Regional Natural Hazard Mitigation Plan

2012 UPDATE - Approved by FEMA, July 30, 2012

Prepared by the:

Thomas Jefferson Planning District Commission

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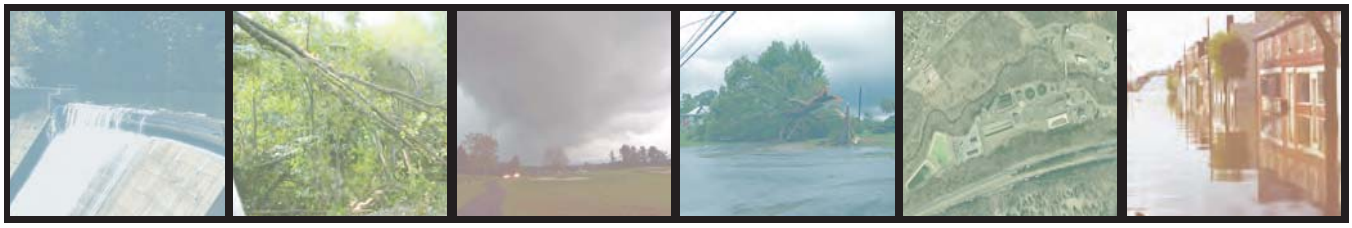


Executive Summary

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, and the plan has been updated in 2012.

Sections of Plan

The following sections are included in the plan:

1. Introduction – an overview of hazard mitigation generally and an outline of the plan
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 human impact hazards could cause, with estimated potential losses for various hazard scenarios
6. Capabilities Assessment – a survey of current local capacity to mitigate natural hazards
7. Mitigation Strategy – goals, objectives, and action items selected to mitigate hazards identified in the region

Planning Process

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

The following sources of stakeholder input were used:

- Regular meetings of the Hazard Mitigation Working Group
- Two public workshops
- An online survey and solicitation of public input from website
- Presentations to Local Emergency Planning Committees, Rural Technical Committee, Town of Columbia Task Force, and Town of Mineral Business Group
- Recommendations from existing plans and documents
- Informational presentations to elected bodies of all eleven localities in the region

- Posting document on website and 30-day public comment period for all draft plan elements

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 potential impact of an event.

	PROBABILITY 2011	HUMAN IMPACT 2011	PROPERTY IMPACT 2011	BUSINESS IMPACT 2011	RISK 2011
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interruption of services*	*Relative threat (increases with Percentage)*
EVENT	**0 = N/A 1 = Low 2 = Low-Moderate 3 = Moderate 4= Hi-Moderate 5=High**	**0 = N/A 1 = Low 2 = Moderate 3 = High**			*0 - 100%*
Flooding	5	3	3	2	89%
Winter Storms	5	2	2	2	67%
Hurricanes	3	2	2	2	40%
High Wind / Windstorms	3	2	2	1	33%
Wildfire	3	1	2	1	27%
Lightning	4	1	1	1	27%
Tornadoes	2	2	2	2	27%
Drought	3	0	2	2	27%
Extreme Heat	3	2	0	1	20%
Dam Failure	1	3	3	2	18%
Landslides	2	1	1	1	13%
Earthquake	2	1	1	1	13%
Extreme Cold	1	2	1	1	9%
AVERAGE SCORE	2.64	1.57	1.57	1.36	26%

Risk = Probability * Severity

Risk	Probability	Severity
.26	.53	.50

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

- GOAL: Increase awareness of hazards and how to prepare for them through education and training
    - OBJECTIVE: Educate families and individuals on household techniques for disaster preparedness
    - OBJECTIVE: Train key agency staff and volunteer groups in disaster mitigation and preparedness, with an emphasis on emergency respondents, building inspectors and code officials
    - OBJECTIVE: Encourage and equip employers to adopt emergency action plans for their workplace
    - OBJECTIVE: Maintain a consistent message across agencies and providers for hazard mitigation and disaster response activities using clear language

- GOAL: Encourage individual action to reduce the impacts of hazards
    - OBJECTIVE: Encourage water conservation
    - OBJECTIVE: Encourage property owners to design and maintain buildings and grounds to reduce risks of damage
    - OBJECTIVE: Protect sensitive areas through conservation easements
    - OBJECTIVE: Encourage residents to provide adequate access to property for emergency services

Infrastructure and Buildings

- GOAL: Reduce the short and long-term impact of hazard events on regional 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

- GOAL: Identify and implement physical projects that will directly reduce impacts to structures from hazards
    - OBJECTIVE: Elevate, retrofit and relocate existing structures and facilities in vulnerable locations
    - OBJECTIVE: Maintain and/or augment critical facilities and infrastructure necessary for emergency response during and after a hazard event

People and Vulnerable Populations

- GOAL: Prepare to meet the immediate needs of population during natural hazards
    - OBJECTIVE: Identify and record concentrations of vulnerable populations, especially in high-risk areas
    - OBJECTIVE: Train staff to effectively communicate with and transport vulnerable populations
    - OBJECTIVE: Install devices and signage to improve communication and warning systems, ensure operations of emergency shelters, and reduce response time in the event of a natural hazard
    - OBJECTIVE: Ensure that facilities and equipment are in place to transport, shelter and serve vulnerable populations

Mitigation Capacity

- GOAL: Incorporate mitigation concepts into existing and future policies and plans
    - OBJECTIVE: Reduce property risks through zoning, ordinances and building codes
    - OBJECTIVE: Increase storage capacity of streams and rivers and reduce flow rates of stormwater through mitigation policies and best management practices.
    - OBJECTIVE: Link community planning and mitigation planning together to achieve common goals
    - OBJECTIVE: Incorporate mitigation planning concepts into building codes

- GOAL: Pursue funding to implement identified mitigation strategies
    - OBJECTIVE: Identify appropriate funding sources
    - OBJECTIVE: Create or strengthen partnerships to develop integrated grant proposals and coordinated implementation plans
    - OBJECTIVE: Increase staffing to implement mitigation strategies

Information and Data Development

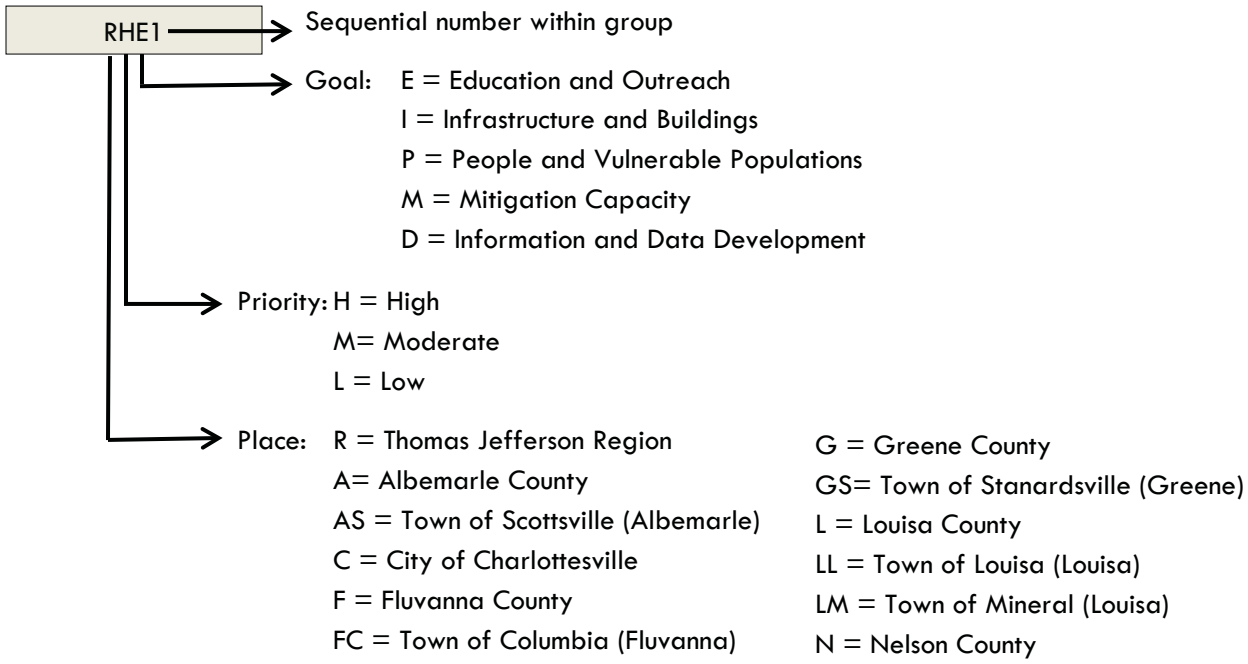
- GOAL: Build capacity with information and data development to refine hazard identification and assessment, mitigation targeting and funding identification
    - OBJECTIVE: Identify data and information needs and develop methods to meet these needs
    - OBJECTIVE: Ensure that critical facilities meet disaster preparedness requirements

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 mitigated, 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.

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

*Activity Code Key



Activity Code	Activity Description
Thomas Jefferson Region	
RHE1	Create a hazards library and information toolkit
RHE2	Provide a copy of the Regional Natural Hazard Mitigation Plan to each library in the Jefferson-Madison Regional Library system
RHI1	Adopt a cooperative agreement between localities to set a single code to alter traffic signals for use by emergency response vehicles from each jurisdiction
RHP1	Establish a registry of individuals with specialized needs, including their location, and their requirements for transportation assistance
RHP2	Ensure that emergency shelters meet accessibility requirements, have back-up power, and are capable of housing caretakers, medical equipment and service animals for the elderly and those with disabilities
RHD1	Update addresses in Repetitive Loss Properties database
RME1	Create a website and app that allows members of public to report potentially hazardous situations as they are observed
RME2	Conduct a public education program on disaster preparedness, leveraging existing materials and sharing resources regionally
RME3	Encourage all property owners of commercial, industrial, and multifamily housing facilities to have an Emergency Action Plan, including evacuation, sheltering, and communications protocol
RME4	Encourage all businesses and congregate housing facilities to have an Emergency Action Plan that is coordinated with plans for the facility
RME5	Encourage major businesses to adopt a Business Continuity Plan, especially businesses that provide critical services in the aftermath of a natural disaster
RMP1	Incorporate training on how to effectively communicate with people with disabilities during an emergency event into existing education for transit drivers, first responders and emergency management staff
RMD1	Identify locations for deposit of debris after a hazard
RLE1	Add emergency preparedness and response information into local phone books
RLE2	Establish a "Hazard Awareness Week" with local media to educate public about natural hazards
RLE3	Identify, engage and coordinate with amateur radio operators to prepare for communications during an event
RLP1	Coordinate with Neighborhood Associations to establish a point person within each neighborhood for communications and assisting vulnerable populations
RLP2	Coordinate with local churches to distribute necessary resources to households and assist in evacuation
RLM1	Plan for facilitating affordable housing in the aftermath of a disaster, in cases where the regional housing supply is temporarily reduced

Activity Code	Activity Description
RLM2	Adopt a Regional Recovery Plan that provides a blueprint for the restoration of business operations and rebuilding of communities and infrastructure
RLD1	Identify potential locations for temporary housing for use after a hazard

Albemarle County	
AHE1	Create educational campaign about the benefits of open space protection
AHE2	Provide educational information about the burn permit process
AHI1	Retrofit Observatory Hill Dining Facilities with generator quick connects to enable generator hook-up to support the provision of ongoing food service for state shelter and local needs
AHI2	Partner with utility companies to keep power lines free of vegetation
AHI3	Implement recommendations from the Community Water Supply Plan
AHI4	Conduct structural evaluations of all current and proposed shelters
AHP1	Add or modify paratransit routes to serve the new Martha Jefferson hospital site
AHM1	Incorporate hazard mitigation plan into community plans
AHM2	Increase number of trained emergency responders
AHD1	Assess resistance of existing critical facilities to natural hazards
AME1	Conduct FireWise workshops
AMI1	Build or repair bridges so as to not impede floodwaters
AMI2	Upgrade all area bridges to support emergency vehicles
AMP1	Ensure that all schools have regular disaster response drills
AMM1	Implement recommendations from Drought Management Plan
AMM2	Continue to pursue conservation easements in sensitive areas, including flood-prone areas.
AMD1	Expand GIS data for use in mitigation planning, preparedness planning, and response activities
ALE1	Encourage residents and agencies to clear storm drain inlets, ditches, and channels
ALI1	Encourage property owners to clear creek beds or dredge creeks to remove debris where flooding has increased
ALI2	Reduce pollution discharge via stormwater systems
ALI3	Install more dry hydrants in high wildfire risk areas
ALI4	Adopt a policy to create safe interior spaces in county-owned buildings for protection during tornados and high wind events
ALM1	Use recreational trails as fire breaks and access lines
ALM2	Maintain and add more fire rings in camping areas for controlled fires

Town of Scottsville	
ASMM1	Ensure all houses have clear address signs that are visible during snowstorms
ASLM2	Incorporate hazard mitigation plan into community plans

Activity Code	Activity Description
City of Charlottesville	
CHE1	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
CHI1	Implement recommendations from the Community Water Supply Plan
CHP1	Ensure that all schools have regular disaster response drills
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 and expand use of citizen alert systems
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 systems
CLI2	Reduce pollution discharge via stormwater systems
CLI3	Retrofit stormwater management basins
CLM1	Hire a floodplain management official and enforce floodplain regulations.

Fluvanna County	
FHI1	Conduct structural evaluations and study of resistance to hazards of all current and proposed shelters
FHI2	Implement recommendations from Water Supply Plan
FHI3	Implement recommendations from the Wireless Telecommunications Facility Master Plan to enhance emergency communications
FHI4	Retrofit emergency services building for hazard resistance
FHI5	Install backup generators in shelters and critical facilities
FHP1	Ensure that all schools have regular disaster response drills

Activity Code	Activity Description
FHM1	Improve local capabilities to perform earthquake building safety evaluations and enforce building codes in high seismic hazard areas
FME1	Create a community toolbox with tools and information for local homeowners
FMM1	Ensure all houses have clear address signs that are visible during snowstorms
FMM2	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
FLE1	Develop an all-hazard resource center at libraries or other public office, including a copy of the Regional Natural Hazard Mitigation Plan
FLE2	Create an educational program to help residents understand the benefits and costs of earthquake insurance
FLI1	Retrofit existing public buildings to meet contemporary standards for earthquake resistance
FLI2	Equip owners of historic properties that may be more susceptible to earthquake damage with information about retrofitting structures to improve earthquake resistance
FLI3	Update building codes to improve earthquake resilience
FLM1	Require protective stormwater mitigation measures such as reducing impervious surfaces, stilling and infiltration basins, and restoring wetlands in growth areas

Town of Columbia	
FCHI1	Acquire existing structures within the floodplain and either demolish or relocate
FCHM1	Create a relocation plan for residents currently living within the floodplain to offer housing choices outside of a hazard area
FCMI1	Enhance emergency communications to provide reliable mobile coverage within the Town, per the adopted Fluvanna County telecommunications plan
FCMI2	Repurpose the properties within the floodplain to serve the Town of Columbia without imposing risks from future flooding
FCLI1	Expand cell phone coverage to provide reliable service to the whole Town
FCLI2	Maintain an evacuation route out of town with proper signage
FCLI1	Repair, replace or relocate septic and drainage fields that leak sewage into the river during flooding
FCLM1	Incorporate hazard mitigation plans into community plans

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
GHP1	Ensure that all schools have regular disaster response drills
GHM1	Continue and expand use of citizen alert systems

Activity Code	Activity Description
GHM2	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
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
GME1	Develop cooperative agreement between all agencies involved in emergency management, provide methods of communication between agencies responsible for being present at Emergency Communication Center following disaster, and conduct joint emergency exercises
GMM1	Incorporate hazard mitigation plan into community plans
GMM2	Conduct Community Emergency Response Team (CERT) classes to equip individuals and groups to assist in the event of a disaster
GMM3	Investigate safety and maintenance of roads in private communities
GMD1	Standardize GIS data for use in mitigation planning
GMD2	Conduct channel improvement study
GMD3	Create needs survey identifying special populations
GMD4	Ensure evacuation routes are upgraded to proper standards
GLE1	Develop all-hazard resource center
GLI1	Retrofit emergency services building 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
GLP1	Update Greene County Emergency Operations Plan
GLM1	Adopt more stringent policy to discourage floodplain development
GLM2	Provide paid fire and rescue staff
GLM3	Ensure all houses 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
GSMP1	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

Activity Code	Activity Description
LHI4	Ensure all shelters and public buildings have a battery-powered emergency radio & flashlight
LHP1	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	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
LMP1	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

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 loss of life and damage caused by disasters when they do occur over an extended period of time. 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 hazards.

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, Columbia, 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.

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 educational campaigns to raise awareness of hazards and wise floodplain management. Actions may be targeted to protect existing development, or could be designed to protect future development. It is widely accepted that the most effective mitigation measures are implemented at the local government level, where decisions to regulate 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

This plan systematically identifies potential hazards and sets goals for implementation over the long-term that will result in a reduction in risk. 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.

Sections of the Plan

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

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

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.

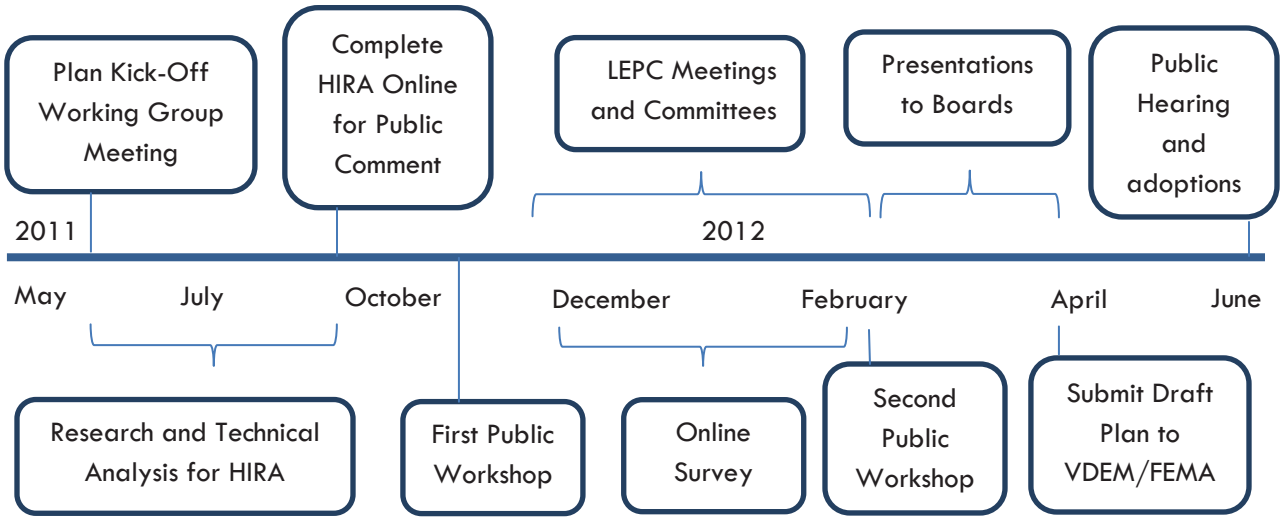
The **Capabilities Assessment** provides an examination of the region's capacity to implement meaningful mitigation actions and identifies existing opportunities for program enhancement. Capabilities addressed in this section include staff and organizational capability, technical capability, and fiscal capability.

The **Mitigation Strategy** forms the basis for action, identifying broad goal statements, supporting objectives and specific hazard mitigation actions. Hazard mitigation actions include both policies and projects designed to reduce the impacts of hazardous events. The section also describes how the action items effectively mitigate high and moderate risk hazards identified in the plan.

Planning Process and Public Involvement

This section describes the planning process undertaken by the Thomas Jefferson Planning District Commission in preparation of the Regional Natural Hazard Mitigation Plan, as well as the means for monitoring the plan between 2012 and 2017. 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:



Upon approval from VDEM and FEMA, a public hearing will be held before the Thomas Jefferson Planning District Commission to adopt the plan as a region. Additionally, staff from the Thomas Jefferson Planning District Commission will return to each of the local boards of elected officials to request a resolution of support for the final plan.

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

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 seven primary methods for obtaining input for the plan:

- Regular meetings of the Hazard Mitigation Working Group
- Two public workshops
- An online survey and solicitation of public input from website
- Presentations to Local Emergency Planning Committees, Rural Technical Committee, Town of Columbia Task Force, and Town of Mineral Business Group
- Recommendations from existing plans and documents
- Informational presentations to elected bodies of all eleven localities in the region
- Posting document on website and 30-day public comment period for all draft plan elements

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.

Hazard Mitigation Working Group

The Working Group, consisting primarily of planners and emergency operations coordinators in each locality, served as the decision-making body guiding the plan. The Working Group also provided technical input on the content of the plan at multiple points along the timeline of the update. The Working Group was originally formed during the creation of the 2006 Regional Natural 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 Appendix A.

Public Workshops

The first public event was held on October 19, 2011. The event was widely advertised both through a regional email list and physical mailings to individuals with a special interest in hazard mitigation and emergency response. Additionally, a press release was issued to local media outlets.

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 a list of "problem statements" that were derived from the HIRA and previous input from the Working Group. The majority of the meeting was dedicated to drafting the goals and objectives for mitigation through group exercises.

A second public workshop was held on February 8, 2012. The purpose of this meeting was to sift through action items derived from the previous plan, online survey suggestions, recommendations from the working group, and other sources. The attendees measured the appropriateness of each action item in light of the goals and objectives of the plan, the relative risks posed by hazards in the region, and their own expertise. Through the work of three separate groups, the attendees were able to narrow down and significantly revise the action items into the final draft form.

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.

Throughout December 2011 and into January 2012, 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 118 responses. Although the preponderance of responses were from Albemarle County and the City of Charlottesville, all localities were represented by the survey.

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.

Presentations to Local Committees

TJPDC staff met with several local committees to make them aware of the hazard mitigation plan update and incorporate the specific expertise of the group into the plan. The Mineral Business Association discussed the plan during their October 17, 2011 meeting. Having persisted through a major earthquake and a series of aftershocks over the previous two months, the association was uniquely equipped with insight into maintaining business continuity through a disaster, effective emergency response, and smooth post-disaster recovery. The Town of Columbia Task Force was briefed about the hazard mitigation plan during their December 9th, 2011 meeting, and the group contributed new action items to mitigate flooding that has historically impeded the town's revitalization.

The Rural Technical Committee was briefed on the plan during their December 20, 2011 and January 17, 2012 meetings. This group is comprised of planners and transportation administrators from five counties in the region. They understand the special circumstances of rural areas and the infrastructure assets and constraints they currently have.

Contact was made with all Local Emergency Planning Committees and memos were sent to each detailing suggested action items for the locality. Two LEPCs were briefed in person during a scheduled meeting. The Ablemarle-Charlottesville-UVa LEPC discussed the plan during their October 26, 2011 and November 30, 2011 meetings, and the Fluvanna County LEPC discussed the plan during their January 18, 2012 meeting. These groups have valuable experience as emergency responders and managers that improved the quality and feasibility of the plan's recommendations.

Recommendations from Existing Plans and Documents

TJPDC staff reviewed the Comprehensive Plans from each locality, as well as a number of adopted technical documents from various agencies and non-profits in the region, to ensure that the vision presented in the Regional Natural Hazard Mitigation Plan is broadly compatible with goals set forth in other plans. In some cases, specific relevant projects were taken directly from these plans and included as action items in the regional plan. A meeting was held with staff from the University of Virginia Office of Emergency Preparedness to make sure the regional plan supports and draws from their own hazard mitigation plan for the university grounds.

Presentations to Elected Officials

Staff from TJPDC visited boards of elected officials in the region, including the five counties, five towns, the City of Charlottesville, and the Thomas Jefferson Planning District Commission. Each board was sent a memo in advance, outlining the process and timeline of the plan with an attached set of action items for

their respective locality. Because the boards will be asked to pass a resolution of support for the plan in its final rendition, it was important to take their opinions into account early in the plan adoption process. Several boards provided substantive feedback, and the action items in the plan were revised accordingly.

Public comment Period

The entire draft Regional Natural Hazard Mitigation Plan was made available to the public for comment between March 16th and April 16th of 2012. The comment period was advertised in local media on March 16, 2012.

Method of Update

The 2012 Regional Natural Hazard Mitigation Plan is an update of an original plan 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. The Vulnerability Assessment is mostly new for this plan, because the software used to analyze scenarios has been updated since 2006. This section also includes conditions that have been updated to reflect changes in development, as well as new information about hazards.

Goals and objectives were considered freshly in the first public workshop. This was an intentional decision to allow the overall direction of the plan to flow directly from public input received, rather than be overly prejudiced by the vision of the previous plan. Staff then merged some of the previous objectives with the new ones, and the Hazard Mitigation Working Group reviewed the final product.

Action items determined in 2006 framed the basis of discussion of the mitigation strategy update. During annual meetings, some action items were completed or determined to be unfeasible and these were removed from the plan. A list of removed items and a justification for removal is included in Appendix C. Other action items have not been started within the original 5-year timeframe of the plan and are still included in the 2012 plan. A justification for the deferral of action items is included in Appendix C.

Staff moved several action items that did not meet the criteria of a discrete, measureable project up to the level of objective. The action items were further revised through LEPC meetings, Working Group meetings, the second public workshop, and input from locality staff and other stakeholders. Some new action items were generated by the online survey. The final set of action items draws from previous experience while assimilating new information and current public will.

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.

Each locality will receive a copy of the completed plan to keep on file at the county or city office. The TJPDC will post the plan on their website (www.tjpdc.org/environment/hazard.asp).

The monitoring method and schedule set forth in the 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. Each locality will submit annual reports to the TJPDC staff prior to the May commission meetings.

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 will be submitted to VDEM by the summer of 2017.

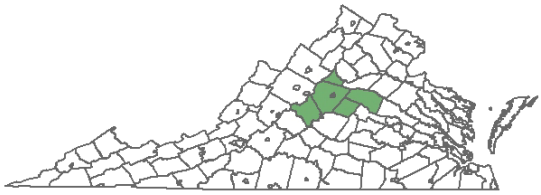
Ongoing public involvement will be critical to ensure the most accurate and up-to-date plan. Significant amendments to the plan will require a public hearing and other efforts to involve the public will be made as necessary.

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 Columbia, Scottsville, Louisa, Mineral and Stanardsville. The Planning District is home to historic resources such as Monticello and Ash Lawn-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



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 is drained 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 20's to July highs in the high 80's. Annual rainfall averages above 40 inches and is 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.

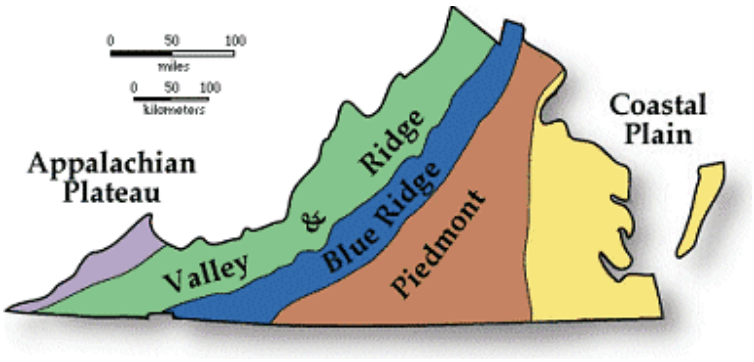
The vast majority of land is either field or forest, with development occupying the remainder. Crop farming is found in larger scale to the south and east, away from the mountains, where land is flatter. Hay and grains are the majority crops, with some corn and other row crops. Orchards and vineyards 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 area. For the Rivanna Watershed, which encompasses 35% of the Planning District, tree canopy accounts for approximately 72% of the basin, open lands 22.8%, impervious surfaces 3.2%, and the remaining 2% is water, orchard, or golf course. 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.

Parts of the Thomas Jefferson Planning District lie in the Blue Ridge province, while most of it is in the Piedmont province. 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. Land use in these areas is controlled by regulations of the federal Department of Interior or Department of Agriculture.

Population and Growth

As the following population figures show, the region grew by approximately 18% from 2000 to 2010. 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. With the exception of Nelson County, which has the region's slowest growth rate, the historically rural counties have been increasing in population most rapidly. However, there has also been significant infill growth over the last decade. The City of Charlottesville's population decreased slightly between 1980 and 2000, but then grew by 8% between 2000 and 2010. This occurred despite a highly constrained supply of new developable land.

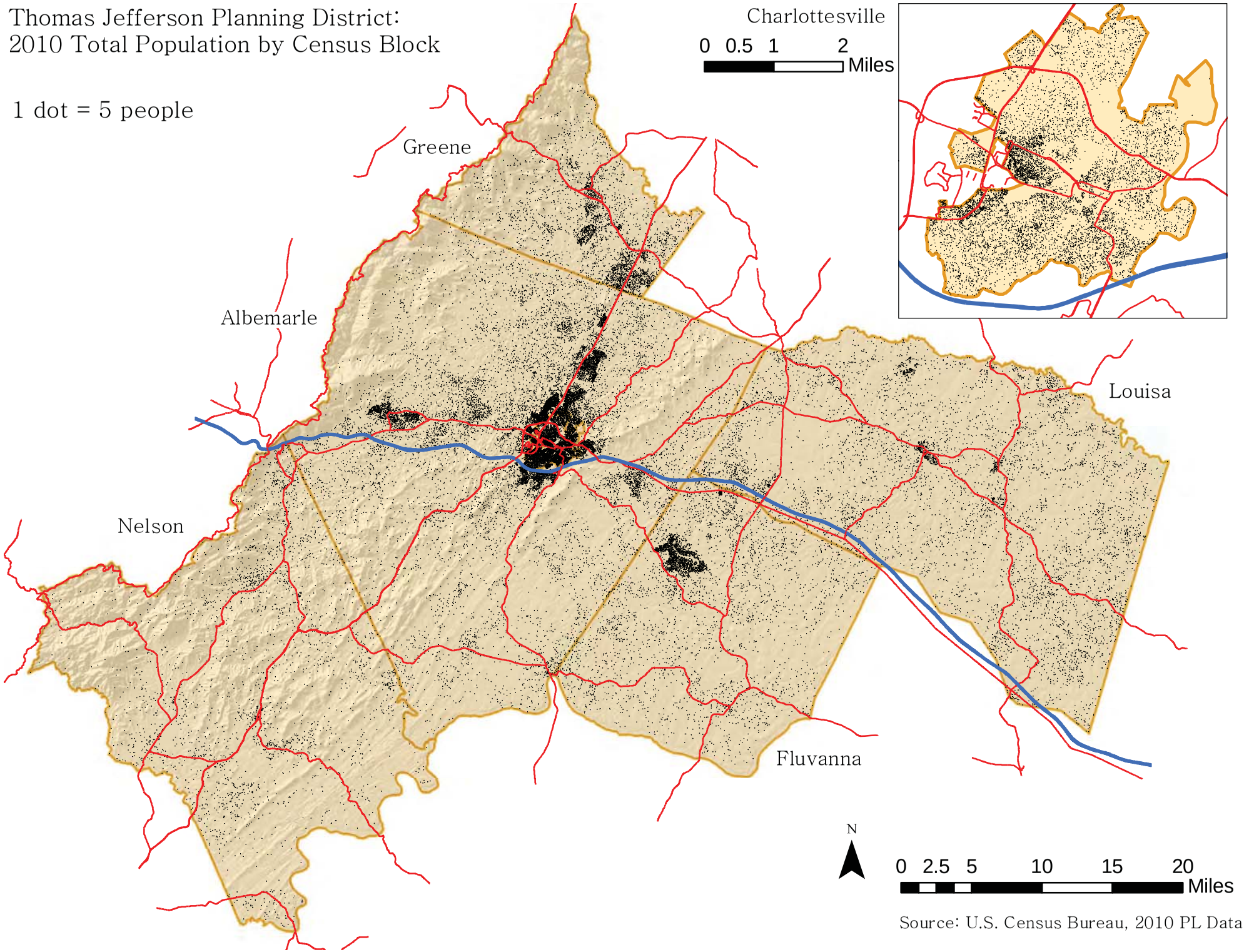
Population Change

Locality	1990	2000	2010	2000-2010 % Change
Charlottesville	40,341	40,099	43,475	8.4%
Albemarle	68,040	84,186	98,970	17.6%
Fluvanna	12,429	20,047	25,691	28.2%
Greene	10,297	15,244	18,403	20.7%
Louisa	20,325	25,627	33,153	29.4%
Nelson	12,778	14,445	15,020	4.0%
Region	164,210	199,648	234,712	17.6%

Source: US Census (1990, 2000, 2010)

Major population centers and growth areas can be identified using census data and local comprehensive planning information. The City of Charlottesville and the surrounding urban ring in Albemarle County are 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 it 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 10 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.


Thomas Jefferson Planning District:
2010 Total Population by Census Block
1 dot = 5 people
Charlottesville
0 0.5 1 2
Miles
Greene
Albemarle
Louisa
Nelson
Fluvanna
N
0 2.5 5 10 15 20
Miles
Source: U.S. Census Bureau, 2010 PL Data

Land Use and Development Trends

Central Virginia is an attractive place to live and work, and therefore all 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 more attractive, although this effect has been somewhat attenuated in recent years by a depressed housing market. 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 a standard that allows them to be used as such. 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 that have been recommended throughout the region and are currently awaiting funding. Solid waste services and collection points may also change and grow in all areas.

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 multifamily units dropped off sharply following the national housing downturn in 2007 and 2008. New construction is still very slow, although an uptick in multifamily units has occurred in 2010 as a result of a few large developments. Most residential development occurs on undeveloped land, but redevelopment of existing parcels has taken place in the more urbanized parts of the region, where the demand for housing pushes up against constraints in the supply of available land.

Agriculture and Forestry: Land in farms and forestry is slowly converting to mainly residential and estate uses across the region. However, there has been a slight increase in the total number of farms, signaling the emergence of small agricultural operations. The George Washington National Forest is not expected to change size, but may be more or less open to logging depending on economic and political forces.

Open Space: Open space can be defined as any land left in a completely natural, recreational park or agricultural state. The growth in population entails that land is slowly being converted to residential and commercial uses, although there is are a growing number of properties entering permanent protection through conservation easements. State Park land has increased with the purchase of Biscuit Run State Park south of Charlottesville, and the Shenandoah National Park is not expected to change in area. Some developments in rural areas use conservation design techniques to preserve a set amount of open space 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 residential areas. In recent years, new large-scale retail has been built further from Charlottesville in Zion Crossroads in Louisa County and Ruckersville in Greene County. Additionally, large, mixed-use projects are underway in the U.S 29 corridor.

Public Space: The primary social public space for the region is the Downtown Mall in Charlottesville, although other commercial centers function as public gathering spaces, even if they are under private ownership. Each county has at least one park available for public use. 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 of this plan.

Economic Growth and Development

Relative to other metropolitan regions in Virginia and around the country, the overall economic growth from the Planning District has been healthy. However, the region has not been immune to 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
Charlottesville	3.3 %	1.7 %	6.1 %
Albemarle	2.4 %	1.4 %	4.9 %
Fluvanna	3.8 %	1.5 %	5.5 %
Greene	3.9 %	1.5 %	5.2 %
Louisa	8.2 %	3.0 %	7.8 %
Nelson	4.0 %	2.3 %	5.9 %
TJPDC	3.6 %	1.7 %	5.9 %
VA	4.9 %	2.2 %	6.3 %
National	6.1 %	4.0 %	9.2 %

Source: Virginia Employment Commission

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. Major employers in the area include the University of Virginia, Martha Jefferson Hospital, State Farm, GE Fanuc, Dominion Virginia Power, Wintergreen Resort, Lexis Publishing, Crutchfield Corporation, FIC Staff Services, Piedmont Virginia Community College, Klockner-Pentaplast, and the Virginia Department of Corrections.

The following table shows changes in various non-farm employment sectors from the Virginia Employment Commission.

Top Industry Sectors in the Charlottesville MSA

Rank	Industry Sector	2010 Establishments	2010 Employees
	Total, all industries	6,490	93,685
1	Education Services	110	17,981
2	Health Care and Social Assistance	809	16,436
3	Retail Trade (44 & 45)	720	10,059
4	Accommodation and Food Services	467	9,419
5	Professional, Scientific & Technical Svc	834	6,363
Rank	**Industry Sector**	**Establishments**	**Employees**
6	Construction	753	5,189
7	Public Administration	117	3,845
8	Other Services (except Public Admin.)	750	3,842
9	Manufacturing (31-33)	193	3,625

Source: Labor Market Statistics, Quarterly Census of Employment and Wages Program

Most jobs in the region are located in Charlottesville, along the Route 29 corridor, or in the Pantops area of Albemarle County. The other counties in the region host 17% of the region's employment, where the major employment centers are schools and a small number of manufacturing centers. Rural employment is distributed more evenly in relation to residential density. Albemarle County saw an average annual job growth of 2.9% between 2000 and 2010, with Louisa and Fluvanna showing 1.8% and 1.2% growth. Employment in Nelson County and Charlottesville has not grown significantly, and Greene County lost 2% of their jobs over the last decade.

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.

The economic impact of a natural disaster can often be felt long after the debris is cleared. 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 U.S. Census, in 2010 there were a total of 105,453 housing units in the Thomas Jefferson Planning District and eighty-seven percent of all units are currently occupied year round. Over two-thirds of units are single-family detached homes, and 65% include three or more bedrooms. Multifamily construction peaked in 2002 and single-family construction peaked in 2005, with both housing types showing significant drops in the last few years. There remains a high inventory of homes, particularly in the rural areas. Louisa and Fluvanna counties, as well as some neighborhoods in Charlottesville, are experiencing high levels of foreclosures. This suggests that the housing supply for both rentals and ownership is not expected to grow by a significant amount in the near future.

Number of Housing Units

Locality	2000	2010	% Change
Charlottesville	17,591	19,189	9.1%
Albemarle	33,720	42,112	24.9%
Fluvanna	8,018	10,383	29.5%
Greene	5,986	7,509	25.4%
Louisa	11,855	16,319	37.7%
Nelson	8,554	9,931	16.1%

Source: US Census Bureau

The following table outlines the increases in household income over a 10-year period. It is clear that in many cases, when compared with the increase in housing costs (shown on the following page), income increases are not sufficient to keep up.

Median Household Income from 1990 to 2009

Locality	1990	2000	2005-2009	% Change 2000 - 05-09
Charlottesville	$24,190	$31,007	$38,369	23.7%
Albemarle	$36,886	$50,749	$64,306	26.7%
Fluvanna	$31,378	$46,372	$62,163	34.1%
Greene	$29,799	$45,931	$54,153	17.9%
Louisa	$26,169	$39,402	$51,775	31.4%
Nelson	$23,705	$36,769	$44,326	20.6%

Source: US Census Bureau

Median home values are perceived to be highest in Charlottesville and Albemarle, which indicates 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. Typically self-reported home values lag behind changes in the market, meaning they may be inflated during recessions or deflated in times of growth compared to fair market value.

Median Home Values: From 1990 to 2009

Locality	1990	2000	2005 - 2009	% Change 2000 - 05-09
Albemarle	$111,200	$160,500	$336,100	109%
Charlottesville	$85,600	$117,800	$265,300	125%
Fluvanna	$75,100	$113,200	$236,200	109%
Greene	$73,700	$108,200	$215,000	99%
Louisa	$64,400	$96,100	$202,300	111%
Nelson	$53,100	$94,000	$161,200	71%

Source: U.S. Census Bureau

The 2000 median self-reported figures for homes in the Planning District show a substantial increase from the self-reported figures from the 1990 Census. The following table shows that actual sale prices increased significantly between 2005 and 2007, and then back-tracked almost exactly to 2005 levels over the next two years, as a result of the housing downturn.

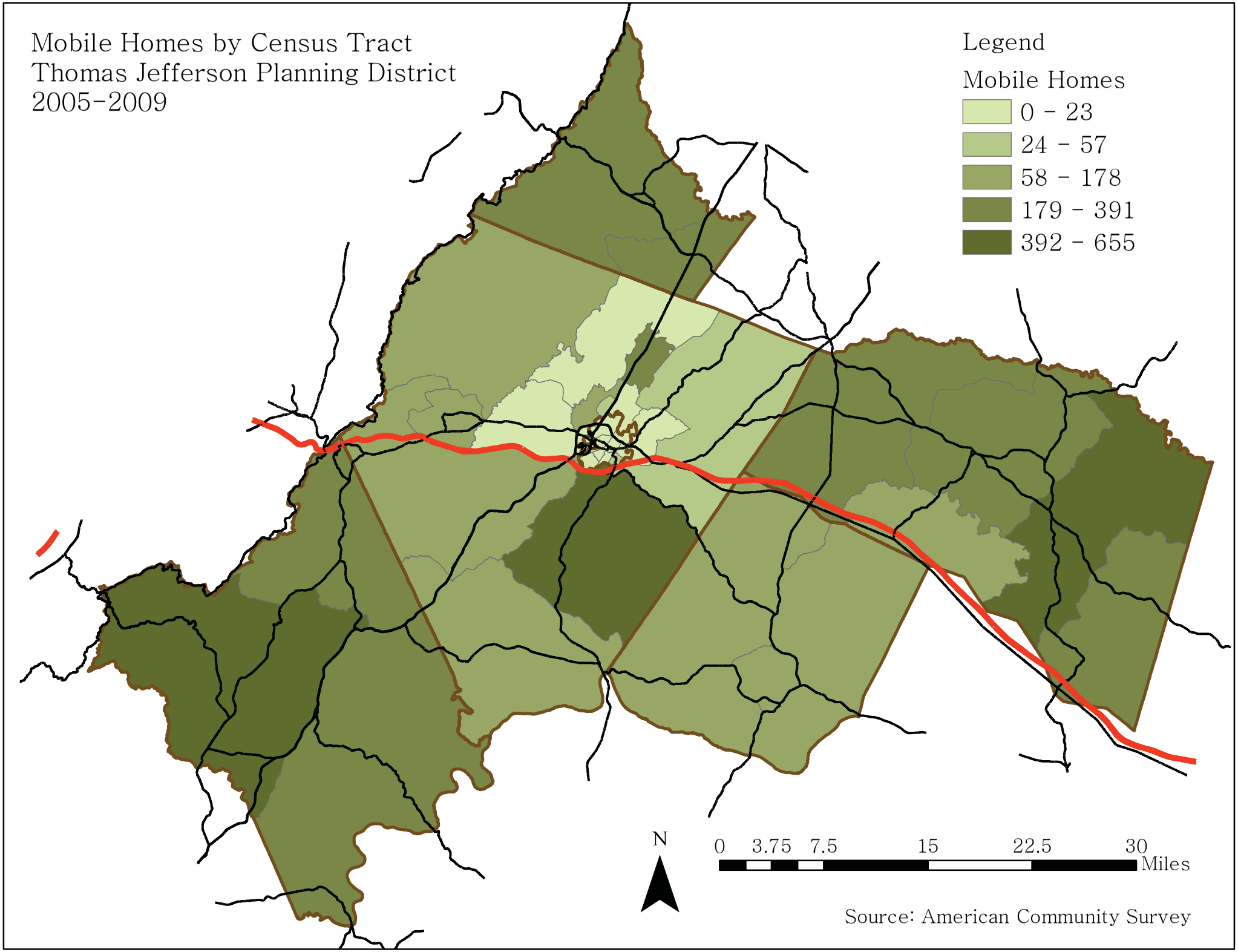
Median Sale Price: 2005- 2009

Locality	2005	2007	% Change 2005 -2007	2009	% Change 2007 -2009
Albemarle	$ 285,000	$ 320,000	12%	$ 320000	0%
Charlottesville	$ 249,000	$ 280,000	12%	$ 246750	-12%
Fluvanna	$ 234,000	$ 260,000	11%	$ 201978	-22%
Greene	$ 234,900	$ 285,000	21%	$ 245000	-14%
Louisa	$ 205,900	$ 265,000	29%	$ 209900	-21%
Nelson	$ 300,000	$ 310,000	3%	$ 278500	-10%
Region	$ 251,467	$ 286,667	14%	$ 250,355	-13%

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 on the following page illustrates the concentration of mobile homes in the Planning District. Mobile homes are often susceptible to extensive damage in flooding and high winds.


Mobile Homes by Census Tract
Thomas Jefferson Planning District
2005-2009
Legend
Mobile Homes
0 - 23
24 - 57
58 - 178
179 - 391
392 - 655
N
0 3.75 7.5 15 22.5 30
Miles
Source: American Community Survey

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 were declared
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

Source: FEMA, VDEM

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.

The 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 completed in 2006 and have not significantly changed in the previous five years. However, new data and information on regional events that occurred between 2004 and 2010 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, flooding, winter storms, hurricanes, and high wind 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 2006.

	PROBABILITY 2011	HUMAN IMPACT 2011	PROPERTY IMPACT 2011	BUSINESS IMPACT 2011	RISK 2011
	Likelihood this will occur	*Possibility of death or injury*	*Physical losses and damages*	*Interruption of services*	*Relative threat (increases with Percentage)*
EVENT	**0 = N/A 1 = Low 2 = Low-Moderate 3 = Moderate 4= Hi-Moderate 5=High**	**0 = N/A 1 = Low 2 = Moderate 3 = High**			*0 - 100%*
Flooding	**5**	**3**	**3**	**2**	**89%**
Winter Storms	**5**	**2**	**2**	**2**	**67%**
Hurricanes	**3**	**2**	**2**	**2**	**40%**
High Wind / Windstorms	**3**	**2**	**2**	**1**	**33%**
Wildfire	**3**	**1**	**2**	**1**	**27%**
Lightning	**4**	**1**	**1**	**1**	**27%**
Tornadoes	**2**	**2**	**2**	**2**	**27%**
Drought	**3**	**0**	**2**	**2**	**27%**
Extreme Heat	**3**	**2**	**0**	**1**	**20%**
Dam Failure	**1**	**3**	**3**	**2**	**18%**
Landslides	**2**	**1**	**1**	**1**	**13%**
Earthquake	**2**	**1**	**1**	**1**	**13%**
Extreme Cold	**1**	**2**	**1**	**1**	**9%**
AVERAGE SCORE	**2.64**	**1.57**	**1.57**	**1.36**	**26%**

Risk = Probability * Severity

Risk	Probability	Severity
.26	.53	.50

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.

Source: National Weather Service

Analysis

Flooding is the most significant 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.

Before the levee was built in Scottsville

Markings show the height of past floods

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.

The James and Rivanna Rivers converge in Columbia

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 2004 - 2010					
Locality	**#**	**Deaths**	**Injuries**	**Property Loss**	**Crop Damage**
Albemarle	24	0	0	$ 5,000	$ -
Charlottesville	2	0	0	$ 5,000	$ -
Fluvanna	0	0	0	$ -	$ -
Greene	8	0	0	$ 100,000	$ -
Louisa	3	0	0	$ -	$ -
Nelson	14	0	0	$ -	$ -
Region	**51**	**0**	**0**	**$ 110,000**	**$ -**

Flood Record 1993 - 2003					
Locality	**#**	**Deaths**	**Injuries**	**Property Loss**	**Crop Damage**
Albemarle	24	1	0	$ 336,000	$ 900,000
Charlottesville	4	0	0	$ -	$ -
Fluvanna	5	0	0	$ 10,000	$ 361,000
Greene	25	4	1	$ 17,141,000*	$ -
Louisa	25	0	0	$ 71,000	$ -
Nelson	8	0	0	$ 1,296,000	$ 50,000
Region	**91**	**5**	**1**	**$ 18,854,000**	**$ 1,311,000**

Source: National Climatic Data Center ** Total reported for multiple localities*

Notable Flood Events in the Planning District (1993-2010)

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 problems with wells & septic tanks	June 27, 1995
Flood	Albemarle	$1,000 property damage	June 25, 1994
Flood	Albemarle	$5,000 property damage	Aug 17, 1993
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 Bremo	$5,000 property damage	Jan 17, 1995
Flash Flood	Fluvanna	$5,000 property damage	March 4, 1993
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

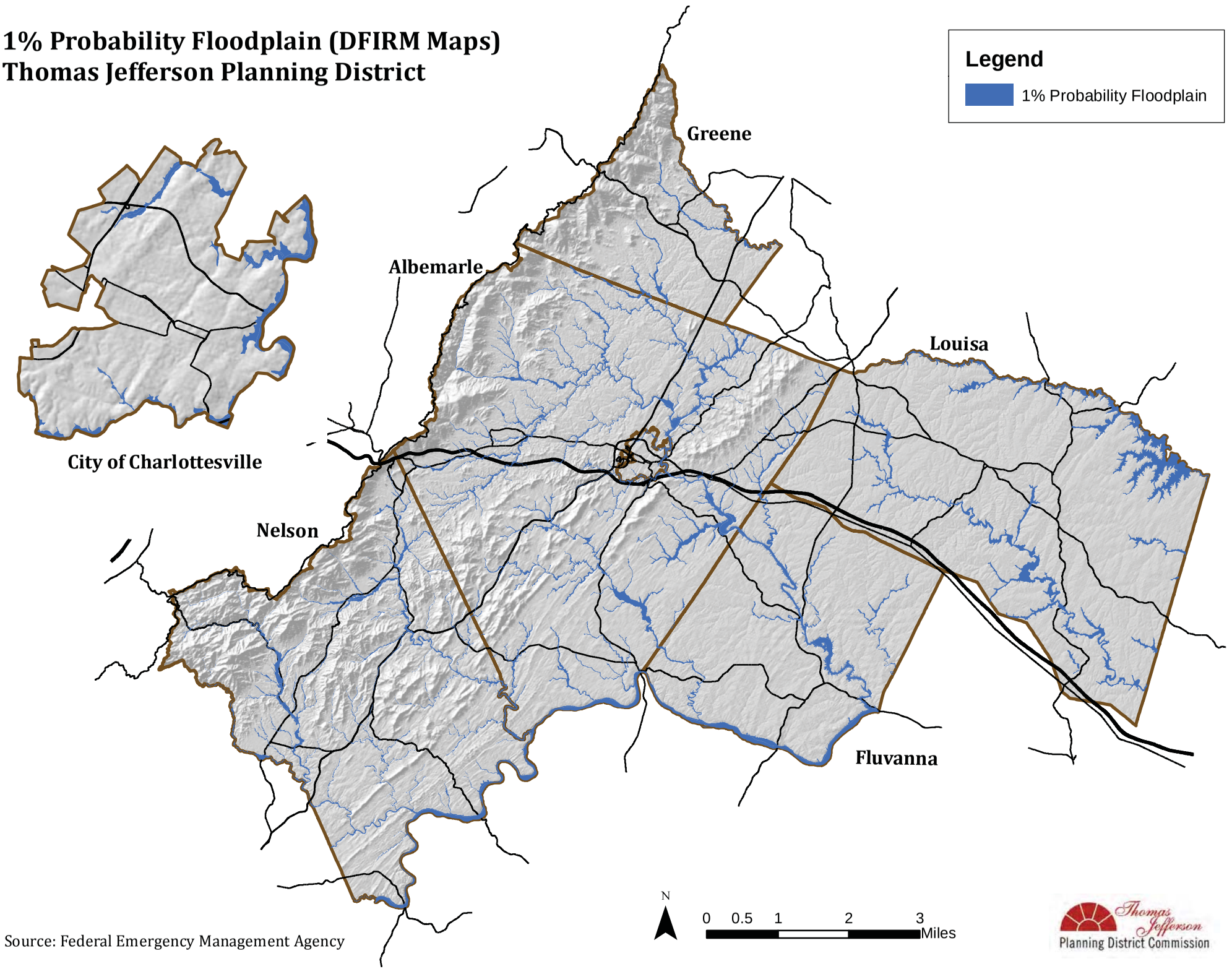
Flash Flood	Greene		Sept 9, 1999
Flood	Greene	$10,000 property damage	March 20, 1998
Flood	Greene	$2,000 property damage	Feb 17, 1998
Flood	Greene	$5,000 property damage	Feb 4, 1998
Flood	Greene		Jan 28, 1998
Flood	Greene	$3,000 property damage	Jan 23, 1998
Flash Flood	Greene	$10,000 property damage	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	Jan 19, 1996
Flash Flood	Greene		Oct 5, 1995
Flash Flood	Greene (Dyke)	$250,000 property damage	Jun 27, 1995
Flash Flood	Greene	$1,000 property damage	Aug 17, 1994
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
Flash Flood	Louisa	$1,000 property damage	Aug 17, 1994
Flash Flood	Louisa	$5,000 property damage	March 4, 1993
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
Flash Flood	Nelson	$1000 property damage	Aug 17, 1994
Flash Flood	Nelson	$5,000 Property Damage	March 4, 1993

Source NOAA, NCDC, Historical Society (newspapers)

Data Disclaimer: In all tables where 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.

1% Probability Floodplain (DFIRM Maps)
Thomas Jefferson Planning District



Source: Federal Emergency Management Agency

Thomas Jefferson Planning District Commission

Severe Winter Storms and Extreme Cold

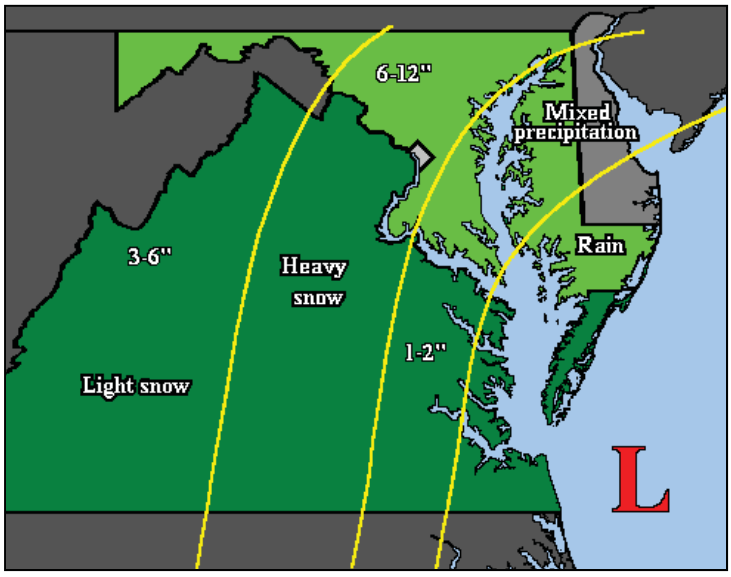
Identification

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.

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.

Analysis

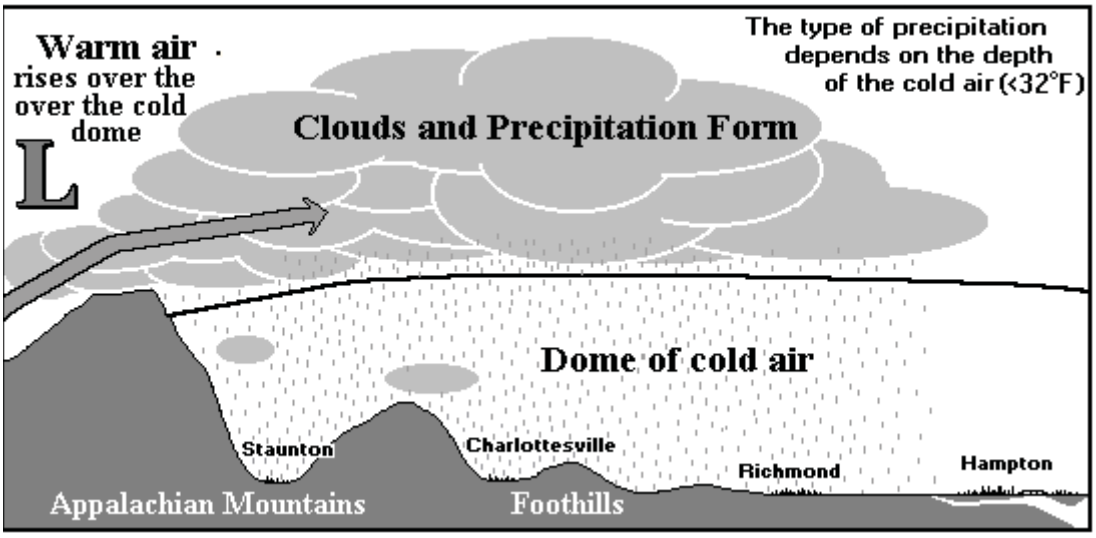


Heavy Snow: Virginia's biggest winter storms are labeled as "Nor'easters". These storms occur when arctic air flows from New England into Virginia. Cold dry air becomes trapped to the east of the Appalachian Mountains, funneling down the valleys and along the coastal plain toward North Carolina. When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

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 wrecks 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 occur to buildings and communication towers. During the February 10-11, 1994 ice storm, some areas of southern Virginia received 3 inches of ice causing extensive tree damage and weeklong power outages. All of the localities in the Thomas Jefferson Planning District are affected by severe winter storms every year, with the severity and extent varying year to year.

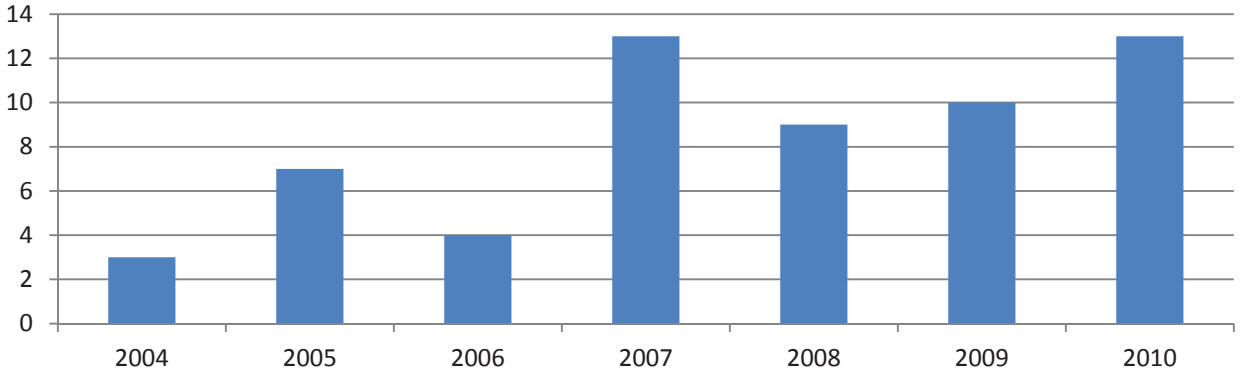
Extreme Cold: Extremely cold temperatures have also caused some damage in the Thomas Jefferson Planning District, particularly crop damage. In January 1994, temperatures reached -15°F, damaging peach crops. In April 1997, $18 million in crop damage was reported due to extremely cold weather. Temperatures of -30°F were reported in February of 1899.

Summary of Winter Storms

Winter Events by Type from 2004 - 2010						
	Winter Weather	**Winter Storm**	**Frost/Freeze**	**Winter Weather/mix**	**Ice Storm**	**Freezing Fog**
Albemarle	16	14	9	2	4	1
Charlottesville	0	0	0	0	0	0
Fluvanna	13	11	0	6	0	0
Louisa	3	9	0	0	0	0
Greene	15	12	7	7	2	0
Nelson	8	10	6	6	4	0
Region	**55**	**56**	**22**	**21**	**10**	**1**

Source: National Climate Data Center

Total Winter Events in Thomas Jefferson Region (2004 - 2010)

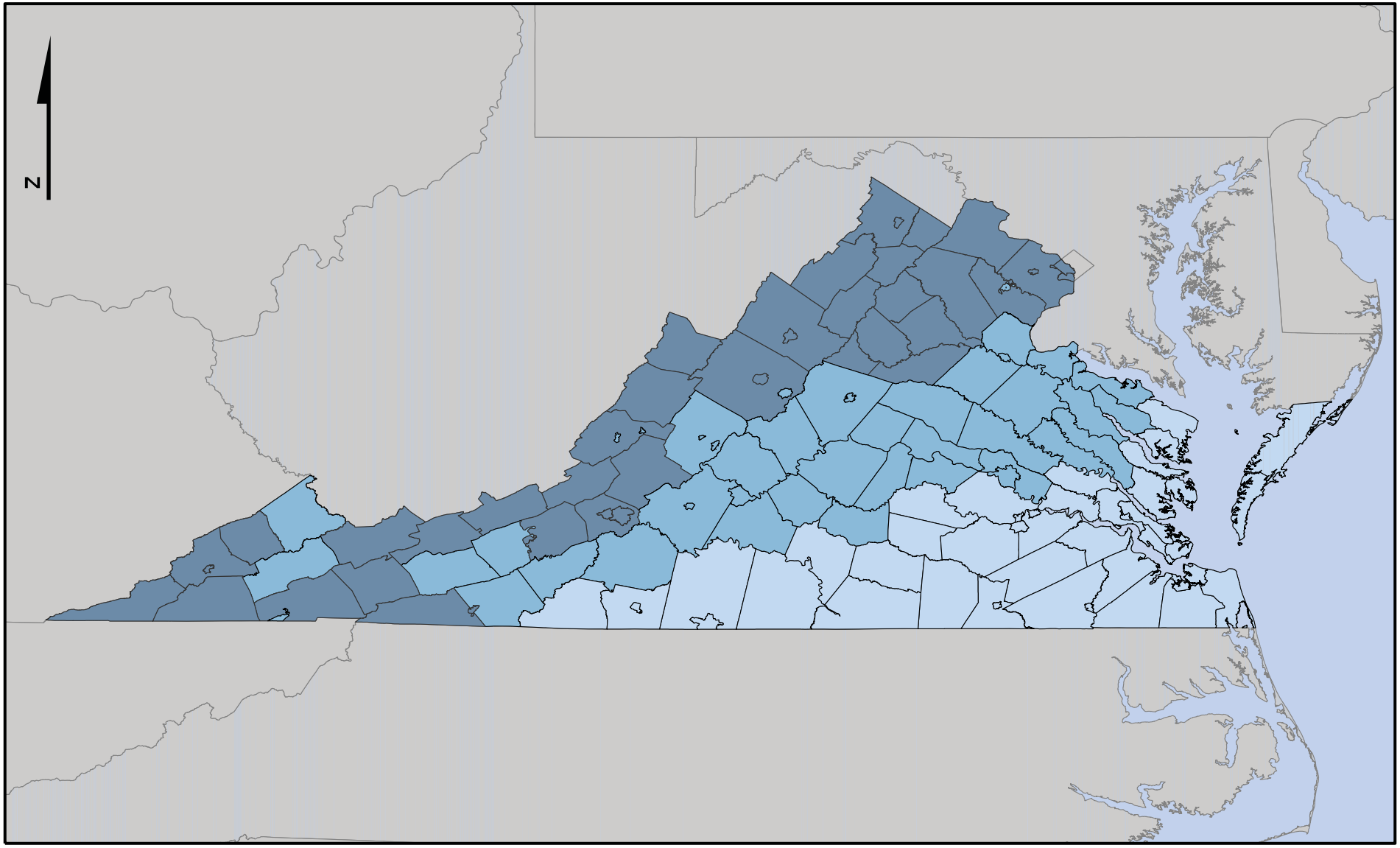


Notable Winter Storms in the Planning District

Event	Damage	Date
Winter Storm		Dec. 18, 2009
Winter Storm	$8.9 Million property damage, 1 death	Feb 14, 2003
Ice Storm	$465,000 property damage, 2 injuries	Jan 30, 2000
Ice Storm	$125,000 property damage, $1.2 million crop damage	Feb 4, 1998
Ice Storm	$20 million property damage	Dec 12, 1998
Heavy Snow	$350,000 property damage, 1 injury	Jan 12, 1996
Blizzard (Presidential Disaster)	$250,000 property damage, 1 death, 1 injury	Jan 6, 1996

Source: NCDC

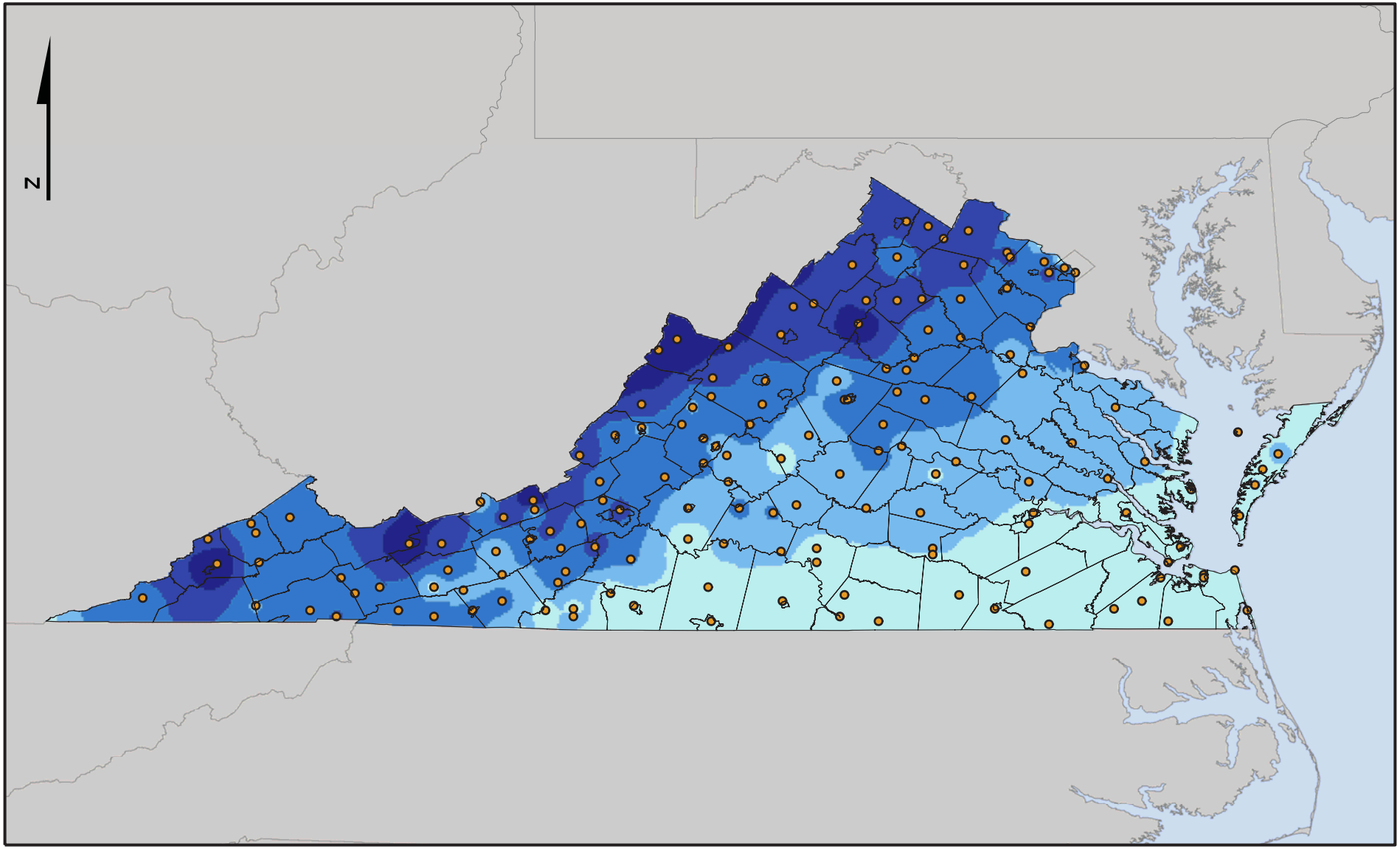
WINTER STORM SEVERITY FOR VIRGINIA



Low Severity
Medium Severity
High Severity

Map prepared by Virginia Tech Center for Geospatial Information Technology
Date: February 2004
Data Sources: NOAA snowfall records VT CGIT

VIRGINIA SNOWFALL (inches)



Weather Stations

2.65 - 10.69

10.69- 16.12

16.12- 21.55

21.55 - 29.37

29.37 - 58.26

Map prepared by Virginia Tech Center for Geospatial Information Technology

Date: July 2004

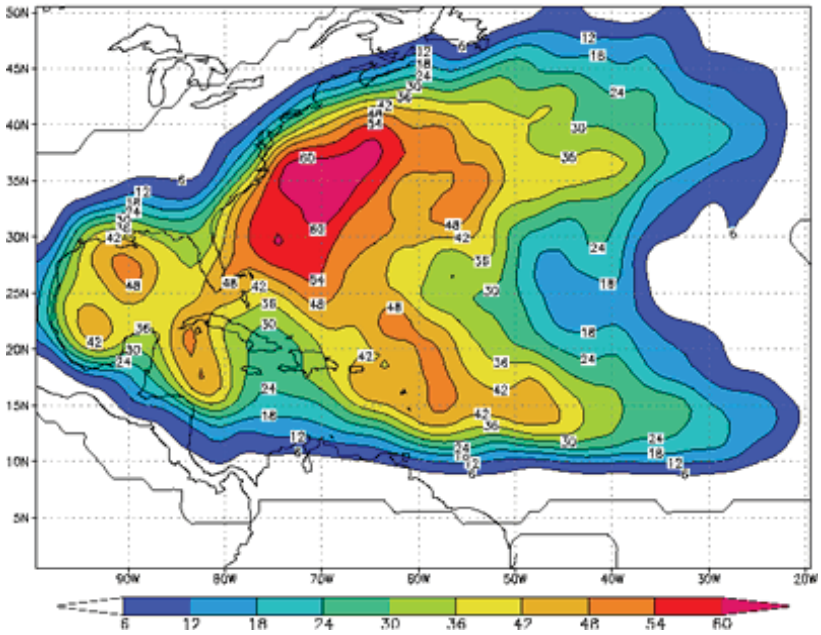
Data Sources: NOAA Snowfall Records, SE Regional Climate Center, VT CGIT

Hurricanes

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.

Empirical Probability of a Named Storm



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

Category	Maximum Sustained Wind Speed (MPH)	Minimum Surface Pressure (Millibars)	Storm Surge (Feet)
1	74—95	Greater than 980	3—5
2	96—110	979—965	6—8
3	111—130	964—945	9—12
4	131—155	944—920	13—18
5	155+	Less than 920	19+

Source: National Hurricane Center

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.

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.

Source: National Hurricane Center

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 temperature 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 may catch some by surprise, 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.

Summary of Hurricanes

Hurricane and Tropical Storm Record (1954 - 2010)					
Locality	**#**	**Deaths**	**Injuries**	**Property Loss**	**Crop Damage**
Albemarle/Cville (reported with Nelson)	1	0	0	0	0
Fluvanna (reported with Louisa)	1	3	0	$45,070,000	$7,140,000
Greene	0	0	0	0	0
Louisa (reported with Fluvanna)	1	3	0	$45,070,000	$7,140,000
Nelson (reported with Albemarle)	1	0	0	0	0

Source: National Climate Data Center

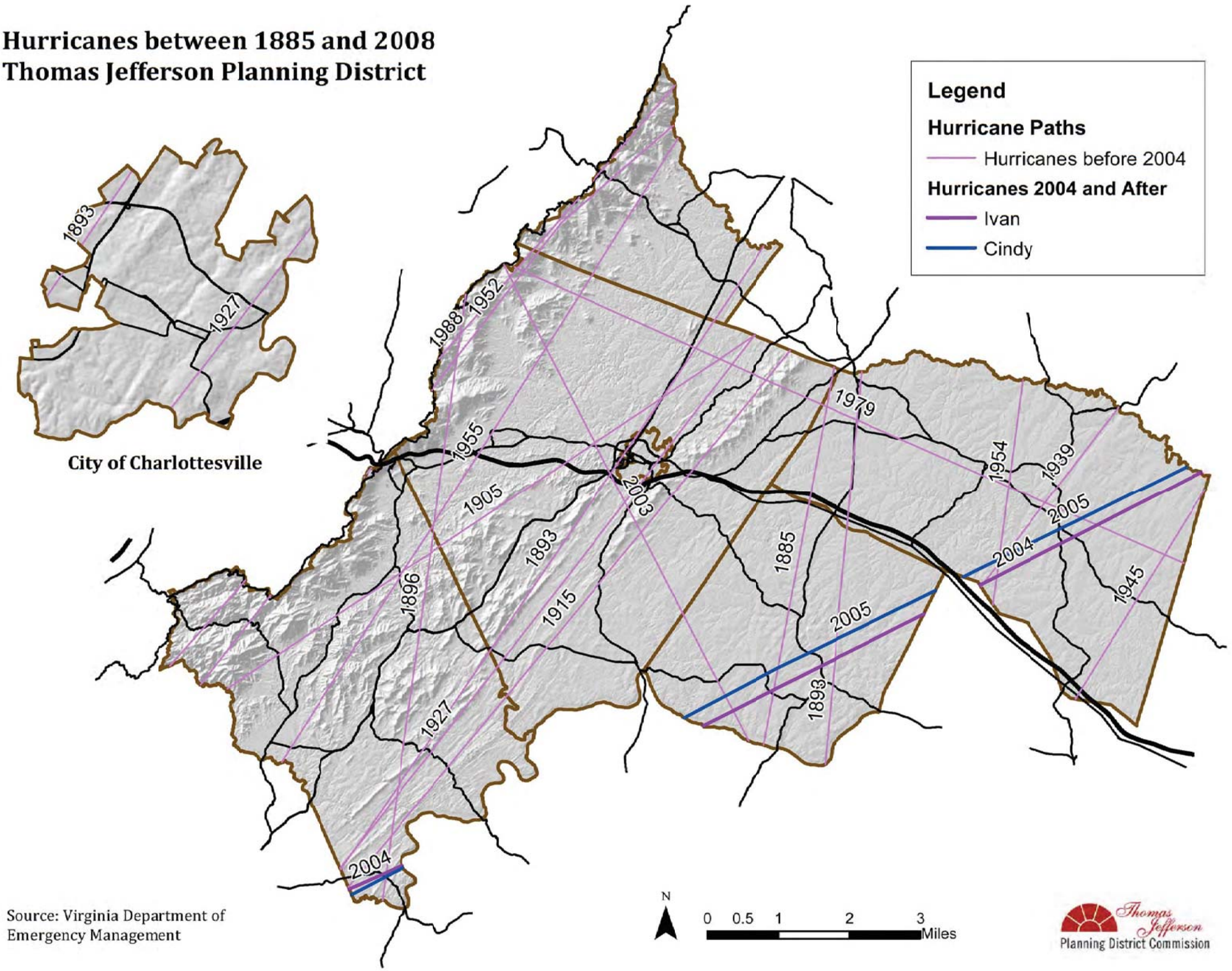
Notable Hurricanes in the Planning District

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.**
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 2008
Thomas Jefferson Planning District



Source: Virginia Department of Emergency Management

Thomas Jefferson Planning District Commission

High Winds and Thunderstorms

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.

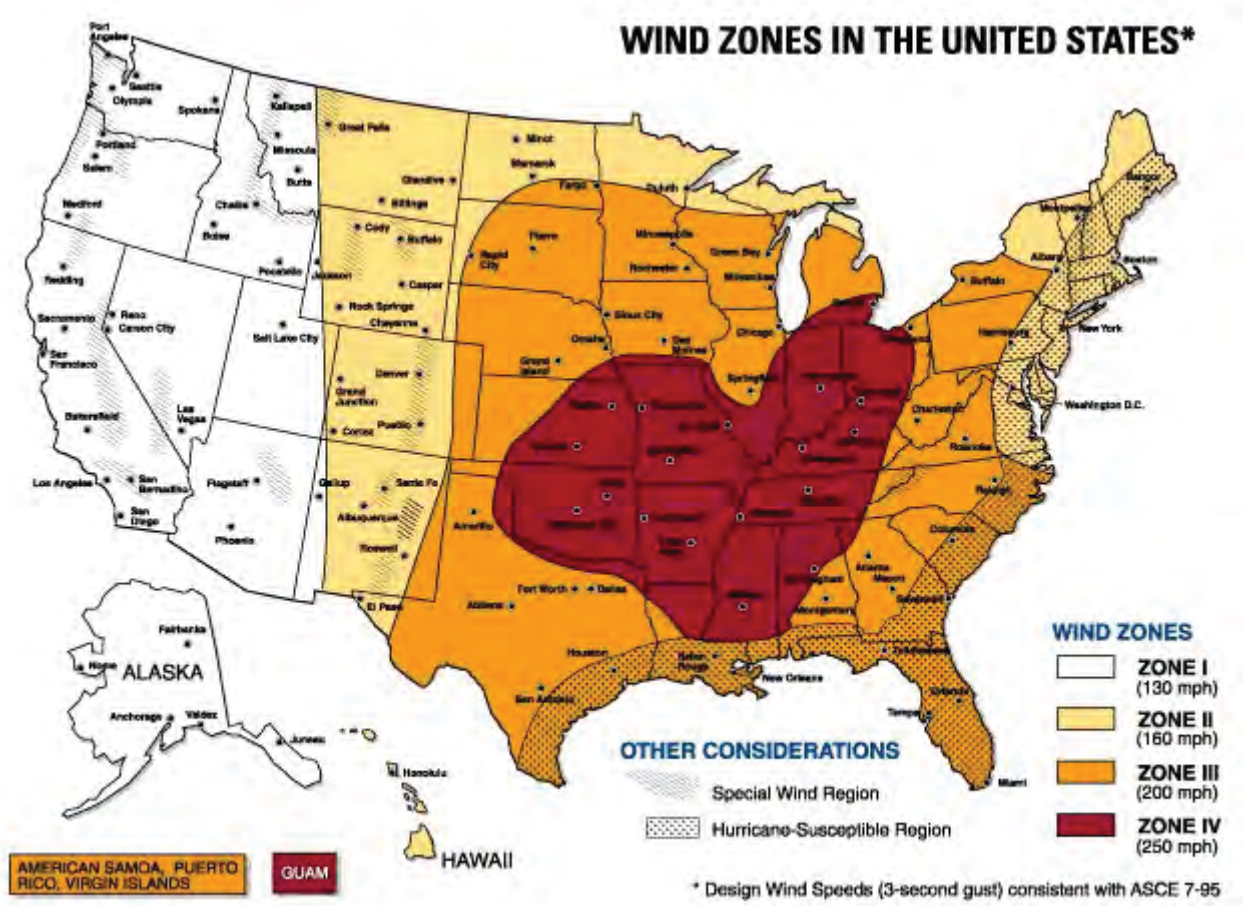
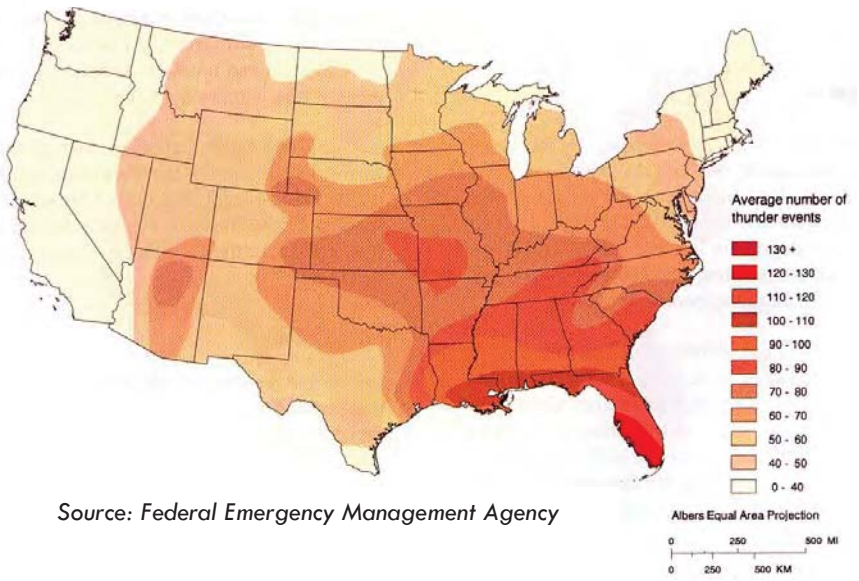


Figure I.2 Wind zones in the United States

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 because atmospheric conditions in those regions are most ideal for generating these powerful storms.

Annual Average Number of Thunder Events



Source: Federal Emergency Management Agency

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 figure to the right illustrates thunderstorm hazard severity based on the annual average number of thunder events from 1948 to 1977.

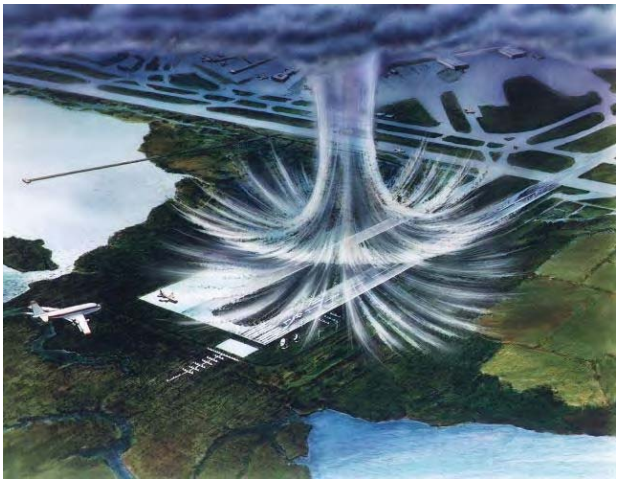


Illustration of Microburst *Source: NASA*

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.

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

Summary of Thunderstorms and High Wind

Thunderstorms Record from 1956-2010					
Locality	**#**	**Deaths**	**Injuries**	**Property Loss**	**Crop Damage**
Albemarle	110	0	1	$958,000	-
Charlottesville	33	0	3	$221,000	-
Fluvanna	41	0	0	$364,000	-
Greene	39	0	0	$150,000	-
Louisa	41	0	0	$364,000	-
Nelson	46	0	0	$175,000	-

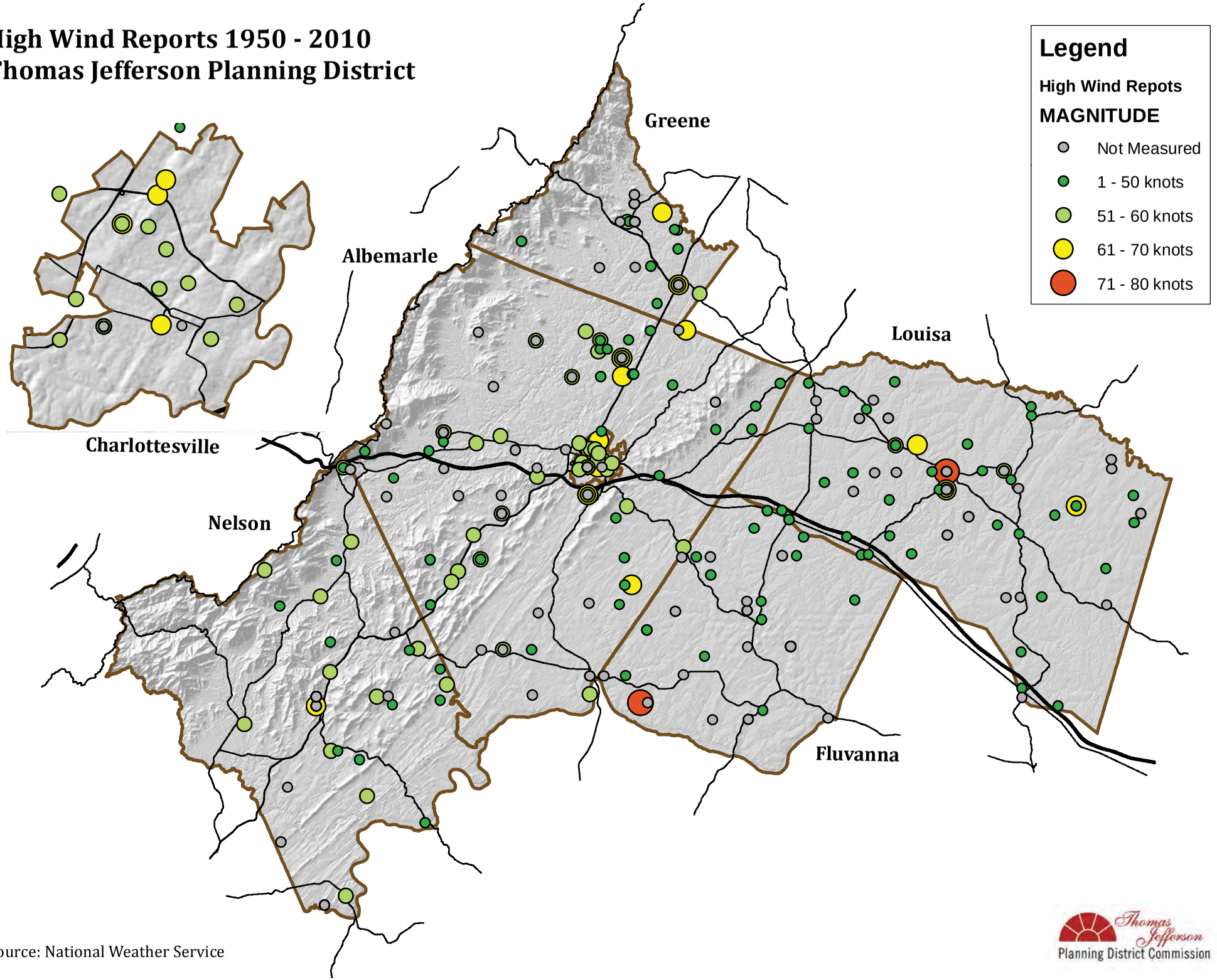
Source: National Climate Data Center

Notable windstorms and thunderstorms in the Planning District

Storm type	Damage	Date
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 (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

High Wind Reports 1950 - 2010
Thomas Jefferson Planning District



Source: National Weather Service

Thomas Jefferson Planning District Commission

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.

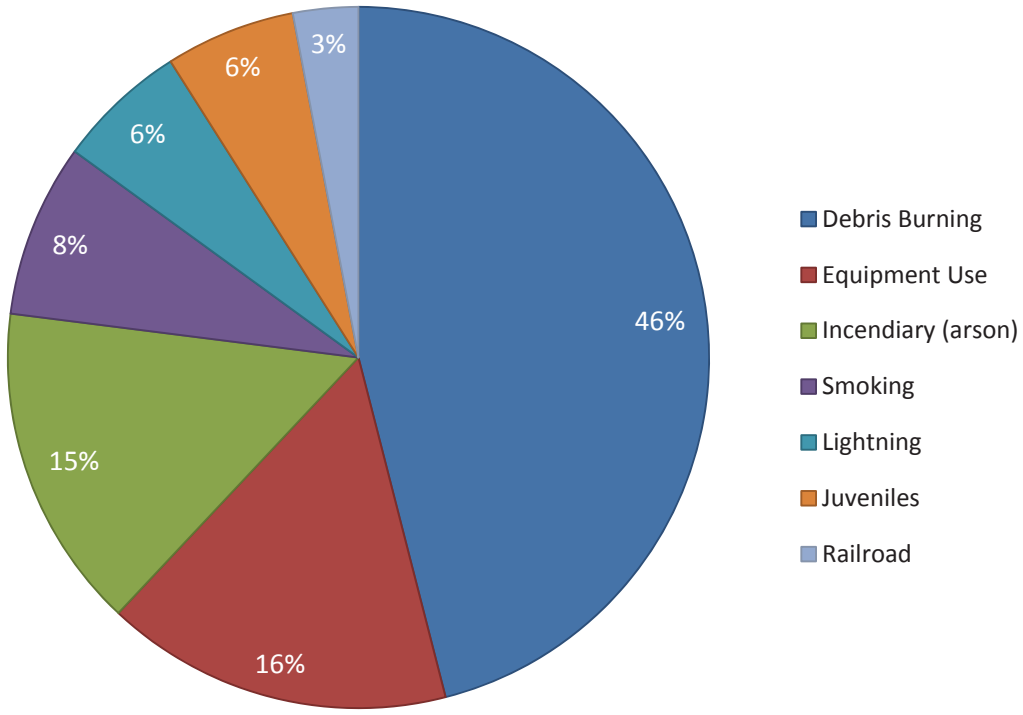
Many individual homes and cabins, subdivisions, resorts, recreational areas, organizational camps, businesses, and industries are located within high fire hazard areas. The term wildland-urban interface refers to the zone of transition between unoccupied land and human development. The increasing demand 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

Summary of Wildfires

Wildfire Events 1995-2004						
Locality	**# of Fires**	**Acres**	**Timber/Crop Damage**	**Building/Personal Property Damage**	**Total Property Damage**	**Suppression Costs**
Albemarle	472	2,420	$13,685	$228,190	$241,675	$214,695
Fluvanna	108	445	$9,210	$171,050	$180,260	$7,909
Greene	69	115	$5,042	$43,950	$48,992	$4,581
Louisa	249	689	$65,065	$138,123	$203,188	$18,105
Nelson	241	3,098	$40,926	$1,202,095	$1,243,021	$229,670
TJPD	1139	6,767	$133,928	$1,783,408	$1,917,336	$474,960

Source: VA Department of Forestry

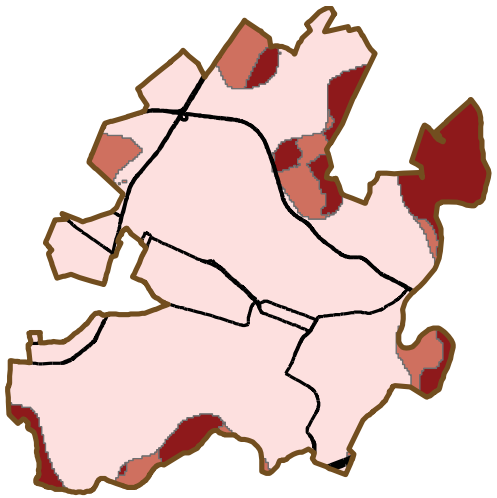
Notable Wildfires in the Planning District

County	Damage	Date
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 Virginia Department of Forestry for the Thomas Jefferson Planning District Commission. The first map is a composite index of wildfire risk that takes into account factors, such as forest conditions, historic precedent, and population density, that influence the probability of a fire occurring. Because the index was determined based on data up to 2001, the second map is provide to show the location and economic impact of all wildfire incents between 2004 and 2008.

Wildfire Hazard Assessment
Thomas Jefferson Planning District

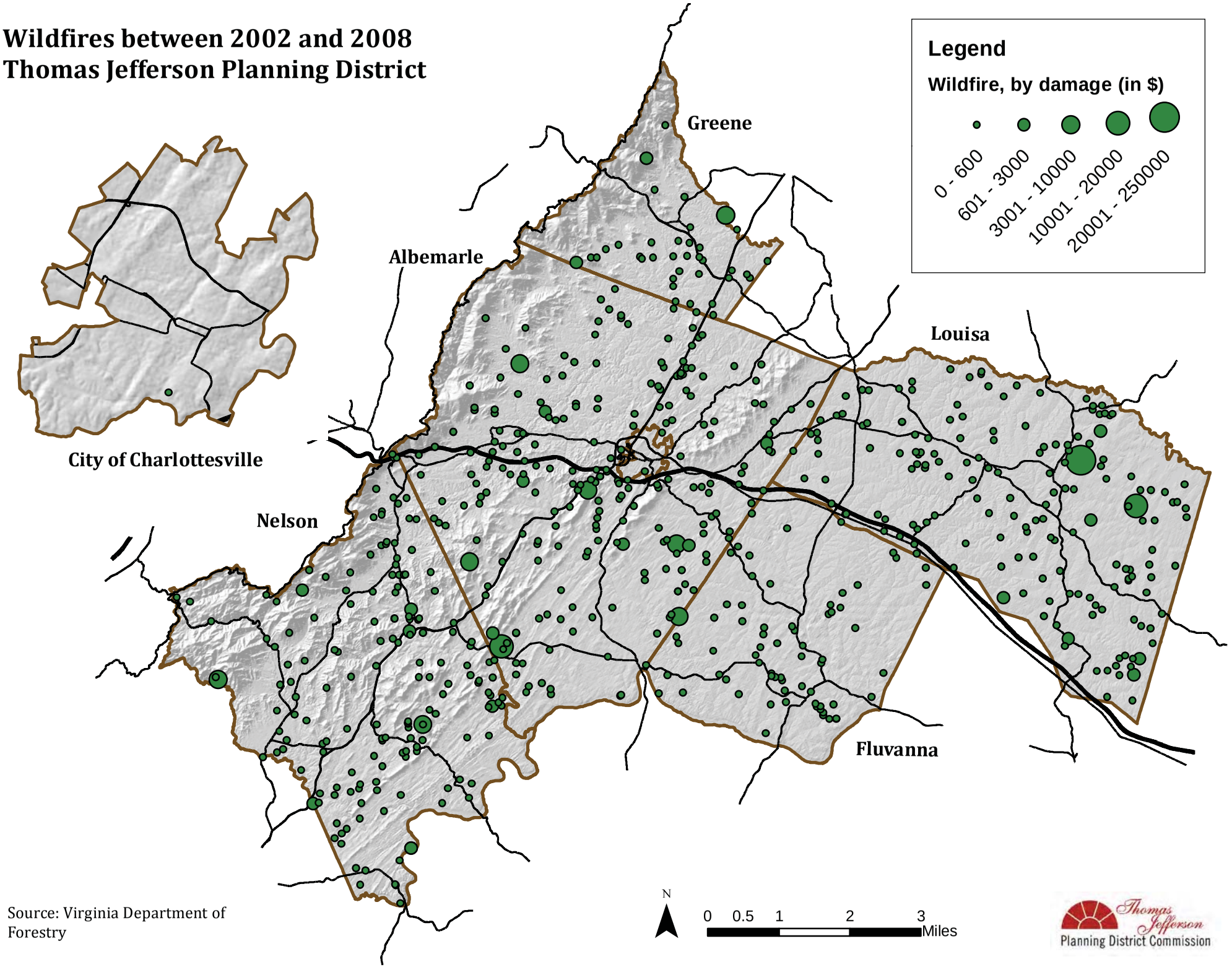


City of Charlottesville

Source: Virginia Department of Forestry, 2003

Thomas Jefferson Planning District Commission

Wildfires between 2002 and 2008
Thomas Jefferson Planning District



Source: Virginia Department of Forestry

Thomas Jefferson Planning District Commission

Tornadoes

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.

Enhanced Fujita Scale

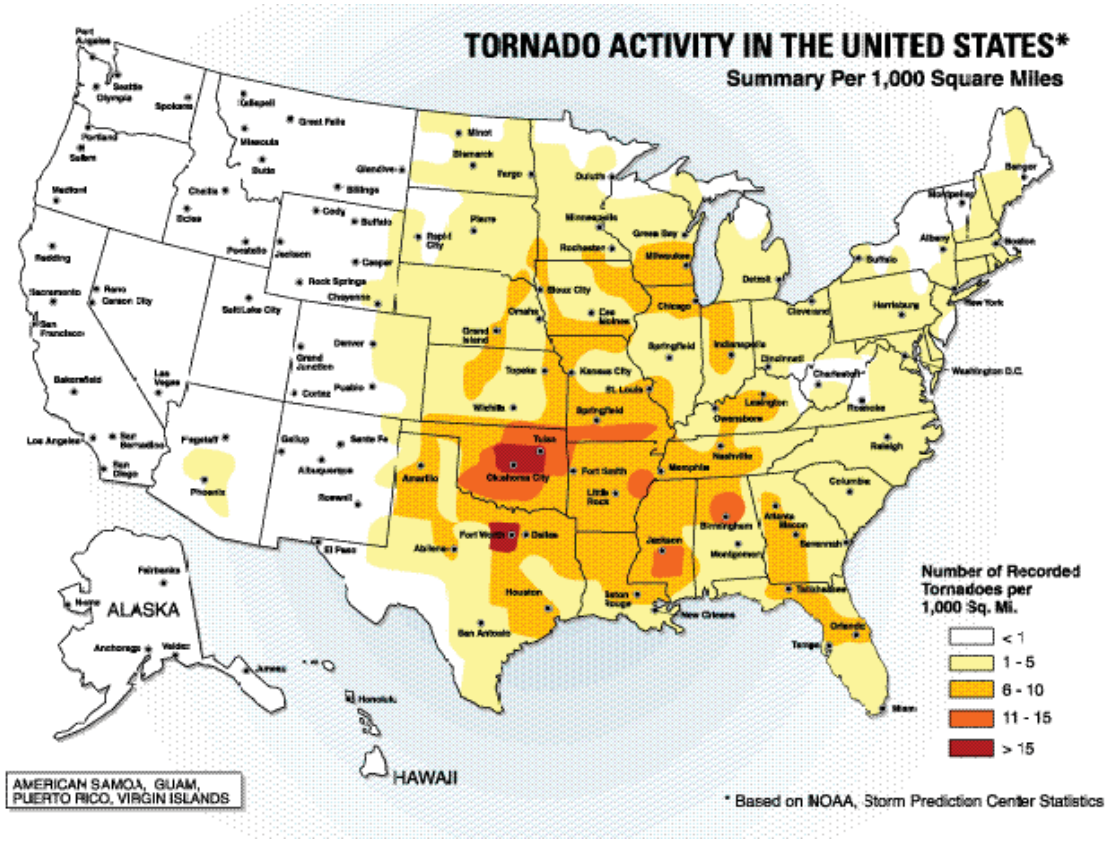
Scale	Wind speed	Name	Example of Damage
EF0	65–85	Gale	
EF1	86–110	Weak	
EF2	111–135	Strong	
EF3	136–165	Severe	
EF4	166–200	Devastating	
EF5	>200	Incredible	

Source: National Weather Service, photos from Wikicommons

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.



Source: American Society of Civil Engineers

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 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.

Tornado touching down on Route 29

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 2010. Albemarle, Louisa, and Greene counties were ranked high. The City of Charlottesville and Nelson and Greene counties were ranked moderate.

Summary of Tornadoes

Tornado Record 1959-June 2007					
Locality	**#**	**Deaths**	**Injuries**	**Property Loss**	**Crop Damage**
Albemarle/Cville	11	11	4	$750,000	0
Fluvanna	6	0	0	$278,000	0
Greene	4	1	12	$3,302,000	0
Louisa	9	0	0	$808,000	0
Nelson	2	0	0	$58,000	0

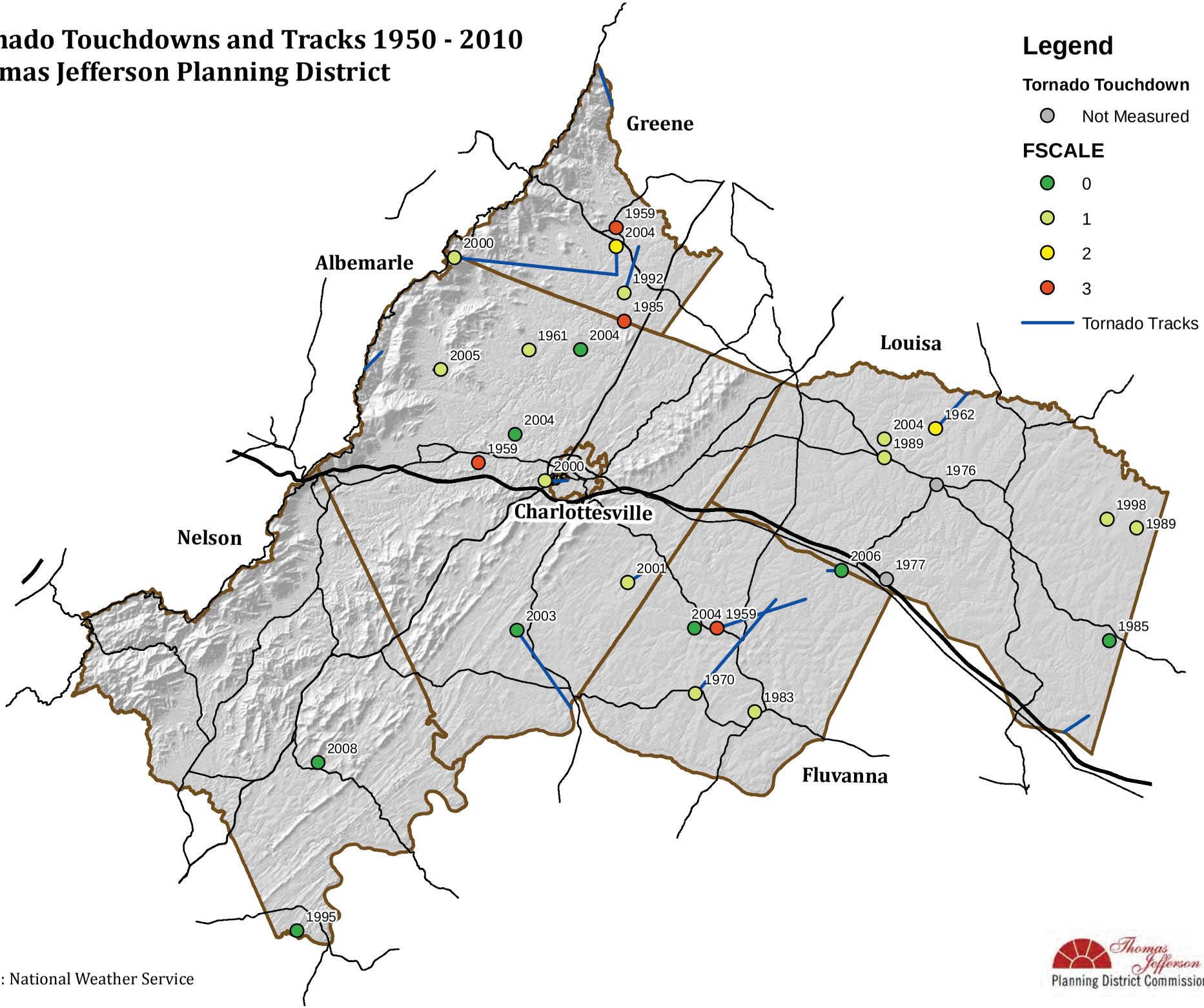
Source: National Climate Data Center, Virginia Department of Emergency Management

Notable Tornadoes in the Planning District

Class	Damage	Date
EF1	Historic homes damaged in Louisa County	October 13, 2011
F1	$500,000 property damage	August 30, 2005
F2	$3 million in property damage to Greene County. Produced by Tropical Storm Ivan.	Sept. 17, 2004
F1	$500,000 property damage	May 13, 2000
F1	$250,000 property damage	May 5, 1989
F3	$250,000 property damage	July 25, 1985
F1	$250,000 property damage	October 13, 1983
F2	$250,000 property damage	August 9, 1962
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

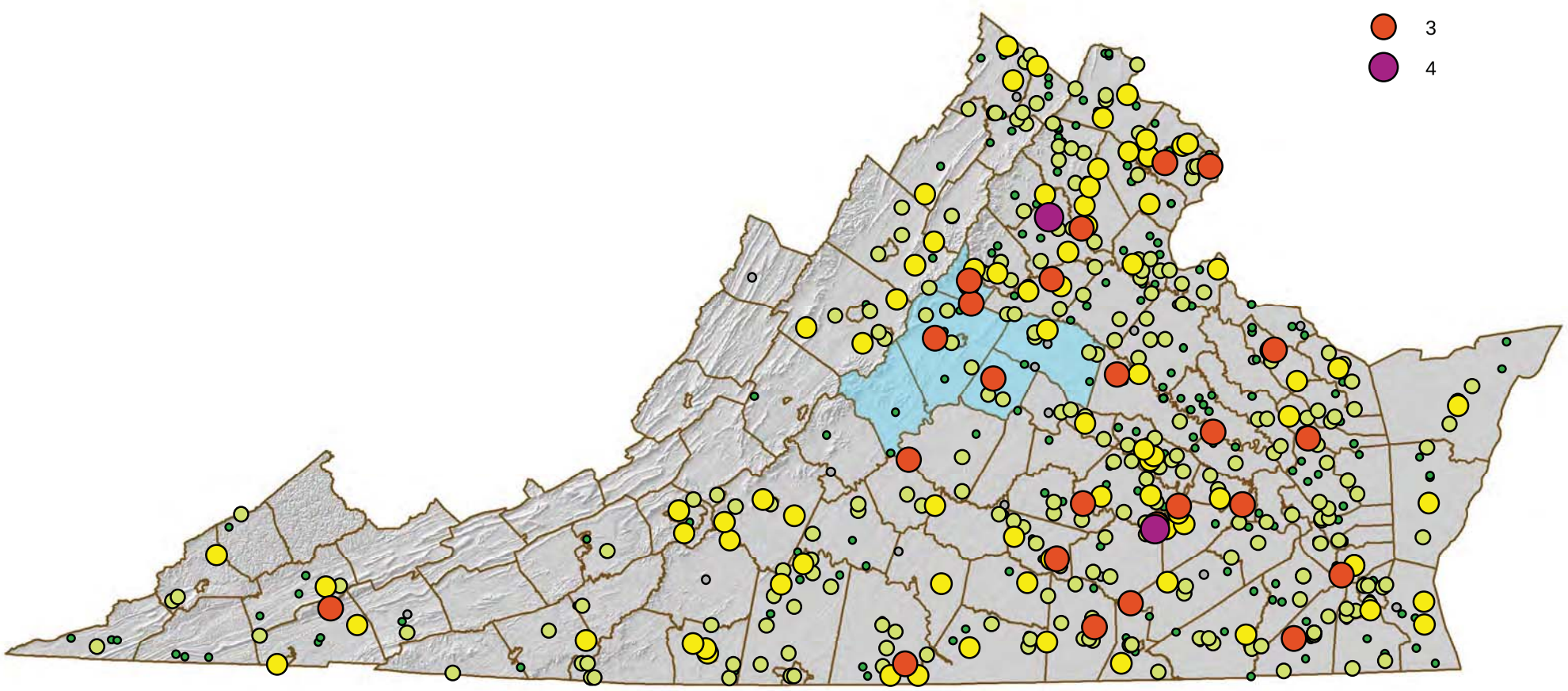
Tornado Touchdowns and Tracks 1950 - 2010
Thomas Jefferson Planning District



Source: National Weather Service

Thomas Jefferson Planning District Commission

Tornado Touchdowns 1950 - 2010
Commonwealth of Virginia



Source: National Weather Service

Thomas Jefferson Planning District Commission

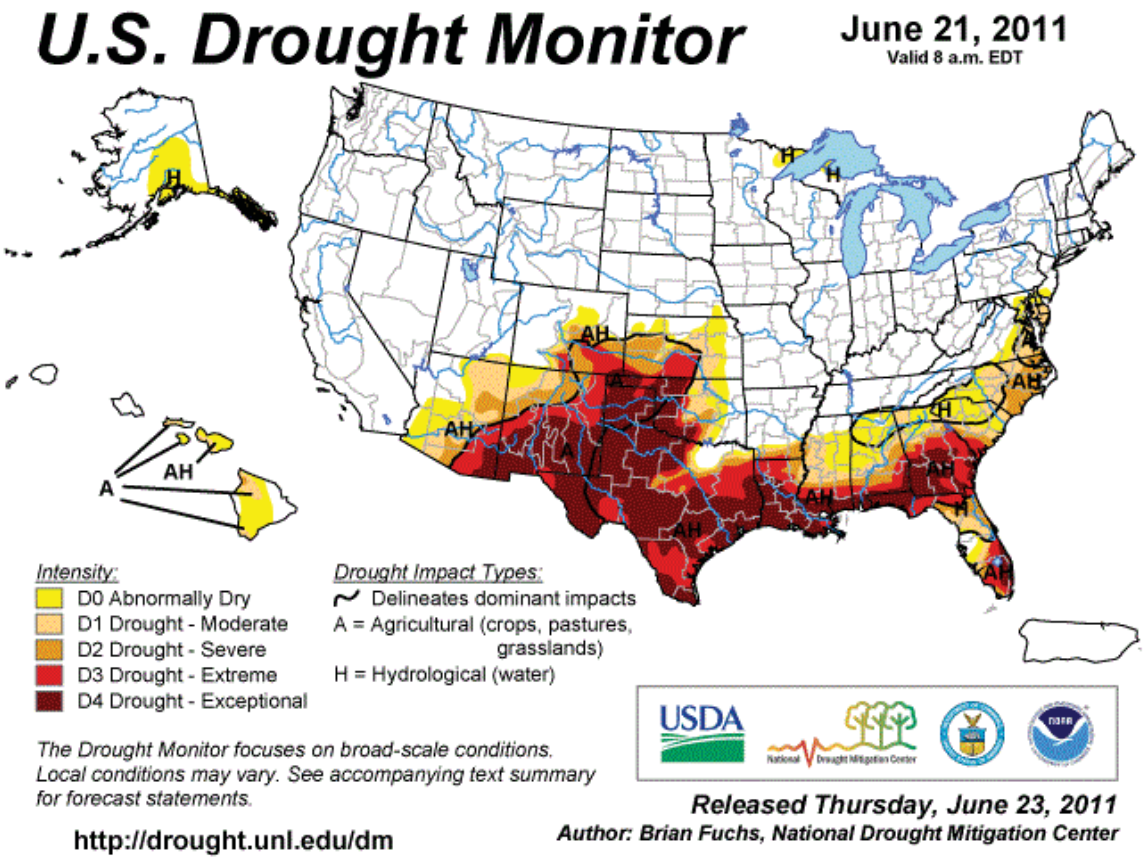
Drought and Extreme Heat

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.

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

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 droughts in the Planning District

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	July-Aug 1999
$58.8M crop damage	Oct-Nov 1998
Virginia Drought Emergency Declaration made on July 23, 2007	1976-1977
Nationwide – widespread damage	1931
Jamestown colony lands in an extended drought, not many survive.	1607

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.

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.

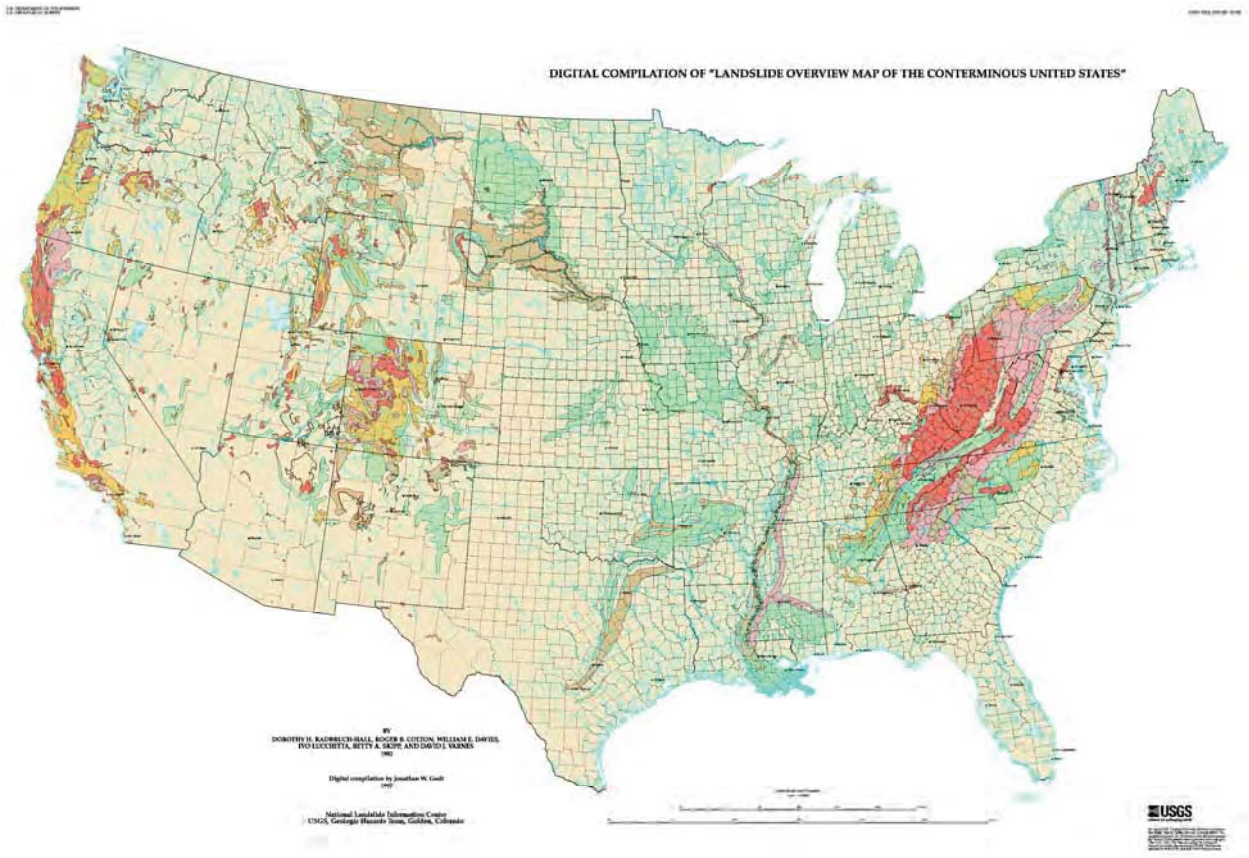
There are several types of landslides: rock falls, rock topple, slides, and flows. Rock falls are rapid movements of bedrock, which result in bouncing or rolling. A topple is a section or block of rock that rotates or tilts before falling to the slope below. Slides are movements of soil or rock along 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 of the Conterminous United States



LANDSLIDE INCIDENCE
Low (less than 1.5% of area involved)
Moderate (1.5%-15% of area involved)
High (greater than 15% of area involved)

LANDSLIDE SUSCEPTIBILITY/INCIDENCE
Moderate susceptibility/low incidence
High susceptibility/low incidence
High susceptibility/moderate incidence

Source: United States Geological Survey

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.

Hurricane and landslide damage in Nelson County

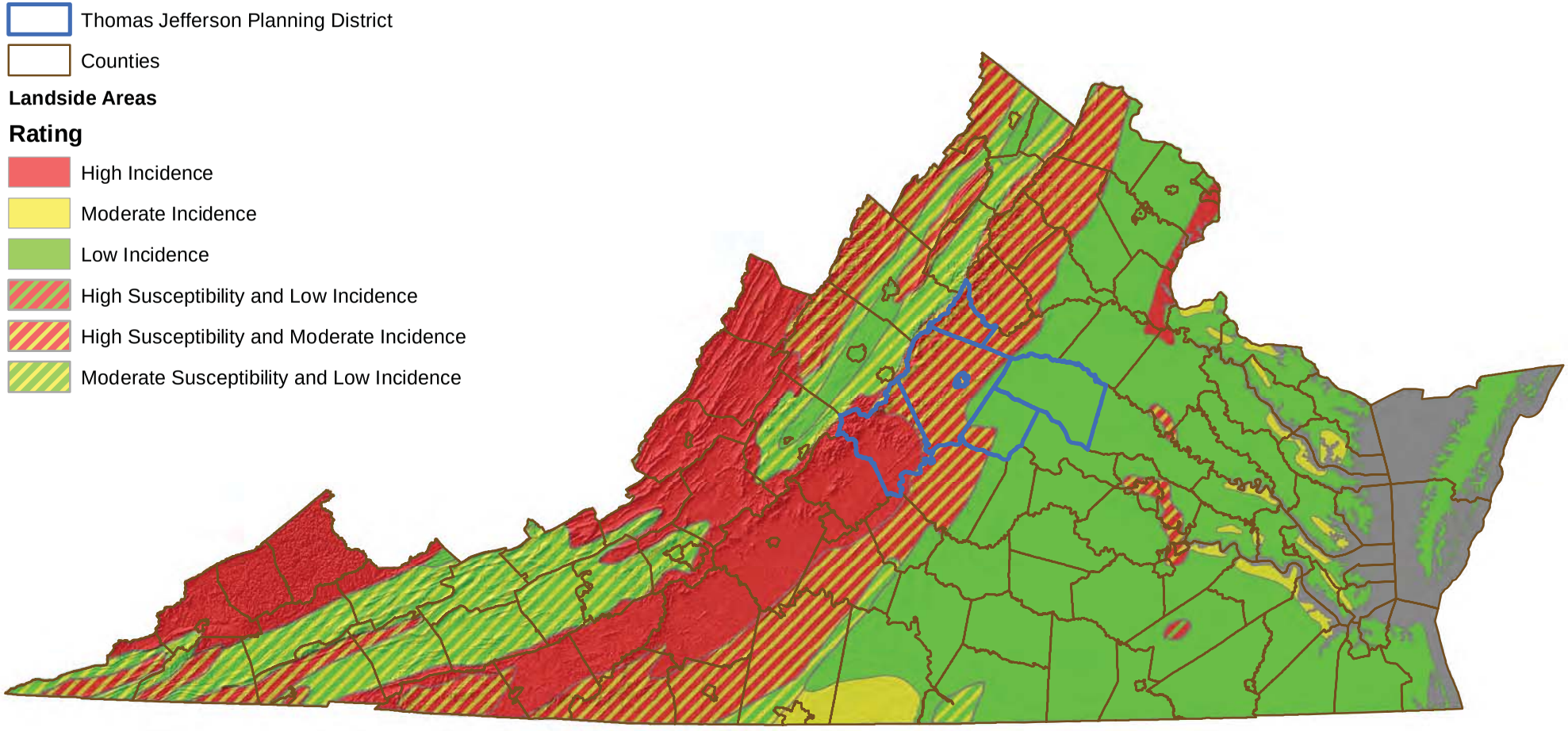
Landslide damage from Hurricane Camille

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.

Landside Susceptibility and Incidence
Commonwealth of Virginia



Source: U.S. Geological Survey

Thomas Jefferson Planning District Commission

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

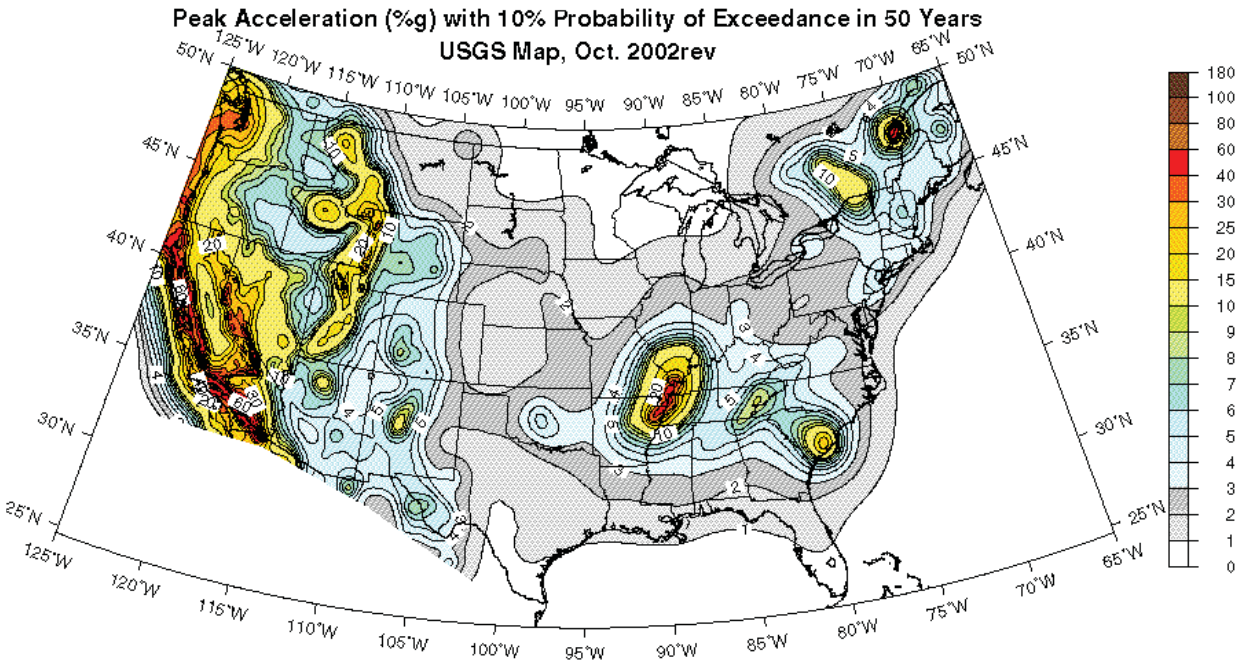
Richter Magnitudes	Earthquake Effects
Less than 3.5	Generally not felt, but recorded.
3.5-5.4	Often felt, but rarely causes damage.
Under 6.0	At most slight damage to well-designed buildings. Can cause major damage to poorly constructed buildings over small regions.
6.1-6.9	Can be destructive in areas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

Modified Mercalli Intensity Scale for Earthquakes

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.



Source: United States Geological Survey

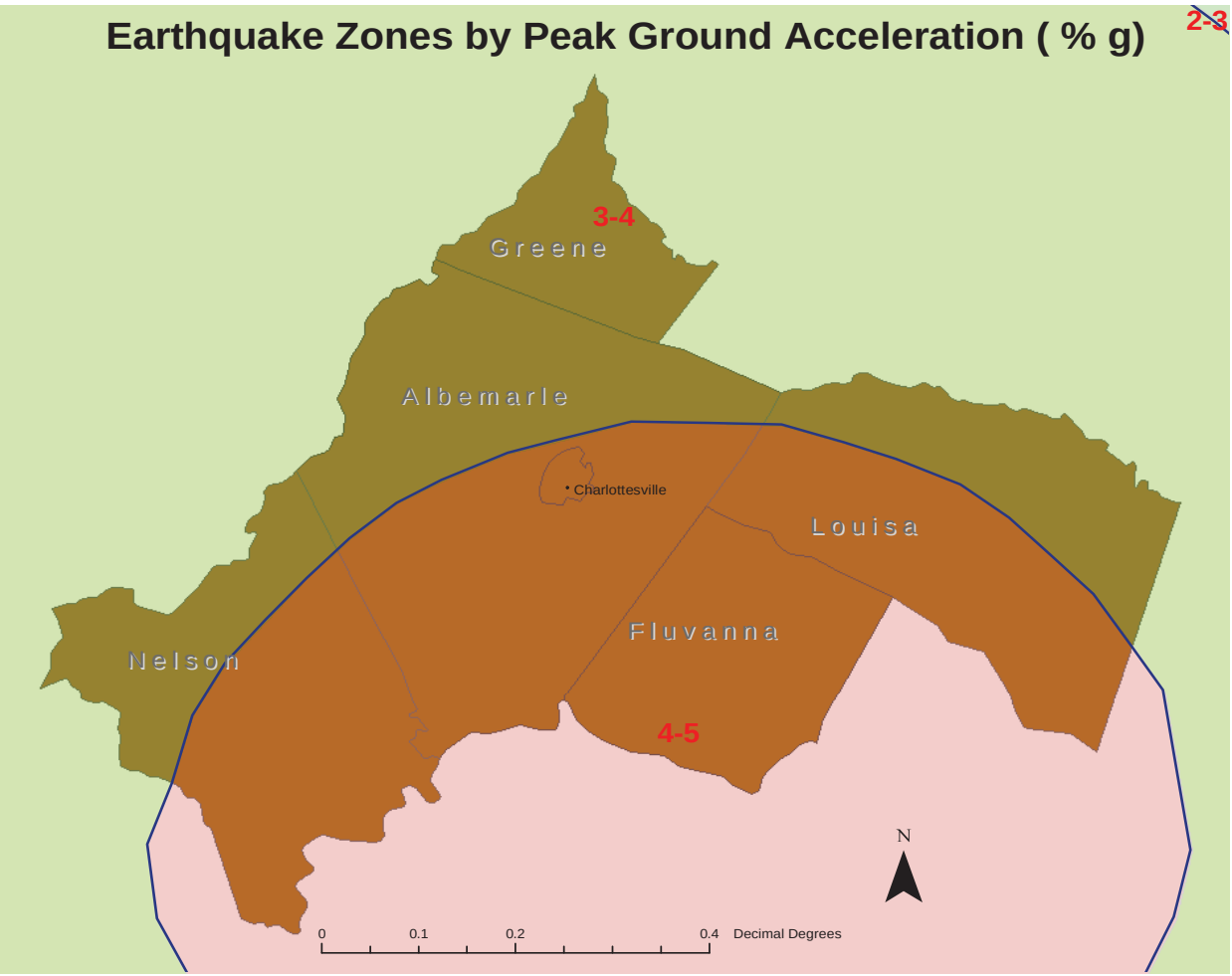
Analysis

Although earthquakes have not historically posed a significant risk to the Thomas Jefferson Planning District, there have been several recorded earthquake events, included 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.

Notable earthquakes in the Planning District

Location	Damage	Date
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

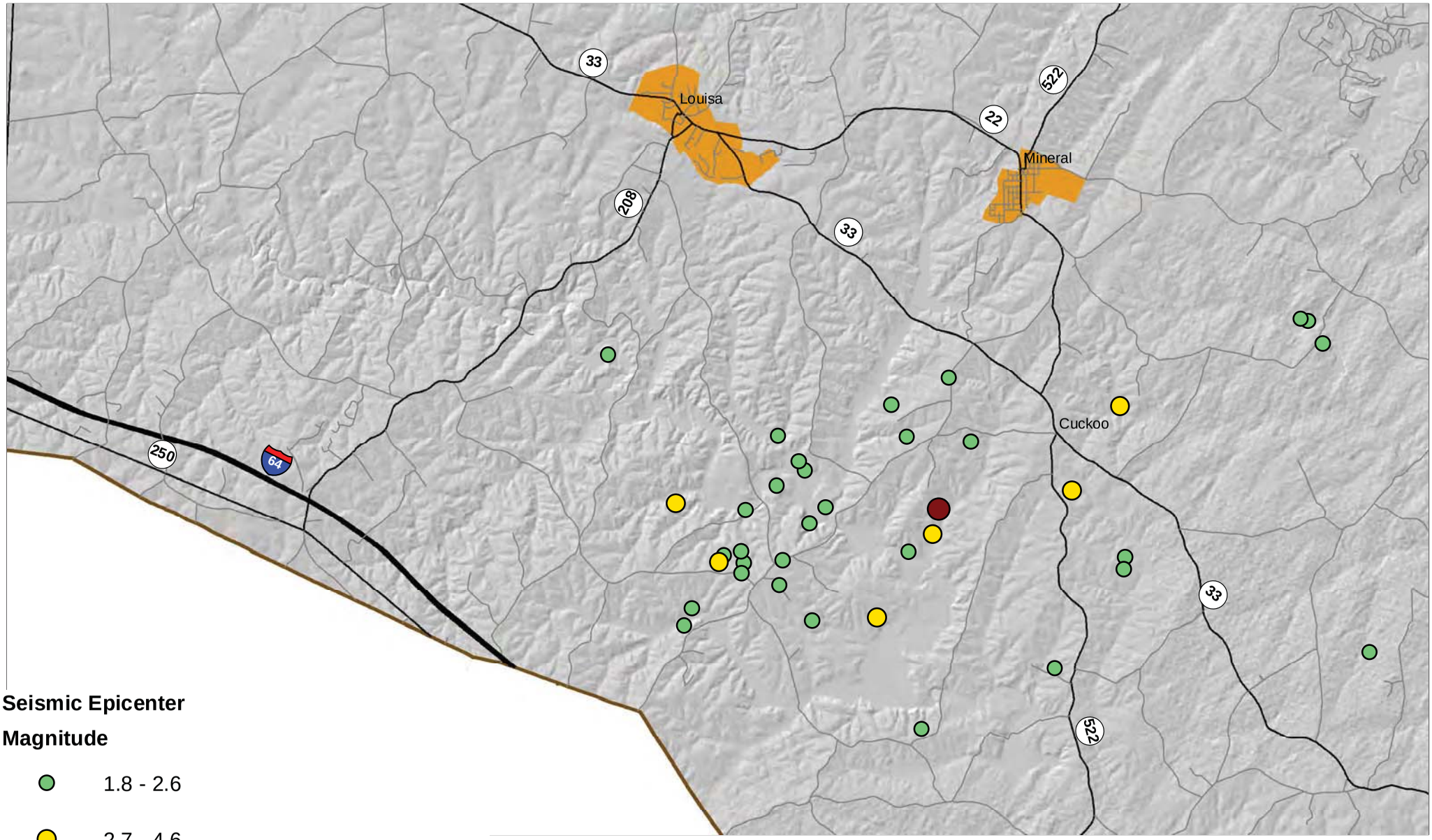
FEMA uses the indicator of Peak Ground Acceleration (PGA) (%g, where g = 9.8 m/s^2) to show the probability of earthquakes in the U.S. The national map of Peak Ground Acceleration (%g) indicates that parts of the Planning District have a PGA rate of 3-4%g, while others (see map below) have a 4-5% PGA. 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.



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.

Earthquake and Aftershock Epicenters: August 23 - September 19, 2011



Seismic Epicenter

Magnitude

- 1.8 - 2.6
- 2.7 - 4.6
- 5.8 Earthquake
- Incorporated Towns (Louisa and Mineral)

Source: USGS

N

0 0.375 0.75 1.5 2.25 3 Miles

Thomas Jefferson Planning District Commission

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.

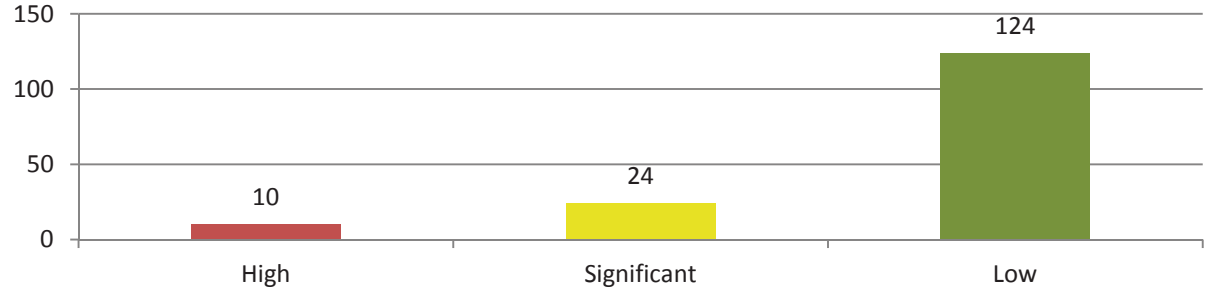
Sugar Hollow Dam, Albemarle County

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, 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 in Thomas Jefferson Planning District by Hazard Level



High Risk Dams in the Thomas Jefferson Planning District

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

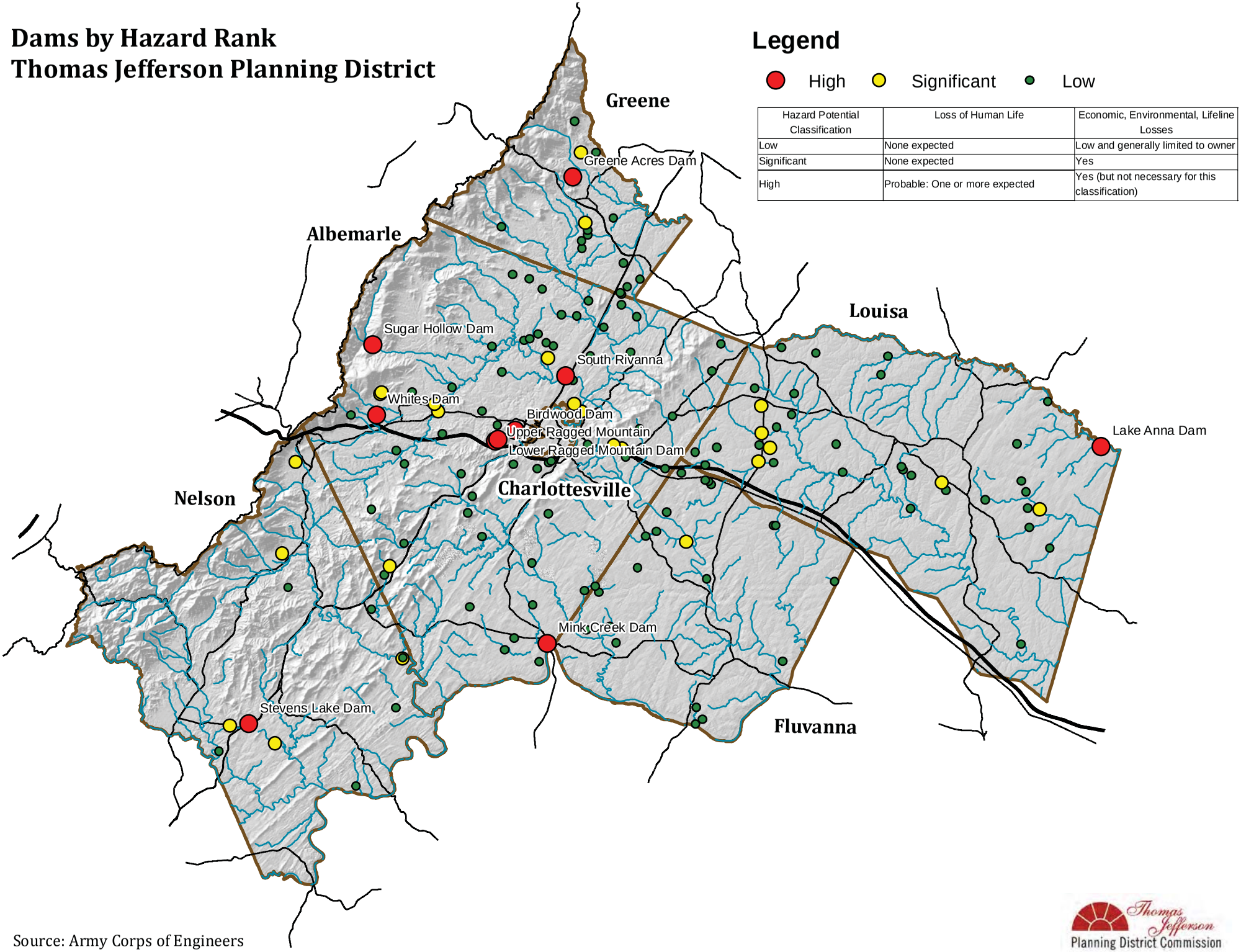
It is important to note that the NID hazard rank is not a determination of structural soundness of a dam or the probability of a failure or misoperation. It ranks the severity of a hazard, in terms of loss of human life and property, should a dam fail. Oversight of dam maintenance and operation is typically 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.

Dams by Hazard Rank
Thomas Jefferson Planning District



Hazard Potential Classification	Loss of Human Life	Economic, Environmental, Lifeline Losses
Low	None expected	Low and generally limited to owner
Significant	None expected	Yes
High	Probable: One or more expected	Yes (but not necessary for this classification)

Source: Army Corps of Engineers

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.

A 2007 sinkhole on US 29 near Hollymead

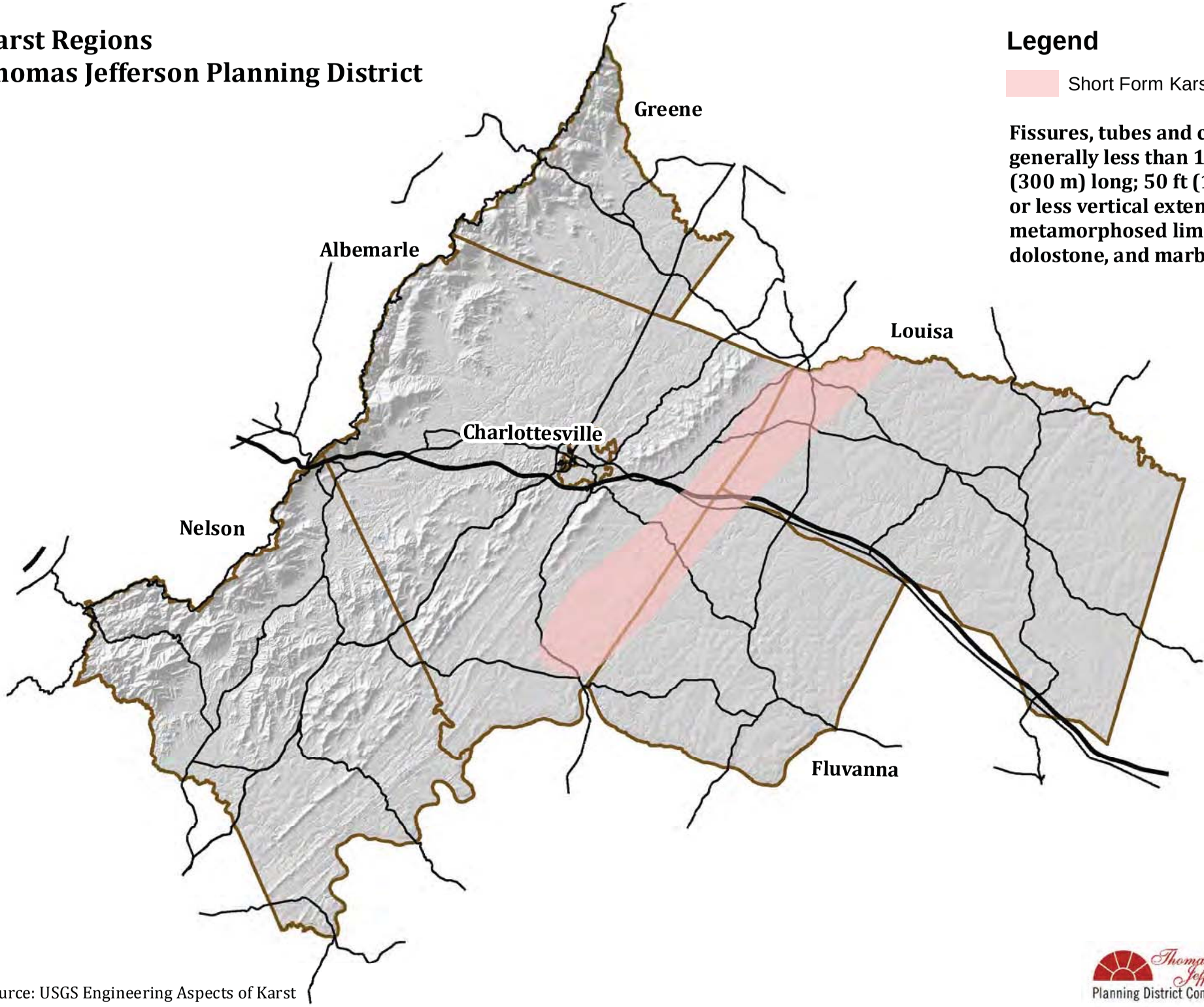
Four geologic hazards are associated with karst. Two common karst-related geologic hazards -- cover-collapse sinkholes and sinkhole flooding -- cause the most damage to buildings. A third karst hazard is relatively high concentrations of radon, sometimes found in basements and crawl spaces of houses 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.

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 Regions
Thomas Jefferson Planning District



Legend

Short Form Karst

Fissures, tubes and caves generally less than 1,000 ft (300 m) long; 50 ft (15 m) or less vertical extent; in metamorphosed limestone, dolostone, and marble

Source: USGS Engineering Aspects of Karst

Thomas Jefferson Planning District Commission

Other

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

201.6(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…

201.6(c)(2)(iii): For multijurisdictional plans, the risk assessment section must assess each jurisdiction's risks where they vary from the risks facing the entire planning area.

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:

1. Population and Building Exposure
2. Development Trends
3. Infrastructure
4. Critical Facilities
5. Estimating Potential Loss
    a. Floods
    b. Winter Storms
    c. Hurricanes
    d. Tornadoes
    e. Drought
    f. Earthquake
    g. Wildfire
    h. Dam Failure

Population

According to the 2010 Census, the total population of the Thomas Jefferson Planning District was 234,712, which is an 18% increase from a population of 199,648 recorded in 2000. The table below shows the population by locality, and the percent growth in population between 2000 and 2010.

Locality	Population 2000	Population 2010	2000 – 2010 % Change
Charlottesville	40,099	43,475	8%
Albemarle	84,186	98,970	18%
Fluvanna	20,047	25,691	28%
Greene	15,244	18,403	21%
Louisa	25,627	33,153	29%
Nelson	14,445	15,020	4%
Region	199,648	234,712	18%

Source: US Census

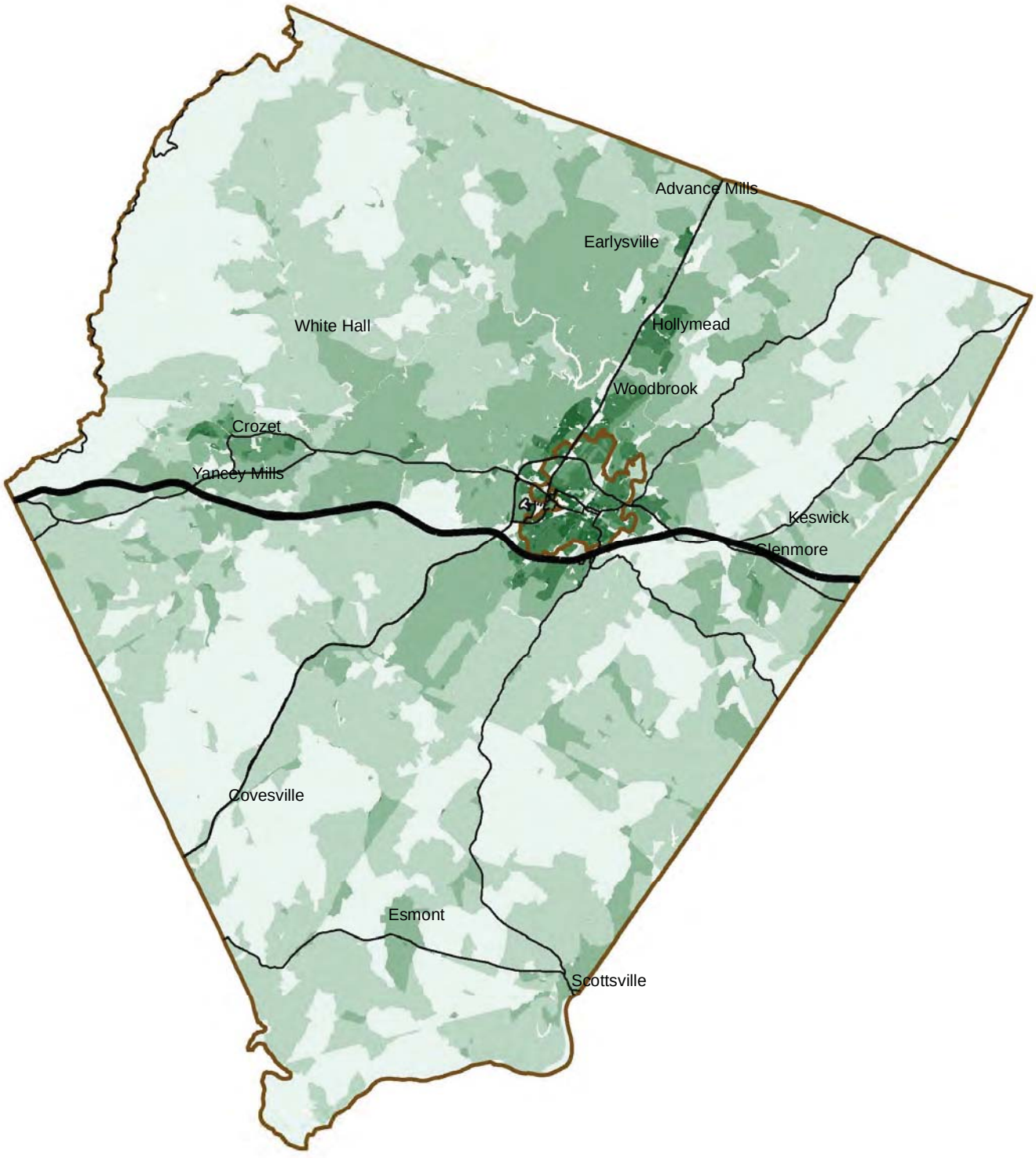
Some segments of the population are more adversely affected than others by hazards. The elderly, low-income households, people with disabilities, and families with young children may be less able to prepare for a disaster, put at high risk during a disaster, and slower to recover after a disaster.

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.

The following pages include maps for each locality illustrating population density.

Population Density by Census Block (2010)
Albemarle County and City of Charlottesville



Persons Per Square Mile

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

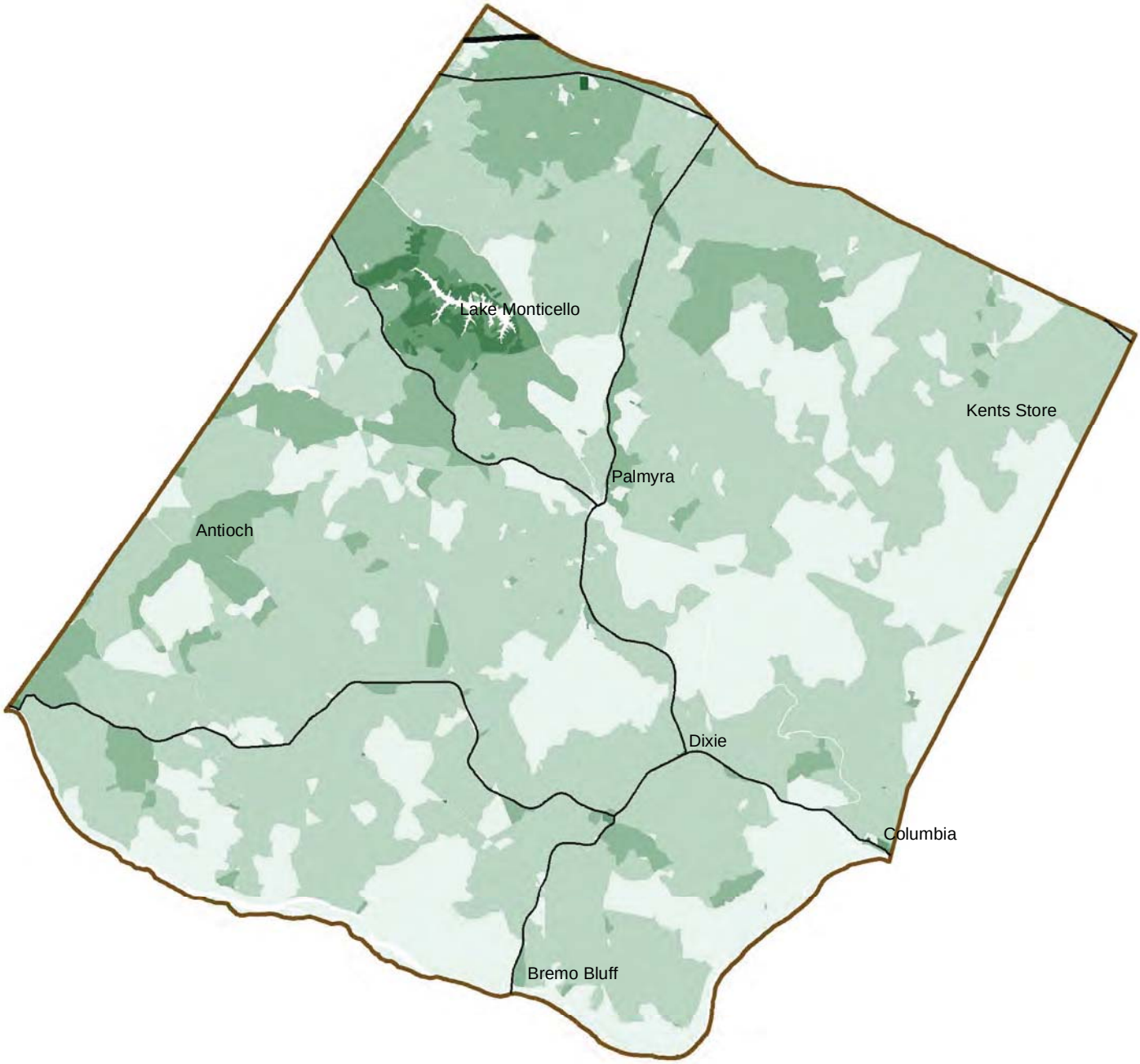
Source: U.S. 2010 Decennial Census

N

0 0.5 1 2 3 4 Miles

Thomas Jefferson Planning District Commission

Population Density by Census Block (2010)
Fluvanna County



Persons Per Square Mile

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

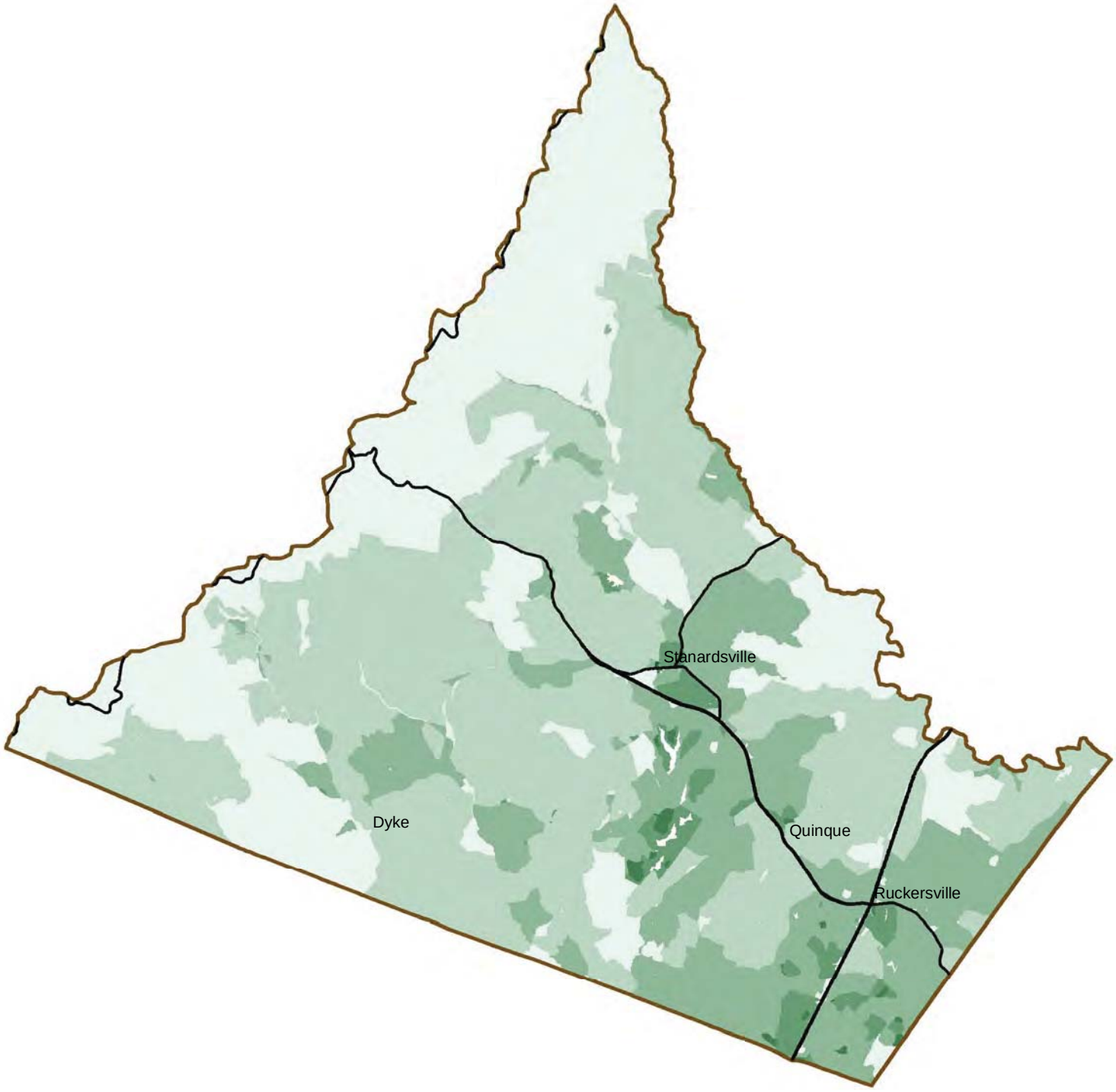
Source: U.S. 2010 Decennial Census

N

0 1 2 3 4 Miles

Thomas Jefferson Planning District Commission

Population Density by Census Block (2010)
Greene County



Persons Per Square Mile

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

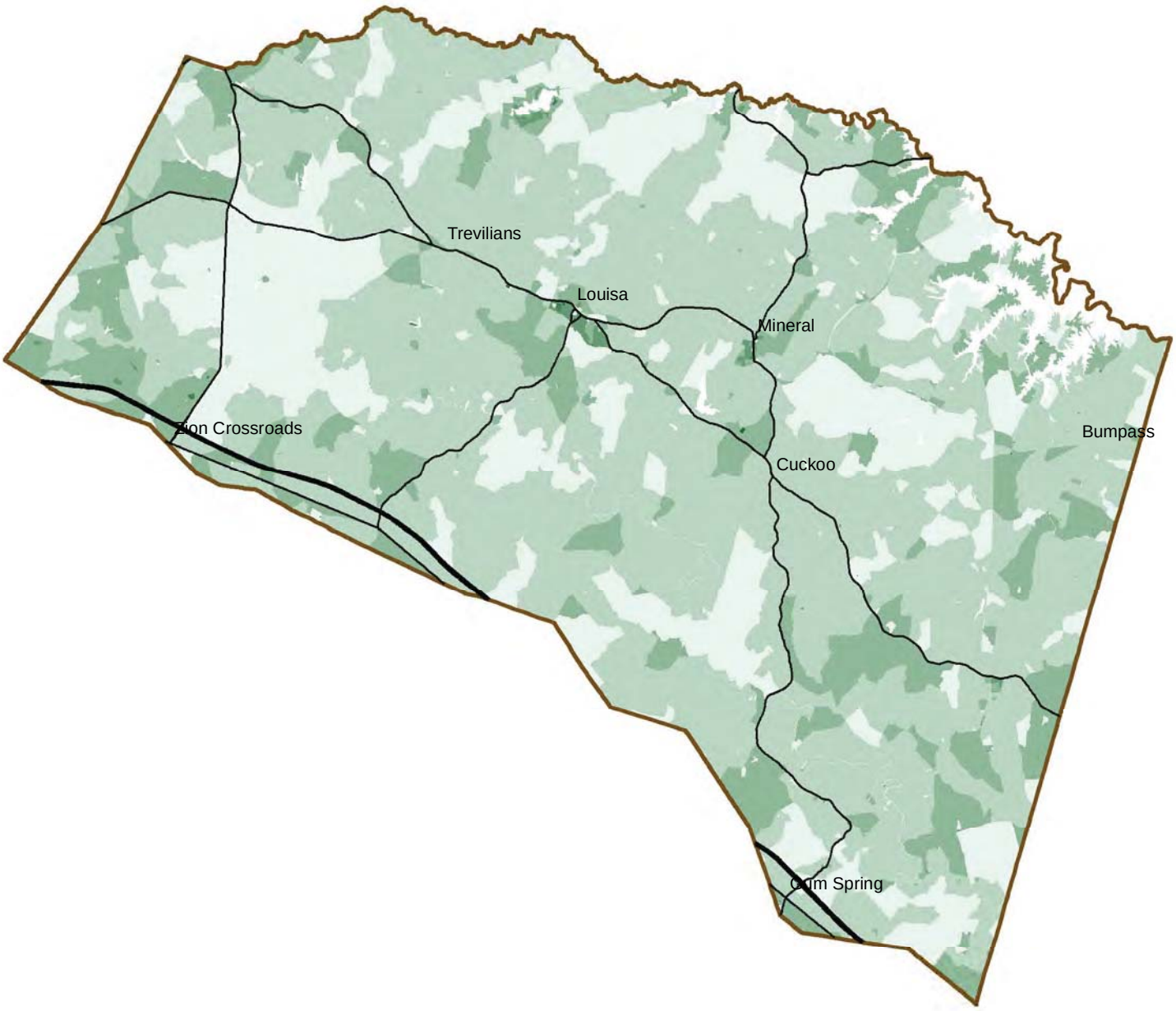
Source: U.S. 2010 Decennial Census

N

0 1 2 3 4 Miles

Thomas Jefferson Planning District Commission

Population Density by Census Block (2010)
Louisa County



Persons Per Square Mile

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

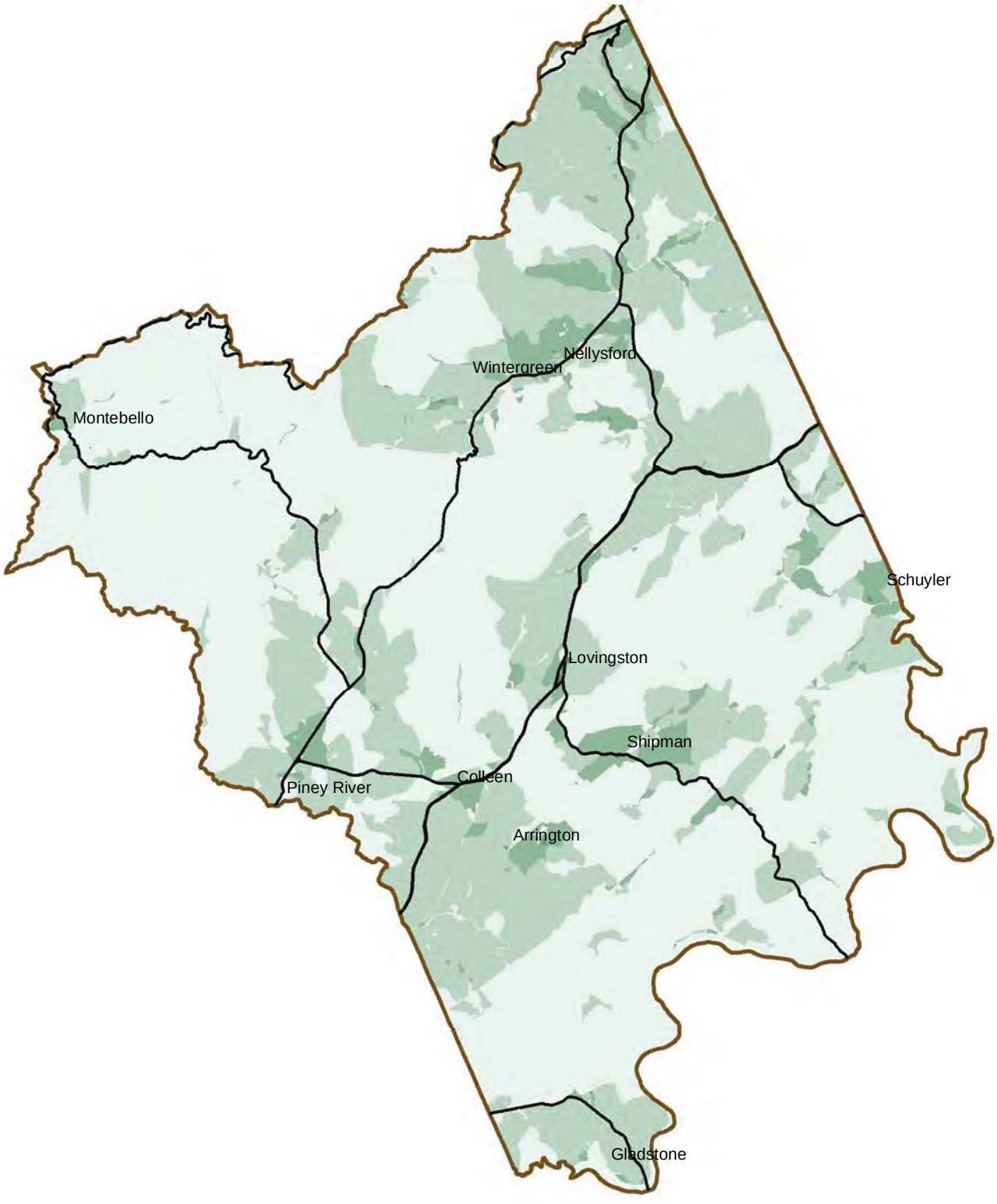
Source: U.S. 2010 Decennial Census

N

0 0.5 1 2 3 4
Miles

Thomas Jefferson Planning District Commission

Population Density by Census Block (2010)
Nelson County



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:

Locality	Total Buildings	Residential Buildings	Non-Residential Buildings	Residential Buildings Built since 2000
Charlottesville	16,842	15,201	1,641	2,298
Albemarle	39,446	36,811	2,635	7,587
Fluvanna	11,178	10,908	270	2,446
Greene	16,906	15,899	1,007	1,737
Louisa	17,372	16,473	899	4,407
Nelson	10,435	9,841	594	1,280
Region	**112,179**	**105,133**	**7,046**	**19,755**

Source: U.S. Census Bureau, Weldon Cooper Center

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. The estimate was reduced to account for demolitions, conversions, and other attrition, based on a 0.19% annual national average. No 2010 Census data on housing structures were available at the time of publication. Non-residential counts were determined by private firm Dun and Bradstreet in 2006 and acquired through FEMA.

Using planimetric data provided by localities, a total of 160,041 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.

Land Use and Development Trends

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.

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 18% between 2000 and 2010. 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.

The 2008 downturn in the housing market has virtually stalled all new suburban development, as well as urban condo construction, and several proposed subdivisions have been abandoned. Smaller-scale projects, including some infill and redevelopment, have been relatively more attractive due to lower financial requirements. The glut of homes on the market due to vacancies and foreclosures, especially in Louisa and Fluvanna counties, seems to indicate that growth will be slow into the immediate future. Development of multifamily units, on the other hand, has seen a slight increase, as reductions in homeownership levels have increased demand somewhat in the rental market.

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 localitites, 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. Therefore, forecasting new development is particularly challenging.

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

** Growth areas are conceptual, not spatially-defined* *Source: Local Governments*

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. Fluvanna's only incorporated town, Columbia, grew very rapidly over the past decade, but it's small size makes it difficult to discern whether this is a trend or natural fluctuation.

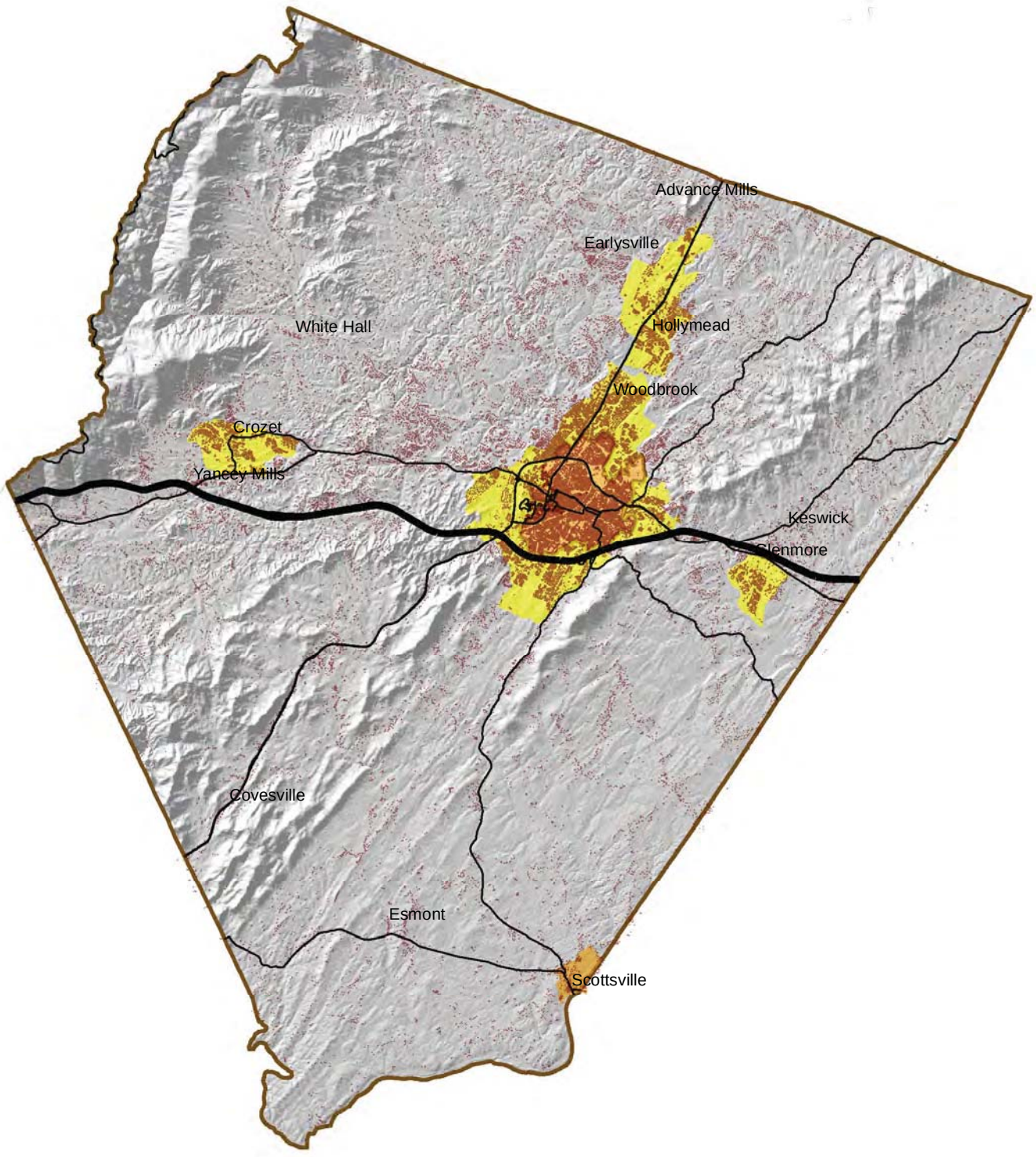
Greene

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 notable 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.

Existing Buildings and Designated Growth Areas
Albemarle County and City of Charlottesville



Existing Buildings

Albemarle Growth Areas

City of Charlottesville and Town of Scottsville

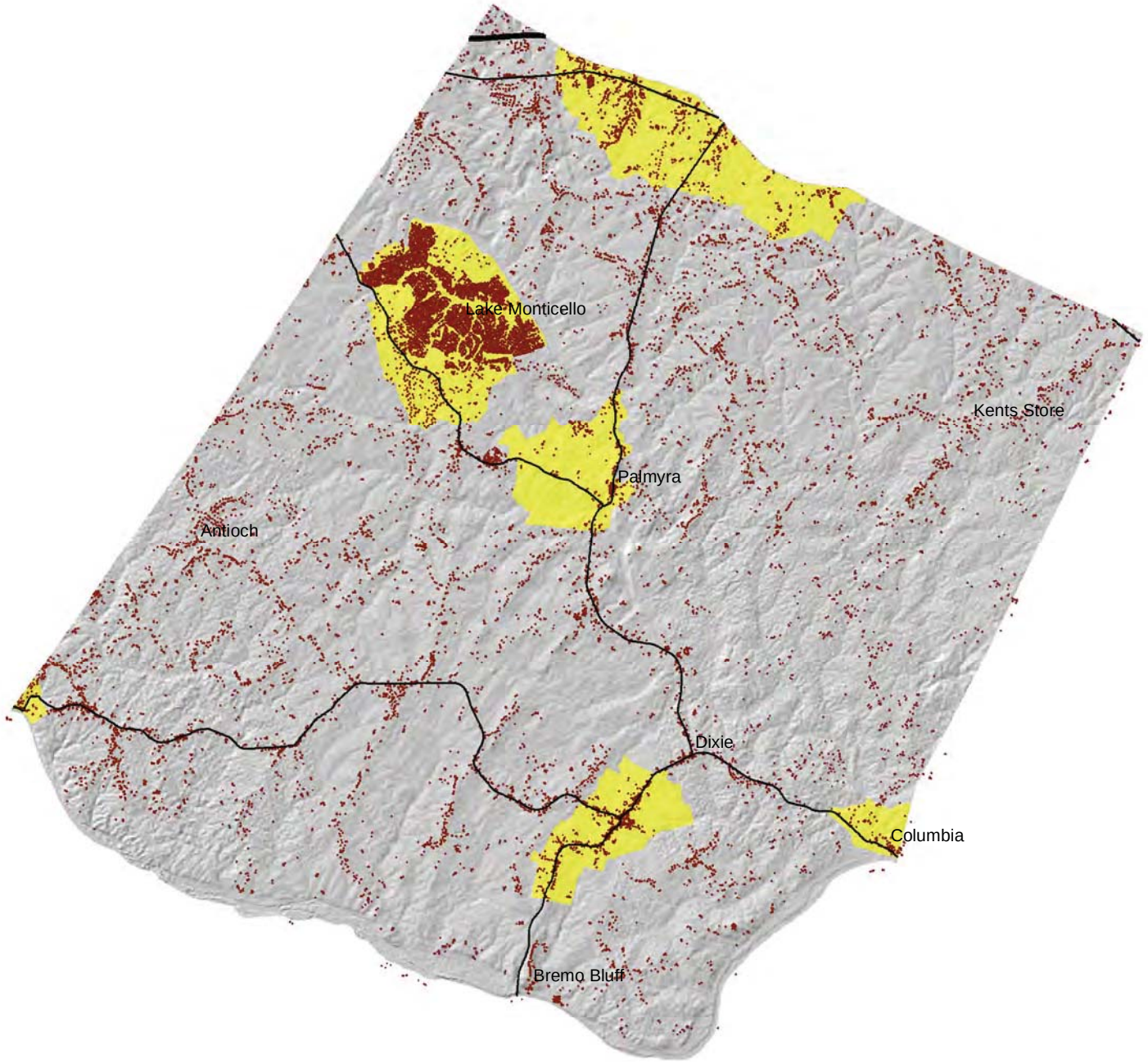
Source: Albemarle County, City of Charlottesville

N

0 1 2 4 6 8 Miles

Thomas Jefferson Planning District Commission

Existing Buildings and Designated Growth Areas
Fluvanna County



Fluvanna Buildings

Fluvanna Community Planning Areas

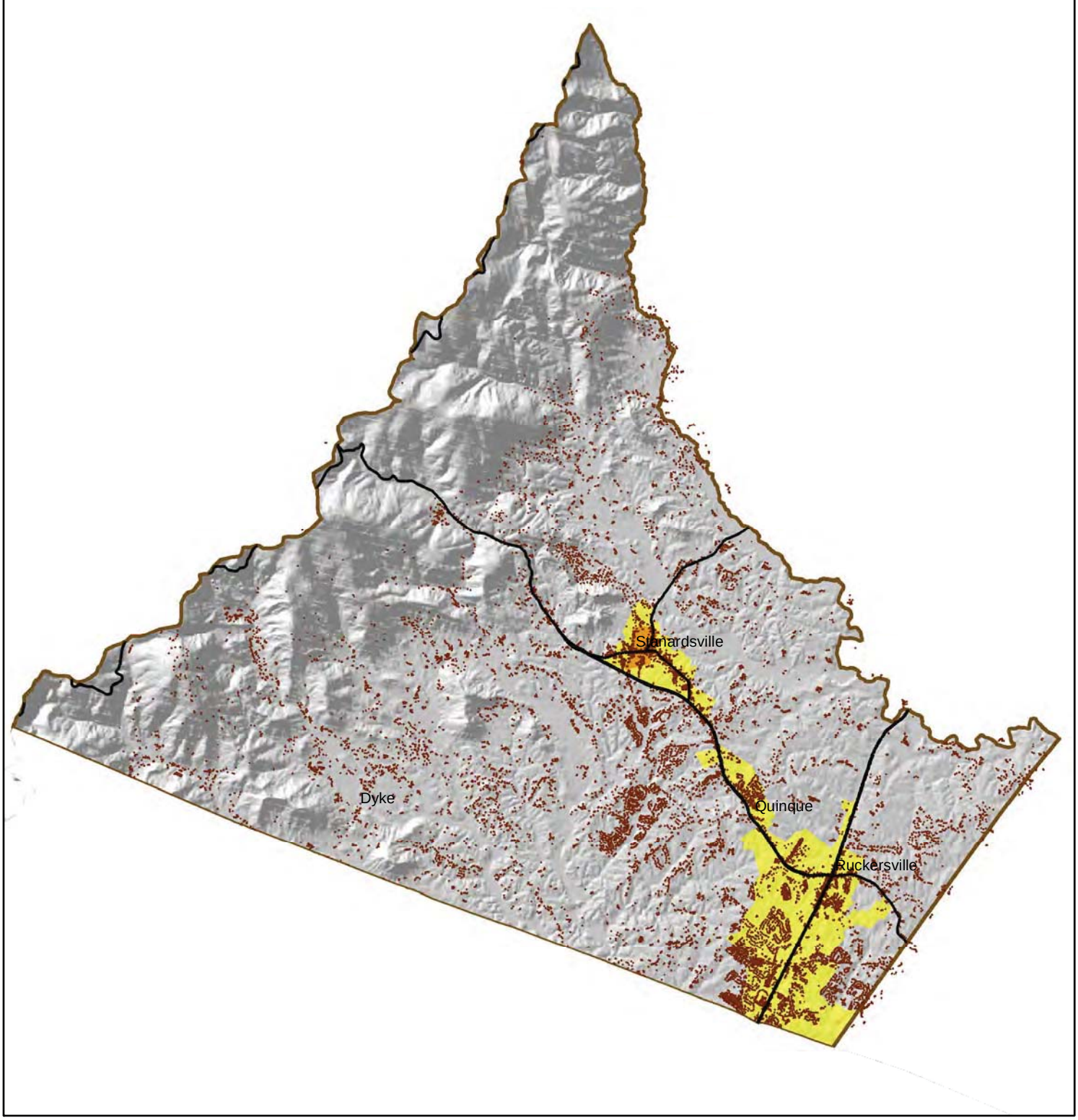
Source: Fluvanna County

N

0 1 2 3 4 Miles

Thomas Jefferson Planning District Commission

Existing Buidlings and Designated Growth Areas
Greene County



Greene Buildings

Greene Designated Growth Areas

Incorporated Town (Stanardsville)

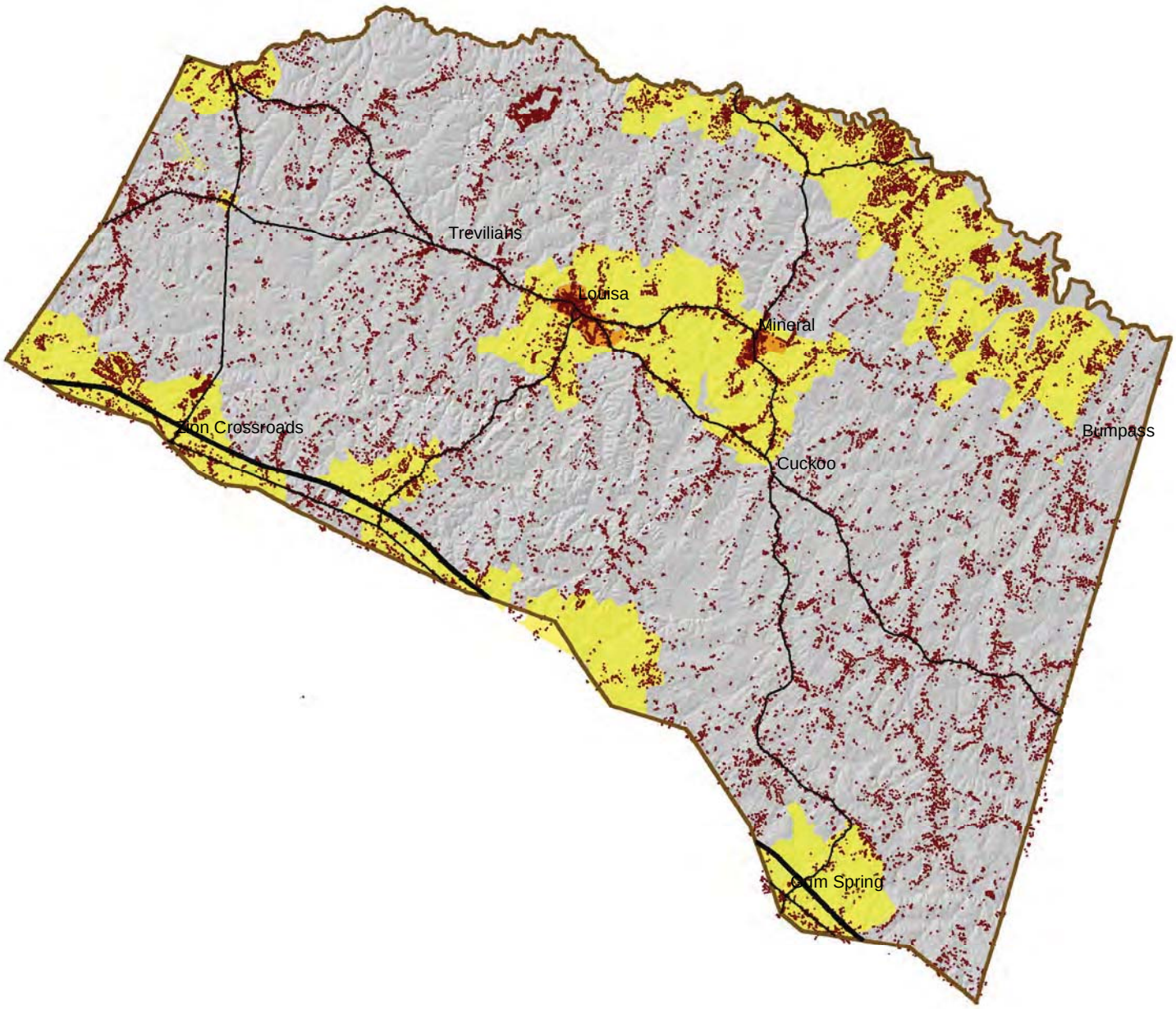
Source: Greene County

N

0 1 2 3 4 Miles

Thomas Jefferson Planning District Commission

Existing Buildlings and Designated Growth Areas
Louisa County



Louisa Buildings

Louisa Growth Areas

Incorporated Towns (Louisa and Mineral)

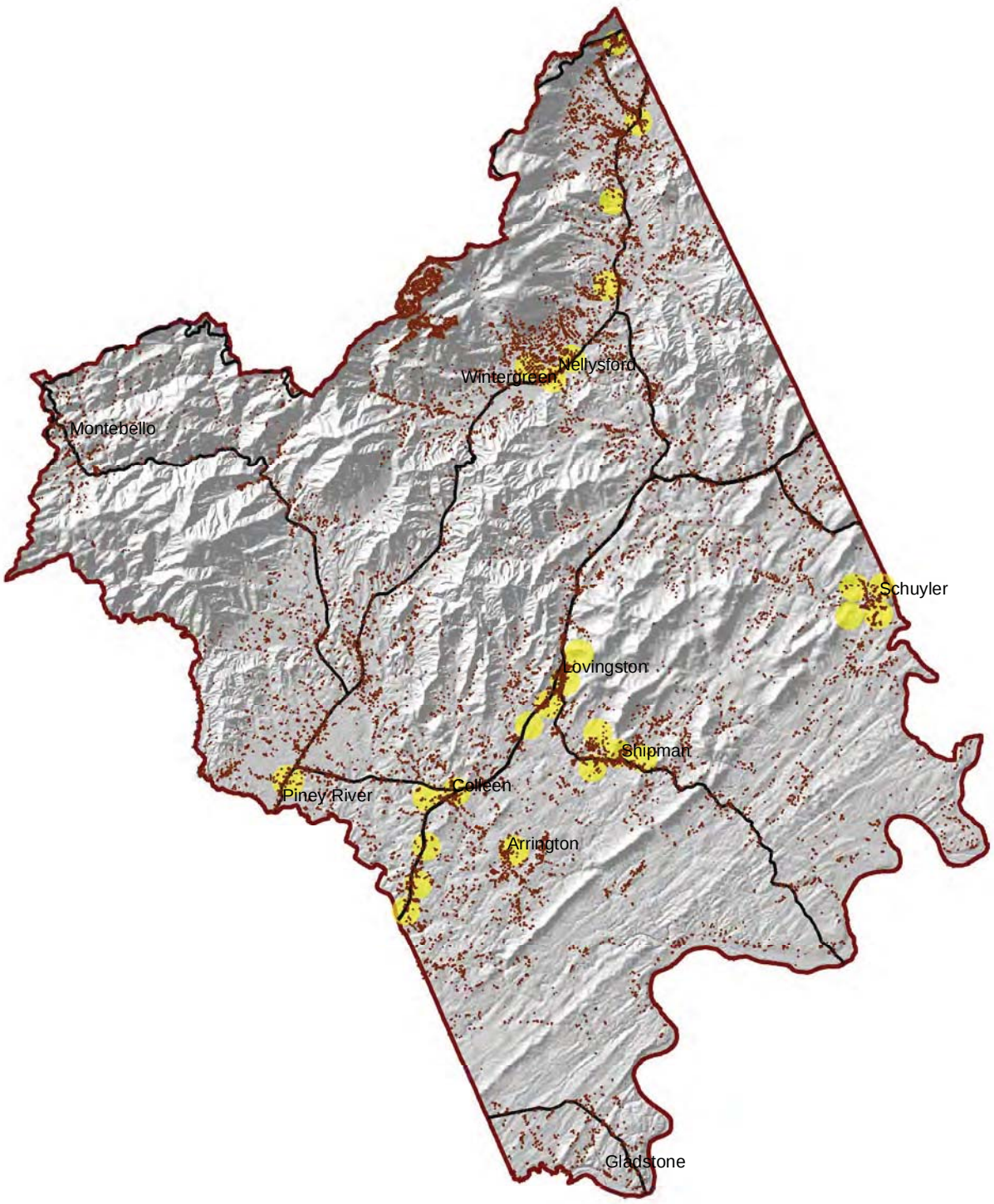
Source: Louisa County

N

0 0.5 1 2 3 4 Miles

Thomas Jefferson Planning District Commission

Existing Buildings and Designated Growth Areas
Nelson County



Existing Buildings

Nelson Growth Areas

Source: Albemarle County

N

0 1 2 4 6 8 Miles

Thomas Jefferson Planning District Commission

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} 2.0 shows the number and value of transportation and utility infrastructure in the Planning District.

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

*Value in millions. Source: HAZUS MH 2.0

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)
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

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
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)

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 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.

Route 747

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:
   a. Hospitals/Medical clinics
   b. Police stations
   c. Fire stations
   d. Emergency operation centers
   e. Shelters

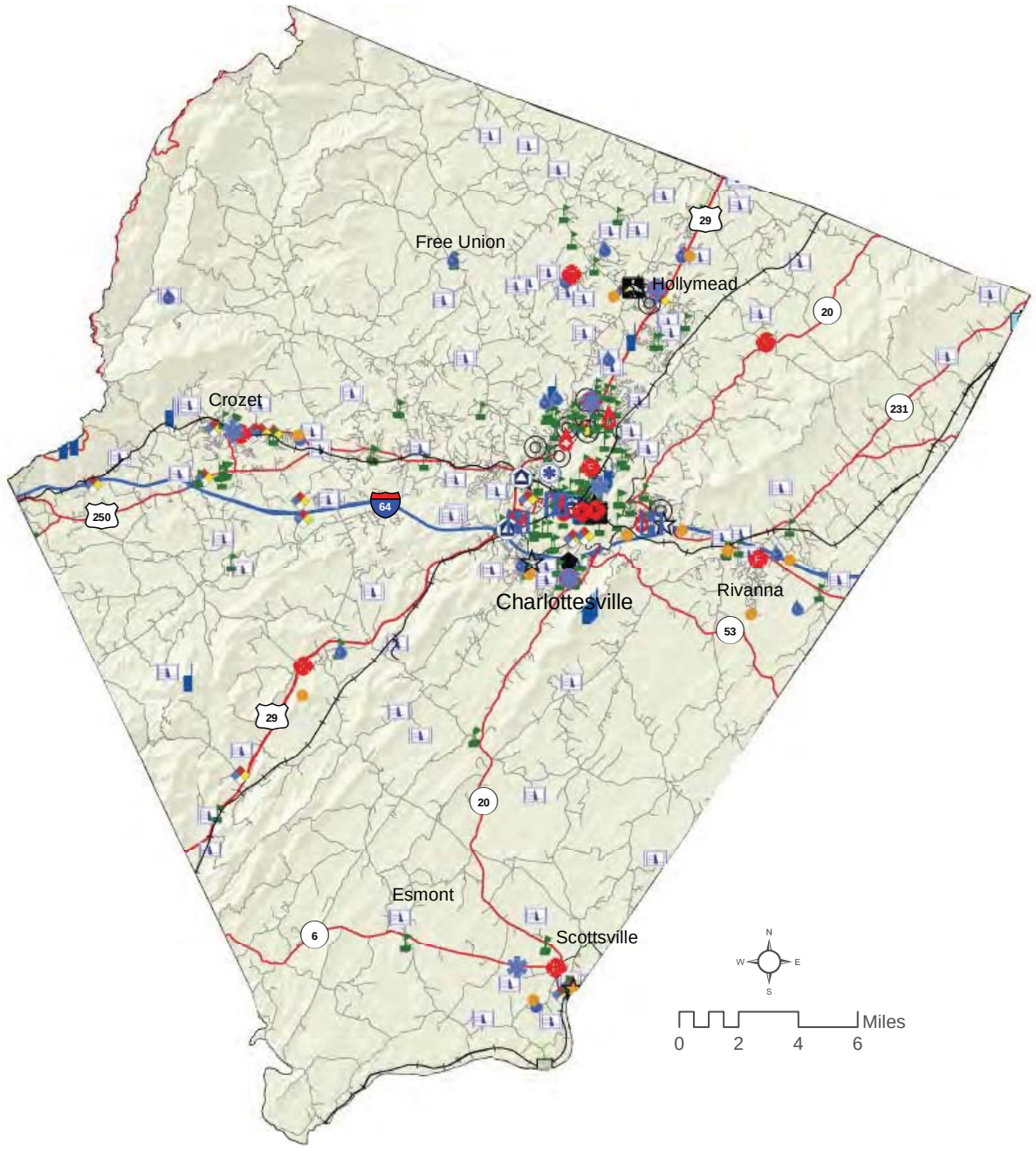
2. **Essential Infrastructure**: necessary to retain operational status of community; to be restored as quickly as possible following a disaster
   a. Transportation systems—includes roads, bridges, rail, airports, bus stations, ferry
   b. Potable water systems
   c. Wastewater systems
   d. Power—includes buildings, substations
   e. Communication systems—includes towers
   f. 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.
   a. Schools/Daycares – includes schools that double as shelters
   b. Prisons
   c. 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
      i. Facilities on CERCLIS (Superfund)
      ii. RCRA Large Quantity Generators (facilities that generate over 1000 kg of ignitable, corrosive, reactive, or toxic waste per month)
      iii. Facilities on Toxics Release Inventory (1987 - 2009)

Albemarle Critical Facilities



Emergency Facilities

- Hospital
- Emergency Care
- Blood Bank
- Rescue Squad
- Shelter
- Emergency Op. Center
- Fire Station
- Police Station

Essential Infrastructure

- Natural Gas Facility
- Sewage Treatment Plant
- Potable Water Facility
- Communication Facility
- Electrical Power Facility
- Airport
- Ferry
- Bus Station
- Railroad
- Rail Facility
- Pump Station

Roads

- Interstate
- Primary Route
- Secondary Route

Important Community Facilities

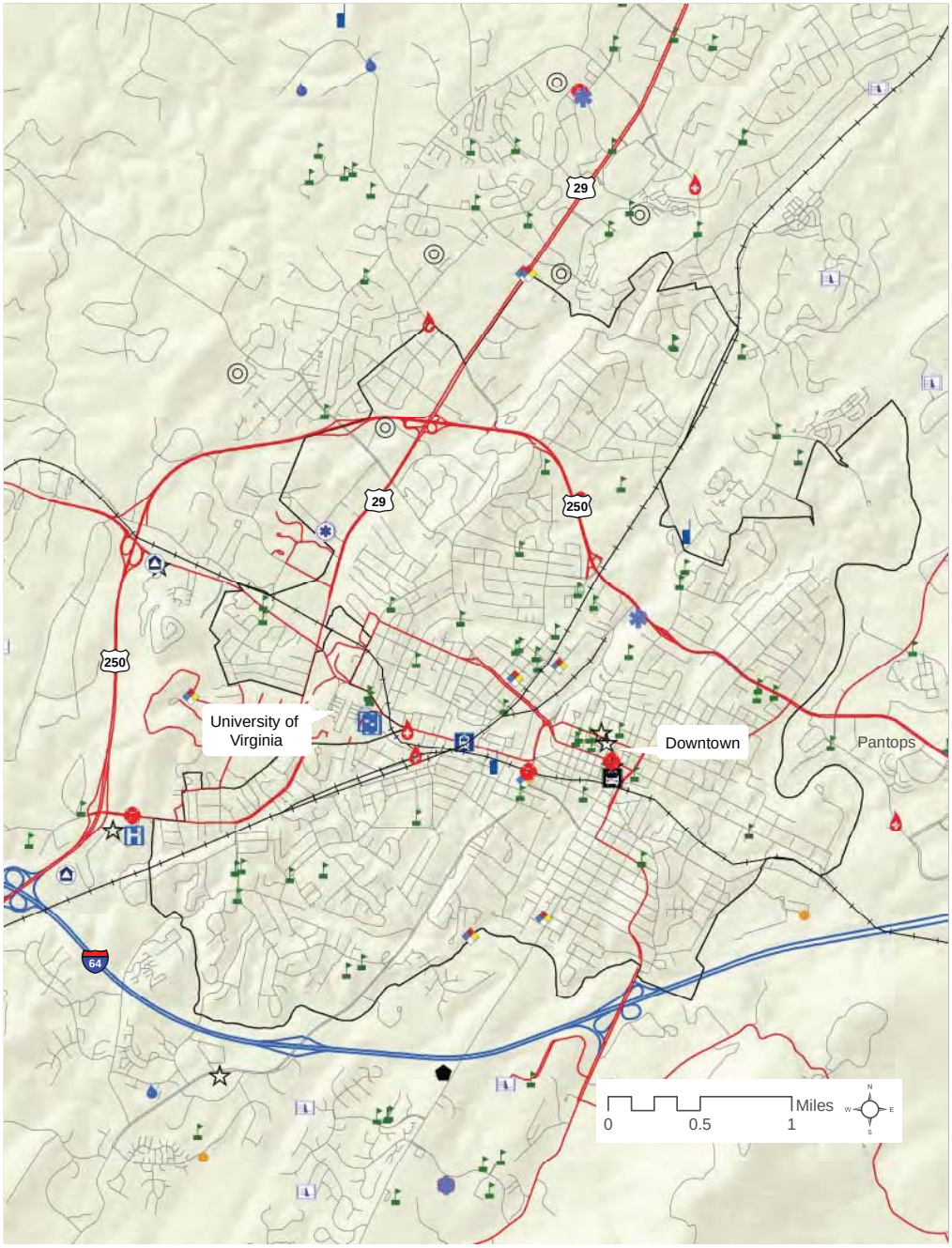
- School/Shelter/Daycare
- Assisted Living Facility
- Prison

High Potential Loss Facilities

- Nuclear Facility
- Hazardous Materials
- Dam

Thomas Jefferson Planning District Commission

Charlottesville Critical Facilities



Emergency Facilities

- Hospital
- Emergency Care
- Blood Bank
- Rescue Squad
- Shelter
- Emergency Op. Center
- Fire Station
- Police Station

Essential Infrastructure

- Natural Gas Facility
- Sewage Treatment Plant
- Potable Water Facility
- Communication Facility
- Electrical Power Facility
- Airport
- Ferry
- Bus Station
- Railroad
- Rail Facility
- Pump Station

Roads

- Interstate
- Primary Route
- Secondary Route

Important Community Facilities

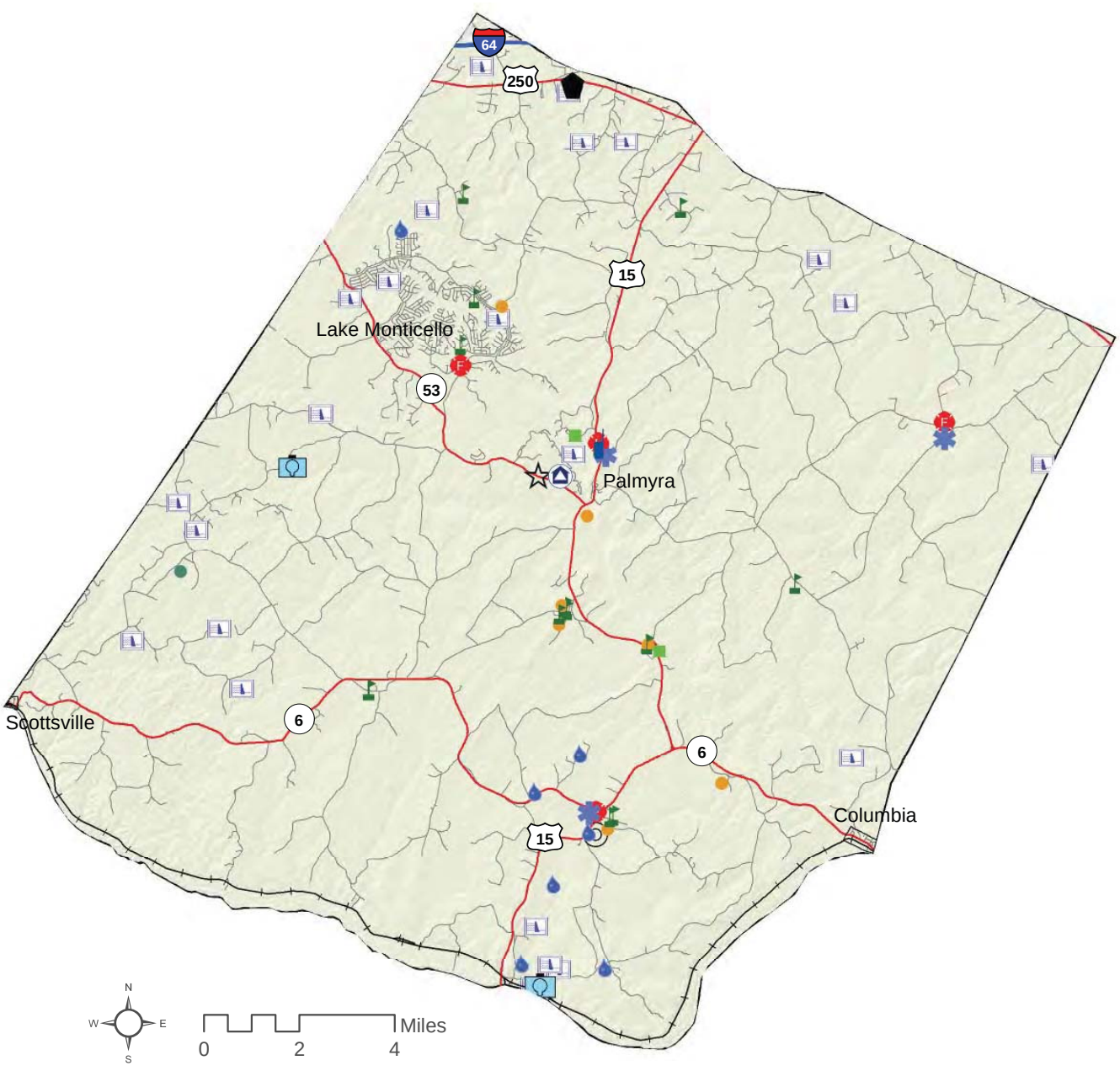
- School/Shelter/Daycare
- Assisted Living Facility
- Prison

High Potential Loss Facilities

- Nuclear Facility
- Hazardous Materials
- Dam

Thomas Jefferson Planning District Commission

Fluvanna Critical Facilities



Emergency Facilities

- Hospital
- Emergency Care
- Blood Bank
- Rescue Squad
- Shelter
- Emergency Op. Center
- Fire Station
- Police Station

Essential Infrastructure

- Natural Gas Facility
- Sewage Treatment Plant
- Potable Water Facility
- Communication Facility
- Electrical Power Facility
- Airport
- Ferry
- Bus Station
- Railroad
- Rail Facility
- Pump Station

Roads

- Interstate
- Primary Route
- Secondary Route

Important Community Facilities

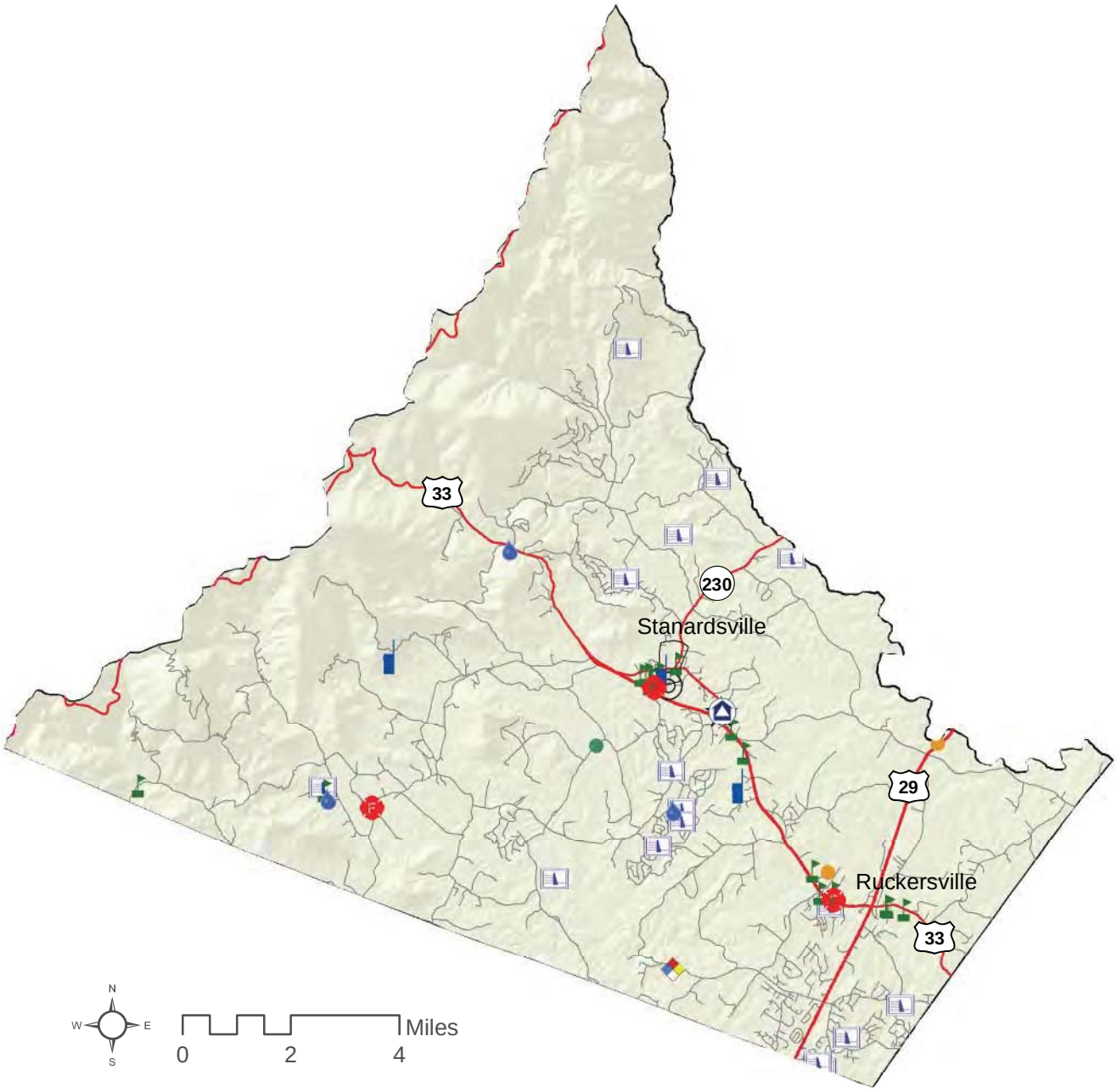
- School/Shelter/Daycare
- Assisted Living Facility
- Prison

High Potential Loss Facilities

- Nuclear Facility
- Hazardous Materials
- Dam

Thomas Jefferson Planning District Commission

Greene Critical Facilities



Emergency Facilities

- Hospital
- Emergency Care
- Blood Bank
- Rescue Squad
- Shelter
- Emergency Op. Center
- Fire Station
- Police Station

Essential Infrastructure

- Natural Gas Facility
- Sewage Treatment Plant
- Potable Water Facility
- Communication Facility
- Electrical Power Facility
- Airport
- Ferry
- Bus Station
- Railroad
- Rail Facility
- Pump Station

Roads

- Interstate
- Primary Route
- Secondary Route

Important Community Facilities

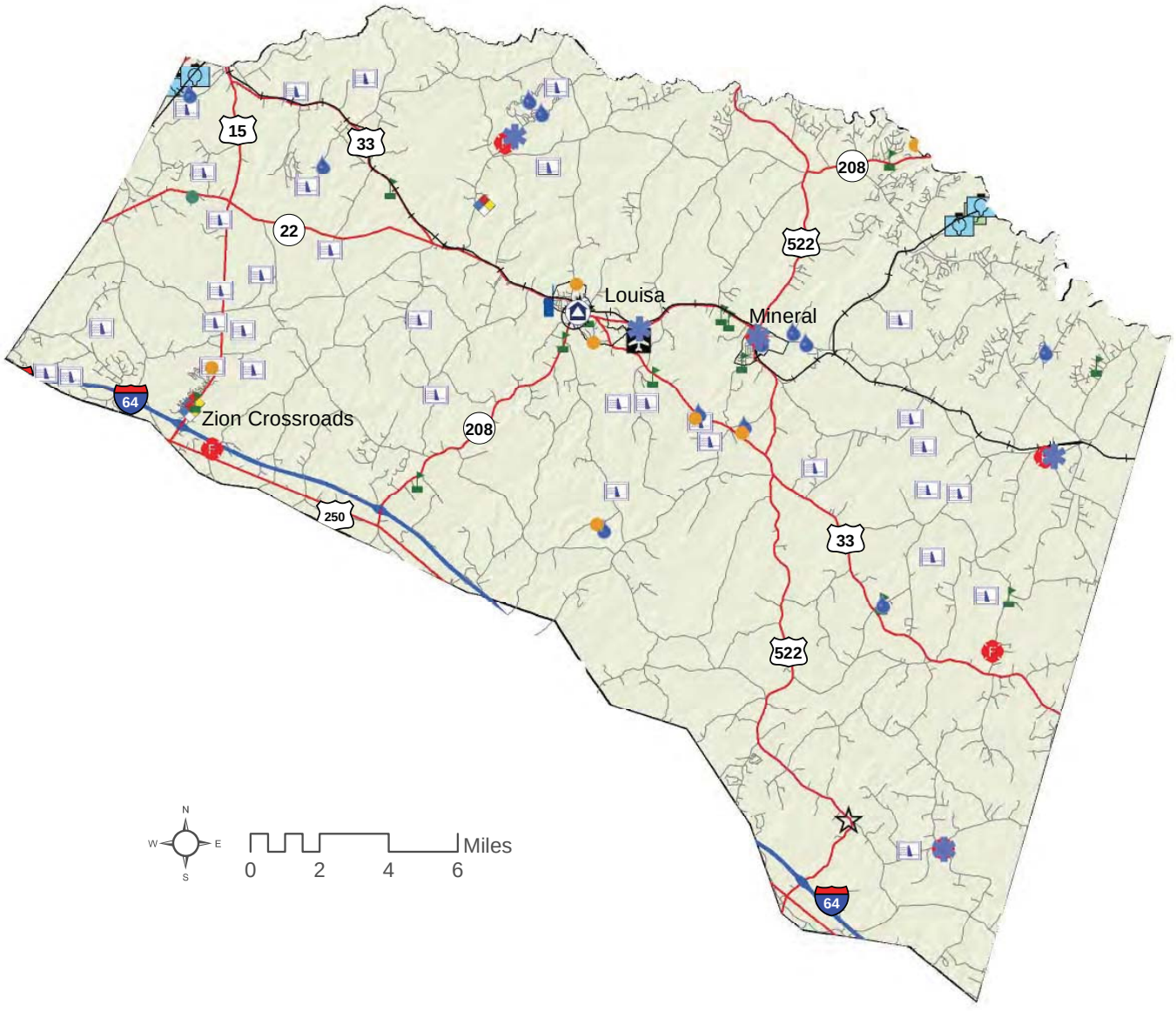
- School/Shelter/Daycare
- Assisted Living Facility
- Prison

High Potential Loss Facilities

- Nuclear Facility
- Hazardous Materials
- Dam

Thomas Jefferson Planning District Commission

Louisa Critical Facilities



Emergency Facilities

- Hospital
- Emergency Care
- Blood Bank
- Rescue Squad
- Shelter
- Emergency Op. Center
- Fire Station
- Police Station

Essential Infrastructure

- Natural Gas Facility
- Sewage Treatment Plant
- Potable Water Facility
- Communication Facility
- Electrical Power Facility
- Airport
- Ferry
- Bus Station

- Railroad
- Rail Facility
- Pump Station

Roads

- Interstate
- Primary Route
- Secondary Route

Important Community Facilities

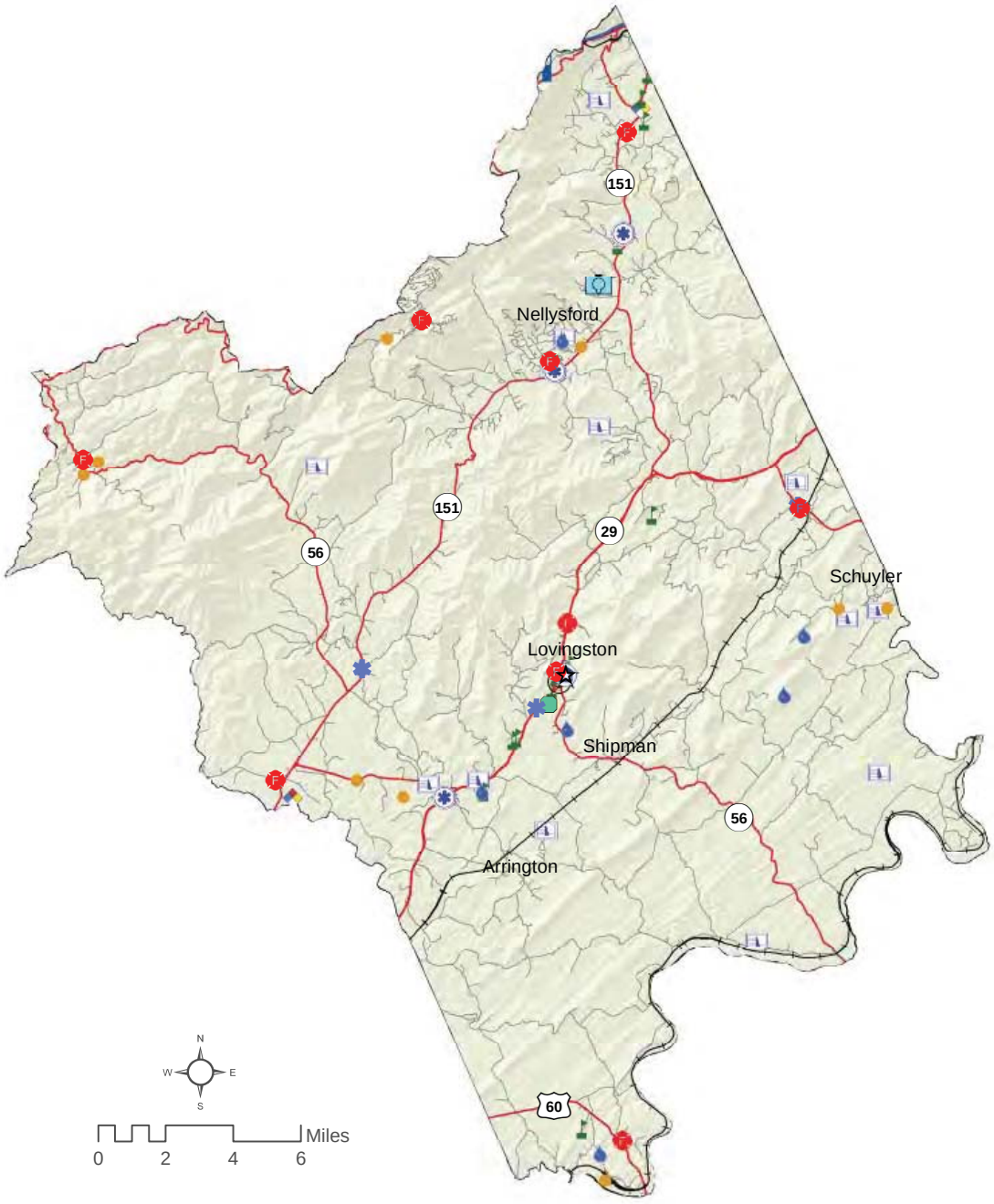
- School/Shelter/Daycare
- Assisted Living Facility
- Prison

High Potential Loss Facilities

- Nuclear Facility
- Hazardous Materials
- Dam

Thomas Jefferson Planning District Commission

Nelson Critical Facilities



Emergency Facilities

- Hospital
- Emergency Care
- Blood Bank
- Rescue Squad
- Shelter
- Emergency Op. Center
- Fire Station
- Police Station

Essential Infrastructure

- Natural Gas Facility
- Sewage Treatment Plant
- Potable Water Facility
- Communication Facility
- Electrical Power Facility
- Airport
- Ferry
- Bus Station
- Railroad
- Rail Facility
- Pump Station

Roads

- Interstate
- Primary Route
- Secondary Route

Important Community Facilities

- School/Shelter/Daycare
- Assisted Living Facility
- Prison

High Potential Loss Facilities

- Nuclear Facility
- Hazardous Materials
- Dam

Thomas Jefferson Planning District Commission

Estimating Potential Loss

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. Flood
2. Severe Winter Storm
3. Hurricane
4. Tornado
5. Windstorms
6. Drought
7. Earthquake
8. Wildfire
9. 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.

Flood: Estimated Losses

Methodology

The flood loss estimations were performed using the HAZUS ^{MH} 2.0 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} 2.0 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

Scenarios for the Rappahannock River, South Anna River, and Turkey Run were not available through HAZUS due to insufficient data. 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} 2.0 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 Expected Losses after a 100-Year Flood Event (in Thousands)

Locality	Total Loss	Per Capita Loss	Building Loss (James System)	Contents Loss (James System)	Building Loss (Rivanna System)	Contents Loss (Rivanna System)	Building Loss (Anna System)	Contents Loss (Anna System)
Nelson	**$ 2,074,000**	**$ 138**	$1,046,000	$1,028,000	$ -	$ -	$ -	$ -
Fluvanna	**$ 9,700,000**	**$ 378**	$729,000	$585,000	$5,118,000	$3,268,000	$ -	$ -
Albemarle	**$ 62,649,000**	**$ 633**	$1,221,000	$1,155,000	$32,072,000	$28,201,000	$ -	$ -
Greene	**$5,000**	**$ 0.27**	$ -	$ -	$ 2,000	$ 3,000	$ -	$ -
Louisa	**$ 333,000**	**$ 10**	$ -	$ -	$ -	$ -	$183,000	$150,000
Charlottesville	**$ 29,304,000**	**$ 674**	$ -	$ -	$16,698,000	$12,606,000	$ -	$ -
Region	**$104,065,000**	**$ 443**	$2,996,000	$2,768,000	$53,890,000	$44,078,000	$183,000	$150,000

Source: HAZUS MH 2.0

Direct economic loss to the region from a 100-Year flood is estimated to be $104,065,000, with 88% the total loss occurring in Albemarle County and the far eastern portion of the City of Charlottesville. This amounts to $443 per person in the region. Most of the damage, approximately 77%, 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 2,758 people are expected to be displaced and in need of temporary shelter, and 5,275 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 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 Footage with Substantial Flood Damage (over 50%) by Use

Locality	Residential	Commercial	Industrial	Agricultural	Religious/ Non-Profit	Government	Schools
Nelson	21,906	342	2,231	-	-	-	450
Fluvanna	431,816	7,193	5,535	1,214	13	-	2,306
Albemarle	174,820	128,392	38,999	7,862	6,556	2,849	9,537
Greene	33	-	-	-	-	-	-
Louisa	1,675	-	10	-	-	-	-
Charlottesville	319,392	55,460	14,358	130	4,071	-	177
Region	947,967	191,388	61,123	9,207	10,640	2,849	12,020

Source: HAZUS MH 2.0

Percentage of Total Square Footage with Substantial Flood Damage

Locality	Total Residential in Locality	Total Non-Res in Locality	Residential with Flood Damage	Non-Res with Flood Damage	% Res with Damage	% Non-Res with Damage
Nelson	12,236,818	2,020,073	21,906	3,024	0.18%	0.15%
Fluvanna	12,526,429	1,200,788	431,816	16,261	3.45%	1.35%
Albemarle	51,276,247	15,613,181	174,820	194,195	0.34%	1.24%
Greene	9,126,410	1,596,330	33	-	0.00%	0.00%
Louisa	17,604,718	4,076,964	1,675	10	0.01%	0.00%
Charlottesville	25,765,270	10,864,809	319,392	74,196	1.24%	0.68%
Region	128,535,891	35,372,146	947,967	284,378	0.74%	0.80%

Source: HAZUS MH 2.0

Displaced Population

Locality	Displaced Population
Nelson	111
Fluvanna	372
Albemarle	1574
Greene	2
Louisa	26
Charlottesville	1004
Region	2758

Debris after Flooding

Locality	Debris (tonnes)
Nelson	184
Fluvanna	726
Albemarle	1202
Greene	1
Louisa	78
Charlottesville	3083
Region	5275

Source: HAZUS MH 2.0

The expected damage to residential square footage exceeds damage to all other uses combined, although on a percentage basis non-residential structures are overrepresented. 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 2758. Each of these people will need temporary shelter during the flooding and throughout a recovery period. The flood is also expected to deposit 5275 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 100-Year Return

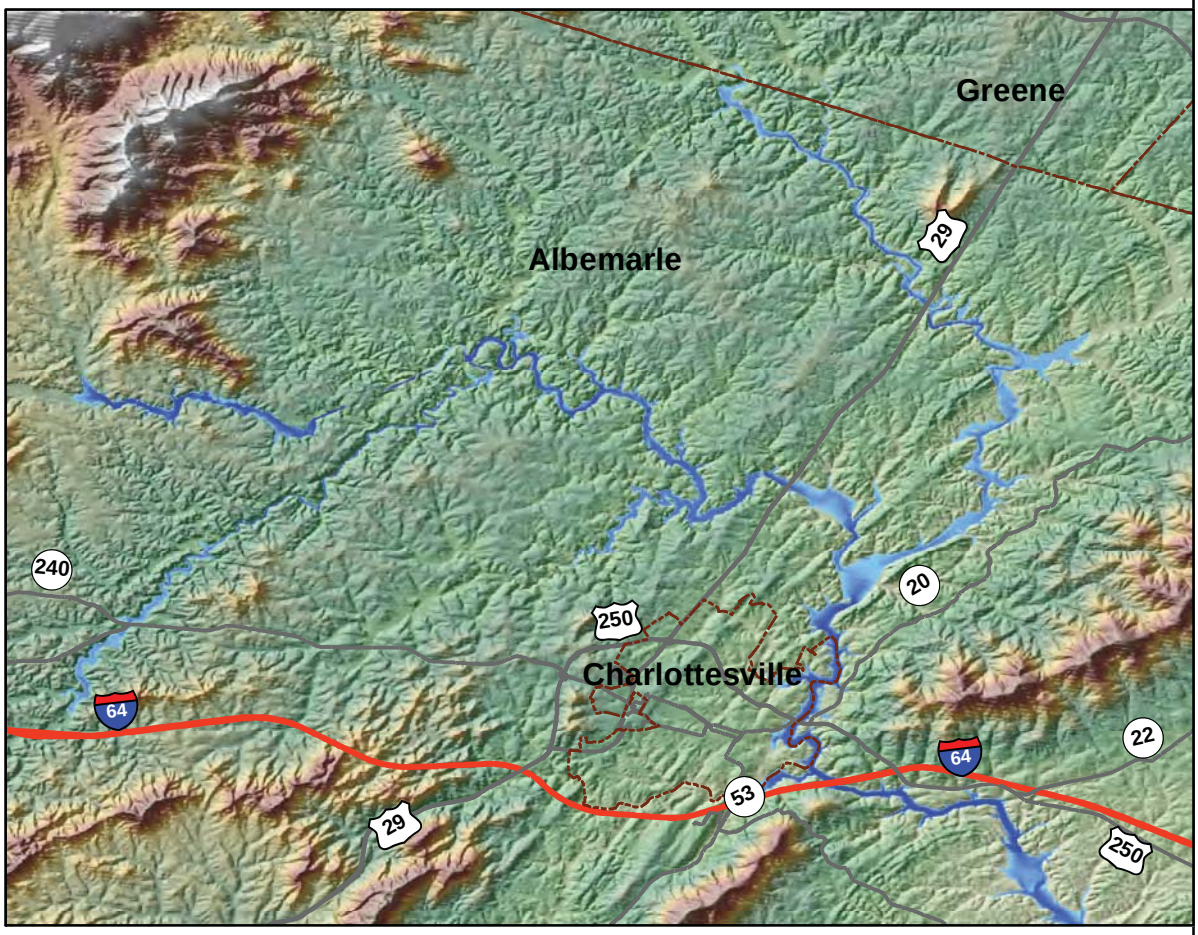
Floodplain with Depth Grid

100-Year Depth

in Feet

High : 78

Low : 0.1



Estimated Economic Loss

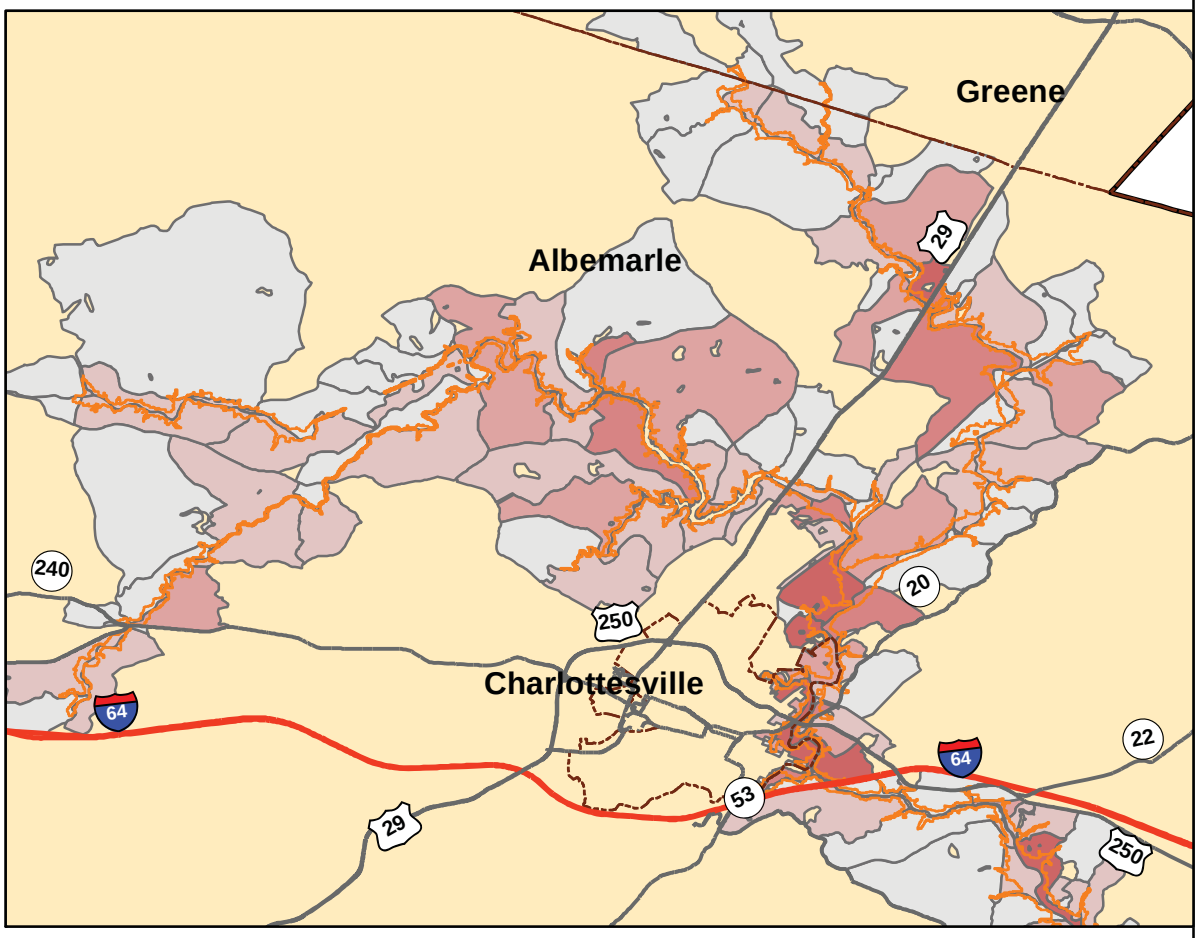
defined as the depreciated value of replacement of both building and contents due to flood damage of all occupancy classes, both pre-FIRM and post-FIRM.

Flood Area

Economic Loss

in Thousands

- 0 - 150
- 151 - 500
- 501 - 1000
- 1001 - 2500
- 2501 - 8500



N

0 1.25 2.5 5 7.5 10

Miles

Lower Rivanna 100-Year Return

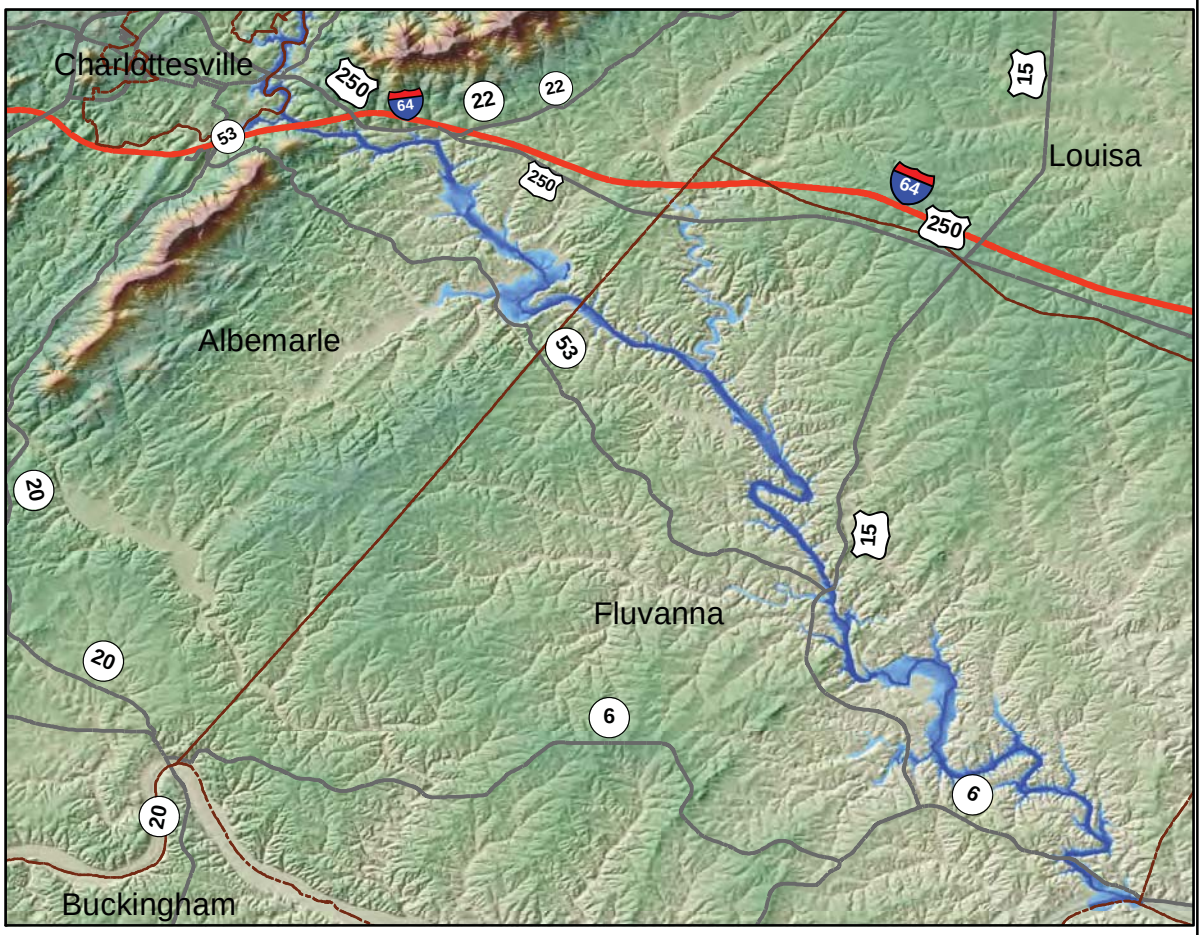
Floodplain with Depth Grid

100-Year Depth

in Feet

High : 78

Low : 0.1



Estimated Economic Loss

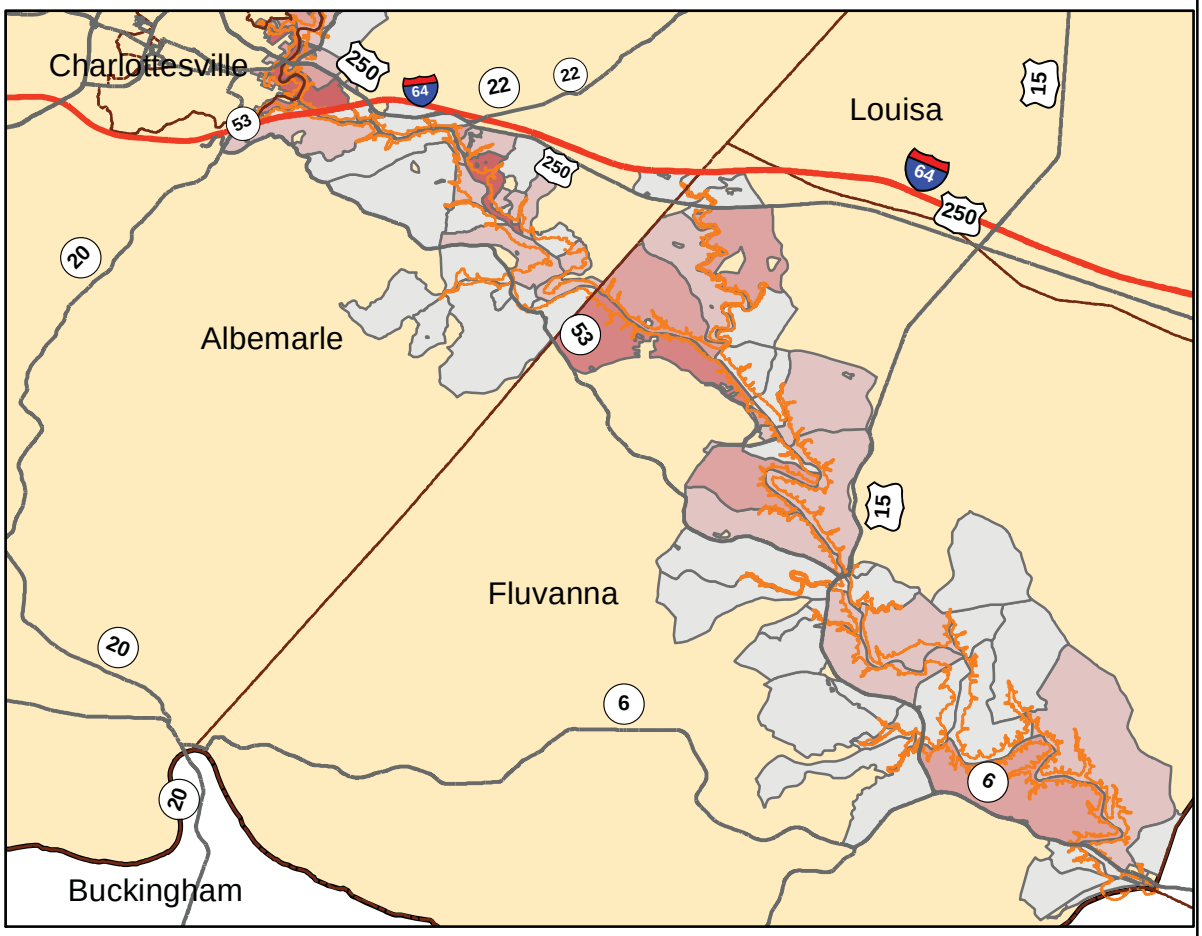
defined as the depreciated value of replacement of both building and contents due to flood damage of all occupancy classes, both pre-FIRM and post-FIRM.

Flood Area

Economic Loss

in Thousands

- 0 - 150
- 151 - 500
- 501 - 1000
- 1001 - 2500
- 2501 - 8500



N

0 1.5 3 6 9 12

Miles

Upper James 100-Year Return

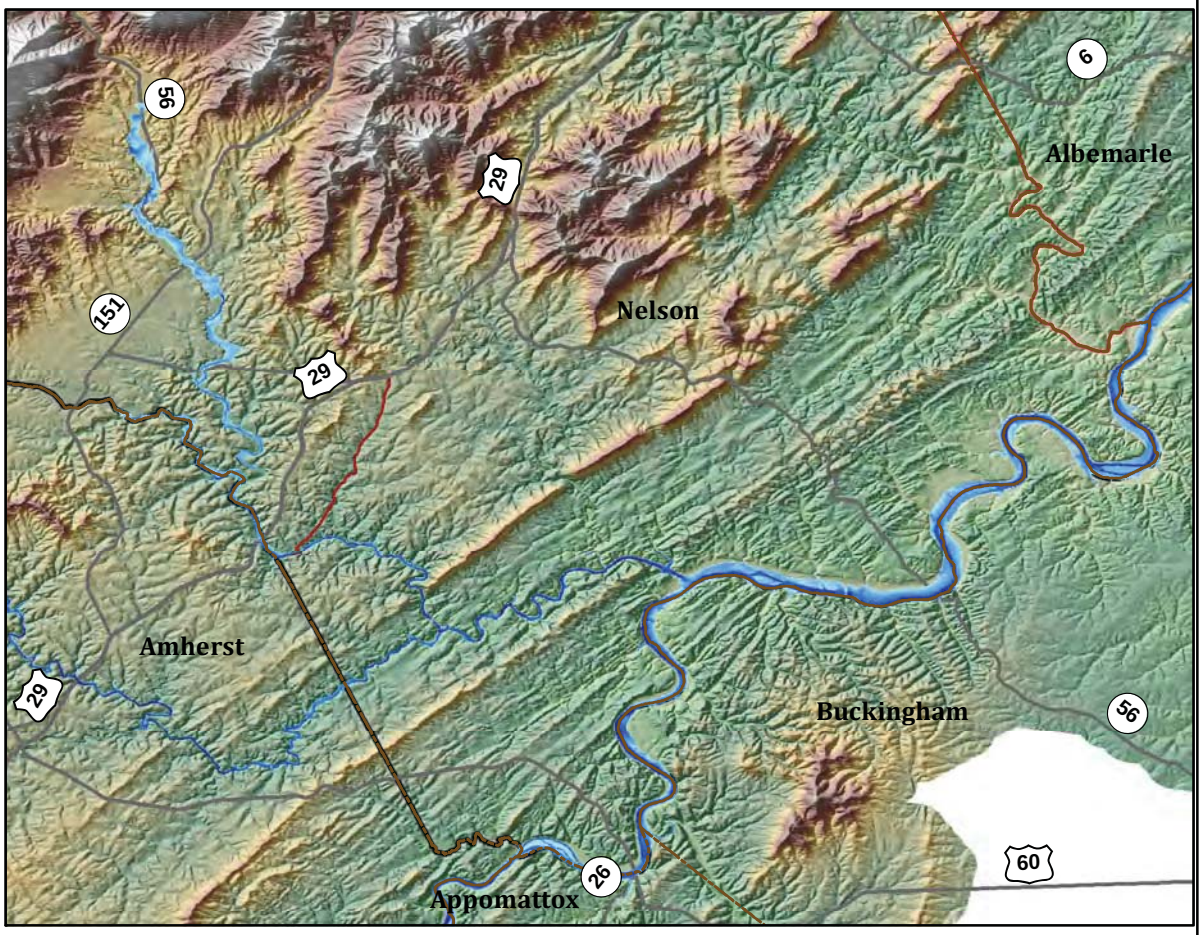
Floodplain with Depth Grid

100-Year Depth

in Feet

High : 79

Low : 0.1



Estimated Economic Loss

defined as the depreciated value of replacement of both building and contents due to flood damage of all occupancy classes, both pre-FIRM and post-FIRM.

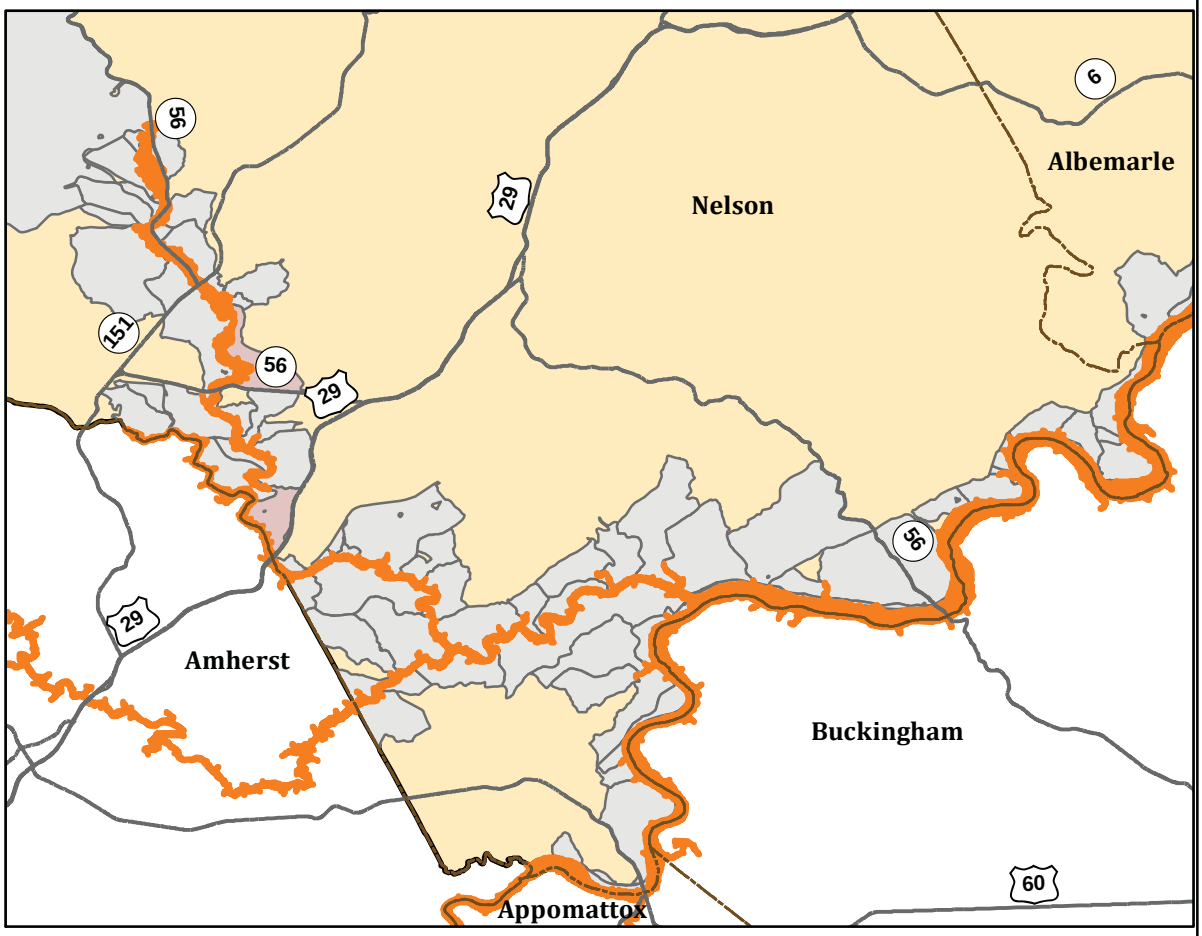
Flood Area

Economic Loss

in Thousands

- 0 - 150
- 151 - 500
- 501 - 1000
- 1001 - 2500
- 2501 - 8500

(Hydrological analysis failed for Rockfish River based on insufficient data)



N

0 1.5 3 6 9 12

Miles

Lower James 100-Year Return

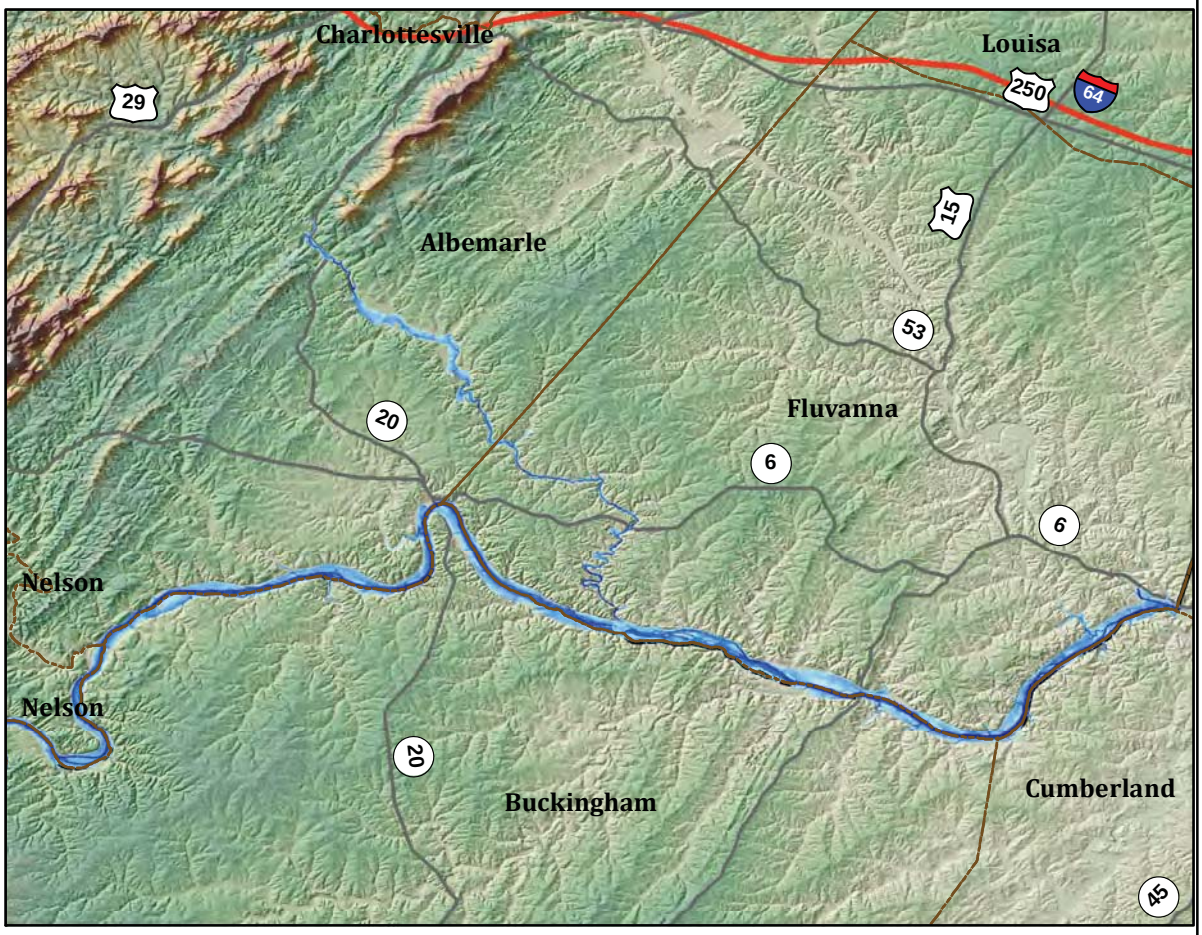
Floodplain with Depth Grid

100-Year Depth

in Feet

High : 79

Low : 0.1



Estimated Economic Loss

defined as the depreciated value of replacement of both building and contents due to flood damage of all occupancy classes, both pre-FIRM and post-FIRM.

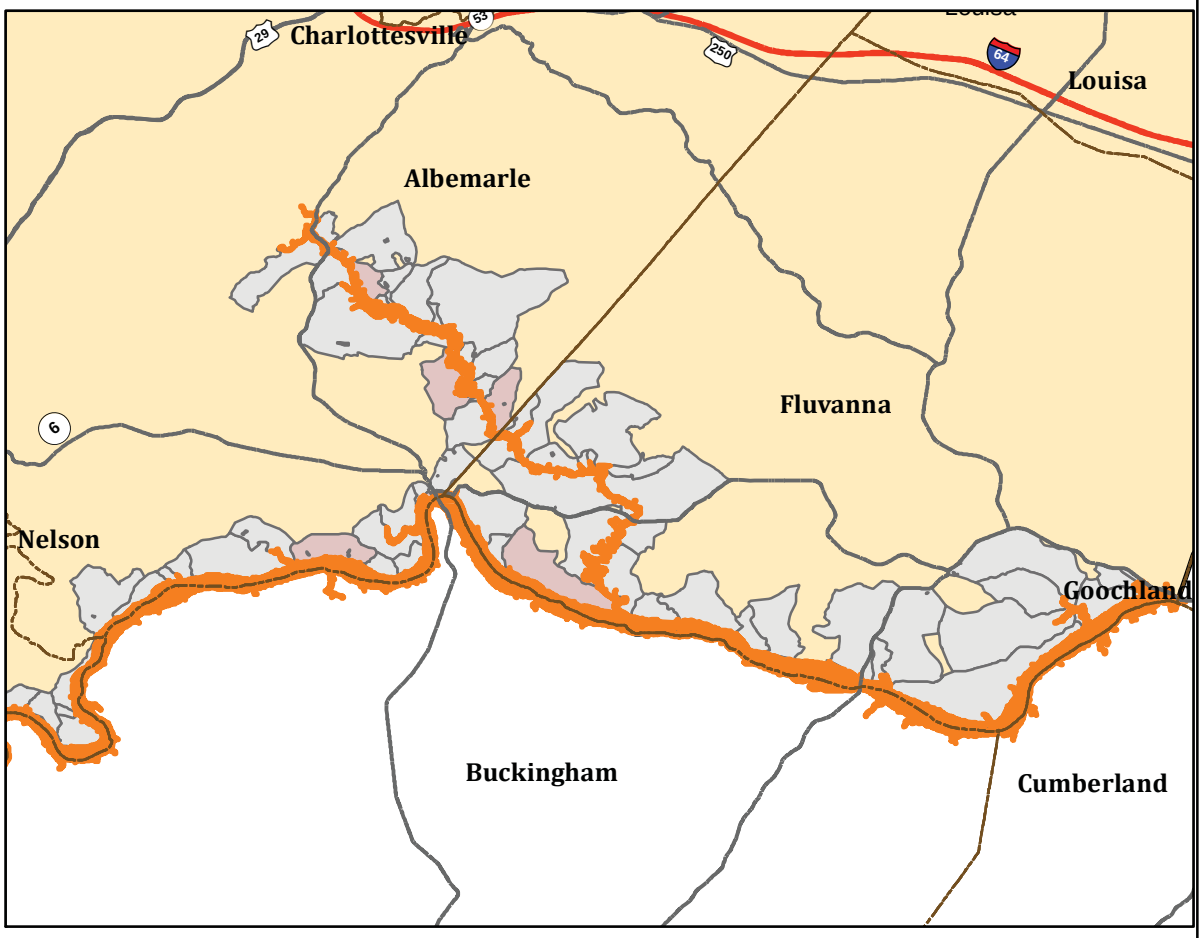
Flood Area

Economic Loss

in Thousands

- 0 - 150
- 151 - 500
- 501 - 1000
- 1001 - 2500
- 2501 - 8500

(Hydrological analysis failed for Rockfish River based on insufficient data)



N

0 2 4 8 12 16

Miles

North Anna 100-Year Return

Floodplain with Depth Grid

Depth

in Feet

High : 16

Low : 0.1

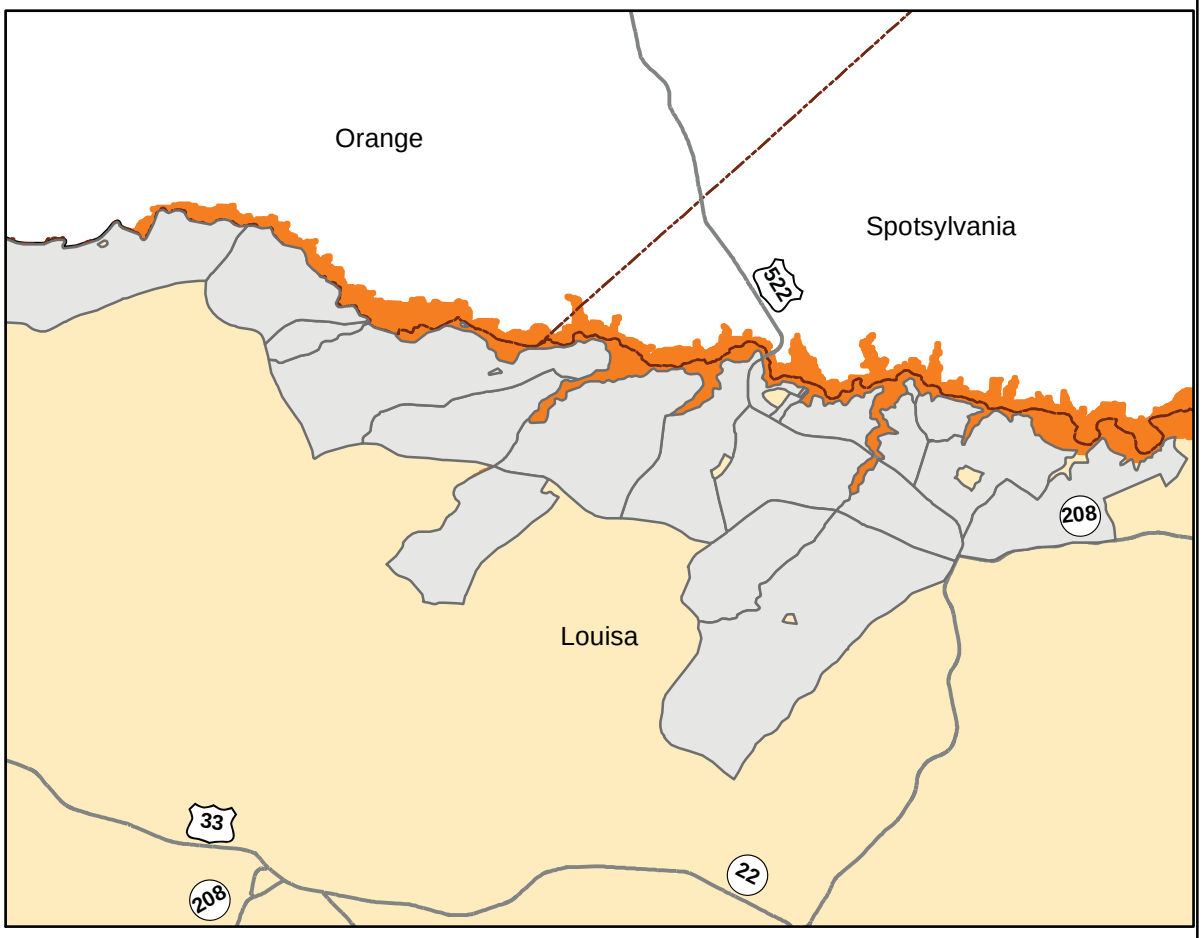
Estimated Economic Loss

defined as the depreciated value of replacement of both building and contents due to flood damage of all occupancy classes, both pre-FIRM and post-FIRM.

Economic Loss
In Thousands

- 0 - 150
- 151 - 500
- 501 - 1000
- 1001 - 2500
- 2501 - 8500
- Flood Area

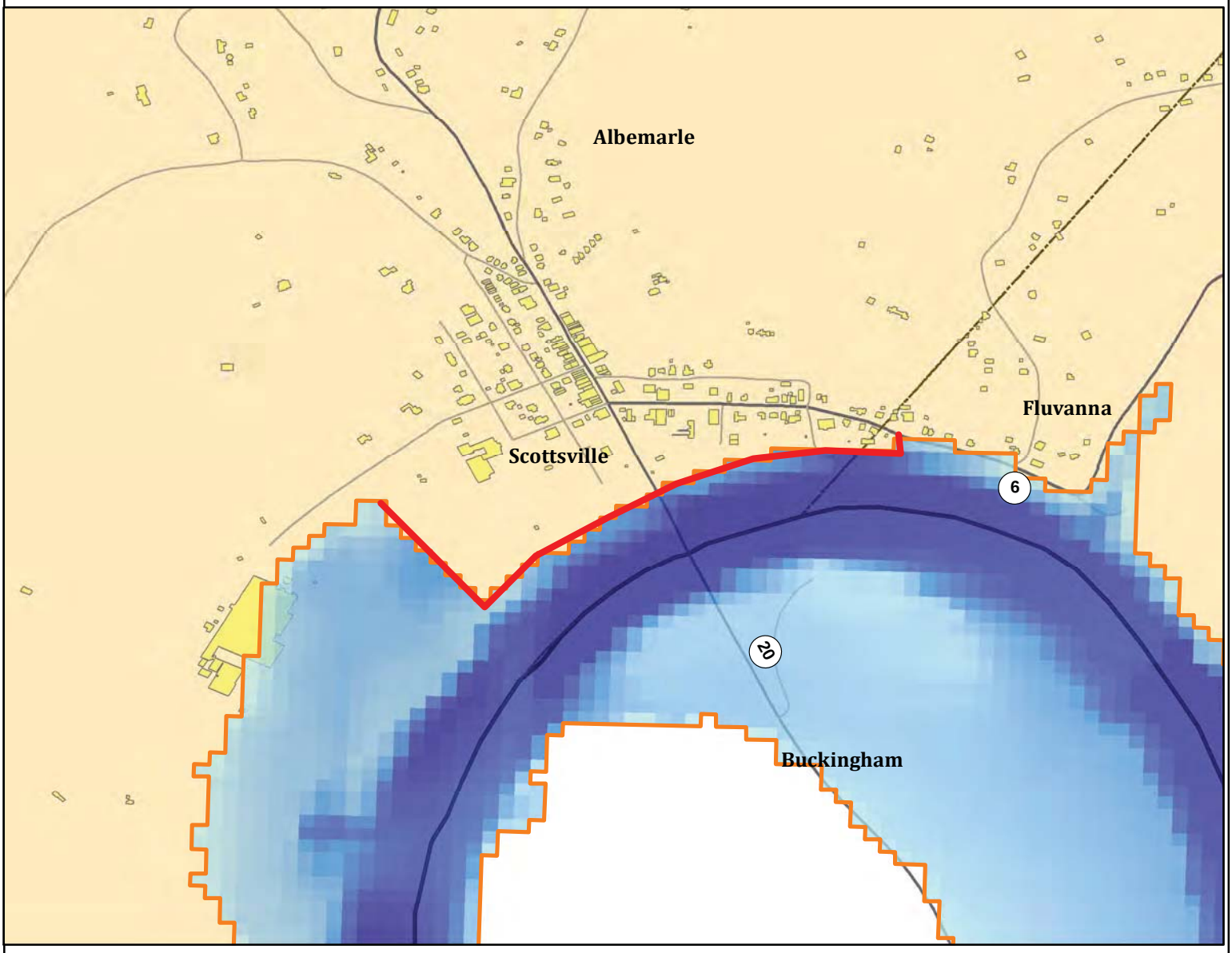
Hydrological analysis failed for other portions of the North Anna River based on insufficient data



N

0 0.5 1 2 3 4 Miles

Scottsville 100-Year Return



Scottsille Levee, completed in 1990, rises 37 feet above river level. This is 3 feet higher than the 1972 flood, which is the highest recorded in recent history.

Note: The Scottsville Waste Water Treatment building, the large building depicted on this map, appears to be vulnerable to a 100-Year Flood, but the site is mitigated by a berm that limits it's exposure.

Flood Area

River Depth in Feet

High : 79

Low : 0.1

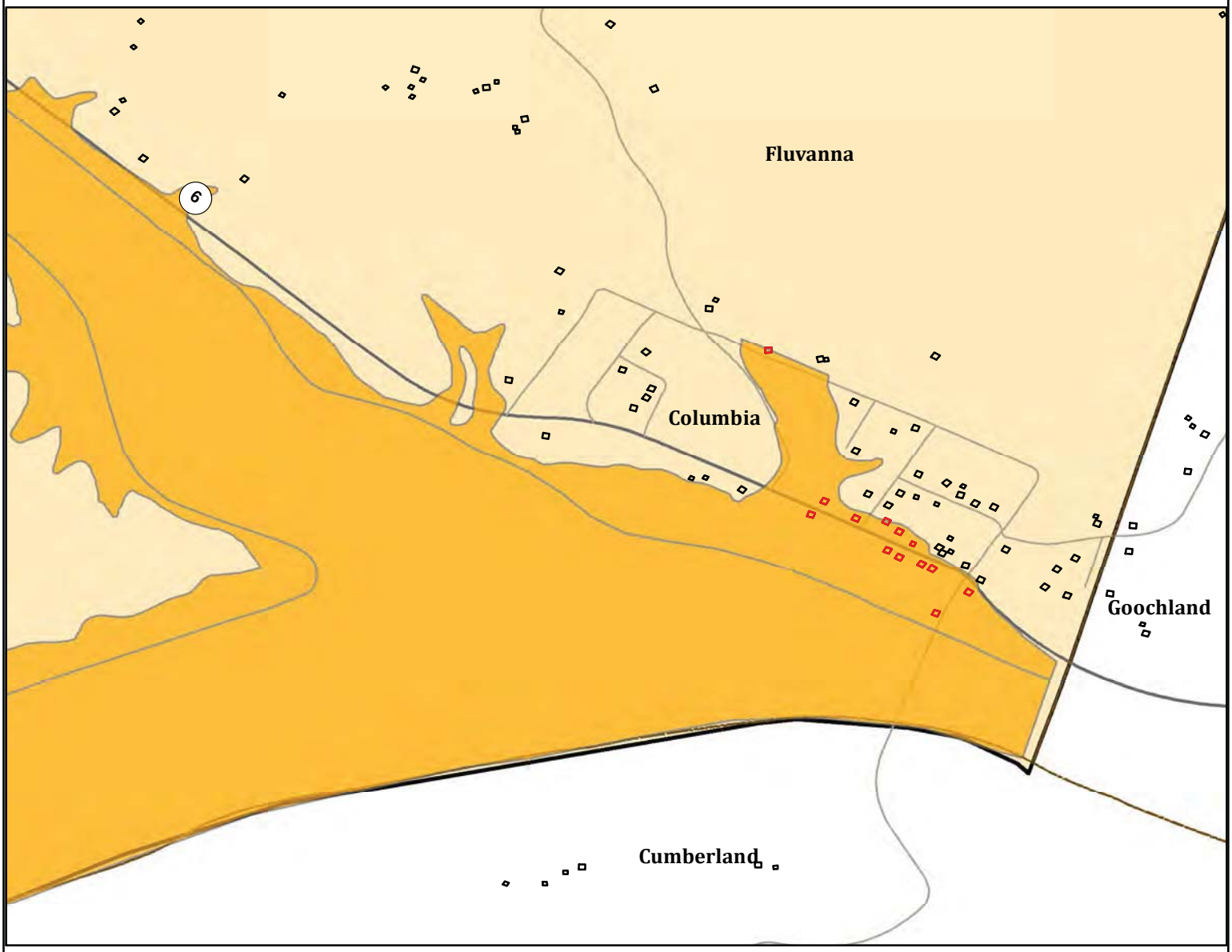
Buildings

Levee

N

0 0.05 0.1 0.2 0.3 0.4 Miles

Columbia 100-Year Return



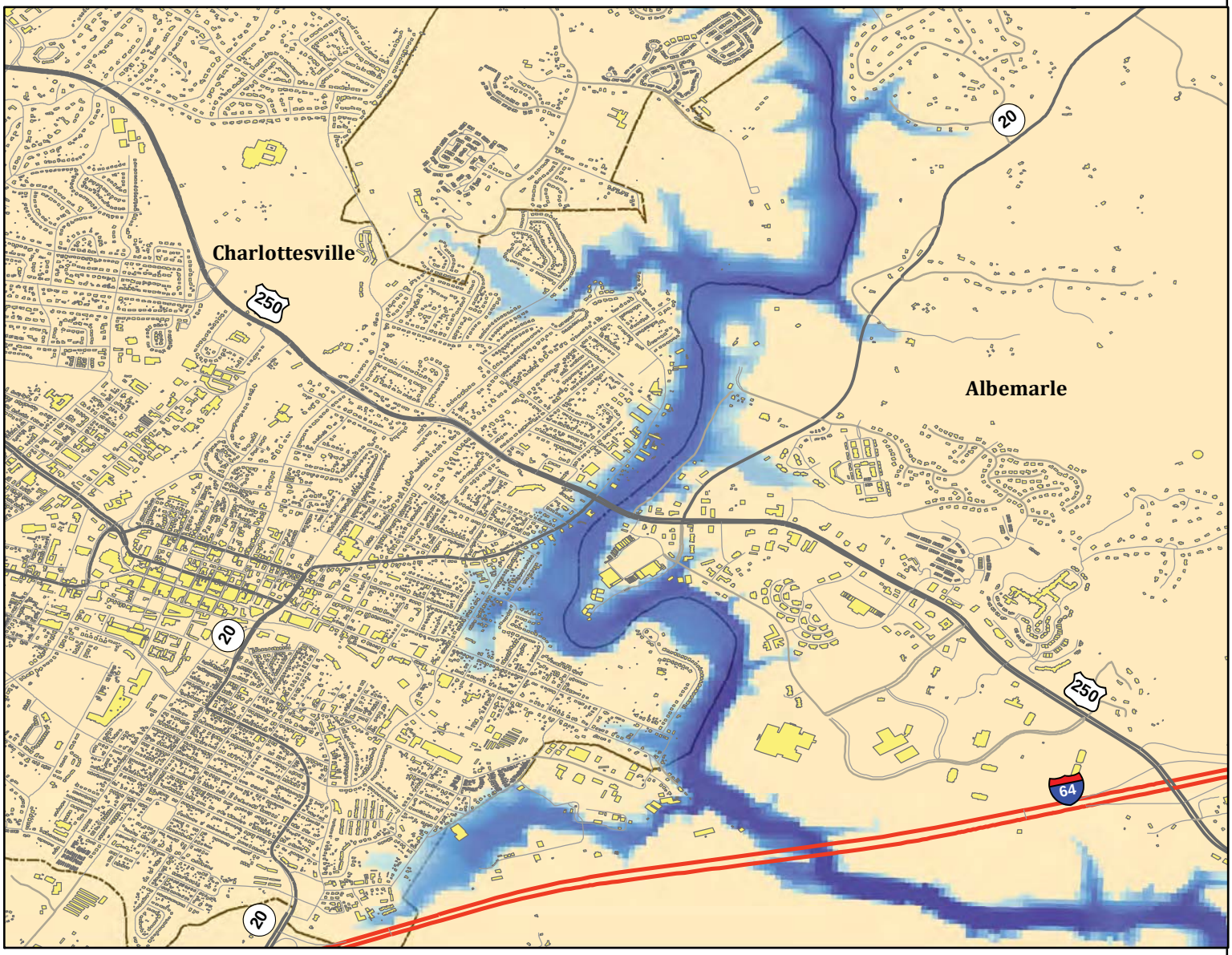
The DFIRM from the NFIP is used to estimate the impact of a 100-Year Flood for the Town of Columbia

Flood Area
Buildings
Buildings Damaged by Flood

N

0 0.05 0.1 0.2 0.3 0.4
Miles

Charlottesville/Pantops 100-Year Return



The most significant damage and economic loss is expected to occur along the Rivanna River between Charlottesville and the Pantops area of Albemarle County.

Buildings

Depth in Feet

High : 79

Low : 0.1

N

0 0.125 0.25 0.5 0.75 1 Miles

Data on expected flood losses by county is also available from the Virginia Department of Emergency Management (VDEM), as included in the State Hazard Mitigation Plan in 2008. While the previously cited HAZUS scenario modeling can give specific loss estimates based on given parameters, the aggregate VDEM data can be used to make broad overall estimates at the county-wide level. All loss is based on damage to property, which may account for why the figure is lower than estimates generated through modeling.

Annualized Expected Losses to Flooding by Locality

Locality	Annual Expected loss	Annual Per Capita Loss	State Rank of estimated loss
Albemarle	$ 702,604	$ 7.10	23 of 134
Charlottesville	$ 248,812	$ 5.72	57 of 134
Fluvanna	$ 120,734	$ 4.70	100 of 134
Greene	$ 16,807	$ 0.91	125 of 134
Louisa	$ 81,677	$ 2.46	94 of 134
Nelson	$ 57,832	$ 3.85	86 of 134
Region	$ 204,744	$ 0.87	-

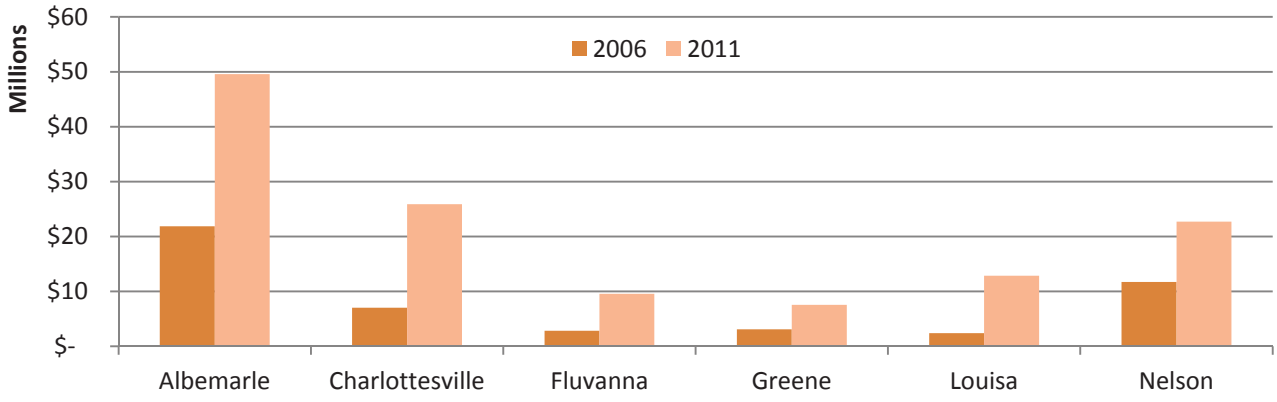
Source: VDEM

Other Flood Vulnerability Considerations

National Flood Insurance Program

Every locality in the TJPD 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 $128 million in flood insurance was held in the region, with annual premiums totaling about $116 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 $1 million. Twenty-two of those losses have occurred in the last five years, amounting to $354 thousand.

Total Insurance Held in the National Flood Insurance Program



National Flood Insurance Statistics by Locality in TJPD

Locality	Entry into NFIP	# of Policies 2011	Change in Policies 2006 - 2011	Total NFIP Insurance 2011	Annual Insurance Premium 2011	Total Losses since Entry	Payments since Entry	Payments 2006 - 2011
Albemarle	1980	207	85%	$ 49,563,500	$ 161,713	41	$ 305,822	$ 43,765
Charlottesville	1979	107	161%	$ 25,869,700	$ 101,806	35	$ 285,738	$ 263,561
Fluvanna	1978	36	112%	$ 9,565,500	$ 20,528	13	$ 205,961	$ 6,358
Greene	1984	31	48%	$ 7,531,000	$ 12,227	14	$ 36,761	$ -
Louisa	1989	48	200%	$ 12,839,000	$ 32,567	1	$ -	$ -
Nelson	1978	106	29%	$ 22,696,600	$ 77,259	34	$ 175,862	$ 41,147
Region	**-**	**535**	**85%**	**$ 128,065,300**	**$ 406,100**	**138**	**$ 1,010,144**	**$ 354,831**

Source: NFIP

There has been a clear increase in both policies and premiums over the last five years throughout the region. The number of policies held in the TJPD has increased by 85%, and total premiums paid throughout the region have more than tripled. The growth rate of policies in the region has exceeded that of the State of Virginia, which grew by 3% between 2009 and 2010. Most localities have also had an increase in payments made for losses with the exception of Greene County and Louisa County. Louisa County has never received a payment from the program.

Repetitive Loss Structures

A repetitive loss structure, as defined by FEMA, is a property that is currently insured through the National Flood Insurance Program, for which two or more losses (occurring more than 10 days apart) of at least $1,000 each have been paid within any 10-year period since 1978.

There are currently ten repetitive loss structures in the Planning District; 3 in Albemarle County, 2 in the City of Charlottesville, 3 in Fluvanna County, and 2 in Nelson County. Their total claimed losses amount to $526,894. All ten of the properties have reported claims at least twice, two have ade claims three times, one property have been flooded five times, and one property has been flooded seven times. One property in Albemarle County on Berkmar Dr. has accounted for over half of all Repetitive Loss flood damage in the region. It is a non-residential structure that has been flooded seven times, at a total cost of almost $232,123 in damage to the contents of the property. These structures may be important to target for possible mitigation activities. The following chart shows selected claims data reported to the NFIP.

Repetitive Loss Structures (as of July 2010)

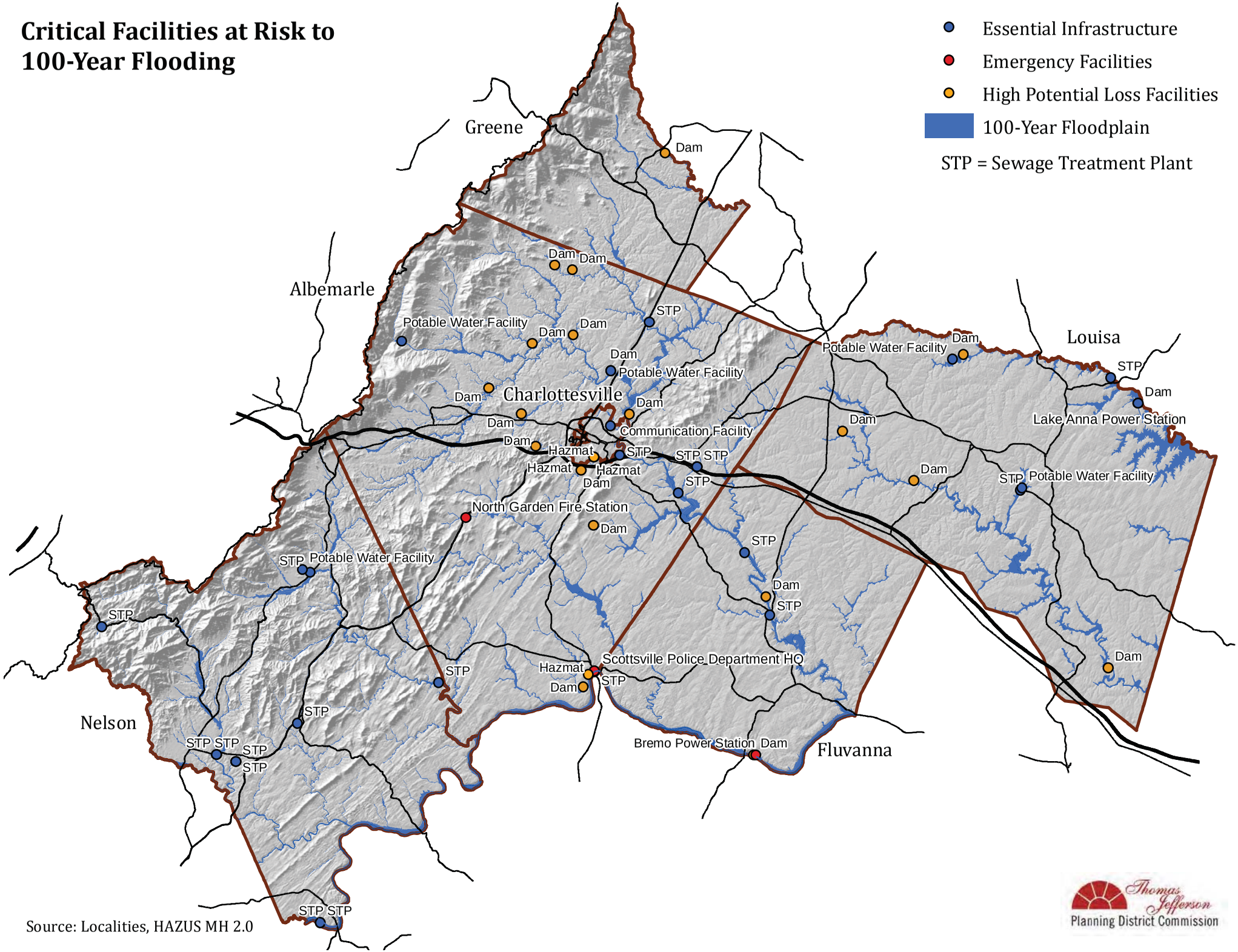
County	Type	Imp Value	Mitigated	Insured	# of Losses	Most recent Loss	Total Building Damage	Total Content Damage	Total Damage
Albemarle	Non Res	0	No	No	7	08/06/2005	$ 0	$ 232,123	$ 232,123
Fluvanna	Non Res	$ 170,600	No	No	3	09/07/1996	$ 78,996	$ 330	$ 79,326
Fluvanna	1 fmly	$ 42,000	No	No	2	09/06/1996	$ 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
Cville	1 fmly	$ 28,500	No	Yes	2	09/21/1979	$ 9,493	$ 5,000	$ 14,493

Source: NFIP

Critical Facilities in floodplain

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.

Critical Facilities at Risk to 100-Year Flooding



Source: Localities, HAZUS MH 2.0

Thomas Jefferson Planning District Commission

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 would indicate that over the next ten years the region will be hit by 30-40 winter storms causing several deaths and dozens of injuries, mostly due to automobile accidents. Direct property loss can be expected to be minimal over the decade, under $1 million in total damages, but storms will continue to significantly impede business when infrastructure and services are blocked. 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.

Hurricane: Estimated Losses

Methodology

Hurricane losses have been estimated using HAZUS ^{MH} 2.0. 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)	604	38
Households Displaced	3	0
Debris (tons)	224,213	15,940
Direct Property Loss	$ 17,337,000	$ 545,000
Indirect Economic Loss	$ 352,000	$ 1,000
Total Loss	$ 17,689,000	$ 546,000

Source: HAZUS MH 2.0

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.

Expected Economic Losses from Storms with Range of Return Periods

Storm	Property Damage Losses	Business Interruption Losses	Total Losses
10-Year Return	0	0	**0**
20-Year Return	0	0	**0**
50-Year Return	$ 1,479,000	$ 1,000	**$ 1,480,000**
100-Year Return	$ 6,230,000	$ 2,000	**$ 6,232,000**
200-Year Return	$ 15,950,000	$ 146,000	**$ 16,396,000**
500-Year Return	$ 39,024,000	$ 1,425,000	**$ 40,451,000**
1000-Year Return	$ 64,986,000	$ 4,060,000	**$ 69,046,000**
Annualized	$362,000	$23,000	**$385,000**

Source: HAZUS MH 2.0

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 $385,000 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

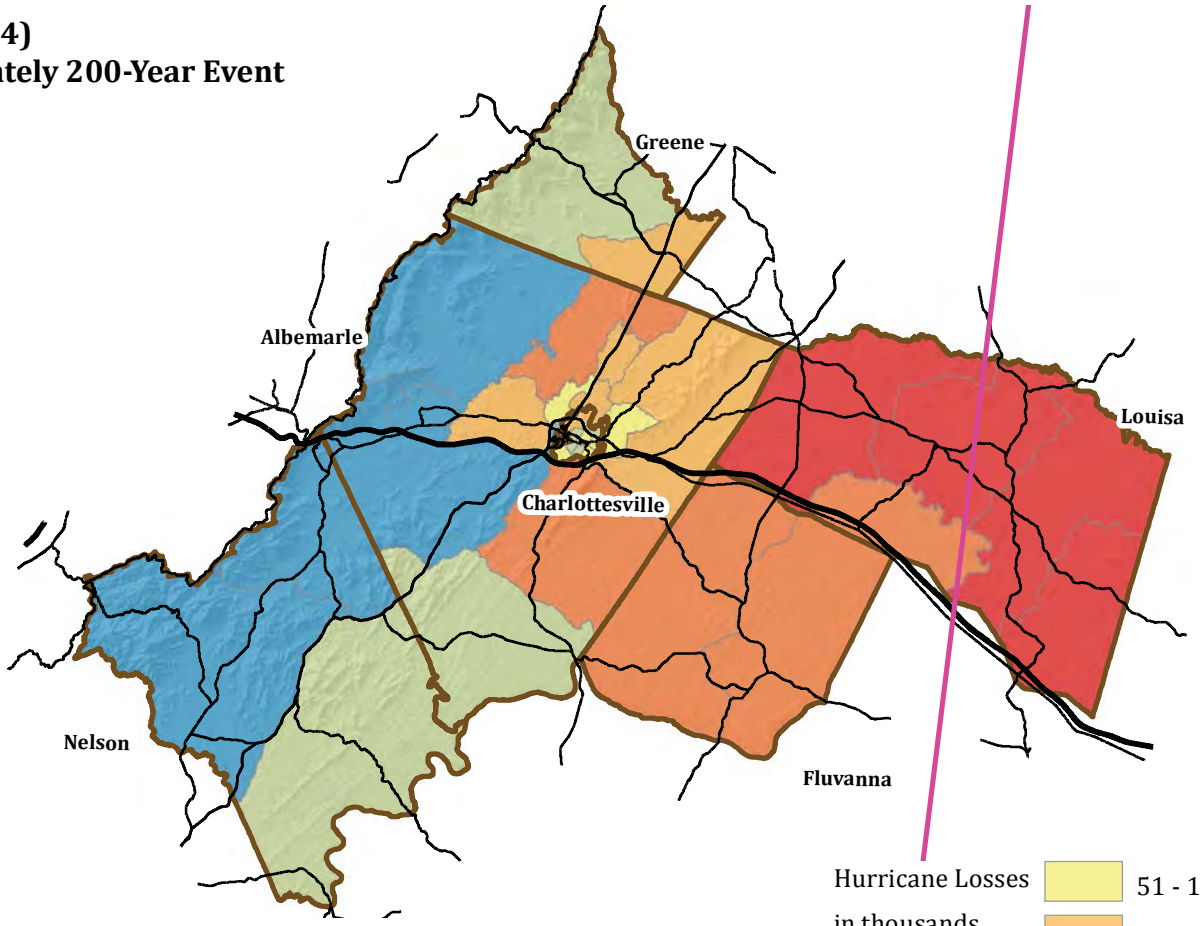
Locality	Annual Property Damage Loss	Annual Income Loss	Total Annual Losses
Albemarle	$ 143,000	$ 9,000	$ 152,000
Charlottesville	$ 52,000	$ 9,000	$ 61,000
Fluvanna	$ 38,000	$ 2,000	$ 40,000
Greene	$ 18,000	$ 1,000	$ 19,000
Louisa	$ 88,000	$ 3,000	$ 91,000
Nelson	$ 21,000	$ 1,000	$ 22,000
Region	$ 360,000	$ 25,000	$ 385,000

Source: HAZUS MH 2.0

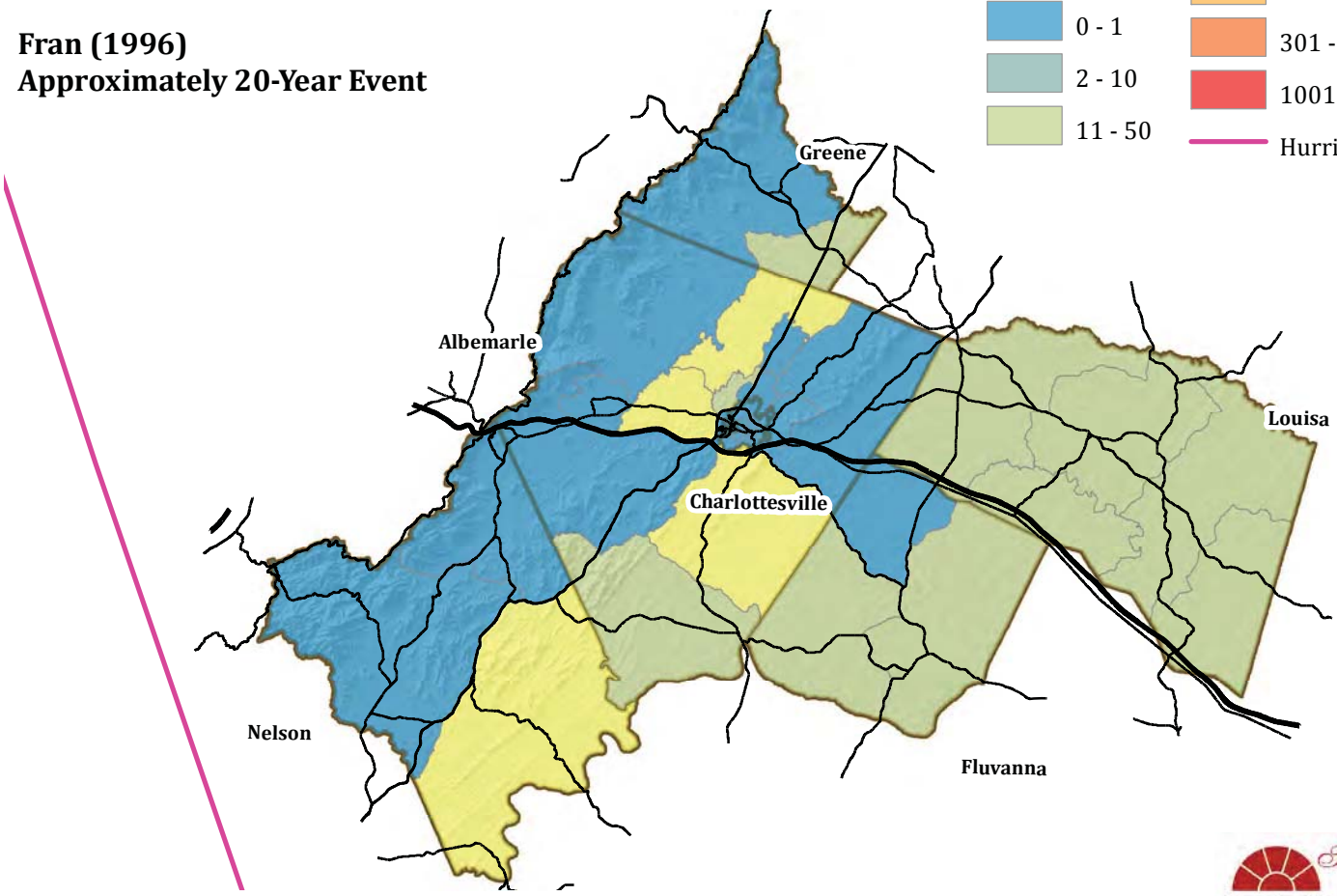
The following maps show residential, commercial, and industrial losses in thousands of dollars as determined by HAZUS MH 2.0.

Expected Economic Losses from Historic Hurricane Event Scenarios

Hazel (1954)
Approximately 200-Year Event



Fran (1996)
Approximately 20-Year Event



Hurricane Losses in thousands

- 0 - 1
- 2 - 10
- 11 - 50
- 51 - 100
- 101 - 300
- 301 - 1000
- 1001 - 4145
- Hurricane Track

Source: HAZUS M-H

Thomas Jefferson Planning District Commission

Tornadoes: Estimated Losses

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.

Drought: Estimated Losses

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 are not affected by drought conditions. The City of Charlottesville and urbanized Albemarle County depend on surface water 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 - $10 million) to crops in the region and some business operations may be impeded by water usage restrictions.

Earthquake: Estimated Losses

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 have been reported. The Louisa County High School and Thomas Jefferson Elementary School were damaged and are closed for the year. The rest of the TJPD did not report much damage. Outside of Louisa County, most damage was reported to the north along known fault lines.

The historic Pendleton-Wootton house sustained serious structural damage and the collapse of all four chimneys. The house is within 2 miles of the earthquake epicenter. Source: Louisa County Historical Society.

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.

Methodology

HAZUS ^{MH} 2.0 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 $300 million in building damage and loss of income throughout the region, with 70% of all economic loss occurring in Louisa County.

Building Stock Exposure prior to Earthquake (in thousands)

Locality	Residential	Commercial	Industrial	Agriculture	Religion	Government	Education	Total
Albemarle	$ 3,914,671	$ 908,203	$ 171,554	$ 31,584	$ 94,965	$ 16,170	$ 156,439	$ 5,293,586
Charlottesville	$1,913,656	$ 795,922	$ 84,147	$ 7,116	$ 79,702	$ 28,136	$ 94,986	$ 3,003,665
Fluvanna	$ 929,559	$ 63,544	$ 15,678	$ 2,827	$ 5,650	$ 3,391	$ 13,925	$1,034,574
Greene	$ 629,500	$ 77,327	$ 18,871	$ 4,735	$ 13,511	$ 3,896	$ 12,551	$ 760,391
Louisa	$ 1,231,503	$ 196,489	$ 77,137	$ 8,357	$ 32,242	$ 5,739	$ 15,323	$ 1,566,790
Nelson	$ 776,045	$ 101,565	$27,476	$ 8,539	$ 25,102	$ 8,141	$ 5,621	$952,489
Region	$ 9,394,934	$2,143,050	$394,863	$63,158	$ 251,172	$ 65,473	$ 298,845	$12,611,495

Capital Stock Losses after Earthquake (in thousands)

Locality	Structural Damage	Non-Structural Damage	Contents Loss	Inventory Loss	Loss Ratio	Total Capital Stock Loss
Albemarle	$ 5,083	$ 15,104	$ 6,053	$ 190	**0.38%**	$ 26,430
Louisa	$ 29,508	$ 100,619	$ 40,672	$ 1,357	**8.31%**	$ 172,156
Charlottesville	$ 3,080	$ 10,085	$ 4,315	$ 94	**0.44%**	$ 17,574
Greene	$ 606	$ 1,543	$ 536	$ 18	**0.28%**	$ 2,703
Fluvanna	$ 2,777	$ 9,976	$ 4,194	$ 56	**1.23%**	$ 17,003
Nelson	$ 372	$ 785	$ 215	$ 6	**0.12%**	$ 1,378
Region	$ 41,426	$ 138,111	$ 55,985	$ 1,721	**1.79%**	$ 237,243

Income Losses after Earthquake (in thousands)

Locality	Relocation Loss	Capital Related Loss	Wages Loss	Rental Income Loss	Total Income Loss	Total Loss
Albemarle	$ 4,509	$ 1,496	$ 1,990	$2,071	$ 10,066	**$ 36,495**
Louisa	$ 23,349	$ 3,409	$ 4,872	$ 8,069	$ 39,699	**$ 211,854**
Charlottesville	$ 2,862	$ 1,301	$ 1,756	$1,730	$ 7,649	**$ 25,224**
Greene	$ 531	$ 83	$ 110	$ 189	$ 913	**$ 3,616**
Fluvanna	$ 2,356	$ 297	$ 360	$ 772	$ 3,785	**$ 20,787**
Nelson	$ 346	$ 81	$ 102	$ 139	$ 668	**$ 2,047**
Region	$ 33,952	$ 6,668	$ 9,190	$ 12,970	$ 62,780	**$ 300,023**

Source: HAZUS MH 2.0

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.

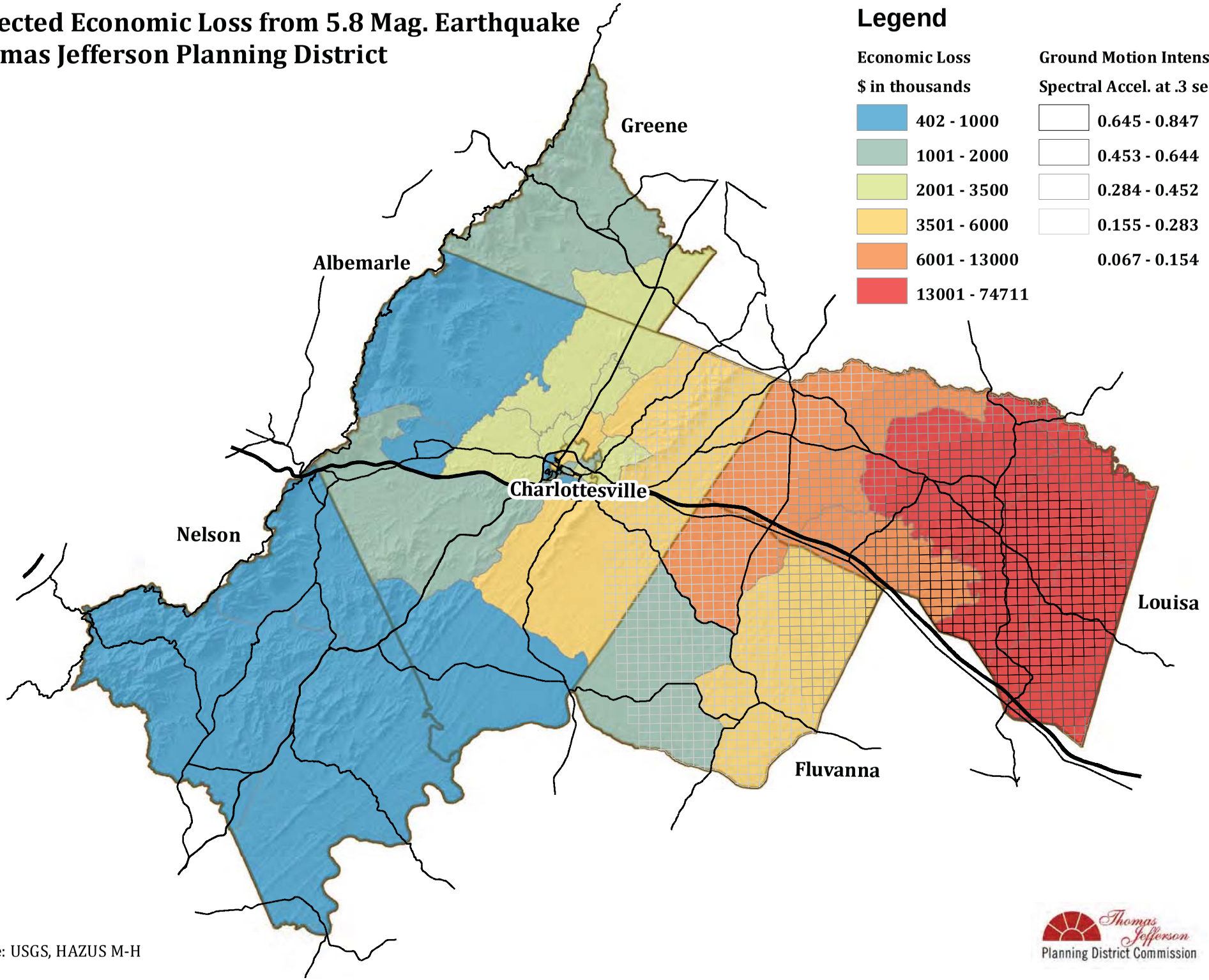
Income losses include the cost of relocating after an earthquake, capital-related losses (i.e. the loss of function of buildings during time of replacement), wage losses from unemployment and lost hours, and loss of rental income. The total losses reported take into account all of these quantified factors. 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 minor injuries and 1 moderate injury occurs.
- 3% of the 448 highway bridges in the region receive at least slight damage. 1% are extensively damaged.
- 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 measureable loss to transportation and communications infrastructure functionality and no power outages.
- Police and Fire response is reduced by 25-30% due to facility damage. Schools in Louisa lose 75% of functionality, at least temporarily. Hospitals remain fully functional.
- Depending on the amount of aid provided, an additional $8-$17 million in indirect economic losses occur due to depreciated incomes.

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.

Expected Economic Loss from 5.8 Mag. Earthquake
Thomas Jefferson Planning District



Source: USGS, HAZUS M-H

Thomas Jefferson Planning District Commission

Wildfire: Estimated Losses

As stated in the Hazard Identification Section, the Virginia Department of Forestry has subdivided the region into areas of high, medium, and low risk for wildfires. These categories were established in 2003, and they represent the most current approximation of wildfire hazard areas available.

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. 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 relateively few residential buildings.

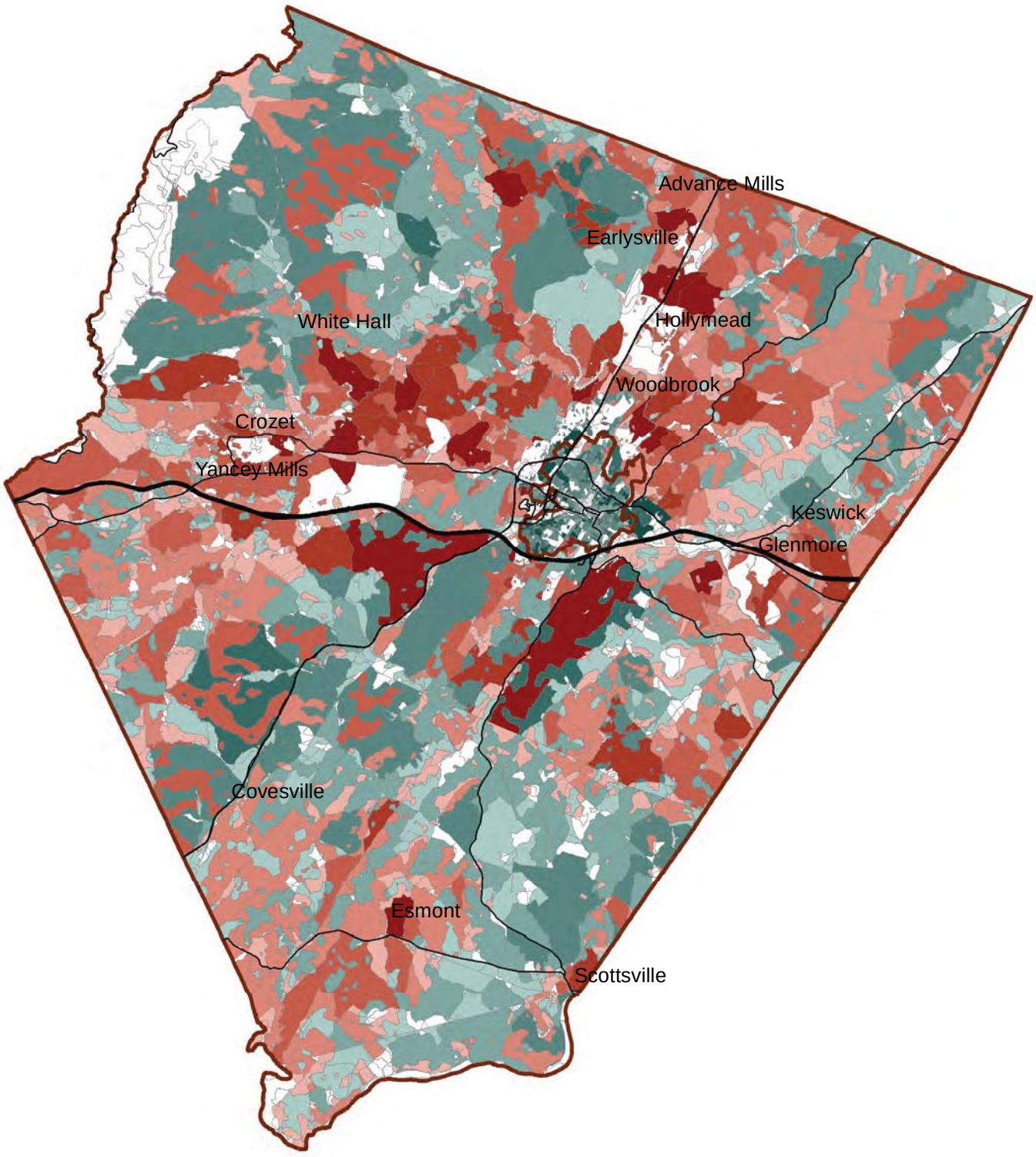
Exposure to High-Risk Wildfire Areas in 2010

	% 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: Dept. of Forestry, U.S. Census Bureau

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.

Homes at Risk to Wildfire (2010)
Albemarle County and City of Charlottesville



At-Risk Homes

Homes not at risk

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

Cville Total: 706 Homes

Albe Total: 28349 Homes

Cville Total: 18483 Homes

Albe Total: 13773 Homes

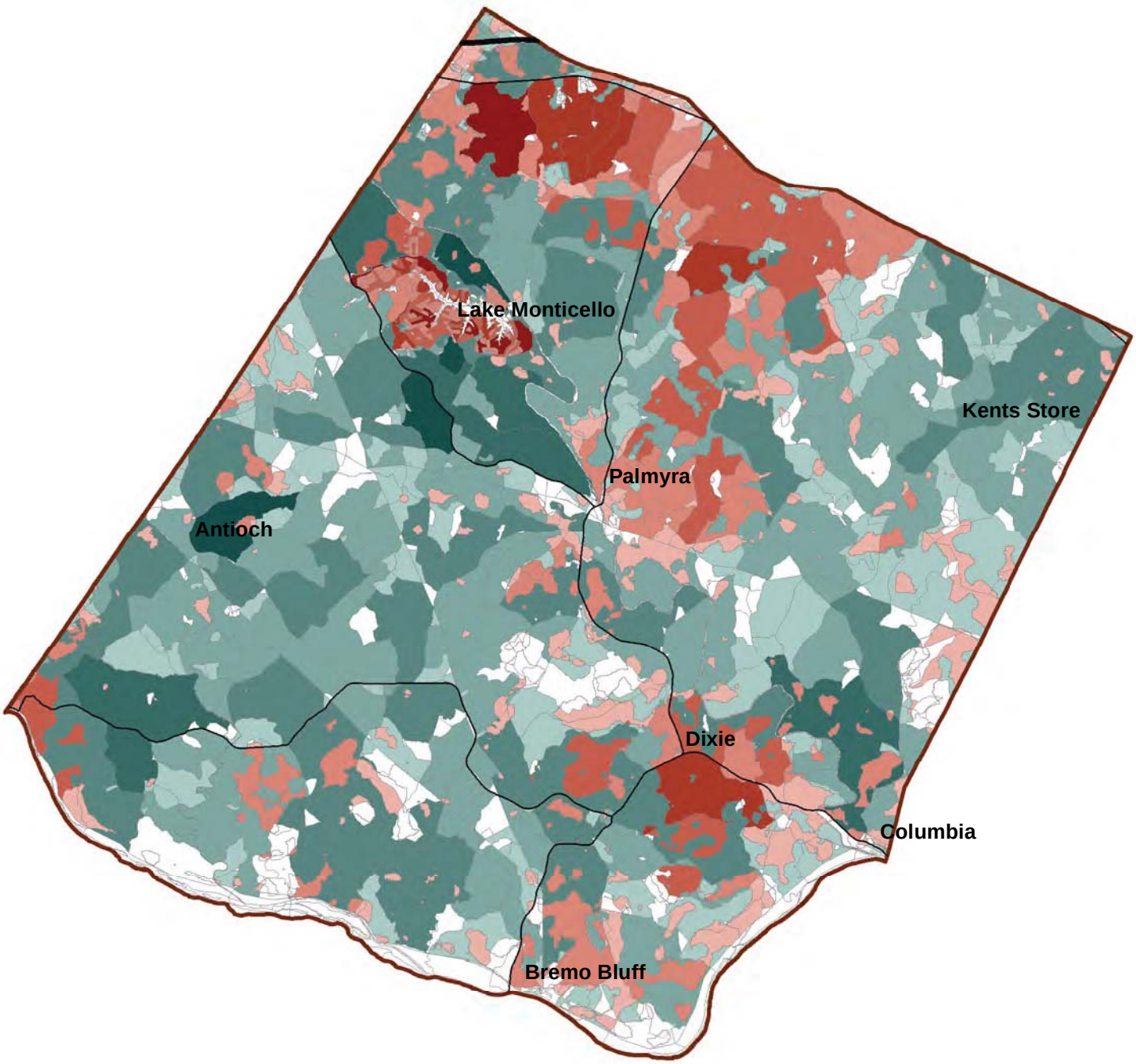
Source: Dept. of Forestry, Census Bureau

0 0.5 1 2 3 4 Miles

N

Thomas Jefferson Planning District Commission

Homes at Risk to Wildfire (2010)
Fluvanna County



At-Risk Homes

Total: 5188 Homes

Homes not at risk

Total: 5195 Homes

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

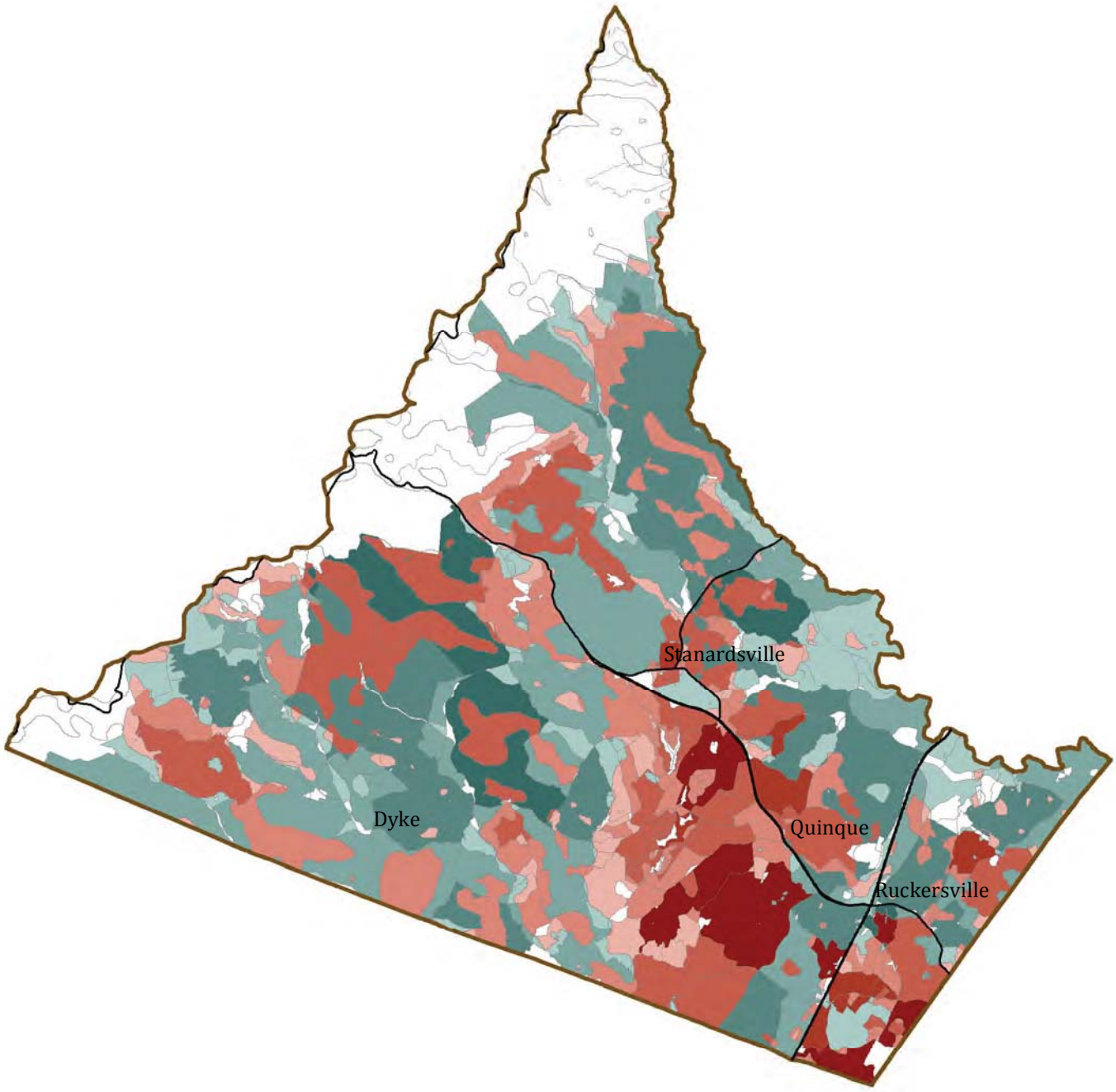
Source: Dept. of Forestry, Census Bureau

0 0.5 1 2 3 4 Miles

N

Thomas Jefferson Planning District Commission

Homes at Risk to Wildfire (2010)
Greene County



At-Risk Homes

Total: 5511 Homes

Homes not at risk

Total: 1998 Homes

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

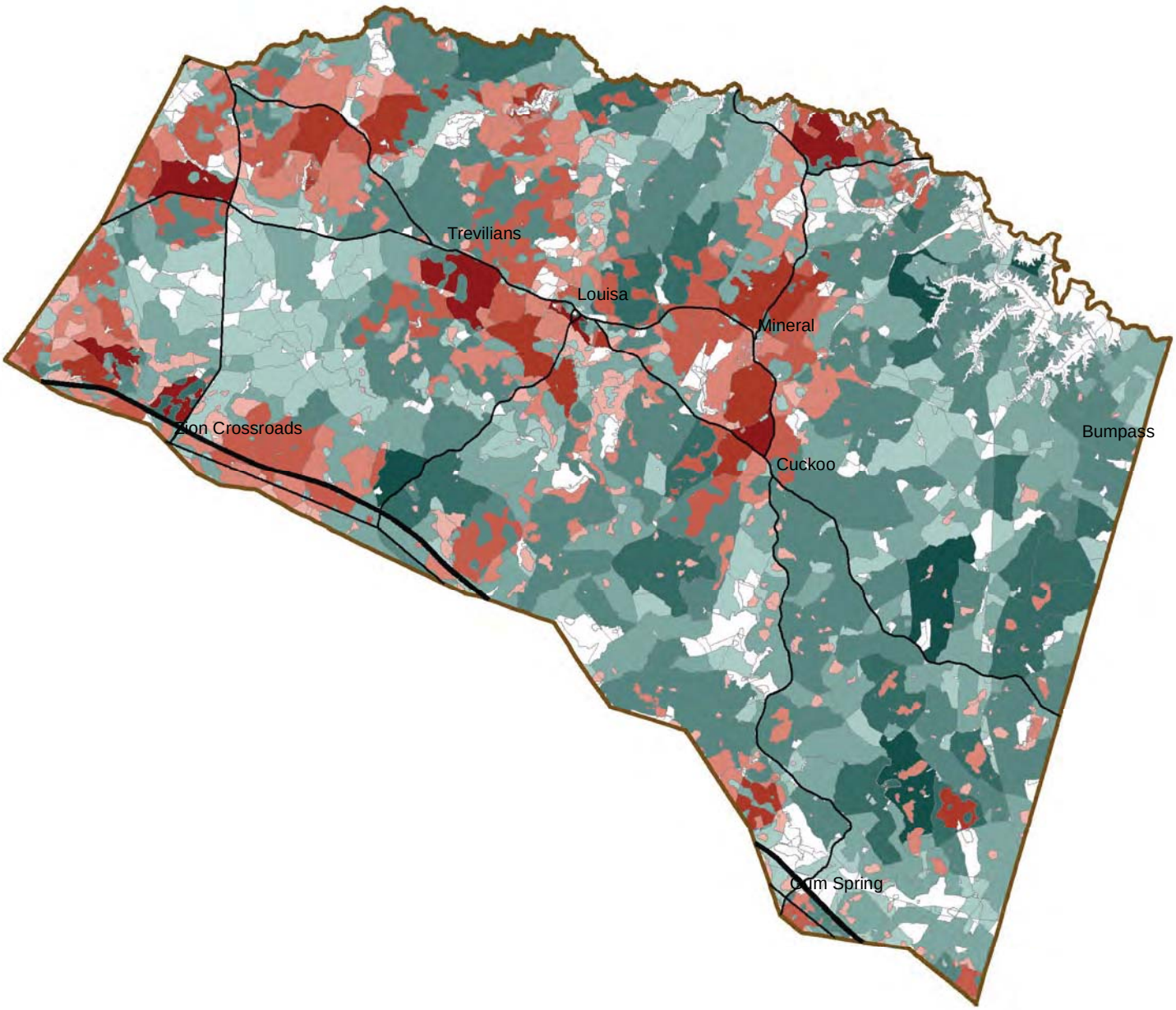
Source: Dept. of Forestry, Census Bureau

0 0.45 0.9 1.8 2.7 3.6 Miles

N

Thomas Jefferson Planning District Commission

Homes at Risk to Wildfire (2010)
Louisa County



At-Risk Homes

Total: 6063 Homes

Homes not at risk

Total: 10256 Homes

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

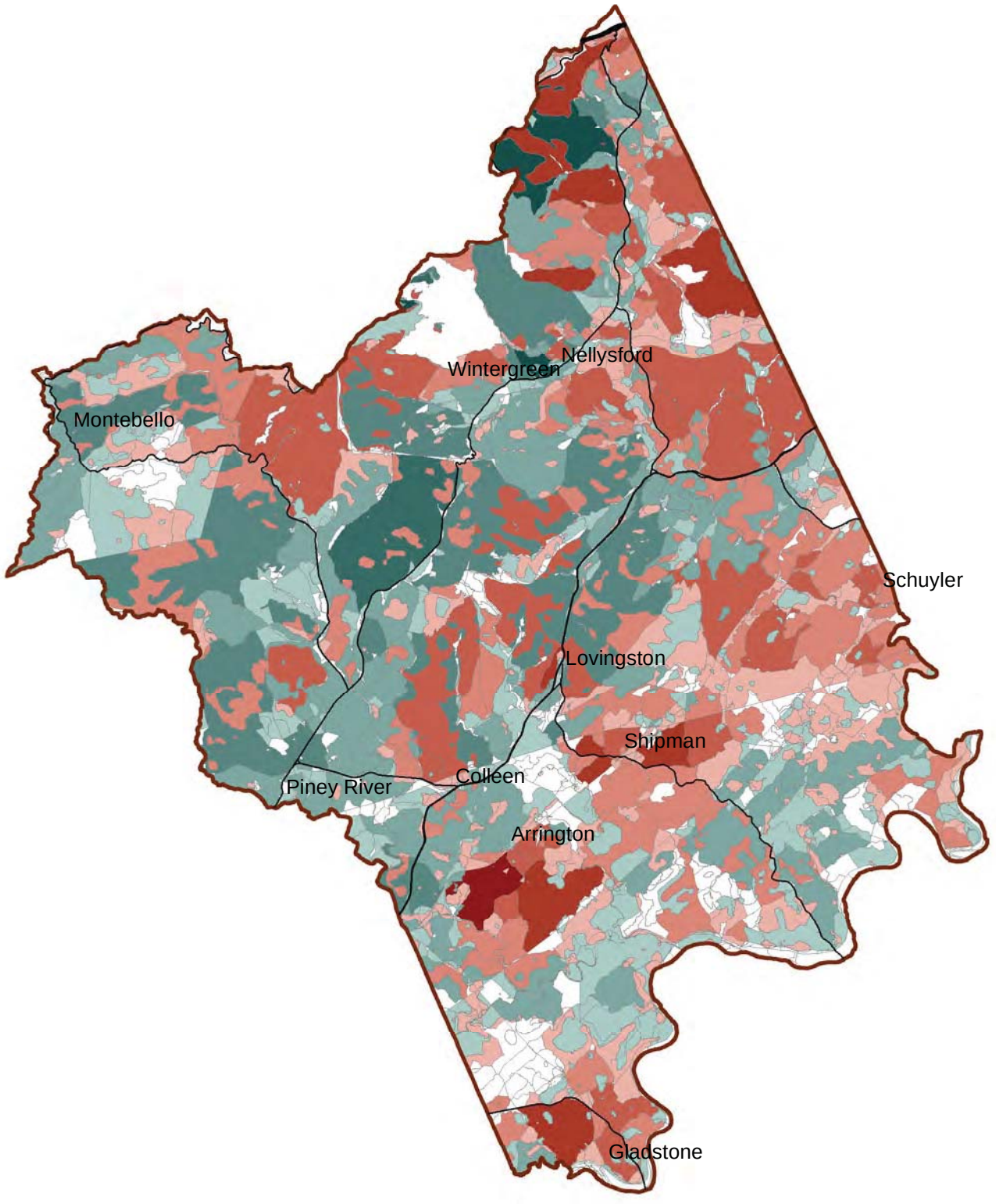
Source: Dept. of Forestry, Census Bureau

0 0.5 1 2 3 4 Miles

N

Thomas Jefferson Planning District Commission

Homes at Risk to Wildfire (2010)
Nelson County



At-Risk Homes

Total: 5400 Homes

Homes not at risk

Total: 4531 Homes

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

Source: Dept. of Forestry, Census Bureau

00.51 2 3 4 Miles

N

Thomas Jefferson Planning District Commission

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.

Total Economic Losses to Wildfires by Locality between 2002 and 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.

Dam Failure: Estimated Losses

Ten dams in the TJPD could cause loss of life if they were to fail. Of these ten, six have emergency action plans in place, 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) are implementing a water-supply plan that would significantly alter the upper dam by increasing its size and enhancing its internal drainage system. New dam inundation maps, areas that would be flooded in the event of a breach, were developed in 2011, and an updated emergency response plan is underway. Various scenarios have been 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.

Dams of significant risk to the area are not required to have emergency action plans; however, at least 12 dams do have these plans. According to the Virginia State Hazard Mitigation Plan, "hazard potential is not related to the structural integrity of a dam but strictly to the potential for adverse downstream effects if the dam were to fail. Frequency of dam inspection is dependent on how the dam is classified." Further information can be referenced in each locality's Emergency Operations Plan. At this time, no data are available as to how much life or property loss would be likely to occur in the event that any of these dams were to fail.

Capabilities Assessment

The 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. The assessment also measures outcomes that may have resulted from the adoption of the 2006 Regional Natural Hazard Mitigation Plan, in terms of policies and programs that reflect the goals of the plan.

The assessments are self-ratings of localities in the region for the technical, fiscal, and administrative capacity to implement hazard mitigation strategies. They were conducted by local staff familiar with hazard mitigation and in a position to determine the overall capability of their locality to implement action items. The five towns in the region are considered within their respective counties, because town residents are served by relevant county services. Different regulatory capacities for towns are discussed below.

	Fluvanna	Nelson	Louisa	Albemarle	Charlottesville	Greene
TECHNICAL capability to implement hazard mitigation strategies?	Moderate	Moderate	Moderate	High	High	Moderate
FISCAL capability to implement hazard mitigation strategies?	Low	Low	Moderate	Moderate	Moderate	Moderate
ADMINISTRATIVE capability to implement hazard mitigation strategies?	Moderate	Moderate	Moderate	High	High	High
OVERALL CAPABILITY	Moderate	Moderate	Moderate	High	High	Moderate

The results from the survey taken in 2011 show improvements in technical and administrative capabilities since the survey was last administered in 2004. These improvements were experienced throughout the region, which may be the result of a greater awareness among the public on the importance of mitigation. However, fiscal capacity shows no improvement region wide, which likely reflects the results of an economic downturn that has limited funds available from local, state, and federal sources.

Other Capability Considerations

Current local funding

The City of Charlottesville and Albemarle County has dedicated local funds to hazard mitigation, but other counties in the region have not to a significant degree. 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.

Inter-governmental 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.

Intra-governmental 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. The Town of Columbia's zoning ordinance has not been updated for many years. However, the town has recently adopted selected, appropriate Fluvanna County ordinances and is negotiating agreements with the county for planning and services.

Mitigation Strategy

This section contains the following:

- 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

- GOAL: Increase awareness of hazards and how to prepare for them through education and training
    - OBJECTIVE: Educate families and individuals on household techniques for disaster preparedness

- OBJECTIVE: Train key agency staff and volunteer groups in disaster mitigation and preparedness, with an emphasis on emergency respondents, building inspectors and code officials
- OBJECTIVE: Encourage and equip employers to adopt emergency action plans for their workplace
- OBJECTIVE: Maintain a consistent message across agencies and providers for hazard mitigation and disaster response activities using clear language

- GOAL: Encourage individual action to reduce the impacts of hazards
  - OBJECTIVE: Encourage water conservation
  - OBJECTIVE: Encourage property owners to design and maintain buildings and grounds to reduce risks of damage
  - OBJECTIVE: Protect sensitive areas through conservation easements
  - OBJECTIVE: Encourage residents to provide adequate access to property for emergency services

Infrastructure and Buildings

- GOAL: Reduce the short and long-term impact of hazard events on regional 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

- GOAL: Identify and implement physical projects that will directly reduce impacts to structures from hazards
  - OBJECTIVE: Elevate, retrofit and relocate existing structures and facilities in vulnerable locations
  - OBJECTIVE: Maintain and/or augment critical facilities and infrastructure necessary for emergency response during and after a hazard event

People and Vulnerable Populations

- GOAL: Prepare to meet the immediate needs of population during natural hazards
  - OBJECTIVE: Identify and record concentrations of vulnerable populations, especially in high-risk areas
  - OBJECTIVE: Train staff to effectively communicate with and transport vulnerable populations
  - OBJECTIVE: Install devices and signage to improve communication and warning systems, ensure operations of emergency shelters, and reduce response time in the event of a natural hazard

- OBJECTIVE: Ensure that facilities and equipment are in place to transport, shelter and serve vulnerable populations

Mitigation Capacity

- GOAL: Incorporate mitigation concepts into existing and future policies and plans
  - OBJECTIVE: Reduce property risks through zoning, ordinances and building codes
  - OBJECTIVE: Increase storage capacity of streams and rivers and reduce flow rates of stormwater through mitigation policies and best management practices.
  - OBJECTIVE: Link community planning and mitigation planning together to achieve common goals
  - OBJECTIVE: Incorporate mitigation planning concepts into building codes

- GOAL: Pursue funding to implement identified mitigation strategies
  - OBJECTIVE: Identify appropriate funding sources
  - OBJECTIVE: Create or strengthen partnerships to develop integrated grant proposals and coordinated implementation plans
  - OBJECTIVE: Increase staffing to implement mitigation strategies

Information and Data Development

- 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 critical facilities meet disaster preparedness requirements

Hazard-Specific Strategies

The action items determined for each locality by this plan are directly linked to the hazards identified in this plan, and the following hazard-specific strategies elaborate on the specific connections between the problems and solutions.

The Hazard Mitigation Working Group identified two high-risk hazards in the region and four moderate-risk hazards in the region that necessitate special attention in this plan. With a relative threat rating of 89%, flooding was determined to be the hazard with the greatest probability of occurrence and highest impact on the community. Winter storms were ranked second, with a relative threat rating of 67%. These hazards are considered high-risk for all localities in the region.

Hurricanes were ranked third and high wind/windstorms were ranked fourth. Because these hazards lend themselves to similar mitigation responses, they will be considered together in this section. Wildfire, lightning, tornados, and drought were scored evenly as the fifth ranked hazards. These hazards are

identified as moderate-risk. Wildfire and lightning are covered under the same strategy, and tornados are included in the general windstorm strategy. Drought is considered under a separate strategy. Although earthquakes were not prioritized as highly during the vulnerability assessment, an earthquake event in August 2011 has raised interest in preparing for this possibility in the future. A strategy on earthquakes is also included.

Flooding | High Risk

Flooding is the 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 from rains and snow melt in the Blue Ridge Mountains. Stormwater drainage may create flooding throughout the region.

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. Limit development and/or remove objects of value from the path of floodwaters. 3. Prepare and educate the public for responding to floods.

The most significant current elements of flood control 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 enhancing flood control. These are especially important in urbanized areas with more density that can be impacted. More urbanized areas have a 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 currently 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. The plan includes action items for removing buildings in the floodplain in the Town of Columbia and that are abandoned or heavily disinvested.

Finally, the plan includes action items intended to assist the public in preparing themselves for flood hazards and empower emergency responders in their roles. 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 educational campaigns targeted toward individual households with ideas for flood-smart landscaping and household practices. There are also general action items intended to prepare for multiple hazards with properly equipped shelters, communications, and organization of staff and volunteers.

§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.

All 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. All towns, with the exception of the Town of Louisa and the Town of Mineral, participate in the program. The two towns in Louisa County are identified by this plan as very low flood-risk.

The following table is from the FEMA National Flood Insurance Program Community Status Book, as of March 2012:

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	02/04/05	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	06/01/89
Nelson County	11/22/74	08/01/78	06/18/10	08/01/78
Scottsville, Town Of	09/10/76	09/05/79	02/04/05	09/05/79
Stanardsville, Town Of	02/11/77	12/26/78	NSFHA*	12/26/78
Columbia, Town Of	12/28/73	09/29/78	05/16/08	09/29/78

* No special flood hazard area.

All participating 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 further the purpose of the NFIP program and assume continued participation from localities in the region.

Winter Storms | High 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 localities 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, medical devices, or other needs 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.

High Wind Events | Moderate Risk

For the purposes of the mitigation strategies, all wind events are considered together. However, hurricanes and tornadoes are very different in the scale of impact and require unique preparedness measures. 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.

Wildfire | Moderate Risk

Wildfire impacts all localities in the region, except for the City of Charlottesville. The threat is greatest along the wildland-urban interface, and it therefore grows in proportion to the amount of development that occurs in previously rural areas.

One strategy for mitigating the impact of wildfires is to limit the amount of development that occurs in areas susceptible to wildfires. All localities in the region currently encourage growth to occur in designated growth areas through various means of land use regulation. There are a few action items that recommend also using conservation easements to protect open space, and education programs that communicate the value of open space protection.

There are also practices that individual homeowners can use to protect their own property. The plan recommends conducting "Firewise" workshops, a program devised by the Virginia Department of Forestry to encourage such actions are removal of debris from an area around structures. In the cases of public infrastructure, there are action items recommended that flammable debris be removed from ditches along roadways. The plan also recommends the installation and maintenance of dry hydrants in developed areas removed from public waters supply.

Drought | Moderate Risk

Droughts are a unique case in this plan, because the effects of a drought are less acutely felt and there is little need for emergency response. However, drought did arise to the level of a moderate-risk hazard, predominately because the costs of water limitations and supply shortages on business and the general population.

The drought-related action items in this plan are directly linked to community Water Supply Plans and Drought Management Plans. The Virginia General Assembly required the adoption of a Water Supply Plan for all localities in the state. All localities in the TJPD have adopted plans. Albemarle County and Charlottesville have jointly adopted a plan, and Nelson County has joined Region 2000's water supply plan. Implementation of recommendations from these plans is included as an action item for each locality, but the specific proposals are not listed redundantly.

Earthquake | Moderate Risk

The primary threat posed by earthquakes is to structures with human inhabitation. Although, historically, they have been relatively rare, a recent occurrence has raised speculation that they may be more probable in this region than previously thought. Also their relative scarcity has meant that our region is less prepared for earthquakes than other areas that have experienced them more frequently.

The primary means for encouraging structure stability is through the building code. Although all localities are required to adopted, at a minimum, the Virginia Uniform Statewide Building Code, there is an option for adding additional protections. Elected officials must be sensitive to the costs any additional requirements would impose on builders, but the plan does recommend the consideration of changes in the codes. Short of requirements, there is also the option of adopting architectural design guidelines for earthquake resilience.

There are other action items intended to improve the earthquake resistance of existing structures through retrofitting improvements to stabilize vulnerable aspects of a building. Historic properties can be

especially susceptible to damage, and the Virginia Department of Historic Resources provides a number of recommendations to homeowners on this matter. Bridges may also be damaged during an earthquake, particular bridges that are already deemed to be structurally-deficient. This is primarily under the purview of VDOT, but there are ways localities can partner with the state agency to ensure that safety is a priority.

Finally, many of the action items provide general enhancements to preparedness for all disasters, including earthquakes. These include improvements to shelters, enhancement of cellular communications capacity that can be overloaded immediately after an event, and general organization of volunteer and staff responders.

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 measureable, 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 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.

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 sources. Items that were included in the 2006 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. Finally elected officials requested specific actions items, and these were indicated as high priority.

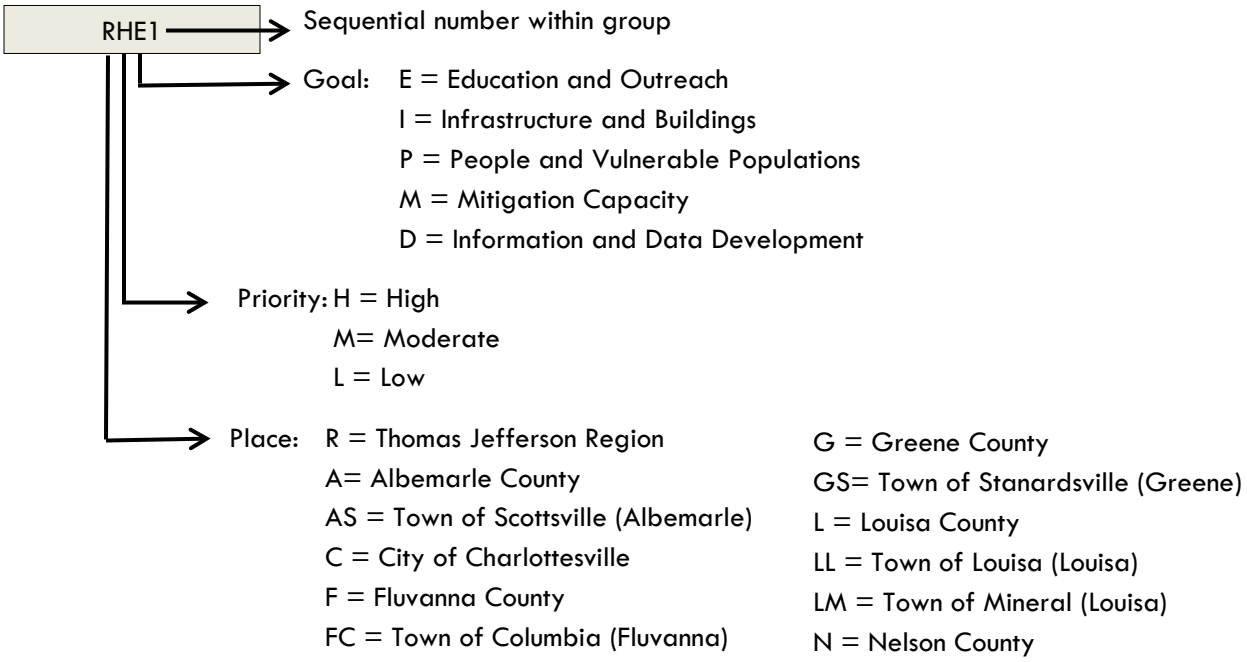
At each iteration in the process of filtering through action items, the Working Group, TJPDC staff, or elected officials weighed the costs of performing an action against the benefits it would yield. In some cases this calculation led to the removal of items that were considered desirable yet cost-prohibitive within the 5-year time frame. The Working Group will review such items and consider including them in the next update. A formal cost-benefit analysis was not conducted for each action items in this plan, but localities understand that one would be required by FEMA before certain types of actions can be funded.

The action items are presented here in both 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. For reference purposes, each item is given a unique “activity code” that identifies the jurisdiction, the priority level, and the goal for the action.

2012 Abridged Action Items

The following key is for use with the activity code that identifies each individual action item:

Activity Code Key



Activity Code	Activity Description
Thomas Jefferson Region	
RHE1	Create a hazards library and information toolkit
RHE2	Provide a copy of the Regional Natural Hazard Mitigation Plan to each library in the Jefferson-Madison Regional Library system
RHI1	Adopt a cooperative agreement between localities to set a single code to alter traffic signals for use by emergency response vehicles from each jurisdiction
RHP1	Establish a registry of individuals with specialized needs, including their location, and their requirements for transportation assistance
RHP2	Ensure that emergency shelters meet accessibility requirements, have back-up power, and are capable of housing caretakers, medical equipment and service animals for the elderly and those with disabilities
RHD1	Update addresses in Repetitive Loss Properties database
RME1	Create a website and app that allows members of public to report potentially hazardous situations as they are observed
RME2	Conduct a public education program on disaster preparedness, leveraging existing materials and sharing resources regionally

Activity Code	Activity Description
RME3	Encourage all property owners of commercial, industrial, and multifamily housing facilities to have an Emergency Action Plan, including evacuation, sheltering, and communications protocol
RME4	Encourage all businesses and congregate housing facilities to have an Emergency Action Plan that is coordinated with plans for the facility
RME5	Encourage major businesses to adopt a Business Continuity Plan, especially businesses that provide critical services in the aftermath of a natural disaster
RMP1	Incorporate training on how to effectively communicate with people with disabilities during an emergency event into existing education for transit drivers, first responders and emergency management staff
RMD1	Identify locations for deposit of debris after a hazard
RLE1	Add emergency preparedness and response information into local phone books
RLE2	Establish a "Hazard Awareness Week" with local media to educate public about natural hazards
RLE3	Identify, engage and coordinate with amateur radio operators to prepare for communications during an event
RLP1	Coordinate with Neighborhood Associations to establish a point person within each neighborhood for communications and assisting vulnerable populations
RLP2	Coordinate with local churches to distribute necessary resources to households and assist in evacuation
RLM1	Plan for facilitating affordable housing in the aftermath of a disaster, in cases where the regional housing supply is temporarily reduced
RLM2	Adopt a Regional Recovery Plan that provides a blueprint for the restoration of business operations and rebuilding of communities and infrastructure
RLD1	Identify potential locations for temporary housing for use after a hazard

Albemarle County	
AHE1	Create educational campaign about the benefits of open space protection
AHE2	Provide educational information about the burn permit process
AHI1	Retrofit Observatory Hill Dining Facilities with generator quick connects to enable generator hook-up to support the provision of ongoing food service for state shelter and local needs
AHI2	Partner with utility companies to keep power lines free of vegetation
AHI3	Implement recommendations from the Community Water Supply Plan
AHI4	Conduct structural evaluations of all current and proposed shelters
AHP1	Add or modify paratransit routes to serve the new Martha Jefferson hospital site
AHM1	Incorporate hazard mitigation plan into community plans
AHM2	Increase number of trained emergency responders
AHD1	Assess resistance of existing critical facilities to natural hazards
AME1	Conduct FireWise workshops

Activity Code	Activity Description
AMI1	Build or repair bridges so as to not impede floodwaters
AMI2	Upgrade all area bridges to support emergency vehicles
AMP1	Ensure that all schools have regular disaster response drills
AMM1	Implement recommendations from Drought Management Plan
AMM2	Continue to pursue conservation easements in sensitive areas, including flood-prone areas.
AMD1	Expand GIS data for use in mitigation planning, preparedness planning, and response activities
ALE1	Encourage residents and agencies to clear storm drain inlets, ditches, and channels
ALI1	Encourage property owners to clear creek beds or dredge creeks to remove debris where flooding has increased
ALI2	Reduce pollution discharge via stormwater systems
ALI3	Install more dry hydrants in high wildfire risk areas
ALI4	Adopt a policy to create safe interior spaces in county-owned buildings for protection during tornados and high wind events
ALM1	Use recreational trails as fire breaks and access lines
ALM2	Maintain and add more fire rings in camping areas for controlled fires

Town of Scottsville	
ASMM1	Ensure all houses have clear address signs that are visible during snowstorms
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
CHI1	Implement recommendations from the Community Water Supply Plan
CHP1	Ensure that all schools have regular disaster response drills
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 and expand use of citizen alert systems
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

Activity Code	Activity Description
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 systems
CLI2	Reduce pollution discharge via stormwater systems
CLI3	Retrofit stormwater management basins
CLM1	Hire a floodplain management official and enforce floodplain regulations.

Fluvanna County	
FHI1	Conduct structural evaluations and study of resistance to hazards of all current and proposed shelters
FHI2	Implement recommendations from Water Supply Plan
FHI3	Implement recommendations from the Wireless Telecommunications Facility Master Plan to enhance emergency communications
FHI4	Retrofit emergency services building for hazard resistance
FHI5	Install backup generators in shelters and critical facilities
FHP1	Ensure that all schools have regular disaster response drills
FHM1	Improve local capabilities to perform earthquake building safety evaluations and enforce building codes in high seismic hazard areas
FME1	Create a community toolbox with tools and information for local homeowners
FMM1	Ensure all houses have clear address signs that are visible during snowstorms
FMM2	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
FLE1	Develop an all-hazard resource center at libraries or other public office, including a copy of the Regional Natural Hazard Mitigation Plan
FLE2	Create an educational program to help residents understand the benefits and costs of earthquake insurance
FLI1	Retrofit existing public buildings to meet contemporary standards for earthquake resistance
FLI2	Equip owners of historic properties that may be more susceptible to earthquake damage with information about retrofitting structures to improve earthquake resistance
FLI3	Update building codes to improve earthquake resilience
FLM1	Require protective stormwater mitigation measures such as reducing impervious surfaces, stilling and infiltration basins, and restoring wetlands in growth areas

Activity Code	Activity Description
Town of Columbia	
FCHI1	Acquire existing structures within the floodplain and either demolish or relocate
FCHM1	Create a relocation plan for residents currently living within the floodplain to offer housing choices outside of a hazard area
FCMI1	Enhance emergency communications to provide reliable mobile coverage within the Town, per the adopted Fluvanna County telecommunications plan
FCMI2	Repurpose the properties within the floodplain to serve the Town of Columbia without imposing risks from future flooding
FCLI1	Expand cell phone coverage to provide reliable service to the whole Town
FCLI2	Maintain an evacuation route out of town with proper signage
FCLI1	Repair, replace or relocate septic and drainage fields that leak sewage into the river during flooding
FCLM1	Incorporate hazard mitigation plans into community plans

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
GHP1	Ensure that all schools have regular disaster response drills
GHM1	Continue and expand use of citizen alert systems
GHM2	Provide training for building inspectors and code officials on mitigation techniques and hazard-resistant building
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
GME1	Develop cooperative agreement between all agencies involved in emergency management, provide methods of communication between agencies responsible for being present at Emergency Communication Center following disaster, and conduct joint emergency exercises
GMM1	Incorporate hazard mitigation plan into community plans
GMM2	Conduct Community Emergency Response Team (CERT) classes to equip individuals and groups to assist in the event of a disaster
GMM3	Investigate safety and maintenance of roads in private communities
GMD1	Standardize GIS data for use in mitigation planning
GMD2	Conduct channel improvement study
GMD3	Create needs survey identifying special populations
GMD4	Ensure evacuation routes are upgraded to proper standards
GLE1	Develop all-hazard resource center

Activity Code	Activity Description
GLI1	Retrofit emergency services building 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
GLP1	Update Greene County Emergency Operations Plan
GLM1	Adopt more stringent policy to discourage floodplain development
GLM2	Provide paid fire and rescue staff
GLM3	Ensure all houses 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
GSMP1	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
LHP1	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	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
LMP1	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

Activity Code	Activity Description
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

2012 Detailed Action Items

Action items are described according to the following template:

[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:	Create a hazards library and information toolkit
Hazard (s):	Multiple
Lead Party Responsible:	TJPDC
Estimated Cost:	$25,000-30,000
Funding Method:	FEMA Hazard Mitigation Grant Program, Pre Disaster Mitigation Grant
Implementation Schedule:	1-3 years
Priority:	High

RHE2 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Provide a copy of the Regional Natural 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:	Hazard Mitigation Planning Funds
Implementation Schedule:	6 months
Priority:	High

RHI1 Mitigation Action: Thomas Jefferson Region	
Goal:	Infrastructure and Buildings
Action Item Description:	Adopt a cooperative agreement between localities to set a single code to

	alter traffic signals for use by emergency response vehicles from each jurisdiction
Hazard (s):	Multiple
Lead Party Responsible:	TJPDC
Estimated Cost:	$1,000 - $3,000
Funding Method:	Member contributions
Implementation Schedule:	1-3 Years
Priority:	High

RHP1 Mitigation Action: Thomas Jefferson Region	
Goal:	People and Vulnerable Populations
Action Item Description:	Establish a registry of individuals with specialized needs, including their location, and their requirements for transportation assistance
Hazard (s):	Multiple
Lead Party Responsible:	TJPDC
Estimated Cost:	$5,000 - $10,000
Funding Method:	Grants through DSB
Implementation Schedule:	3-5 Years
Priority:	High

RHP2 Mitigation Action: Thomas Jefferson Region	
Goal:	People and Vulnerable Populations
Action Item Description:	Ensure that emergency shelters meet accessibility requirements, have back-up power, and are capable of housing caretakers, medical equipment and service animals for the elderly and those with disabilities
Hazard (s):	Multiple
Lead Party Responsible:	Red Cross
Estimated Cost:	Unknown
Funding Method:	
Implementation Schedule:	Ongoing
Priority:	High

RHD1 Mitigation Action: Thomas Jefferson Region	
Goal:	Information and Data Development
Action Item Description:	Update addresses in Repetitive Loss Properties database
Hazard (s):	Multiple
Lead Party Responsible:	TJPDC
Estimated Cost:	Minimal
Funding Method:	Hazard Mitigation Planning Funds
Implementation Schedule:	6 Months

Priority:	High

RME1 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Create a website and app that allows members of public to report potentially hazardous situations as they are observed
Hazard (s):	Multiple
Lead Party Responsible:	Charlottesville Fire Department
Estimated Cost:	$50,000 - $80,000
Funding Method	Grant
Implementation Schedule:	5 Years
Priority:	Moderate

RME2 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

RME3 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Encourage all property owners of commercial, industrial, and multifamily housing facilities to have an Emergency Action Plan, including evacuation, sheltering, and communications protocol
Hazard (s):	Multiple
Lead Party Responsible:	Local Emergency Management Departments
Estimated Cost:	Unknown
Funding Method:	General Revenue
Implementation Schedule:	3-5 Years
Priority:	Moderate

RME4 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Encourage all businesses and congregate housing facilities to have an Emergency Action Plan that is coordinated with plans for the facility

Hazard (s):	Multiple
Lead Party Responsible:	Local Emergency Management Departments
Estimated Cost:	Unknown
Funding Method:	General Revenue
Implementation Schedule:	3-5 Years
Priority:	Moderate

RME5 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Encourage major businesses to adopt a Business Continuity Plan, especially businesses that provide critical services in the aftermath of a natural disaster
Hazard (s):	Multiple
Lead Party Responsible:	Local Emergency Management Departments
Estimated Cost:	Unknown
Funding Method:	General Revenue
Implementation Schedule:	3-5 Years
Priority:	Moderate

RMP1 Mitigation Action: Thomas Jefferson Region	
Goal:	People and Vulnerable Populations
Action Item Description:	Incorporate training on how to effectively communicate with people with disabilities during an emergency event into existing education for transit drivers, first responders and emergency management staff
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

RLE1 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Add emergency preparedness and response information into local phone books
Hazard (s):	Multiple
Lead Party Responsible:	Local Emergency Management Departments
Estimated Cost:	Minimal
Funding Method:	N/A
Implementation Schedule:	1 Year
Priority:	Low

RLE2 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Establish a "Hazard Awareness Week" with local media to educate public about natural hazards
Hazard (s):	Multiple
Lead Party Responsible:	Local Emergency Management Departments
Estimated Cost:	Minimal
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Low

RLE3 Mitigation Action: Thomas Jefferson Region	
Goal:	Education and Outreach
Action Item Description:	Identify, engage and coordinate with amateur radio operators to prepare for communications during an event
Hazard (s):	Multiple
Lead Party Responsible:	Local Emergency Management Departments
Estimated Cost:	$50,000 - $80,000
Funding Method:	Grant
Implementation Schedule:	Ongoing
Priority:	Low

RLP1 Mitigation Action: Thomas Jefferson Region	
Goal:	People and Vulnerable Populations
Action Item Description:	Coordinate with Neighborhood Associations to establish a point person within each neighborhood for communications and assisting vulnerable populations
Hazard (s):	Multiple
Lead Party Responsible:	Local Community Development Departments

Estimated Cost:	Minimal
Funding Method:	N/A
Implementation Schedule:	1-3 Years
Priority:	Low

RLP2 Mitigation Action: Thomas Jefferson Region	
Goal:	People and Vulnerable Populations
Action Item Description:	Coordinate with local churches to distribute necessary resources to households and assist in evacuation
Hazard (s):	Multiple
Lead Party Responsible:	Red Cross
Estimated Cost:	Minimal
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Low

RLM1 Mitigation Action: Thomas Jefferson Region	
Goal:	Mitigation Capacity
Action Item Description:	Plan for facilitating affordable housing in the aftermath of a disaster, in cases where the regional housing supply is temporarily reduced
Hazard (s):	Multiple
Lead Party Responsible:	HOME Consortium
Estimated Cost:	$5,000
Funding Method:	Hazard Mitigation Grant Program, HOME administrative funds
Implementation Schedule:	1-3 Years
Priority:	Low

RLM2 Mitigation Action: Thomas Jefferson Region	
Goal:	Mitigation Capacity
Action Item Description:	Adopt a Regional Recovery Plan that provides a blueprint for the restoration of business operations and rebuilding of communities and infrastructure
Hazard (s):	Multiple
Lead Party Responsible:	TJPDC
Estimated Cost:	$20,000 - $30,000
Funding Method:	FEMA Grant
Implementation Schedule:	5 Years
Priority:	Low

RLD1 Mitigation Action: Thomas Jefferson Region	
Goal:	Information and Data Development
Action Item Description:	Identify potential locations for temporary housing for use 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:	Low

AHE1 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Create educational campaign about the benefits of open space protection
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development, Planning, County Executive's Office, Community Relations
Estimated Cost:	Unknown
Funding Method:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant
Implementation Schedule:	Ongoing
Priority:	High

AHE2 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Provide educational information about the burn permit process
Hazard (s):	Multiple
Lead Party Responsible:	Virginia Department of Forestry, Albemarle County Fire Rescue Department, Prevention Division and Office of Fire Marshall, County Executive's Office, Community Relations
Estimated Cost:	Staff time and resources
Funding Method:	General Operations
Implementation Schedule:	Ongoing
Priority:	High

AHI1 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Building
Action Item Description:	Retrofit Observatory Hill Dining Facilities with generator quick connects to enable generator hook-up to support the provision of ongoing food service for state shelter and local needs
Hazard (s):	Multiple
Lead Party Responsible:	University of Virginia, Charlottesville-UVa-Albemarle Emergency

	Management Coordinator
Estimated Cost:	$300,000
Funding Method:	Grants
Implementation Schedule:	1 year
Priority:	High

AHI2 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:	Charlottesville-UVa-Albemarle Emergency Management Coordinator
Estimated Cost:	Unknown
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	High

AHI3 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Implement recommendations from the Community Water Supply Plan
Hazard (s):	Drought, Flood
Lead Party Responsible:	Rivanna Water and Sewer Authority (RWSA)
Estimated Cost:	$140M
Funding Method:	RWSA, Flood control and dam safety program funds
Implementation Schedule:	Ongoing
Priority:	High

AHI4 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Conduct structural evaluations of all current and proposed shelters
Hazard (s):	Multiple
Lead Party Responsible:	County Executive's Office, Albemarle County Public Schools, Department of Community Development, Building Code and Inspections,
Estimated Cost:	$5 - $10 thousand per structure
Funding Method:	Hazard Mitigation Grant Program
Implementation Schedule:	1-3 years
Priority:	High

AHP1 Mitigation Action: Albemarle County	
Goal:	People and Vulnerable Populations
Action Item Description:	Add or modify paratransit routes to serve the new Martha Jefferson

	Hospital
Hazard (s):	Multiple
Lead Party Responsible:	JAUNT
Estimated Cost:	$50,000
Funding Method:	JAUNT Operating Funds, Grants
Implementation Schedule:	1 year
Priority:	High

AHM1 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Incorporate hazard mitigation plan into community plans
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development, Thomas Jefferson Planning District Commission
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	1-2 years
Priority:	High

AHM2 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Increase number of trained emergency responders.
Hazard (s):	Multiple
Lead Party Responsible:	Albemarle County Fire and Rescue, Albemarle County Police Department, Emergency Communications Center, Charlottesville-UVa-Albemarle Emergency Management Coordinator
Estimated Cost:	Unknown
Funding Method:	General Revenue
Implementation Schedule:	As increased population warrants
Priority:	High

AHD1 Mitigation Action: Albemarle County	
Goal:	Information and Data Development
Action Item Description:	Assess resistance of existing critical facilities to natural hazards
Hazard (s):	Multiple
Lead Party Responsible:	County Executive's Office, Albemarle-Charlottesville-UVa Emergency Management Coordinator.
Estimated Cost:	Staff time and resources
Funding Method:	Incorporate into facility assessment schedule, general funds
Implementation Schedule:	1-3 years

Priority:	High

AME1 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Conduct FireWise workshops
Hazard (s):	Wildfire
Lead Party Responsible:	Albemarle County Fire and Rescue Prevention Division and Office of Fire Marshal.
Estimated Cost:	$2,000
Funding Method:	Virginia FireWise Grant
Implementation Schedule:	2-5 years
Priority:	Moderate

AMI1 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Building
Action Item Description:	Build or repair bridges so as not to impede floodwaters
Hazard (s):	Flood
Lead Party Responsible:	Virginia Department of Transportation
Estimated Cost:	Unknown
Funding Method:	Hazard Mitigation Grant Program, 406 Public Assistance Program (Following a disaster)
Implementation Schedule:	When bridges are repaired or newly built
Priority:	Moderate

AMI2 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Building
Action Item Description:	Upgrade all area bridges to support emergency vehicles
Hazard (s):	Multiple
Lead Party Responsible:	Virginia Department of Transportation, CSX Railroad
Estimated Cost:	Unknown-based on individual projects
Funding Method:	406 Public Assistance Program (following a disaster), Hazard Mitigation Grant Program
Implementation Schedule:	As repairs are made
Priority:	Moderate

AMP1 Mitigation Action: Albemarle County	
Goal:	People and Vulnerable Populations
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:	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:	Linked to Water Supply Projects
Funding Method:	RWSA
Implementation Schedule:	Ongoing
Priority:	Moderate

AMM2 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Continue to pursue conservation easements 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
Estimated Cost:	Based on individual property assessments
Funding Method:	Various
Implementation Schedule:	Ongoing
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:	Department of Community Development – Planning, Thomas Jefferson Planning District Commission, Charlottesville-Albemarle-UVa Emergency Management Coordinator
Estimated Cost:	$50,000
Funding Method:	Hazard Mitigation Grant Program ,General Revenue, ESRI, Pre-Disaster Mitigation Grant, Department of the Interior – National Cooperative Geologic Mapping Program
Implementation Schedule:	2-5 years

Priority:	Moderate

ALE1 Mitigation Action: Albemarle County	
Goal:	Education and Outreach
Action Item Description:	Encourage residents and agencies to clear storm drain inlets, ditches, and channels
Hazard (s):	Multiple
Lead Party Responsible:	Department of Community Development - Water Resources/County Executive's Office – Community Relations
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Low

ALI1 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Buildings
Action Item Description:	Encourage property owners to clear creek beds or dredge creeks to remove debris where flooding has increased
Hazard (s):	Flood
Lead Party Responsible:	General Services, Department of Forestry
Estimated Cost:	Unknown; based on need
Funding Method:	General Revenue
Implementation Schedule:	5+ years
Priority:	Low

ALI2 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Building
Action Item Description:	Reduce pollution discharge via stormwater systems
Hazard (s):	Flood
Lead Party Responsible:	General Services
Estimated Cost:	Unknown; based on need
Funding Method:	General Revenue, Stormwater Management Programs
Implementation Schedule:	Ongoing
Priority:	Low

ALI3 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Building
Action Item Description:	Install more dry hydrants in high wildfire risk areas
Hazard (s):	Wildfire
Lead Party Responsible:	Virginia Department of Forestry, Albemarle County Fire and Rescue Fire

	Chief
Estimated Cost:	Unknown; based on need
Funding Method:	Virginia Dry Hydrant Grant Program
Implementation Schedule:	3-5 years
Priority:	Low

ALI4 Mitigation Action: Albemarle County	
Goal:	Infrastructure and Building
Action Item Description:	Adopt a policy to create safe interior spaces in county-owned buildings for protection during tornados and high wind events
Hazard (s):	Tornados, high wind events.
Lead Party Responsible:	Office of Facility Development, Department of General Services
Estimated Cost:	$10,000
Funding Method:	Grants
Implementation Schedule:	1 year
Priority:	Low

ALM1 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Use recreational trails as fire breaks and access lines
Hazard (s):	Wildfire
Lead Party Responsible:	Virginia Department of Forestry, Albemarle County Department of Fire and Rescue, Albemarle County Parks and Recreation
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Low

ALM2 Mitigation Action: Albemarle County	
Goal:	Mitigation Capacity
Action Item Description:	Maintain and add more fire rings in camping areas for controlled fires
Hazard (s):	Multiple
Lead Party Responsible:	Private Campground Owners, National Park Service
Estimated Cost:	$50,000
Funding Method:	General Funds, Hazard Mitigation Grant Program
Implementation Schedule:	5+ years
Priority:	Low

ASMM1 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:	Moderate

ASLM2 Mitigation Action: Town of Scottsville	
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:	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

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 M
Funding Method:	RWSA, Flood control and dam safety program funds
Implementation Schedule:	Ongoing
Priority:	High

CHP1 Mitigation Action: City of Charlottesville	
Goal:	People and Vulnerable Populations
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

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:	1-2 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:	Encourage more institutions to use 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 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

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 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

CME1 Mitigation Action: City of Charlottesville	
Goal:	Education and Outreach
Action Item Description:	Support purchase of rain barrels
Hazard (s):	Drought
Lead Party Responsible:	Neighborhood Development Services
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 (Following a disaster)
Implementation Schedule:	When bridges
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

CMM1 Mitigation Action: City of Charlottesville	
Goal:	Mitigation Capacity

Action Item Description:	Support volunteer groups and encourage collaboration on public outreach and education
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 protection
Hazard (s):	Multiple
Lead Party Responsible:	Neighborhood Development Services
Estimated Cost:	$2000
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 systems
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
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
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:	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
Implementation Schedule:	Ongoing
Priority:	Low

CLM1 Mitigation Action: City of Charlottesville

Goal:	Mitigation Capacity
Action Item Description:	Hire a floodplain management official and enforce floodplain regulations
Hazard (s):	Flood
Lead Party Responsible:	Neighborhood Development Services
Estimated Cost:	$70,000
Funding Method:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant, General Revenue
Implementation Schedule:	3-5 year
Priority:	Low

FHI1 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Conduct structural evaluations and study of resistance to hazards of all current and proposed shelters
Hazard (s):	Multiple
Lead Party Responsible:	County Administrator
Estimated Cost:	Staff time and resources; Red Cross provides technical assistance and design criteria
Funding Method:	N/A
Implementation Schedule:	1-5 Years
Priority:	High

FHI2 Mitigation Action: Fluvanna 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

FHI3 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Implement recommendations from the Wireless Telecommunications Facility Master Plan to enhance emergency communications
Hazard (s):	Multiple
Lead Party Responsible:	Planning & Community Development Department
Estimated Cost:	Staff Time
Funding Method:	General Revenue

Implementation Schedule:	1 – 3 Years
Priority:	High

FHI4 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Conduct structural evaluations and study of resistance to hazards of all current and proposed shelters
Hazard (s):	Multiple
Lead Party Responsible:	County Administrator
Estimated Cost:	Staff time and resources; Red Cross provides technical assistance and design criteria
Funding Method:	N/A
Implementation Schedule:	1-5 Years
Priority:	High

FHI5 Mitigation Action: Fluvanna 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

FHP1 Mitigation Action: Fluvanna County	
Goal:	People and Vulnerable Populations
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

FHM1 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Improve local capabilities to perform earthquake building safety evaluations and enforce building codes in high seismic hazard areas

Hazard (s):	Earthquake
Lead Party Responsible:	Planning Department, County Administrator
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	1-3 years
Priority:	High

FME1 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Create a community toolbox with tools and information for local homeowners
Hazard (s):	Multiple
Lead Party Responsible:	TJPDC
Estimated Cost:	$10,000
Funding Method:	Hazard Mitigation Grant Program, Pre-Disaster Mitigation Grant
Implementation Schedule:	3-5 years
Priority:	Moderate

FMM1 Mitigation Action: Fluvanna 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

FMM2 Mitigation Action: Fluvanna 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:	Planning Department, County Administrator
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	1-3 years
Priority:	Moderate

FLE1 Mitigation Action: Fluvanna County	
Goal:	Education and Outreach
Action Item Description:	Develop an all-hazard resource center at libraries or other public office, including a copy of the Regional Natural Hazard Mitigation Plan
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

FLE2 Mitigation Action: Fluvanna 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

FLI1 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Retrofit existing public buildings to meet contemporary standards for earthquake resistance
Hazard (s):	Earthquake
Lead Party Responsible:	County Administrator
Estimated Cost:	Pending structural evaluations
Funding Method:	Pre-hazard mitigation funds
Implementation Schedule:	5+ Years
Priority:	Low

FLI2 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Equip owners of historic properties that may be more susceptible to earthquake damage with information about retrofitting structures to improve earthquake resistance
Hazard (s):	Earthquake

Lead Party Responsible:	Virginia Department of Historic Resources
Estimated Cost:	Unknown
Funding Method:	N/A
Implementation Schedule:	Ongoing
Priority:	Low

FLI3 Mitigation Action: Fluvanna County	
Goal:	Infrastructure and Buildings
Action Item Description:	Update building codes to improve earthquake resilience
Hazard (s):	Earthquake
Lead Party Responsible:	Planning & Community Development Department
Estimated Cost:	Staff Time
Funding Method:	General Revenue
Implementation Schedule:	3-5 Years
Priority:	Low

FLM1 Mitigation Action: Fluvanna County	
Goal:	Mitigation Capacity
Action Item Description:	Encourage proactive stormwater mitigation measures such as flood project, reducing impervious surfaces, stilling and infiltration basins, and restoring wetlands in growth areas
Hazard (s):	Flood
Lead Party Responsible:	Planning Department, County Administrator
Estimated Cost:	None
Funding Method:	N/A
Implementation Schedule:	5+ years
Priority:	Low

FCHI1 Mitigation Action: Town of Columbia	
Goal:	Infrastructure and Buildings
Action Item Description:	Acquire existing structures within the floodplain and either demolish or relocate
Hazard (s):	Flood
Lead Party Responsible:	TJPDC
Estimated Cost:	$400,000
Funding Method:	CDBG Community Improvement Grant
Implementation Schedule:	2-4 years
Priority:	High

FCHM1 Mitigation Action: Town of Columbia

Goal:	Mitigation Capacity
Action Item Description:	Create a relocation plan for residents currently living within the floodplain to offer housing choices outside of a hazard area
Hazard (s):	Flood
Lead Party Responsible:	TJPDC
Estimated Cost:	$6,000
Funding Method:	Community Development Block Grant
Implementation Schedule:	1 year
Priority:	High

FCMI1 Mitigation Action: Town of Columbia	
Goal:	Infrastructure and Buildings
Action Item Description:	Enhance emergency communications to provide reliable mobile coverage within the Town, per the adopted Fluvanna County telecommunications plan
Hazard (s):	Multiple
Lead Party Responsible:	Town Council in partnership with Fluvanna County
Estimated Cost:	Staff Time
Funding Method:	N/A
Implementation Schedule:	3-5 years
Priority:	Moderate

FCMI2 Mitigation Action: Town of Columbia	
Goal:	Infrastructure and Buildings
Action Item Description:	Repurpose the properties within the floodplain to serve the Town of Columbia without imposing risks from future flooding
Hazard (s):	Flood
Lead Party Responsible:	TJPDC
Estimated Cost:	$200,000
Funding Method:	CDBG Community Improvement Grant
Implementation Schedule:	3-5 years
Priority:	Moderate

FCLI1 Mitigation Action: Town of Columbia	
Goal:	Infrastructure and Buildings
Action Item Description:	Expand cell phone coverage to provide reliable service to the whole Town
Hazard (s):	Multiple
Lead Party Responsible:	Town Council in partnership with Fluvanna County
Estimated Cost:	Staff Time
Funding Method:	N/A
Implementation Schedule:	3-5 years

Priority:	Low

FCLI2 Mitigation Action: Town of Columbia	
Goal:	Infrastructure and Buildings
Action Item Description:	Maintain an evacuation route out of town with proper signage
Hazard (s):	Multiple
Lead Party Responsible:	VDOT
Estimated Cost:	Unknown
Funding Method:	N/A
Implementation Schedule:	2 years
Priority:	Low

FCLI1 Mitigation Action: Town of Columbia	
Goal:	Infrastructure and Buildings
Action Item Description:	Repair, replace or relocate septic and drainage fields that leak sewage into the river during flooding
Hazard (s):	Flood
Lead Party Responsible:	Town Council in partnership with DEQ
Estimated Cost:	Pending site evaluations
Funding Method:	Water Quality Improvement Fund grant
Implementation Schedule:	5+ years
Priority:	Low

FCLM1 Mitigation Action: Town of Columbia	
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

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
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
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

GHP1 Mitigation Action: Greene County	
Goal:	People and Vulnerable Populations
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

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 Public Works
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 Services, Emergency Services, Planning
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 Department
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

GME1 Mitigation Action: Greene County	
Goal:	Education and Outreach
Action Item Description:	Develop cooperative agreement between all agencies involved in emergency management, provide methods of communication between agencies responsible for being present at Emergency Communication Center following disaster, and conduct joint emergency exercises
Hazard (s):	Multiple
Lead Party Responsible:	Emergency Services
Estimated Cost:	None – Staff time
Funding Method:	N/A
Implementation Schedule:	Ongoing
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 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:	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:	Public Works, Emergency Management
Estimated Cost:	Staff Time and Resources
Funding Method:	N/A
Implementation Schedule:	2-5 years
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 needs survey identifying special populations
Hazard (s):	Multiple
Lead Party Responsible:	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:	Ensure evacuation routes are updated to proper standards
Hazard (s):	Multiple
Lead Party Responsible:	emergency management 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:	VDOT, Public Works
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:	VDOT, Public Works
Estimated Cost:	Minimal – staff time & labor
Funding Method:	General Revenue, EPA Chesapeake Bay Act
Implementation Schedule:	Ongoing
Priority:	Low

GLP1 Mitigation Action: Greene County	
Goal:	People and Vulnerable Populations
Action Item Description:	Update Greene County Emergency Operations Plan
Hazard (s):	Multiple
Lead Party Responsible:	Emergency 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
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:	Town Manager
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

GSMP1 Mitigation Action: Town of Stanardsville	
Goal:	People and Vulnerable Populations
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

LHI4 Mitigation Action: Louisa County	
Goal:	Infrastructure and Buildings
Action Item Description:	Ensure 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:	1 year
Priority:	High

LHP1 Mitigation Action: Louisa County	
Goal:	People and Vulnerable Populations
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 Services 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:	EMT
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:	Improve local capabilities to perform earthquake building safety evaluations and enforce building codes in high seismic hazard areas

Hazard (s):	Earthquake
Lead Party Responsible:	Planning Department, County Administrator
Estimated Cost:	None
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

LMP1 Mitigation Action: Louisa County	
Goal:	People and Vulnerable Populations
Action Item Description:	Create a needs survey that identifies special needs homes or facilities in need of attention in case of emergencies or evacuations
Hazard (s):	Multiple
Lead Party Responsible:	EMS
Estimated Cost:	$5,000
Funding Method:	Pre-Disaster Mitigation Grant, Hazard Mitigation Grant Program
Implementation Schedule:	3-5 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 Services 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:	Town Manager
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:	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
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

LLI1 Mitigation Action: Louisa County	
Goal:	Infrastructure and Buildings
Action Item Description:	Equip owners of historic properties that may be more susceptible to earthquake damage with information about retrofitting structures to

	improve earthquake resistance
Hazard (s):	Earthquake
Lead Party Responsible:	Virginia Department of Historic Resources
Estimated Cost:	Unknown
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:	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, EMS
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

LLLI1 Mitigation Action: Town of Louisa	
Goal:	Infrastructure and Buildings
Action Item Description:	Bury utilities underground in Town of Louisa
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

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:	Department of Community Development - Planning
Estimated Cost:	None
Funding Method:	N/A
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

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:	Moderate

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:	Building Inspections Department

Estimated Cost:	$10,000
Funding Method:	Hazard Mitigation Grant Program, General Revenue
Implementation Schedule:	1-3 years
Priority:	High

NHM3 Mitigation Action: Nelson 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 Services Coordinator
Estimated Cost:	$10,000
Funding Method:	FEMA Community Emergency Response Teams, FEMA Emergency Management Performance Grant
Implementation Schedule:	Ongoing
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

NMI1 Mitigation Action: Nelson County	
Goal:	Infrastructure and Buildings

Action Item Description:	Investigate safety and maintenance of roads in private communities
Hazard (s):	Multiple
Lead Party Responsible:	VDOT, Emergency Management
Estimated Cost:	Staff Time and Resources
Funding Method:	N/A
Implementation Schedule:	2-5 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:	911 Coordinator and Emergency Services
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:	Private Campground Owners, National Park Service, Forestry Department
Estimated Cost:	$50,000
Funding Method:	General Revenue, Hazard Mitigation Grant Program
Implementation Schedule:	5+ years
Priority:	Low