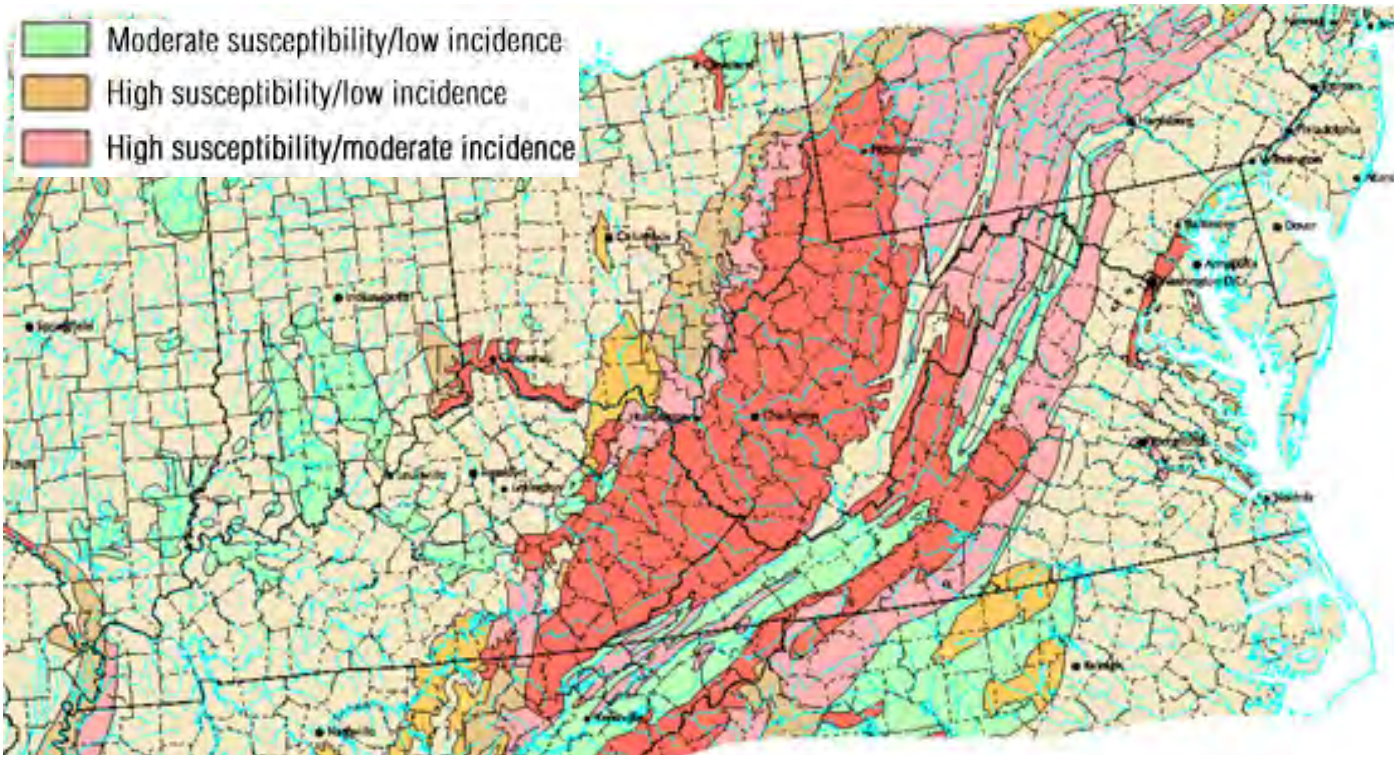
There are several types of landslides: rock falls, rock topple, slides, and flows. Rock falls are rapid movements of bedrock, which result in bouncing or rolling. A topple is a section or block of rock that rotates or tilts before falling to the slope below. Slides are movements of soil or rock along a distinct surface of rupture, which separates the slide material from the more stable underlying material. Mudflows, sometimes referred to as mudslides, mudflows, lahars or debris avalanches, are fast-moving rivers of rock, earth, and other debris saturated with water. They develop when water rapidly accumulates in the ground, such as from heavy rainfall or rapid snowmelt, changing the soil into a flowing river of mud or "slurry." Slurry can flow rapidly down slopes or through channels, and can strike with little or no warning at avalanche speeds. Slurry can travel several miles from its source, growing in size as it picks up trees, cars, and other materials along the way. As the flows reach flatter ground, the mudflow spreads over a broad area where it can accumulate in thick deposits.

Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effect of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly.

In the United States, it is estimated that landslides cause up to $2 billion in damages and from 25 to 50 deaths annually. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year.

The figure below shows areas where large numbers of landslides have occurred and areas that are susceptible to landslides in the conterminous United States:

Landslide Overview Map



Source: USGS

Analysis

The western edges of Greene and Albemarle County and much of Nelson County are most at risk of landslide in the Thomas Jefferson Planning District. When torrential rains hit the slopes of mountains, unstable earth can become loose and can be washed downhill. Earthquakes may also trigger rock and landslides, but this is rare in the Planning District.

During Hurricane Camille in 1969, extensive damage was done by landslides and flooding in Massies Mill, Woods Mill, Roseland, Tyro, Lovingston, Norwood, Schuyler, and along Davis and Muddy Creeks. There were an estimated 286 houses and outbuildings damaged or destroyed, 2 fraternal lodges, 1 warehouse, 2 churches, 17 trailers, 175 cars and trucks, 1 school, 2 pieces of construction equipment, 2 post offices, 11 pieces of farm machinery, 5 industrial plants of which one was a water system and about 18,500 acres of pasture and cropland.

An intense storm in June 1995 triggered landslides, including soil slips, slumps, debris slides, and debris flows, as well as associated flooding along the North Fork of the Moormans River in the northwestern portion of Albemarle County. The area immediately affected by the storm was within the boundaries of Shenandoah National Park, but flooding resulted in the Sugar Hollow Reservoir and downstream for another four miles, as far as White Hall. The Sugar Hollow Reservoir acted as an impoundment for the boulders, silt, and trees that had been dislodged upstream.

No summary data of damage is available from the National Climate Data Center for landslides in the Planning District. The June 1995 event prompted Albemarle County to commission a study by the U.S. Geological Survey (USGS) to evaluate the potential for debris flows resulting from severe storms in the county. This study, Debris-Flow Hazard Inventory and Evaluation: Albemarle County, Virginia (USGS, 2000), did not find evidence of historic debris flows other than the 1995 event and some damage from Hurricane Camille near the Nelson County border. The eastern slopes of the Blue Ridge and the North and South Forks of the Moormans River were found to have both the requisite elevation and slope for debris flows and evidence of prehistoric debris flows; these areas were therefore considered to be the most susceptible to future debris flows.

Several sites in the Covesville area, in the southern part of the county near the Nelson County border, were found to have the necessary elevation and slopes, but no evidence of debris flows other than moderate activity from Hurricane Camille along one stream. This area is therefore judged as having an intermediate susceptibility. As small areas of the Southwest Mountains and their southern extension south of Charlottesville have the requisite slope, but show no evidence of debris flows, they are rated with lower susceptibility. Carbon-14 sampling performed for the study indicates that recurrence intervals in Albemarle County for a specific site are on the order of 3,000 years, and similar sampling in Nelson County has indicated a recurrence interval of about 3,000-6,000 years; however, the historic record indicates that a debris flow will occur somewhere within the Blue Ridge of Virginia about once per decade.

Hurricane and landslide damage in Nelson County

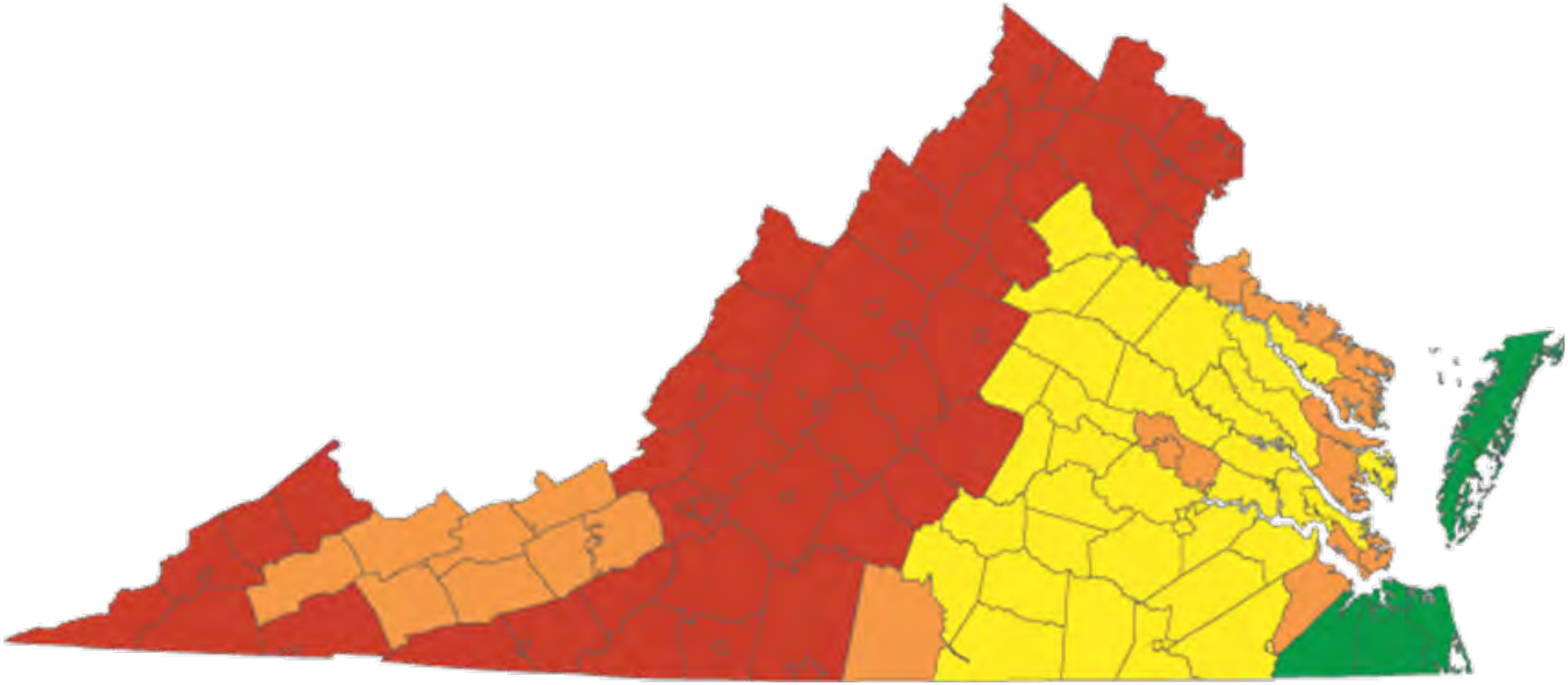
Source: TJPDC

Landslide damage from Hurricane Camille

Source: TJPDC

Landslide Potential

Adopted from the USGS Landslide Overview Map of The United States



***Red** = high potential; orange = moderate potential; **yellow** = moderate to low potential; **green** = low potential*

Dam Failure

Identification

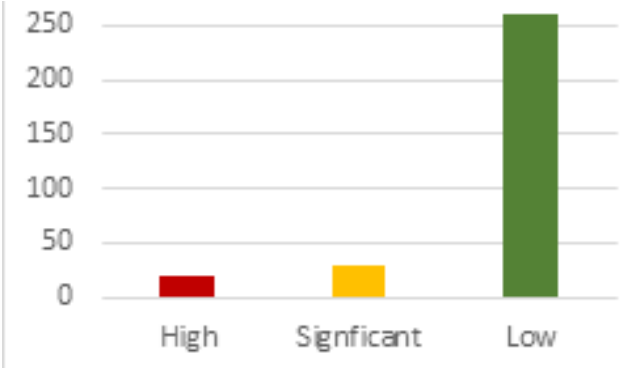
Worldwide interest in dam and levee safety has risen significantly in recent years. Aging infrastructure, new hydrologic information, and population growth in floodplain areas downstream from dams and near levees have resulted in an increased emphasis on safety, operation and maintenance. As of 2010, the National Inventory of Dams (NID) shows more than 85,000 dams in the United States. The federal government owns or regulates only 11% of those dams, and responsibility for ensuring the safety of the rest of the nation's dams falls to state dam safety programs.

Though dams have many benefits, they also can pose a risk to communities if not designed, operated, and maintained properly. In the event of a dam failure, the energy of the water stored behind even a small dam is capable of causing loss of life and great property damage if development exists downstream of the dam. According to the American Society of Civil Engineers, the number of high hazard potential dams is increasing much faster than the total number of dams, now totaling 15,237. That represents an increase of more than 3,300 new high hazard potential dams since 2007. This increase is a result of new development below dams, which is dramatically increasing the consequences of failure and resulting in the reclassification of dams.

Analysis

The National Inventory of Dams (NID), maintained by the U.S. Army Corps of Engineers, is a list of all private and public dams meeting specific criteria for the definition of a dam. The criteria exclude insignificant dams, natural dams, and privately owned ponds. Each dam is ranked in accordance to its hazard potential, with high hazard dams being those where failure or misoperation will most likely cause loss of human life.

Number of Dams by Hazard Level



Source: DCR

It is important to note that the NID hazard rank is not a determination of structural soundness of a dam or the probability of a failure or misoperation. It ranks the severity of a hazard, in terms of loss of human life and property, should a dam fail. Oversight of dam maintenance and operation is typically conducted at the federal level by the Federal Energy Regulatory Commission or through the Virginia Department of Recreation Dam Safety and Floodplain Management program. Five dams in the region are federally-regulated, including high-hazard South Rivanna and Lake Anna dams. Of all dams in the region 58% are not subject to any regulation on account of a small size, low capacity, or agricultural use. Three dams ranked high hazard are exempt by DCR from any regulation: Birdwood Dam, Stevens Lake Dam, and Whites Dam.

The safety of the Upper and Lower Ragged Mountain dams is of particular concern. The dam is ranked High Hazard because of the high population in Charlottesville within the dam inundation zone. It has been a subject of public discussion as a part of a 50-year regional water supply plan that would increase the height of the dam to enlarge water supply capacity. The Ragged Mountain Dam was determined, through a 1979 federal inspection, to be "seriously inadequate" and the Virginia Department of Conservation and Recreation Dam Safety committee has consistently reaffirmed its inadequacy and requested the deficiencies to be addressed immediately.

Although there has not been a significant history of dam failure in the region, a threat to property and life is possible with the failure of any of the high hazard dams. The Lake Louisa dam failed during Hurricane Camille in 1969. It is considered a rare event because of the severity of the storm and the age of the dam. Most dams in the TJPD are relatively undeveloped at the base of the dam, with most development occurring behind the dams near the lakes. The Ragged Mountain Dam has the potential for generating the most property damage, injury, and loss of life if it fails due to its proximity to the City of Charlottesville, the densest population center in the region. Implementation of the adopted regional water supply plan is expected to increase the dam's inundation zone and likely increase the potential for hazard should a dam failure occur.

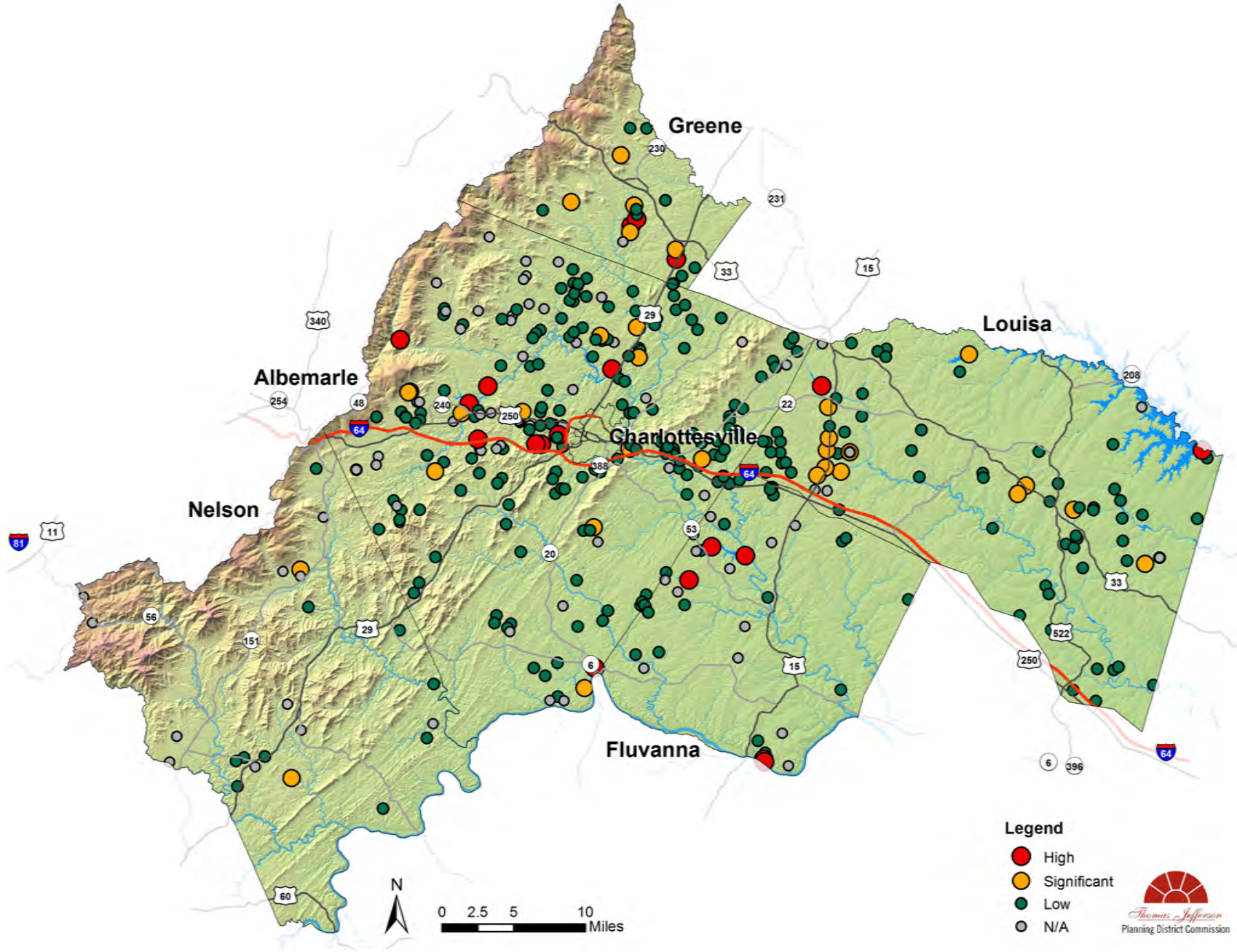
As Sugar Hollow and Crozet develop further as is projected, the dam at Sugar Hollow may become a larger threat. The South Fork Rivanna Dam would also threaten the urban Albemarle and Charlottesville landscape should it fail. Restrictions on development in the floodplains have limited the risk of dam failure losses, but older structures may be at risk.

High Risk Dams

Dam	County	River	Owner	Purposes	Year Completed	Height (ft.)	Drain Area (Sq. Mi.)	Regulated
Lake Anna Dam	Louisa	N Anna River	Virginia Electric and Power Co.	Water Supply	1972	90	343	Federal
South Rivanna	Albemarle	S Fork Rivanna	RWSA	Hydropower	1965	47	259	Federal
Sugar Hollow Dam	Albemarle	Mormans River	RWSA	Water Supply	1950	77	17	State
Lower Ragged Mountain Dam	Albemarle	Moores Creek	RWSA	Water Supply	1908	67	2	State
Upper Ragged Mountain	Albemarle	Moores Creek	RWSA	Water Supply	1885	47	1	State
Mink Creek Dam	Albemarle	Mink Creek	Town of Scottsville	Flood Control, Water Supply, Recreation	1977	39	1	State
Greene Acres Dam	Greene	TR-South River	Greene Acres Owners Assoc.	Recreation	1970-1992	37	1	State
Whites Dam	Albemarle	Slabtown Branch	William H. White (N)	Irrigation	1971	37	0	None
Stevens Lake Dam	Nelson	TR-Brown Creek	Russell A. Stevens	Water Supply	1960	31	0	None
Birdwood Dam	Albemarle	TR- Morey Creek	University of Virginia	Irrigation, Recreation	1930	24	0	None

Source: DCR

Dams


Greene
Albemarle
Charlottesville
Louisa
Nelson
Fluvanna
Legend
High
Significant
Low
N/A
N
0 2.5 5 10
Miles
Thomas Jefferson
Planning District Commission

Karst

Identification

Karst is a terrain with distinctive landforms and hydrology created from the dissolution of soluble rocks, principally limestone and dolomite. Karst terrain is characterized by springs, caves, sinkholes, and a unique hydrogeology that results in aquifers that are highly productive but extremely vulnerable to contamination. About 20% of the land surface in the U.S. is classified as karst, and about 40% of the groundwater used for drinking comes from karst aquifers.

Four geologic hazards are associated with karst. Two common karst-related geologic hazards -- cover-collapse sinkholes and sinkhole flooding -- cause the most damage to buildings. A third karst hazard is relatively high concentrations of radon, sometimes found in basements and crawl spaces of houses built on karst. Finally, the hydrogeology of karst aquifers makes the groundwater vulnerable to pollution, and this vulnerability may also be considered a type of geologic hazard.

2007 SinkHole on US-29

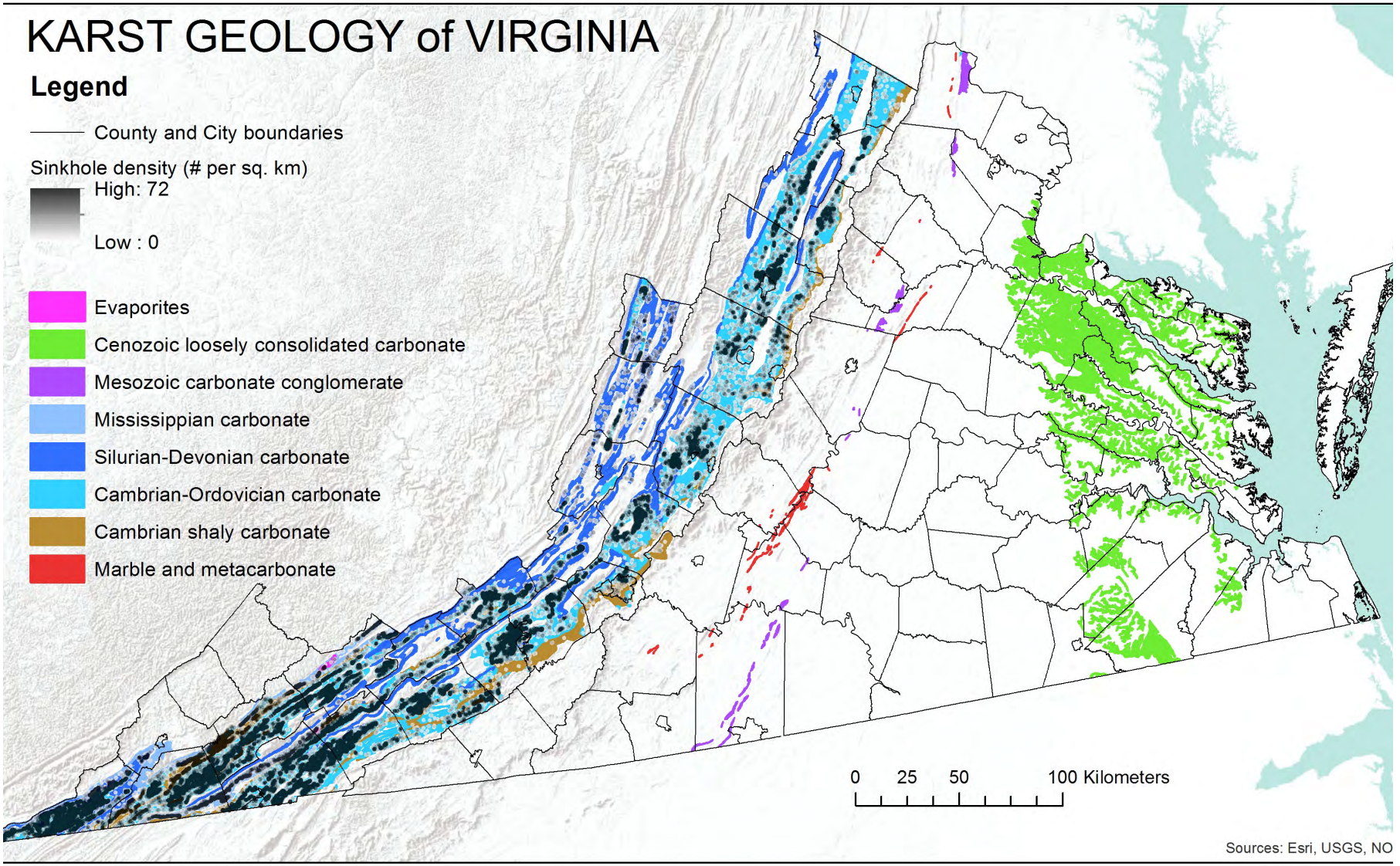
Source: TJPDC

Analysis

The Thomas Jefferson Planning District contains one area with karst geology directly to the east of the Southwest Mountains in Albemarle County. The area contains metamorphosed limestone, dolostone, and marble. The U.S. Geological survey characterizes this as the “short type,” defined as fissures, tubes, and caves generally less than 1000 ft. long; 50 ft. or less vertical extent. The Virginia Department of Emergency Management ranks Albemarle County with high karst vulnerability, and Fluvanna County and Louisa County as moderately vulnerable to karst-related hazards, based on the percentage of land in the county containing karst geology.

The predominate karst region in Virginia is the I-81 corridor, where several land-subsidence sinkholes have been documented in recent history. VDOT’s Staunton district spent over a million dollars in 2011 on karst-related incidents triggered by high levels of precipitation. The development of roadways and other impervious services has, in some cases, increased stormwater flows and exacerbated karst-related flooding over time. Loudon County has also seen significant impacts due to land subsidence, particularly near Leesburg. There have been no documented historic incidents related to Karst in the Planning District.

Karst Geology



Other Hazards

The following list identifies additional hazards. Some of the hazards such as lightning and hail do exist in the Planning District, but do not pose a significant threat, while others such as volcanoes and tsunamis do not affect the Planning District.

Lightning: Lightning is a discharge of electrical energy resulting from the buildup of positive and negative charges within a thunderstorm, creating a "bolt" when the buildup of charges becomes strong enough. This flash of light usually occurs within the clouds or between the clouds and the ground. A bolt of lightning can reach temperatures approaching 50,000 degrees Fahrenheit. Lightning rapidly heats the sky as it flashes but the surrounding air cools following the bolt. This rapid heating and cooling of the surrounding air causes thunder. On average, 89 people are killed each year by lightning strikes in the United States. The greatest threat from lightning is the chance of starting a wildfire, discussed in the wildfire section.

Hailstorms: Hailstorms are an outgrowth of severe thunderstorms. Early in the developmental stages of a hailstorm, ice crystals form within a low-pressure front due to the rapid rising of warm air into the upper atmosphere and the subsequent cooling of the air mass. Frozen droplets gradually accumulate on the ice crystals until, having developed sufficient weight, they fall as precipitation—as balls or irregularly shaped masses of ice greater than 0.75 in. (1.91 cm) in diameter. The size of hailstones is a direct function of the size and severity of the storm. High velocity updraft winds are required to keep hail in suspension in thunderclouds. The strength of the updraft is a function of the intensity of heating at the Earth's surface. Higher temperature gradients relative to elevation above the surface result in increased suspension time and hailstone size.

Hailstorms have caused some damage to the region including softball sized hail on July 3, 1983, but in general do not pose a serious threat.

Erosion: Erosion is the gradual breakdown and movement of land due to both physical and chemical processes of water, wind, and general meteorological conditions. Natural, or geologic, erosion has occurred since the Earth's formation and continues at a very slow and uniform rate each year.

There are two types of soil erosion: wind erosion and water erosion. Wind erosion can cause significant soil loss. Winds blowing across sparsely vegetated or disturbed land can pick up soil particles and carry them through the air, thus displacing them. Water erosion can occur over land or in streams and channels. Water erosion that takes place over land may result from raindrops, shallow sheets of water flowing off the land, or shallow surface flow, which is concentrated in low spots. Stream channel erosion may occur as the volume and velocity of water flow increases enough to cause movement of the streambed and bank soils. Major storms such as hurricanes may cause significant erosion by combining high winds with heavy surf and storm surge to significantly impact the shoreline.

Expansive Soils: Soils and soft rock that tend to swell or shrink due to changes in moisture content are commonly known as expansive soils. In the United States, two major groups of rocks serve as parent materials of expansive soils, and occur more commonly in the West than in the East. The first group consists of ash, glass, and rocks of volcanic origin. The aluminum silicate minerals in these volcanic materials often decompose to form expansive clay minerals of the smectite group, the best known of which is montmorillonite. The second group consists of sedimentary rock containing clay minerals, examples of which are the shales of the semiarid West-Central States. Because clay materials are most susceptible to swelling and shrinking, expansive soils are often referred to as swelling clays.

Changes in soil volume present a hazard primarily to structures built on top of expansive soils.
Most engineering problems caused by volume changes in swelling clays result from human activities that modify the local environment. They commonly involve swelling clays beneath areas covered by buildings and slabs or layers of concrete and asphalt, such as those used in construction of highways, canal linings, walkways, and airport runways.

Land subsidence: Land subsidence is the lowering of the land-surface elevation from changes that take place underground. Common causes of land subsidence from human activity are pumping water, oil, and gas from underground reservoirs; dissolution of limestone aquifers (sinkholes); collapse of underground mines; drainage of organic soils; and initial wetting of dry soils (hydrocompaction). Land subsidence occurs in nearly every state of the United States, but is more prevalent in the Southwestern part of the country.

Land subsidence causes many problems including: (1) changes in elevation and slope of streams, canals, and

drains; (2) damage to bridges, roads, railroads, storm drains, sanitary sewers, canals, and levees; (3) damage to private and public buildings; and (4) failure of well casings from forces generated by compaction of fine-grained materials in aquifer systems. In some coastal areas, subsidence has resulted in tides moving into low-lying areas that were previously above high-tide levels.

Tsunami: The word tsunami is Japanese and means "harbor wave." A tsunami is a series of great waves that are created by undersea disturbances such as earthquakes or volcanic eruptions. From the area of disturbance, tsunami waves will travel outward in all directions. Tsunamis can originate hundreds or even thousands of miles away from coastal areas.

In the United States, tsunamis have historically affected the West Coast, but the threat of tsunami inundation is also possible on the Atlantic Coast. Pacific Ocean tsunamis are classified as local, regional, or Pacific-wide. Regional tsunamis are most common. Large-scale Pacific-wide tsunamis are much less common, with the last one being recorded in 1964, but consist of larger waves, which have high potential to cause destruction. However, the December 2004 tsunami which struck Sri Lanka, Indonesia, India, Thailand and other small countries, completely destroyed cities and towns. After a month of searching, the death toll is over 100,000 with 125,000 people still missing. The effects of this tsunami were felt even here, as relief, money, and volunteers are still being sent to these countries in dire need of assistance.

Volcano: Over 75 percent of the Earth's surface above and below sea level, including the seafloors and some mountains, originated from volcanic eruption. Emissions from these volcanoes formed the Earth's oceans and atmosphere. Volcanoes can also cause tsunamis, earthquakes, and dangerous flooding.

There are more than 500 active volcanoes in the world. More than half of these volcanoes are part of the "Ring of Fire," a region that encircles the Pacific Ocean. More than 50 volcanoes in the United States have erupted one or more times in the past 200 years. The most volcanically active regions of the nation are in Alaska, Hawaii, California, Oregon and Washington. The danger area around a volcano covers approximately a 20-mile radius. Some danger may exist 100 miles or more from a volcano.

Avalanche: An avalanche can be defined as a large mass of snow, ice, etc, detached from a mountain slope and sliding or falling suddenly downward. To occur, they need a steep slope, snow cover, a weak layer in the snow cover, and a trigger, such as an earthquake, thermal change, blizzard, or human intervention. Most common in the mountainous western U.S., none of these conditions are found in the TJPDC area and no reported deaths from avalanches have occurred since data recording began in 1950

Meteorites: A meteorite is a natural object originating in outer space that survives impact with the Earth's surface. Although impact from a meteorite in the planning district is not considered to have a high probability, a large object could have a significant effect. One of the leading theories for the cause of the Cretaceous–Tertiary extinction event that included the dinosaurs is a large meteorite impact.

Data Sources

American Society of Civil Engineers (ASCE)
Web site: www.windhazards.org

Bureau of Reclamation, U.S. Department of the Interior
Web site: www.usbr.gov

Federal Emergency Management Agency (FEMA)
Web site: www.fema.gov

National Climatic Data Center (NCDC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: http://lwf.ncdc.noaa.gov/oa/ncdc.html

National Drought Mitigation Center, University of Nebraska-Lincoln
Web site: www.drought.unl.edu/index.htm

National Severe Storms Laboratory (NSSL), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: www.nssl.noaa.gov

National Weather Service (NWS), U.S. Department of Commerce, National Oceanic and Atmospheric Administration
Web site: www.nws.noaa.gov

Storm Prediction Center (SPC), U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service
Web site: www.spc.noaa.gov

United States Geological Survey (USGS), U.S. Department of the Interior
Debris-Flow Hazard Inventory and Evaluation: Albemarle County, Virginia.
USGS Karst Interest Group
Web site: www.usgs.gov

Virginia Department of Forestry (VDOF)
Web site: www.dof.virginia.gov

Virginia Department of Emergency Management (VDEM)
Web site: www.vaemergency.com

Vulnerability Assessment

01.6(c)(2)(ii)(A): The plan should describe vulnerability in terms of: The types and numbers of existing and future buildings, infrastructure, and critical facilities located in the identified hazard areas…

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Purpose

The Vulnerability Assessment section provides an overview and analysis of vulnerability in the Thomas Jefferson Planning District to the hazards listed below. While the previous Hazard Identification and Analysis section defined and described the prevalence and intensity of hazards in the region, this section combines the hazard analysis with both present and projected human settlement patterns to measure their human impact. Hazards that pose significantly less risk to the region are not covered in this section. Where appropriate, distinctions have been made regarding relative risk for each locality.

Risk contains three elements: **hazard**, vulnerability, and exposure. A hazard is an act or phenomenon that has the potential to produce harm or other undesirable consequences of a person or thing. **Vulnerability** is a susceptibility to physical injury, harm, damage, or economic loss. **Exposure** describes the people, property, systems, or functions that could be lost to a hazard.

This Section Includes the following

1. Population and Building Exposure
2. Development Trends
3. Infrastructure
4. Critical Facilities
5. Estimating Potential Loss

Population

According to the 2015 American Community Survey, the total population of the Thomas Jefferson Planning District was 234,988, which is an 3.1% increase from a population of 234,712 recorded in 2010. The table below shows the population by locality, and the percent growth in population between 2010 and 2015.

Population by Locality

Locality	Population 2000	Population 2010	10-15 Change
Charlottesville	43,475	45,084	3.7%
Albemarle	98,970	103,108	4.2%
Fluvanna	25,691	26,014	1.3%
Greene	18,403	18,938	2.9%
Louisa	33,153	33,986	2.5%
Nelson	15,020	14,858	-1.1%
Region	234,712	241,988	3.1%

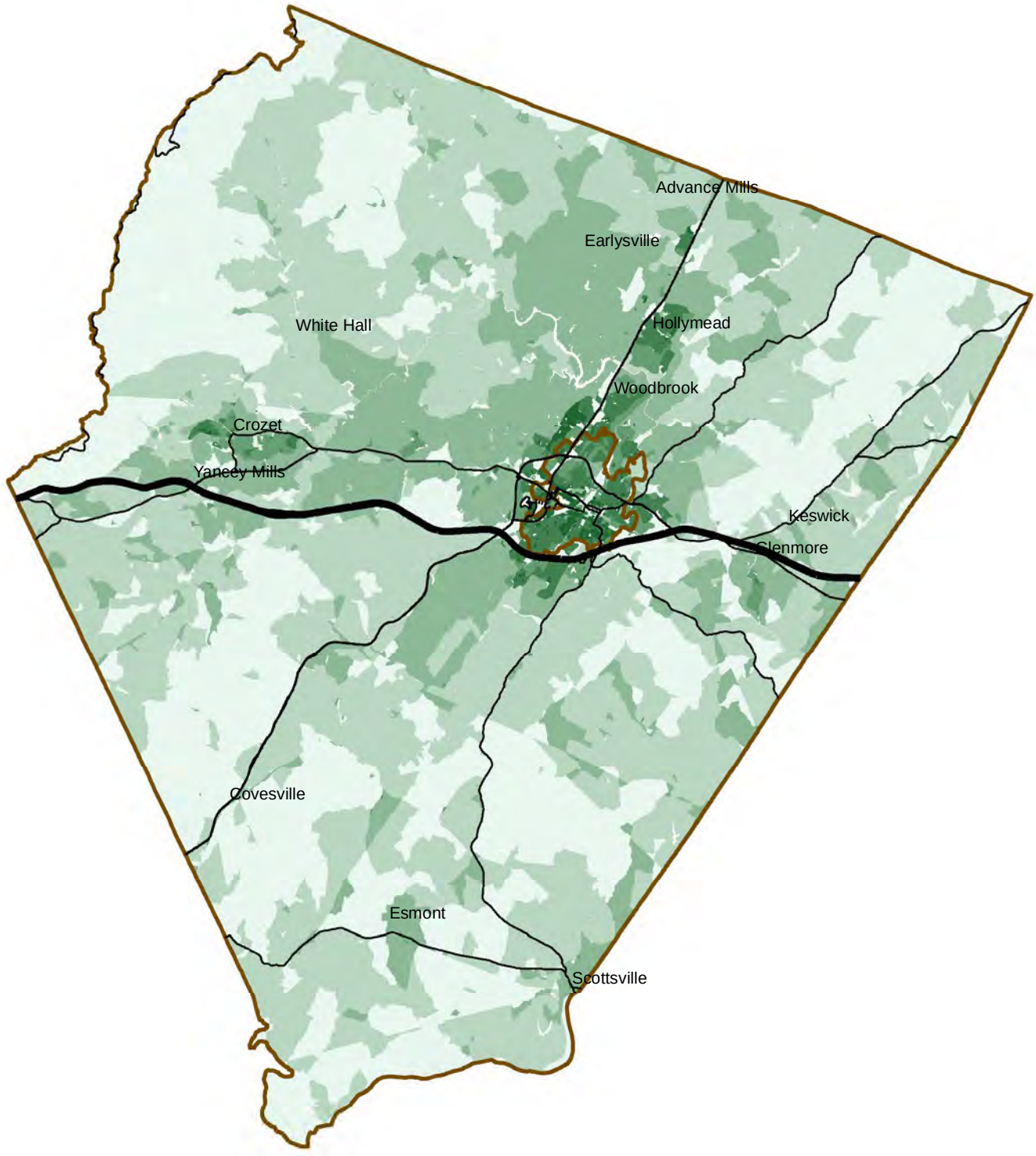
Source: US Census 2010 and 2015 ACS

Some segments of the population are more adversely affected than others by hazards. The elderly, low-income households, people with disabilities, and families with young children may be less able to prepare for a disaster, put at high risk during a disaster, and slower to recover after a disaster.

A lower-income household may be more likely to live in a floodplain, because of depreciated land values, and less likely to hold health insurance or extra insurance on their property. They are more likely to live in older homes with more structural deficiencies susceptible to earthquake damage, or mobile homes that are less protected from wind storms. They are also more likely to lack transportation options, which may impair mobility if infrastructure or transit service is impeded. In severe disasters that remove a sizable number of housing units from the regional housing stock, a prolonged shortage of affordable housing is a common outcome.

The elderly, people with disabilities, and, in some cases, young children may have impaired mobility and need special assistance during emergency operations. Stress and the general disruption of care can have serious health impacts on high-risk individuals. In event of a displacement, shelters or temporary residences may or may not be equipped to meet special needs. This is especially true, considering that many displaced individuals opt to use personal contacts to find temporary housing.

Population Density by Census Block (2010) Albemarle + Charlottesville



Persons Per Square Mile

0 - 20
21 - 100
101 - 800
801 - 2000
2001 - 6000
6001 - 25645

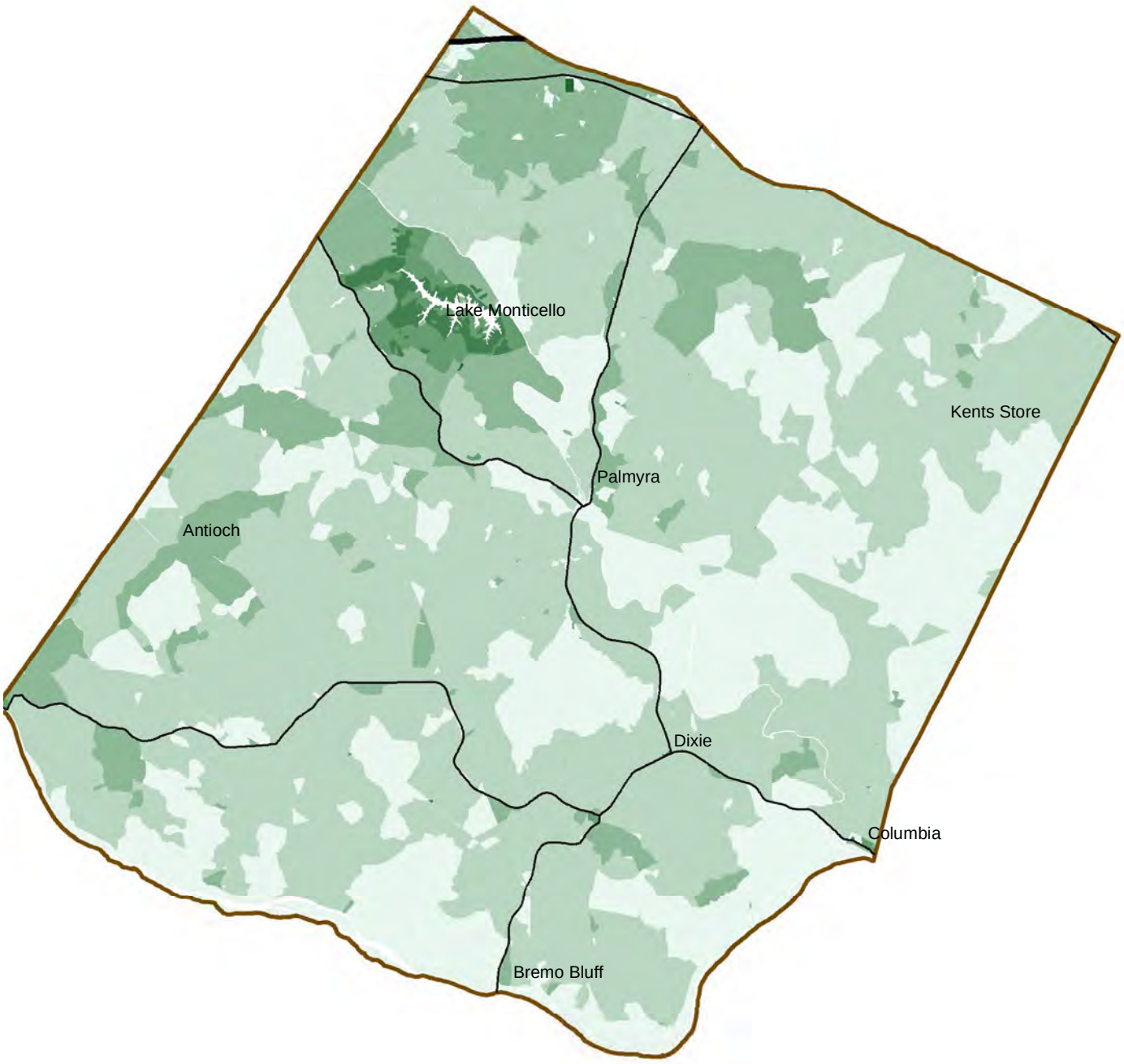
Source: U.S. 2010 Decennial Census

N

0 0.5 1 2 3 4 Miles

Thomas Jefferson Planning District Commission

Population Density by Census Block (2010) Fluvanna



Persons Per Square Mile

0 - 20 | 21 - 100 | 101 - 800 | 801 - 2000 | 2001 - 6000 | 6001 - 25645

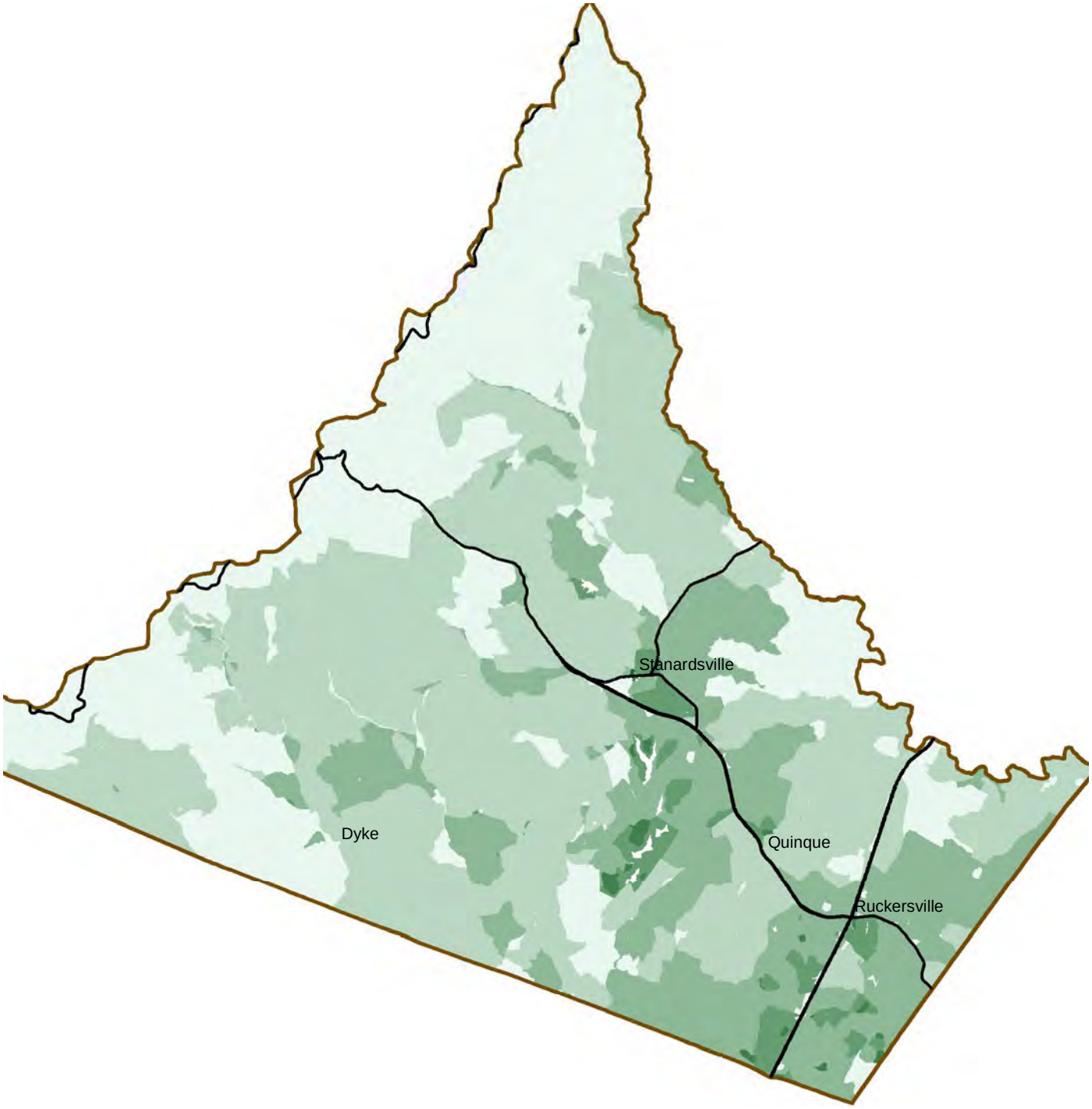
Source: U.S. 2010 Decennial Census

N

0 1 2 3 4 Miles

Thomas Jefferson Planning District Commission

Population Density by Census Block (2010) Greene



Persons Per Square Mile

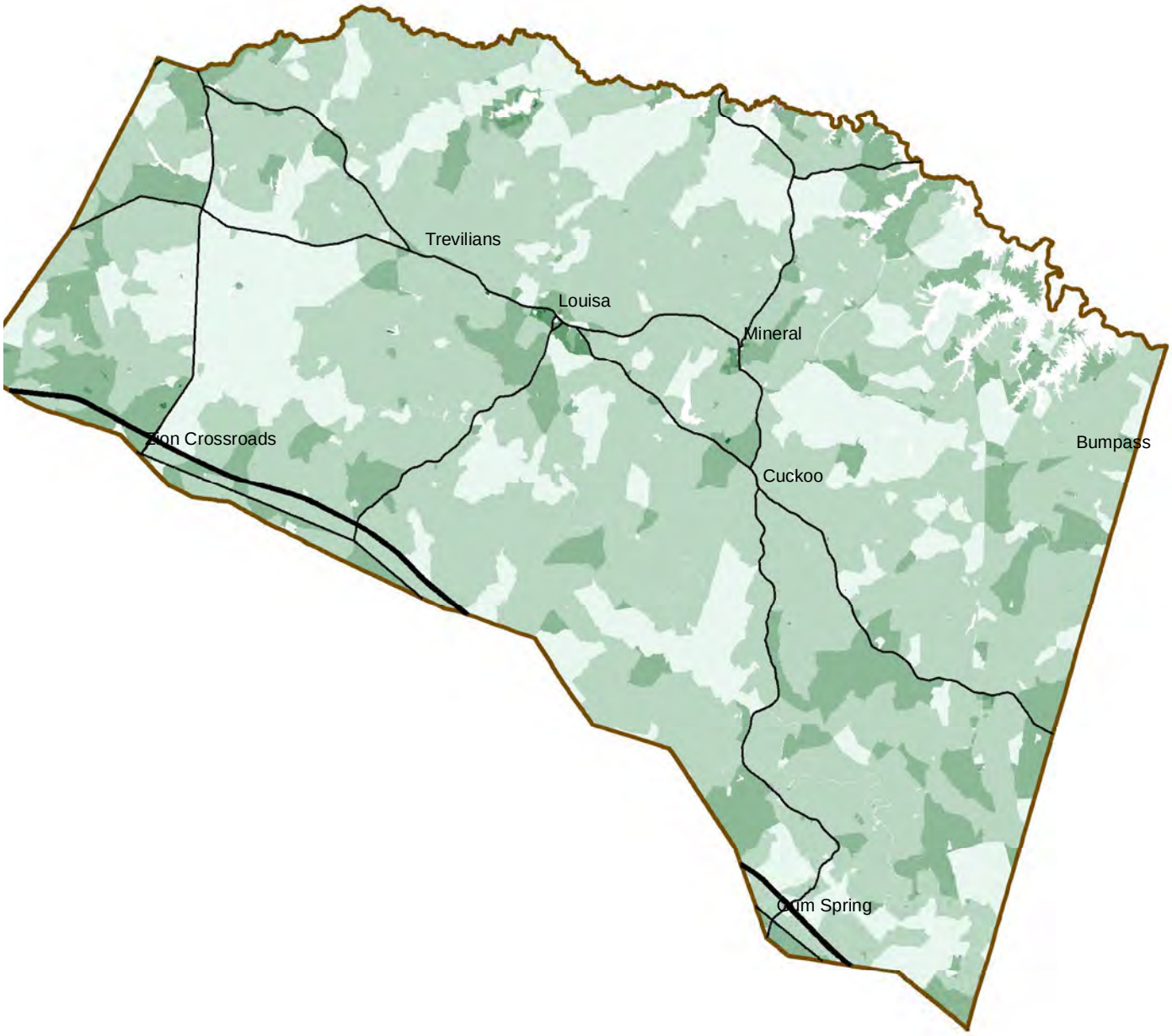
0 - 20
21 - 100
101 - 800
801 - 2000
2001 - 6000
6001 - 25645

Source: U.S. 2010 Decennial Census

0 1 2 3 4
Miles

Thomas Jefferson Planning District Commission

Population Density by Census Block (2010) Louisa



Persons Per Square Mile

0 - 20
21 - 100
101 - 800
801 - 2000
2001 - 6000
6001 - 25645

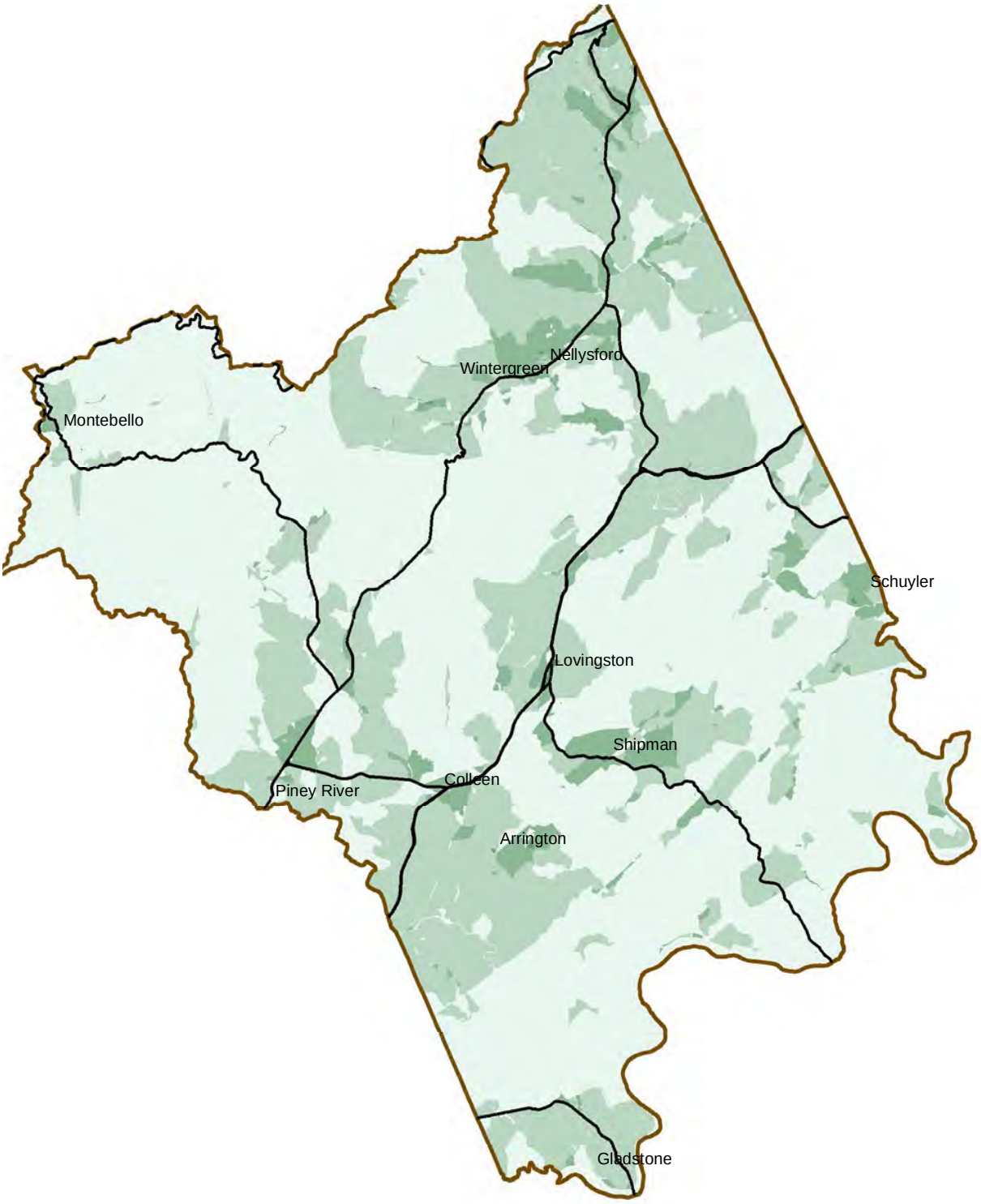
Source: U.S. 2010 Decennial Census

N

0 0.5 1 2 3 4 Miles

Thomas Jefferson Planning District Commission

Population Density by Census Block (2010) Nelson



Persons Per Square Mile

0 - 20
21 - 100
101 - 800
801 - 2000
2001 - 6000
6001 - 25645

Source: U.S. 2010 Decennial Census

N

0 1 2 3 4
Miles

Thomas Jefferson Planning District Commission

Buildings

The estimated numbers of buildings by locality in 2011 are as follows:

Number of Buildings by Locality

Locality	Total Buildings	Residential Buildings	Non-Residential Buildings	Residential Buildings Built since 2000
Albemarle	41,194	38,559	2,635	1,748
Charlottesville	17,082	15,441	1,641	240
Fluvanna	11,524	11,254	270	346
Greene	17,116	16,109	1,007	210
Louisa	18,126	17,227	899	754
Nelson	10,595	10,001	594	160
Region	115,637	108,591	7,046	3,458

Source: U.S. Census 2000, US Census building permit data 2012-2016, Dun and Bradstreet 2006

Residential building counts were derived from 2000 U.S. Census data and augmented by residential building permits reported by individual localities between 2001 and 2010 this was further updated using annual residential permit data available from the US Census through 2016. In order to account for demolition the residential building total were reduced by 0.19% annual national average to account for demolition and conversion. Non-residential counts were determined by private firm Dun and Bradstreet in 2006 and acquired through FEMA. As of publication no newere data was available.

Using planimetric data provided by localities, a total of 164,859 structures can be identified in the region, which is significantly higher than the estimates provided above. However, this data does not differentiate between primary structures and secondary structures, such as small sheds or garages. For the purposes of estimating loss, these planimetric data can lead to inflated results. Therefore, the counts reported in the table above will be used for all loss estimation.

201.6(c)(2)(ii)(C): The plan should describe vulnerability in terms of providing a general description of land uses and development trends within the community so that mitigation options can be considered in future land use decisions.

Land Use and Development Trends

Changes in land use over time will affect the ability to mitigate and respond to hazards, as well as provide opportunity for improvements. Each locality is growing in population and the region, as a whole, grew by 6% between 2010 and 2015. Growth is being channeled into certain areas based on a number of factors, including market demand, location of roads and other infrastructure, topography, and local policies. Over the last several decades, the most basic trend has been conversion of land from undeveloped forest and farmland into residential, commercial, institutional and other more urban uses. Exurban growth has been predominately in the form of Single-family residences spreading further into the countryside outside of traditional town centers. One significant driving force is the price of housing in the urban area, leading to increased commuting from outlying counties.

Commercial uses and employment centers remain clustered in Charlottesville and the urban areas of Albemarle County, especially the US 29 corridor and Pantops. The majority of employees who live in the outlying counties continue to commute into these areas. Two major commercial exceptions are big box store developments that have occurred in Zions Crossroad and Ruckersville within the last five years.

Construction activity across the planning district has returned to near pre recession levels with several major stalled developments and project phases moving forward Within the urbanized areas there has been an increase in infill projects.

Citizens, planners, and public officials have sought ways to foster development of vibrant, compact, mixed use communities while protecting the rural countryside, with varying degrees of success. Floodplain maps included in this section show targeted growth areas in each locality. Each locality defines growth areas differently, and applies varying levels of incentives and/or restrictions to concentrate growth in those areas. The Virginia General

Assembly has passed legislation to require high-growth localities, including all counties in the Thomas Jefferson Planning District, to adopt Urban Development Areas into their Comprehensive Plans and create incentives to further concentrate new development into these areas. The character of new growth that emerges in the wake of the current economic recession remains to be seen.

Growth Areas

Locality	Percent of County Land that is designated for Growth	Percent of all Structures that are in Growth Area
Nelson*	NA	NA
Fluvanna	10.8%	37.5%
Greene	6.7%	24.6%
Albemarle	5.1%	39.3%
Louisa	23.6%	35.9%
Charlottesville	NA	NA

Source: Local Government GIS

Because there are significant differences between localities with respect to land use and development, each locality in the region is discussed individually below:

Charlottesville

Although there is limited developable land remaining in the City of Charlottesville, redevelopment and selected small-scale infill has been occurring over the last decade and can expect to increase in the future. The population of Charlottesville remained stagnant between 1970 and 2000, but then grew by 8% between 2000 and 2010. Much of this growth occurred around the University of Virginia in the Venable and Jefferson Park Avenue neighborhoods, as a result of zoning changes that allowed higher densities for multifamily construction. The other major growth area was the Belmont and Fifeville neighborhoods. Higher property values have encouraged renovations and new construction, which, however, may be resulting in the displacement of lower-income households. Commercial and office growth has been relatively healthy in downtown Charlottesville and the warehouse district, with few changes elsewhere in the city.

Albemarle

Albemarle County's population growth has slowed down in the last decade, and is now growing at the regional average of 18%. However, the areas of Pantops, Crozet, Hollymead/Forest Lakes, and southwest of Charlottesville down to North Garden have seen considerable residential growth. A wider range of housing types have been built in the last decade, including many townhomes and condos, along with conventional single-family homes. Albemarle County has strict growth boundaries in place in order to concentrate new growth around existing commercial centers and preserve the rural countryside. The construction of the Hollymead Town Center in the northern US29 corridor was the first major development under the auspices of the Neighborhood Model, intended to promote compact, mixed-use, and walkable neighborhoods. Construction of Stonefield, another major US29 development near the city, broke ground in the spring of 2011. The transfer of Martha Jefferson Hospital and auxiliary medical services from Charlottesville to Pantops in August 2011 and the creation of the National Ground Intelligence Center on the US 29 corridor introduces major employment centers to urban Albemarle.

Louisa

Louisa County has shown more residential growth than any other in the region over the last decade, but the housing downturn may have a significant effect on future growth. Louisa's location between Charlottesville, Richmond, and Fredericksburg has made it an attractive bedroom area for commuters to these places, as well as to northern Virginia. Residential growth has occurred fairly evenly throughout the county. Although Louisa's two incorporated Towns, Louisa and Mineral, have grown over the last decade, these traditional towns have experienced the slowest growth rate of any area within the county. The Lake Anna area continues to attract seasonal residents with second homes. A Walmart and a Lowes built at Zions Crossroads represent the counties first major retailers, and some relatively high-density residential development is occurring in close proximity to this commercial area.

Fluvanna

Fluvanna County continues to experience rapid growth in its northwest corner and along its western border with Albemarle County. Lake Monticello, a 4,500-home gated community, is the largest population center. The subdivision itself is reaching full build-out of lots, but spillover residential development has occurred in the vicinity. Some commercial development has started to form at the entrance of the subdivision, however overall non-residential uses remain very limited in the county. The eastern portion of the county is more sparsely population, but still grew at a rate of 14% over the decade.

Greene

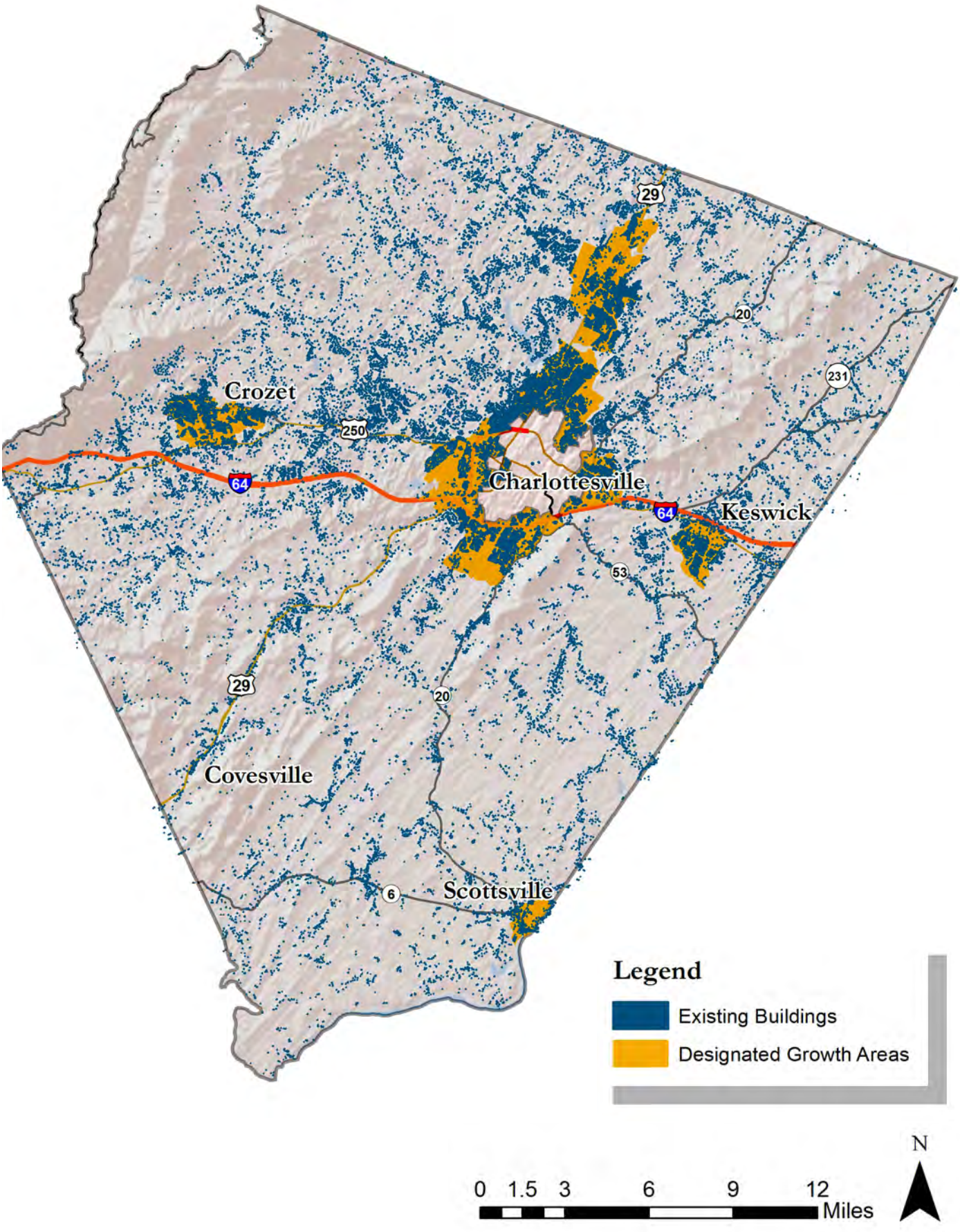
Greene County has grown slightly faster than the regional average. Much of the new development is concentrated along the border with Albemarle County on the US 29 corridor, but all parts of the county are receiving nota-

ble population growth. The introduction of the National Ground Intelligence Center, overall development along the US 29 corridor, and potential infrastructure improvements may considerably increase the growth rate of Greene County in the future. Most of the County has been characterized by single-family dwellings in a suburban or rural setting, but new development proposals under review contain a large number of townhomes. The Town of Stanardsville has not kept pace with growth, although revitalization efforts have been initiated to, among other things, attract development to the Town. A new Walmart in Ruckersville anchors the first major commercial area in Greene County, which may also induce further residential development in the County.

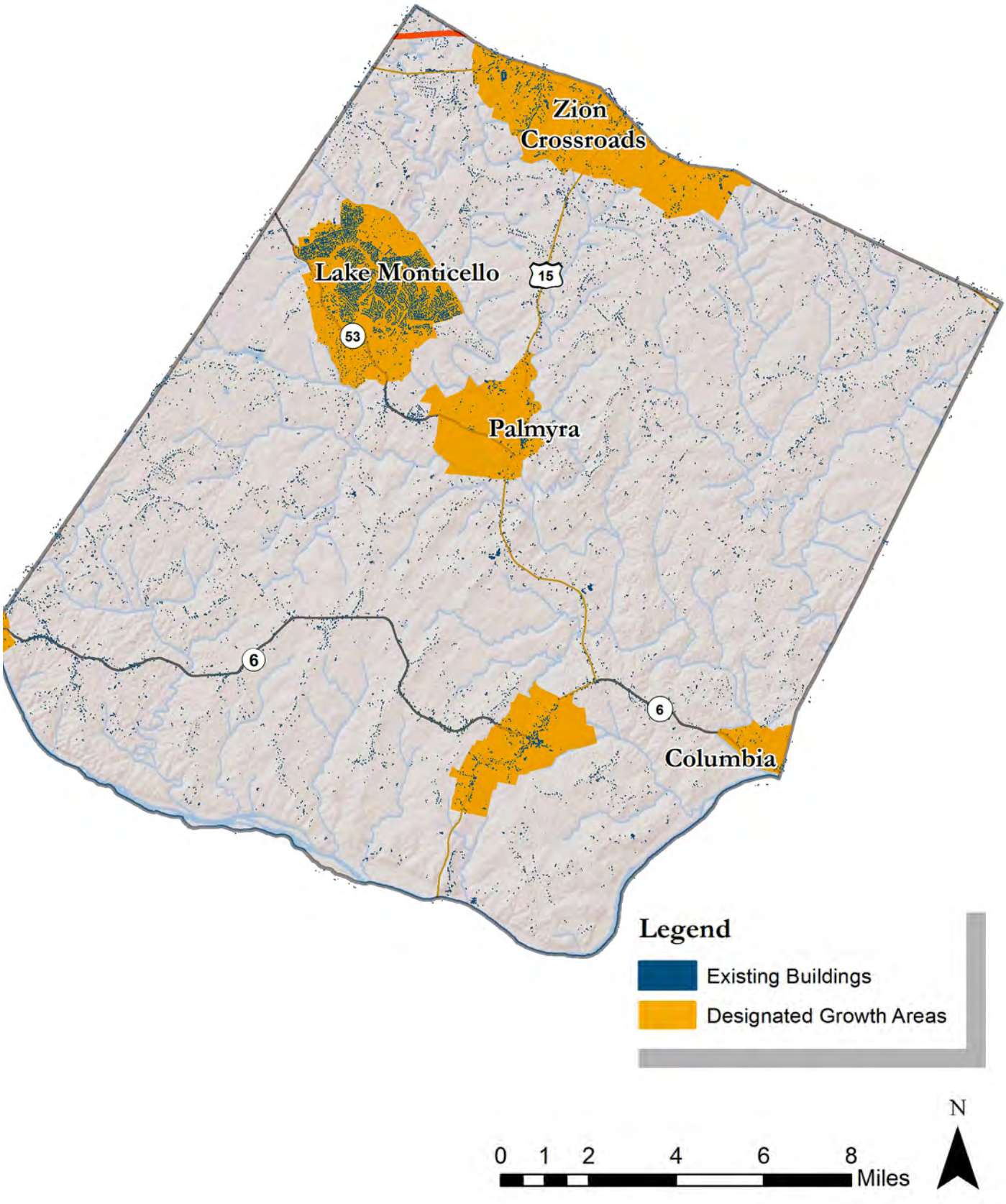
Nelson

Nelson County remains largely rural with the slowest growth rate in the region. The Rockfish River Valley, which borders Albemarle County and is home to Wintergreen Resort, is growing, but the rate of growth has slowed since the 1990s. The county's most significant new growth has occurred in the southeastern potion near the James River and along the border with Amherst County, likely as a result of the completion of the Lynchburg/Madison Heights Bypass in 2005. The growth is of an exurban character. The County Seat of Lovingston has not been growing, although the County has selected it as a growth area.

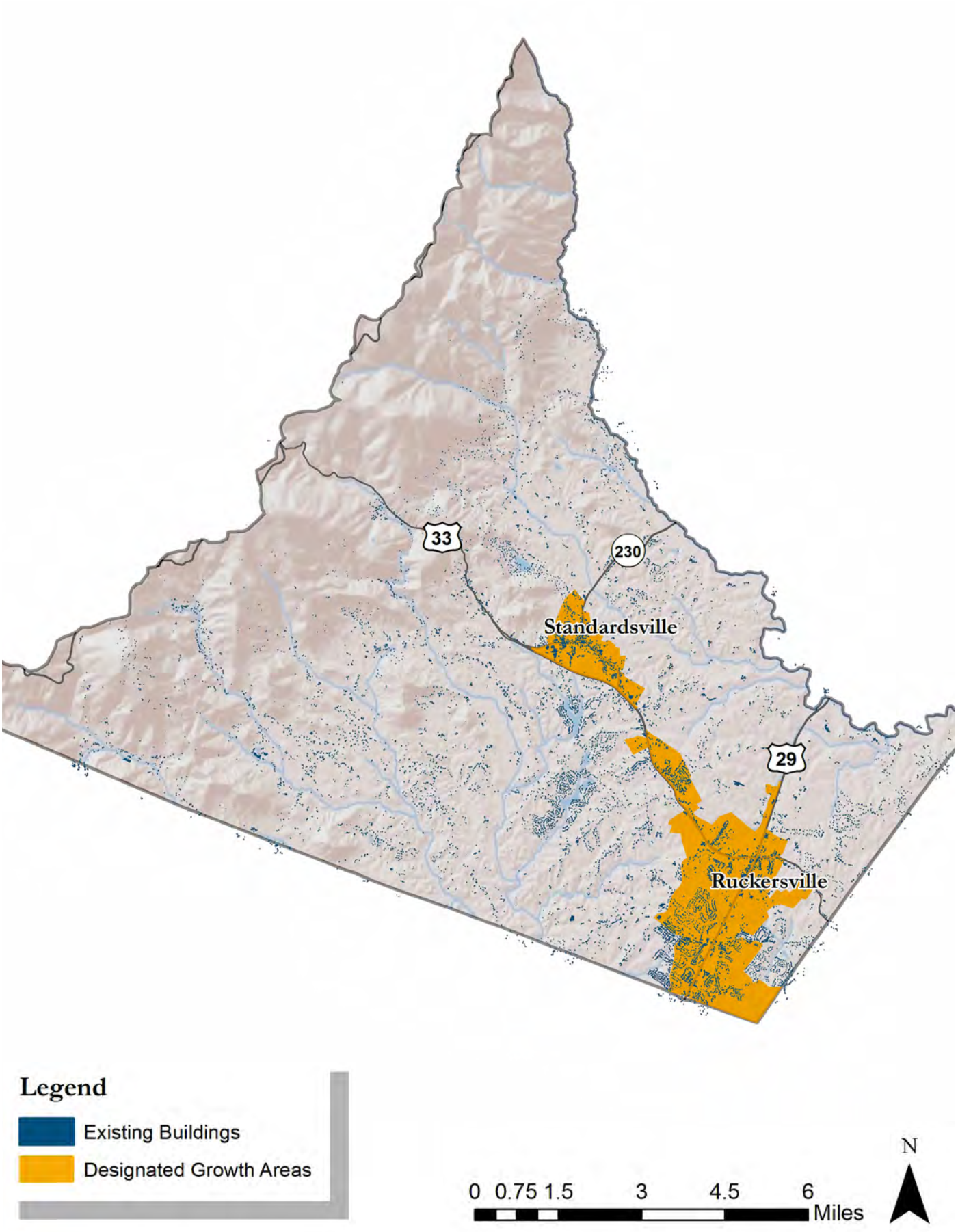
Buildings and Designated Growth Areas Albemarle + Charlottesville



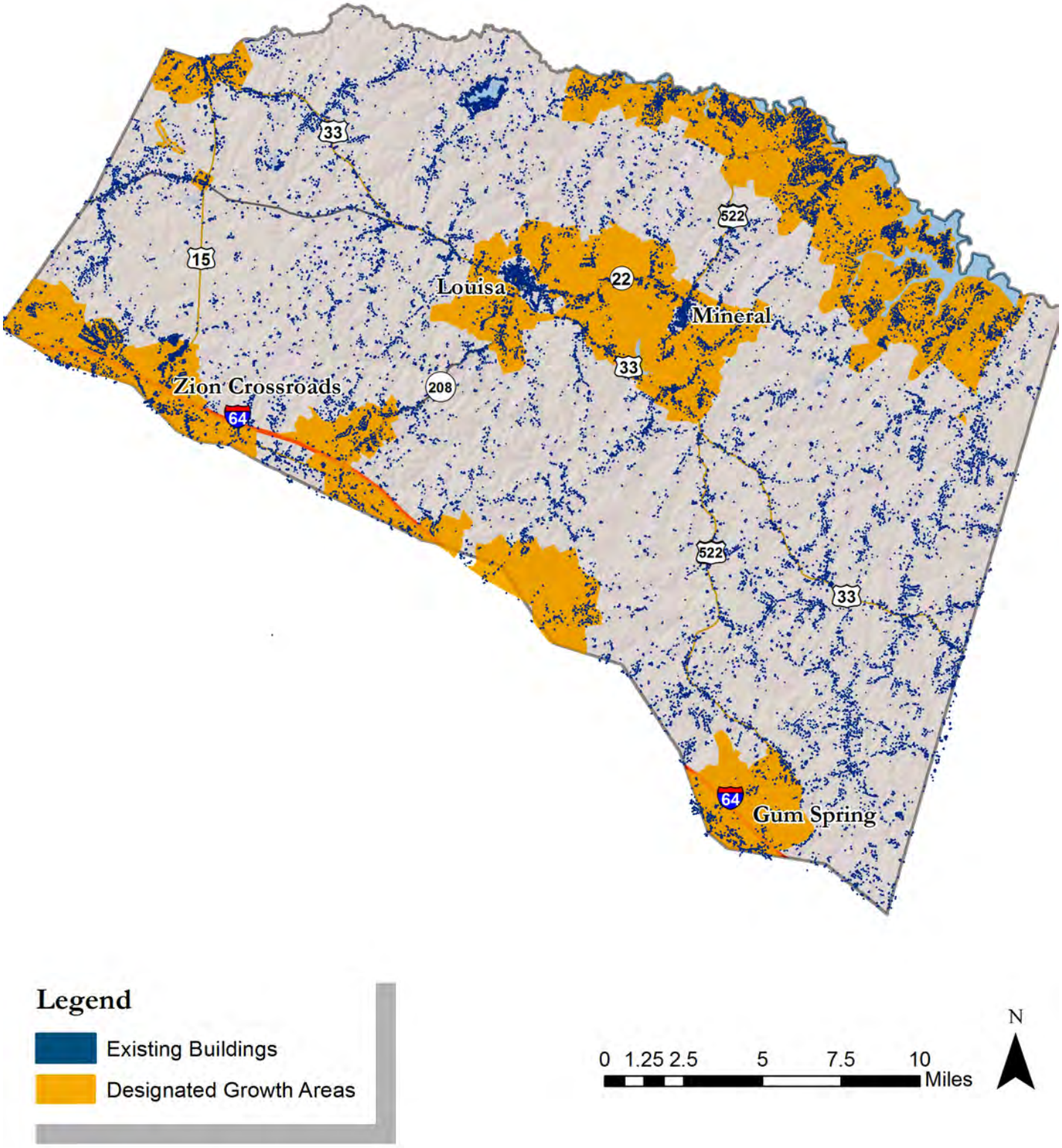
Buildings and Designated Growth Areas Fluvanna



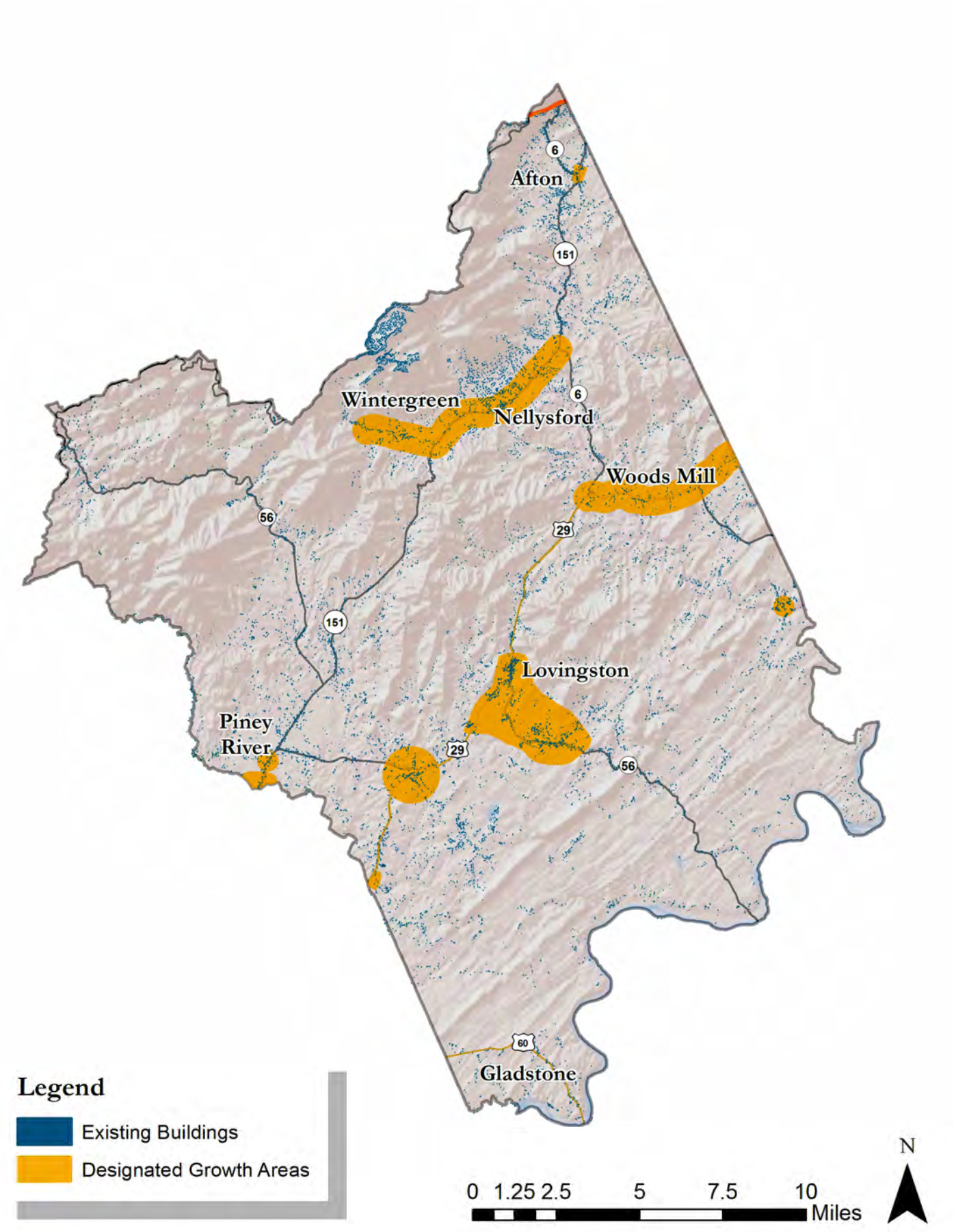
Buildings and Designated Growth Areas Greene



Buildings and Designated Growth Areas Louisa



Buildings and Designated Growth Areas Nelson



Infrastructure

The resilience and availability of essential infrastructure is critical to a functioning community and an effective emergency response. The table below, taken from HAZUS MH 3.2 shows the number and value of transportation and utility infrastructure in the Planning District.

Transportation Infrastructure

Transportation	Utility		
Number	Value*	Number	Value*
1392 lane miles and 448 bridges	$3,835	49 facilities	$1,519

**Value in millions. Source: HAZUS MH 3.2*
Transportation includes highway, rail, and airport. Utility includes potable water, wastewater, natural gas, electric power, and communication. Includes both lines and buildings.

High Water Roads are roadways and/or bridges that can become impassable to traffic in event of a large scale rain. The resulting road closures can be economically disruptive, and can be a severe hindrance to emergency operations. Some of the roadways in Charlottesville and urban Albemarle are used by Charlottesville Area Transit, making any closure disruptive to bus service as well. Greenways are commonly located in floodplains, and heavy rain may render many trails in the region impassable.

The following lists include high water roads in each of the localities. These lists were compiled by local emergency services staff:

High Water Roads-Albemarle, Charlottesville, UVA
21 Curves Road (Old Garth Road)
21 Curves Road at pond
29 North at Camelot
Airport Road at new post office (2 Times – doesn't close road – about to rebuild anyway)
Albemarle Lake Road at Garth Road
Alderman Road at Twyman
Avon Street at Bridge
Ballards Mill Road ¼ mile to 4024 (2 Times)
Route 680 - Browns Gap Road at 240 (2 Times)
Carters Bridge Route 20 South
Cherry Avenue 500-700 block
Cherry Avenue at Johnson School to Cleveland
Clark Road just off 810
Earlysville 700
East High Street 1500 block) (2 Times – doesn't close road)
East Market Street 1100 (3 Times)
Esmont Road (old railroad trestle) (2 Times)
Faulconer Drive at Railroad Bridge (2 Times)
Free Union Road (4933-4920) (2 Times)
Gilbert Station Road at 640 at bridge
Ivy Depot Road / Route 786 at 250 (2 Times)
Route 726 - James River Road at Totier Creek (2 Times)
Jarmans Gap / Carter Street (2 Times – road to be rebuilt soon)
Jefferson Park 1700 at Woodrow
Kingston Drive at West Leigh Drive (2 Times)
Meade Avenue 200
Meade at Fairway over the bridge
Milton Road 2100 at Milton Hills
North Berkshire 2300
Old Ballard Road (2 spots)
Old Ivy Road at Garth Road
Old Ivy Road at underpass and exit ramp (2 Times)
Old Lynchburg Road 1200
Polo Grounds Road east of Route 29 North
Proffit Road at North Fork Rivanna
Stony Point Road at Key West
University Avenue east of Emmet
Route 795 past Route 622
Route 20 south at 708
Route 240 at 680
Route 240 Browns Gap Turnpike
Route 250 west at UPD (clears quickly after rain)
Route 250 bypass at Locust (clears quickly after rain)
Route 29 north At Camelot
Route 29 ¼ mile south of Red Hill (2 Times)
Route 53 ¼ mile past Monticello exit
Route 53 at Jefferson Vineyard (2 Times)
Route 53 at Monticello
Route 6 at Scotland Farm
Route 600 ¼ mile from Route 22
Route 600 at Route 20 (2 Times)
Route 600 Watts Passage Railroad bridge
Route 601 at 810 (2 Times)
Route 601 at Barracks Road
Route 602 and 722
Route 614 1st low spot from Whitehall to Sugar Hollow
Route 620 1/8 mile south of County Line
Route 620 at Buck Island Creek
Route 622 1 ½ mile from 795 (closed)
Route 622
Route 773
Route 761
Route 622 at Hardware River
Route 626 Loan Oak Farm (2 Times)
Route 627 at Albemarle Farm
Route 627 at View Mount Farm (3 Times)
Route 631 and 706 at bridge

Route 631 at Dudley Mountain Road
Route 631 at Gentry Lane (2 Times)
Route 640 at Route 20 (2 Times)
Route 641 Advance Mills Road (little bridge - 4 Times)
Route 667 (2 Times)
Route 672 (2 Times)
Route 674 - Slam Gate/ Heart break Road (2 Times)
Route 680 – Brown's Gap from 240 to 802 (3 Times)
Route 683 – Shelton's Mill (closed)
Route 687 (2 Times)
Route 704 between Route 715 and dead end
Route 706 ½ mile off 631 (2 Times)
Route 708 at KOA (2 Times)
Route 708 at Nutmeg Farm (2 Times)
Route 708 between 627 and 795
Route 712 at 713
Route 712 between 627 and 717
Route 712 between 719 and 631
Route 712 between Route 713 and 795
Route 713 from 20 to dead end (3 Times)
Route 715 between 20 South and 627
Route 715 between 719 and Route 6
Route 723 south of Route 6
Route 726 – James River Road - at Totier Creek (closed)
Route 729 near Route 53 (2 Times)
Route 736 between 635 and 636 (2 Times)
Route 737 between 726 and route 6 (3 Times)
Route 747 Route 723 south of route 6 (closed)
Route 761 between 622 and 620
Route 776 off Route 667 (5 Times)
Route 786 at 250 Ivy Depot Road
Route 795 at 638 (Hardware River)
Route 795 at Ash lawn
Route 795 between 713 and 708 (3 Times)
Route 795 between Route 620 and Route 708 (washed out under pavement – fixed)
Route 795 north of Ash Lawn
Route 810 Mont Fair (2 Times)
Route 810 North 601
Route 810 near Crozet Rescue Squad (stream to Beaver Creek)
Route 810 north route 687
Route 810 Nortonsville Route 628 (2 Times)
Route 810 1st bridge north Garrisons
Sharon Road 1/10 mile to 6 (Route 622)
Sharon Road at the bridge (3 Times)
Totier Road North of Route 626
Watts Passage Road between bridge and railroad track
West Leigh Drive/ Leigh Way (annually) (Has been fixed, but it didn't work)
West Leigh Drive at 250 (2 Times – rare and due to poor ditches)

High Water Roads—Fluvanna County
Hardware Road (Route 646 at HRWMA)
Bremo Road
East River Road (Route 6 – Columbia)
East River Road (Route 6 – Rivanna)
West River Road (Route 6 – Scottsville)
West River Road (Route 6 – Hardware)
North Boston Road (Route 600)
Carysbrook Road (Route 615)
Hunters Lodge Road (Route 631)
Bybees Church Road (Route 613)
Ridge Road (Route 632)
James Madison Highway (Route 15 at Cunningham Creek)
Venable Road (Route 601 at Kent Branch)
Venable Road (Route 601 at Venable Branch)
Route 617 between 15 & 31
Route 630 at Byrd Creek and at Venable Creek (between 601 and 659)
Route 649 at Middle Fork Cunningham
Route 659 between 712 and 626
Route 759 between 250 and dead-end

High Water Roads—Greene County
Smaller Routes 605, 667, 634, 628, 621, 616, 642, 619, 627, 635, 643, and 810

High Water Roads—Louisa County
Route 601 at South Anna River and Cub Creek
Route 604 at South Anna River and at Harris Creek (between 646 and 714)
Route 610 at South Anna River
Route 611 at Flemings Creek
Route 613 at Duckinghole Creek
Route 624 at Christopher Creek (between 623 and 625)
Route 635 at South Anna River
Route 636 at Millington Creek
Route 639 at North Anna River
Route 640 at Fosters Creek (between 613 and 626), South Branch Creek (between 604 and 605), and Deep Creek (between 629 and 647)
Route 644 between 605 and 33
Route 645 at unnamed creek
Route 646 at South Anna River
Route 647 at South Anna River (between 522 and 640)
Route 651 between 669 and Orange County
Route 660 at Happy Creek
Route 663 at Owens Creek
Route 665 at Northeast Creek branch
Route 669 at North Anna River and Fox Branch Creek
Route 683 at Fork Creek
Route 692 at north and south forks of Hickory Creek
Route 695 at South Anna River

Route 697 at unnamed creek
Route 714 at unnamed creek
Route 717 at Central Branch

High Water Roads—Nelson County
Rt 655 .30 miles east of Rt. 151
Rt. 56 west has several spots depending on amounts of rain.
Rt. 56 .10 miles west of Rt. 151
Rt. 56 .15 miles east and west of Rt. 680N.
Rt. 56 .30 miles west of Rt. 712
Rt. 56 .40 miles west of Rt. 814
Rt. 56 .60 miles west of Rt. 687
Rt. 687/North Fork Tye River Road gets most damage to road in each flood due to stream crossings and stream along the roadway.

⏩ Critical Facilities

For the purposes of this plan, critical facilities were broken down into four categories: emergency facilities, essential infrastructure, important community facilities, and high potential loss facilities. Each category includes the following facilities.

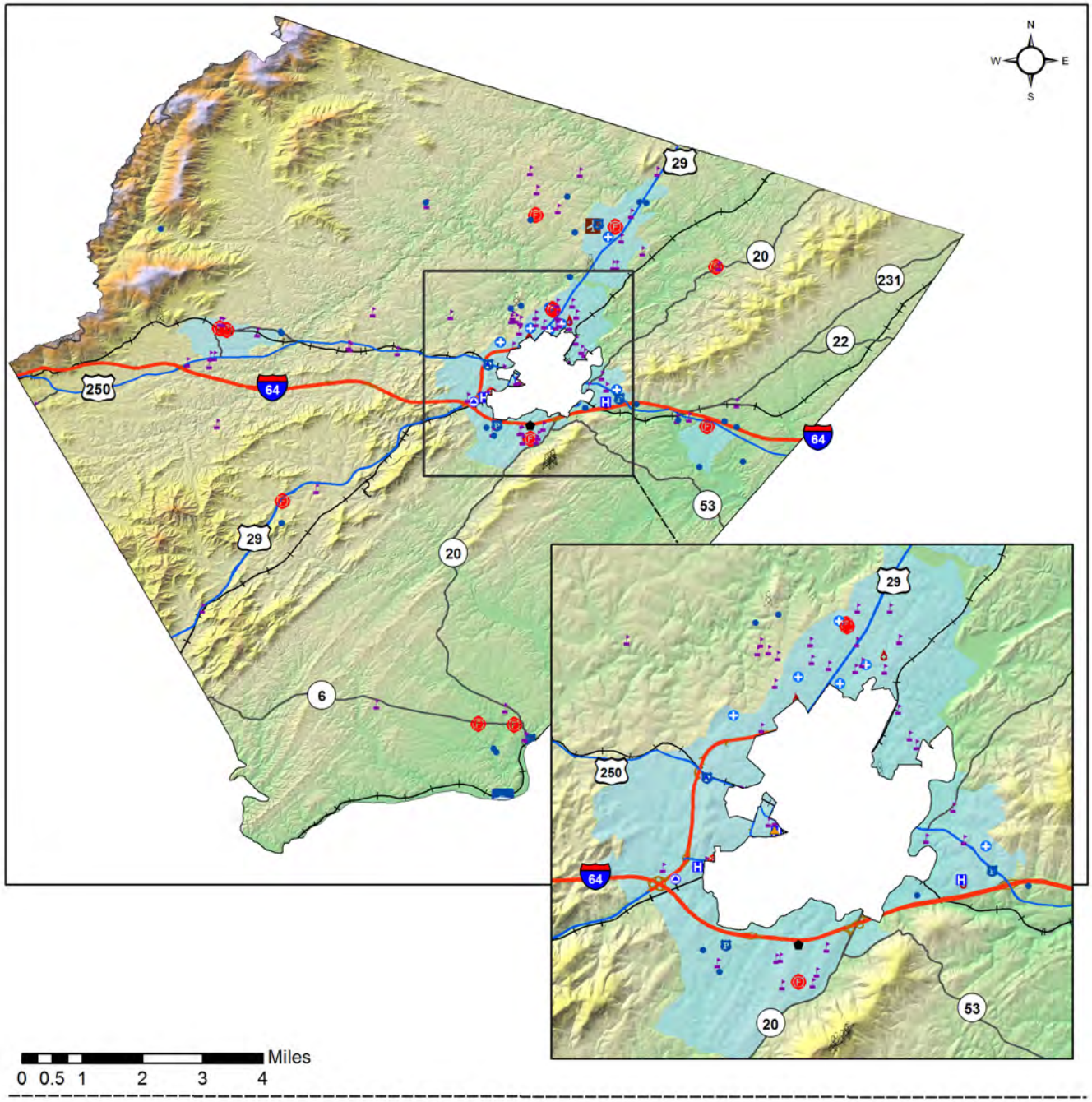
1. Emergency facilities: should be operational directly following a disaster:
- Hospitals/Medical clinics
- Police stations
- Fire stations
- Emergency operation centers
- Shelters

2. Essential Infrastructure: necessary to retain operational status of community; to be restored as quickly as possible following a disaster
- Transportation systems—includes roads, bridges, rail, airports, bus stations, ferry
- Potable water systems
- Wastewater systems
- Power—includes buildings, substations
- Communication systems—includes towers
- Oil and natural gas facilities

3. Important Community Facilities: structures which may incur significant loss of life, structural damage, and economic loss to the community.
- Schools/Daycares – includes schools that double as shelters
- Prisons
- Elderly, Disabled, or Assisted Living Facilities

4. High Potential Loss Facilities: Facilities that have the potential to cause significant loss of life, structural damage, and economic loss to the community if they sustain damage from a natural disaster.
- Structures housing Hazardous Materials
- Facilities on CERCLIS (Superfund)
- RCRA Large Quantity Generators (facilities that generate over 1000 kg of ignitable, corrosive, reactive, or toxic waste per month)
- Facilities on Toxics Release Inventory (1987 - 2009)

Critical Facilities Albemarle + Charlottesville



Emergency Facilities

- Hospital
- Emergency Care
- Blood/Organ Bank
- Emergency Opt. Center
- Fire
- Police

Essential Infrastructure

- Airport
- Ferry
- Communication Facility
- Water Utility

Municipal boundaries

- County boundry
- Albemarle County Growth Areas

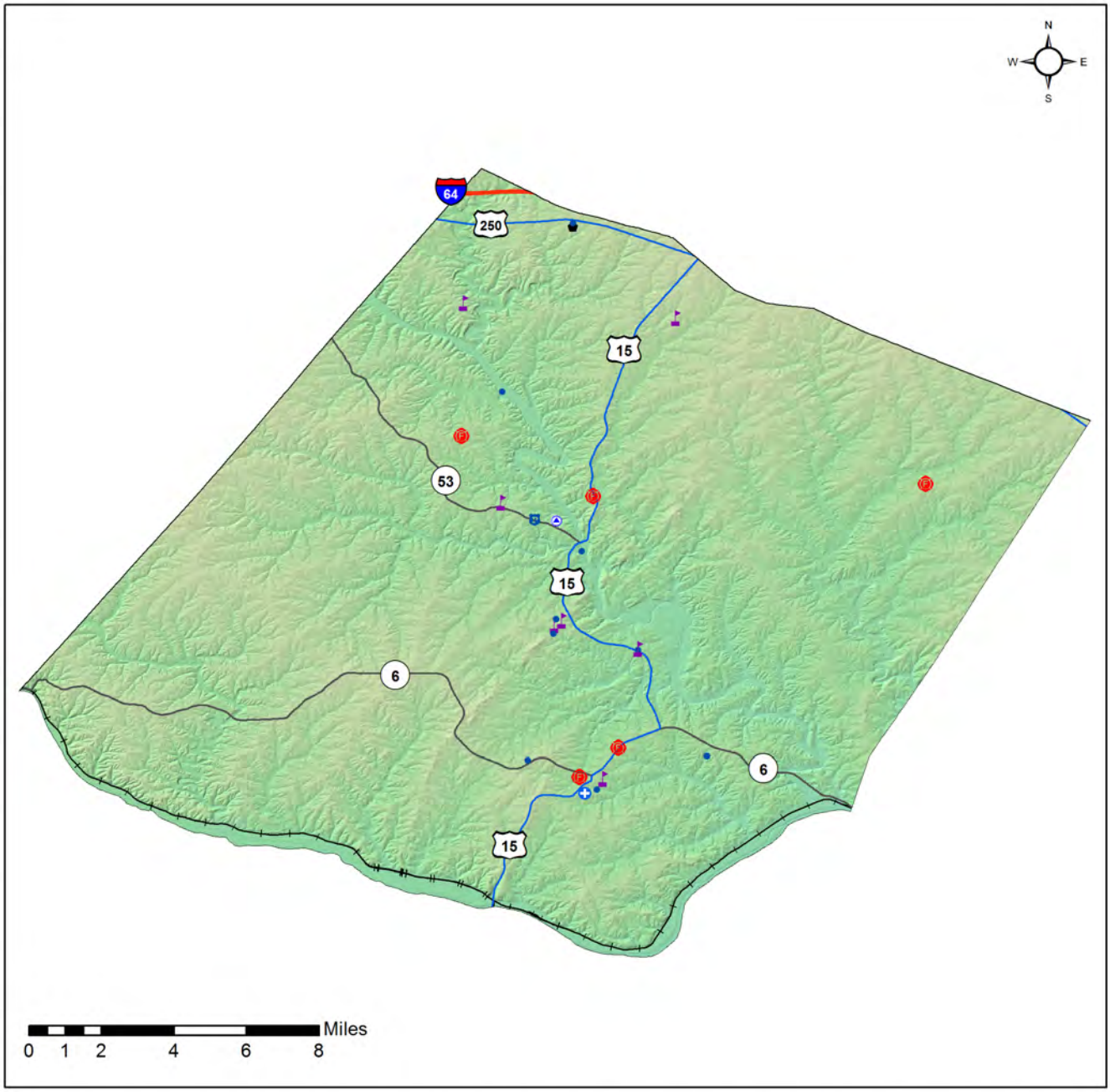
Important Community Facilities

- Prison
- Nursing Home
- Schools

Roads

- Interstate
- Ramps
- US Highway
- State Route
- Railroads

Critical Facilities Fluvanna



Emergency Facilities

- Hospital
- Emergency Care
- Blood/Organ Bank
- Emergency Opt. Center
- Fire
- Police

Essential Infrastructure

- Airport
- Ferry
- Communication Facility
- Water Utility

Municipal boundaries

- County boundry

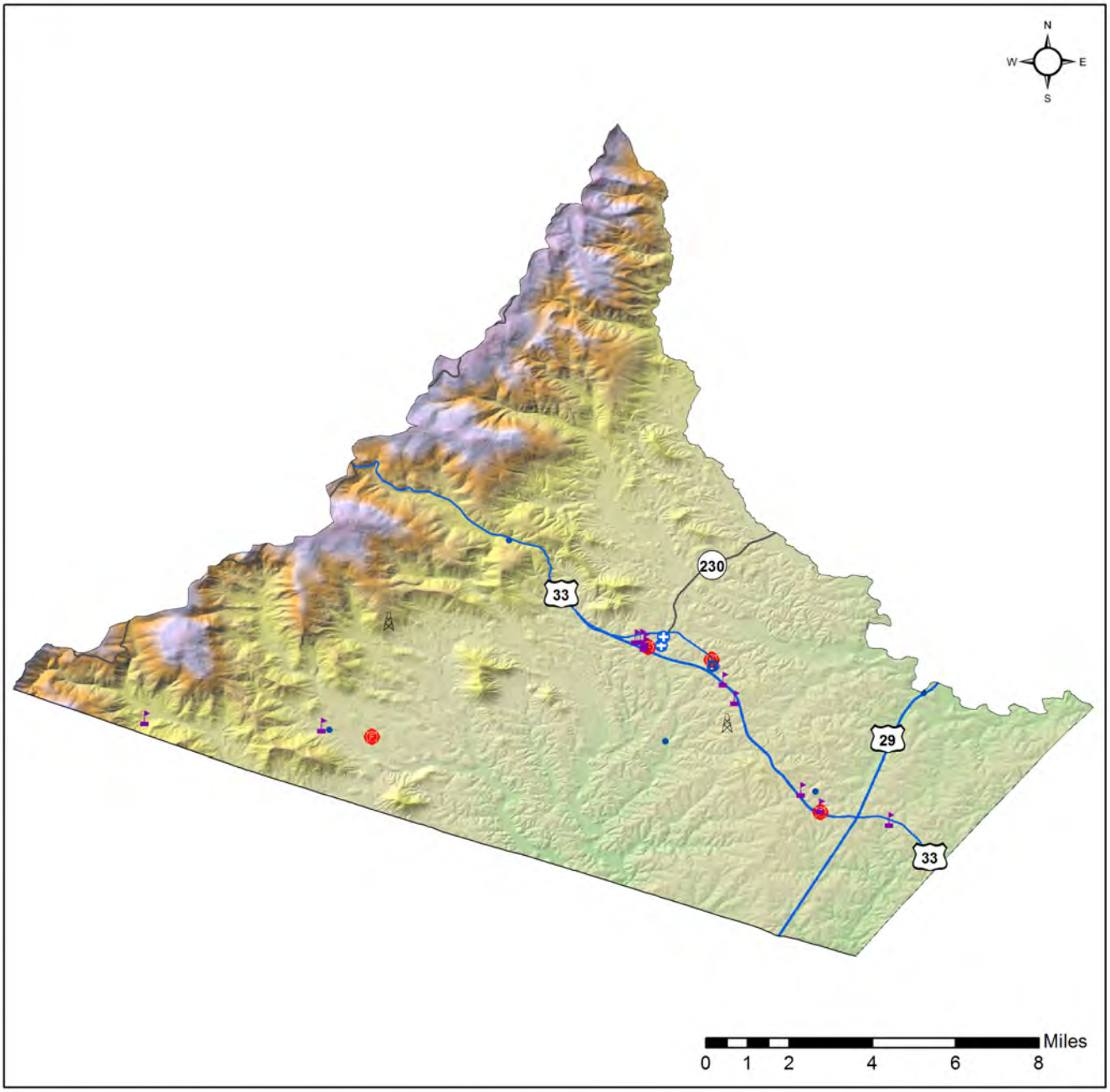
Important Community Facilities

- Prison
- Nursing Home
- Schools

Roads

- Interstate
- Ramps
- US Highway
- State Route
- Railroads

Critical Facilities Greene



Emergency Facilities

- Hospital
- Emergency Care
- Blood/Organ Bank
- Emergency Opt. Center
- Fire
- Police

Essential Infrastructure

- Airport
- Ferry
- Communication Facility
- Water Utility

Municipal boundaries

- County boundry

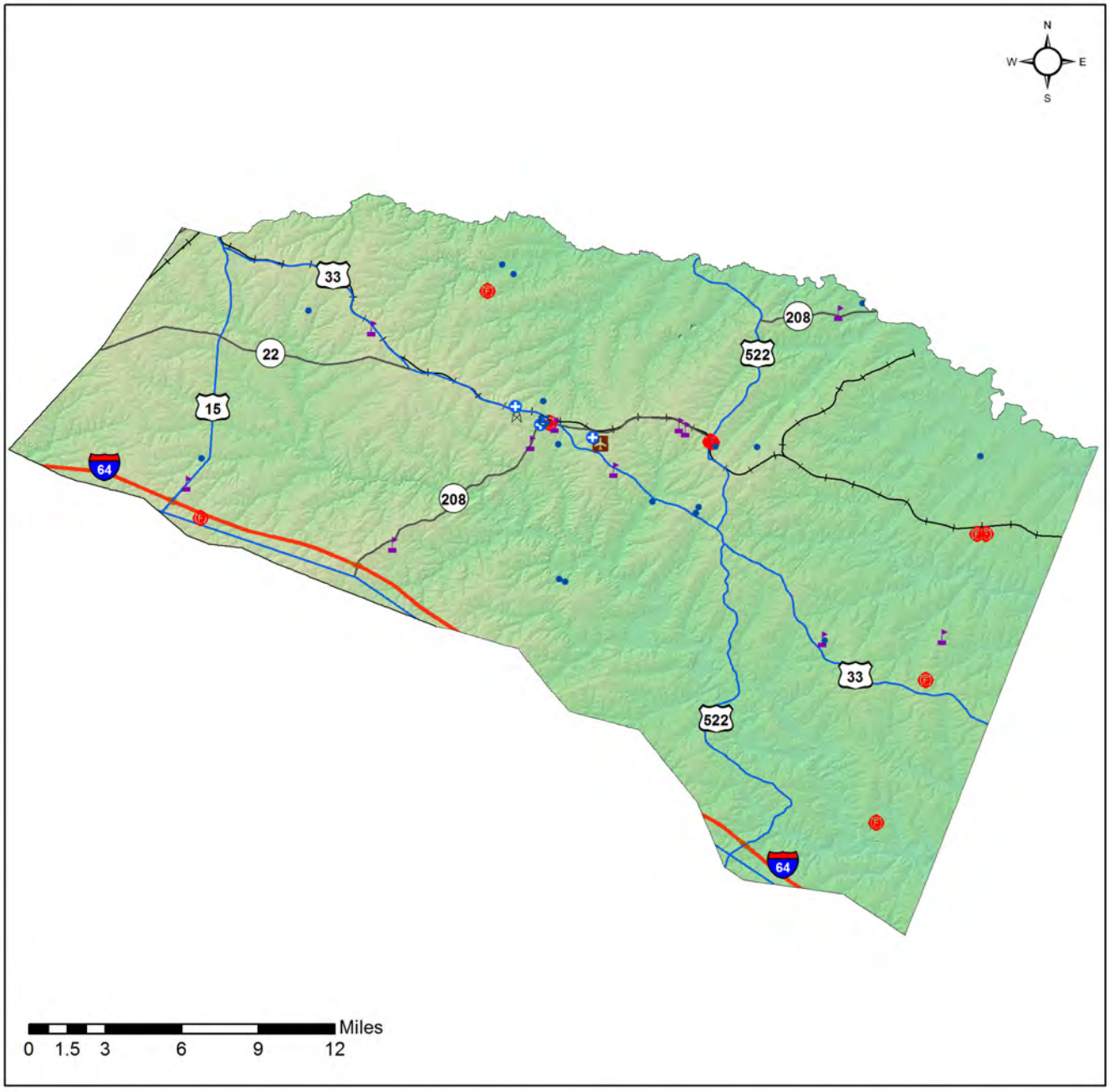
Important Community Facilities

- Prison
- Nursing Home
- Schools

Roads

- Interstate
- Ramps
- US Highway
- State Route
- Railroads

Critical Facilities Louisa



Emergency Facilities

- Hospital
- Emergency Care
- Blood/Organ Bank
- Emergency Opt. Center
- Fire
- Police

Essential Infrastructure

- Airport
- Ferry
- Communication Facility
- Water Utility

Municipal boundaries

- County boundry

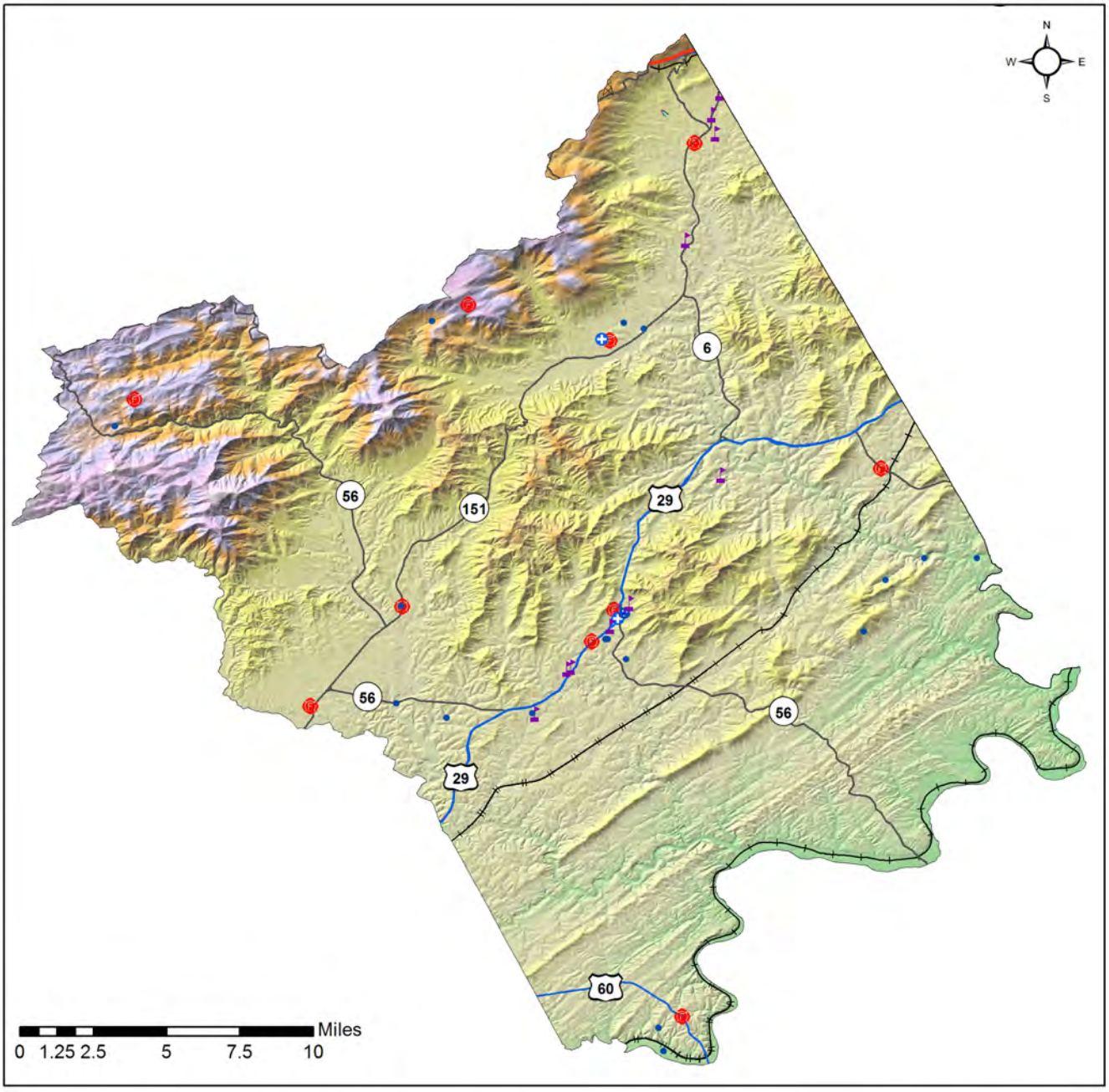
Important Community Facilities

- Prison
- Nursing Home
- Schools

Roads

- Interstate
- Ramps
- US Highway
- State Route
- Railroads

Critical Facilities Nelson



Emergency Facilities

- Hospital
- Emergency Care
- Blood/Organ Bank
- Emergency Opt. Center
- Fire
- Police

Essential Infrastructure

- Airport
- Ferry
- Communication Facility
- Water Utility

Municipal boundaries

- County boundry

Important Community Facilities

- Prison
- Nursing Home
- Schools

Roads

- Interstate
- Ramps
- US Highway
- State Route
- Railroads

Estimating Potential Loss

1.1 Purpose

201.6(c)(2)(ii)(B): The plan should describe vulnerability in terms of an estimate of the potential dollar losses to vulnerable structures identified in paragraph (c)(2)(i)(A) of this section and a description of the methodology used to prepare the estimate…

The following section includes an inventory of assets and estimation of loss for the following hazards deemed to pose the most significant risk to the Planning District:

1. Hurricane
2. Flood
3. Winter Storms
4. Wildfires
5. Lightning
6. Drought and Heat
7. Tornado
8. Earthquake
9. Landslides
10. Dam Failure

Methods used to estimate losses vary by hazard, depending on data and models available, as well as the nature of the risk. Therefore, a description of methodology is included under the section for each hazard.

Hurricane: Estimated Losses

Methodology

Hurricane losses have been estimated using HAZUS MH 3.2. The hurricane model predicts losses due to wind, including wind pressure, wind borne debris missiles, tree blow down, and rainfall. Flooding or other hazards that may be linked to hurricanes are not measured in this section. The hurricane model uses the same inventory of existing building stock and critical facilities as the flood loss estimations, although transportation and utility infrastructure are not taken into account. Tree coverage and terrain have a significant effect on the results of the model. Losses are measured for structural damage, damage to contents and inventory, and disruption of business operations.

Two types of models have been used. First, parameters from two historic storms that have affected the Planning District were modeled: Hazel in 1954, representing a major hurricane, and Fran in 1996, representing a minor hurricane. Although there have been six hurricanes of Category 3 or higher in recent history in the TJPD, these two can be seen as a representative sample. It is important to note that results do not represent the actual impact of these storms, but rather the projected impact if a storm exactly like the historic event were to occur in the future.

Results

Scenarios based on historic storms Hazel and Fran reveal the broad difference between major and minor hurricane events.

Expected Losses Modeled from Historic Storm Event Parameters

Storm	Hazel (1954)	Fran (1996)
Building Damage (Count)	429	37
Households Displaced	2	0
Debris (tons)	150,959	26,761
Direct Property Loss	$ 32,066,000	$ 2,924,000

Source: HAZUS MH 3.2

In addition to the historic events, a range of hypothetical storms were modeled based on the predicted return period. The combination of methods provides a balance between the specificity of actual events and the generality of informed probabilistic future events.

Annualized Expected Losses to Hurricanes by Locality

Storm	Capital Stock Losses	Income Losses	Total Losses
10-Year Return	0	0	0
20-Year Return	0	0	0
50-Year Return	$ 3,110,000	0	$ 3,110,000
100-Year Return	$ 15,625,000	$ 2,000	$ 15,627,000
200-Year Return	$ 39,621,000	$ 60,000	$ 39,681,000
500-Year Return	$ 91,467,000	$ 709,000	$ 92,176,000
1000-Year Return	$ 145,681,000	$ 3,694,000	$ 149,375,000
Annualized	$816,000	$ 20,000	$836,000

Source: HAZUS MH 3.2

An annualized expect loss can be generated by combining losses from the full range of scenarios: 10-Year, 20-Year, 50-Year, 100-Year, 200-Year, and 500-Year Storms. Annualized losses, both direct and indirect, are predicted to be $816,000 for the region. The following table disaggregates this estimate by locality. As development increases, these numbers are very likely to increase. However, this may be somewhat attenuated by enhancements in hurricane prediction science and improved construction practices in newer buildings.

Annualized Expected Losses to Hurricanes by Locality

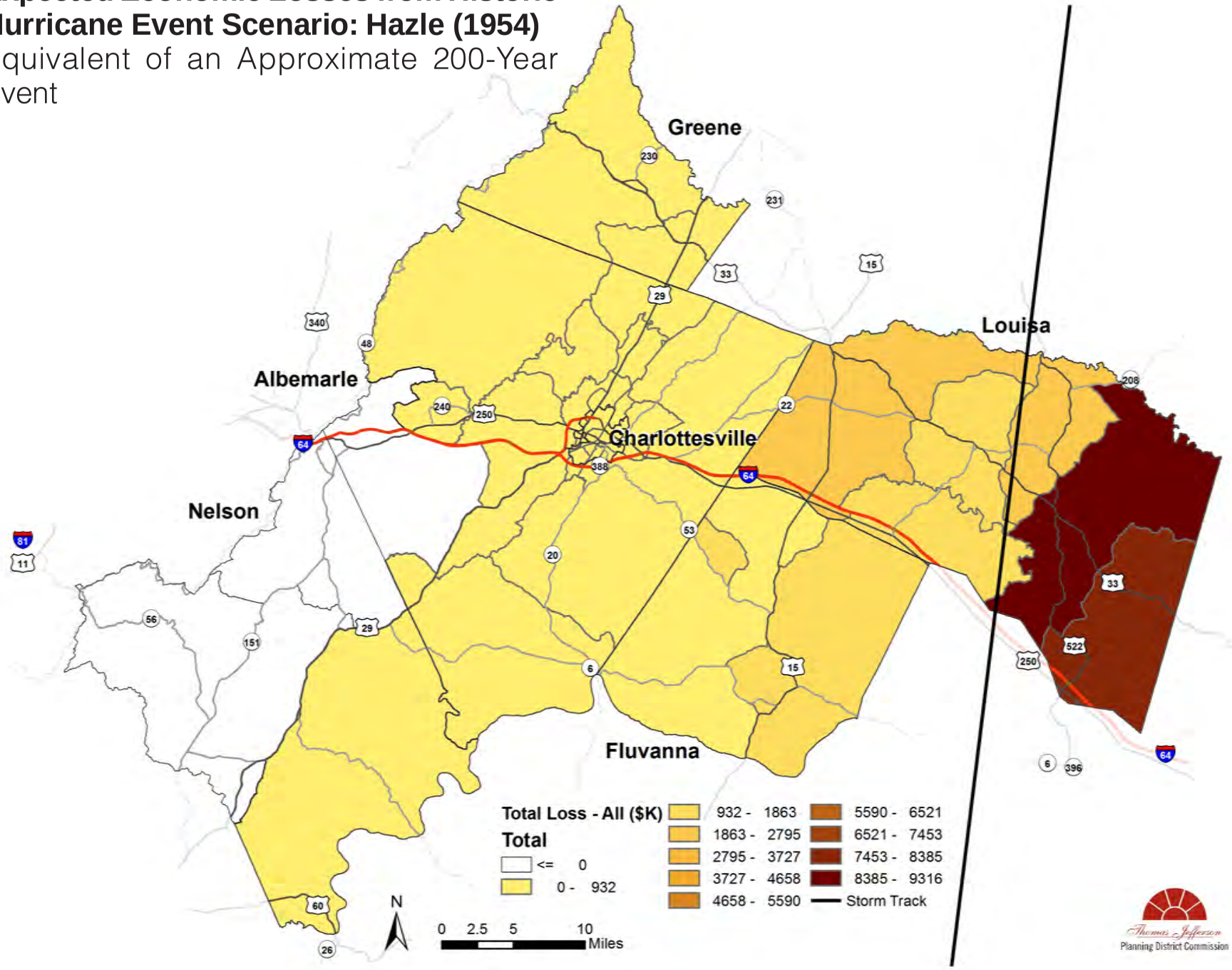
Locality	Annual Property Damage Loss	Annual Income Loss	Total Annual Losses
Albemarle	$ 304,000	$ 7,000	$ 311,000
Charlottesville	$ 95,000	$ 3,000	$ 98,000
Fluvanna	$ 135,000	$ 1,000	$ 136,000
Greene	$ 34,000	$ 1,000	$ 35,000
Louisa	$ 205,000	$ 1,000	$ 206,000
Nelson	$ 42,000	$ 4,000	$ 46,000
Region	$ 815,000	$ 17,000	$ 832,000

Source: HAZUS MH 3.2

The following maps show residential, commercial, and industrial losses in thousands of dollars as determined by HAZUS MH 3.2.

Expected Economic Losses from Historic Hurricane Event Scenario: Hazle (1954)

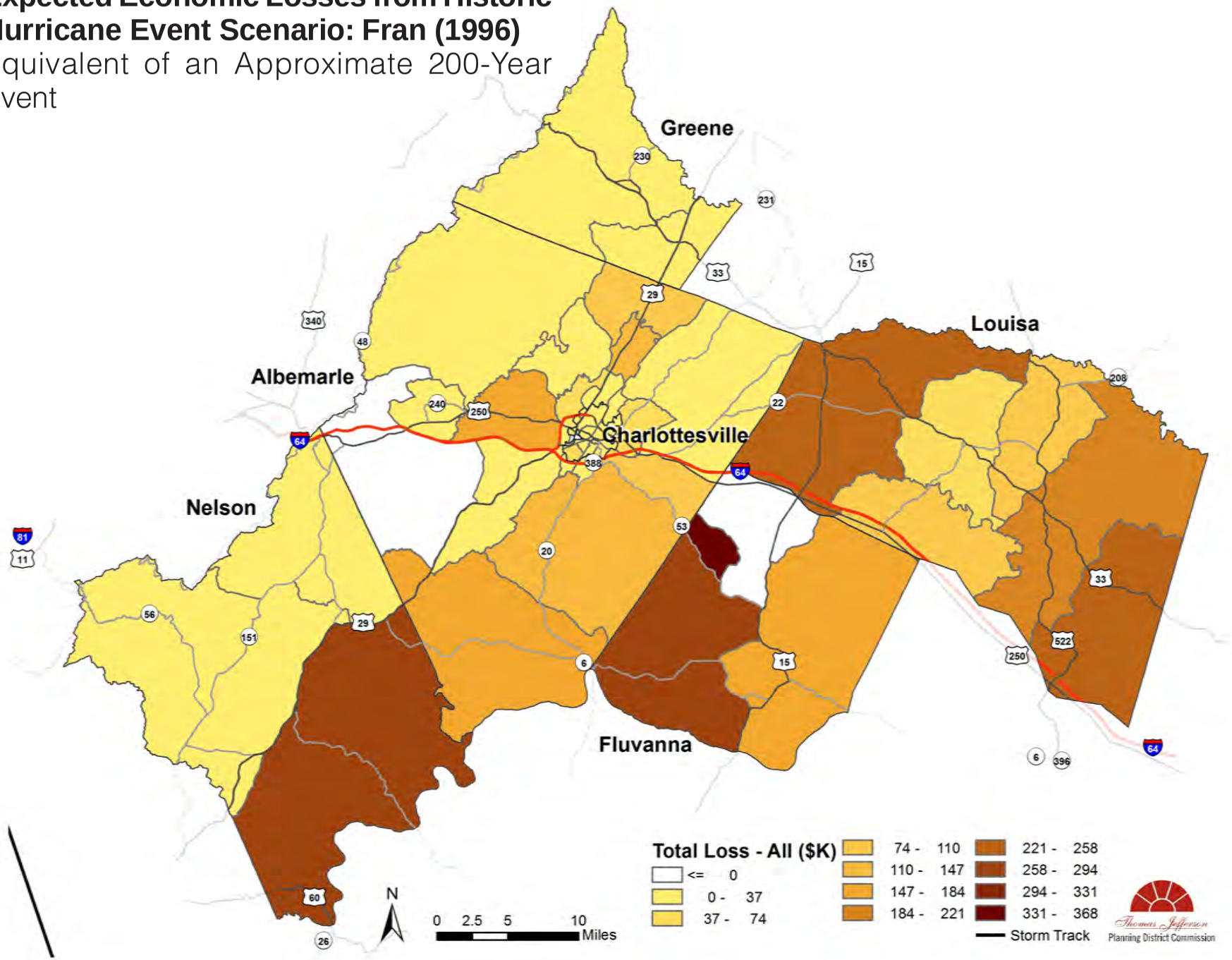
Equivalent of an Approximate 200-Year Event



Source: HAZUS MH 3.2

Expected Economic Losses from Historic Hurricane Event Scenario: Fran (1996)

Equivalent of an Approximate 200-Year Event



Source: HAZUS MH 3.2

Flood: Estimated Losses

Methodology

The flood loss estimations were performed using the HAZUS MH 3.2 model developed by FEMA. The analysis is based on an inventory of estimates provided by FEMA of general building stock by census block in the region. Buildings are differentiated by occupancy type, and estimates of square footage and value are derived from the type of structure. Other facilities and infrastructure, such as dams, and bridges are considered in the model, as well as the economic costs of displacement and business interruption. Losses are estimated by the proportion of the structures that would sustain damage under any particular scenario.

It should be noted that losses are estimated by census block. It is assumed that structures are distributed evenly throughout the block. Although precise planimetric data would be preferred, the census block-level data is the best available for use with the HAZUS model. For a full description of the loss estimation methodology, see the HAZUS MH 3.2 Technical Manual available from the FEMA website.

All of the scenarios included below were generated for both 100-year and 500-year floods. Four separate scenarios were generated, one for each major waterway system in the region:

- The Rivanna River and tributaries
- The James River and tributaries upstream from the Rivanna River
- North Anna River in Louisa County

Each scenario assumes that a flood warning was issued, allowing a certain amount of time for households to remove contents and perform some emergency mitigation to protect individual structures. For purposes of agricultural losses, an assumed flood date of July 1 is used. Historically, flooding has occurred in all seasons approximately equally in the TJPD, so the assumption is not based on any special prevalence for summer flooding.

The HAZUS MH 3.2 flood model does not estimate casualties due to flooding. National data does not reveal any per capita increase in flooding casualties over the last several decades, so it can be assumed that casualties in the region will only increase proportional to population.

Results

Direct Expected losses are a measurement of flood damage to building stock and contents of buildings within the region.

Direct economic loss to the region from a 100-Year flood is estimated to be $437,109, with 74% the total loss occurring in Albemarle and Charlottesville combined. Most of the damage, approximately 91%, is expected to be incurred by residential structures. However, notable damage to commercial and industrial sites in Albemarle County and Charlottesville is also expected. The levee in Scottsville will hold, preventing a significant increase in damage to the town. A total of 3,980 people are expected to be displaced and in need of temporary shelter, and 8,117 tons of debris are expected to be generated. The number of casualties directly attributed to a 100-Year Flood can be expected to remain low, between one and zero series injuries. However, the likelihood of casualties may grow in proportion to population growth.

An annualized loss estimate of $1,400,000 can be generated from the total regional loss. However, this estimate does not account for smaller flood events that may occur on a periodic basis, not does it account for the potential for 500-Year events. There are also overlaps between flooding and other hazards such as hurricanes and winter storms, which can result in springtime flooding. There are also indirect costs to consider. The following indirect costs of a flood event would be incurred, in addition to the direct costs cited above:

- Loss of business operations impeded by flooding and recovery
- Costs of either temporary or permanent relocation of uses
- Loss of wages and rental income
- Devaluation of land in response to flood event
- Spill-over effects on business operations not direct impeded by flooding and recovery

An updated Hazard Mitigation Plan may offer quantified estimates for these indirect costs, as data becomes available, as well as estimates for the full range of flood probabilities endemic to the region. The following tables

Direct Economic Losses after 100-Year Flood Event

Locality	Total Loss	Building Loss	Contents Loss
Nelson	43,174	26,133	16,733
Fluvanna	39,096	21,591	16,847
Albemarle	160,407	93,970	63,549
Greene	11,176	6,745	4,376
Louisa	16,058	10,150	5,897
Charlottesville	167,198	96,436	69,441
Region	437,109	255,025	176,843

Source: HAZUS 3.2

depict the square footage of damage by the use of the building, the percent of all buildings damaged by flooding, the number of people displaced, and the amount of debris removed.

Square Footages with Substantial Flood Damage (over 50%)

Locality	Residential	Commercial	Industrial	Agricultral	Religious/ Non-Profit	Government	Schools
Nelson	106,000	1,500	4,500	700	500	200	-
Fluvanna	14,500	9,900	18,000	3,000	850	600	1600
Albemarle	507,000	23,000	47,000	7,000	1750	400	2300
Greene	16,500	200	600	100	-	-	-
Louisa	64,000	1,300	400	50	-	-	-
Charlottes-ville	556,000	84,000	25,000	4,500	5000	900	2600
Region	1,264,000	119,900	95,500	15,350	8100	2100	6500

Source: HAZUS 3.2

Debris after Flooding

Locality	Debris (tonnes)
Nelson	971
Fluvanna	786
Albemarle	2183
Greene	302
Louisa	500
Charlottesville	3375
Region	8117

Source: HAZUS 3.2

Displaced Populations

Locality	Displaced Population
Nelson	472
Fluvanna	316
Albemarle	1250
Greene	123
Louisa	244
Charlottesville	1575
Region	3980

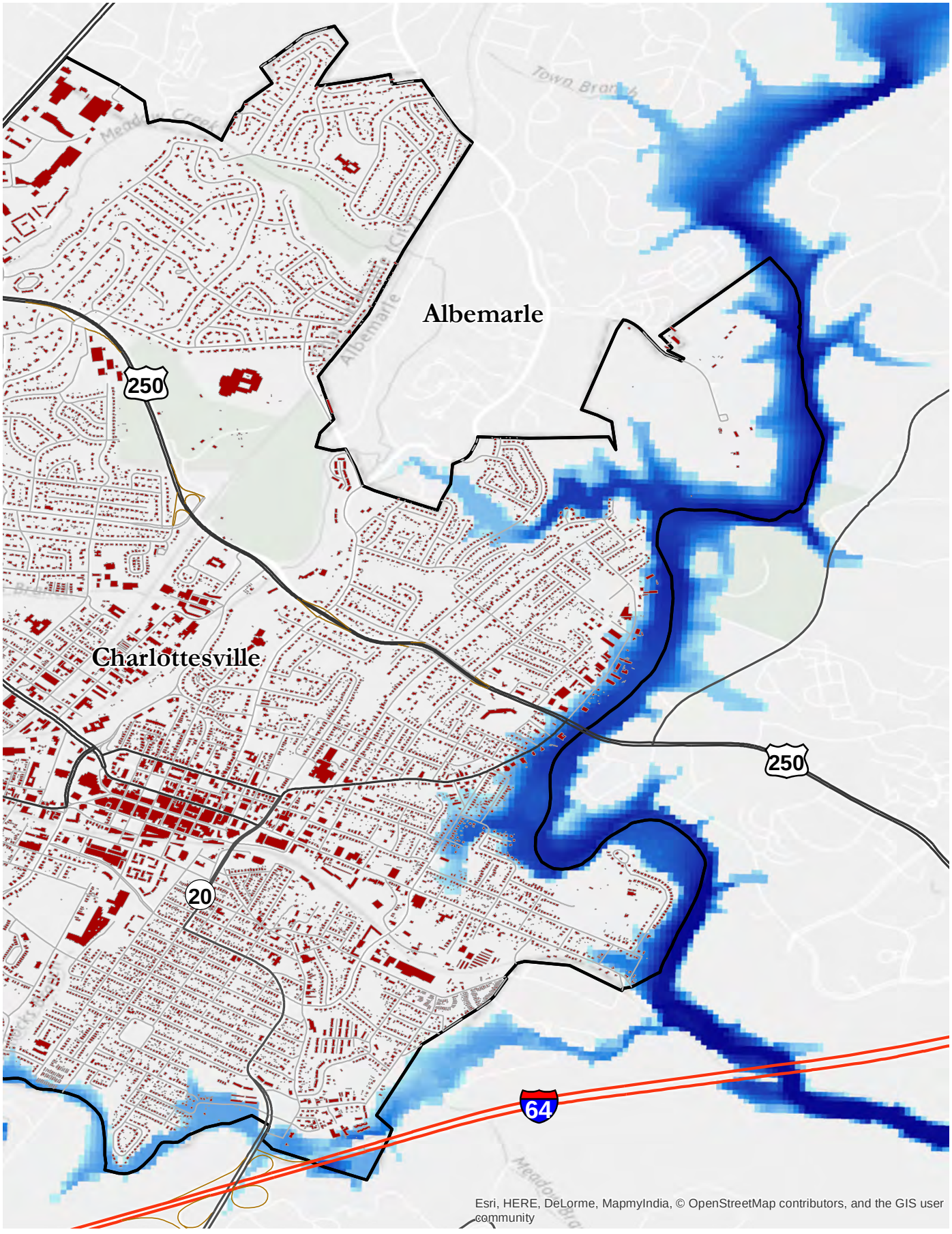
Source: HAZUS 3.2

The expected damage to residential square footage exceeds damage to all other uses combined, although on a percentage basis non-residential structures are over-represented. Most of the damage is expected to occur in basements and some first floors in the floodplains of the Rivanna and James Rivers. Of all non-residential square footage in the region, 0.8% is expected to be substantially damaged, while 0.74% of all residential square footage is expected to be substantially damaged. Albemarle County and the City of Charlottesville are expected to receive the most damage, and Greene County and Louisa the least, although it should be noted that rivers in each of these rural counties were not included in the analysis due to insufficient data. Fluvanna County is expected to have the largest proportion of its square footage damaged, 3.45% of all residential and 1.34% of all non-residential.

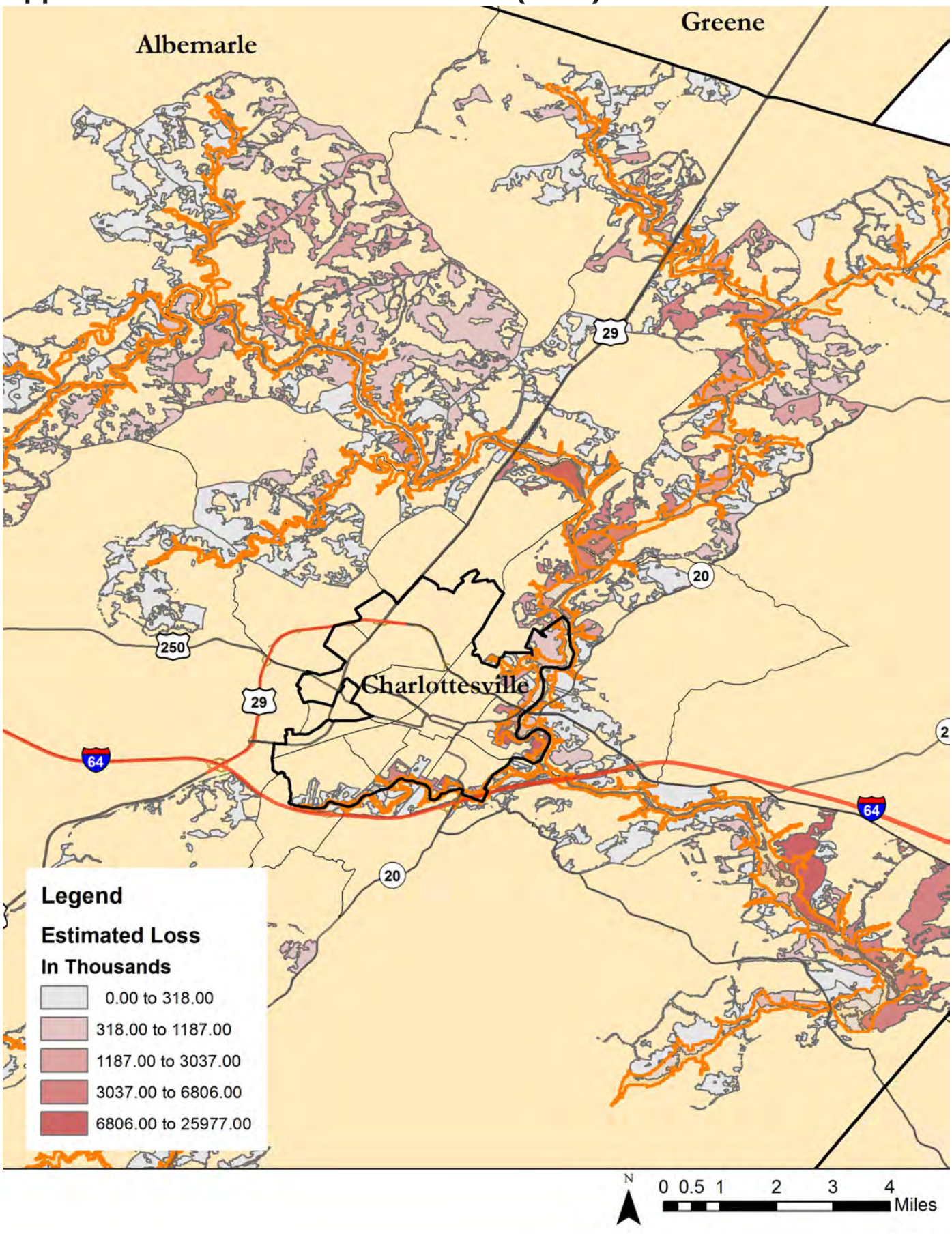
The expected displaced population is 3,980. Each of these people will need temporary shelter during the flooding and throughout a recovery period. The flood is also expected to deposit 8,117 tons of debris that will need to be removed from sites throughout the region. Most of the debris is expected to be deposited in the City of Charlottesville.

The maps on the following pages depict more localized loss estimates along the three river systems analyzed. The upper portion shows the depth grid of the river at the peak of its flood stage. The lower map depicts expected economic losses by block group in the flood area. Separate maps for the Town of Scottsville, the Town of Columbia, and the flood-prone portion of the City of Charlottesville are included. These areas are especially susceptible to flooding, and, in Scottsville's case, the existence of a levee protects the town against a 100-Year flood risk.

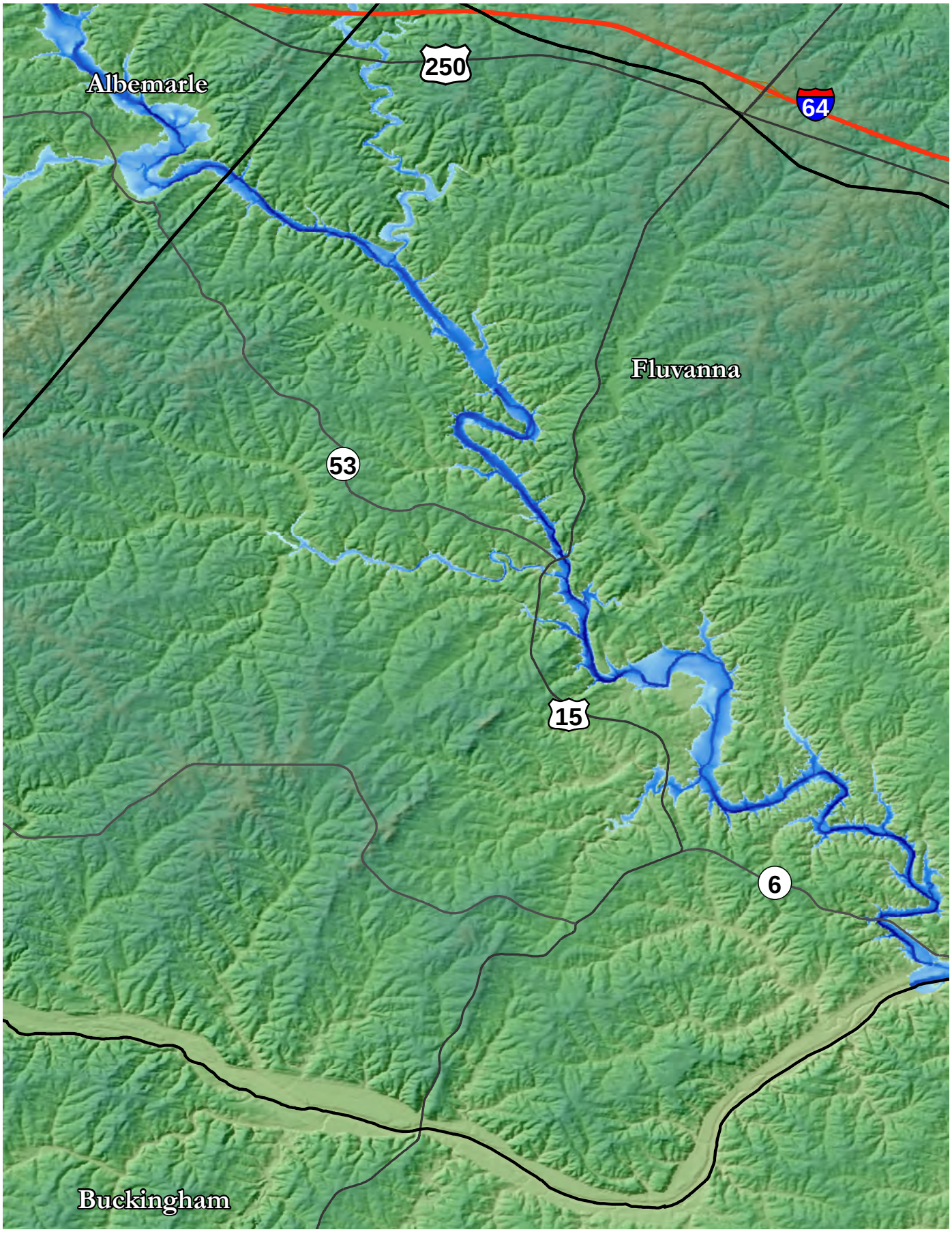
Upper Rivanna River 100 Year Return (Flooding)



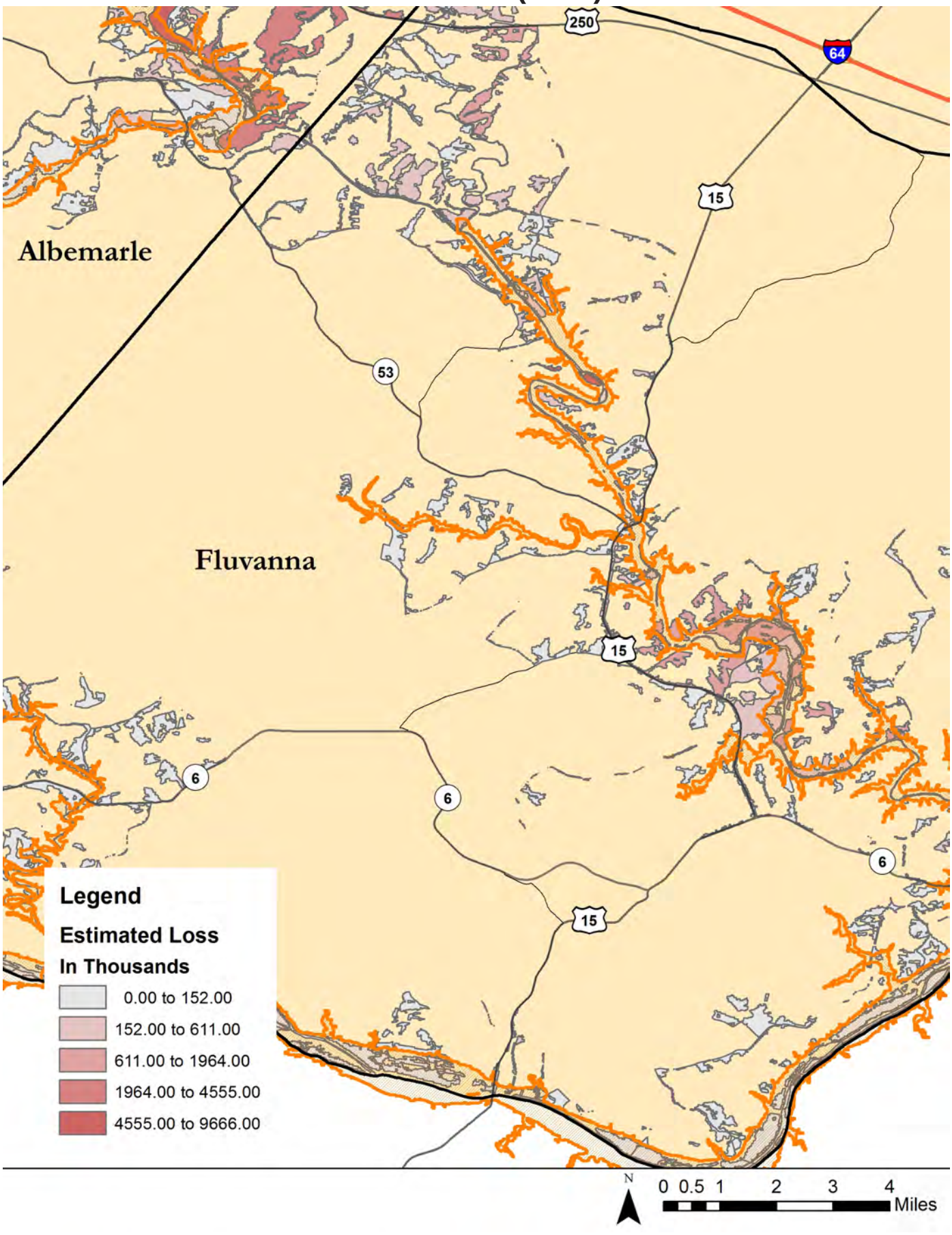
Upper Rivanna River 100 Year Return (Loss)



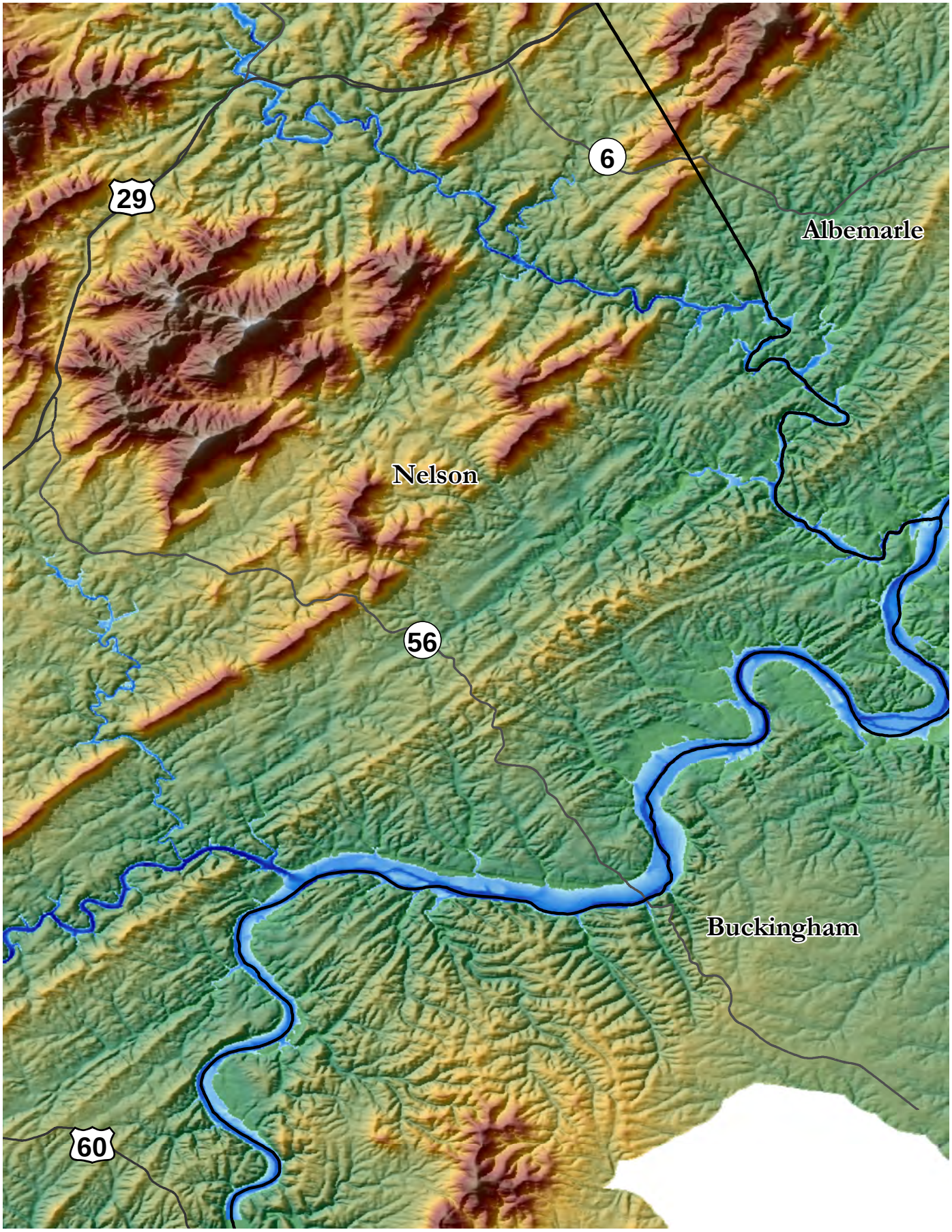
Lower Rivanna River 100 Year Return (Flooding)



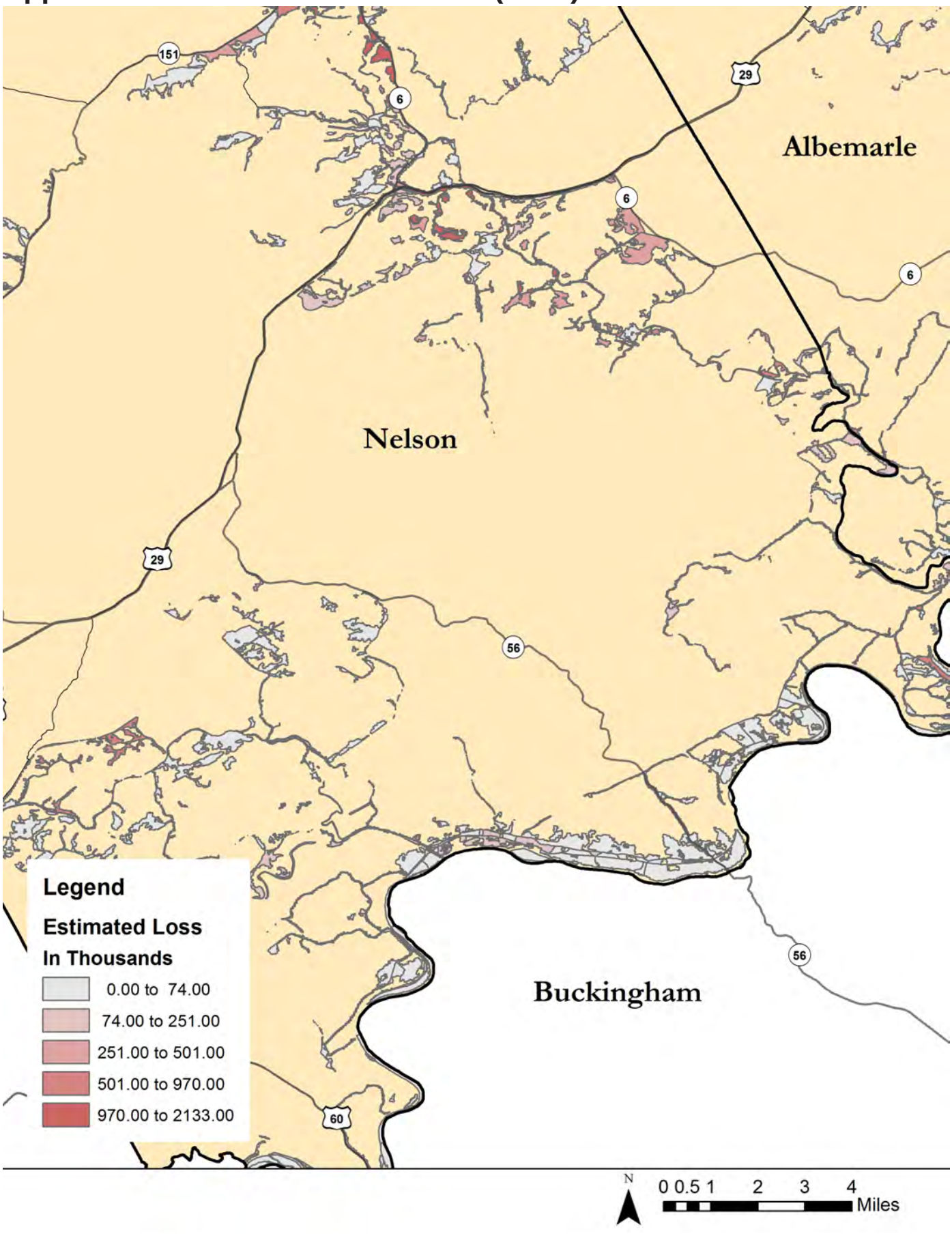
Lower Rivanna River 100 Year Return (Loss)



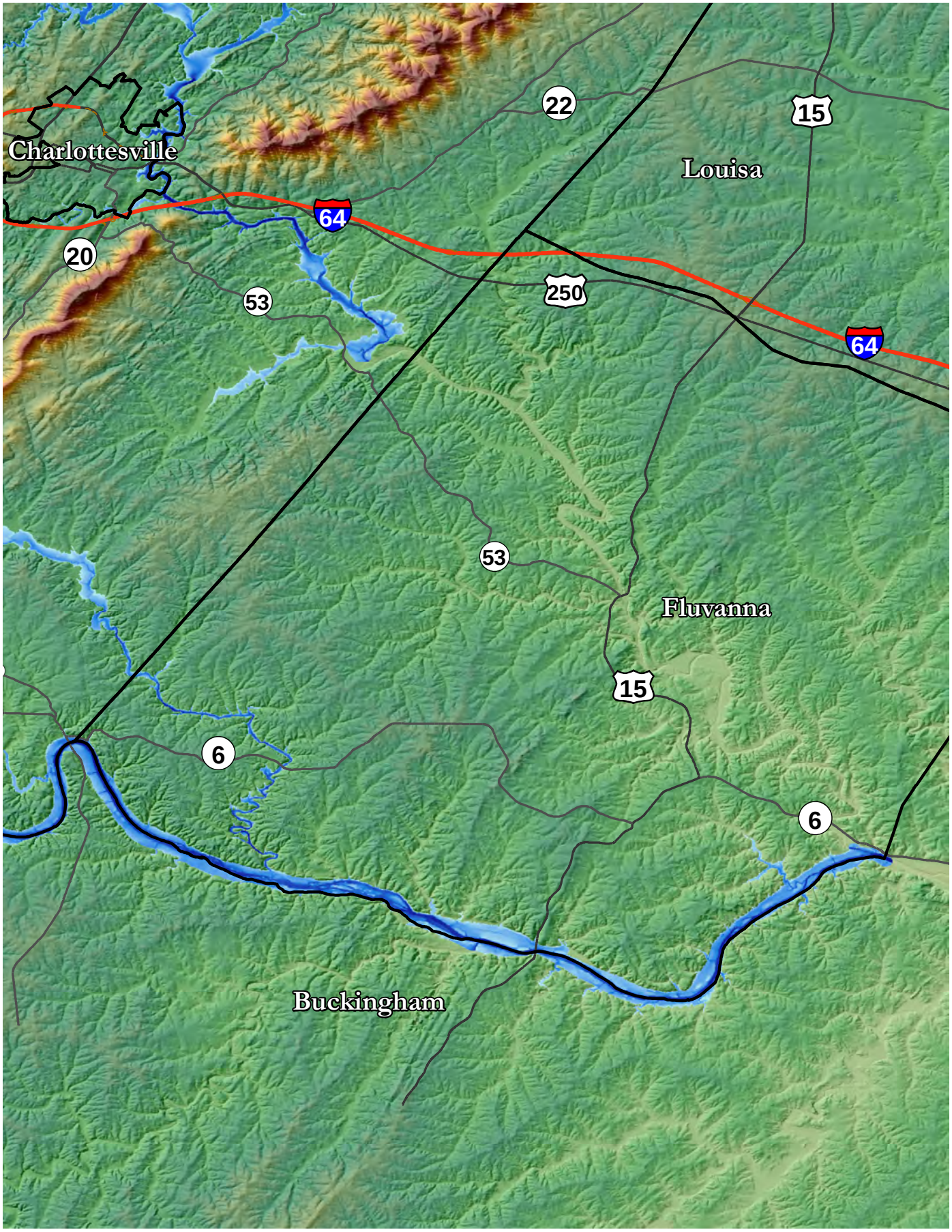
Upper James River 100 Year Return (Flooding)



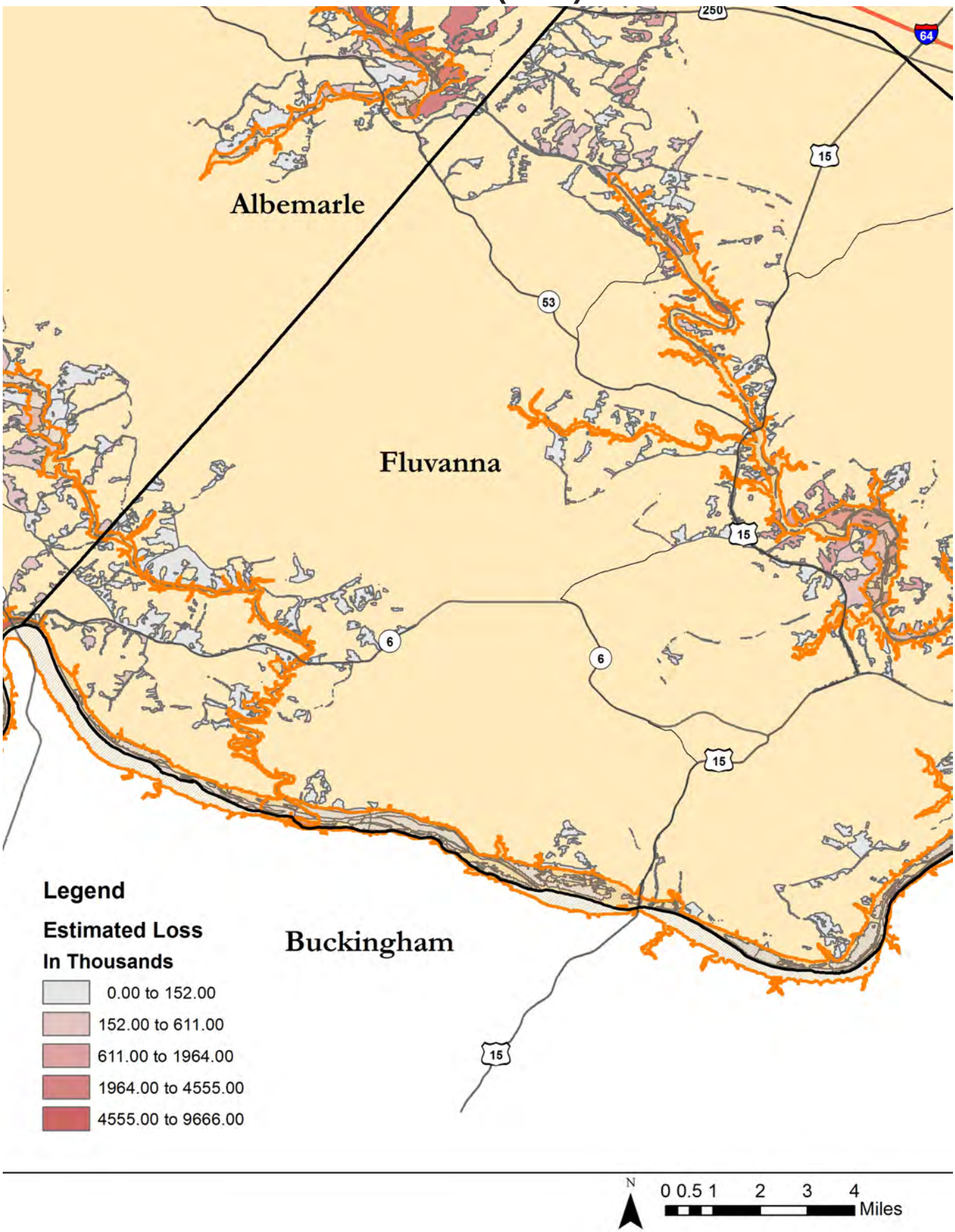
Upper James River 100 Year Return (Loss)



Lower James River 100 Year Return (Flooding)

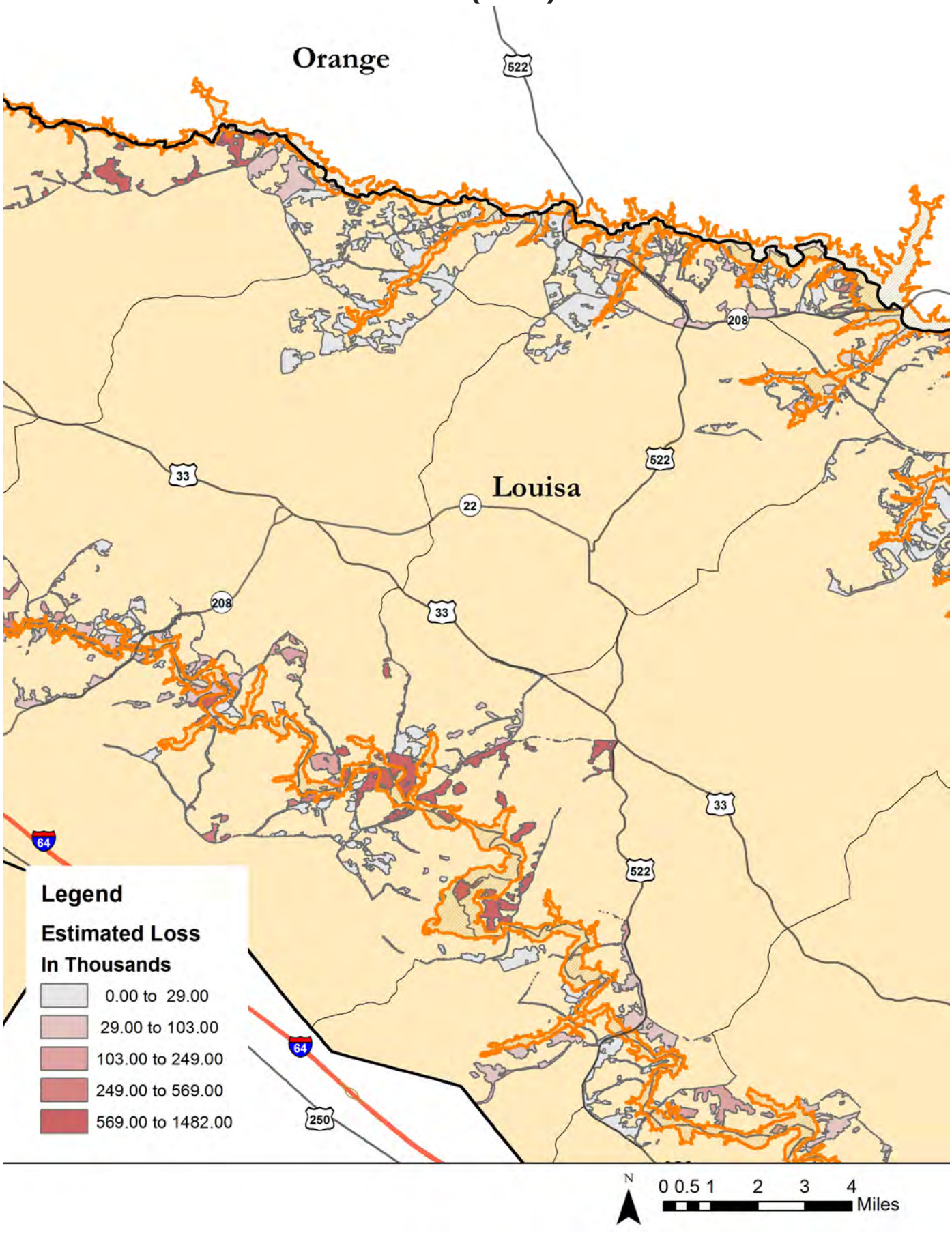


Lower James River 100 Year Return (Loss)

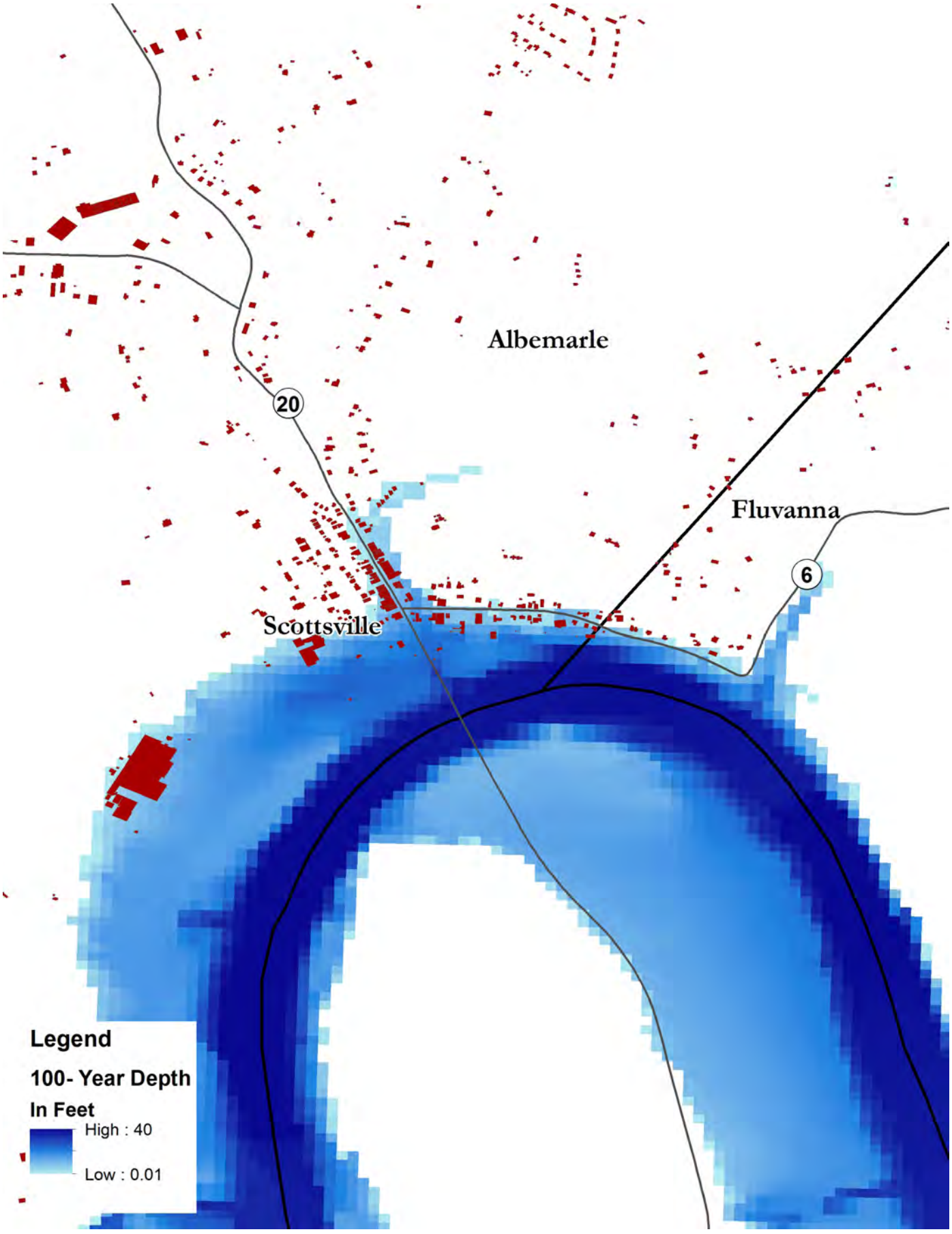


North Anna River 100 Year Return (Flooding)

North Anna River 100 Year Return (Loss)



Scottsville Area 100 Year Return (Flooding)



Other Flood Vulnerability Considerations

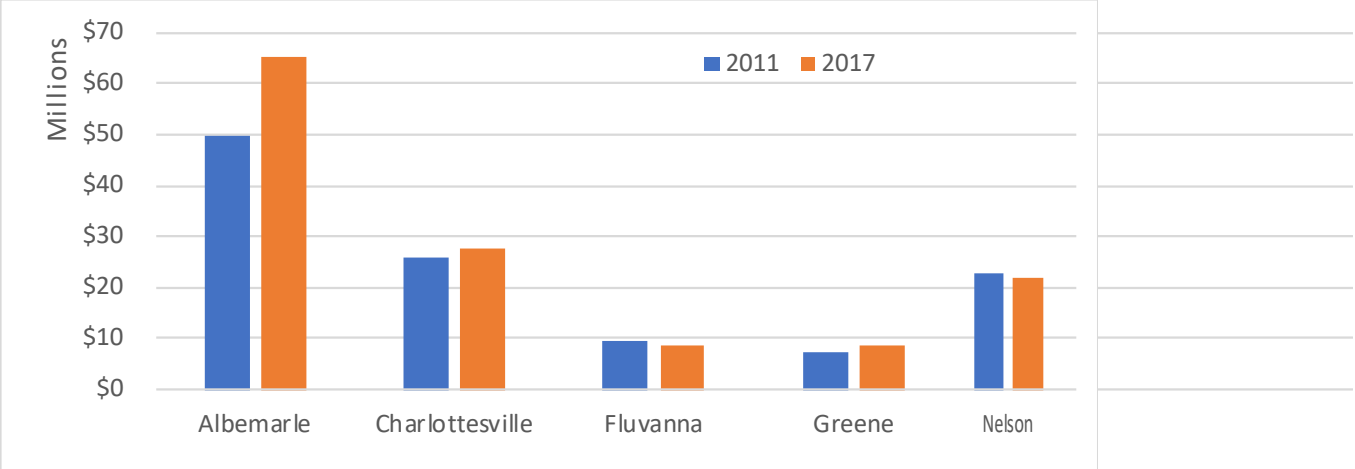
National Flood Insurance Program

Five out of six of the TJPDC localities participates in the National Flood Insurance Program (NFIP), which insures individual properties in the event of a flood, provides mapping and technical information on flood hazards, and assists in mitigation efforts. An analysis of the insurance held and claims made can provide insight into the financial risk to property posed by floods throughout the region. As of July 2011, over $146 million in flood insurance was held in the region, with annual premiums totaling about $493 thousand. Since the inception of the program, ranging by locality between 1978 and 1989, 138 losses have been claimed for a total of a little over $2 million.

Repetitive Loss Structures:

NFIP Definition:
Repetitive Loss Structure. An NFIP-insured structure that has had at least 2 paid flood losses of more than $1,000 each in any 10-year period since 1978.

Total Insurance Held in the National Flood Insurance Program



National Flood Insurance Statistics by Locality 2017

Locality	Entry into NFIP	# of Policies 2017	Change in Policies 2011-2017	Total NFIP Insurance 2017	Annual Insurance Premium 2017	Total Losses since Entry	Payments since Entry	Payments 2011-2017
Albemarle*	1980	314	52%	$65,135,700	$199,544	125	$1,217,656	$911,834
Charlottes-ville	1979	104	-3%	$27,707,800	$135,537	39	$295,874	$10,136
Fluvanna	1978	36	0%	$8,529,800	$20,127	14	$214,500	$8,539
Greene^	1984	34	10%	$8,804,000	$16,153	19	$71,500	$34,739
Louisa ^^								
Nelson	1978	92	-13%	$21,685,600	$77,842	35	$239,775	$63,913
Region	-	635	19%	$146,799,300	$493,316	235	$2,042,433	$1,032,289

**Includes Scottsville*
^Includes Stanardsville
^^ No new policies in Louisa County have been issued since County left the NFIP in 2017
Source: NFIP Via FEMA https://www.fema.gov/policy-claim-statistics-flood-insurance 10/2017

Hazard Mitigation Assistance Definition:

FEMA may contribute up to 90 percent Federal cost share for RL properties. An RL property is a structure covered by a contract for flood insurance made available under the NFIP that:
(a) Has incurred flood-related damage on two occasions, in which the cost of the repair, on the average, equaled or exceeded 25 percent of the market value of the structure at the time of each such flood event; and
(b) At the time of the second incidence of flood-related damage, the contract for flood insurance contains increased cost of compliance coverage. There are 10 structures in the region that fit this category. the type of structure and jurisdiction is listed in the adjacent table.

Severe Repetitive Loss Structures:

An SRL property is a structure that:
(a) Is covered under a contract for flood insurance made available under the NFIP; and
(b) Has incurred flood related damage
i. For which four or more separate claims payments (includes building and contents) have been made under flood insurance coverage with the amount of each such claim exceeding $5,000, and with the cumulative amount of such claims payments exceeding $20,000, or
ii. For which at least two separate claims payments (includes only building) have been made under such coverage, with the cumulative amount of such claims exceeding the market value of the insured structure. There is one such structure in the region. It is a non residential structure located in Albemarle County. The structure has had over 7 losses and accounts for over half of all Repetitive Loss flood damage in the region, at a total cost of almost $232,123 in damage to the contents of the property. This structure may be important to target for possible mitigation activities. The following chart shows selected claims data reported to the NFIP.
Critical Facilities in floodplain

Repetitive Loss/ Sever Repetitive Loss Structures

County	Res	Comm.	Total
Albemarle	2	1*	3
Charlottesville	2		2
Fluvanna	2	1	3
Greene	1		1
Louisa			
Nelson	2		2
Region	9	2	11

Source: NFIP Via VDEM 2017

Several of the critical facilities in the region may be impacted by flooding. The HAZUS-generated results presented above take into account damage to essential infrastructure, such as roadways and utilities, as well as essential facilities such as schools and hospitals. However, a more fine-grained approach to flood vulnerability is warranted, especially for facilities that are critical to emergency response. The map on the following page depicts all critical facilities identified in the region that fall within the 100-Year flood plain. Unless the vulnerability is mitigated, use of these facilities may be compromised in event of a flood.

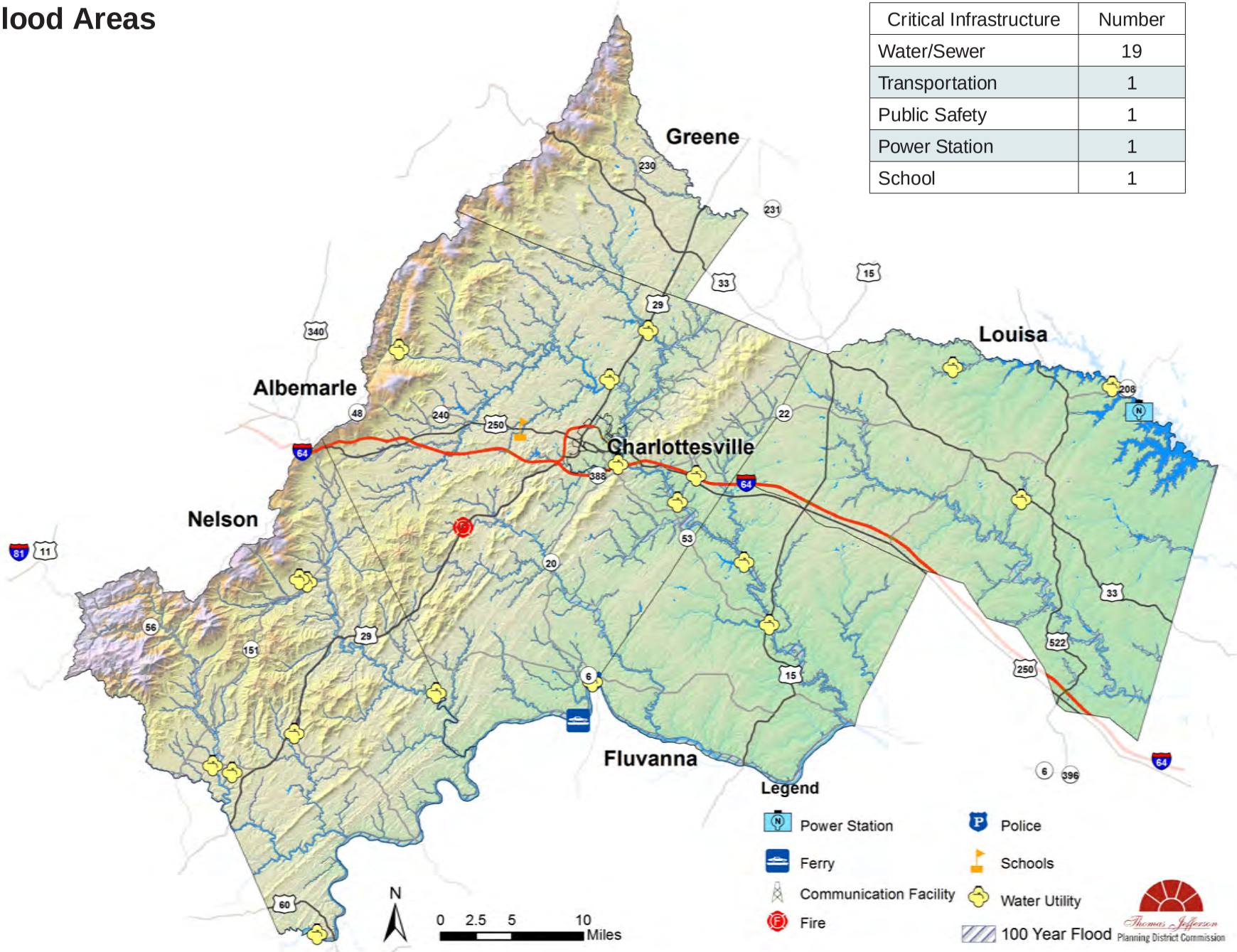
National Flood Insurance Statistics by Locality

County	Type	Imp Value	Miti-gated	Insured	# of Loss	Most Recent Loss	Total Building Damage	Total Contents Damage	Total Damage
Albemarle	Non Res	0	No	No	7	08/06/2005	$ 0	$ 232,123	$ 232,123
Fluvanna	Non Res	$ 170,600	No	No	3	09/07/1996	$ 78,996	$ 330	$ 79,326
Fluvanna	1 fmly	$ 42,000	No	No	2	09/06/1996	$ 52,629	$ 0	$ 52,629
Albemarle	1 fmly	$ 83,250	No	No	5	01/20/1996	$ 37,716	$ 4,216	$ 41,932
Nelson	1 fmly	$ 50,000	No	Yes	2	11/29/2005	$ 20,413	$ 5,508	$ 25,922
Cville	1 fmly	$ 40,500	No	Yes	2	09/21/1979	$ 13,074	$ 9,270	$ 22,345
Fluvanna	1 fmly	$ 50,100	No	No	2	09/08/1987	$ 21,688	$ 0	$ 21,688
Albemarle	1 fmly	$ 51,168	No	Yes	2	09/09/2004	$ 19,459	$ 0	$ 19,459
Nelson	1 fmly	$ 70,000	No	Yes	3	09/06/1996	$ 16,977	$ 0	$ 16,977
C'ville	1 fmly	$ 28,500	No	Yes	2	09/21/1979	$ 9,493	$ 5,000	$ 14,493
Greene	1 fmly	$ 172,718	No	Yes	3	09/29/2015	$7,665.09	$ 0	$ 7,665

Source: NFIP Via VDEM

Critical Facilities Located within 100-Year Flood Areas

Critical Infrastructure	Number
Water/Sewer	19
Transportation	1
Public Safety	1
Power Station	1
School	1



Source: HAZUS 3.2

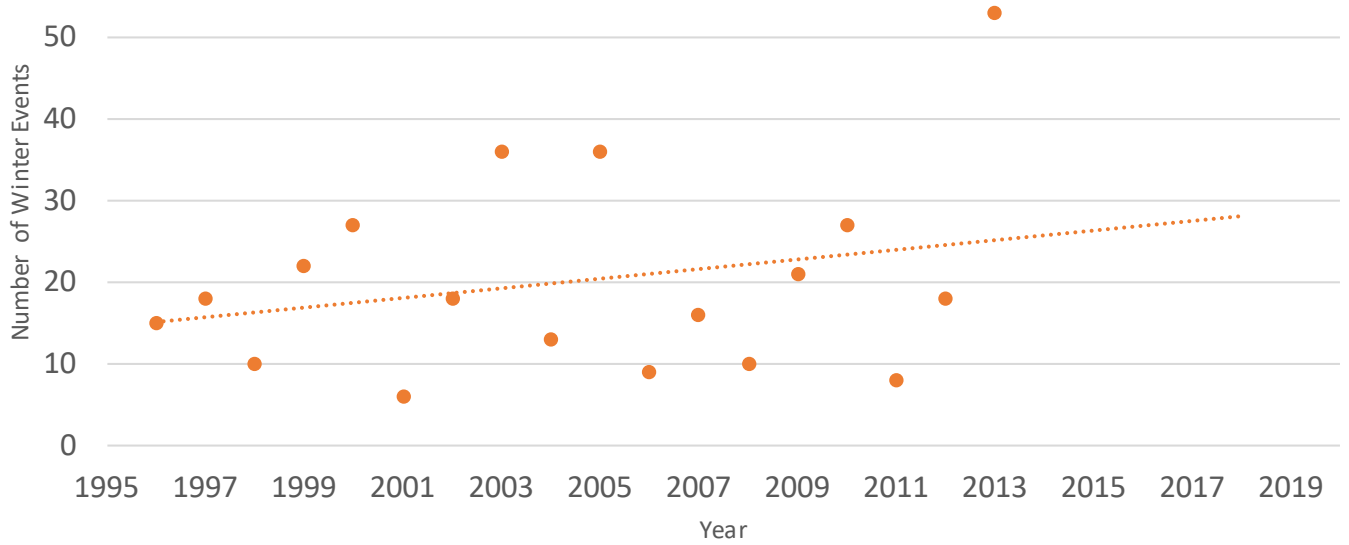
Winter Storm: Estimated Losses

Winter Storm events pose less of a direct risk to human life and property, but they can become a significant impediment to business and emergency response operations, as well as a cause for traffic accidents. In general, the western part of the Planning District at higher elevations experiences greater snowfall, but most storms affect the region as a whole. Costs of snow removal can be high for state agencies and local governments. VDOT spent in excess of $200 million in response to winter storms during the 2009-2010 season, exceeding the budgeted amount by $110 million. The City of Charlottesville estimated a little over $1million in snow removal expenses and lost revenue over the same period. Remote homes, especially in the more mountainous areas of the Planning District, are at a greater risk of being isolated as roads become impassable.

From historical data presented in the Hazard Analysis section, a basic trend line indicate that over the next ten years the region will be hit on average by 20 winter weather events a season. This figure includes winter storms, ice storms and winter weather. Winter weather frequently cause conditions that result in injuries and death, mostly due to automobile accidents and people over exerting themselves clearing snow. Direct property loss can be expected to be minimal over the decade, under $1 million in total damages. However single season losses might be larger. for example, the winter of 2015-2016 saw several buildings damaged due to snowfall accumulation on roofs. The single largest impact from winter storms is the significant impedance they cause to businesses when infrastructure and services are blocked. Winter storms also present economic challenges for families who have to deal with school closings. It is important to note that as the region continues to grow and spread out into low-density exurban development, the population becomes more dependent on well-functioning transportation infrastructure. The impact of winter storms can be expected to increase proportionally.

Source: Andrew Shurtleff/The Daily Progress via AP

Winter Weather Trends 1995-2015



Note: Winter events include winter storms, ice storms, and winter weather
Source: NOAA NCDC

Wildfire: Estimated Loss

Since the last Hazard Mitigation plan update several new tools for assessing fire risk have become widely available to planners. These include data from the Southern Group of State Foresters Southern Wildfire Risk Assessment tool and the U.S. Forest Service. These tools provide interactive mapping that allows for planners to assess fire potential based on a variety of factors. A map depicting the burn probability based on the Southern Wildfire Risk tool is included on the following pages.

For Estimating Losses the older Virginia Department of Forestry Risk maps (2003) were used. These maps provide a more localized look at wildfires and wildfire risk specific to Virginia. These maps subdivide the region into areas of high, medium, and low risk for wildfires.

Burn Probability- Acres

	Class	Acres	Percent
	1	330,747	28.0%
	2	354,346	30.0%
	3	236,743	20.1%
	4	116,050	9.8%
	5	141,460	12.0%
	6	0	0.0%
	7	0	0.0%
	8	0	0.0%
	9	0	0.0%
	10	0	0.0%

Source: Southern Wildfire Risk

To assess vulnerability to wildfire, the number of housing units that fall within the "high-risk" zone were counted, based on census block-level counts from the 2010 Census. Almost half of all homes in the region fall within a wildfire risk zone. Further, 91% of the region's population live within the Wildland Urban Interface (WUI). The WUI is the area where structures and other human improvements meet and intermingle with undeveloped wildland or vegetative fuels. Population growth within the WUI substantially increases the risk from wildfire.

Based on the 2010 zone analyses Albemarle County has the greatest number of at-risk units, and Greene County has the highest proportion of at-risk units. Additionally, 114,641 people in the region are exposed to high wildfire risk. The City of Charlottesville has by-far the lowest risk of can locality. Although 11% of the land is at-risk, most of this area is park land. Only 4% of home are at-risk. For all other localities, homes are actually more likely to be located in high-risk areas than lower risk areas. This could be explained by the prevalence of farmland in low-risk areas that have relatively few residential buildings. The maps on the following pages compare the number of housing units at risk with units that are not at substantial risk to wildfire. This is a measure of total exposure, not a measure of expected loss, because wildfires are highly localized events that do not adhere to a predictable spatial pattern.

The maps on the following pages compare the number of housing units at risk with units that are not at substantial risk to wildfire. This is a measure of total exposure, not a measure of expected loss, because wildfires are highly localized events that do not adhere to a predictable spatial pattern.

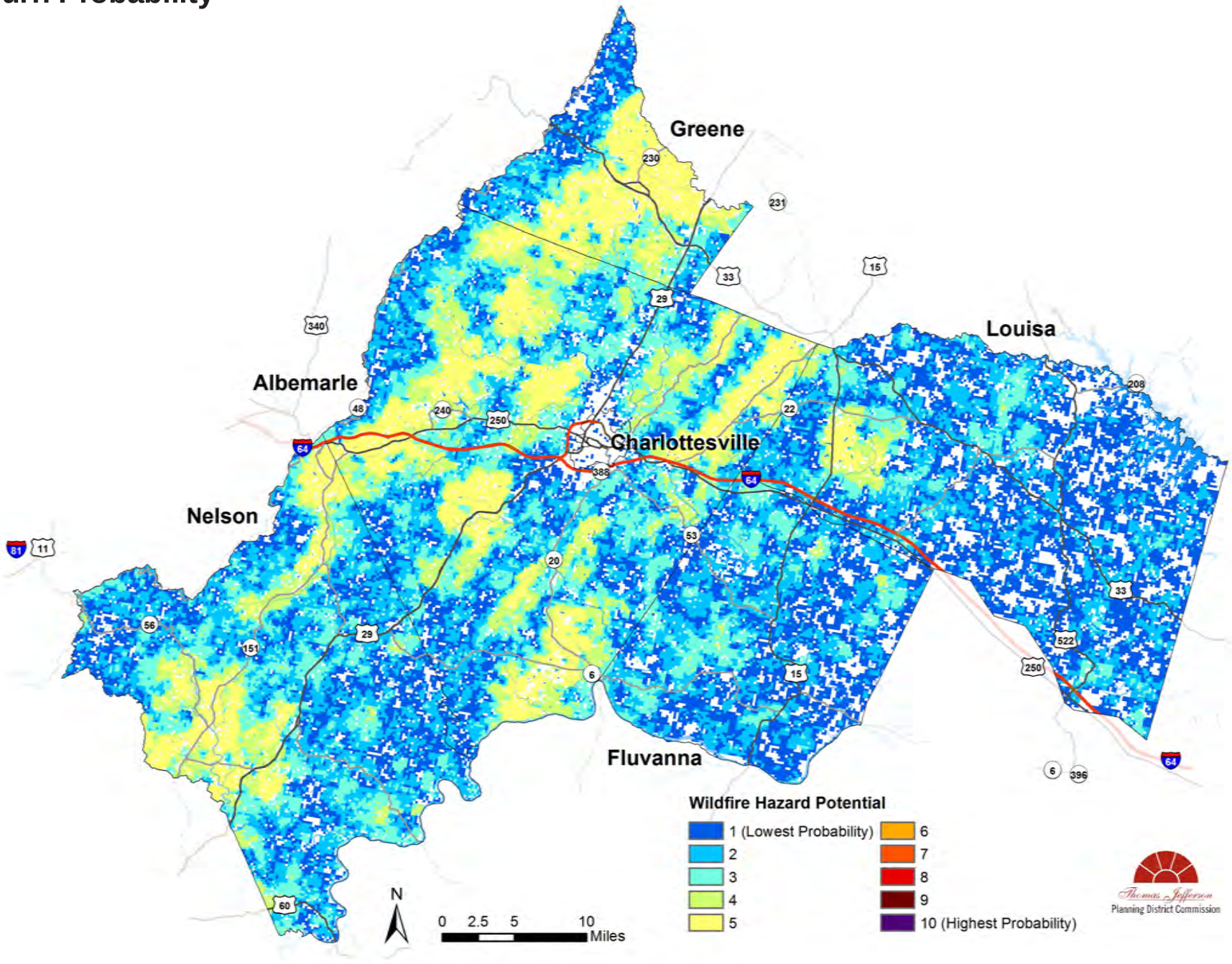
Source: TJ Wood Via NBC29

Exposure to High-Risk Wildfire Area (2010 Census & 2003 Fire Risk Maps)

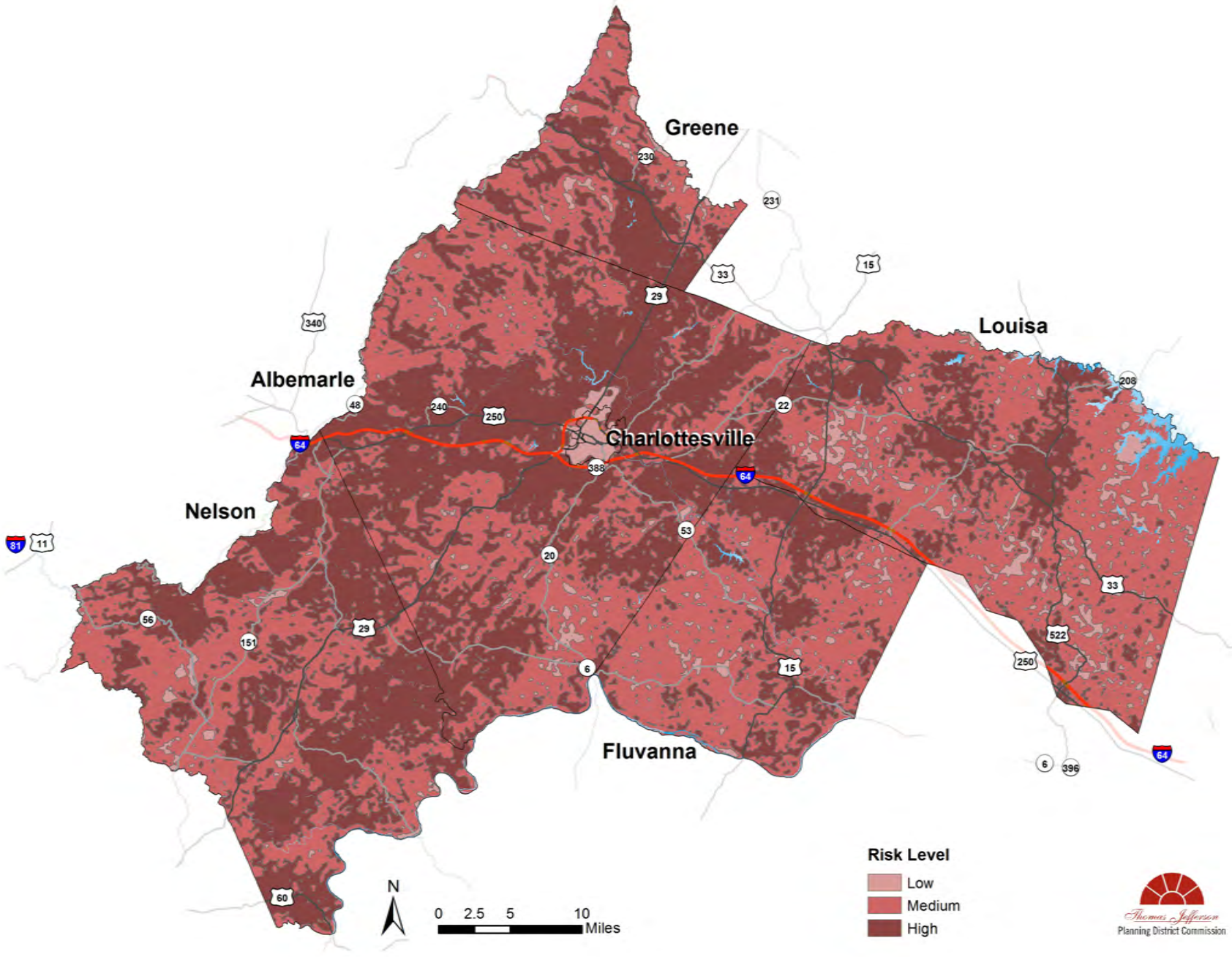
	% of Land at Risk to Wildfire	Housing Units at Risk to Wildfire	% of Housing Units At-Risk	Population at Risk to Wildfire
Albemarle	56%	28,349	67%	65,684
Louisa	27%	6,063	37%	12,403
Charlottesville	11%	706	4%	1,527
Greene	47%	5,511	73%	13,908
Fluvanna	26%	5,188	50%	12,837
Nelson	51%	5,400	54%	8,282
Region	43%	51,217	49%	114,641

Source: Source: Dept. of Forestry, U.S. Census Bureau 2010 Decennial Census

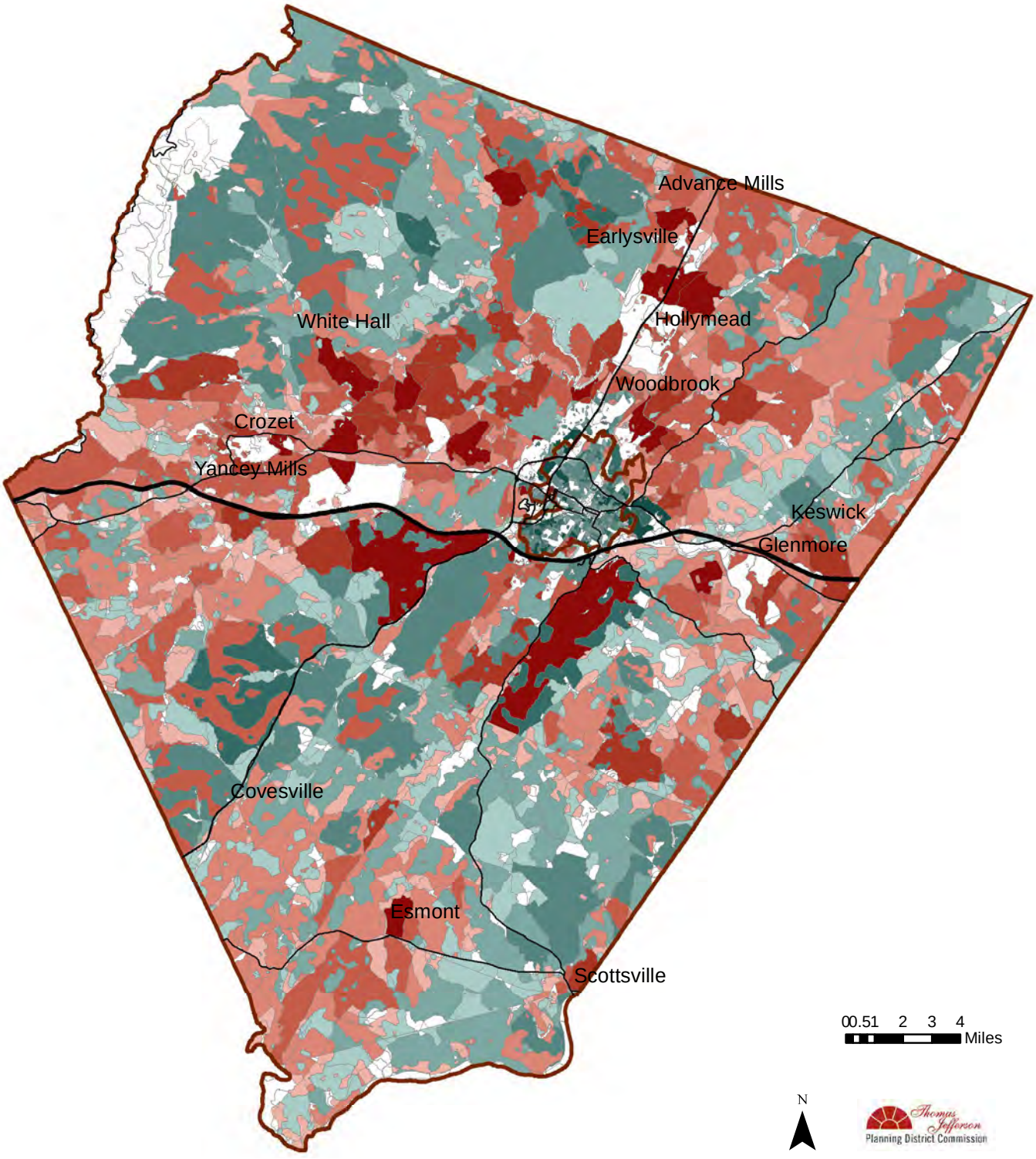
Burn Probability



Wildlife Hazard Assessment 2003



Homes at Risk to Wildfire (2010) Albemarle + Charlottesville



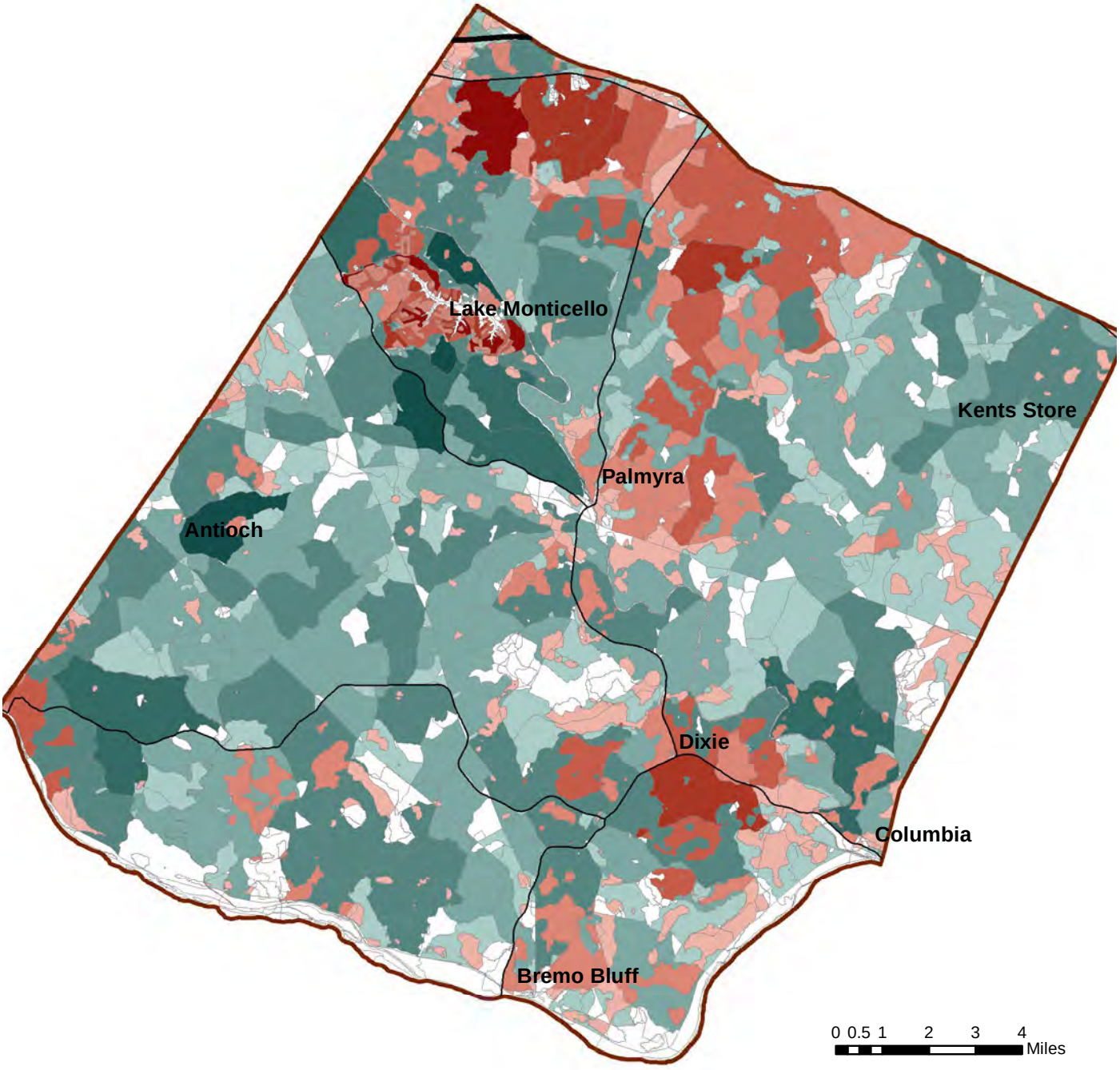
Cville Total: 706 Homes

Albe Total: 28349 Homes

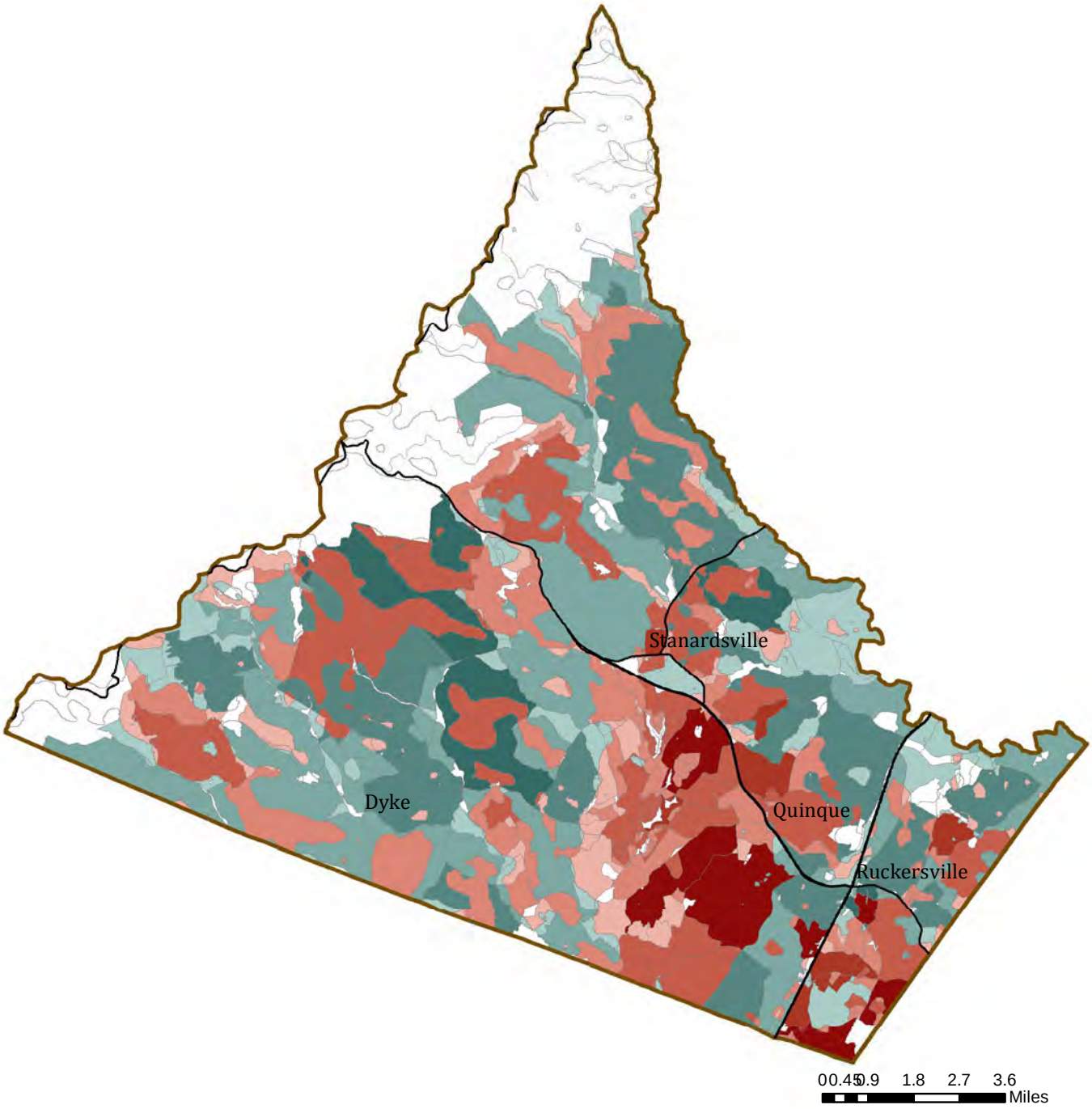
Cville Total: 18483 Homes

Albe Total: 13773 Homes

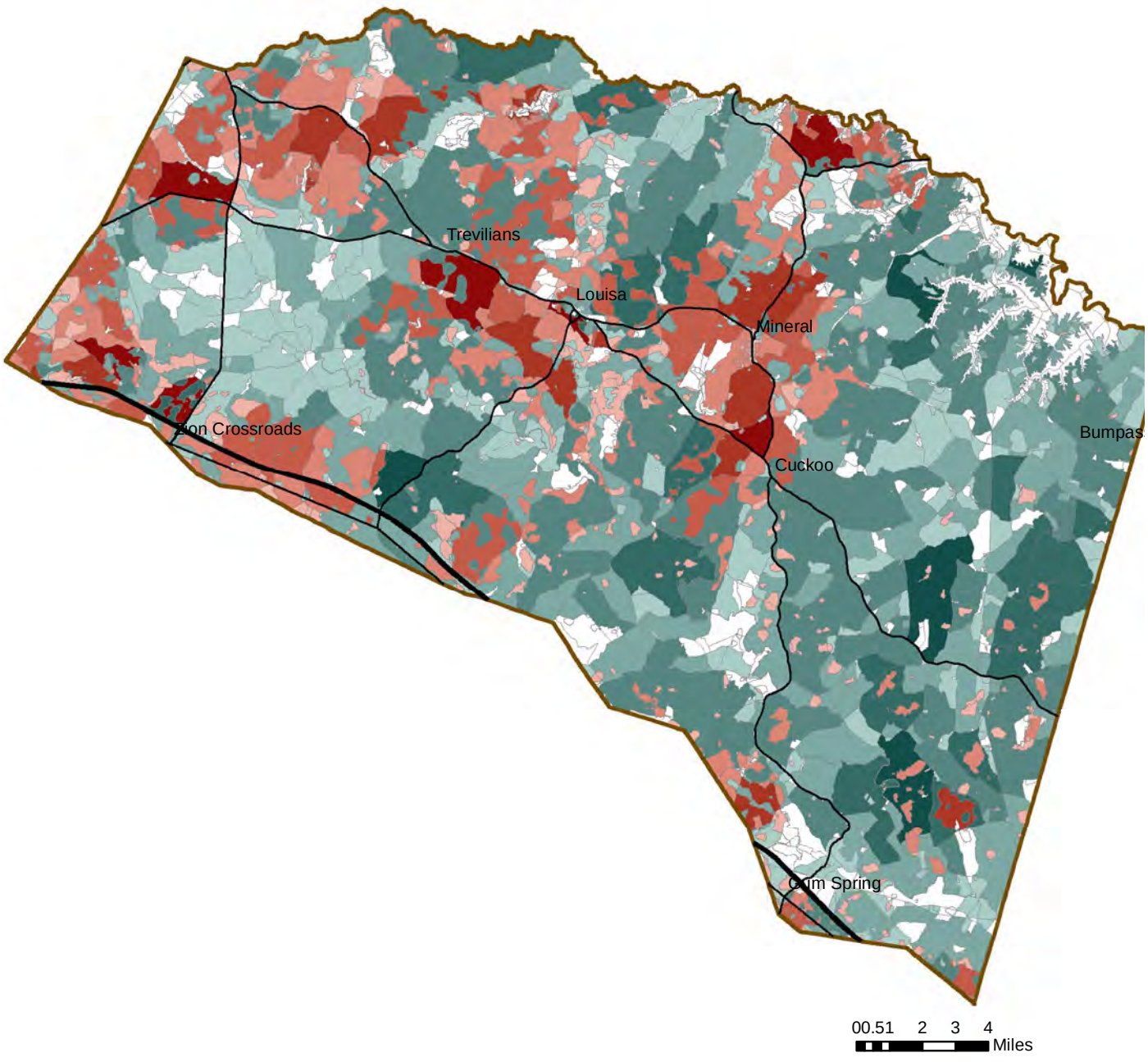
Homes at Risk to Wildfire (2010) Fluvanna



Homes at Risk to Wildfire (2010) Greene



Homes at Risk to Wildfire (2010) Louisa



At-Risk Homes

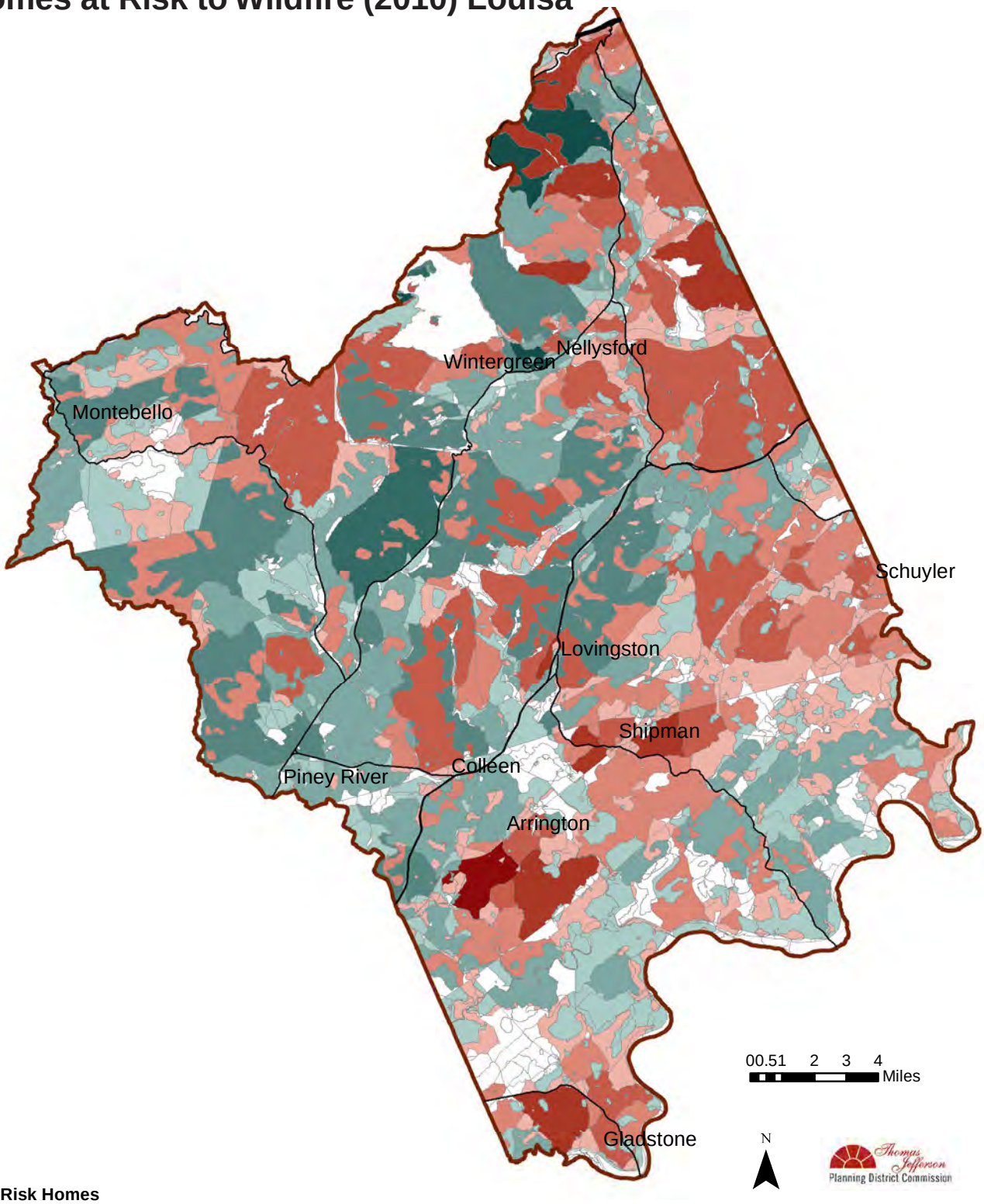
Total: 6063 Homes

Homes not at risk

Total: 10256 Homes

0 | 1 - 5 | 6 - 20 | 21 - 50 | 51 - 80 | 81 - 133

Homes at Risk to Wildfire (2010) Louisa



At-Risk Homes

Total: 5400 Homes

Homes not at risk

Total: 4531 Homes

0 | 1 - 5 | 6 - 20 | 21 - 50 | 51 - 80 | 81 - 133

Based on a trend between 2002 and 2008, the annual expected loss for the region is $53,400 in direct fire damage, not accounting for indirect damages such as displacement or loss of access. Business operations as less likely to be impeded by wildfires, because commercial areas tend to occupy more urban sites. Note; more recent statistics are unavailable.

Total Economic Losses to Wildfires by Locality from 2002 through 2008

Locality	2002	2003	2004	2005	2006	2007	2008	Annual Avg.
Albemarle	$ -	$ -	$ 100	$ 30,800	$ 18,050	$ 8,500	$ 1,100	$ 8,364
Fluvanna	$ -	$ -	$ -	$ -	$ 250	$ 100	$ -	$ 50
Greene	$ 1,400	$ 100	$ -	$ -	$ 1,500	$ 150	$ 13,000	$ 2,307
Louisa	$ 4,000	$ -	$ 200	$ 2,000	$ 600	$ 1,000	$ 271,000	$ 39,829
Nelson	$ 1,850	$ -	$ -	$ 500	$ 2,100	$ 12,000	$ 3,500	$ 2,850
Region	$ 7,250	$ 100	$ 300	$ 33,300	$ 22,500	$ 21,750	$ 288,600	$ 53,400

Source: Virginia Department of Forestry

Losses varied significantly between localities, from $50 per year in Fluvanna to $39,829 per year in Louisa. However, it should be noted that one 2008 fire in Louisa at Freshwater Creek accounted for a full 67% of all damage in the region for the seven-year period. Based on exposure to fire risk previously identified, Louisa does not appear to be more susceptible to future wildfires than other counties in the region.

Drought: Estimated Loss

Estimated potential losses due to drought are difficult to calculate because drought causes little damage to the built environment, mostly affecting crops and farmland. Water supply effects of droughts are also hard to project, because they are based on several contingencies such as future capacity, water conservation behavior, and projected demand. By land area, most of the region is dependent on groundwater reserves that can be susceptible to falling groundwater tables during extreme drought conditions. The City of Charlottesville and urbanized Albemarle County depend on surface water storage system which includes a system of five reservoirs that provide 3.3 billion gallons of water storage. These reservoirs are fed by stream intakes that are affected by rain levels. The 2011 RWSA Regional Water Supply plan contains a drought response plan, including monitoring policy, public notification, and emergency supply sources.

Based upon droughts over the past ten years, the region will most likely be affected by one or two droughts over the next ten years. No loss of life or injury will be caused, and there will be no direct property damage. However, future droughts are expected to cause damage ($5 - $15 million) to crops in the region and some business operations may be impeded by water usage restrictions.

Tornadoes: Estimated Loss

Because it cannot be predicted where a tornado may touch down, all above-ground buildings and facilities are considered to be exposed to this hazard and could potentially be impacted. It is also not possible to estimate the number of residential, commercial, and other buildings or facilities that may experience losses.

The locations of past tornado events within the Planning District are shown on the map in Hazard Identification and Analysis section. Based on historic trends, the region is expected to experience several tornadoes (30-35) in the next fifty years, causing 10-15 deaths and several injuries. Property loss will likely total $5 to $7 million. As the population and number of structures increases in the area, the number of casualties and amount of property damage are likely to rise proportionately.

Earthquake: Estimated Loss

The August 23, 2011 earthquake with an epicenter near Mineral was the first in recent history to cause significant property damage. As of the end of September 2011, Louisa County reported a total of $80.6 million in damages, by far the largest amount of any county in Virginia. Of the total, $63.8 million is attributed to the Louisa County public schools. No losses of human life or injuries were reported. The Louisa County High School and

Thomas Jefferson Elementary School were damaged. The High School was replaced with a new facility that came online for the 2015/2016 School Year. Thomas Jefferson Elementary school was replaced and opened in time for the 2014/2015 school year. The rest of the TJPDC Reported only limited damage. Outside of Louisa County, most damage was reported to the north along known fault lines.

Governor McDonnell requested a federal Emergency Declaration approximately one month after the event occurred, noting that much of the damage only became apparent upon inspection of homes by a qualified engineer. Damaged buildings prevent further safety concerns, especially if the damage goes undetected. Louisa County have dispatched teams of building inspectors and fire marshals to 1,000 homes in the area to inspect and install donated smoke and carbon monoxide detectors to reduce the risk of fires and poisoning once homes are heated in the winter.

All modern buildings – including critical facilities – must adhere to the statewide building code, which has certain provisions to prevent excessive damage from earthquakes. Therefore, many of the most impacted buildings have been the older building stock, including historic structures.

Source: Louisa County Historical Society

Methodology

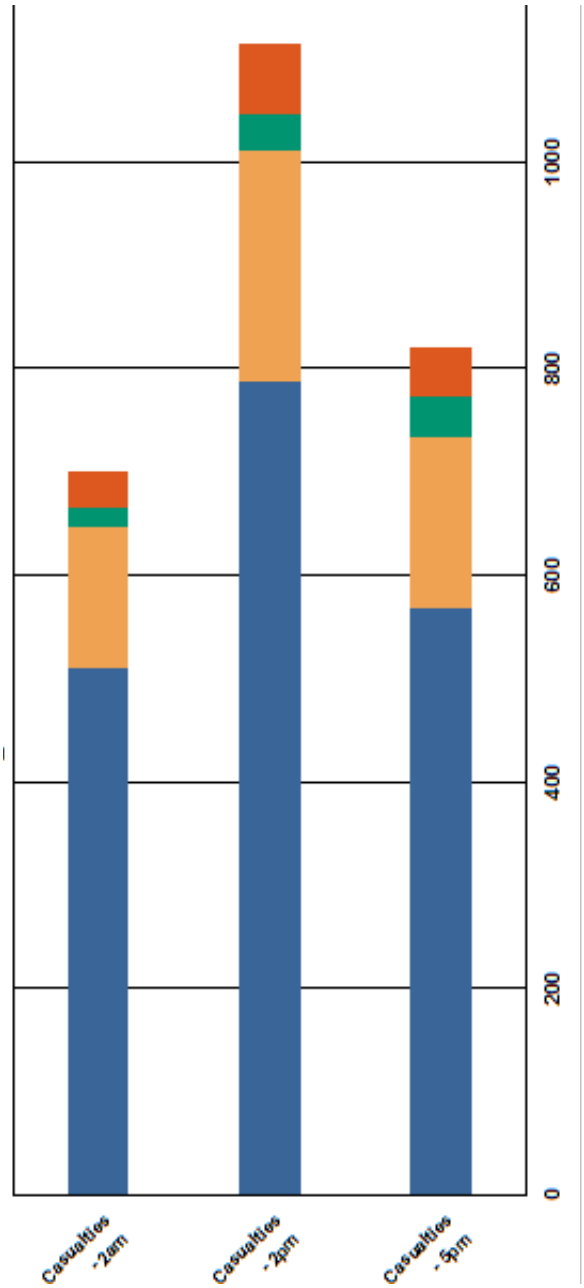
HAZUS MH 3.2 was used to estimate losses of a future earthquake. Data from the August 23rd 2011 earthquake was used as parameters for a scenario, and data for building inventory, soil type, and fault lines was supplied through HAZUS. The scenario assumes a 5.8 magnitude earthquake at a depth of 6 km, with an epicenter near Mineral in Louisa County. This is a very low-probability event, roughly equivalent to a 500-Year Flood according to current USGS predictions. All economic numbers are shown in thousands.

Results

The 5.8 Magnitude earthquake modeled would result in a total of about $233 million in structural damage, 733 million in non-structural damage and income loss equivalent to $241 million. 72% of all economic loss occurring in Louisa County.

Casualties and injuries are represented on a four-tier severity level with level 1 being the lowest and representing an injury like a sprain or a severe cut. Level 2 injuries

Regional Total Casualties



Source: Hazus MH 3.2

requiring x-ray or surgery but not expected to progress to life threatening. Level 3 injuries that pose an immediate life threatening condition. Level 4 are injuries that result in instantaneous death or mortal injury. The chart below presents the expected casualties for the region at 2am, 2pm, and 5pm Louisa has the largest number of casualties with a 2pm casualty count of 1,011 across all severity levels.

Regional Total Casualties

Locality	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Albemarle	$11,274,622	$1,438,340	$270,116	$48,763	$144,970	$25,098	$261,832	$13,463,741
Charlottesville	$3,650,397	$1,189,446	$123,644	$10,330	$114,234	$40,174	$149,366	$5,277,591
Fluvanna	$2,819,432	$94,126	$23,088	$4,122	$8,148	$4,940	$22,446	$2,976,302
Greene	$1,680,572	$118,666	$28,883	$7,139	$20,215	$5,922	$21,738	$1,883,135
Louisa	$3,678,259	$292,083	$113,398	$12,056	$46,156	$8,286	$25,365	$4,175,603
Nelson	$1,993,207	$158,527	$43,285	$13,150	$38,225	$13,015	$9,967	$2,269,376
Region	$25,096,489	$3,291,188	$602,414	$95,560	$371,948	$97,435	$490,714	$30,045,748

Source: Hazus MH 3.2

Capital Stock Losses after Earthquake (in thousands)

Locality	Structural Damage	Non-Structural Damage	Contents Loss	Inventory Loss	Loss Ratio	Total Capital Stock Loss
Albemarle	$22,694	$60,853	$19,041	$348	0.62%	$102,936
Louisa	$183,522	$593,681	$203,375	$6,879	18.61%	$987,457
Charlottesville	$10,025	$28,597	$10,052	$162	0.73%	$48,836
Greene	$2,503	$5,954	$1,657	$30	0.45%	$10,144
Fluvanna	$1,502	$3,049	$637	$11	0.20%	$5,199
Nelson	$13,582	$41,772	$13,943	$100	1.86%	$69,397
Region	$233,828	$733,906	$248,705	$7,530	3.75%	$1,223,969

Source: Hazus MH 3.2

Income Losses after Earthquake (in thousands)

Locality	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss	Total Income Loss	Total Loss
Albemarle	$13,354	$4,208	$5,505	$6,188	$29,255	$36,495
Louisa	$96,150	$17,721	$25,338	$35,425	$174,634	$211,854
Charlottesville	$7,329	$3,709	$4,918	$3,876	$19,832	$25,224
Greene	$1,584	$216	$277	$531	$2,608	$3,616
Fluvanna	$972	$187	$234	$363	$1,756	$20,787
Nelson	$8,152	$1,006	$1,177	$2,734	$13,069	$2,047
Region	$127,541	$27,047	$37,449	$49,117	$241,154	$300,023

Source: Hazus MH 3.2

Losses can be categorized as capital stock losses and income losses. Capital losses include damage to buildings. This can be damage to the building's structure or non-structural, such as damage to interior walls, ceilings, utilities, fixtures. Capital losses also include damage to the contents of a building or, in the case of businesses, inventory stock. Because total exposure data is held for each of these items, a ratio can be calculated. A total of 8.31% of all capital in Louisa County is expected to be damage, which is by far the largest amount in the region, which is expected to see 1.79% of capital damaged. Buildings of unreinforced masonry, including many historic structures built before enhanced building codes, are expected to receive the most damage.

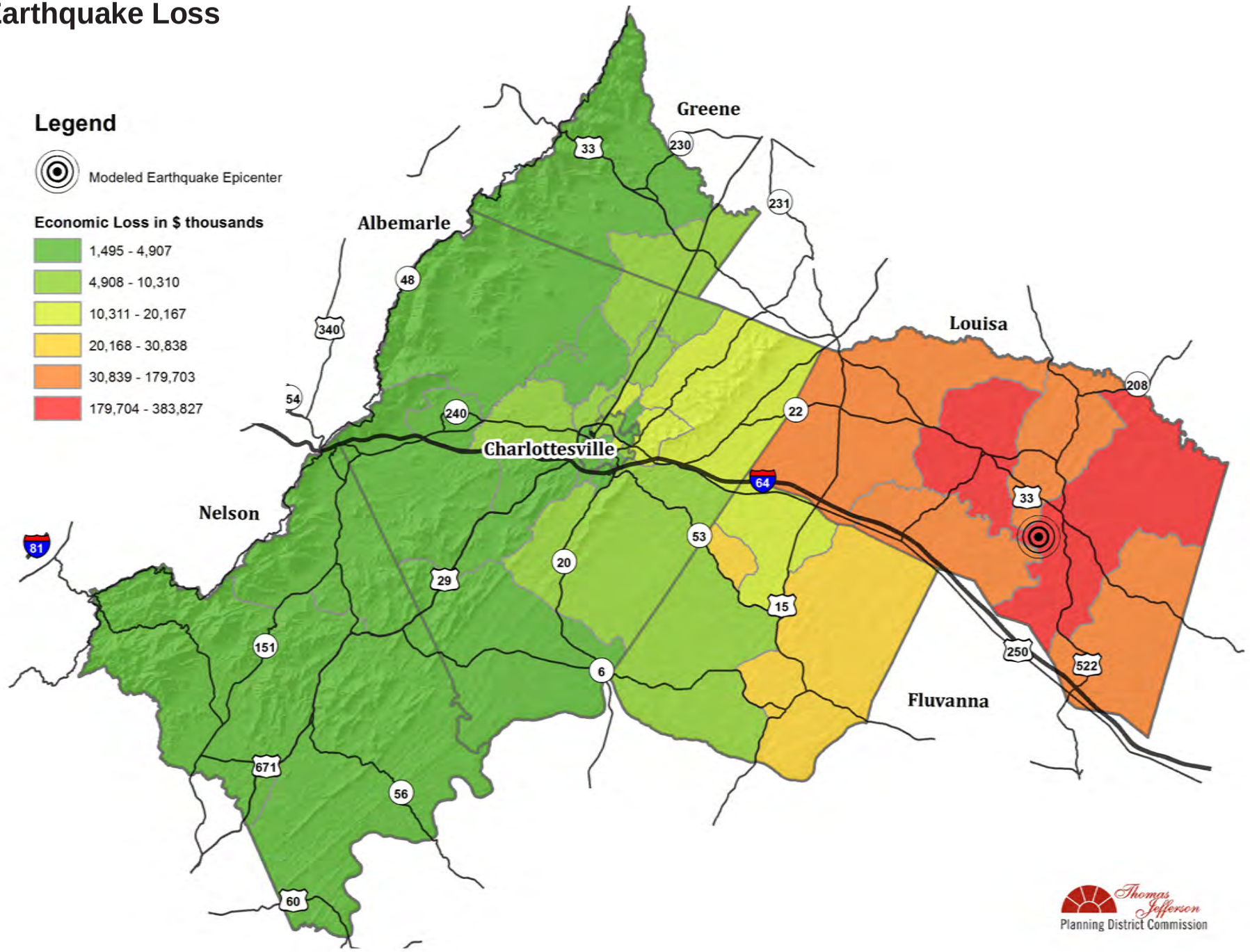
Income losses include the cost of relocating after an earthquake, capital-related losses (i.e. the loss of function of buildings during time of replacement), wage losses from unemployment and lost hours, and loss of rental income. The total losses reported take into account all of these quantified factors. The map on the following page shows the expected losses by census tract throughout the region and the spectral acceleration at 0.3 seconds, a measurement of the intensity of the earthquake.

The following losses are also expected to occur:

- 10% of the 447 highway bridges in the region receive at least slight damage. One-third of all potable water systems in Louisa are extensively damaged. Slight to moderate damage occurs in other localities. However, no households will lose access to water.
- No measurable loss to transportation and communications infrastructure functionality and no power outages.
- Police and Fire response is significantly reduced with functioning capacity at 7% capacity for fire stations and 1% for police stations. Other counties in the PDC fare much better with Fluvanna experiencing the second highest reduction in Fire (57%) and Police (61%)functionality.
- Schools in Louisa lose 93% of functionality, at least temporarily. Hospitals remain fully functional.
- The quake would generate approximately 542,000 tons of debris with 80% of the debris generated in Louisa County.

Minor earthquakes are far more likely to occur in the region, but the damage curve drops off considerably as the event approaches a magnitude of 5.0 or below. Therefore, HAZUS does not model earthquakes below this level.

Earthquake Loss



Dam Failure: Estimated Loss

Ten dams in the TJPDC could cause loss of life if they were to fail. Of these ten, six have emergency action plans in place. Two of the dams do not require them and the last is the New Ragged Mountain Dam, which was completed in 2014. The new dam replaced two separate dams and combined the upper and lower reservoir into a singe facility. The new dam includes a new spillway and real time monitoring and rapid response features.

An updated emergency action plan for the Upper Ragged Mountain dam is under review, and the other three do not require them. The Ragged Mountain Dams, because of their location near Charlottesville, have the highest potential to cause damage and loss of life. The Rivanna Water and Sewer Authority (RWSA) revised their regional water water-supply plan in 2011. As part of this update new inundation maps were produce in anticipation of the Ragged Mountain dam replacement.

Additionally, during the engineering phase of the new Ragged Mountain Dam various scenarios were analyzed, with conditions ranging from a clear day to a Probable Maximum Precipitation (PMP) event, also known as a 10,000-year storm. The RWSA board and engineer consultants have expressed that the new dam, although larger, will be safer than the existing dam built in 1908

Landslide: Estimated Loss

There is the potential for landslides within the planning area. However, the risk is limited to the western portions of Albemarle, Greene and Nelson Counties, along the steeper slopes of the Blue Ridge. The greatest danger of landslides occur during periods of extensive heavy rain as occurred in Nelson County in during Hurricane Camille. During Camille landslides blocked creeks and rivers causing massive debris flows which rushed into narrow valleys causing extensive flooding and loss of life.

The best indicator of future landslides is where they have occurred in the past areas of risk include steep slopes, poor drainage, and erosion have a greater probability of landslides. Developed hillsides and slopes denuded by wildfires can also lead to landslides. One area in our region where rock slides are common is along Interstate 64 at Afton Mountain (Nelson County). in 2013 VDOT removed soil and rock from problem slopes to reduce the risk of future slides.

Capabilities Assessment

A capability assessment helps identify, review, and analyze current mitigation activities undertaken within the region, as well as the ability of each jurisdiction to implement future mitigation projects. Below are ratings of the six localities in the region for the technical, fiscal, and administrative capacity to implement hazard mitigation strategies. The assessment utilized the Capability Assessment Worksheets from the Local Mitigation Planning Handbook. Local staff serving on the Hazard Mitigation Plan Working Group completed the forms, which also guided the review of other local plans for actions to include in the plan. The form included tables for the areas of Planning and Regulatory, Administrative and Technical, Financial, and Education and Outreach. The four towns in the region are considered within their respective counties, since town residents are served by relevant county services.

	Fluvanna	Nelson	Louisa	Charlottesville	Greene
PLANNING and REGULATORY – plans, policies codes and ordinances	High	High	High	High	High
ADMINISTRATIVE and TECHNICAL: staff, skills and tools for planning and action	High	Moderate	High	High	High
FINANCIAL – access or eligibility for funding resources	Moderate	Moderate	High	High	Moderate
EDUCATION and OUTREACH – programs and methods in place to implement actions	Moderate	Moderate	High	Moderate	High
OVERALL CAPABILITY	Moderate	Moderate	High	High	High

Planning and Regulatory: Most localities do not have an Economic Development Plan or Continuity of Operations Plan, but all have Local Emergency Operations Plan, Comprehensive Plans, and Capital Improvement Plans. The level of addressing hazards in locality plans varies among the jurisdictions. Transportation Planning for the urban areas is carried out by the Metropolitan Planning Organization (MPO) and coordinated for the rural areas through the Rural Long-Range Planning process. All localities have codes and ordinances in place.

Administrative and Technical: All localities have Commissions, Committees, and staff in place, with some positions being part-time or having some functions shared by a single staff person. The City of Charlottesville, County of Albemarle, and University of Virginia have shared staff through the Office of Emergency Management and the Emergency Communications Center. TJPDC provided the Hazus analysis for all localities in the Planning District. Nelson County had a vacancy in the Emergency Services

Coordinator position, which was filled in June. The Chief Building Official also vacated that position unexpectedly, and this is currently staffed part-time, but anticipated to be filled full-time in the future. Nelson County is developing a true Local Emergency Planning Committee.

Financial: All localities have Capital Improvements project funding, fees for utilities, and have the ability to incur debt through general obligation bonds. The City of Charlottesville is an entitlement community for Community Development Block Grant (CDBG) funds, but generally utilizes those for economic development purposes. All Counties have utilized CDBG funds, with current projects underway in Albemarle County and the Town of Stanardsville in Greene County. Charlottesville, Albemarle County and Nelson County assess storm water fees, but the other rural counties do not. Charlottesville and Albemarle utilize federal and state funding to a greater extent than the rural counties.

Education and Outreach: All localities have active local citizen groups and non-profit organizations. Only Greene County reported having Storm Ready and FireWise certifications. Louisa County reports that the Department of Fire and EMS conduct regular monthly public education activities in addition to ongoing preparedness information via the department web site.

Other Capability Considerations

Current local funding

The City of Charlottesville and Albemarle County have dedicated local funds to hazard mitigation, but the other counties in the region have not. Albemarle County conducts staff training on building and fire codes, citizen education on hazards, and GIS mapping products that identify hazard-related features. The county also invests in conservation easements in high-hazard areas and other open space protection measures. The City of Charlottesville has also used local funds for a stream restoration project and the rehabilitation of the stormwater system.

Intergovernmental Cooperation

Localities in the region augment their hazard mitigation and emergency response capabilities by cooperating regionally. All localities have joined a mutual aid agreement between emergency services departments. Staff from Louisa County report having used the mutual aid agreement in response to a disaster. Staff from the City of Charlottesville and Albemarle County rate the current level of intergovernmental cooperation as high. Both localities are currently in the process of updating their comprehensive plans in partnership with the Livable Communities project administered by the Thomas Jefferson Planning District Commission. The other localities Louisa County, Nelson County, and Fluvanna County rate their intergovernmental cooperation as moderate. However, staff in the outlying localities note that the potential for cooperation in mitigation-related goals is high.

Intragovernmental Organization

Within localities, a variety of departments are assigned responsibilities for handling certain hazard mitigation tasks. In most counties, planning and public works departments are the key players. Nelson

County assigns most responsibility to the Emergency Management Department. Police and fire departments are integral to emergency response, and they also play a supportive role in pre-disaster mitigation.

Land use

Local land use planning and regulations, in general, have an impact on mitigation capabilities. All localities in the region practice some form of growth management, including limiting development in hazard areas such as flood plains. Comprehensive plans delineate growth areas that are intended to absorb the majority of commercial and residential growth projected over the next planning cycle. Zoning codes, subdivision ordinances, and other regulations have been adopted to support and further the land use goals in the comprehensive plans.

Towns

Governmental services offered by counties apply to towns, including emergency response such as fire and rescue. The Town of Scottsville supplements county law enforcement with a town department, and several towns offer general public services such as water and sewer and solid waste disposal. In terms of hazard mitigation activities, towns have little additional capacity beyond the counties they are contained within.

Some county-wide regulations apply to towns, but towns must adopt their own zoning and subdivision ordinances. The Town of Stanardsville adopts the Greene County ordinance as their own. The town does not hire their own staff, but shares planning and development staff with Greene County. The Town of Mineral and the Town of Louisa practice a similar approach, and each have a person on staff to administer the code and direct public works operations. The Town of Scottsville has an independent zoning ordinance that was last updated in 2011.

Mitigation Action Plan

This section outlines the Mitigation Action Plan including:

- Goals and Objectives guiding the plan
- Hazard-specific strategies
- A summary of mitigation action items by locality
- Detailed mitigation action items by locality

201.6(c)(3)(i): [The hazard mitigation strategy shall include a] description of mitigation goals to reduce or avoid long-term vulnerabilities to the identified hazards.

201.6(c)(3)(ii): [The mitigation strategy shall include a] section that identifies and analyzes a comprehensive range of specific mitigation actions and projects being considered to reduce the effects of each hazard, with particular emphasis on new and existing buildings and infrastructure.

201.6(c)(3)(iii): [The mitigation strategy section shall include] an action plan describing how the actions identified in section (c)(3)(ii) will be prioritized, implemented, and administered by the local jurisdiction. Prioritization shall include a special emphasis on the extent to which benefits are maximized according to a cost benefit review of the proposed projects and their associated costs.

201.6(c)(3)(iv): For multi-jurisdictional plans, there must be identifiable action items specific to the jurisdiction requesting FEMA approval or credit of the plan.

Goals and Objectives:

While the goals of this hazard mitigation plan are concurrent with the goals of FEMA and the Virginia Department of Emergency Management in reducing loss of life and property, the Hazard Mitigation Working group has developed a set of goals and objectives specific to the region. The goals are sorted into five broad categories.

Education and Outreach (E)

- GOAL: Increase awareness of hazards and encourage action to mitigate the impacts
    - OBJECTIVE: Educate families and individuals on disaster mitigation and preparedness
    - OBJECTIVE: Train key agency staff and volunteer groups in disaster mitigation and preparedness
    - OBJECTIVE: Train staff at schools and residential facilities in disaster mitigation and preparedness
    - OBJECTIVE: Encourage and equip employers to develop emergency action plans
    - OBJECTIVE: Protect sensitive areas through conservation practices

Infrastructure and Buildings (I)

- GOAL: Reduce the short and long-term impact of hazard events on buildings and infrastructure
    - OBJECTIVE: Diversify the energy system to provide multiple power source and fuel supply options

- OBJECTIVE: Diversity the communications system to provide alternative lines for use during loss of capacity
- OBJECTIVE: Diversify the transportation system by increasing connectivity and providing modal options
- OBJECTIVE: Elevate, retrofit and relocate existing structures and facilities in vulnerable locations
- OBJECTIVE: Construct or upgrade drainage, retention, and diversion elements to lessen the impact of a hazard

Whole Community (C)

- GOAL: Prepare to meet the immediate needs of the population during natural hazards
  - OBJECTIVE: Train staff to effectively communicate with and transport people regardless of their language proficiency and physical needs.
  - OBJECTIVE: Ensure that the population can access emergency shelters in a timely manner and have functional needs met, in the event of a natural hazard

Mitigation Capacity (M)

- GOAL: Increase mitigation capacity through planning and project implementation
  - OBJECTIVE: Reduce property risks through planning, zoning, ordinances and regulations
  - OBJECTIVE: Incorporate mitigation planning concepts into local plans and ordinances
  - OBJECTIVE: Pursue funding to implement identified mitigation strategies

Information and Data Development (D)

- GOAL: Build capacity with information and data development to refine hazard identification and assessment, mitigation targeting and funding identification
  - OBJECTIVE: Identify data and information needs and develop methods to meet these needs
  - OBJECTIVE: Ensure that each critical facility has a disaster plan in place

Hazard-Specific Strategies

The mitigation action items are organized in this plan by jurisdiction, in order to highlight regional differences and assign ownership to local governments. However, there is also a need to explicitly link the action items determined for each locality with the hazards identified regionally in this plan, in order to determine whether the actions are properly aligned with the actual threats posed by natural hazards in the region. Hazard-specific strategies are included for those hazards ranked high or moderate.

The Hazard Mitigation Working Group identified two high-risk hazards in the region and one moderate-risk hazard in the region that necessitate special attention in this plan. With a relative threat rating of 100%, wind events (Hurricane/high wind/windstorms) was determined to be the hazard with the greatest probability of occurrence and highest impact on the community. Flooding ranked second with a relative score of 67%. These hazards are considered high-risk for all localities in the TJPD.

Winter storms/weather was considered a moderate risk, with a relative score of 56%. Scores dropped sharply for other risks, with wildfire, lightning, drought/extreme heat, and dam failure all were scored equally with a relative threat rating of 22% as the fourth ranked hazards. Wildfire and lightning are covered under the same strategy. Drought/extreme heat is considered as a single strategy, as is dam failure. Tornado and earthquake both had a relative rating of 19%, and landslide at 11%. All of these are considered low risk hazards.

High Wind Events | High Risk

Hurricanes, high winds and windstorms combined were ranked as the most significant hazard in the region. For the purposes of the mitigation strategies, these wind events and tornadoes are considered together. Hurricanes and tornadoes are very different in their impact and require somewhat of a difference in preparedness. It should be noted that some of the greatest impacts of hurricanes are associated with the flooding caused by these major storms. Mitigation of water-related impacts is considered in the flooding strategy above, and this strategy will only consider the wind related impacts.

Similar to winter storms, high wind can disrupt the power system. There are recommendations to remove vegetation from the vicinity of power lines, with the understanding that complete removal of street trees is not desirable for many residents in urban areas. There are also action items related to keeping properties and driveways free of dangerous trees or vegetation, although this strategy is completely voluntary and implemented through educational programs.

Flooding | High Risk

Flooding is the second most significant hazard in the region, and several of the mitigation action items in this plan are intended to limit its impacts. All localities in the region experience flooding, but there are important differences in the types of flood events that occur. Portions of Fluvanna County, the City of Charlottesville, and Albemarle County may be inundated in riverine flooding from the James River or the Rivanna River. Flooding the Greene County, Nelson County, and western Albemarle County are prone to flash floods and stormwater drainage from the Blue Ridge Mountains.

There are essentially three primary strategies for mitigation of flooding: 1. adjust the path of flooding either through engineering or passive restoration of natural function. 2. Limited development and/or remove objects of value from the path of floodwaters. 3. Prepare and educated the public for responding to floods.

The most significant element of flood control currently in the region are the dams for reservoirs and the levee protecting Scottsville. No specific action items are recommended for these improvements, because the responsibility for dam monitoring and management is outside the scope of local responsibility. The levee in Scottsville was evaluated in the vulnerability assessment and determined to withstand a 1% flood. There are no improvements recommended by this plan for the levee.

Several action items directly involve stormwater management, with the purpose of enhance flood control. These are especially important in more urbanized areas with more density that can be impacted. More

urbanized areas also tend to have higher proportion of impervious surfaces that tend to speed up and redirect the flow of stormwater in ways that can be harmful. The Virginia Department of Environmental Quality has mandated or encouraged certain stormwater management practices, with the purpose of complying with the Chesapeake Bay Act in improving water quality. Flood control is another important factor to consider, so many of these practices are included in this plan as well. These practices include increasing the storage capacity of streams, maintenance of stormwater conveyance systems, removal of debris that may block channels, and the installation or maintenance of basins for the collection of storm water.

The second strategy is to limit human settlement in the path of waters. This can be done through policy, such as zoning codes establishing special zones for flood areas, or retroactive practices of removing structures current susceptible to flooding. Most jurisdictions in the area already have zoning codes meant to protect from flooding, but this plan does recommend strengthening those codes in some cases.

Finally, the plan includes action items intended to assist the public and emergency responders in cases when flooding does occur. Many of the action items are intended to provide crucial information, such as signage along routes that are susceptible to flooding and high-water marks on bridges. There are recommended education campaigns targeted toward individual households with ideas for flood-smart landscaping and household practices. There are also general action items intended prepare for multiple hazards with properly equipped shelters, communications, and organization of staff and volunteers. One of the plans objectives is particularly geared toward floodplains: Elevate, retrofit and relocate existing structures and facilities in vulnerable locations. The list of potential actions prepared by TJPDC for locality use suggested several strategies under this objective, including the Identification of vulnerable structures and application for funding to implement acquisition and demolition, relocation, floodproofing, or structural retrofit projects. The list of suggested action item for each goal and objective was included in the meeting packet and discussion for the December 8, 2016 Working Group Meeting. This strategy was also mentioned at meetings with Local Emergency Planning Committees (LEPCs) and discussions with locality staff.

§201.6(c)(3)(ii): [The mitigation strategy] must also address the jurisdiction's participation in the National Flood Insurance Program (NFIP), and continued compliance with NFIP requirements, as appropriate.

Five counties in the region and the City of Charlottesville participate in the National Flood Insurance Program (NFIP), which enables property owners to purchase federally-backed insurance to protect against losses from flooding. The towns of Stanardsville and Scottsville also participate. Louisa County was suspended from NFIP on October 31, 2016 and does not plan to pursue reinstatement. The Towns of Louisa and Mineral in Louisa County have not participated in NFIP, but are identified by this plan as very low flood-risk.

Except for the County of Louisa, all jurisdictions in the Thomas Jefferson region meet or exceed the minimum regulatory requirements by limiting the extent of development in identified floodplains. Participating in NFIP also makes localities and property owners within flood hazard areas eligible for various mitigation funds that are intended to reduce the risk of future flood losses. Several action items in

this plan take advantage of this opportunity for localities to reduce their overall exposure to flooding damage.

The following table is from the FEMA National Flood Insurance Program Community Status Book, as of May 2017:

Community	Flood Hazard Boundary Map Identified	Flood Insurance Rate Map Identified	Current Effective Map Date	Date Community Joined Program
Albemarle County	08/25/78	12/16/80	05/16/16	12/16/80
Charlottesville City	05/24/75	06/15/79	02/04/05	06/15/79
Fluvanna County	12/13/74	08/15/78	05/16/08	08/15/78
Greene County	12/13/74	09/10/84	01/05/07	09/10/84
Louisa County	12/20/74	06/01/89	11/5/97	Suspended – 10/31/16
Nelson County	11/22/74	08/01/78	06/18/10	08/01/78
Scottsville, Town Of	09/10/76	09/05/79	05/16/16	09/05/79
Stanardsville, Town Of	02/11/77	12/26/78	NSFHA*	12/26/78

* No special flood hazard area.

Louisa County became aware that FEMA and the Virginia Department of Conservation and Recreation (DCR) required updates to the County's regulations relating to development in the Floodplain Overlay District in order to ensure continued participation in National Flood Insurance Program (NFIP) in late 2014. At the December 1, 2014 regular meeting of the Board of Supervisors (BOS), the BOS referred updates to the regulations to the Planning Commission. The resolution noted that the FEMA Flood Insurance Rate Maps for Louisa County had serious inaccuracies that should be remedied.

FEMA notified the County by letter dated February 23, 2016 that it could cut off residents' access to flood insurance and some disaster aid if the County did not strengthen its flood plain ordinance. The County's current ordinance noted that homes could not be built in a floodplain, but did not have the same restriction for commercial construction. The BOS discussed the Floodplain (FP) Zoning Overlay District at their meeting held Monday, June 6, 2016. Discussion noted that the Planning Commission discussed the draft floodplain ordinance at its February 12, 2015 meeting, but deferred the issue to the Board. FEMA directed the County to update and adopt an amended ordinance by August 31, 2016 in order to remain in good-standing in the NFIP. The June 6 discussion included questions and comments to the Board regarding the inaccuracy of the federal agency maps of Louisa County. The BOS directed staff to work closely with FEMA and DCR on making the recommended changes. FEMA published Louisa County's suspension of community eligibility in the Federal Register on September 29, 2016, effective October 31, 2016.

The Louisa County BOS held a public hearing at their October 3, 2016 meeting on repealing the Floodplain Overlay District. Forty-two people spoke in opposition of the amendments to the floodplain regulations ordinance. One person submitted written comments in favor of the amendments to the floorplan regulations notice. The BOS, on a vote of 5 to 2, voted to revoke the current floodplain ordinance in its entirety. Landowners in Louisa who were opposed to FEMA's proposed ordinance said it threatened their rights to use their property.

The Louisa BOS held a Special Public Meeting and Hearing on October 26, 2016 to accept public comment related to the adoption of a floodplain ordinance. The proposed ordinance defined the floodplain on a map prepared by the County, expressly excluded certain land that comprises or adjoins Blue Ridge Shores and Lake Anna, and provided for the appeal of any determination related to the location of land in a floodplain to the BOS and/or to the circuit court. The BOS unanimously passed the proposed ordinance, but it did not meet FEMA's requirements. The County has indicated it does not intend to pursue reinstatement in the NFIP, primarily based on input from citizens. FEMA is updating the flood plain maps. Citizens are now aware that they cannot obtain flood insurance is the County is not included in the NFIP. A letter to the editor calling for the Board of Supervisors to revisit participation in the NFIP appeared in **The Central Virginia** on January 18, 2018.

TJPDC hosted a Floodplain Management Workshop on December 12. 2017, inviting locality staff to attend. Staff from the Department of Conservation and Recreation (DCR) provided the training. The event included the following topics: Benefits of the National Flood Insurance Program, Floodplain Ordinances, Permitting Requirements, How to use Flood Hazard Data & Maps, Community Rating System, DCR Floodplain Program Updates, and Virginia Flood Risk Information System (VFRIS).

Winter Storms | Moderate Risk

Winter storms are common in the region. The primary impacts are felt in infrastructure, both in the safety of the roadways, the disruption of business operations, and loss of power. Impedance of access is another important impact of storms. Snow can make emergency response and travel to critical services difficult, especially for vulnerable populations in rural areas. Finally, extreme cold can be harmful to vulnerable populations.

Several actions items are intended to prevent the loss of power during a snowstorm. The plan recommends for localities to partner with power companies to make sure that trees or other obstacles do not pose a threat to power lines. In some cases, the burial of utilities is recommended for urban areas. Other action items are intended to maintain the emergency response function during a power outage. It is important for localities to have multiple means for communication, and not to be overly reliant on devices that require power. Back-up generators are recommended for all shelters, as well as for businesses that are critical to the community such as grocery stores. Other action items are intended to assist in locating vulnerable households that may require assistance in heating or other attention during a power outage.

Another mitigation strategy is to limit the impact on transportation infrastructure during storms. Snow removal on public roads is conducted by VDOT in all localities except for the City of Charlottesville, but there are several private communities and individual driveways that rely on other means for snow removal. All localities also include an action item to encourage address signs that are visible during winter storms.

Mitigation Actions

Mitigation actions are discrete projects, programs, or policies that are recommended for implementation in this plan. The action items differ from objectives in that they are measurable, have a party responsible for completion, and typically can be completed within a given timeframe. The action items presented in this

plan represent the aspirations of the various localities in the region, with the understanding that they may be completed as resources are made available from a variety of sources. Mitigation actions are to be implemented by the lead party, as identified in the plan, often in partnership with other agencies and organizations.

Several action items, particularly those involving the creation or revision of policy, will enhance resilience to hazards for development that occurs after implementation. Other action items are intended to retroactively improve existing structures and infrastructure to mitigation hazards. In many cases ongoing maintenance, such as clearing debris to prevent forest fires, or practices of household and business preparedness are recommended. The list of action items strikes a balance between structural, policy-oriented, and programmatic recommendations.

TJPDC staff compiled input from the Working Group into a listing of potential actions organized under each goal and objective. The list was provided to each jurisdiction, and used in discussions with Local Emergency Plan Committees (LEPCs) and at Working Group meetings. Each action item in the plan is prioritized as high, moderate, or low to reflect the mitigation value of the action or the urgency it requires. Priorities were determined based on several criteria. Items that were included in the 2012 plan generally maintain the same priority. The online survey asked respondents to prioritize goals and objectives, and this information has been used to prioritize the associated action items. Locality staff considered the severity and urgency of the issue to be addressed, the locality's capacity to complete the action, and the benefit to be realized compared to the estimated cost of completion. A broad range of benefits were considered; some actions provide benefits beyond mitigating the impacts of hazards. The table in the appendices identifies 2012 actions removed or revised as to their priority.

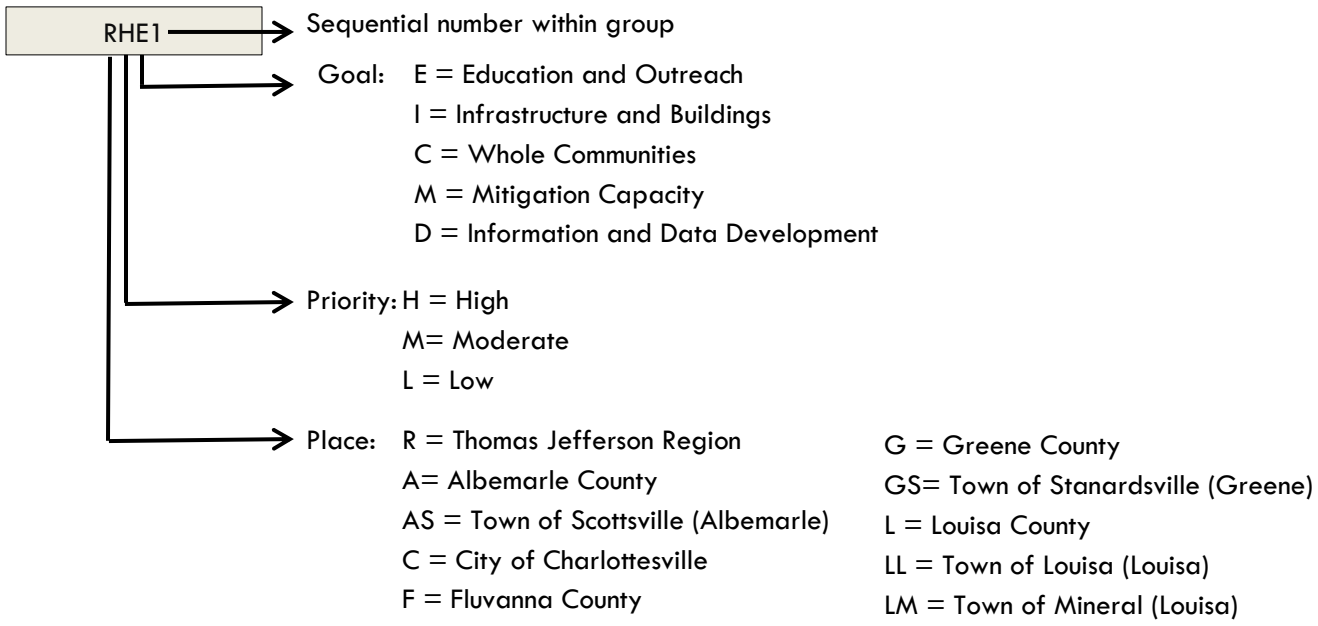
Actions to include the Hazard Mitigation Plan into other community plans have been included in the 2006 plan, the 2012 plan and this plan. Community plans would generally include the Comprehensive Plan, the Emergency Operations Plan and the Capital Improvement Plan. The Hazard Mitigation Plan is specifically cited in the Comprehensive Plans for Charlottesville, Albemarle, Fluvanna and Greene Counties. The City of Charlottesville is currently updating its Comprehensive Plan for adoption in 2018. There is no specific reference to the Hazard Mitigation Plan in Comprehensive Plans for Louisa County (last amended in 2016) or Nelson County (last updated in 2014). Towns are addressed in their respective County Comprehensive Plans and all towns in the Planning district have their own Comprehensive Plans, focusing on land use and Town goals and objectives. None of the Town plans specifically reference the Hazard Mitigation Plan. Capital Improvement Plans (CIPs) are generally reviewed and updated on an annual basis. The integration of the HMP requirements into other planning mechanisms will be specifically addressed in annual meetings to maintain the plan to ensure that this requirement is addressed by the localities.

Process Discussion

The action items are presented here in both in an abridged and unabridged form to facilitate ease of use. Each item is color-coded by locality and numbered sequentially with higher priority action items appearing earlier on the list. The Mitigation Action Worksheet template follows:

[Activity Code] Mitigation Action: [Jurisdiction]	
Category:	One of the goal categories listed above that is supported by the action
Action Item (Describe):	Brief description of action item
Hazard (s):	The hazard(s) the action is intended to mitigate
Lead Agency/Department Responsible:	Identify the local agency, department, or organization that is best suited to accomplish the action.
Estimated Cost:	An estimate of the costs required to complete the project or continue the project for the course of 5-years; this amount should be estimated until a final dollar amount can be determined.
Funding Method: (General Revenue, Contingency/Bonds, External Sources, etc.)	Potential sources of funds to complete the action, when applicable
Implementation Schedule:	Timeframe for which the action is expected to be completed
Priority	Placement in the order of importance and urgency

Activity Code Key



2018 Action Items for Regional Hazard Mitigation Plan

Activity Code	Activity Description
Thomas Jefferson Region	
RHE1	Provide a copy of the Regional Hazard Mitigation Plan to each library in the Jefferson-Madison Regional Library system
RME1	Conduct a public education program on disaster preparedness, leveraging existing materials and sharing resources regionally
RMD1	Identify locations for deposit of debris after a hazard
Albemarle County	
AHE1	Develop a Comprehensive fire safety communications/education strategy, addressing open space protection, the burn permit process, and "Ready, Set, Go Program" (Fire Wise workshops), and residential and business preparedness
AHE2	Increase the number of trained emergency responders, both staff and volunteers
AHI1	Implement recommendations from the Community Water Supply Plan, including water demand management/conservation and drought monitoring and management
AHI2	Develop an integrated regional security and monitoring system, including access control and intrusion detection
AHM1	Incorporate this Regional Hazard Mitigation Plan into local comprehensive plans and Emergency Operations Plans
AHM2	Install fire mitigation measures, including dry hydrants, fire breaks, and fire rings.
AHD1	Continue to assess resistance of existing critical facilities to natural hazards
AHD2	Mitigate Water and Wastewater System Failure or Contamination through community coordination and information/equipment sharing. Provide planning support for operational and integrated security management (including communications plan and continuity plan, emergency exercises, coordinated committee)
AHC1	Continue and expand the use of citizen alert systems
AME1	Ensure that all schools have regular disaster response drills
AME2	Continue to pursue conservation practices in sensitive areas, including flood-prone areas.
AMI1	Build or repair bridges so as not to impede floodways
AMI2	Upgrade bridges to support emergency vehicles
AMI3	Carry out physical security improvements to water and wastewater systems, which may include fencing, door hardening, window hardening, locks, bollards, cameras, signage, lighting, access control and intrusion detection.
AMI4	Procure technology equipment for Water/Wastewater system component inspections.
AMM1	Implement recommendations from Drought Management Plan
AMM2	Through the development process, discourage or disallow development in flood-prone areas
AMM3	Provide planning support for water and wastewater systems operational and integrated security management
AMM4	Seek financial support for an integrated regional cameral and monitoring system, including research, planning, procurement, implementation, management and maintenance.
AMD1	Expand GIS data for use in mitigation planning, preparedness planning, and response activities

ALE1	Encourage property owners and residents to clear creek beds, storm drain inlets, ditches and channels, and to remove debris where flooding has increased.
ALE2	Ensure all houses and businesses have clear address signs that are visible during snowstorms and other emergencies
ALE3	Continue educational campaign about the benefits of open space and sensitive area protection.
ALC1	Increase the capacity to shelter in place in public buildings.
ALI1	Improve the maintenance of stormwater conveyance system.
ALI2	Implement Stormwater Management Plan to reduce floodwater and pollution discharge via stormwater systems.
ALI3	Maintain and Retrofit stormwater management basins/facilities including dam maintenance and upgrades
ALI4	Partner with utility companies to keep power lines free of vegetation
ALI5	Reduce pollution discharge via stormwater systems

Town of Scottsville	
ASMM1	Ensure all houses and businesses have clear address signs that are visible during snowstorms and other emergencies
ASMM2	Enforce removal of debris from the bank of the James River on a periodic basis, to comply with flood zone ordinance
ASLM1	Install a camera to gauge the level of the creek at the pump station.
ASLM2	Incorporate hazard mitigation plan into community plans

City of Charlottesville	
CHE1	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
CHE2	Ensure that all schools have regular disaster response drills.
CHI1	Implement recommendations from the Community Water Supply Plan.
CHI2	Develop an integrated regional security and monitoring system, including access control and intrusion detection
CHM1	Incorporate hazard mitigation plan into community plans.
CHM2	Conduct Community Emergency Response Team (CERT) classes to equip individuals and groups to assist in the event of a disaster.
CHM3	Provide incentives to institutions and homeowners for use of low-flow appliances.
CHM4	Continue to expand use of citizen alert system.
CHM5	Implement recommendations from Drought Management Plan.
CHM6	Ensure that all shelters and public buildings have a battery-powered emergency radio and flashlight.
CHD1	Mitigate Water and Wastewater System Failure or Contamination through community coordination and information/equipment sharing. Provide planning support for operational and integrated security management (including communications plan and continuity plan, emergency exercises, coordinated committee)
CME1	Support purchase of rain barrels
CMI1	Build or repair bridges so as not to impede floodwaters
CMI2	Add signage to roads in locations that frequently flood.
CMI3	Retrofit emergency service buildings for hazard resistance.

CMI4	Carry out physical security improvements to water and wastewater systems, which may include fencing, door hardening, window hardening, locks, bollards, cameras, signage, lighting, access control and intrusion detection.
CMI5	Procure technology equipment for Water/Wastewater system component inspections.
CMM1	Support volunteer groups and encourage collaboration on public outreach and education programs on hazard mitigation.
CMM2	Create a strategy for using existing media outlets for communications during a hazard event.
CLE1	Provide citizens with literature about flood and drought-smart landscaping.
CLE2	Create educational campaign about the benefits of open space and sensitive area protection.
CLI1	Improve the maintenance of stormwater conveyance system.
CLI2	Reduce pollution discharge via stormwater systems.
CLI3	Retrofit stormwater management basins

Fluvanna County	
FHE1	Ensure all houses and businesses have clear address signs that are visible during snowstorms and other emergencies
FHE2	Carry out an educational campaign for businesses to develop emergency procedures and shelter-in-place plans
FHI1	Install warning signs and develop alternate routes for roads that flood briefly during heavy rains (e.g. Slaters Fork Road, Carysbrook, farm pond dam locations)
FHI2	Install new fire hydrants along new JRWA water line on east side of County
FHC1	Implement community notification protocols before, during, and after a disaster event
FHC2	Conduct regular disaster response drills in schools, and with staff at Assisted Living Facilities and Nursing Homes
FHC3	Continue and expand the use of citizen alert systems
FHM1	Develop a comprehensive fire safety communication strategy, addressing open space, burn permit, FireWise, and dry hydrants
FHM2	Adopt fire code
FHM3	Develop protocols and enforcement mechanisms for a burn ban
FHM4	Incorporate this Regional Hazard Mitigation Plan into local comprehensive plans and Emergency Operations Plans
FHD1	Develop a disaster plan for the Fork Union Sanitary District (FUSD)
FME1	Carry out a targeted educational campaign in subdivisions at high risk for fire impacts
FME2	Conduct tabletop exercises for damage assessments
FME3	Bring in experts to conduct in-house staff training in best management practices in hazard mitigation and preparedness
FME4	Offer training on post-event inspection and develop a protocol to serve as a mechanism for prioritization
FME5	Increase the number of trained emergency responders, both staff and volunteers
FME6	Conduct FireWise workshops
FME7	Provide educational information about burn laws permit process
FMI1	Identify vulnerable structures and apply for funding to implement acquisition and demolition, relocation, floodproofing, or structural retrofit projects
FMI2	Demolish and Remove remains of old surface water treatment plant located on TM 58 A 26 & 27(County-owned property)

FMI3	Remove +/-20,000 gallon water storage tank from James River.
FMC1	Continue campaigns like "Five-Dog Nights" in the county to distribute emergency kits/supplies to low-income and vulnerable populations
FMC2	Develop protocols and applications to communicate with individuals and households about emergency planning and shelter information (utilize Meals on Wheels lists and/or welfare check lists)
FMM1	Identify areas to receive debris from post-event clean-up efforts
FMM2	Develop evacuation plans for dam breaches from Charlottesville-area dams
FMD1	Expand GIS data for us in mitigation planning, preparedness planning, and response activities
FLE1	Promote CERT training opportunities available in the region to equip individuals and groups to assist in the event of a disaster
FLE2	Cross-train current volunteers across other County functional areas
FLI1	Identify repetitive loss properties, develop appropriate mitigation action, and apply for funding
FLC1	Develop County agreements (possibly with women's prison) for food services for county-supported shelters (including high school and Lake Monticello clubhouse)
FLM1	Develop Continuity of Operations Plans (COOP) for locality departments and update the plans annually
FLM2	Develop county-wide evacuation plans for catastrophic incidents

Greene County	
GHI1	Partner with utility companies to keep power lines free of vegetation
GHI2	Conduct structural evaluations of current and proposed shelters
GHI3	Install backup generators in shelters and critical facilities
GHI4	Enhance public safety emergency communications to provide reliable, dependable coverage
GHI5	Enhance access to broadband county-wide
GHC1	Assist the schools with regular disaster response drills and disaster planning
GHM1	Continue and expand use of citizen alert systems
GHM2	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant buildings
GHM3	Ensure all critical facilities have updated shelter-in-place plans
GHM4	Update driveway codes to allow access for emergency vehicles
GHM5	Routinely inspect fire hydrants
GHM6	Update local stormwater ordinances to be in compliance with statewide regulations
GHM7	Increase number of trained emergency responders
GHM8	Ensure that all shelters and public buildings have a battery-powered emergency radio and flashlight
GME1	Develop cooperative agreements between all agencies involved in emergency management, provide methods of communication between agencies responsible for being present at the Emergency Operations Center following a disaster, and conduct joint exercises
GME2	Conduct FireWise workshops (in conjunction with the Virginia Department of Forestry)
GMI1	Add signage to roads in locations that frequently flood

GMM1	Incorporate hazard mitigation plan into other applicable community plans
GMM2	Conduct Community Emergency Response Team (CERT) classes to equip individuals and citizens to assist one another in the event of a disaster
GMM3	Investigate safety and maintenance of roads in private communities
GMM4	Develop and implement a Drought Management Plan
GMD1	Standardize GIS data for use in mitigation planning
GMD2	Conduct channel improvement study
GMD3	Create a needs survey that identifies special needs population and residences and/or facilities needing attention in the event of emergencies or evacuations
GMD4	Ensure evacuation routes are upgraded to proper standards
GLE1	Develop an all-hazard resource center
GLI1	Retrofit emergency services buildings for hazard resistance
GLI2	Build and repair bridges so as not to impede floodwaters
GLI3	Ensure culverts, streams, channels, storm drains, and gutters remain clear of debris
GLI4	Install more dry hydrants in high wildfire risk areas
GLC1	Update the Greene County Emergency Operations Plan
GLM1	Adopt more stringent policy to discourage floodplain development
GLM2	Provide paid fire and rescue staff
GLM3	Ensure all structures have clear address signs that are visible during snowstorms

Town of Stanardsville	
GSHM1	Increase water capacity and pressure for the Town of Stanardsville to enable optimal emergency response
GSMC1	Partner with Greene County to provide a mobile pet shelter for use during hazard events
GSMM1	Ensure all houses have clear address signs that are visible during snowstorms
GSLM1	Incorporate hazard mitigation plan into community plans

Louisa County	
LHI1	Enhance access to broadband internet in rural areas
LHI2	Install backup generators in shelters and critical facilities
LHI3	Implement recommendations from Water Supply Plan
LHC1	Ensure that all schools have regular disaster response drills
LHM1	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
LHM2	Continue and expand use of citizen alert systems countywide, including within Towns
LHM3	Increase number of trained emergency responders
LHM4	Develop driveway codes to allow emergency vehicle access
LMI1	Put high water marks on bridges
LMM1	Investigate safety and maintenance of roads in private communities
LMM2	Investigate, plan and implement repairs and/or upgrades to Bowlers Mill dam to preserve flood control benefits for the historic Green Springs area.

LMM2	Conduct Community Emergency Response Team (CERT) classes to equip individuals and groups to assist in the event of a disaster
LMM3	Ensure all houses have clear address signs that are visible during snowstorms
LMM4	Incorporate hazard mitigation plans into community plans
LMM5	Incorporate special needs populations into Hazard Mitigation and Emergency Operations Plans
LLE1	Provide more education about the burn permit process
LLE2	Create an educational program to help residents understand the benefits and costs of earthquake insurance
LLI2	Add signage to roads in locations that frequently flood
LLD1	Track and map space available for pets at local SPCA and other animal shelters

Town of Louisa	
LLHM1	Incorporate hazard mitigation plans into community plans
LLMM1	Ensure all houses have clear address signs that are visible during snowstorms

Town of Mineral	
LMHM1	Incorporate hazard mitigation plans into community plans
LMMM1	Ensure all houses have clear address signs that are visible during snowstorms
LMMM2	Work with the Louisa County to designate a representative for the County's Emergency Operations Committee
LMMM3	Develop a system for alerts and other communication with citizens
LMMI1	Mark the fire hydrants with reflective markers for large snow storms
LMMI2	Install emergency generator for wells
LMLI1	Bury utilities underground in town of Mineral

Nelson County	
NHI1	Install backup generators in shelters and critical facilities
NHM1	Continue and expand use of citizen alert systems
NHM2	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
NME1	Conduct Firewise Workshops
NME2	Provide educational instruction and materials to school age youth and their teachers on proper procedures for responding to natural disasters
NMI1	Investigate safety and maintenance of roads in private communities
NMM1	Ensure all houses have clear address signs that are visible during snowstorms
NLE1	Ensure that all homeowners and businesses located in areas prone to landslides are aware of the risks and appropriate responses to an event
NLI2	Maintain and add more fire rings in camping areas for controlled fires

2018 Detailed Action Items

[Activity Code] Mitigation Action: [Jurisdiction]	
Goal:	One of the goal categories listed above that is supported by the action
Action Item Description:	Brief description of action item
Hazard (s):	The hazard(s) the action is intended to mitigate
Lead Party:	Identify the local agency, department, or organization that is best suited to accomplish the action
Estimated Cost:	An estimate of the costs required to complete the project or continue the project for the course of 5 years; this amount should be estimated until a final dollar amount can be determined
Funding Method:	Potential sources of funds to complete the action, when applicable
Implementation Schedule:	Timeframe for which the action is expected to be completed
Priority	Placement in the order of importance and urgency

RHE1 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Provide a copy of the Regional Hazard Mitigation Plan to each library in the Jefferson-Madison Regional Library system
Hazard (s):	Multiple
Lead Party Responsible:	TJPDC
Estimated Cost:	Minimal
Funding Method:	Regional Hazard Mitigation Planning Funds
Implementation Schedule:	6 months
Priority:	High

RME1 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Conduct a public education program on disaster preparedness, leveraging existing materials and sharing resources regionally
Hazard (s):	Multiple
Lead Party Responsible:	Local Emergency Management Departments
Estimated Cost:	Unknown
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	Moderate

RMD1 Mitigation Action: Thomas Jefferson Region	
Goal:	Information and Data Development
Action Item Description:	Identify locations for deposit of debris after a hazard
Hazard (s):	Multiple
Lead Party Responsible:	VDEM, UVa
Estimated Cost:	$5,000
Funding Method:	General funds
Implementation Schedule:	1-3 Years
Priority:	Moderate

AHE1 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Develop a Comprehensive fire safety communications/education strategy, addressing open space protection, the burn permit process, and "Ready, Set, Go Program" (Fire Wise workshops), and residential and business preparedness
Hazard (s):	Multiple
Lead Party Responsible:	Fire Rescue Dept., Dept. of Community Development
Estimated Cost:	$10,000
Funding Method:	Hazard Mitigation Grant Program, General Revenue/Dept funding
Implementation Schedule:	Ongoing/new initiatives 1-3 years
Priority:	High

AHE2 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Increase the number of trained emergency responders, both staff and volunteers
Hazard (s):	Multiple
Lead Party Responsible:	Community Development Dept., Police Dept., Fire Rescue Dept., Emergency Communications Center/Charlottesville-Albemarle-UVA Emergency Mgt. Coordinator
Estimated Cost:	unknown
Funding Method:	N/A
Implementation Schedule:	1-3 years
Priority:	High

AHI1 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Implement recommendations from the Community Water Supply Plan, including water demand management/conservation and drought monitoring and management
Hazard (s):	Drought, Flood, adequate potable water
Lead Party Responsible:	RWSA, Dept. of Community Development, other County agencies
Estimated Cost:	Variable
Funding Method:	RWSA, flood control and dam safety programs/funds
Implementation Schedule:	3-5 years
Priority:	High

AHI2 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Develop an integrated regional security and monitoring system, including access control and intrusion detection
Hazard (s):	Multiple (including outsider physical threat and terrorism)
Lead Party Responsible:	Albemarle County Service Authority, RWSA, Security lead for County
Estimated Cost:	$4 Million
Funding Method:	Hazard Mitigation Grant Program, Utility Revenue, General Revenue
Implementation Schedule:	1-3 years
Priority:	High

AHM1 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate this Regional Hazard Mitigation Plan into local comprehensive plans and Emergency Operations Plans
Hazard (s):	Multiple
Lead Party Responsible:	Community Development Dept., Thomas Jefferson Planning District Comm.
Estimated Cost:	None (other than staff costs)
Funding Method:	County operational budget (for staff time)
Implementation Schedule:	3-5 years
Priority:	moderate

AHM2 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Install fire mitigation measures, including dry hydrants, fire breaks, and fire rings.
Hazard (s):	Wildfire
Lead Party Responsible:	Fire Rescue Dept., Community Development Dept., Building Official, Dept. of Forestry
Estimated Cost:	Unknown; based on need
Funding Method:	Grant programs (Va. dry hydrant grant program)
Implementation Schedule:	Ongoing
Priority:	High

AHD1 Mitigation Action: Albemarle County	
Goal:	Information and Data Development
Action Item Description:	Continue to assess new and existing critical facilities for resistance to/preparedness for natural hazards
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator; Dept. of Facilities and Envron. Services, Community Development Dept.
Estimated Cost:	Varies
Funding Method:	General Revenue; possible grant sources
Implementation Schedule:	Ongoing
Priority:	High

AHD2 Mitigation Action: Albemarle County	
Goal:	Information and Data Development
Action Item Description:	Mitigate Water and Wastewater System Failure or Contamination through community coordination and information/equipment sharing. Provide planning support for operational and integrated security management (including communications plan and continuity plan, emergency exercises, coordinated committee)
Hazard (s):	All
Lead Party Responsible:	Albemarle County Service Authority and RWSA
Estimated Cost:	$500,000
Funding Method:	Hazard Mitigation Grant Program, Utility Revenue
Implementation Schedule:	1-2 years
Priority:	High

AHC1 Mitigation Action: Albemarle County	
Goal:	Whole Community
Action Item Description:	Continue to expand use of citizen alert system.
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$5,000
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	High

AME1 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Ensure that all schools have regular disaster response drills
Hazard (s):	Multiple
Lead Party Responsible:	Dept. of Schools and Education; independent private school
Estimated Cost:	N/A
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

AME2 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Continue to pursue conservation practices in sensitive areas, including flood-prone areas.
Hazard (s):	Multiple
Lead Party Responsible:	Virginia Outdoors Foundation, Nature Conservancy, Thomas Jefferson Soil and Water Conservation District, Albemarle Co Public Recreational Facilities Authority, Albemarle Co Gov't, Community Development Dept.
Estimated Cost:	Based on individual property assessments and/or practices implemented
Funding Method:	Various
Implementation Schedule:	Ongoing
Priority:	Moderate

AMI1 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Build or repair bridges and culverts so as not to impede floodways
Hazard (s):	Flood
Lead Party Responsible:	Virginia Dept. of Transportation
Estimated Cost:	Unknown-based on individual projects
Funding Method:	State transportation funding; federal bridge funds/highway funds, Hazard Mitigation Grant Program, 406 Public Assistance Program (after disaster), private foundation funding
Implementation Schedule:	Ongoing (as bridges and culverts are maintained, repaired, replaced or newly built)
Priority:	Moderate

AMI2 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Upgrade bridges to support emergency vehicles
Hazard (s):	Multiple
Lead Party Responsible:	VDOT, Railroads
Estimated Cost:	Unknown-based on individual projects
Funding Method:	State transportation funding; federal bridge funds/highway funds, Hazard Mitigation Grant Program, 406 Public Assistance Program (after disaster)
Implementation Schedule:	Ongoing (as bridges are maintained, repaired, replaced or newly built
Priority:	Moderate

AMI3 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Carry out physical security improvements to water & wastewater systems, which may include fencing, door hardening, window hardening, locks, bollards, cameras, signage, lighting, access control and intrusion detection.
Hazard (s):	Multiple (including outsider physical threat)
Lead Party Responsible:	Albemarle County Service Authority & Rivanna Water and Sewer Authority
Estimated Cost:	$2 Million
Funding Method:	Hazard Mitigation Grant Program, Utility Revenue
Implementation Schedule:	1-3 years
Priority:	Moderate

AMI4 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Procure technology equipment for Water/Wastewater system component inspections.
Hazard (s):	Multiple (including natural disasters and contamination)
Lead Party Responsible:	Albemarle County Service Authority & Rivanna Water and Sewer Authority
Estimated Cost:	$100,000
Funding Method:	Hazard Mitigation Grant Program, Utility Revenue
Implementation Schedule:	1-2 years
Priority:	Moderate

AMI5 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Improve the maintenance of stormwater conveyance system: pipes, road culverts, discharge structures
Hazard (s):	Flood
Lead Party Responsible:	Facilities and Environmental Services Dept., VDOT
Estimated Cost:	Unknown
Funding Method:	EPA – Water Quality Cooperative Agreements, EPA-Nonpoint Source Grant Program, 406 Public Assistance (following a federally declared disaster), USDA-Watershed Protection and Flood Prevention Program, USDA-Environmental Quality Incentives Program, Stormwater Utility Fee, County funding (CIP); Hazard Mitigation Grant Program
Implementation Schedule:	Ongoing
Priority:	Moderate

AMM1 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Implement recommendations from Drought Management Plan
Hazard (s):	Drought
Lead Party Responsible:	RWSA
Estimated Cost:	Variable – linked to Water Supply projects
Funding Method:	RWSA
Implementation Schedule:	Ongoing
Priority:	Moderate

AMM2 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Through the development process, discourage or disallow development in flood-prone areas
Hazard (s):	Flood
Lead Party Responsible:	Community Development Dept.
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

AMM3 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Provide planning support for water and wastewater systems operational and integrated security management.
Hazard (s):	Multiple
Lead Party Responsible:	RWSA, ACSA, Community Development Dept.
Estimated Cost:	none
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

AMM4 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Seek financial support for an integrated regional camera and monitoring system, including research, planning, procurement, implementation, management and maintenance.
Hazard (s):	Multiple
Lead Party Responsible:	
Estimated Cost:	
Funding Method:	
Implementation Schedule:	
Priority:	Moderate

AMD1 Mitigation Action: Albemarle County	
Goal:	Information and Data Development
Action Item Description:	Expand GIS data for use in mitigation planning, preparedness planning, and response activities
Hazard (s):	Multiple
Lead Party Responsible:	Community Development Dept., TJPDC., Emergency Communications Center/Charlottesville-Albemarle-UVA Emergency Mgt. Coordinator
Estimated Cost:	$70,000
Funding Method:	General Revenue, Hazard Mitigation Grant Program, ESRI, Pre-Disaster Mitigation Grant, Dept. of Interior Geologic Mapping Program
Implementation Schedule:	2-5 years
Priority:	Moderate

ALE1 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Encourage property owners and residents to clear creek beds, storm drain inlets, ditches and channels, and to remove debris where flooding has increased.
Hazard (s):	Flood
Lead Party Responsible:	Facilities and Environmental Services Dept., Forestry Dept.
Estimated Cost:	Unknown, based on need
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	Low

ALE2 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Ensure all houses and businesses have clear address signs that are visible during snowstorms and other emergencies
Hazard (s):	Multiple
Lead Party Responsible:	Community Development Dept, Fire-Rescue Dept., County Executive's Office
Estimated Cost:	$4,000
Funding Method:	General Revenues
Implementation Schedule:	Ongoing
Priority:	Low

ALE3 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Continue educational campaign about the benefits of open space and sensitive area protection.
Hazard (s):	Multiple
Lead Party Responsible:	Virginia Outdoors Foundation, Nature Conservancy, Thomas Jefferson Soil and Water Conservation District, Albemarle Co Public Recreational Facilities Authority, Community Development Dept.
Estimated Cost:	Variable
Funding Method:	County funding, State funds for farmland and open space preservation (VDACS Farmland Preservation)
Implementation Schedule:	Ongoing
Priority:	Low

ALC1 Mitigation Action: Albemarle County	
Goal:	Whole Community
Action Item Description:	Increase the capacity to shelter in place in public buildings
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Communications Center/Charlottesville-Albemarle-UVA Emergency Mgt. Coordinator
Estimated Cost:	Unknown
Funding Method:	General Revenue, FEMA funds/grants
Implementation Schedule:	Ongoing
Priority:	Low

ALI1 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Implement Stormwater Management Plan to reduce floodwater and pollution discharge via stormwater systems.
Hazard (s):	Flood
Lead Party Responsible:	Facilities and Environmental Services Dept.
Estimated Cost:	Unknown, based on need
Funding Method:	EPA – Water Quality Cooperative Agreements, EPA-Nonpoint Source Grant Program, 406 Public Assistance (after a federally declared disaster), USDA-Watershed Protection and Flood Prevention Program, USDA-Environmental Quality Incentives Program, Stormwater Utility Fee, County funding (CIP)
Implementation Schedule:	Ongoing
Priority:	Low

ALI2 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Maintain and Retrofit stormwater management basins/facilities including dam maintenance and upgrades
Hazard (s):	Flood
Lead Party Responsible:	Facilities and Environmental Services Dept.
Estimated Cost:	Unknown, based on individual projects
Funding Method:	EPA – Water Quality Cooperative Agreements, EPA-Nonpoint Source Grant Program, 406 Public Assistance (after a federally declared disaster), USDA-Watershed Protection and Flood Prevention Program, USDA-Environmental Quality Incentives Program, Stormwater Utility Fee, County funding (CIP)
Implementation Schedule:	Ongoing
Priority:	Low

ALI3 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Partner with utility companies to keep power lines free of vegetation
Hazard (s):	Multiple
Lead Party Responsible:	County Executive's Office, Community Development
Estimated Cost:	Unknown
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Low

ALI4 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Reduce pollution discharge via stormwater systems
Hazard (s):	Flood, contamination
Lead Party Responsible:	Community Development Dept., Facilities and Environmental Services
Estimated Cost:	Unknown, based on need
Funding Method:	EPA – Water Quality Cooperative Agreements, EPA-Nonpoint Source Grant Program, 406 Public Assistance (following a federally declared disaster), USDA-Watershed Protection and Flood Prevention Program, USDA-Environmental Quality Incentives Program, Stormwater Utility Fee
Implementation Schedule:	Ongoing
Priority:	Low

ASMM1 Mitigation Action: Town of Scottsville	
Goal:	Mitigation Capacity
Action Item Description:	Ensure all houses and businesses have clear address signs that are visible during snowstorms and other emergencies
Hazard (s):	Winter Storms, Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

ASMM2 Mitigation Action: Town of Scottsville	
Goal:	Mitigation Capacity
Action Item Description:	Enforce removal of debris from the bank of the James River on a periodic basis, to comply with flood zone ordinance
Hazard (s):	Floods, Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	Staff and Council action only
Funding Method:	Unknown
Implementation Schedule:	1 year initially and then periodically as needed
Priority:	Moderate

ASLM1 Mitigation Action: Town of Scottsville	
Goal:	Mitigation Capacity
Action Item Description:	Install a camera to gauge the level of the creek at the pump station
Hazard (s):	Floods, Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	Unknown
Funding Method:	Unknown
Implementation Schedule:	3-5 years
Priority:	Low

ASLM2 Mitigation Action: Town of Scottsville	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate hazard mitigation plan into community plans
Hazard (s):	Multiple
Lead Party Responsible:	Town Planning Commission
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	1-5 years
Priority:	Low

CHE1 Mitigation Action: City of Charlottesville	
Goal:	Education and Outreach
Action Item Description:	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building.
Hazard (s):	Multiple
Lead Party Responsible:	Neighborhood Development Services, Public Works
Estimated Cost:	$10,000
Funding Method:	Hazard Mitigation Grant Program, General Revenue
Implementation Schedule:	1-3 years
Priority:	High

CHE2 Mitigation Action: City of Charlottesville	
Goal:	Education and Outreach
Action Item Description:	Ensure that all schools have regular disaster response drills.
Hazard (s):	Multiple
Lead Party Responsible:	Public School System, independent private schools
Estimated Cost:	N/A
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	High

CHI1 Mitigation Action: City of Charlottesville	
Goal:	Infrastructure and Buildings
Action Item Description:	Implement recommendations from the Community Water Supply Plan.
Hazard (s):	Drought, Flood
Lead Party Responsible:	RWSA
Estimated Cost:	$140,000,000
Funding Method:	RWSA, Flood control and dam safety program funds
Implementation Schedule:	Ongoing
Priority:	High

CHI2 Mitigation Action: City of Charlottesville	
Goal:	Infrastructure and Buildings
Action Item Description:	Develop an integrated regional security and monitoring system, including access control and intrusion detection
Hazard (s):	Multiple (including outsider physical threat and terrorism)
Lead Party Responsible:	City Utilities, RWSA, Security lead for City
Estimated Cost:	$4 Million
Funding Method:	Hazard Mitigation Grant Program, Utility Revenue, General Revenue
Implementation Schedule:	1-3 years
Priority:	High

CHM1 Mitigation Action: City of Charlottesville	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate hazard mitigation plan into community plans.
Hazard (s):	Multiple
Lead Party Responsible:	Neighborhood Development Services
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	3-5 years
Priority:	High

CHM2 Mitigation Action: City of Charlottesville	
Goal:	Mitigation Capacity
Action Item Description:	Conduct Community Emergency Response Team (CERT) classes to equip individuals and groups to assist in the event of a disaster.
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$10,000
Funding Method:	FEMA Community Emergency Response Teams, FEMA Emergency Management Performance Grant
Implementation Schedule:	Ongoing
Priority:	High

CHM3 Mitigation Action: City of Charlottesville	
Goal:	Mitigation Capacity
Action Item Description:	Provide incentives to institutions and homeowners for use of low-flow appliances.
Hazard (s):	Drought
Lead Party Responsible:	Neighborhood Development Services
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	High

CHM4 Mitigation Action: City of Charlottesville	
Goal:	Mitigation Capacity
Action Item Description:	Continue to expand use of citizen alert system.
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$5,000
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	High

CHM5 Mitigation Action: City of Charlottesville	
Goal:	Mitigation Capacity
Action Item Description:	Implement recommendations from Drought Management Plan.
Hazard (s):	Drought
Lead Party Responsible:	RWSA
Estimated Cost:	Linked to Water Supply Projects
Funding Method:	RWSA
Implementation Schedule:	Ongoing
Priority:	High

CHM6 Mitigation Action: City of Charlottesville	
Goal:	Mitigation Capacity
Action Item Description:	Ensure that all shelters and public buildings have a battery-powered emergency radio and flashlight.
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$40/location
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	High

CHD1 Mitigation Action: City of Charlottesville	
Goal:	Information and Data Development
Action Item Description:	Mitigate Water and Wastewater System Failure or Contamination through community coordination and information/equipment sharing. Provide planning support for operational and integrated security management (including communications plan and continuity plan, emergency exercises, coordinated committee)
Hazard (s):	All
Lead Party Responsible:	City Utilities and Rivanna Water and Sewer Authority (RWSA)
Estimated Cost:	$500,000
Funding Method:	Hazard Mitigation Grant Program, Utility Revenue
Implementation Schedule:	1-2 years
Priority:	High

CME1 Mitigation Action: City of Charlottesville	
Goal:	Education and Outreach
Action Item Description:	Support purchase of rain barrels.
Hazard (s):	Drought
Lead Party Responsible:	Public Works
Estimated Cost:	$10,000
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	Moderate

CMI1 Mitigation Action: City of Charlottesville	
Goal:	Infrastructure and Buildings
Action Item Description:	Build or repair bridges so as not to impede floodwaters
Hazard (s):	Flood
Lead Party Responsible:	VDOT
Estimated Cost:	Unknown
Funding Method:	Hazard Mitigation Grant Program, 406 Public Assistance Program
Implementation Schedule:	When bridges are repaired/replaced
Priority:	Moderate

CMI2 Mitigation Action: City of Charlottesville	
Goal:	Infrastructure and Buildings
Action Item Description:	Add signage to roads in locations that frequently flood.
Hazard (s):	Flood
Lead Party Responsible:	Virginia Department of Transportation, Public Works
Estimated Cost:	Unknown
Funding Method:	406 Public Assistance Program (following a disaster), Hurricane Local Grant Program, Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant
Implementation Schedule:	3-5 years
Priority:	Moderate

CMI3 Mitigation Action: City of Charlottesville	
Goal:	Infrastructure and Buildings
Action Item Description:	Retrofit emergency service buildings for hazard resistance.
Hazard (s):	Structural
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Unknown
Funding Method:	All hazards Emergency Operations Planning, Assistance to Local Firefighters Grant, Local Hurricane Grant Program, Pre-Disaster Mitigation Grant, Hazard Mitigation Grant Program
Implementation Schedule:	3-5 years
Priority:	Moderate

CMI4 Mitigation Action: City of Charlottesville	
Goal:	Infrastructure and Buildings
Action Item Description:	Carry out physical security improvements to water and wastewater systems, which may include fencing, door hardening, window hardening, locks, bollards, cameras, signage, lighting, access control and intrusion detection.
Hazard (s):	Multiple (including outsider physical threat)
Lead Party Responsible:	City Utilities and Rivanna Water and Sewer Authority (RWSA)
Estimated Cost:	$1 Million
Funding Method:	Hazard Mitigation Grant Program, Utility Revenue
Implementation Schedule:	1-3 years
Priority:	Moderate

CMI5 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Procure technology equipment for Water/Wastewater system component inspections.
Hazard (s):	Multiple (including natural disasters and contamination)
Lead Party Responsible:	City Utilities, RWSA, and UVA Facilities Management
Estimated Cost:	$50,000
Funding Method:	Hazard Mitigation Grant Program, Utility Revenue
Implementation Schedule:	1-3 years
Priority:	Moderate

CMM1 Mitigation Action: City of Charlottesville	
Goal:	Mitigation Capacity
Action Item Description:	Support volunteer groups and encourage collaboration on public outreach and education programs on hazard mitigation.
Hazard (s):	Multiple
Lead Party Responsible:	All City Departments, Emergency Services Coordinator
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

CMM2 Mitigation Action: City of Charlottesville	
Goal:	Mitigation Capacity
Action Item Description:	Create a strategy for using existing media outlets for communications during a hazard event.
Hazard (s):	Flood
Lead Party Responsible:	Office of Communications
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

CLE1 Mitigation Action: City of Charlottesville	
Goal:	Education and Outreach
Action Item Description:	Provide citizens with literature about flood and drought-smart landscaping.
Hazard (s):	Drought
Lead Party Responsible:	Neighborhood Development Services, Public Works
Estimated Cost:	$5,000
Funding Method:	Pre-Disaster Mitigation Grant, Hazard Mitigation Grant Program
Implementation Schedule:	3-5 years
Priority:	Low

CLE2 Mitigation Action: City of Charlottesville	
Goal:	Education and Outreach
Action Item Description:	Create educational campaign about the benefits of open space and sensitive area protection.
Hazard (s):	Multiple
Lead Party Responsible:	Neighborhood Development Services
Estimated Cost:	$2,000
Funding Method:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant
Implementation Schedule:	Ongoing
Priority:	Low

CLI1 Mitigation Action: City of Charlottesville	
Goal:	Infrastructure and Buildings
Action Item Description:	Improve the maintenance of stormwater conveyance system.
Hazard (s):	Flood
Lead Party Responsible:	Public Works
Estimated Cost:	Unknown
Funding Method:	Environmental Protection Agency – Water Quality Cooperative Agreements, EPA-Nonpoint Source Grant Program, 406 Public Assistance (following a federally declared disaster), USDA-Watershed Protection and Flood Prevention Program, USDA-Environmental Quality Incentives Program, Stormwater Utility Fee
Implementation Schedule:	Ongoing
Priority:	Low

CLI2 Mitigation Action: City of Charlottesville	
Goal:	Infrastructure and Buildings
Action Item Description:	Reduce pollution discharge via stormwater systems.
Hazard (s):	Flood
Lead Party Responsible:	Public Works
Estimated Cost:	Unknown, based on need
Funding Method:	Environmental Protection Agency – Water Quality Cooperative Agreements, EPA-Nonpoint Source Grant Program, 406 Public Assistance (following a federally declared disaster), USDA-Watershed Protection and Flood Prevention Program, USDA-Environmental Quality Incentives Program, Stormwater Utility Fee
Implementation Schedule:	Ongoing
Priority:	Low

CLI3 Mitigation Action: City of Charlottesville	
Goal:	Infrastructure and Buildings
Action Item Description:	Retrofit stormwater management basins
Hazard (s):	Flood
Lead Party Responsible:	Public Works
Estimated Cost:	Unknown, based on individual projects
Funding Method:	EPA – Water Quality Cooperative Agreements, EPA-Nonpoint Source Grant Program, 406 Public Assistance (after a federally declared disaster), USDA-Watershed Protection and Flood Prevention Program, USDA-Environmental Quality Incentives Program, Stormwater Utility Fee
Implementation Schedule:	Ongoing
Priority:	Low

FHE1 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Ensure all houses and businesses have clear address signs that are visible during snowstorms and other emergencies
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$250,000
Funding Method:	Grants and/or CIP
Implementation Schedule:	1-3 years
Priority:	High

FHE2 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Carry out an educational campaign for businesses to develop emergency procedures and shelter-in-place plans
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	High

FHI1 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Install warning signs and develop alternate routes for roads that flood briefly during heavy rains (e.g. Slaters Fork Road, Carysbrook, farm pond dam locations)
Hazard (s):	Multiple
Lead Party Responsible:	Public Works
Estimated Cost:	$5,000
Funding Method:	Grants
Implementation Schedule:	1-3 years
Priority:	High

FHI2 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Install new fire hydrants along new JRWA water line on east side of County
Hazard (s):	Multiple
Lead Party Responsible:	Public Works
Estimated Cost:	$200,000
Funding Method:	Grants, Fund balance
Implementation Schedule:	1-3 years
Priority:	High

FHC1 Mitigation Action: Fluvanna County	
Goal:	Whole Community
Action Item Description:	Implement community notification protocols before, during, and after a disaster event
Hazard (s):	Multiple
Lead Party Responsible:	Public Safety
Estimated Cost:	
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	High

FHC2 Mitigation Action: Fluvanna County	
Goal:	Whole Community
Action Item Description:	Conduct regular disaster response drills in schools, and with staff at Assisted Living Facilities and Nursing Homes
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator, Schools
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	High

FHC3 Mitigation Action: Fluvanna County	
Goal:	Whole Community
Action Item Description:	Continue and expand the use of citizen alert systems
Hazard (s):	Multiple
Lead Party Responsible:	Public Safety
Estimated Cost:	$10,000
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	High

FHM1 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Develop a comprehensive fire safety communication strategy, addressing open space, burn permit, FireWise, and dry hydrants
Hazard (s):	Multiple
Lead Party Responsible:	Fire & Rescue Association, Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	High

FHM2 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Adopt fire code
Hazard (s):	Multiple
Lead Party Responsible:	Fire & Rescue Association, Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	High

FHM3 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Develop protocols and enforcement mechanisms for a burn ban
Hazard (s):	Multiple
Lead Party Responsible:	Fire & Rescue Association, Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	High

FHM4 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate this Regional Hazard Mitigation Plan into local comprehensive plans and Emergency Operations Plans
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator, Planning Department
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	High

FHD1 Mitigation Action: Fluvanna County	
Goal:	Information and Data Development
Action Item Description:	Develop a disaster plan for the Fork Union Sanitary District (FUSD)
Hazard (s):	Multiple
Lead Party Responsible:	FUSD, Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	High

FME1 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Carry out a targeted educational campaign in subdivisions at high risk for fire impacts
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator and Fire-Rescue Association
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	Moderate

FME2 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Conduct tabletop exercises for damage assessments
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator; Public Works; Building Inspections
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	Moderate

FME3 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Bring in experts to conduct in-house staff training in best management practices in hazard mitigation and preparedness
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator, Public Works, Building Inspections
Estimated Cost:	$5,000
Funding Method:	grants
Implementation Schedule:	1-3 years
Priority:	Moderate

FME4 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Offer training on post-event inspection and develop a protocol to serve as a mechanism for prioritization
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator; Public Works; Building Inspections
Estimated Cost:	
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	Moderate

FME5 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Increase the number of trained emergency responders, both staff and volunteers
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$3,000
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	Moderate

FME6 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Conduct FireWise workshops
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator and Fire-Rescue Association
Estimated Cost:	Staff time and supplies
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	Moderate

FME7 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Provide educational information about burn laws permit process
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator and Fire-Rescue Association
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	Moderate

FMI1 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Identify vulnerable structures and apply for funding to implement acquisition and demolition, relocation, floodproofing, or structural retrofit projects
Hazard (s):	Multiple
Lead Party Responsible:	Building Inspections, Emergency Services Coordinator
Estimated Cost:	
Funding Method:	
Implementation Schedule:	3-5 years
Priority:	Moderate

FMI2 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Demolish and remove remains of old surface water-treatment plant located on TM 58 A 26 & 27(County-owned property)
Hazard (s):	Multiple, but primarily: 1) Property is in flood plain – materials, including a +/- 20,000 gallon water storage tank, could be washed downstream by flood waters. 2) Attractive nuisance.
Lead Party Responsible:	Public Works, FUSD, Building Inspections, Emergency Services Coordinator
Estimated Cost:	$25,000 (SWAG)
Funding Method:	Unknown
Implementation Schedule:	1-3 years
Priority:	Moderate

FMI3 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Remove +/-20,000 gallon water storage tank from James River.
Hazard (s):	Multiple, but primarily flooding: 1) Future floods could dislodge it from its current resting place and wash it further down stream. 2) Attractive nuisance.
Lead Party Responsible:	Public Works, FUSD, Building Inspections, Emergency Services Coordinator
Estimated Cost:	$50,000 (SWAG)
Funding Method:	Unknown
Implementation Schedule:	1-3 years
Priority:	Moderate

FMC1 Mitigation Action: Fluvanna County	
Goal:	Whole Community
Action Item Description:	Continue campaigns like “Five-Dog Nights” in the county to distribute emergency kits/supplies to low-income and vulnerable populations
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$3,000
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	Moderate

FMC2 Mitigation Action: Fluvanna County	
Goal:	Whole Community
Action Item Description:	Develop County agreements (possibly with women's prison) for food services for county-supported shelters (including high school and Lake Monticello clubhouse)
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	Low

FMM1 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Identify areas to receive debris from post-event clean-up efforts
Hazard (s):	Multiple
Lead Party Responsible:	Public Works
Estimated Cost:	
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	Moderate

FMM2 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Develop evacuation plans for dam breaches from Charlottesville-area dams
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	Moderate

FMD1 Mitigation Action: Fluvanna County	
Goal:	Information and Data Development
Action Item Description:	Expand GIS data for use in mitigation planning, preparedness planning, and response activities
Hazard (s):	Multiple
Lead Party Responsible:	Planning Administrator
Estimated Cost:	
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	Moderate

FLE1 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Promote CERT training opportunities available in the region to equip individuals and groups to assist in the event of a disaster
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$1,000
Funding Method:	Grants and/or General Fund
Implementation Schedule:	1-3 years
Priority:	Low

FLE2 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Cross-train current volunteers across other County functional areas
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Staff time and supplies
Funding Method:	
Implementation Schedule:	Ongoing
Priority:	Low

FLI1 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Identify repetitive loss properties, develop appropriate mitigation action, and apply for funding
Hazard (s):	Multiple
Lead Party Responsible:	Building Inspections, Emergency Services Coordinator
Estimated Cost:	
Funding Method:	
Implementation Schedule:	1-3 years
Priority:	Low

FLC1 Mitigation Action: Fluvanna County	
Goal:	Whole Community
Action Item Description:	Develop County agreements (possibly with women's prison) for food services for county-supported shelters (including high school and Lake Monticello clubhouse)
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	Low

FLM1 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Develop Continuity of Operations Plans (COOP) for locality departments and update the plans annually
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	3-5 years
Priority:	Low

FLM2 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Develop county-wide evacuation plans for catastrophic incidents
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Staff time
Funding Method:	n/a
Implementation Schedule:	1-3 years
Priority:	Low

GHI1 Mitigation Action: Greene County	
Goal:	Infrastructure and Buildings
Action Item Description:	Partner with utility companies to keep power lines free of vegetation
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development, Emergency Services Coordinator
Estimated Cost:	Unknown
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	High

GHI2 Mitigation Action: Greene County	
Goal:	Infrastructure and Buildings
Action Item Description:	Conduct structural evaluations of all current and proposed shelters
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator, Department of Community Development - Building Code and Inspections
Estimated Cost:	Staff time and resources; Red Cross provides technical assistance and design criteria
Funding Method:	N/A
Implementation Schedule:	1-3 years
Priority:	High

GHI3 Mitigation Action: Greene County	
Goal:	Infrastructure and Buildings
Action Item Description:	Install backup generators in shelters and critical facilities.
Hazard (s):	Multiple
Lead Party Responsible:	County Administrator, Emergency Services Coordinator
Estimated Cost:	$60,000-$70,000/project
Funding Method:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant, All Hazards Emergency Operations Planning Grant
Implementation Schedule:	1-5 Years
Priority:	High

GHI4 Mitigation Action: Greene County	
Goal:	Infrastructure and Buildings
Action Item Description:	Enhance public safety emergency communications to provide reliable, dependable coverage
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$7,500,000
Funding Method:	General Revenue, Grants
Implementation Schedule:	1-3 Years
Priority:	High

GHI5 Mitigation Action: Greene County	
Goal:	Infrastructure and Buildings
Action Item Description:	Enhance access to broadband county-wide
Hazard (s):	Multiple
Lead Party Responsible:	County Administration
Estimated Cost:	Unknown
Funding Method:	General Revenue, Grants
Implementation Schedule:	Ongoing
Priority:	High

GHC1 Mitigation Action: Greene County	
Goal:	Whole Community
Action Item Description:	Assist the schools with regular disaster response drills and disaster planning
Hazard (s):	Multiple
Lead Party Responsible:	Public School System, Individual private schools
Estimated Cost:	N/A
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	High

GHM1 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Continue and expand use of the citizen alert system.
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$5,000
Funding Method:	General Revenue, pre-disaster mitigation funds
Implementation Schedule:	Ongoing
Priority:	High

GHM2 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building.
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development
Estimated Cost:	$10,000
Funding Method:	Hazard Mitigation Grant Program, General Revenue
Implementation Schedule:	1-3 years
Priority:	High

GHM3 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Ensure all critical facilities have updated shelter-in-place plans
Hazard (s):	Multiple
Lead Party Responsible:	Building, Planning, Emergency Services Coordinator
Estimated Cost:	Minimal / Staff Time
Funding Method:	N/A
Implementation Schedule:	1-3 years
Priority:	High

GHM4 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Update driveway codes to allow access for emergency vehicles.
Hazard (s):	Multiple
Lead Party Responsible:	Planning Department
Estimated Cost:	None / Staff time
Funding Method:	N/A
Implementation Schedule:	1-3 years
Priority:	High

GHM5 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Routinely inspect fire hydrants.
Hazard (s):	Wildfire
Lead Party Responsible:	Fire Departments, Rapidan Service Authority
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	High

GHM6 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Update local stormwater ordinances to be in compliance with statewide regulations
Hazard (s):	Flood
Lead Party Responsible:	Planning Department
Estimated Cost:	Staff time
Funding Method:	General Revenue, EPA Chesapeake Bay Act
Implementation Schedule:	2 – 4 Years
Priority:	High

GHM7 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Increase number of trained emergency responders
Hazard (s):	Multiple
Lead Party Responsible:	County Office of Emergency Services, Volunteer fire and rescue agencies
Estimated Cost:	Unknown
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	High

GHM8 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Ensure that all shelters and public buildings have a battery-powered emergency radio and flashlight
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$40 per location
Funding Method:	General Revenue, Grants
Implementation Schedule:	Ongoing
Priority:	High

GME1 Mitigation Action: Greene County	
Goal:	Education and Outreach
Action Item Description:	Develop cooperative agreements between all agencies involved in emergency management, provide methods of communication between agencies responsible for being present at Emergency Operations Center following disaster, and conduct joint emergency exercises
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	None – Staff time
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

GME2 Mitigation Action: Greene County	
Goal:	Education and Outreach
Action Item Description:	Conduct FireWise workshops (in conjunction with the Virginia Department of Forestry)
Hazard (s):	Wildfire
Lead Party Responsible:	Virginia Department of Forestry, Emergency Services Coordinator
Estimated Cost:	$1,000
Funding Method:	Virginia FireWise grant
Implementation Schedule:	2-5 years
Priority:	Moderate

GMI1 Mitigation Action: Greene County	
Goal:	Infrastructure and Building
Action Item Description:	Add signage to roads in locations that frequently flood
Hazard (s):	Flood
Lead Party Responsible:	Virginia Department of Transportation
Estimated Cost:	Unknown
Funding Method:	Public Assistance Program, Grants, General Revenue
Implementation Schedule:	1-3 years
Priority:	Moderate

GMM1 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate hazard mitigation plan into community plans
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development - Planning
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	1-2 years
Priority:	Moderate

GMM2 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Conduct Community Emergency Response Team (CERT) classes to equip individuals and citizens to assist in the event of a disaster
Hazard (s):	Multiple
Lead Party Responsible:	Law enforcement
Estimated Cost:	Unknown
Funding Method:	FEMA Community Emergency Response Teams, FEMA Emergency Management Performance Grant
Implementation Schedule:	Ongoing
Priority:	Moderate

GMM3 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Investigate safety and maintenance of roads in private communities.
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development, Emergency Services Coordinator
Estimated Cost:	Staff Time and Resources
Funding Method:	N/A
Implementation Schedule:	2-5 years
Priority:	Moderate

GMM4 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Develop and implement a Drought Management Plan
Hazard (s):	Drought
Lead Party Responsible:	Greene County Office of Emergency Services, Rapidan Service Authority
Estimated Cost:	Staff Time and Resources
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

GMD1 Mitigation Action: Greene County	
Goal:	Information and Data Development
Action Item Description:	Standardize GIS data for use in mitigation planning
Hazard (s):	Multiple
Lead Party Responsible:	Planning Department or GIS consultant
Estimated Cost:	$50,000
Funding Method:	Hazard Mitigation Grant Program, General Revenue, ESRI Grants
Implementation Schedule:	2-5 years
Priority:	Moderate

GMD2 Mitigation Action: Greene County	
Goal:	Information and Data Development
Action Item Description:	Conduct channel improvement study
Hazard (s):	Floods
Lead Party Responsible:	Army Corps of Engineers
Estimated Cost:	$20,000
Funding Method:	External Sources
Implementation Schedule:	Watershed Protection and Flood Prevention Program (Department of Agriculture, National Resource Conservation Service)
Priority:	Moderate

GMD3 Mitigation Action: Greene County	
Goal:	Information and Data Development
Action Item Description:	Create a need survey that identifies special needs population and residences and/or facilities needing attention in the event of emergencies or evacuations
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator, Social Services, Planning Department
Estimated Cost:	$3,000
Funding Method:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant, General Revenue, All-Hazards Emergency Operations Planning
Implementation Schedule:	1-3 years
Priority:	Moderate

GMD4 Mitigation Action: Greene County	
Goal:	Information and Data Development
Action Item Description:	Identify and evaluate evacuation routes are updated to determine/update to proper standards.
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator, VDOT
Estimated Cost:	Staff time
Funding Method:	Pre-Disaster Mitigation Grant, general revenue
Implementation Schedule:	1-3 years
Priority:	Moderate

GLE1 Mitigation Action: Greene County	
Goal:	Education and Outreach
Action Item Description:	Develop an all-hazard resource center.
Hazard (s):	Multiple
Lead Party Responsible:	Public Safety, TJPDC
Estimated Cost:	$5,000
Funding Method:	Pre-Disaster Mitigation Grant, Hazard Mitigation Grant Program, General Revenue
Implementation Schedule:	3-5 years
Priority:	Low

GLI1 Mitigation Action: Greene County	
Goal:	Infrastructure and Buildings
Action Item Description:	Retrofit emergency services building for hazard resistance.
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services, Building Services, Engineer
Estimated Cost:	Dependent upon evaluation
Funding Method:	Pre-Disaster Mitigation, All Hazard Emergency Operation Planning Grant, Hazard Mitigation Grant Program
Implementation Schedule:	2-5 years
Priority:	Low

GLI2 Mitigation Action: Greene County	
Goal:	Infrastructure and Buildings
Action Item Description:	Build and repair bridges so as not to impede floodwaters.
Hazard (s):	Flood
Lead Party Responsible:	Department of Community Development, VDOT
Estimated Cost:	Dependent upon number and type of structures.
Funding Method:	VDOT primary road funds, County secondary road funds, 406 Public Assistance Program (following a disaster), Hurricane Local Grant Program
Implementation Schedule:	5+ years
Priority:	Low

GLI3 Mitigation Action: Greene County	
Goal:	Infrastructure and Buildings
Action Item Description:	Ensure culverts, streams, channels, storm drains, and gutters remain clear of debris.
Hazard (s):	Flood
Lead Party Responsible:	Department of Community Development, VDOT
Estimated Cost:	Minimal – staff time & labor
Funding Method:	General Revenue, EPA Chesapeake Bay Act
Implementation Schedule:	Ongoing
Priority:	Low

GLI4 Mitigation Action: Greene County	
Goal:	Infrastructure and Buildings
Action Item Description:	Install more dry hydrants in high wildfire risk areas
Hazard (s):	Wildfire
Lead Party Responsible:	Virginia Department of Forestry, Greene County Office of Em. Services
Estimated Cost:	Unknown
Funding Method:	Virginia Dry Hydrant Grant Program
Implementation Schedule:	3-5 years
Priority:	Low

GLC1 Mitigation Action: Greene County	
Goal:	Whole Community
Action Item Description:	Update Greene County Emergency Operations Plan
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Staff Time
Funding Method:	General Revenue
Implementation Schedule:	2 Years
Priority:	Low

GLM1 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Adopt more stringent policy to discourage floodplain development.
Hazard (s):	Floods
Lead Party Responsible:	Planning Department
Estimated Cost:	Staff time
Funding Method:	N/A
Implementation Schedule:	In next zoning code and subdivision code updates.
Priority:	Low

GLM2 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Provide paid fire and rescue staff
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	Unknown
Funding Method:	General Revenue
Implementation Schedule:	3-5 years
Priority:	Low

GLM3 Mitigation Action: Greene County	
Goal:	Mitigation Capacity
Action Item Description:	Ensure all houses have clear address signs that are visible during snowstorms
Hazard (s):	Winter Storms, Multiple
Lead Party Responsible:	Planning Department
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Low

GSHM1 Mitigation Action: Town of Stanardsville	
Goal:	Mitigation Capacity
Action Item Description:	Increase water capacity and pressure for the Town of Stanardsville to enable optimal emergency response
Hazard (s):	Multiple
Lead Party Responsible:	Rapidan Service Authority
Estimated Cost:	$5 – 6 Million
Funding Method:	RSA funds, Community Development Block Grant
Implementation Schedule:	5+ Years
Priority:	High

GSMC1 Mitigation Action: Town of Stanardsville	
Goal:	Whole Community
Action Item Description:	Partner with Greene County to provide a mobile pet shelter for use during hazard events
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Coordinator
Estimated Cost:	$50,000
Funding Method:	Pre-hazard Mitigation Funds
Implementation Schedule:	2-4 Years
Priority:	Moderate

GSMM1 Mitigation Action: Town of Stanardsville	
Goal:	Mitigation Capacity
Action Item Description:	Ensure all houses have clear address signs that are visible during snowstorms
Hazard (s):	Winter Storms, Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

GSLM1 Mitigation Action: Town of Stanardsville	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate hazard mitigation plan into community plans
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development - Planning
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	1-2 years
Priority:	Low

LHI1 Mitigation Action: Louisa County	
Goal:	Infrastructure and Buildings
Action Item Description:	Enhance access to broadband internet in rural areas
Hazard (s):	Multiple
Lead Party Responsible:	Planning Department
Estimated Cost:	Unknown
Funding Method:	Rural Broadband Planning Initiative, Telecommunications firms
Implementation Schedule:	Ongoing
Priority:	High

LHI2 Mitigation Action: Louisa County	
Goal:	Infrastructure and Buildings
Action Item Description:	Install backup generators in shelters and critical facilities.
Hazard (s):	Multiple
Lead Party Responsible:	County Administrator
Estimated Cost:	$5,000-$15,000/generator
Funding Method:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant, All Hazards Emergency Operations Planning Grant
Implementation Schedule:	1-5 Years
Priority:	High

LHI3 Mitigation Action: Louisa County	
Goal:	Infrastructure and Buildings
Action Item Description:	Implement recommendations from the Water Supply Plan
Hazard (s):	Drought, Flood
Lead Party Responsible:	Planning & Community Development Department
Estimated Cost:	$150 M - $200 M
Funding Method:	General Revenue, Flood control and dam safety program funds
Implementation Schedule:	Ongoing
Priority:	High

LHC1 Mitigation Action: Louisa County	
Goal:	Whole Community
Action Item Description:	Ensure that all schools have regular disaster response drills
Hazard (s):	Multiple
Lead Party Responsible:	Public School System, Individual private schools
Estimated Cost:	N/A
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	High

LHM1 Mitigation Action: Louisa County	
Goal:	Mitigation Capacity
Action Item Description:	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building.
Hazard (s):	Multiple
Lead Party Responsible:	Department of Public Works
Estimated Cost:	$10,000
Funding Method:	Hazard Mitigation Grant Program, General Revenue
Implementation Schedule:	1-3 years
Priority:	High

LHM2 Mitigation Action: Louisa County	
Goal:	Mitigation Capacity
Action Item Description:	Continue and expand use of the citizen alert system, including with towns.
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Coordinator
Estimated Cost:	$5,000
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	High

LHM3 Mitigation Action: Louisa County	
Goal:	Mitigation Capacity
Action Item Description:	Increase number of trained citizen emergency responders
Hazard (s):	Multiple
Lead Party Responsible:	Dept of Fire-EMS
Estimated Cost:	$5,000
Funding Method:	Hazard Mitigation Grant Program
Implementation Schedule:	Ongoing
Priority:	High

LHM4 Mitigation Action: Louisa County	
Goal:	Mitigation Capacity
Action Item Description:	Develop driveway codes to allow access for emergency vehicles.
Hazard (s):	Multiple
Lead Party Responsible:	Planning Department
Estimated Cost:	None / Staff time
Funding Method:	N/A
Implementation Schedule:	1-3 years
Priority:	High

LMI1 Mitigation Action: Louisa County	
Goal:	Infrastructure and Buildings
Action Item Description:	Put high water marks on bridges.
Hazard (s):	Flood
Lead Party Responsible:	Virginia Department of Transportation, Public Works
Estimated Cost:	$15,000
Funding Method:	406 Public Assistance Program (following a disaster), Hurricane Local Grant Program, Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant
Implementation Schedule:	2-5 years
Priority:	Moderate

LMI2 Mitigation Action: Louisa County	
Goal:	Infrastructure and Buildings
Action Item Description:	Investigate, plan and implement repairs and/or upgrades to Bowlers Mill dam to preserve flood control benefits for the historic Green Springs area.
Hazard (s):	Flood
Lead Party Responsible:	Louisa County Water Authority
Estimated Cost:	$3 to 4 million
Funding Method:	Natural Resources Conservation Service (NRCS), Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant, County funds
Implementation Schedule:	4-15 years
Priority:	Moderate

LMM1 Mitigation Action: Louisa County	
Goal:	Mitigation Capacity
Action Item Description:	Investigate safety and maintenance of roads in private communities.
Hazard (s):	Multiple
Lead Party Responsible:	Public Works, Emergency Management
Estimated Cost:	Staff Time and Resources
Funding Method:	N/A
Implementation Schedule:	2-5 years
Priority:	Moderate

LMM2 Mitigation Action: Louisa County	
Goal:	Mitigation Capacity
Action Item Description:	Conduct Community Emergency Response Team (CERT) classes to equip individuals and groups to assist in the event of a disaster
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Coordinator
Estimated Cost:	$10,000
Funding Method:	FEMA Community Emergency Response Teams, FEMA Emergency Management Performance Grant
Implementation Schedule:	Ongoing
Priority:	Moderate

LMM3 Mitigation Action: Louisa County	
Goal:	Mitigation Capacity
Action Item Description:	Ensure all houses have clear address signs that are visible during snowstorms
Hazard (s):	Winter Storms, Multiple
Lead Party Responsible:	Planning and Emergency Management
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

LMM4 Mitigation Action: Louisa County	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate hazard mitigation plan into community plans
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development - Planning
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	1-2 years
Priority:	Moderate

LMM5 Mitigation Action: Louisa County	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate Special Needs Populations into Mitigation and Emergency Operations Plans
Hazard (s):	Multiple
Lead Party Responsible:	Dept of Fire-EMS
Estimated Cost:	Staff time and resources.
Funding Method:	N/A
Implementation Schedule:	1-3 years
Priority:	Moderate

LLE1 Mitigation Action: Louisa County	
Goal:	Education and Outreach
Action Item Description:	Provide educational information about the burn permit process.
Hazard (s):	Multiple
Lead Party Responsible:	Department of Forestry, Department of Public Works, County Executive's Office – Community Relations, Dept of Fire-EMS
Estimated Cost:	Staff time and resources; additional costs possible
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	Low

LLE2 Mitigation Action: Louisa County	
Goal:	Education and Outreach
Action Item Description:	Create an educational program to help residents understand the benefits and costs of earthquake insurance
Hazard (s):	Earthquake
Lead Party Responsible:	Insurance Companies, County Administrator
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Low

LLI2 Mitigation Action: Louisa County	
Goal:	Infrastructure and Buildings
Action Item Description:	Add signage to roads in locations that frequently flood.
Hazard (s):	Flood
Lead Party Responsible:	Dept of Fire-EMS, VDOT
Estimated Cost:	$10,000
Funding Method:	406 Public Assistance Program (following a disaster), Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant, All Hazards Emergency Operations Planning Grant
Implementation Schedule:	3-5 years
Priority:	Low

LLD1 Mitigation Action: Louisa County	
Goal:	Information and Data Development
Action Item Description:	Track and map space available for pets at local SPCA and other animal shelters.
Hazard (s):	Multiple
Lead Party Responsible:	Planning Department, Emergency Coordinator
Estimated Cost:	Staff Time and Resources
Funding Method:	N/A
Implementation Schedule:	1-5 years
Priority:	Low

LLHM1 Mitigation Action: Town of Louisa	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate hazard mitigation plan into community plans
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development - Planning
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	1-2 years
Priority:	High

LLMM1 Mitigation Action: Town of Louisa	
Goal:	Mitigation Capacity
Action Item Description:	Ensure all houses have clear address signs that are visible during snowstorms
Hazard (s):	Winter Storms, Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

LMHM1 Mitigation Action: Town of Mineral	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate hazard mitigation plan into community plans
Hazard (s):	Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	Staff time only
Funding Method:	Local funds
Implementation Schedule:	1-2 years
Priority:	High

LMMM1 Mitigation Action: Town of Mineral	
Goal:	Mitigation Capacity
Action Item Description:	Ensure all houses have clear address signs that are visible during snowstorms
Hazard (s):	Winter Storms, Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

LMMM2 Mitigation Action: Town of Mineral	
Goal:	Mitigation Capacity
Action Item Description:	Work with the Louisa County to designate a representative for the County's Emergency Operations Committee
Hazard (s):	Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	Staff Time only
Funding Method:	N/A
Implementation Schedule:	1-2 years
Priority:	Moderate

LMMM3 Mitigation Action: Town of Mineral	
Goal:	Mitigation Capacity
Action Item Description:	Develop a system for alerts and other communication with citizens
Hazard (s):	Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	Unknown
Funding Method:	Local Funds, All Hazards Emergency Operations Planning Grant
Implementation Schedule:	2-6 years
Priority:	Moderate

LMMI1 Mitigation Action: Town of Mineral	
Goal:	Infrastructure and Buildings
Action Item Description:	Mark the fire hydrants with reflective markers for large snow storms
Hazard (s):	Winter Storms
Lead Party Responsible:	Town Manager
Estimated Cost:	$1,000
Funding Method:	Local Funds
Implementation Schedule:	1-2 years
Priority:	Moderate

LMMI2 Mitigation Action: Town of Mineral	
Goal:	Infrastructure and Buildings
Action Item Description:	Install emergency generator for wells
Hazard (s):	Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	$5,000-$15,000/generator
Funding Method:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant, All Hazards Emergency Operations Planning Grant
Implementation Schedule:	2-4 years
Priority:	Moderate

LMLI1 Mitigation Action: Town of Mineral	
Goal:	Infrastructure and Buildings
Action Item Description:	Bury utilities underground in Town of Mineral
Hazard (s):	Winter Storms, Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	Unknown
Funding Method:	Community Development Block Grant, Pre-hazard mitigation funds
Implementation Schedule:	5+ Years
Priority:	Low

NHI1 Mitigation Action: Nelson County	
Goal:	Infrastructure and Buildings
Action Item Description:	Install backup generators in shelters and critical facilities.
Hazard (s):	Multiple
Lead Party Responsible:	County Administrator
Estimated Cost:	$5,000-$15,000/generator
Funding Method:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant, All Hazards Emergency Operations Planning Grant
Implementation Schedule:	1-5 Years
Priority:	High

NHM1 Mitigation Action: Nelson County	
Goal:	Mitigation Capacity
Action Item Description:	Continue and expand use of the citizen alert system.
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator
Estimated Cost:	$5,000
Funding Method:	General Revenue
Implementation Schedule:	Ongoing
Priority:	High

NHM2 Mitigation Action: Nelson County	
Goal:	Mitigation Capacity
Action Item Description:	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building.
Hazard (s):	Multiple
Lead Party Responsible:	Department of Public Works
Estimated Cost:	$10,000
Funding Method:	Hazard Mitigation Grant Program, General Revenue
Implementation Schedule:	1-3 years
Priority:	High

NME1 Mitigation Action: Nelson County	
Goal:	Education and Outreach
Action Item Description:	Conduct FireWise workshops.
Hazard (s):	Wildfire
Lead Party Responsible:	Virginia Department of Forestry, Emergency Services Coordinator
Estimated Cost:	$2,000
Funding Method:	Virginia FireWise Grant, General Revenue
Implementation Schedule:	2-5 years
Priority:	Moderate

NME2 Mitigation Action: Nelson County	
Goal:	Education and Outreach
Action Item Description:	Provide educational instruction and materials to school age youth and their teachers on proper procedures for responding to natural disasters
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services Coordinator, Public Schools
Estimated Cost:	$5,000
Funding Method:	General Revenue
Implementation Schedule:	3-5 Years
Priority:	Moderate

NMM1 Mitigation Action: Nelson County	
Goal:	Mitigation Capacity
Action Item Description:	Ensure all houses have clear address signs that are visible during snowstorms
Hazard (s):	Winter Storms, Multiple
Lead Party Responsible:	Town Manager
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Moderate

NLE1 Mitigation Action: Nelson County	
Goal:	Education and Outreach
Action Item Description:	Ensure that all homeowners and businesses located in areas prone to landslides are aware of the risks and appropriate responses to an event
Hazard (s):	Landslides
Lead Party Responsible:	Planning Department
Estimated Cost:	Staff Time
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Low

NLI2 Mitigation Action: Nelson County	
Goal:	Infrastructure and Building
Action Item Description:	Maintain and add more fire rings in camping areas for controlled fires.
Hazard (s):	Multiple
Lead Party Responsible:	Albemarle Recreation Department, Private Campground Owners, National Park Service
Estimated Cost:	$50,000
Funding Method:	General Revenue, Hazard Mitigation Grant Program
Implementation Schedule:	5+ years
Priority:	Low