
Crater Regional Hazard Mitigation Plan

March 2006



Crater Planning District Commission
Hazard Mitigation Plan

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Section I. Executive Summary

Background

Beginning in 2003, the Commonwealth of Virginia encouraged the twenty-one planning districts in the commonwealth to take the lead on development of local hazard mitigation plans. These plans, which are required by the Disaster Mitigation Act of 2000 (DMA2K), help local governments determine risks and vulnerabilities and identify projects to reduce these risks. The plan developed under the auspices of the Crater Planning District includes the counties of Chesterfield, Dinwiddie, Greensville, Prince George, Surry, and Sussex; the cities of Colonial Heights, Emporia, Hopewell, and Petersburg; and the towns of Claremont, Dendron, Jarratt, McKenney, Stony Creek, Surry, Wakefield, and Waverly.

Representatives from each of the jurisdictions were invited to be a member of the Mitigation Advisory Committee coordinated by the Crater Planning District. Representatives from private utility companies, non-profit organizations (e.g., American Red Cross) and other stakeholders (e.g., Virginia State University, Fort Lee) also were invited to participate in the Mitigation Advisory Committee. The Mitigation Advisory Committee met several times over the course of the planning process and worked closely with the consultant to develop the plan. Public input was sought throughout the process in accordance with DMA2K requirements.

Hazard Identification and Risk Assessment

The Hazard Identification and Risk Assessment consists of three parts:

1. Identify what hazards that could affect the Crater Planning District Commission
2. Profile hazard events and determine what areas and community assets are the most vulnerable to damage from these hazards
3. Estimate losses and prioritize the potential risks to the community

Hazards were ranked by the steering committee to determine what hazards they feel have the largest impact on their communities. Certain hazards were not addressed due to the infrequency of occurrence and/or limited impact. Table I-1 summarizes the results of the hazard identification, which are explained fully in Section V of this plan.

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Table I-1. Crater PDC Planning Consideration Levels	
Hazard Identification Results	
Hazard Type	Planning Consideration Level
Flooding	Significant
Hurricane	Moderate
Wind	Moderate
Winter Storms	Moderate
Drought	Limited
Tornado	Limited
Wildfire	Limited
Earthquake	None
Landslide/Shoreline Erosion	None

The Hazard Identification and Risk Assessment described each of the hazards in varying levels of detail consistent with each planning consideration level. In general, floods were found to be the most significant hazard. Flooding occurs primarily along the James River and Chowan River and their tributaries. Flood durations typically range between a couple of hours to a few days. Localized flooding also occurs due to drainage issues.

Wind (including hurricanes) is a moderate hazard with localized impacts throughout the region. The impacts may last several months. Estimated losses are primarily from wood frame buildings and residential structures. In addition, hurricanes can bring heavy rain and sometimes tornados. Winter storms are a moderate hazard with biggest impact in Chesterfield County. Winter storms in the Crater region are often a mix of snow, ice, sleet, and rain. Winter weather may cause city, county and state roads closures and may cause a loss of power and telephone service. Storm-related business and industry disruptions can negatively affect the economy.

Capability Assessment

The Capability Assessment evaluates the current capacity of the communities of the Crater Planning District to mitigate the effects of the natural hazards identified in the Hazard

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Identification and Risk Assessment. By providing a summary of each jurisdiction’s existing capabilities, the Capability Assessment serves as the foundation for designing an effective hazard mitigation strategy. Table I-2 summarizes the Capability Self-Assessment provided by the participating jurisdictions.

Table I-2. Capability Self-Assessment				
Jurisdiction	Administrative Capability	Technical Capability	Planning and Regulatory Capability	Fiscal Capability
<i>Chesterfield County</i>	Moderate	Moderate	High	Moderate
<i>Colonial Heights</i>	Moderate	Low	Moderate	Low
<i>Dinwiddie County</i>	Moderate	Low	Moderate	Low to moderate
<i>Emporia</i>	Low	Low	Low to Moderate	Low
<i>Greensville County</i>	Moderate	Moderate	Low	Low
<i>Hopewell</i>	Moderate	High	Moderate	Low
<i>Petersburg</i>	Moderate	Moderate	Low to Moderate	Moderate
<i>Prince George County</i>	Low	Low	Moderate to High	Low
<i>Surry County</i>	High	Moderate	Moderate	Low
<i>Sussex County</i>	Low	Low	Moderate	Low

Mitigation Strategy

The Crater Mitigation Advisory Committee members used the results of the Hazard Identification and Risk Assessment as well as the Capability Assessment to develop goals and actions for the region and their jurisdictions. In addition, the committee prioritized actions for the region and their own jurisdictions. The priorities differ somewhat from jurisdiction to jurisdiction. Each jurisdiction’s priorities were developed based on past damages, existing exposure to risk, community goals, and weaknesses identified in the Capability Assessment.

The Mitigation Advisory Committee developed the following overarching goal to guide plan development:

Develop and maintain a community that is more resilient to natural disasters.

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In addition, more specific goals were identified. The goals fell into five broad categories: Public Safety, Property Protection, Public Awareness, Local Capacity, and Institutionalization. Actions were identified that dealt with all of the hazards identified in the Hazard Identification and Risk Assessment. In addition, each goal had at least one objective and one action associated with it.

Plan Maintenance Procedures

The plan outlines a procedure for implementing, maintaining, and updating the plan. Each jurisdiction will provide annual progress reports on implementation of its Mitigation Action Plan. The Crater PDC will receive these progress reports and coordinate an annual review of them by the Mitigation Advisory Committee. The Mitigation Advisory Committee members will develop annual measures of success and five-year measure of success for each action against which progress can be measured.

In accordance with FEMA regulations, a written update will be submitted to the commonwealth and FEMA Region III in five years, unless circumstances (e.g., Presidential disaster declaration, changing regulations) require a formal update in the meantime. The public will be continually informed of changes to the plan as they occur.

Conclusion

This plan symbolizes the continued commitment and dedication of the Crater Region's local governments and community members to enhancing the safety of residents and businesses by taking actions before a disaster strikes. While nothing can be done to prevent natural hazard events from occurring, the region is poised to minimize the disruption and devastation that so often accompanies these disasters.

Section II. Introduction

Mitigation

Mitigation is commonly defined as sustained actions taken to reduce or eliminate long-term risk to people and property from hazards and their effects. Hazard mitigation focuses attention and resources on community policies and actions that will produce successive benefits over time. A mitigation plan states the aspirations and specific courses of action that a community intends to follow to reduce vulnerability and exposure to future hazard events. These plans are formulated through a systematic process centered on the participation of citizens, businesses, public officials, and other community stakeholders.

A local mitigation plan is the physical representation of a jurisdiction's commitment to reduce risks from natural hazards. Local officials can refer to the plan in their day-to-day activities and in decisions regarding regulations and ordinances, granting permits, and in funding capital improvements and other community initiatives. Additionally, these local plans will serve as the basis for states to prioritize future grant funding as it becomes available.

It is hoped that the Crater Hazard Mitigation Plan will be a useful tool for all community stakeholders by increasing public awareness about local hazards and risks, while at the same time providing information about options and resources available to reduce those risks. Teaching the public about potential hazards will help each of the area's jurisdictions protect themselves against the effects of the hazards, and will enable informed decision making on where to live, purchase property, or locate businesses.

The area covered by this plan includes the counties of Chesterfield, Dinwiddie, Greensville, Prince George, Surry, and Sussex; the cities of Colonial Heights, Emporia, Hopewell, and Petersburg; and the towns of Claremont, Dendron, Jarratt, McKenney, Stony Creek, Surry, Wakefield, and Waverly.

The Local Mitigation Planning Impetus

On October 30, 2000, President Clinton signed into law the Disaster Mitigation Act of 2000 (DMA 2000), which established a national disaster hazard mitigation grant program that would help to reduce loss of life and property, human suffering, economic disruption, and disaster assistance costs resulting from natural disasters.

DMA 2000 amended the Robert T. Stafford Disaster Relief and Emergency Assistance Act and added a new section to the law, Section 322 Mitigation Planning. Section 322 requires local governments to prepare and adopt jurisdiction-wide hazard mitigation plans for

disasters declared after November 1, 2003, (subsequently revised to November 1, 2004) as a condition of receiving Hazard Mitigation Grant Program (HMGP) project grants and other forms of non-emergency disaster assistance. Local governments must review and, if necessary, update the mitigation plan every five years from the original date of the plan to continue program eligibility.

Interim Final Rule Planning Criteria

As part of the process of implementing DMA 2000, FEMA prepared an Interim Final Rule to define the mitigation planning criteria for States and communities. Published in the *Federal Register* on February 26, 2002, at 44 CFR Part 201, the Rule serves as the governing document for DMA 2000 planning implementation.

Organization of the Plan

The remaining sections of this document follow the process enumerated in DMA 2000.

Section III – Planning Process describes the Crater region’s stakeholder involvement and defines the processes followed throughout the creation of this plan.

Section IV – Community Profile provides a physical and demographic profile of the area, looking at things such as geography, hydrography, development, people, and land uses.

Section V – Hazard Identification and Risk assessment evaluates the natural hazards likely to affect the Crater, and quantifies whom, what, where, and how the region might be affected by natural hazards.

Section VI – Capability Assessment analyzes each of the four local jurisdictions’ policies, programs, plans, resources, and capabilities to reduce exposure to hazards in the community.

Section VI – Mitigation Strategy addresses the Crater’s issues and concerns for hazards by establishing a framework for mitigation activities and policies. The strategy includes a mission, statement, goals, objectives, and a range of actions to achieve the goals.

Section VIII – Plan Maintenance Procedures specifies how the plan will be monitored, evaluated, and updated, including a process for continuing stakeholder involvement once the plan is completed.

Section IX – References include a list of reports and data used to develop this plan.

Section IX – Appendices are included at the end of the plan, and contain supplemental reference materials and more detailed calculations and methodologies used in the planning process. The appendices also provide a list of commonly used mitigation terms and acronyms.

SECTION III. Planning Process

The Crater Planning District Commission is a voluntary organization comprised of the region's four local governments, whose primary goal is to help find regional solutions to common problems. As stated on the Commission's website, the Commission focuses on economic, industrial and small business development, reflecting the priorities established by the member localities. Another important work area involves environmental issues, including the local ramifications of the Chesapeake Bay Preservation Act, air quality standards, and solid waste management. The Commission also addresses regional transportation issues and assists localities in their transportation planning efforts. The Planning District was formed by local governments in 1968 under the authority of the Virginia Area Development Act.

Beginning in 2003, the State of Virginia encouraged the twenty-one planning districts in the state to take the lead on development of local hazard mitigation plans. These plans, which are required by DMA 2000, help local governments determine risks and vulnerabilities and identify projects to reduce these risks. The plan developed under the auspices of the Crater Planning District will include the counties of Chesterfield, Dinwiddie, Greensville, Prince George, Surry, and Sussex; the cities of Colonial Heights, Emporia, Hopewell, and Petersburg; and the towns of Claremont, Dendron, Jarratt, McKenney, Stony Creek, Surry, Wakefield, and Waverly.

After receiving funding in 2004, the Crater Planning District contracted with the engineering consulting firm, Dewberry, to develop a multi-hazard mitigation plan including a Hazard Identification and Risk Assessment (HIRA) and mitigation strategies. The Mitigation Advisory Committee worked with the consultants throughout the planning process to ensure that potential stakeholders participated in the planning process and had opportunities for input in the draft and final phases of the plan.

The Mitigation Advisory Committee

The planning district convened a Mitigation Advisory Committee (MAC) comprised of representatives of the participating jurisdictions. Representatives from private utility companies, non-profit organizations (e.g., American Red Cross) and other stakeholders (e.g., Virginia State University, Fort Lee) also were invited to participate in the MAC. The MAC worked with the Dewberry team and provided input at key stages of the process. Efforts to involve county departments and community organizations that might have a role in the implementation of the mitigation actions or policies included invitations to attend meetings and serve on the MAC, access to the project website (projects.dewberry.com/craterHMP), e-

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mail updates, strategy development workshops, plus opportunities for input and comment on all draft deliverables.

The Crater PDC would like to thank and acknowledge the following persons who served on the MAC and their representative departments and organizations throughout the planning process:

Table III-1. Crater Mitigation Meeting Participants		
Name	Title/Department	Jurisdiction
<i>Executive Committee Members</i>		
Herbert Bragg	Public Information/Research Officer	City of Hopewell
Ted Costin	Deputy County Administrator	Greensville County
David Jolly	Director of Public Safety	Dinwiddie County
Gilbert Lee	Assistant County Administrator	Prince George County
Terry D. Lewis	County Administrator	Surry County
Gary S. Peterson	Deputy Fire Chief & Emergency Coordinator/Petersburg Fire, Rescue & Emergency Services	City of Petersburg
Lynda Price	Emergency Management Coordinator/Fire Administration	Chesterfield County
Tony Williams	Emergency Manager/Colonial Heights Fire and EMS	City of Colonial Heights
Gene Wills	Facilities Manager	City of Emporia
Eddie T. Vick	Emergency Management Coordinator	Sussex County
<i>Other Participants</i>		
Rosalyn B. Andrews	Executive Director	American Red Cross
Thomas W. Baicy, III	Mayor	Town of Stony Creek
T. Wayne Birdsong	Mayor	Town of Wakefield

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Table III-1. Crater Mitigation Meeting Participants

M. Dale Bradshaw	Chief Executive Officer	Prince George Electric Cooperative
Donald E. Bradshaw	Director of Operations and Public Safety/Directorate of Operations and Public Safety	Fort Lee Army Base
J.C. Carter	Yardmaster	Norfolk Southern Corporation
James C. Dawson		South Central Wastewater Authority
Arthur G. Elliott, Jr.	Safety Officer	Town of Jarratt
George A. Felts	System Engineer	Southside Electric Cooperative
Dan Gerding	Mayor	Town of Claremont
Earnest Greene	External Affairs Manager	Dominion Resources Services
Mark Haley	Director	Hopewell Regional Wastewater Facility
Richard Hartman	Executive Director	Appomattox River Water Authority
John Herrin	Special Agent/Police Department	CSX Transportation
John H. Holt	Mayor	Town of Surry
Kim Johnson	Emergency Services Coordinator	City of Hopewell
Ted J. Jones	Director of Emergency Services	American Red Cross
First Sergeant Robert Loftis		Virginia State Police
Charles T. Mansfield	Mayor	Town of McKenney
Jeff Merriman	Manager, Economic Development & Government Affairs	Verizon
Benny W. Muncy	Mayor	Town of Dendron
Mayra R. Nickerson		City of Colonial Heights

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Table III-1. Crater Mitigation Meeting Participants

Harold Paxton	Transportation Planning Engineer	Virginia Dept. of Transportation
Susan Pope-Irving	Mayor	Town of Waverly
David Powell	Environmental Compliance Officer	Virginia Dept. of Forestry
Mark Riblett		Virginia Dept. of Transportation
First Sergeant Lisa Roakes		Virginia State Police
Donald Rodgers	Chief, Fire and Emergency Services	Defense Logistics Agency
Eric Stringfield		Virginia Dept. of Transportation
Eileen Tarr	Planner	Virginia Dept. of Emergency Management
Phil Wilson	Operations Center Manager	Columbia Gas of Virginia
Mario Wooden		Virginia American Water
Doug Woodhouse		Virginia American Water
Jimmy L. Wilson	Chief, Police	Virginia State University
<i>*Executive Committee members</i>		
<i>PDC Staff</i>		
Ian S. Birnie	GIS Manager	Crater PDC
Victor Liu	Community Development Director	Crater PDC
Dennis K. Morris	Executive Director	Crater PDC
James R. McClure	Director of Business Assistance	Crater PDC

Between October 2004 and July 2005, the MAC held four meetings and supervised work on the area's mitigation plan. The MAC members coordinated and consulted with other entities and stakeholders to identify and delineate natural hazards within the seven local

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jurisdictions and to assess the risks and vulnerability of public and private buildings, facilities, utilities, communications, transportation systems, and other vulnerable infrastructure.

In developing the mitigation plan, a majority of necessary communication occurred through telephone calls and emails. The MAC and its consultant chose this avenue to best accommodate budgets and schedules. A project website (<http://projects.dewberry.com/CraterHMP/>) was established to facilitate the planning process. Table III-2 documents formal meeting dates and their purposes.

Table III-2. Mitigation Advisory Committee	
Meeting Dates	Summary of Discussions
October 28, 2004	Planning process was described. Commitment to the project and schedule was obtained. Discussion regarding the purpose of the plan was held. Hazard identification and prioritization exercise was conducted. Preliminary hazard history and problem spot information was collected. An overarching plan goal was discussed and debated.
January 13, 2005	Results of the HIRA were presented. Region-wide goals for the plan were discussed and debated. Mitigation alternatives were presented. A public meeting followed the committee meeting.
March 17, 2005	Draft Plan presentation. Regional and local action plans were discussed. Plan maintenance procedures were agreed upon.
July 11, 2005	Final Plan presentation. Adoption process to be discussed.

Public Participation and Citizen Input

As shown in Table III-2 above, the public was afforded several opportunities to provide input and to participate throughout the planning process. An open public meeting was held on January 13, 2005, to allow the general public an opportunity to meet with the planning consultants and MAC members, ask questions, and provide comments and input on the draft mitigation plan. The hazard mitigation plan also was discussed at the Crater Planning District Commission meetings, which are advertised and open to the public. Table III-3 has a complete listing of the dates and topic of discussions.

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Table III-3. Crater Planning District Commission Meetings

Meeting Dates	Summary of Discussions
September 9, 2004	Executive Committee Meeting – Outlined process to be followed in the plan development schedule. Also, discussed funding of project.
October 14, 2004	Full Commission Meeting – Discussed membership on Mitigation Planning Committee and RFP process
November 30, 2004	Executive Committee Meeting – Approved grant funding for the project and contract with Dewberry. Gave an update on schedule of plan development
February 10, 2005	Full Commission Meeting – Discussed local capability assessments, draft HIRA, and goals of plan
March 10, 2005	Executive Committee Meeting – Gave an update on plan development progress and outlined major benchmarks of remaining schedule
June 29, 2005	Full Commission Meeting – Discussed completed plan
September 8, 2005	Full Commission Meeting – Recommended adoption of the plan by participating jurisdictions [proposed meeting topic]

The draft plan was made available on the Planning District Commission’s website (<http://www.craterpdc.state.va.us/>) as well as on various member jurisdiction websites (e.g., the City of Colonial Heights at <http://www.colonial-heights.com/FireEMSEmergencyMgmt.htm>). A customizable brochure was developed for the jurisdictions to use in their public outreach efforts. This brochure was widely distributed throughout the planning district. Staff from the Planning District Commission also gave presentations on the mitigation plan to various citizens groups such as the Petersburg Kiwanis Club and the Sussex County Chamber of Commerce. Table III-4 has the complete listing of presentations.

Table III-4. Outreach to Businesses and other Groups

Meeting Dates	Civic and Government Organization
September 9, 2004	Petersburg Kiwanis Club
October 6, 2004	Sussex County Chamber of Commerce
November 5, 2004	Crater District Local Directors of Planning

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Table III-4. Outreach to Businesses and other Groups

December 9, 2004	Crater District County Administrators and City Managers
February 11, 2005	Crater District Local Directors of Planning

Copies of the plan were made available to neighboring Planning District Commissions for their review and input. These commissions included Richmond Regional, Southside, and Hampton Roads. In addition, a copy was sent to the County of Northampton in North Carolina, which borders the Planning District Commission.

Participating jurisdictions were encouraged to obtain formal acknowledgement of the MAC from their governing boards, and to appoint MAC members by resolution. A sample resolution for establishing the Mitigation Advisory Committee is included in Appendix A.

Section IV. Community Profile

Introduction

The Crater Planning District covers six counties, four cities, and eight towns in the east-central part of Virginia. These jurisdictions are:

Counties

- ❖ Chesterfield County
- ❖ Dinwiddie County
- ❖ Greensville County
- ❖ Prince George County
- ❖ Surry County
- ❖ Sussex County

Cities

- ❖ Colonial Heights
- ❖ Emporia
- ❖ Hopewell
- ❖ Petersburg

Towns

- ❖ Claremont
- ❖ Dendron
- ❖ Jarratt
- ❖ McKenney
- ❖ Stony Creek
- ❖ Surry
- ❖ Wakefield
- ❖ Waverly

The planning area encompasses approximately 2,308 square miles and is bordered generally by Brunswick, Nottoway, Amelia and Powhatan Counties to the west; Goochland, Henrico, Charles City Counties, City of Richmond and the James River to the north; Isle of Wight and Southampton Counties to the east; and the State of North Carolina to the south. The location of the Crater planning area within the State of Virginia is depicted in Figure IV-1.

Dinwiddie County is the largest jurisdiction with respect to land mass at 504 square miles. The Cities of Emporia and Colonial Heights are the smallest jurisdictions in the area at 7 square miles each, while Prince George County is the smallest county at 266 square miles.

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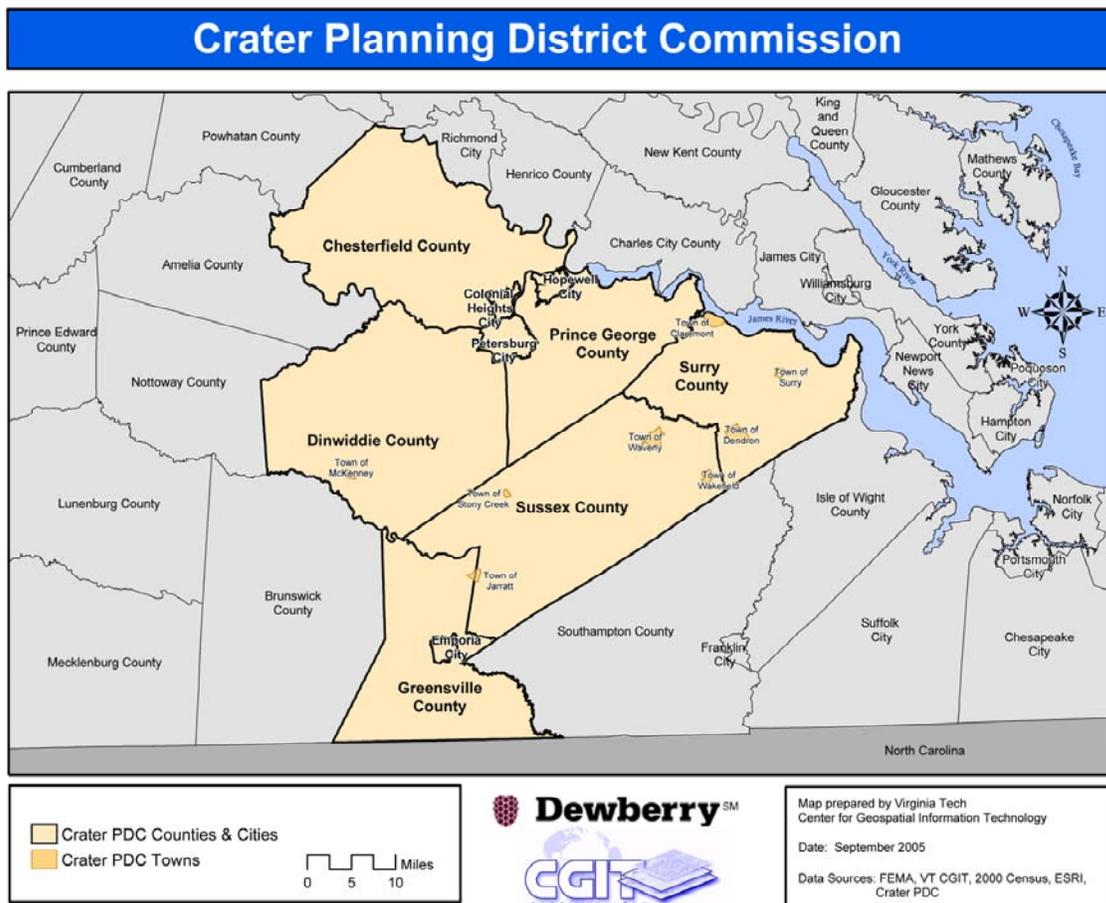


Figure IV-1 – Location of Crater PDC in Virginia

Physiography

Elevations vary from sea level to 400 feet above sea level. Generally, the western portions of the planning area are at higher elevations. The planning area is divided between two distinct regions, the Piedmont and the Coastal Plain, which are separated by the Fall Line. The Piedmont is characterized by deeply weathered, poorly exposed bedrock and a rolling topography. The Fall Line is the easternmost extent of rocky river rapids, the point at which east-flowing rivers cross from the hard, igneous and metamorphic rocks of the Piedmont to the relatively soft, unconsolidated strata of the flat Coastal Plain. The area of the planning district in the coastal plain is gently dissected by streams but can be locally quite rugged where short, high gradient streams have incised steep ravine systems.ⁱ

Hydrology

The planning area lies within two major watersheds – the James and the Chowan. The James watershed spans 10,236 square miles, the largest in Virginia, and is fed mainly by the James River, the Appomattox River, Maury River, Jackson River, and Rivanna River. The majority of the planning area falls in the Chowan River basin. This basin spans 3,675 square miles and is comprised of the Nottaway River, Meherrin River, and Blackwater River.

Numerous rivers flow through the planning district including the James River, Appomattox River, Blackwater River, Meherrin River, and Nottaway River. The Meherrin River runs through the center of the City of Emporia while the Appomattox goes through the City of Petersburg. The City of Hopewell is located at the confluence of the Appomattox and James Rivers.

In addition, several large creeks such as Stony Creek, which passes through the center of the Town of Stony Creek, run through the planning area. Swift Creek forms the northern boundary of the City of Colonial Heights.

Land Use and Trends

The character of the jurisdictions in the planning area varies dramatically. The four cities have a typical urban/suburban development pattern while most of the counties are rural in character.

Chesterfield County

The County has been split into numerous small areas for planning purposes and the development pattern varies immensely between these areas. Portions of the County are built out at suburban densities while other portions of the County remain fairly undeveloped and rural. For instance, the western part of the Southern and Western Planning area is designated as rural conservation, meaning that uses should be restricted to large-lot residential, forestry or agriculture. Closer to the City of Richmond, however, the development intensity increases. In this area, the Midlothian Turnpike corridor will continue to be one of the County's prime locations for planned light industrial, commercial, and office uses.

Leapfrog development has characterized the Central Area, creating a disjointed development pattern. The types of development in the Central Area have included single family subdivisions, scattered multifamily complexes, small to medium sized shopping areas often along highway corridors, large employment centers, industrial parks, and an airport. This area is experiencing rapid growth, particularly west of Route 10.

Significant commercial and industrial development has occurred in the Eastern Area in recent years, and this trend is expected to continue. The Eastern Area also has a great deal of residential development, often adjacent to older commercial-strip zoning and uses. This pattern is particularly seen along Route 10.

City of Colonial Heights

Colonial Heights is located at the Fall Line, or where the Coastal Plain meets the Piedmont. The city shows a linear development pattern along U.S. Route 1. Residential uses, mainly single family detached homes, dominate the city, comprising almost 50% of the land use. Recent residential development has come in the form of planned unit developments (PUDs). PUDs allow for subdivision design flexibility and often a mix of housing types. Public sewer is available to most of the developed area. There are six homes along Swift Creek Lane and Pondola Lane that, because of their low-lying location, would be cost-prohibitive to run sewer lines to.

The amount of commercial and business uses have been increasing in recent years. For instance, Southpark Mall Regional Shopping Center, which is accessible from I-95, was built in the past thirty years. Industrial development is limited to the Colonial Heights Industrial Park. About 29% (1,625 acres) of the city is not developed, but the majority of the undeveloped land (983 acres) is unbuildable because of site constraints such as the presence of wetlands, floodplains, or steep slopes.

Dinwiddie County

Dinwiddie County, like many of the jurisdictions in the planning district, is divided by the Fall Zone into two physiographic provinces, the Piedmont and the Coastal Plain. The major rivers that flow through this area, the Appomattox and Nottoway, occupy narrow floodplains with only minor meandering. The portion of the county in the Coastal Plain tends to be flat and swampy, which deters development.

The County has grown in three distinct areas. The first area is along the major highways such as River Road, U.S. Route 1, and U.S. Route 460. Such development occurs individually or in small strips. Clusters of development also are located in the fringe parts of the Town of McKenney and existing villages and crossroads such as Dinwiddie Courthouse and Sutherland areas. Finally, as the City of Petersburg has expanded, development has begun to cluster in its outskirts in the northeastern part of the County. Approximately 40 percent of the County residents live in this portion of the County. It is also one of the areas where public utilities are available. Residential development patterns include single-family and duplex units, apartment complexes, and manufactured housing parks.

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In Dinwiddie County, commercial development tends to occur near residential development. Most of the commercial establishments are located in the northeastern section of the County. In addition, a few businesses are located in the Courthouse area, while travel service facilities such as gasoline stations, motels, and restaurants are located mainly along U.S. Routes 1 and 460. The County has an industrial park at the municipal airport. There is also some industrial presence in the Town of McKenney.

Most of the open space land in Dinwiddie County is under the ownership of timber companies. It is estimated that over 240,000 acres of land, or 76% of the County's land area, are in some sort of timber production. The timber stands are mainly located in the western half of county.

Future growth will be centered in the urban northeastern area of the County and scattered throughout the rest of the County. There is concern that farmers will find it difficult to continue using their land for agricultural purposes as development increases.

City of Emporia

Emporia is located along the Meherrin River at the Fall Line. Due to the city's location in the two physiographic provinces, the slope of its waterways varies between ten feet per mile to one foot per mile.

Emporia has been the historic trade center for Greensville County. It is the County seat and provides travel services for drivers on I-95. As of 1989, most of the land (57.4%) within the city limits was undeveloped. About 26% of this land had site constraints such as floodplains or steep slopes that prevented it from being developed. Of the developed portions of the city, most land was in residential use. Single family detached homes are the most common type of residential construction in the city, though there are multi-family units scattered throughout. Many of the higher-density units are concentrated in the northeastern section of the city. New residential development is occurring in the southwest part of the city.

Industrial uses are the second most common type of use in Emporia. These uses tend to be concentrated near major transportation routes, such as adjacent to the railroad tracks and near the Meherrin River Dam. There are three main retail areas. One is north of the river and is made up of a part of the central business district and the Emporia Shopping Center. The second is south of the river and is comprised of the other part of the central business district and the area near the Courthouse. The third area is at the intersection of I-95 and Route 58, which is the site of a large shopping center.

The Emporia Comprehensive Plan states that demand for development will continue along its traditional pattern. Single family homes will continue to be in demand as will auto-oriented commercial uses. The plan does note a focus on downtown revitalization and a desire to discourage rampant strip development.

Greensville County

Rolling hills give way to flat land midway through Greensville County, which is bisected by the Fall Line and I-95. Floodplains are wide in the eastern part of the County, accounting for almost half of the land in that part of Greensville. The County's population is primarily clustered around the City of Emporia, which is located in the center of Greensville County. Another population cluster is in the Towns of Jarratt and Purdy. There is some residential development scattered along the primary roads and highways in the County. Mobile homes account for over 20% of the housing stock.

Future growth is expected in the Emporia fringe area and along the I-95/U.S. Route 301 corridor. The County plans to implement an urban services district in which capital improvements will be focused. The urbanized parts of the County are currently served by the Greensville County Water and Sewer Authority.

City of Hopewell

The City of Hopewell falls entirely within the Coastal Plain (close to the western edge of the province) and the area governed by the Chesapeake Bay Preservation Act. The steepest slopes in the City can be found along the James and Appomattox Rivers. The City is over 400 years old and has a significant amount of historic buildings and other resources.

Residential uses dominant the land use pattern of the city. Single family homes are the main housing type though there are some multi-family units such as apartments, townhomes, and condominiums. Much of the housing was built in the 1900s for workers. Two large subdivisions have been built since 1991.

Industrial uses are found in the northeastern part of the City along the James River and Baileys Creek. The vacant industrial land is owned by existing businesses and is reserved for their future growth. According to the Comprehensive Plan, a large part of the industrial development is in the floodplain.

The amount of vacant land in the City is not enough to meet future demands for growth. Infill development and redevelopment of existing parcels will have to be pursued. As of 2001, there was vacant land available at the new I-295 interchange for commercial development.

City of Petersburg

The City of Petersburg has a finite amount of land for growth as annexation of County land is not an option. Developable land is limited by the Chesapeake Bay Preservation Act requirements and other physical site constraints. About 3,586 acres are available for future development (about 70% of the vacant land). Land use fragmentation is a major issue in Petersburg with incompatible uses often located side by side.

The city has two distinct residential patterns. The first is found in the “Old City,” north of I-85. A mix of residential types (e.g., single family, multi-family, and duplexes) is found here. Newer developments, mainly suburban subdivisions, have sprung up south of I-85. Some infill of single family homes and duplexes also has been seen.

Commercial development has occurred along the major thoroughfares leading from the central business district. There has been commercial infill development, and a new shopping center has been built on U.S. Route 301. A marina is planned for the area between the I-95 bridge and the Route 1/301 bridge.

Industrial uses can be found along the Appomattox River in the central business district. New industrial parks also have been built in the southwest (near I-85 and Route 604) and southeast (I-95 and Route 632) parts of the City.

Prince George County

Over the past 50 years, Prince George County has seen growth despite annexations by the Cities of Petersburg and Hopewell. The County’s residents are concentrated in the Prince George Planning District, which is the northwest portion of the county between the two cities. Three-quarters of the growth between 1980 and 1990 occurred in that district.

In 1999, forests covered about 69% of the County. The Flowerdew Hundred Planning District was designated as primarily for conservation. Residential uses dominated the developed part of the County. Single family homes comprised about 74% of the housing stock followed by manufactured homes that accounted for about 12%. Most of the single family homes were found in subdivisions near the two cities. The remainder of the residential development was scattered throughout the county. Commercial development occurred primarily as strip development along major routes.

Surry County

Surry County is a rural county characterized by a rolling topography that gradually becomes more level in the eastern portions of the County. Seventy-five percent of the County is forested. Traditionally, forestry and agriculture have been the main industries, but they are

currently in a decline. Surry County is the location of the Surry Power Station, a nuclear power plant built in 1972.

About 25% of the County lies within the area regulated by the Chesapeake Preservation Act. The County has a floodplain overlay district and relies on the Uniform State Building Code to restrict development in the floodplain.

Large tracts of land are generally not available for development. The dominant development trend is the subdivision of farms into large lots. This development trend may create an inefficient land development pattern. The majority of the county is zoned agricultural-residential. Concern is expressed in the comprehensive plan about the County's lack of legal authority to control mobile home placements in the agricultural-residential district. Considering that the majority of new housing units are mobile homes, the County is concerned about a decrease in the property tax base. The Cobham Magisterial District has seen the majority of recent growth in single-family home development.

Some pressure exists to develop along the James River shoreline. Currently, the Towns of Claremont, Sunken Meadow and Scotland Wharf have the largest concentration of development along the James River. The comprehensive plan calls for future development to be concentrated in and around the historic towns and crossroads that already exist in the County.

Sussex County

Sussex County is primarily rural with agriculture and forestry dominating land use. Forests, agriculture and residential uses account for over seventy-nine percent of the county. The topography is slightly rolling or relatively level with some marsh areas. The Towns of Jarratt, Stony Creek, Wakefield and Waverly are located in Sussex County.

The County has experienced a population decline since 1950. In addition, the median age has increased since the 1960s. The majority of housing in the county is single-family detached homes. The number of manufactured homes has risen dramatically since 1990. Manufactured homes accounted for 58% of building permits issued between 1990 and 1996. In 1990, manufactured homes accounted for only 24% of the housing stock; by 1996, that percentage had risen to 40%. Most residential development is in subdivisions or as strips along the highway. This pattern preserves land for agricultural and forestry uses.

The Future Land Use Map shows a large portion of the County, including the floodplains, classified for conservation uses. Large lot, residential development is allowed in this area as

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is agricultural, forestry and passive recreation. In addition, the plan calls for development to be concentrated in existing community hubs instead of scattered throughout the County.

Climate

The present-day climate of Virginia is generally classified as humid subtropical.ⁱⁱ Average temperatures in the Crater region are about 78 degrees Fahrenheit in the summer and 39 degrees in the winter. Average annual rainfall is about 45 inches. Average snowfall is about 10 inches. The snowfall averages range from a low of 5 inches for Prince George County to a high of 14.4 inches for Chesterfield County.

Population

The total population of the planning area is 427,032 (as of the 2000 census). Between 1990 and 2000, Greenville County saw the greatest increase in population with a growth rate of 35.2%. Chesterfield and Prince George Counties also saw dramatic growth. At the other end of the spectrum, the City of Petersburg saw a decline of 9% in population. Table IV-1 shows the population breakdown by jurisdiction with the associated growth rate and number of persons per household.

Table IV-1. Population by Jurisdiction

	Chesterfield County	Colonial Heights city	Dinwiddie County	Emporia city	Greenville County	Hopewell city	Petersburg city	Prince George County	Surry County	Sussex County
Population, 2000	259,903	16,897	24,533	5,665	11,560	22,354	33,740	33,047	6,829	12,504
Population, percent change, 1990 to 2000	24.00%	5.20%	10.10%	2.00%	35.20%	-3.20%	-9.00%	20.70%	11.10%	-4.40%
Persons per household, 2000	2.73	2.37	2.58	2.43	2.51	2.43	2.38	2.76	2.61	2.41

According to the 2000 Census, slightly over half of the population in the planning area is female (50.7%). The majority of the population claimed to be of a single race (98.7%). Of the total population claiming one race, 66.8% (285,202) were White and 1.8% were Asian (7,838). The percentage of the population reporting that they were Black or African American was 28.5% (121,852), higher than the average for Virginia (19.6%). Only 2.6% of the population (11,130) claimed to be of Hispanic origin.

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About 4% (17,749) of the residents in the planning area were foreign-born, and almost 7% (28,934) of the population reported that they spoke a language other than English at home. These statistics indicate there might be a significant portion of the community that requires special consideration when developing hazard reduction and outreach strategies for the community.

Another type of special needs group is characterized by age. Six percent (27,250) of the population is under the age of five while 27% (113,694) is under the age of 18. Additionally, 10.1% (43,251) of the population is over the age of 65. These figures are close to the state averages. Parts of the planning area, such as the City of Emporia and Prince George and Sussex Counties, have seen an increase in the elderly population.

Almost 82% (348,955) of residents have graduated from high school, and about a quarter (108,523) hold bachelor's degrees or higher. The first statistic is on par with the state average while the second is almost five points lower than the state average. The City of Emporia and Sussex County have the lowest percentage of people with high school diplomas, while Chesterfield County and the City of Colonial Heights have the highest. The latter two jurisdictions also have the highest percentage of people with college degrees. Sussex County and the City of Hopewell have the smallest percentage of people with college degrees.

These numbers, coupled with the population characteristics described in the previous paragraph, are important to keep in mind when developing public outreach programs. The content and delivery of public outreach programs should be consistent with the audiences' needs and their ability to understand complex information.

The average median household income is approximately \$38,617, about 82% of the state average (\$46,677). The average per capita household income of \$18,195 is about 75% of the state per capita income of \$23,975. About 7.69% (32,850) of residents within the Crater planning area live below the poverty line. This rate is less than both the national rate of 11.3% and the state rate of 9.6%. Special consideration should be given for this portion of the population, as they may not have the resources available to undertake mitigation projects that require self-funding.

Among the jurisdictions included in the planning area, these statistics vary greatly. Table IV-2 shows the breakdown by jurisdiction. As the table illustrates, only two counties, Chesterfield and Prince George, have a median household income on par with or above the state average. Chesterfield County is above the state per capita income, while the City of Colonial Heights is on par with it. Six of the jurisdictions have poverty rates below the state

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rate of 9.6%. The City of Petersburg has the lowest median income in the planning area, and Greenville County has the lowest per capita income.

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Table IV-2. Income Characteristics by Jurisdiction

	Chesterfield County	Colonial Heights city	Dinwiddie County	Emporia city	Greensville County	Hopewell city	Petersburg city	Prince George County	Surry County	Sussex County
Median household income, 1999	\$58,537	\$43,224	\$41,582	\$30,333	\$32,002	\$33,196	\$28,851	\$49,877	\$37,558	\$31,007
Per capita money income, 1999	\$25,286	\$23,659	\$19,122	\$15,377	\$14,632	\$16,339	\$15,989	\$20,196	\$16,682	\$14,670
Persons below poverty, percent, 1999	4.50%	5.50%	9.30%	16.00%	14.70%	14.90%	19.60%	8.00%	10.80%	16.10%

Housing

There are 171,872 housing units in the planning area. Table IV-3 illustrates the housing characteristics of each jurisdiction. The majority of the housing units are found in Chesterfield County. Not surprisingly, given the more urban nature of these communities, the Cities of Colonial Heights, Hopewell, and Petersburg have the highest percentage of multi-unit structures while Greensville County has virtually none.

About 75.3% of residents own their own homes, higher than the national average of 66.2% and the state average of 68.1%. The Cities of Colonial Emporia, Hopewell and Petersburg, however, have homeownership rates lower than the national average. When mitigation strategies are considered, special attention should be paid to the difference in capabilities between owners and renters.

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Table IV-3. Housing Characteristics by Jurisdiction

	Chesterfield County	Colonial Heights city	Dinwiddie County	Emporia city	Greensville County	Hopewell city	Petersburg city	Prince George County	Surry County	Sussex County
Housing units, 2002	102,926	7,508	10,072	2,557	3,892	9,842	15,868	11,141	3,383	4,683
Housing units in multi-unit structures, percent, 2000	11.90%	18.40%	3.40%	16.90%	1.50%	24.20%	30.00%	10.50%	4.60%	6.80%
Homeownership rate, 2000	80.90%	69.30%	79.20%	52.20%	78.30%	56.00%	51.50%	73.00%	77.20%	69.50%
Median value of owner-occupied housing units, 2000	\$120,500	\$94,800	\$86,900	\$68,700	\$69,000	\$77,300	\$68,600	\$118,200	\$88,100	\$71,600

According to the Crater Planning District, a substantial number of new housing units have been added to the planning area each year. An average of 3,387 units per year were added between 1998 and 2002.

Business & Labor

Table IV-4 presents information on each jurisdiction's top employment sectors. The five most represented sectors, as of the 1997 Economic Census, are

- ❖ Accommodation & foodservices,
- ❖ Health care & social assistance,
- ❖ Manufacturing,
- ❖ Retail trade, and
- ❖ Wholesale trade.

Businesses without employees (such as farmers or fisherman) are not included in this summary. In addition, the table does not reflect employment in the following sectors, as information is not published by county:

- ❖ Construction,
- ❖ Finance & insurance,
- ❖ Information,
- ❖ Mining,
- ❖ Transportation & warehousing,

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- ❖ Utilities, and
- ❖ Management of companies & enterprises.

Table IV-4 . Economic Characteristics by Jurisdiction

Sector	Establishments	Sales, receipts or shipments (\$1,000)	Annual payroll (\$1,000)	Paid employees
Chesterfield County				
Wholesale trade	372	1,447,492	116,289	3,154
Health care & social assistance	383	241,146	118,368	4,392
Accommodation & foodservices	326	222,535	61,701	6,966
Manufacturing	164	2,671,228	412,555	10,166
Retail trade	938	2,412,612	230,717	15,275
Colonial Heights				
Other services (except public administration)	50	19,286	6,748	390
Health care & social assistance	64	39,124	17,100	629
Manufacturing	14	215,440	20,383	838
Accommodation & foodservices	63	40,782	10,937	1,431
Retail trade	205	496,410	46,543	3,776
Dinwiddie County				
Other services (except public administration)	18	3,614	635	54
Health care & social assistance	10	4,217	1,868	73
Accommodation & foodservices	16	5,913	1,338	154
Retail trade	44	64,535	6,045	514

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Table IV-4 . Economic Characteristics by Jurisdiction

Sector	Establishments	Sales, receipts or shipments (\$1,000)	Annual payroll (\$1,000)	Paid employees
Wholesale trade	9	D	D	(250-499)
Emporia				
Health care & social assistance	18	13,226	6,123	191
Accommodation & foodservices	24	16,198	4,447	490
Retail trade	81	97,299	9,670	714
Manufacturing	13	158,732	28,976	1,055
Wholesale trade	8	D	D	(100-249)
Greensville County				
Wholesale trade	10	18,366	909	45
Retail trade	26	23,021	1,853	179
Accommodation & foodservices	14	6,552	1,757	221
Manufacturing	5	120,262	15,014	733
Health care & social assistance	4	D	D	(100-249)
Hopewell				
Other services (except public administration)	36	12,720	4,840	409
Retail trade	83	100,873	10,574	754
Health care & social assistance	50	92,738	39,982	1,444
Manufacturing	19	1,328,058	147,431	2,907
Accommodation & foodservices	46	D	D	(500-999)

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Table IV-4 . Economic Characteristics by Jurisdiction

Sector	Establishments	Sales, receipts or shipments (\$1,000)	Annual payroll (\$1,000)	Paid employees
Petersburg				
Professional, scientific, & technical services	45	79,799	42,062	1,122
Accommodation & foodservices	83	34,227	10,148	1,194
Health care & social assistance	89	64,124	32,630	1,438
Retail trade	189	290,027	29,521	1,764
Manufacturing	43	409,643	72,398	2,553
Prince George County				
Wholesale trade	16	62,401	5,752	189
Professional, scientific, & technical services	36	31,671	13,102	277
Administrative & support & waste management & remediation services	22	14,044	7,889	529
Retail trade	66	91,821	8,396	632
Accommodation & foodservices	27	20,903	5,214	674
Surry County				
Other services (except public administration)	2	D	D	(1-19)
Administrative & support & waste management & remediation services	3	D	D	(1-19)
Health care & social assistance	4	1,482	708	20
Wholesale trade	3	8,569	845	52
Retail trade	17	8,912	1,031	84

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Table IV-4 . Economic Characteristics by Jurisdiction

Sector	Establishments	Sales, receipts or shipments (\$1,000)	Annual payroll (\$1,000)	Paid employees
Accommodation & foodservices	5	D	D	(20-99)
Sussex County				
Wholesale trade	14	30,746	2,096	106
Accommodation & foodservices	14	6,775	1,994	236
Health care & social assistance	7	6,219	3,209	247
Retail trade	47	71,517	5,647	358
Manufacturing	9	283,506	26,525	1,138
D = Withheld to avoid disclosure				
Numbers in parentheses indicate the range in which the true number of employees falls.				

Major employers in the jurisdictions include:

❖ Chesterfield County

- E. I. du Pont de Nemours & Co., Inc.
- Defense Supply Center Richmond
- CJW Medical Center
- Ukrop's Super Markets, Inc.
- United Parcel Service, Inc.

❖ Dinwiddie

- Chaparral Virginia Inc.
- Philip Morris Products, Inc.
- Tindal Concrete Company
- Central State Hospital
- Wal Mart Inc.

❖ Hopewell

- Honeywell
- Hercules, Inc. Aqualon Division
- Smurfit-Stone Container Hopewell, Inc.
- Goldschmidt Chemical Corporation
- John Randolph Hospital

❖ Greenville County and Emporia

- Greenville Correctional Center
- Georgia Pacific Corporation
- Perdue Farms, Inc.
- Boars Head Provisions Company, Inc.
- Grayson Mitchell, Inc.
- Greenville Memorial Hospital

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- | | |
|---|--|
| <ul style="list-style-type: none">❖ Petersburg<ul style="list-style-type: none">- Southside Regional Medical Center- Virginia State University- Brenco, Incorporated- B. I. Chemicals Inc.❖ Prince George County<ul style="list-style-type: none">- Food Lion, Inc.- Desco Corporation- Tarmac Lonestar, Inc.- Standard Motor Products, Inc. | <ul style="list-style-type: none">❖ Surry County<ul style="list-style-type: none">- Seward Lumber Co. Inc.- S. Wallace Edwards & Sons, Inc.- Dominion Virginia Power- Fluor Daniel❖ Sussex County<ul style="list-style-type: none">- Waverly Hardwoods Inc.- Nevamar Company- Carroll Foods of Virginia, Inc.- Virginia Department of Corrections |
|---|--|

Transportation

Interstate 95 is the principal highway in the Crater Planning District. It bisects the planning district, connecting it with Richmond to the north and with North Carolina to the south. I-295, which begins north of Richmond and goes through Hopewell to Petersburg, provides an alternative to I-95. In addition, Interstate 85 originates in Petersburg and slants southwest through Dinwiddie County into North Carolina. U.S. 460 connects the Petersburg area with Norfolk and the ports of Hampton Roads and U.S. 58 passes through Emporia along the state's southern border.

The planning area is well served by various transportation modes. Freight service by CSX and Norfolk Southern is available from Petersburg. The region is served by the Richmond International Airport and numerous general aviation facilities including the Emporia/Greensville Regional Airport, Chesterfield County Airport, Dinwiddie County Airport, Petersburg Municipal Airport, and the Wakefield Municipal Airport. The James River is navigable by large ships up to the Fall Line. City Point Port is located in the City of Hopewell and the Port of Richmond is within a mile of the planning area.

Two interstates, I-95 and I-85, serve the Crater area. Both are north-south routes, with I-95 being the primary route along the East Coast running from Maine to Florida and I-85 the main route between Petersburg, Virginia and Atlanta, Georgia. In addition, I-295 provides an alternative route around the City of Richmond. A number of large U.S. Highways also serve the planning area. They include: US-1, US-301, US-360, US-460, US-58, and US-60. The state road network is extensive throughout the planning area. Some of the major routes include SR-288, SR-10, and SR-156.

Infrastructure

The Crater Planning District is served by four electricity providers: Dominion Virginia Power, Mecklenburg Electric Cooperative, Southside Electric Cooperative, and Prince George Electric Cooperative. Natural gas is provided by the City of Richmond and Columbia Gas of Virginia. Local telephone service is available from Verizon and Cavalier Telephone Company.

Public water is provided by the following:

- Appomattox River Water Authority
- Chesterfield County
- Dinwiddie County Water Authority
- City of Emporia
- Greensville County Water & Sewer Authority
- Town of Jarratt
- Town of McKenney
- Petersburg & Dinwiddie Water Authority
- City of Petersburg
- Prince George County
- City of Richmond
- Town of Stony Creek
- Surry County
- Sussex Service Authority
- Virginia American Water Company

SECTION V. HAZARD IDENTIFICATION AND RISK ASSESSMENT

The Crater Planning District Commission, on behalf of the jurisdictions which comprise the planning area, has developed this Hazard Identification and Risk Assessment (HIRA) to serve as a guide to all communities in the Crater planning area when assessing potential vulnerabilities to natural hazards. When developing this plan, every effort was made to gather input from all aspects of the project area communities to assure that the results of this analysis were as accurate as possible.

The planning area for this study includes four cities, six counties and eight incorporated towns. All jurisdictions located throughout these counties have also been included in this portion of the study, as this analysis has been completed on a regional basis. It should be noted, however that a local jurisdiction's inclusion in the Full Mitigation Plan is dependent on the community's participation in the remainder of the planning process.

The purpose of the HIRA is to:

1. Identify what hazards that could affect the Crater Planning District Commission
2. Profile hazard events and determine what areas and community assets are the most vulnerable to damage from these hazards
3. Estimate losses and prioritize the potential risks to the community

The first step, hazard identification, identifies all the natural hazards that might affect the Crater region. The hazards are ranked to determine what hazards are most likely to impact the communities of the Crater region. The hazards that are determined to have significant impact are analyzed in the greatest detail to determine the magnitude of future events and the vulnerability of the community and its critical facilities. Hazards that receive a moderate impact ranking are analyzed with available data to determine the risk and vulnerability to the specified hazard. The limited impact hazards are analyzed using the best available data to determine the risk to the community.

Watersheds

The major watersheds for the CPDC include the Chowan and James River Basins. The following Figure V-1 illustrates the location of the major watershed boundaries for the planning district.

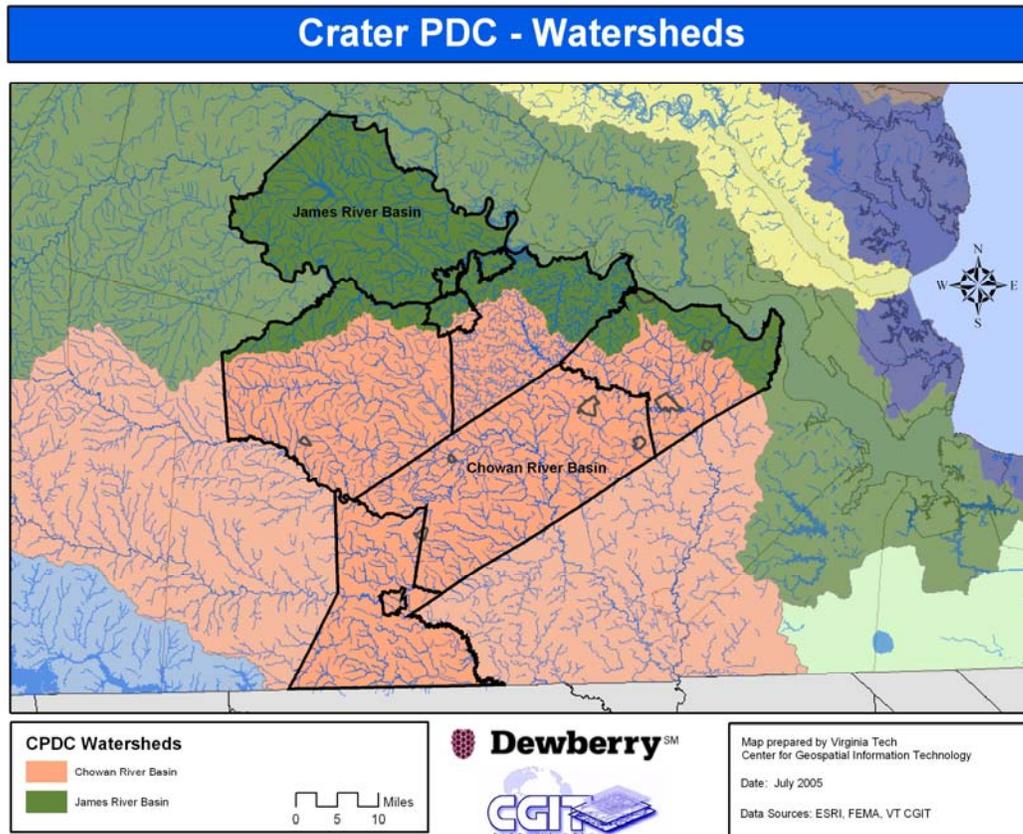


Figure V-1. Crater PDC Watersheds (from VA-DCR)

Critical Facilities

According to the FEMA State and Local Plan Interim Criteria, a critical facility is defined as a facility in either the public or private sector that provides essential products and services to the general public, is otherwise necessary to preserve the welfare and quality of life in the County, or fulfills important public safety, emergency response, and/or disaster recovery functions.

Critical facilities for CPDC were derived from a variety of sources. Information provided by the CPDC was supplemented with ESRI and US Census data.

Data Limitations

The FEMA guidelines emphasize using “best available” data for this plan. The impact of these data limitations will be seen through the different vulnerability assessment and loss estimation methods used for hazards. The limiting factor for the data was the hazard mapping precision at only the county or jurisdiction level. The Planning District Commission provided available base map data including water networks, street mapping

and some zoning information. All other data was derived from existing sources or created by the Virginia Tech Center for Geospatial Information Technology. Critical facilities were determined based on best available data.

Inadequate information posed a problem for developing loss estimates for most of the identified hazards. The limiting factor for the data was that the hazard mapping precision is at only the county or jurisdiction level. In addition, many of the hazards do not have defined damage estimate criteria. Critical facilities and residential and industrial buildings within the 100-year floodplain were identified for flood analysis. The Hazards US (HAZUS-MH) model was used to estimate damage from hurricanes in the Crater region.

Analysis for the region was completed using the best available data. Census blocks were used to assess the areas vulnerability to specific hazards. Flooding analysis was conducted in a slightly different manner. When structure value was not available from the locality, structure value was estimated using average house value in the 2000 Census data. The 2000 Census data for average structure value per block was used as a replacement cost in the event of a disaster. This value can serve as a guide in assessing the impacts of various hazards.

Hazard Identification

Types of Hazards

Although all types of disasters are possible for any given area in the United States, the most likely hazards that could potentially affect the communities in the Crater Planning District were determined through initial research and discussion with community representatives. These hazards include:

- Coastal Erosions
- Droughts
- Flooding
- Hurricanes
- Northeasters
- Tornadoes
- Wildfires
- Winter Storms

Probability of Hazards

Hazards were ranked by the steering committee to determine what hazards they feel have the largest impact on their communities. The results are summarized in Table V-1. Certain hazards were not addressed as a result of the infrequency of occurrence and/or limited impact. Earthquake, for example, falls into this category. Analysis level was determined by the type of data available and the scale of data available for the analysis.

Table V-1. Crater PDC Planning Consideration Levels	
Hazard Identification Results	
Hazard Type	Planning Consideration Level
Flooding	Significant
Hurricane	Moderate
Wind	Moderate
Winter Storms	Moderate
Drought	Limited
Tornado	Limited
Wildfire	Limited
Earthquake	None
Landslide/Shoreline Erosion	None

Major Disasters

Appendix B lists the major disasters that have occurred in the Planning District including Presidentially-declared disasters. The table demonstrates which hazards have impacted each of the communities in the Crater region.

Level of Hazard Analysis

Table V-2 provides a breakdown of the natural hazards addressed in this plan. The level of planning consideration given to each hazard was determined by the committee members. Based on the input of committee members at the kick-off meeting, the hazards were broken into four distinct categories, which represent the level of consideration they will receive throughout the planning process.

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In order to focus on the most critical hazards that may affect the Planning District communities, hazards assigned a level of *Significant* or *Moderate* will receive the most extensive attention in the remainder of the planning analysis, while those with a *Limited* planning consideration level will be assessed in more general terms. The hazards with a planning level of *None* will not be addressed in this plan. The hazards assigned a ranking of *None* are not critical enough to warrant further evaluation; however, these hazards should not be interpreted as having zero probability or impact.

Additional areas of impact were noted by the committee members through a problem spot worksheet, as well as indicating what areas were of concern on paper maps for the region. Each locality provided input, to the best of their ability, in determining what areas were concerns or “problems” in their communities. The areas that the committee members and public indicated were taken into consideration during the analysis phase. The individual community problem spot maps that were developed include flooding, hurricane wind and winter storm.

Table V-2. Crater PDC Natural Hazards HIRA Overview

Hazard	Type	Detail Level	Analysis Level	Data Reference
Flooding	Riverine	Significant	Covered by HIRA flood analysis	FEMA DFIRM, Q3, and FIRM Mapping
Hurricane	Hurricane	Moderate	Covered by HIRA flood and hurricane wind analysis	FEMA DFIRM, Q3, and FIRM Mapping and ASCE Design Wind Speed Maps, FEMA HAZUS model
Wind	Hurricane and Severe Storm Winds	Moderate	Covered by HIRA hurricane wind analysis	FEMA HAZUS model
Winter Storms	Including winter storms, ice storms, and excessive cold	Moderate	Covered by HIRA winter storm analysis	NOAA National Weather Service Records, VirginiaView PRISM
Drought	Including excessive heat	Limited	Covered by HIRA drought analysis	US Census Bureau 1990 Water Source Data
Tornado	Tornados	Limited	Description and Regional Maps	NOAA National Weather Service Records
Wildfire	Wildfire	Limited	Covered by HIRA wildfire analysis	Virginia Department of Forestry
Earthquake	Earthquake	None	None, due to infrequency of occurrence	None
Landslide/Shoreline Erosion	Landslide/Shoreline Erosion	None	None, due to infrequency of occurrence	None

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As shown in Table V-1, earthquakes and landslide have been designated with a hazard level of *None*, and will not be included in this analysis. An earthquake is the shaking of the ground’s surface caused by movements of the plates beneath it. Though there have been historical occurrences of earthquakes that have affected the Crater Region, the probability and impact is low enough for the overall risk to be considered “none” at a planning level. This reasoning is supported by a loss estimate created using FEMA’s Hazards US (HAZUS-MH) that shows annualized losses for the region as about \$1 million. This number is compared to annualized losses from wind events at \$11.7 million.

The term “landslide” describes many types of downhill earth movements ranging from rapidly moving catastrophic rock avalanches and debris flows in mountainous regions to more slowly moving earth slides. Although the United States Geological Survey (USGS) landslide incidence and susceptibility map does identify a portion of the study area as having a moderate risk to landslides, the historic incidences and impacts of landslides in the region were considered by the planning team to be minor and not in need of consideration for this analysis. It should be noted that Prince George County has had incidences of landslides in the eastern portion of the county, from road cuts and stormwater management issues.

Flooding (Significant Ranking)

Hazard History

Table V-3 includes descriptions of major flood events in the Crater PDC. Events have been broken down by the date of occurrence and when available, by individual community descriptions. When no community specific description is available, the general description applies to the entire planning area.

Table V-3. Flood Hazard History	
Date	Damages
August 19, 1969	<p>On August 19, a severe storm system entered Virginia dropping large amounts of rainfall and producing landslides, destroyed bridges and roads, crushed homes and numerous dead. This event produced nominal damages in the Crater PDC region.</p> <p><u>Chesterfield County:</u> Interstate 95 was closed due to heavy flooding.</p> <p><u>Hopewell City:</u> The James River crested at 4 feet and produced nominal flooding along Water Street.</p> <p><i>(Source: The Progress-Index)</i></p>
November 9, 1985	<p>Due to significant rainfall in western Virginia producing landslides and flooding, both the James and Appomattox Rivers swelled from the runoff. The James River was 24 feet above flood level and the Appomattox River had crested at 10 feet. No damages in the Tri-Cities</p>

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Table V-3. Flood Hazard History

Date	Damages
	<p>area were reported for this event.</p> <p><u>Chesterfield County:</u> Interstate 95 was closed due to flooding. The Old Gun Road section had seriously damaged homes, many which were under water. 13 homes and 20 families were evacuated. Old Gun Road, Turner Road, Providence Road, Buford Road, Old Bon Air Road and Groundhog Road were flooded. Schools were closed.</p> <p><u>Greensville County:</u> Meherrin River and smaller tributaries overflowed their banks cresting at 27 feet.</p> <p><u>Surry County:</u> Residential structures and fields were flooded, 15 private docks and piers along the James River were lost. Damages estimated at \$228,000.</p> <p><u>Sussex County:</u> Flooding closed Halifax Road and Cedar Road in Stony Creek and Rt. 40; as well as destroying several fields and caused numerous potholes.</p> <p><i>(Source: The Progress-Index, Independent-Messenger, Sussex-Surry Dispatch and The Gazette)</i></p>
May 25, 2003	<p>On May 25, a severe thunderstorm system produced heavy rains (3 to 5 inches) and high waters.</p> <p><u>Chesterfield County:</u> Kingland Creek overflowed flooding homes and sections of Chester Road, Spring Run, Jessup Road and other county routes. This event severely affected a motel and trailer park on Jefferson Davis Highway, damaging nine units and a trailer. The Appomattox River crested at 14.5 feet at Matoaca. Homes along the Appomattox River in Matoaca also had water damage.</p> <p><u>Colonial Heights City:</u> Newcastle Drive and adjacent homes were flooded. Residents of 36 apartments and 12 homes were evacuated. Three apartment buildings had flood damage.</p> <p><u>Dinwiddie County:</u> Segments of nine roads were washed away and several other highways were closed from high waters. White Oak Road and Court House Road experienced the most damage. Schools were closed. There were no residential or business damages.</p> <p><u>Emporia City:</u> Meherrin River crested at five feet above flood level and flooded homes on Cleveland Avenue. Seven residences were affected.</p> <p><u>Greensville County:</u> Meherrin River crested at five feet above flood level and flooded homes on Center Street</p> <p><u>Petersburg City:</u> Brickhouse Run Creek overflowed and flooded the Carriage House apartments in Old Towne, displacing 300 residents. Much of Old Street and adjacent businesses in addition to a nearby alley were flooded.</p> <p><i>(Source: The Progress-Index, The Independent Messenger and The Tidewater News)</i></p>
September 18, 2003	<p>On the afternoon of Thursday, September 18, a severe storm system entered Virginia, peaked around 7 p.m. ending Friday morning September 19t (Hurricane Isabel). This storm produced moderate rainfall (4.4 inches in Richmond) and winds (sustained winds at 40 mph with gusts up to 70 mph). Throughout the region this event downed trees and power lines, blocking roads, flooding and damaging homes, smashing cars and leaving almost everyone without power. Strong winds knocked down power lines and removed roofs. Sewer systems backed up and telephone service was disrupted. Massive numbers of trees were uprooted;</p>

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Table V-3. Flood Hazard History

Date	Damages
	<p>one property had 30 pine trees uprooted. Schools were closed and power was out for several weeks in many locations. After the event there were long lines for gasoline, food and generators</p> <p><u>Chesterfield County:</u> Six homes were destroyed, with 443 homes requiring repairs. 40 homes had damage that made them uninhabitable. There was three dead, 40 injuries and 20 county roads were closed. Water systems were infiltrated. Damages were estimated at \$6 million for the area.</p> <p><u>Colonial Heights City:</u> Newcastle Drive and homes along it were flooded. Damage estimates at \$2.5 million.</p> <p><u>Dinwiddie County:</u> Extensive damage to timber and agriculture. In the area, 142 homes and 31 manufactured homes were damaged. 78 roads were closed including I-85 Southbound and Rt. 1. 170 residents sought shelter. Damages were estimated at \$7 million.</p> <p><u>Emporia City:</u> Significant damage to the area with landfills had record amounts of debris, traffic lights and telephones service were out.</p> <p><u>Greensville County:</u> In the county, 7 houses were totally destroyed, 12 homes had major damage and 40 received minor damage, 4 mobile homes were destroyed, 3 had major damage and 10 had minor damage. Two businesses were destroyed, one had major damage and seven had minor damage. Jarratt and Laurel Street. Estimated damages at \$3.4 million for the County with agricultural losses of \$2.23 million,</p> <p><u>Petersburg City:</u> Rain and water flooded Old Towne from the Appomattox River. Bank Street and other low-lying roads in Old Towne were flooded. Estimated damages at \$18 million in the city.</p> <p><u>Prince George County:</u> Flash flooding caused approximately 300 homes to be damaged and 8 homes were condemned. At Jordan Point Marina, 100 boats were displaced, buildings were destroyed and docks sunk. Route 460 was closed and there was no power for weeks. Estimated damages at \$14 million.</p> <p><u>Sussex County:</u> During the storm event 1,000 residents sought shelter. Route 460 was closed. Waverly lost power for several weeks.</p> <p><i>(Source: The Progress-Index, The Independent Messenger and The Tidewater News)</i></p>
August 30, 2004	<p>On August 30, a severe storm system (Tropical Storm Gaston) entered Virginia producing torrential rains (12 inches in Richmond), which were not expected. This event produced widespread flooding, high waters, power outages, road closures and 2 fatalities in the area. 400 residents were without power in the Tri-Cities area. Twenty-three roads were closed with water damage in Prince George, Chesterfield and Dinwiddie Counties. I-95 was closed. Heavy flooding sent cars floating down streets and trapping people in buildings. Five people across Virginia were killed.</p> <p><u>Chesterfield County:</u> Falling Creek toppled two bridges.</p> <p><u>Colonial Heights City:</u> A parking lot and park were flooded.</p> <p><u>Dinwiddie County:</u> A man was swept away and killed from a stranded car on a flooded section of Vaughan Road.</p>

Table V-3. Flood Hazard History

Date	Damages
	<p><u>Hopewell City</u>: Possible tornado that caused minor structural damage.</p> <p><u>Petersburg City</u>: Scattered road closures.</p> <p><i>(Source: The Progress-Index)</i></p>

Hazard Profile

A flood occurs when an area that is normally dry becomes inundated with water. Floods may result from the overflow of surface waters, overflow of inland and tidal waters, or mudflows. Flooding can occur at any time of the year, with peak hazards in the late winter and early spring. Snowmelt and ice jam breakaway contribute to winter flooding, and seasonal rain patterns contribute to spring flooding. Torrential rains from hurricanes and tropical systems are more likely to occur in late summer. Development of flood-prone areas tends to increase the frequency and degree of flooding.

Floods typically are characterized by frequency, for example, the “1%-annual chance flood,” commonly referred to as the “100-year” flood. While more frequent floods do occur, in addition to larger events that have lower probabilities of occurrence, for most regulatory and hazard identification purposes the 1%-percent annual chance flood is used.

Floods pick up chemicals, sewage and toxins from roads, factories and farms, therefore any property affected by the flood may be contaminated with hazardous materials. Debris from vegetation and man-made structures may also be hazardous following the occurrence of a flood. In addition, floods may threaten water supplies and water quality, as well as initiate power outages.

Secondary Effects

Flooding can pose some significant secondary impacts to the area where the event has taken place. Some of the impacts to consider include infrastructure and utility failure, impacts to roadways, water service and wastewater treatment. These impacts can affect the entire planning district, making the area vulnerable to limited emergency services.

Flood Maps

FEMA Flood Insurance Rate Maps (FIRMs) for the planning area were not available in digital format. Paper copies of the FIRMs were available for all of the communities in the PDC. To conduct the flood analysis, the paper FIRMs were scanned, georectified and digitized. These

maps were utilized to determine the risk and vulnerability of flooding to the planning district. Figure V-2 shows the extent of the mapped floodplain in the region.

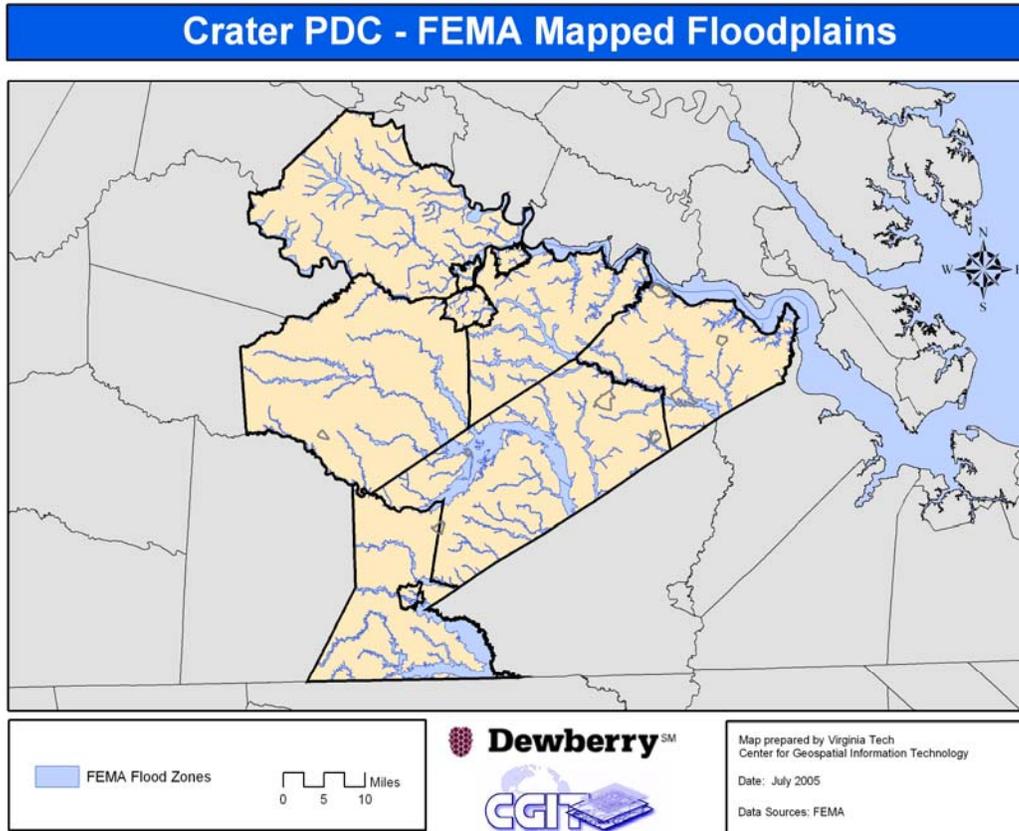


Figure V-2. Crater PDC Floodplains.

Vulnerability Analysis

Specific areas that are susceptible to flooding were determined during the CPDC kick-off meeting. These areas were taken into account when completing the hazard identification and risk assessment.

Many factors contribute to the relative vulnerabilities of areas within the floodplain. Some of these factors include development or the presence of people and property in the floodplain, flood depth, flood velocity, elevation, construction type and flood duration.

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Structures at Risk

The impact of flooding on structures was estimated based on best available data for floodplains and structures for each community. Table V-4 shows the sources for the structure values used for the flood loss analysis.

Table V-4. Crater PDC Structural and Property Data Availability	
Community	Structural and Property Data
Chesterfield County	GIS Tax Parcels with values and building footprints
Colonial Heights City	Average Building Value per Census Block from HAZUS
Dinwiddie County	GIS Tax Parcels with values
*McKenney, Town of	Average Building Value per Census Block from HAZUS
Emporia City	Average Building Value per Census Block from HAZUS
Greensville County	GIS Tax Parcels without values, Average Building Value from HAZUS
*Jarratt, Town of	Average Building Value per Census Block from HAZUS
Hopewell City	GIS Tax Parcels without values and building footprints
Petersburg City	Average Building Value per Census Block from HAZUS
Prince George County	GIS Tax Parcels with values
Surry County	GIS Tax Parcels with values
*Claremont, Town of	Average Building Value per Census Block from HAZUS
*Dendron, Town of	Average Building Value per Census Block from HAZUS
*Surry, Town of	Average Building Value per Census Block from HAZUS
Sussex County	Average Building Value per Census Block from HAZUS
*Stony Creek, Town of	Average Building Value per Census Block from HAZUS
*Wakefield, Town of	Average Building Value per Census Block from HAZUS
*Waverly, Town of	Average Building Value per Census Block from HAZUS
*Denotes that town values also are included in totals for the respective County	

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In general, if tax parcel level information on property value was available, this information was used in the flood loss analysis. If such information was not available, average structural value per census block from HAZUS-MH was used as a substitute.

The flood vulnerability was determined for each locality based on the intersection of floodplain mapping and structure value mapping. The exact methodology varied by community based on the data availability. In communities like Chesterfield and Hopewell where building footprints for structures were known, the intersection analysis showed which structures were partially or entirely within the floodplain. If a community only had parcel mapping, the mapping intersection determined which parcels were partially or entirely in the floodplain. When only census block mapping was available, the mapping intersection showed which census blocks were partially or entirely within the floodplain. Based on the mapping intersection and the number of households and housing units in the census block, an estimate was made of the total structures flooded in each the census block.

Table V-5 lists the total replacement value of structures vulnerable to flooding (both partially and entirely within the floodplain) in each community. The replacement values for structures were calculated as 10% greater than the assessed improvement values from community parcel data or from the HAZUS-MH census block average values. For communities without parcel level property values, these values are underestimates, especially for any non-residential structures in the floodplain.

Table V-5. Structure Value Vulnerability	
Community	Total Structure Value Vulnerability
Chesterfield County	\$591,339,760
Colonial Heights City	\$64,958,630
Dinwiddie County	\$278,148,090
<i>*McKenney, Town of</i>	<i>No Published FIRMs Available</i>
Emporia City	\$16,566,880
Greensville County	\$10,983,500
<i>*Jarratt, Town of</i>	<i>\$137,720</i>
Hopewell City	\$25,673,340
Petersburg City	\$28,999,190

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Prince George County	\$302,775,770
Surry County	\$40,122,060
<i>*Claremont, Town of</i>	<i>\$4,942,190</i>
<i>*Dendron, Town of</i>	<i>\$50,160</i>
<i>*Surry, Town of</i>	<i>No Published FIRMs Available</i>
Sussex County	\$32,214,490
<i>*Stony Creek, Town of</i>	<i>\$5,439,600</i>
<i>*Wakefield, Town of</i>	<i>\$987,690</i>
<i>*Waverly, Town of</i>	<i>\$85,140</i>
Total	\$1,391,781,710
* Denotes town values that also are included in totals for the respective County	

Critical Facilities

Table V-6 denotes the critical facilities that are located within or in close proximity to the FEMA designated floodplain. If more than one building is at risk, the number of buildings for each facility is noted in parentheses after the facility name. The table shows that a large number of manufacturing critical facilities are located in the floodplain.

Table V-6. CPDC Critical Facilities within the Floodplain (# of Buildings)		
Facility Name	Type	Community
Alstom Power Inc. (2)	Manufacturing	Chesterfield
Brasfield Dam - Appomattox RWA Hydro Project (2)	Hydroelectric	Chesterfield
Defense Supply Center – Richmond (11)	Military	Chesterfield
Enon Fire Station (4)	Fire	Chesterfield
Honeywell - Nylon Plant (5)	Manufacturing	Chesterfield
Philip Morris, Inc. - Park 500 (8)	Manufacturing	Chesterfield
South Central Wastewater Authority (11)	Public Works	Chesterfield

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Table V-6. CPDC Critical Facilities within the Floodplain (# of Buildings)

Facility Name	Type	Community
VA Dominion Power - Dutch Gap Plant (3)	Coal	Chesterfield
Lakeview Elementary School (2)	Elementary School	Colonial Heights
Main Administration Building	Administration	Emporia
Synergics - Emporia	Hydroelectric	Emporia
Hercules, Inc. - Aqualon Division	Manufacturing	Hopewell
Honeywell - Polymer Plant (12)	Manufacturing	Hopewell
Hopewell Healthcare Center	Nursing Home	Hopewell
Smurfit-Stone Container Corporation (15)	Manufacturing	Hopewell
Regional Enterprises*	Manufacturing	Hopewell
Tidewater Material	Manufacturing	Hopewell
Virginia American Water Systems*	Public Works	Hopewell
Animal Shelter (2)	Administration	Petersburg
Brasfield Dam – Petersburg (3)	Hydroelectric	Petersburg
Brenco, Inc. (7)	Manufacturing	Petersburg
Multi-Modal Transportation Facility*	Transportation	Petersburg
McKeever Assisted Living Facility*	Nursing home	Petersburg
Vulcan Materials (3)	Manufacturing	Prince George
VA Dominion Power - Surry Nuclear Power Plant	Nuclear	Surry
Stony Creek Volunteer Fire	Fire	Sussex
Stony Creek Volunteer Rescue Squad	Rescue	Sussex
* Identified by City as flood-prone		

Estimating Losses

Using the property values from Table V-5, an estimate of the potential flood loss for each community was developed. Losses for structure and contents damage were calculated using a method based on FEMA Benefit-Cost Analysis. Contents values were estimated as 30% of the structural replacement value. Structural damage percentages were based on the portion of the footprint, parcel, or census block that was in the floodplain. Table V-7 shows how the basis for these damage percentages was assigned depending on the mapping detail.

Table V-7. Flood Damage Classes					
Flood Damage Class	Mapped Footprints in Floodplain	Mapped Parcels in Floodplain	Mapped Census Blocks in Floodplain	100-yr % Structural Damage	Representative Flood Depth Range
1	N/A	< 33%	< 33%	11%	0 to +1 ft
2	Partial	33% - 66%	33% - 66%	20%	+1 to + 3 ft
3	Entire	> 66 %	> 66 %	28%	> 3 ft

Contents damages were estimated as 50% greater than the structural damage percentage. These values were used to predict the damage from a 100-year flood event for the structure. To calculate an annualized flood damage estimate, it was assumed for each structure that damages began with a 25-year event. A percentage of the 100-year flood damage value was used for events less frequent than the 100-year event.

For example, a parcel is determined to have a structure worth \$100,000 based on the community parcel database. The replacement value of the structure would be \$110,000 and the contents value \$33,000. Based on the mapping analysis, it is determined that 45% of the parcel is in the floodplain. Using the classification scheme described above, the structure would be in Flood Damage Class 2, with 20% 100-year structure damage and the 30% contents damage. The damage from a 100-year flood would equal \$22,000 structural plus \$9,900 contents or a total of \$31,900. Figure V-3 shows the probability assumptions used to estimate the annualized loss for this example parcel.

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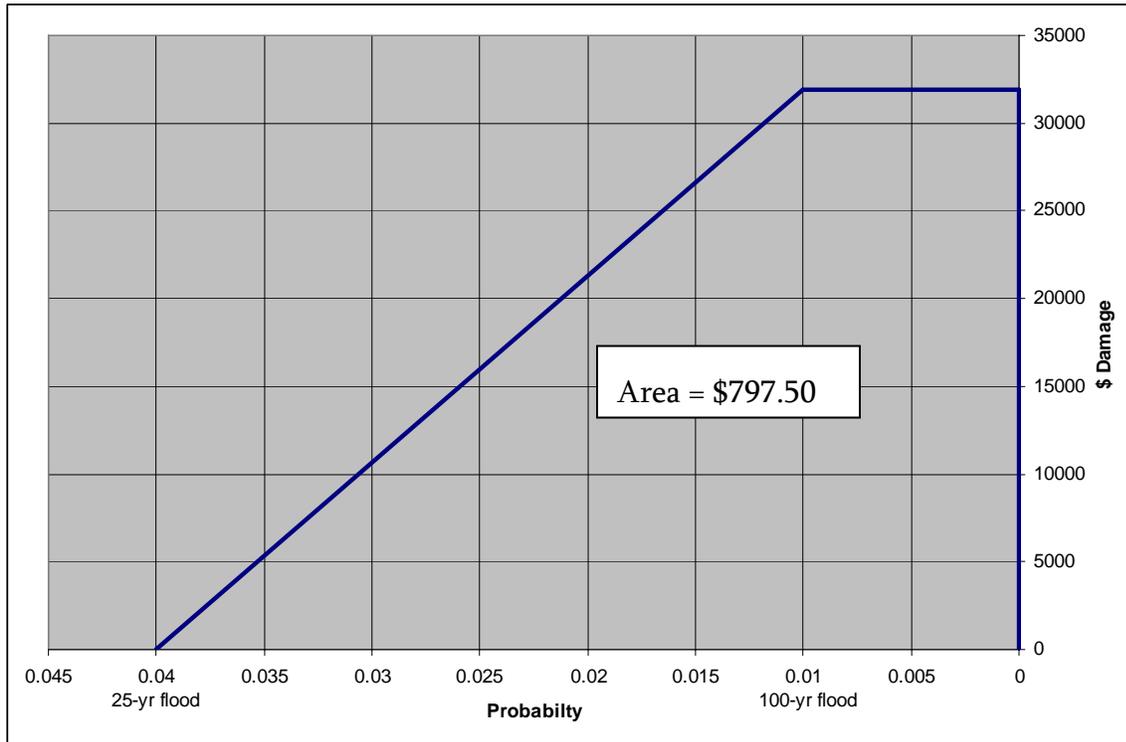


Figure V-3. Example of Flood Loss Estimate Technique

Table V-8 provides the total annualized flood loss estimates for each jurisdiction. As seen in the table, Chesterfield County and Prince George County make up 66% of the total estimated damage amounts.

Table V-8. Annualized Structure and Contents Loss Estimates	
Community	Total Loss Estimate
Chesterfield County	\$2,413,476
Colonial Heights City	\$378,209
Dinwiddie County	\$368,084
<i>*McKenney, Town of</i>	<i>No Published FIRMs Available</i>
Emporia City	\$111,049
Greensville County	\$101,546
<i>*Jarratt, Town of</i>	<i>\$442</i>
Hopewell City	\$220,589

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Table V-8. Annualized Structure and Contents Loss Estimates	
Community	Total Loss Estimate
Petersburg City	\$126,101
Prince George County	\$1,013,300
Surry County	\$187,185
<i>*Claremont, Town of</i>	<i>\$32,898</i>
<i>*Dendron, Town of</i>	<i>\$161</i>
<i>*Surry, Town of</i>	<i>No Published FIRMs Available</i>
Sussex County	\$226,034
<i>*Stony Creek, Town of</i>	<i>\$53,719</i>
<i>*Wakefield, Town of</i>	<i>\$3,164</i>
<i>*Waverly, Town of</i>	<i>\$273</i>
Total	\$5,145,573
* Denotes town values that also are included in totals for the respective County	

One limitation of this analysis method is that it underestimates the loss to higher-valued structures from community tax parcel databases, such as businesses and critical facilities. When this method was used for these multi-million dollar structures, the loss estimates were unrealistic, since many of these structures in the vicinity of the floodplain may be elevated or have floodproofing measures in place which would reduce damages. Therefore, the maximum amount of damage for individual structures was capped at \$400,000 from a 100-year storm event (which translates into \$10,000 as an annualized loss). The values in Table V-8 reflect this assumption.

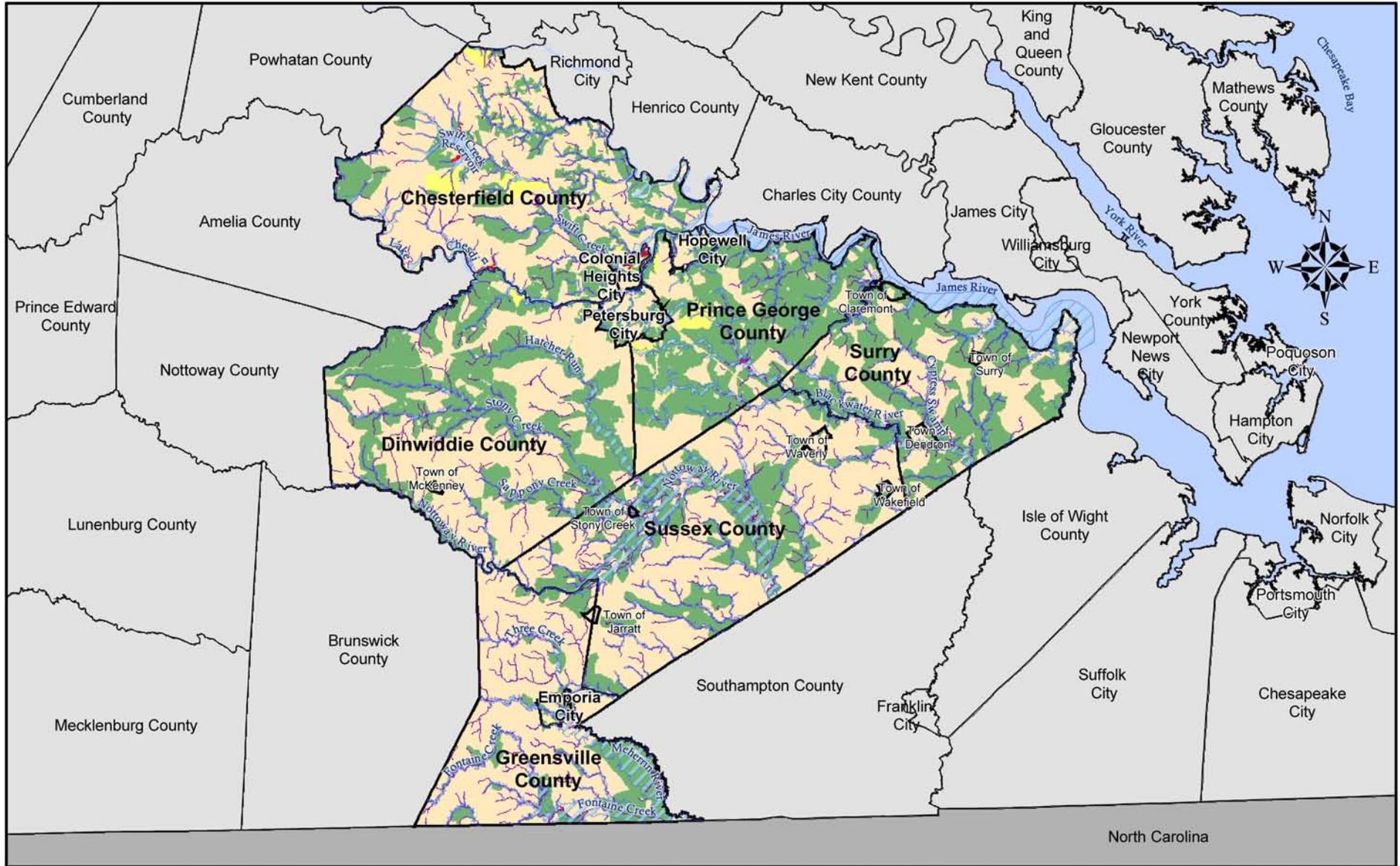
Another limitation of the analysis is that when parcels are used, it may overestimate the loss. It is possible that the actual building location is not within the floodplain though a portion of the parcel is within the floodplain. For instance, Prince George County officials indicated that the annualized flood loss estimate was too high. They felt the actual number of structures at risk was lower than the analysis showed. This was demonstrated in part by losses experienced due to Hurricane Floyd. The county's losses from this 500-year event were only about \$1 million.

Figure V-4 illustrates the distribution of annualized flood damage in the region, by census block. A large majority of the census blocks fall within the “less than \$20,000 annually” flood damage category.

While most of the flood-prone census blocks have less than \$20,000 annual flood losses, there are some areas in Chesterfield and Prince George Counties that have over \$40,000 in one census block.

Jurisdiction-specific annualized flood damage maps have been created for the Crater Planning District Commission (located in Appendix C). Figures C-1 through C-15 show the census blocks where these losses occur, in addition to local comments regarding areas of flooding specific to the community. Tables C-1 through C-9 summarize the problem spot locations that are denoted on Figures C-1 through C-10. It should be noted that no FEMA floodplain maps exist for the towns of McKenney and Surry and therefore flood damage maps for these towns are not included. Each jurisdiction is unique in its exposure to flooding.

Crater PDC - Annualized Flood Damages



Flood Loss by Census Block

- No Loss
- < \$20,000
- \$20,000 - \$40,000
- > \$40,000
- FEMA Flood Zones
- Major Water Bodies
- Streams & Rivers

Dewberry SM
CGIT
 Center for Geospatial Information Technology

Map prepared by Virginia Tech
 Center for Geospatial Information Technology

Date: September 2005

0 5 10 Miles

Data Sources: FEMA, VT CGIT, 2000 Census, Crater PDC

The following paragraphs summarize the major trends illustrated by the jurisdiction-specific maps.

Areas of significant (greater than \$40,000) annualized flood damage in Chesterfield County are located on the Appomattox River in the southern portion of the county, as well as to the north and south of the Swift Creek Reservoir. Annualized damages also are located along most major rivers in the county.

The northern tip of the City of Colonial Heights has a large number of census blocks with greater than \$40,000 annualized flood damage. Overall, the northern and central portions of the city contain the majority of the potential flood damages from Swift Creek and the Appomattox River.

Most of the census blocks that show potential damage in Dinwiddie County fall into the less than \$20,000 potential loss category. Damages are centered on the major stream branches in the county, specifically the Appomattox River, Rowanty Creek, Stony Creek, White Oak Creek, Sappony Creek and the Nottoway River.

The Meherrin River essentially divides the City of Emporia. The southern section of the city falls into the moderate to high annualized flood damage categories. Census blocks located on Falling Run are estimated to have annualized flood damages of between \$20,000 and \$40,000.

Most of the annualized flood damages in Greensville County are limited to areas surrounding the Nottoway River and the Meherrin River. Annualized flood damages are not as significant in Greensville County when compared to other localities in the Crater PDC.

The James River and Baileys Creek are responsible for most of the annualized flood damages in the City of Hopewell. Areas along the northern and eastern borders have the largest percentage of the city's annualized flood losses.

Annualized flood damages in the City of Petersburg are scattered throughout the city, with many streams weaving in and out of the city. Significant water bodies located in Petersburg City are the Appomattox River, Rohoic Creek, Lieutenant Run, and Blackwater Swamp.

Prince George County is bounded to the north by the James River, and has many creeks flowing through the entire county including Blackwater Creek, Powells Creek, Cattail Creek and Warwick Creek. These water bodies are responsible for the extensive annualized flood damages in the county. Most of the census blocks in Prince George County fall within the less than \$20,000 annualized flood damages, with a couple pockets of flood damage between \$20,000 and \$40,000 annually. Bull Hill Run, James River, Warwick Creek and Cattail Creek are large contributors to the extensive annualized flood damage.

More than half of the census blocks in Surry County fall into the less than \$20,000 annualized flood damage category. The major rivers and other water bodies that contribute to these losses are the James River, Blackwater River, Terrapin Swamp, Cypress Swamp and Mill Swamp.

Central Sussex County receives the largest percentage of annualized flood damages, which occur from flooding by the Nottoway River and Rowanty Creek. The Nottoway River and Three Creek form the southwest boundary and the Blackwater River forms the northeast boundary for the county.

The Town of Claremont is located on a bend in the James River. The James River serves as the boundary for the town on three sides. The census blocks located near the James River have an annualized flood loss of less than \$20,000. Hurricane Isabel destroyed many streets in the town; the streets labeled in red were destroyed during the event.

Annualized flood damage is concentrated in the northeastern portion of the Town of Dendron. Major streams impacting Dendron include the Blackwater River to the south and Cypress Swamp to the northeast.

The Town of Jarratt shares its boundary with Greensville County and Sussex County. Annualized flood damages are limited to the Sussex County side of the town, along Poplar Swamp.

The FEMA-designated floodplain covers nearly the entire Town of Stony Creek. Stony Creek flows through the center of the town, perpendicular to Main Street. Roughly half of the census blocks in the town fall within the damage category of less than \$20,000 of annual flood loss.

The Town of Wakefield receives low to moderate annual flood damages from Wildcat Swamp, located on the southwest side of town.

The Town of Waverly is almost entirely free of FEMA-designated floodplains, with a small floodplain area adjacent to Spring Branch along the northwest side of the town. Annualized flood damages are limited to the census block between North Street and Carpenter Drive.

FEMA-Designated Repetitive Loss Properties

There are 23 repetitive loss properties in the Crater region, with an average payment of \$16,172 per claim (Table 10). The majority of the repetitive loss structures for the Crater region are single family homes.

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Table V-9. Crater PDC Repetitive Loss Structures (as of 12/31/2003)

Community Name	Insured	Occupancy	Zone	Building Value	Tot Building Payment	Tot Contents Payment	Losses	Total Paid	Ave. Paid
Chesterfield	NO	SINGLE FMLY	EMG	\$21,500	\$4,288	\$5,497	2	\$9,785	\$4,892
Chesterfield	YES	SINGLE FMLY	A09	\$97,747	\$76,070	\$8,682	4	\$84,752	\$21,188
Chesterfield	YES	SINGLE FMLY	A09	\$93,950	\$61,474	\$0	3	\$61,474	\$20,491
Chesterfield	YES	SINGLE FMLY	A	\$148,200	\$83,389	\$27,281	3	\$110,670	\$36,890
Chesterfield	NO	NON RESIDENT	EMG	\$84,700	\$13,667	\$7,355	3	\$21,023	\$7,008
Chesterfield	YES	SINGLE FMLY	A09	\$93,655	\$16,701	\$8,993	3	\$25,693	\$8,564
Chesterfield	YES	SINGLE FMLY	B	\$84,700	\$6,313	\$0	2	\$6,313	\$3,157
Chesterfield	YES	SINGLE FMLY	AE	\$205,000	\$68,191	\$980	3	\$69,171	\$23,057
Chesterfield	YES	SINGLE FMLY	A	\$121,500	\$34,884	\$2,967	2	\$37,852	\$18,926
Chesterfield	YES	SINGLE FMLY	A14	\$185,000	\$14,970	\$3,773	3	\$18,744	\$6,248
Chesterfield	NO	SINGLE FMLY	A	\$25,760	\$8,177	\$930	2	\$9,107	\$4,553
Chesterfield	NO	OTHER RESID	A	\$186,800	\$9,026	\$0	2	\$9,026	\$4,513
Colonial Heights	NO	NON RESIDENT	EMG	\$24,200	\$8,465	\$0	2	\$8,465	\$4,233
Colonial Heights	NO	SINGLE FMLY	B	\$99,840	\$21,305	\$0	3	\$21,305	\$7,102

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Table V-9. Crater PDC Repetitive Loss Structures (as of 12/31/2003)

Community Name	Insured	Occupancy	Zone	Building Value	Tot Building Payment	Tot Contents Payment	Losses	Total Paid	Ave. Paid
Colonial Heights	YES	OTHER RESID	AE	\$759,108	\$43,549	\$0	2	\$43,549	\$21,775
Colonial Heights	YES	ASSMD CONDO	A03	ASSUMED CONDO	\$326,297	\$0	4	\$326,297	\$81,574
Colonial Heights	YES	SINGLE FMLY	A03	\$99,845	\$49,552	\$0	2	\$49,552	\$24,776
Hopewell	YES	SINGLE FMLY	X	\$123,000	\$16,726	\$21,933	2	\$38,659	\$19,329
Petersburg	YES	ASSMD CONDO	A	ASSUMED CONDO	\$1,625	\$112,183	4	\$113,809	\$28,452
Prince George	YES	SINGLE FMLY	A	\$141,370	\$31,039	\$2,035	2	\$33,074	\$16,537
Surry	YES	SINGLE FMLY	AE	\$54,360	\$16,857	\$4,521	5	\$21,378	\$4,276
Sussex	YES	SINGLE FMLY	X	\$209,739	\$2,726	\$0	2	\$2,726	\$1,363
Sussex	YES	SINGLE FMLY	AE	\$61,148	\$6,118	\$0	2	\$6,118	\$3,059

Hurricane and Extreme Wind (Moderate Ranking)

Hazard History

Table V-10 includes descriptions of major hurricane events in the Crater region. Events have been broken down by the date of occurrence and when available, by individual community descriptions. When no community specific description is available, the general description applies to the entire planning area.

Table V-10. Hurricane Hazard History

Date	Damages
August 23, 1933	On the evening of August 22, a severe storm entered Virginia producing strong winds

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Table V-10. Hurricane Hazard History

Date	Damages
	<p>with gusts up to 80 mph and rain which continued into August 23. This storm event caused no injuries but significant damage due to high winds and heavy rain. Telephone and electric service were disrupted throughout all areas. Damage was mostly to trees, roofs and awnings. Falling debris was a major concern. Many trees were uprooted causing damage to residences, blocking roads, and knocking down fences and utility lines. Trees also downed high tension electric lines in Petersburg causing manufacturing plants to be idle. Many houses suffered flood damage. Crops (e.g., corn, tobacco) and fruit trees were destroyed due to the high winds and rain. Other areas in the Tidewater region had significantly more damage.</p> <p><u>Hopewell City:</u> The Richmond Petersburg Highway was covered with several feet of water and several boats were washed away or severely damaged.</p> <p><u>Surry County:</u> Heavy damage to towns and beaches along the James River were reported. The pier at Jamestown Surry Ferry was severely damaged. Almost all of the cottages and stores at Burwell's Bay were completely destroyed. The Claremont Ferry dock was swept away. The Crouch's Creek bridge was destroyed. Many houses had flood damage and several boats were damaged or washed up on land.</p> <p><u>Sussex County:</u> High winds blew off several roofs. One-fourth of the trees were uprooted in Stony Creek.</p> <p><i>(Source: The Progress-Index and the Sussex-Surry Dispatch)</i></p>
August 15, 1940	<p>Several days of rainfall produced record rising waters in the James, Appomattox and Nottaway Rivers. The James River crested at 25 feet and the Appomattox River rose to 19.6 feet above typical levels, higher than the Johnstown Flood of 1889.</p> <p>This flood blocked main highways in all directions of Petersburg. Many arterials and secondary roads were closed. Highway closures included, Routes 1, 15, 26, 31, 32, 35, 39, 40, 42, 45, 49, 56, 58, 117, 158, 195, 196, 301, 304, 312, 460, 501 and Campbell's Bridge. The bridge over Stony Creek was washed out. Riverfront properties were flooded. Union Station was flooded and several platforms washed out. About 4,000 feet of railroad track was under water. Crops were severely damaged. Tobacco and peanut crops suffered most in Southside counties with greatest losses for Dinwiddie, Surry, Sussex and Greensville Counties. The Appomattox and Buffalo Rivers isolated Farmville. Sewer lines along South Street broke leaving large craters. The canal under Fleet Street overflowed flooding Fleet Street and neighboring homes.</p> <p>Damages estimated at \$100,000.</p> <p><u>Emporia City:</u> Meherrin River rose causing flooding Main Street. The town exhausted its drinking supply.</p> <p><u>Hopewell City:</u> Hopewell had 10.05 inches of rain.</p> <p><u>Petersburg City:</u> River Street was flooded from a 30-foot gap in the Appomattox River's south bank. Electric service was disrupted, many buildings flooded and docks were covered with water.</p> <p><u>Surry County:</u> This flood event caused the largest damage to crops.</p> <p><u>Sussex County:</u> This flood event caused the largest damage to crops (2,000 acres</p>

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Table V-10. Hurricane Hazard History

Date	Damages
	<p>destroyed) flooding fields and destroying several mills. <i>(Source: The Progress-Index and the Sussex-Surry Dispatch)</i></p>
October 15, 1954	<p>On the morning of October 15, a severe storm system entered Virginia from North Carolina producing light rain but strong gale winds of more than 70 mph from the east that intensified mid-afternoon. This was the first recorded hurricane to hit the area. Peanut crops and farm buildings throughout the region were damaged. About 1000 customers were without phone service during this event. Livestock were destroyed.</p> <p>Damages were estimated at \$500,000.</p> <p>Colonial Heights City: Damages were similar to Petersburg City.</p> <p>Emporia City: One person died and another was injured. Trees knocked out electric and telephone service for 48 hours.</p> <p>Greenville County: The Greenville County Courthouse was badly damaged.</p> <p>Hopewell City: Damages were similar to Petersburg City with boats were swamped. Damages were estimated at \$18,000.</p> <p>Petersburg City: In Petersburg, there were no deaths but several injuries for this event. Damages included torn-off roofs, smashed windows, wrecked signs, twisted antennas, uprooted trees, broken limbs, and damaged utility lines and autos hit by falling trees and limbs. Trees falling on high-tension electric lines disrupted power service. Telephone service was disrupted. Schools and businesses closed. There was considerable damage to parks and Blandford Cemetery in Petersburg.</p> <p>Surry County: Wharves at Claremont were almost completely demolished. <i>(Source: The Progress-Index and the Sussex-Surry Dispatch)</i></p>
October 1, 1971	<p>On October 1, a former severe storm system entered Virginia from North Carolina producing moderate winds gusting up to 30 mph. No damages in the Crater PDC area were reported for this event.</p> <p>Petersburg City: The storm produced 4.78 inches of rain. <i>(Source: The Progress-Index)</i></p>
June 23, 1972	<p>On June 23, a severe storm system entered Virginia that was primarily a rainstorm with some locally strong winds. In Richmond, the James River crested at 36 feet above flood stage while the Appomattox River crested at 16 feet. The Crater PDC area received little rain and wind but experienced river flooding from upstream rains. Farmville was severely flooded with its highest flooding on record at 30 feet.</p> <p>Chesterfield County: The area had nominal damage except for flooded homes along Falling Creek and the Matoaca Bridge, disruption and backup of sewage in the Matoaca Bridge area and the shut down of a local power station from flooding. Skinquarter Road and River Road were closed. Route 360 had one lane open.</p> <p>Hopewell City: The Appomattox River flowed over docks and was 150 feet inland.</p> <p>Petersburg City: The Richmond-Petersburg Turnpike and the Huguenot Bridge was</p>

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Table V-10. Hurricane Hazard History

Date	Damages
	<p>closed due to flooding. The area had nominal damage (its divergent channel held), except for a few low-lying businesses being flooded.</p> <p><i>(Source: The Progress-Index and The News-Journal)</i></p>
October 10, 1972	<p>Heavy rains on October 5 and 6, concentrating in the mountainous region of northwest Virginia and in the James and Appomattox River basins, swelled these and other rivers (notably the Nottoway and Meherrin Rivers) out of their banks. The Tri-Cities area received from 4 to 6 inches of rain. The James River crested at 28 feet in Richmond and the Appomattox River crested at 18 feet in Petersburg. Homes in Matoaca along the Appomattox were flooded and evacuated. Area utility and public works companies were hard hit. A natural gas line along U.S. Hwy 1 ruptured cutting off gas service; the Manoaca sewer station ceased operation and a. Power and telephone service was disrupted for the region.</p> <p>Damages were estimated to be greater than \$1 million for the Tri-City Area.</p> <p><u>Chesterfield County:</u> In Chesterfield County, County Cambell's Bridge, Rt. 36, Rt. 360, 8 secondary roads and Archer Avenue in Colonial Heights were flooded.</p> <p><u>Colonial Heights City:</u> In Chesterfield County, County Cambell's Bridge, Rt. 36, Rt. 360, 8 secondary roads and Archer Avenue in Colonial Heights were flooded.</p> <p><u>Dinwiddie County:</u> In Dinwiddie County, Interstate 85, U.S. Hwy 1, 24 secondary roads were flooded. Schools were closed.</p> <p><u>Emporia City:</u> The river swelled and rushed over a dam flooding the Emporia roads of U.S. Hwy 301; Center, Cleveland, Monroe, High, and Shilo Streets; and 10 secondary roads. Along the Meherrin River, homes were damaged. Sewage service was disrupted and discharged into the river. The mayor of Emporia died searching for children in the river.</p> <p><u>Greensville County:</u> In Greensville County, the Meherrin River crested at 30 feet above normal low water level. Damages were estimated at \$250,000 for cropland in Greensville County.</p> <p><u>Hopewell City:</u> Hopewell had nominal flooding.</p> <p><u>Petersburg City:</u> This event caused the worst flooding, in Petersburg and surrounding areas, in 32 years flooding streets, businesses and homes in low-lying areas of the city. In Petersburg, Highway 36, River Street, Old Street, East Bank Street, Bollingbrook, Grove Avenue, Plum Street, Fleet Street and River Street were flooded. Schools were closed. The Petersburg electric substation was deactivated</p> <p><u>Sussex County:</u> In Sussex County, 14 roads were closed. U.S. Hwy 301, Routes 40, 46, 58 and 630 were flooded. Schools were flooded and closed. 10 families in Sussex County were evacuated. Stony Creek was hardest hit with about 6,000 acres flooded. Cropland was flooded and some water damage occurred especially in the Claremont area flooding cottages. Damages were estimated at \$2 million for cropland, houses and business areas.</p> <p><i>(Source: The Progress-Index and The News-Journal)</i></p>
September 6, 1996	<p>On September 6, a severe storm system entered Virginia from North Carolina</p>

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Table V-10. Hurricane Hazard History

Date	Damages
	<p>producing heavy winds gusting between 40 and 50 mph with moderate rainfall. The Meherrin River crested at 24.3 feet, 11 feet above flood stage.</p> <p>Emporia City: Flooding of Center Street in Emporia by the Meherrin River. Roofs were peeled up and awnings ripped off. Schools were canceled.</p> <p>Greensville County: Damages were not as large as expected and were caused mostly from high winds, county damage was limited to broken tree limbs</p> <p>Surry County: Damages were not as large as expected and were caused mostly from high winds, uprooting trees which fell onto homes, trailers, roads and disrupting power and telephone service. 300 acres of crops were damaged from flooded fields.</p> <p>Sussex County: Damages were not as large as expected and were caused mostly from high winds, uprooting trees which fell onto homes, trailers, roads and disrupting power and telephone service. 300 acres of crops were damaged from flooded fields.</p> <p><i>(Source: The Sussex-Surry Dispatch and The Independent Messenger)</i></p>
September 18, 1999	<p>On the afternoon of September 15, a severe storm system entered Virginia producing high winds and rain. Throughout the region trees and power lines were down, roads were blocked and washed out, homes were damaged and flooded. Power was disrupted and water service was infiltrated.</p> <p>Chesterfield County: Several Ettrick and Matoaca homes were flooded and several roads were blocked. Crop damages estimated at \$50,000.</p> <p>Colonial Heights City: Several apartment complexes were evacuated from flood conditions.</p> <p>Dinwiddie County: Ferndale Road, northbound I-85, Route 40 and US Hwy 58 were flooded. Seven state routes were closed for several weeks. Crop damages estimated at \$420K in Dinwiddie County.</p> <p>Emporia City: The area was drenched with about 10 inches of rain and damages estimates of \$60,000.</p> <p>Greensville County: The greatest amount of damage was to agriculture. 1,500 acres were underwater. The Meherrin River was four feet above flood stage. A graveyard flooded causing caskets to float out of their vaults into surrounding streets. Schools and public buildings were closed. A section of Skippers was evacuated. I-95, Routes 46, 58 and 301, Independence Church Road, Moores Ferry Road, Little Lowground Road, Brunswick Road and the Hicksford Bridge were closed. Center Street, Halifax Street, Reese Street, Waterwheel Road and Brink Road in Emporia were closed. 40 residents sought shelter. Crop damages estimated at \$800,000.</p> <p>Petersburg City: Woodmere Lake overflowed evacuating residents at nearby apartment complexes. Low-lying sections were flooded. The sewer system overflowed in West Petersburg. 22 residents sought shelter. Damages estimates of \$782,000.</p> <p>Prince George County: US Route 301 and I-95 were closed. Three state routes were closed for several weeks. Walton Lake Road and the homes along it were flooded. Trees collapsed onto 15 homes. 50 residents sought shelter.</p>

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Table V-10. Hurricane Hazard History

Date	Damages
	<p>Surry County: The area received 14 inches of rain with particular damage occurring in the Claremont District, Sunken Meadow Beach and Claremont Beach. Poplar Lawn Road, Spring Grove Road, College Run and New Design Road were completely washed out. Routes 460 and 10 were closed. Routes 646, 637, and 635 had massive sinkholes. Crop damages estimated at \$1.15 million.</p> <p>Sussex County: Wakefield received 12.73 inches of rain. This event caused the greatest flooding in 60 years. 200 people were evacuated from Stony Creek where homes and businesses were partially submerged by the rising Nottoway River. Portions of Waverly and Wakefield were completely flooded. US Route 460 had a massive sinkhole and other portions were flooded. Roads were washed out on Harrell’s Mill Road and Brittle’s Mill Road. I-95 was closed. Crop damages estimated at \$1 million in Sussex County.</p> <p><i>(Source: The Progress-Index, Sussex-Surry Dispatch and The Independent Messenger)</i></p>
September 18, 2003	Hurricane Isabel - See full description in “Flood” section.
August 30, 2004	Tropical Storm Gaston - See full description in “Flood” section.

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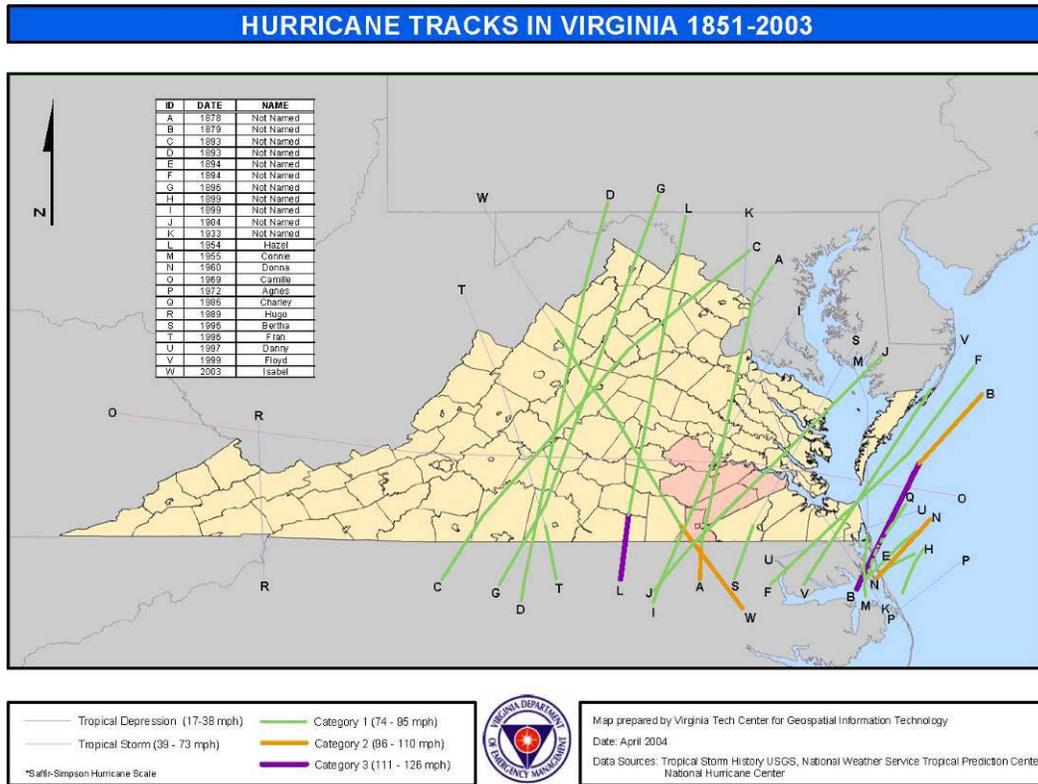


Figure V-5. Virginia Hurricane Tracks (from VDEM).

The Commonwealth of Virginia’s Standard Hazard Mitigation Plan includes hurricane tracks in Virginia spanning from 1851 to 2003 (Figure V-5). The hurricane track map gives an idea of the historical occurrences in the Crater region. From the figure, it can be seen that a number of Category 1 (74-95 mph) hurricanes tracked through the communities within the planning area.

Hazard Profile

A tropical cyclone is the generic term for a non-frontal synoptic scale low-pressure system over tropical or sub-tropical waters with organized convection and definite cyclonic surface wind circulation. Depending on strength, these weather systems are classified as hurricanes or tropical storms. Tropical cyclones involve both atmospheric and hydrologic characteristics, such as severe winds, storm, surge flooding, high waves, coastal erosion, extreme rainfall, thunderstorms, lightning, and, in some cases, tornadoes. Storm surge flooding can push inland, and riverine flooding associated with heavy inland rains can be

extensive. Many areas of the Coastal Plain region are flat, and intense prolonged rainfall tends to accumulate without ready drainage paths. High winds are associated with hurricanes, with two significant effects: 1) widespread debris due to damaged and downed trees and damaged buildings and 2) power outages.

Hurricane Damage Scale

Hurricanes are categorized by the Saffir-Simpson Hurricane Damage Scale listed below (Table V-11). Following the table are detailed descriptions of each category and the potential damage caused by each.

Table V-11. Saffir-Simpson Hurricane Damage Scale			
Hurricane Category	Sustained Winds (mph)	Damage Potential	Description
1	74 - 95	Minimal	Minimal damage to unanchored mobile homes along with shrubbery and trees. There may be pier damage and coastal road flooding, with storm surge 4-5 feet about average.
2	96 - 110	Moderate	Moderate damage potential to mobile homes and piers, as well as significant damage to shrubbery and trees with some damages to roofs, doors and windows. Impacts include flooding 2-4 hours before arrival of the hurricane in coastal and low lying areas. Storm surge can be 6-8 feet above average.
3	111 - 130	Extensive	Extensive damage potential. There will be structural damage to small residences and utility buildings. Extensive damage is to mobile homes and trees and shrubbery. Impacts include flooding 3-5 hours before the arrival of the hurricane cutting off the low lying escape routes. Coastal flooding has the potential to destroy the small structures, with significant damage to larger structures as a result of the floating debris. Land that is lower than 5 feet below mean sea level can be flooded 8 or more miles inland. Storm surge can be 6-12 feet above average.
4	131 - 155	Extreme	Extreme damage potential. Curtain wall failure as well as roof structure failure. Major damage to lower floors near the shoreline. Storm surge generally reaches 13-18 feet above average.
5	> 155	Catastrophic	Severe damage potential. Complete roof failure on residence and industrial structures, with complete destruction of mobile homes. All shrubs, trees and utility lines blown down. Storm surge is generally greater than 18 feet above average.

Vulnerability Analysis

HAZUS-MH was used to complete the wind analysis for vulnerability and loss estimates. The HAZUS software has been developed by FEMA and the Nation Institute of Building Sciences. Level 1, with default parameters, was used for the analysis done in this plan. For analysis purposes, the U.S. Census tracks are the smallest extent in which the model runs. The results of this analysis are captured in the vulnerability analysis and loss estimation.

HAZUS-MH uses historical hurricane tracks and computer modeling to identify the probable tracks of a range of hurricane events. Figures V-6 through V-8 are the individual wind speed maps (50-yr, 100-yr, and 1,000-yr events) for the jurisdictions in the region. When a hurricane impacts these areas, these maps can be used to determine what areas will be more impacted than others (at the U.S. Census Track level). Results from the model were used to develop the annualized damages. The impacts of these various events are combined to create a total annualized loss or the expected value of loss in any given year. Figure V-9 illustrates the annualized damages from hurricane winds.

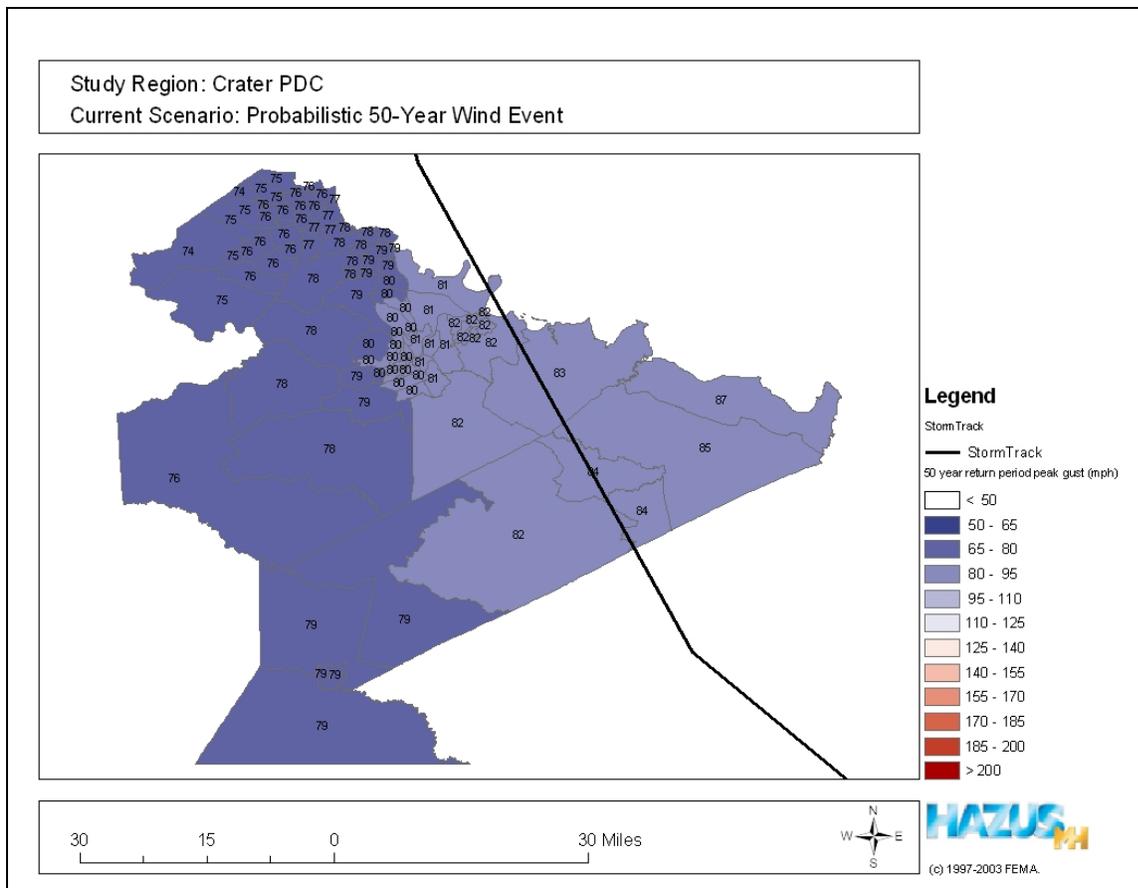


Figure V-6. HAZUS-MH Hurricane Winds for 50-year return period.

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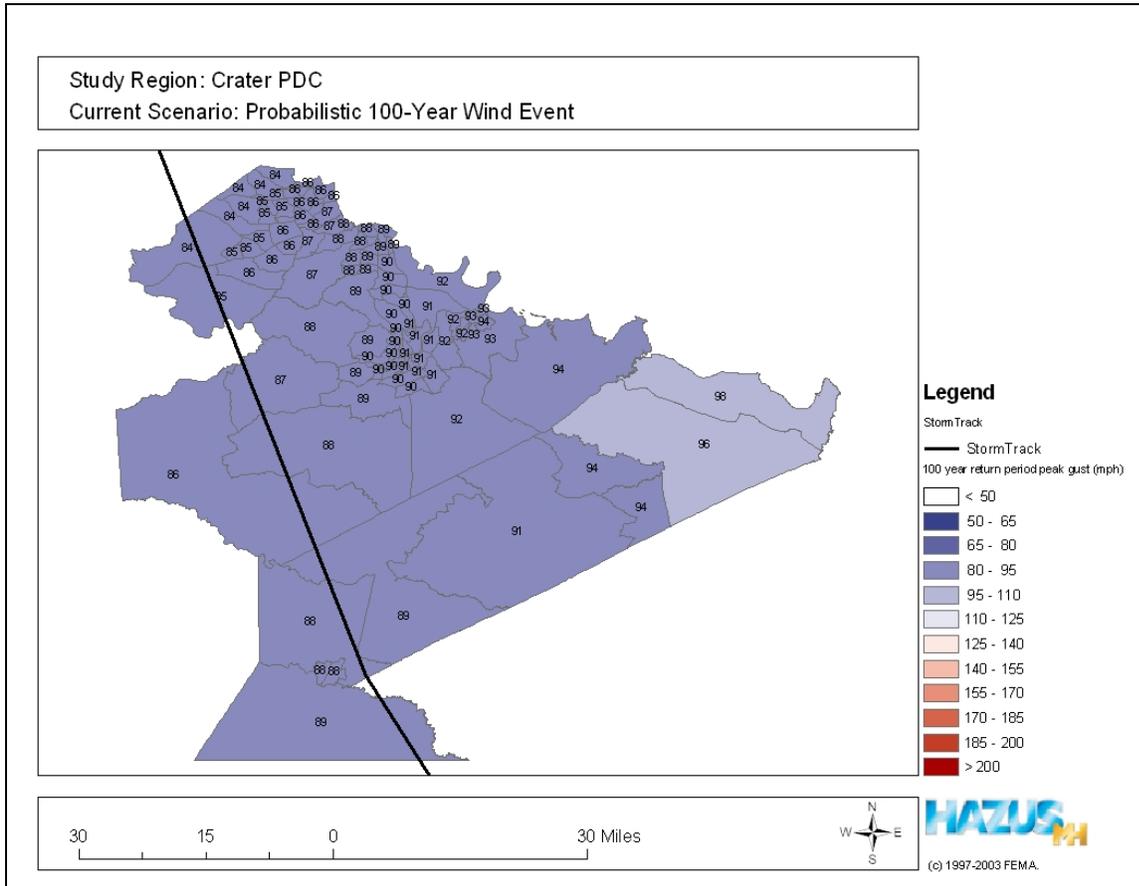


Figure V-7. HAZUS-MH Hurricane Winds for 100-year return period.

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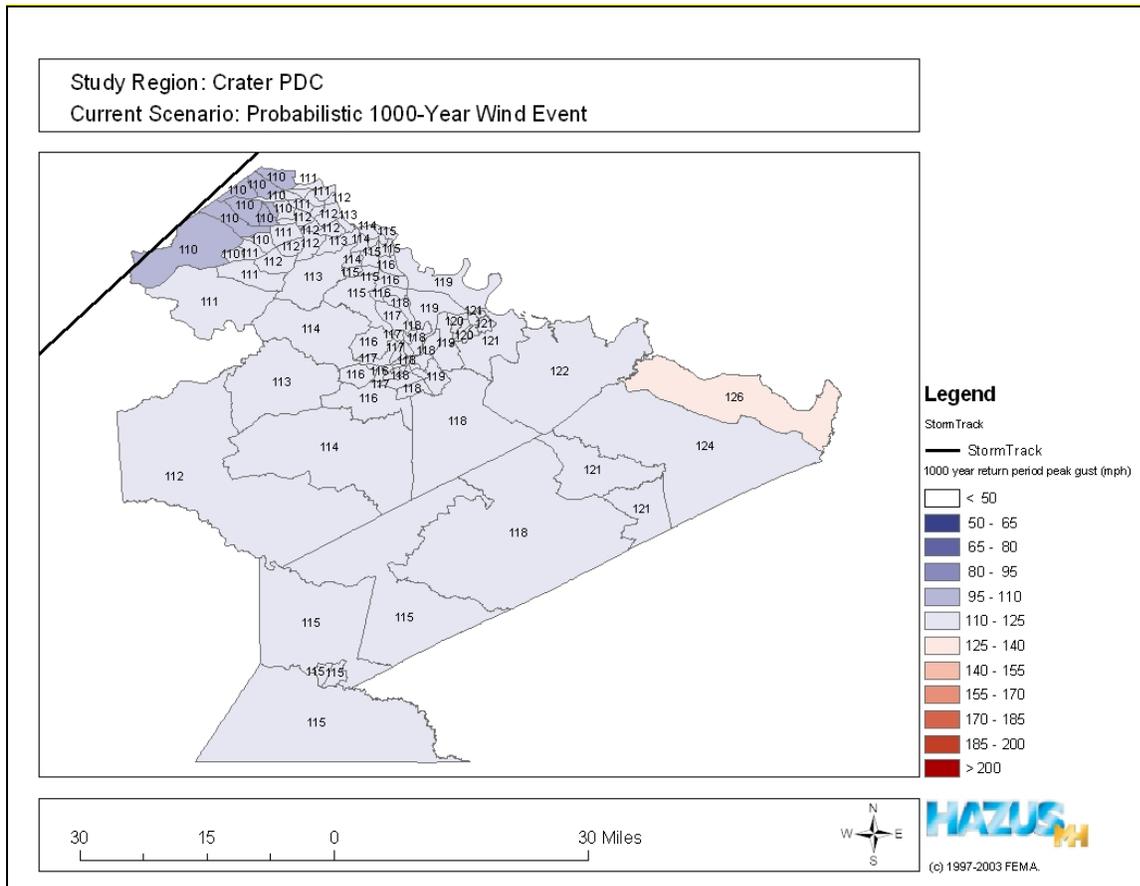


Figure V-8. HAZUS-MH Hurricane Winds for 1,000-year return period.

Building Types

Table V-12 illustrates the probabilistic building stock exposure by building type to hurricanes. For the Crater region, wood-frame buildings account for a large percentage of the building stock (63%). Table V-13 illustrates the building stock exposure broken down by the type of occupancy. As seen in the table, 87% of the building stock for the Crater region is considered residential, with approximately 12% of the building stock is commercial and industrial.

The HAZUS-MH hurricane model only conducts analysis at the U.S. Census tract level, which is larger than most of the towns in the region. Town exposure in Tables V-12 through V-15 has been estimated as a percentage of the housing units in the County.

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Table V-12. Building Stock Exposure By Building Type

Community	Wood	Masonry	Concrete	Steel	MH	Total
Chesterfield County	\$11,329,135	\$4,434,907	\$366,374	\$1,118,544	\$84,699	\$17,333,659
Colonial Heights City	\$796,684	\$356,174	\$40,111	\$143,529	\$1,687	\$1,338,185
Dinwiddie County	\$822,640	\$325,441	\$43,722	\$68,384	\$50,142	\$1,310,329
<i>*McKenney, Town of</i>	<i>\$1,478,760</i>	<i>\$585,006</i>	<i>\$78,594</i>	<i>\$122,926</i>	<i>\$90,134</i>	<i>\$2,355,420</i>
Emporia City	\$207,820	\$98,067	\$20,785	\$48,421	\$3,319	\$378,412
Greensville County	\$276,542	\$115,285	\$22,570	\$32,009	\$31,834	\$478,240
<i>*Jarratt, Town of</i>	<i>\$1,615,077</i>	<i>\$665,399</i>	<i>\$114,663</i>	<i>\$152,135</i>	<i>\$172,456</i>	<i>\$2,719,730</i>
Hopewell City	\$823,075	\$329,974	\$32,653	\$76,380	\$7,070	\$1,269,152
Petersburg City	\$1,298,132	\$594,064	\$90,692	\$238,040	\$12,719	\$2,233,647
Prince George County	\$1,008,353	\$471,694	\$139,230	\$144,154	\$38,679	\$1,802,110
Surry County	\$242,952	\$89,765	\$3,631	\$15,963	\$25,231	\$377,542
<i>*Claremont, Town of</i>	<i>\$1,220,274</i>	<i>\$450,862</i>	<i>\$18,237</i>	<i>\$80,177</i>	<i>\$126,728</i>	<i>\$1,896,279</i>
<i>*Dendron, Town of</i>	<i>\$1,056,622</i>	<i>\$390,397</i>	<i>\$15,792</i>	<i>\$69,425</i>	<i>\$109,732</i>	<i>\$1,641,968</i>
<i>*Surry, Town of</i>	<i>\$932,105</i>	<i>\$344,391</i>	<i>\$13,931</i>	<i>\$61,243</i>	<i>\$96,801</i>	<i>\$1,448,470</i>
Sussex County	\$342,868	\$141,259	\$24,342	\$32,297	\$36,611	\$577,377
<i>*Stony Creek, Town of</i>	<i>\$553,897</i>	<i>\$228,202</i>	<i>\$39,324</i>	<i>\$52,175</i>	<i>\$59,144</i>	<i>\$932,743</i>
<i>*Wakefield, Town of</i>	<i>\$2,846,265</i>	<i>\$1,172,639</i>	<i>\$202,071</i>	<i>\$268,108</i>	<i>\$303,920</i>	<i>\$4,793,005</i>
<i>*Waverly, Town of</i>	<i>\$6,331,432</i>	<i>\$2,608,502</i>	<i>\$449,502</i>	<i>\$596,399</i>	<i>\$676,062</i>	<i>\$10,661,896</i>
Total	\$33,182,633.91	\$13,402,027.73	\$1,716,223.14	\$3,320,309.80	\$1,926,968.57	\$53,548,163.15

All values are in thousands of dollars.

**Denotes town values that also are included in totals for the respective County.*

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Table V-13. Building Stock Exposure By General Occupancy

Community	Residential	Commercial	Industrial	Agri.	Religion	Gov't	Ed.	Total
Chesterfield County	\$15,123,979	\$1,577,481	\$416,981	\$16,304	\$110,907	\$38,230	\$49,798	\$17,333,680
Colonial Heights City	\$1,016,305	\$304,975	\$9,937	\$804	\$4,084	\$0	\$2,082	\$1,338,187
Dinwiddie County	\$1,195,905	\$79,973	\$17,496	\$937	\$8,492	\$2,049	\$5,476	\$1,310,328
<i>*McKenney, Town of</i>	<i>\$2,149,733.44</i>	<i>\$143,757.77</i>	<i>\$31,450.44</i>	<i>\$1,684.33</i>	<i>\$15,265.04</i>	<i>\$3,683.24</i>	<i>\$9,843.54</i>	<i>\$2,355,417.80</i>
Emporia City	\$287,546	\$82,108	\$2,239	\$619	\$3,935	\$1,390	\$575	\$378,412
Greensville County	\$430,727	\$16,108	\$23,341	\$1,457	\$4,702	\$838	\$1,067	\$478,240
<i>*Jarratt, Town of</i>	<i>\$2,500,258.84</i>	<i>\$155,969.12</i>	<i>\$24,414.48</i>	<i>\$5,836.30</i>	<i>\$23,048.44</i>	<i>\$4,338.36</i>	<i>\$5,859.85</i>	<i>\$2,719,725.40</i>
Hopewell City	\$1,137,240	\$108,761	\$14,729	\$304	\$5,097	\$1,881	\$1,141	\$1,269,153
Petersburg City	\$1,775,690	\$370,312	\$53,524	\$630	\$21,614	\$6,686	\$5,191	\$2,233,647
Prince George County	\$1,634,992	\$98,853	\$10,488	\$1,376	\$10,051	\$38,536	\$7,815	\$1,802,111
Surry County	\$342,482	\$12,018	\$1,899	\$1,802	\$7,882	\$11,068	\$390	\$377,541
<i>*Claremont, Town of</i>	<i>\$1,720,183.42</i>	<i>\$60,362.78</i>	<i>\$9,538.10</i>	<i>\$9,050.90</i>	<i>\$39,588.90</i>	<i>\$55,591.21</i>	<i>\$1,958.85</i>	<i>\$1,896,274.17</i>
<i>*Dendron, Town of</i>	<i>\$1,489,488.27</i>	<i>\$52,267.48</i>	<i>\$8,258.94</i>	<i>\$7,837.08</i>	<i>\$34,279.60</i>	<i>\$48,135.83</i>	<i>\$1,696.15</i>	<i>\$1,641,963.35</i>
<i>*Surry, Town of</i>	<i>\$1,313,959.35</i>	<i>\$46,108.01</i>	<i>\$7,285.66</i>	<i>\$6,913.52</i>	<i>\$30,239.92</i>	<i>\$42,463.26</i>	<i>\$1,496.27</i>	<i>\$1,448,465.98</i>
Sussex County	\$530,785	\$33,111	\$5,183	\$1,239	\$4,893	\$921	\$1,244	\$577,376
<i>*Stony Creek, Town of</i>	<i>\$857,474.17</i>	<i>\$53,490.26</i>	<i>\$8,373.05</i>	<i>\$2,001.58</i>	<i>\$7,904.56</i>	<i>\$1,487.86</i>	<i>\$2,009.66</i>	<i>\$932,741.14</i>
<i>*Wakefield, Town of</i>	<i>\$4,406,228.65</i>	<i>\$274,865.79</i>	<i>\$43,025.86</i>	<i>\$10,285.36</i>	<i>\$40,618.47</i>	<i>\$7,645.54</i>	<i>\$10,326.87</i>	<i>\$4,792,996.55</i>
<i>*Waverly, Town of</i>	<i>\$9,801,524.03</i>	<i>\$611,430.73</i>	<i>\$95,709.75</i>	<i>\$22,879.49</i>	<i>\$90,354.58</i>	<i>\$17,007.27</i>	<i>\$22,971.82</i>	<i>\$10,661,877.67</i>
Total	\$47,714,501.17	\$4,081,951.93	\$783,873.29	\$91,960.56	\$462,956.51	\$281,951.58	\$130,942.01	\$53,548,137.05

All values are in thousands of dollars

**Denotes town values that also are included in totals for the respective County.*

Critical Facilities

Vulnerability to critical facilities from hurricane winds is fairly uniform throughout the region. As Figures V-6 through V-8 showed, there is only slight variation (around 10%)

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from the eastern to western portions of the region. In general, critical facilities in the eastern portion of the PDC will have slightly higher vulnerability than those in the western portion of the PDC.

Loss Estimation

Table V-14 provides the loss estimations from HAZUS-MH by building type. As noted earlier, wood structures compose the majority of the structures, and also account for the majority of the losses. Table V-15 shows the loss by occupancy type. Note that differences between the totals in the tables are due to rounding calculations in HAZUS-MH. Figure V-9 illustrates the annualized loss due to hurricane winds.

Individual maps are found in Appendix C. Figures C-16 through C-25 show the census blocks where hurricane losses occur, in addition to local comments regarding areas of concern to the community. Table C-11 summarizes the problem spot locations that are denoted on Figure C-26.

Table V-14. Building Stock Loss By Building Type

Community	Wood	Masonry	Concrete	Steel	MH	TOTAL
Chesterfield County	\$4,059.19	\$1,499.40	\$63.26	\$268.82	\$47.39	\$5,938.06
Colonial Heights City	\$574.67	\$233.81	\$15.30	\$72.58	\$1.36	\$897.72
Dinwiddie County	\$334.52	\$112.32	\$6.08	\$15.85	\$18.51	\$487.28
<i>*McKenney, Town of</i>	<i>\$601.33</i>	<i>\$201.90</i>	<i>\$10.93</i>	<i>\$28.49</i>	<i>\$33.27</i>	<i>\$875.92</i>
Emporia City	\$94.71	\$40.98	\$4.01	\$13.99	\$1.80	\$155.49
Greensville County	\$126.84	\$44.87	\$2.42	\$6.53	\$14.48	\$195.14
<i>*Jarratt, Town of</i>	<i>\$906.02</i>	<i>\$318.19</i>	<i>\$14.98</i>	<i>\$41.36</i>	<i>\$94.35</i>	<i>\$1,374.90</i>
Hopewell City	\$680.86	\$265.87	\$14.36	\$48.48	\$6.31	\$1,015.88
Petersburg City	\$800.21	\$361.39	\$28.27	\$104.66	\$8.17	\$1,302.70
Prince George County	\$679.40	\$254.38	\$24.32	\$52.48	\$28.24	\$1,038.82
Surry County	\$248.55	\$80.44	\$1.99	\$10.35	\$27.10	\$368.43
<i>*Claremont, Town of</i>	<i>\$1,248.39</i>	<i>\$404.03</i>	<i>\$10.00</i>	<i>\$51.98</i>	<i>\$136.12</i>	<i>\$1,850.51</i>
<i>*Dendron, Town of</i>	<i>\$1,080.97</i>	<i>\$349.84</i>	<i>\$8.65</i>	<i>\$45.01</i>	<i>\$117.86</i>	<i>\$1,602.34</i>

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Table V-14. Building Stock Loss By Building Type

Community	Wood	Masonry	Concrete	Steel	MH	TOTAL
<i>*Surry, Town of</i>	<i>\$953.58</i>	<i>\$308.61</i>	<i>\$7.63</i>	<i>\$39.71</i>	<i>\$103.97</i>	<i>\$1,413.51</i>
Sussex County	\$192.34	\$67.55	\$3.18	\$8.78	\$20.03	\$291.88
<i>*Stony Creek, Town of</i>	<i>\$310.72</i>	<i>\$109.13</i>	<i>\$5.14</i>	<i>\$14.18</i>	<i>\$32.36</i>	<i>\$471.53</i>
<i>*Wakefield, Town of</i>	<i>\$1,596.68</i>	<i>\$560.76</i>	<i>\$26.40</i>	<i>\$72.89</i>	<i>\$166.28</i>	<i>\$2,423.00</i>
<i>*Waverly, Town of</i>	<i>\$3,552</i>	<i>\$1,247</i>	<i>\$59</i>	<i>\$162</i>	<i>\$370</i>	<i>\$5,389.88</i>
Total	\$18,040.76	\$6,460.85	\$305.65	\$1,058.28	\$1,227.48	\$27,093.02

All values are in thousands of dollars

**Denotes town values that also are included in totals for the respective County.*

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Table V-15. Building Stock Loss By General Occupancy

Community	Residential	Commercial	Industrial	Agri.	Religion	Gov't	Ed.	Total
Chesterfield County	\$5,397.85	\$333.71	\$159.02	\$4.09	\$19.17	\$12.36	\$10.54	\$5,936.74
Colonial Heights City	\$735.27	\$152.30	\$6.37	\$0.47	\$1.50	\$0.00	\$1.01	\$896.91
Dinwiddie County	\$459.89	\$18.22	\$6.00	\$0.22	\$1.38	\$0.45	\$0.93	\$487.09
<i>*McKenney, Town of</i>	<i>\$826.69</i>	<i>\$32.75</i>	<i>\$10.79</i>	<i>\$0.40</i>	<i>\$2.48</i>	<i>\$0.81</i>	<i>\$1.67</i>	<i>\$875.58</i>
Emporia City	\$128.96	\$24.27	\$0.55	\$0.22	\$0.86	\$0.41	\$0.14	\$155.41
Greensville County	\$181.62	\$3.37	\$8.31	\$0.42	\$0.80	\$0.36	\$0.18	\$195.06
<i>*Jarratt, Town of</i>	<i>\$1,307.16</i>	<i>\$43.90</i>	<i>\$12.95</i>	<i>\$2.21</i>	<i>\$5.51</i>	<i>\$1.46</i>	<i>\$1.74</i>	<i>\$1,374.95</i>
Hopewell City	\$929.15	\$71.59	\$9.77	\$0.24	\$2.45	\$1.52	\$0.71	\$1,015.41
Petersburg City	\$1,099.11	\$167.77	\$22.86	\$0.31	\$7.18	\$3.69	\$1.88	\$1,302.79
Prince George County	\$973.40	\$37.79	\$5.13	\$0.60	\$2.81	\$16.20	\$2.53	\$1,038.48
Surry County	\$346.47	\$7.37	\$1.23	\$1.50	\$3.79	\$7.66	\$0.24	\$368.25
<i>*Claremont, Town of</i>	<i>\$1,740.21</i>	<i>\$37.02</i>	<i>\$6.18</i>	<i>\$7.53</i>	<i>\$19.04</i>	<i>\$38.47</i>	<i>\$1.21</i>	<i>\$1,849.66</i>
<i>*Dendron, Town of</i>	<i>\$1,506.83</i>	<i>\$32.05</i>	<i>\$5.35</i>	<i>\$6.52</i>	<i>\$16.48</i>	<i>\$33.31</i>	<i>\$1.04</i>	<i>\$1,601.60</i>
<i>*Surry, Town of</i>	<i>\$1,329.26</i>	<i>\$28.28</i>	<i>\$4.72</i>	<i>\$5.75</i>	<i>\$14.54</i>	<i>\$29.39</i>	<i>\$0.92</i>	<i>\$1,412.86</i>
Sussex County	\$277.50	\$9.32	\$2.75	\$0.47	\$1.17	\$0.31	\$0.37	\$291.90
<i>*Stony Creek, Town of</i>	<i>\$448.30</i>	<i>\$15.06</i>	<i>\$4.44</i>	<i>\$0.76</i>	<i>\$1.89</i>	<i>\$0.50</i>	<i>\$0.60</i>	<i>\$471.54</i>
<i>*Wakefield, Town of</i>	<i>\$2,303.62</i>	<i>\$77.37</i>	<i>\$22.83</i>	<i>\$3.90</i>	<i>\$9.71</i>	<i>\$2.57</i>	<i>\$3.07</i>	<i>\$2,423.08</i>
<i>*Waverly, Town of</i>	<i>\$5,124</i>	<i>\$172</i>	<i>\$51</i>	<i>\$9</i>	<i>\$22</i>	<i>\$6</i>	<i>\$7</i>	<i>\$5,390.07</i>
Total	\$25,116	\$1,264	\$340	\$44	\$132	\$155	\$36	\$27,087

All values are in thousands of dollars

**Denotes town values that also are included in totals for the respective County.*

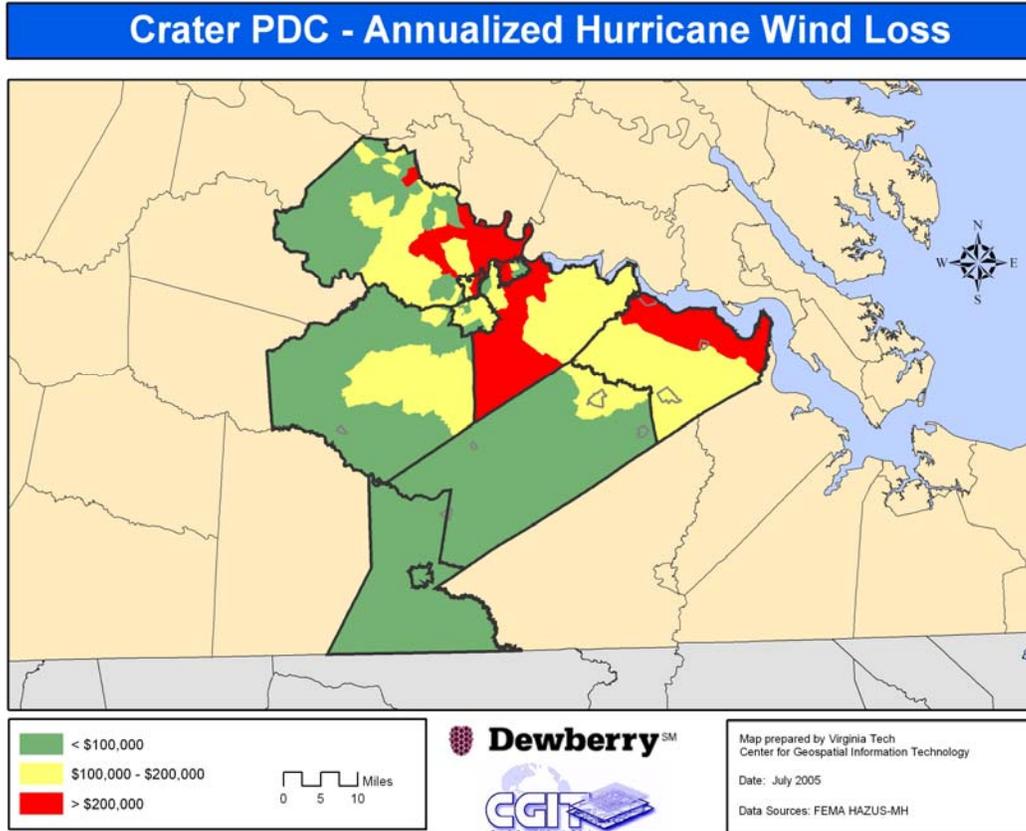


Figure V-9. Total Annualized Hurricane Loss.

Severe Winter Storm (Moderate Ranking)

Hazard History

Table V-16 includes descriptions of major winter storm events in the Crater region. Events have been broken down by the date of occurrence and when available, by individual community descriptions. When no community specific description is available, the general description applies to the entire planning area.

Table V-16. Winter Storm Hazard History	
Date	Damages
March 8, 1962	On March 8, a severe storm system entered Virginia combining the effects of a winter blizzard with an off-shore Nor'easter. Gale force winds and near-record tides sent rivers and the Atlantic Ocean surging over sea walls and beaches. This event flooded low-lying coastal areas and caused destruction

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Table V-16. Winter Storm Hazard History

Date	Damages
	<p>inland along rivers and bays. Inland this storm produced up to three feet of snow blocking roads and knocking out power. The Hampton Roads and Tidewater areas along with Virginia Beach were hardest hit where water rose 5 feet along the ocean front and spread into business areas.</p> <p><i>(Source: The Progress-Index)</i></p>
January 26, 1977	<p>Several weeks of ice, snow (11.1 inches) and record low temperatures produced one of the coldest winter seasons. The James River and Chesterfield County rivers were frozen. Residences and businesses were dealing with frozen and burst pipes. Ice and freezing temperatures caused nuclear plant shutdowns. Ice in the James River stopped ferry service.</p> <p><u>Chesterfield County:</u> These conditions produced icy roads and sidewalks, closed railroads and closed schools in Chesterfield County. Additionally this event caused numerous accidents with 75 in Chesterfield County, several pedestrian injuries and several drowning deaths.</p> <p><u>Colonial Heights City:</u> Additionally this event caused numerous accidents. Several pedestrian injuries and several drowning deaths.</p> <p><u>Dinwiddie County:</u> See overall event description.</p> <p><u>Emporia City:</u> The heating supply and distribution was slowed, causing brownouts and major power outages. This reduced heating supply forced state ordered bans of all non-essential natural gas use, curtailed business hours and reduced business thermostats to 65. This ban generated numerous layoffs and unemployment claims.</p> <p><u>Greensville County:</u> These conditions produced icy roads and sidewalks, closed railroads and closed schools for four days.</p> <p><u>Hopewell City:</u> This event caused numerous accidents with several pedestrian injuries and several drowning deaths.</p> <p><u>Petersburg City:</u> These conditions produced icy roads and sidewalks, closed railroads and closed schools. Additionally this event caused numerous accidents with 21 in the city. Several pedestrian injuries and several drowning deaths.</p> <p><u>Surry County:</u> The heating supply and distribution was slowed, causing brownouts and major power outages. This reduced heating supply forced state ordered bans of all non-essential natural gas use, curtailed business hours and reduced business thermostats to 65. This ban generated numerous layoffs and unemployment claims.</p> <p><u>Sussex County:</u> This event caused numerous accidents, with several pedestrian injuries and several drowning deaths.</p>

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Table V-16. Winter Storm Hazard History

Date	Damages
	<i>(Source: The Progress-Index, The Independent-Messenger and Sussex-Surry Dispatch)</i>
December 23, 1993	<p>On December 23 and 25, the Crater region received 14 inches of snow with freezing rain on December 27. Primary and secondary roads were covered with snow, ice and slush. Public transit was shut down and various businesses closed early. This event caused 232 traffic accidents in the Crater region.</p> <p><u>Chesterfield County:</u> This event caused 109 traffic accidents in the county.</p> <p><u>Dinwiddie County:</u> Governments closed early.</p> <p><u>Hopewell City:</u> This event caused 232 accidents in the city. Interstate 295 near Hopewell had significant ice.</p> <p><u>Prince George County:</u> This event caused 30 traffic accidents in the county. The County government closed early.</p> <p><i>(Source: The Progress-Index)</i></p>
March 10, 1994	<p>A severe ice storm hit the Tri-Cities area from February 8 through February 12, helping to produce the harshest winter in a decade.</p> <p><u>Chesterfield County:</u> The roof of the county library and several school buildings were damaged, with estimates at \$300,000.</p> <p><u>Dinwiddie County:</u> More than 3,000 homes were without power. Damages were estimates at \$10,000.</p> <p><u>Surry County:</u> In Surry County this ice storm damaged a water tower for the school system, knocking out heating and cooling for 30 hours. Damages were estimated at \$30,000.</p> <p><i>(Source: The Sussex-Surry Dispatch and The Independent Messenger)</i></p>
April 11, 1994	<p>A severe ice storm hit the Tri-Cities area from March 1 through March 5, contributed to the harshest winter in a decade. This ice storm had a separate disaster declaration from the February 1994 ice storm. This ice storm produced 50-knot winds and tides up to 3.5 feet above normal suspending ferry service across the James River. There was a significant increase in the number of potholes later in the spring on state highways due to this event and the February events.</p> <p><u>Emporia City:</u> Emporia had \$20,000 of damage to street and road surfaces.</p> <p><u>Surry County:</u> Roads were flooded, trees were knocked down onto roads, and schools were closed early.</p> <p><i>(Source: The Sussex-Surry Dispatch and The Independent Messenger)</i></p>

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Table V-16. Winter Storm Hazard History

Date	Damages
January 13, 1996	<p>From January 6 through January 15, two snow fronts, striking first from the south and then from the north produced large and prolonged snowfall. Snow and rain froze on roads producing hazardous conditions and numerous accidents. School systems throughout the PDC were closed for 5 days. Businesses were closed. 360 customers were without power in Stony Creek, Hopewell and Disputanta. Numerous minor injuries were reported from car accidents and falls. Several residents were hospitalized for pneumonia. People sought shelter in hotels and local shelters (51 in Emporia).</p> <p><u>Chesterfield County:</u> School systems were closed for 5 days.</p> <p><u>Colonial Heights City:</u> School systems in were closed for 5 days. Roofs fell in due to the weight of snow.</p> <p><u>Dinwiddie County:</u> School systems were closed for 5 days.</p> <p><u>Greensville County:</u> School systems were closed for 5 days. Snow removal costs about \$32,000.</p> <p><u>Hopewell City:</u> School systems were closed for 5 days. Roofs fell in due to the weight of snow.</p> <p><u>Petersburg City:</u> More than 2 feet of snow fell in the city. School systems were closed for 5 days. Roofs fell in due to the weight of snow in Colonial Heights and Hopewell. Snow removal was an issue in Petersburg, with removal costs about \$42,000.</p> <p><u>Prince George County:</u> School systems were closed for 5 days.</p> <p><u>Surry County:</u> More than 14 inches of snow fell in the County.</p> <p><u>Sussex County:</u> More than 14 inches of snow fell in the County.</p> <p><i>(Source: The Progress-Index, The Independent-Messenger and Sussex-Surry Dispatch)</i></p>
December 23, 1998	<p>A severe ice storm hit the Tri-Cities area December 23 through December 27. Warm moist air from down south mixed with icy cold air from up north and drenched the region with freezing rain. The precipitation covered roads, power lines and trees with ice causing numerous accidents, trees and power poles toppling and power outages from utility lines were crashing to the ground. It was the worst ice storm in five years and hit the Tri-Cities area hard. This ice storm produced the worst power outages electric companies have had to deal with. Power was out for several days. Sewerage and water service was disrupted. Residents sought shelter in local motels instead of shelters. Telephone service was sporadic. Though numerous accidents occurred especially along I-295 there were no serious injuries. Recovery was slowed due to workers off for the holiday and thawing trees knocking down</p>

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Table V-16. Winter Storm Hazard History

Date	Damages
	<p>previously repaired power lines.</p> <p><u>Colonial Heights City:</u> Eight-five percent of residents in Colonial Heights were without power.</p> <p><u>Dinwiddie County:</u> Dinwiddie County had no power and no water.</p> <p><u>Greensville County:</u> Eighty-one percent of residents were without heat and power.</p> <p><u>Hopewell City:</u> Hopewell had 80 percent of residents without power.</p> <p><u>Petersburg City:</u> 60,200 customers in Petersburg were without power.</p> <p><i>(Source: The Sussex-Surry Dispatch, The Tidewater News and The Independent Messenger)</i></p>
February 28, 2000	<p>During a one-week period in January, two winter storms produced major snowfall (13 to 18 inches with 3.5-foot drifts); blizzard conditions and damaging ice accumulations. This event iced and uprooted trees, disrupted power, closed schools for several days. For several communities contractors were hired. A tractor-trailer overturned on I-95.</p> <p><u>Chesterfield County:</u> Cold temperatures froze and burst pipes throughout the county. Snow removal costs more than \$115,000.</p> <p><u>Colonial Heights City:</u> This event iced and uprooted trees, disrupted power, closed schools for six days. Cold temperatures froze and burst pipes. Snow removal costs more than \$32,000.</p> <p><u>Dinwiddie County:</u> This event iced and uprooted trees, disrupted power, closed schools for eight days.</p> <p><u>Emporia City:</u> In Emporia snow machinery breakdowns and low temperatures hindering salt effectiveness hampered removal. Snow removal costs more than \$50,000.</p> <p><u>Greensville County:</u> This event iced and uprooted trees, disrupted power, closed schools for eight days.</p> <p><u>Petersburg City:</u> Cold temperatures froze and burst pipes. Snow removal costs more than \$380,000.</p> <p><u>Prince George County:</u> This event iced and uprooted trees, disrupted power, closed schools for seven days. Cold temperatures froze and burst pipes. Snow removal costs more than \$1,5000 in the County.</p> <p><i>(Source: The Progress-Index, Sussex-Surry Dispatch and The Independent Messenger)</i></p>

Hazard Profile

Primary Impacts

The impacts of winter storms are minimal in terms of property damage and long-term effects. The most notable impact from winter storms is the damage to power distribution networks and utilities. Severe winter storms have the potential to inhibit normal functions of the community. Governmental costs for this type of event are a result of the needed personnel and equipment for clearing streets. Private sector losses are attributed to lost work when employees are unable to travel. Homes and businesses suffer damage when electric service is interrupted for long periods of time.

Health threats can become severe when frozen precipitation makes roadways and walkways very slippery, when there are prolonged power outages, or if fuel supplies are jeopardized. Occasionally, buildings may be damaged when snow loads exceed the design capacity of their roofs or when trees fall due to excessive ice accumulation on branches. The primary impact of excessive cold is increased potential for frostbite, and potentially death as a result of over-exposure to extreme cold.

Secondary Effects

Some of the secondary effects presented by extreme/excessive cold are a danger to livestock and pets, and frozen water pipes in homes and businesses.

Predictability and Frequency

Winter storms can be a combination of heavy snowfall, high winds, ice and extreme cold. Winter weather impacts the state of Virginia between the months of November and April, with varied intensities from east to west. In order to create a statewide winter weather hazard potential map that captures this variability, gridded climate data was obtained from the Climate Source and through the VirginiaView program. This data was developed by the Oregon State University Spatial Climate Analysis Service (SCAS) using PRISM (Parameter-elevation Regressions on Independent Slopes Model). This climate mapping system is an analytical tool that uses point weather station observation data, a digital elevation model, and other spatial data sets to generate gridded estimates of monthly, yearly, and event-based climatic parameters.

The winter weather risk assessment uses monthly normal precipitation, mean annual days with snowfall greater than 1 inch, and mean monthly snowfall PRISM data to develop snow and ice potential maps for the state. These datasets have been generated to incorporate topographic effects on precipitation, capture orographic rain shadows, and include coastal and lake effect influences on precipitation and snowfall. The monthly precipitation grid

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provides a 30-year climatological average of total precipitation in inches. The mean monthly snowfall grid provides a 30-year climatological average depth of freshly fallen snow in inches. The mean annual days map reveals the 30-year average of the number of days that a location will receive greater than 1 inch of snowfall in a 24-hour period in a given year.

A criterion of greater than 1 inch was selected for winter snowfall severity assessment because this depth will result in complete road coverage that can create extremely dangerous driving conditions and will require removal by the local community. This amount of snowfall in a 24-hour period can also lead to business closure and school delays or cancellation. Figure V-10 shows the average number of days with snowfall greater than one inch for the state and Figure V-11 shows the same for the Crater region. Winter weather mapping resolution does not support town based analysis, since most towns in the region would be represented by one or two pixels at this resolution. As weather data has better spatial resolution in the future, the ability to create town based analysis will be improved.

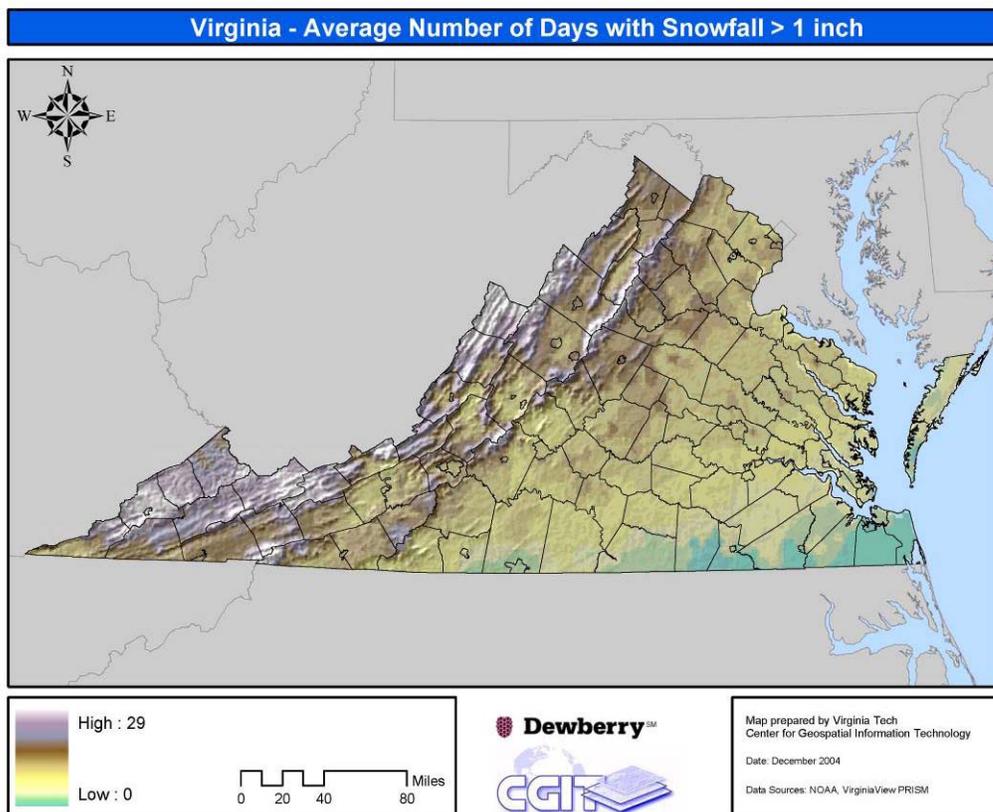


Figure V-10. Virginia Average Number of Days with Snowfall > 1 inch

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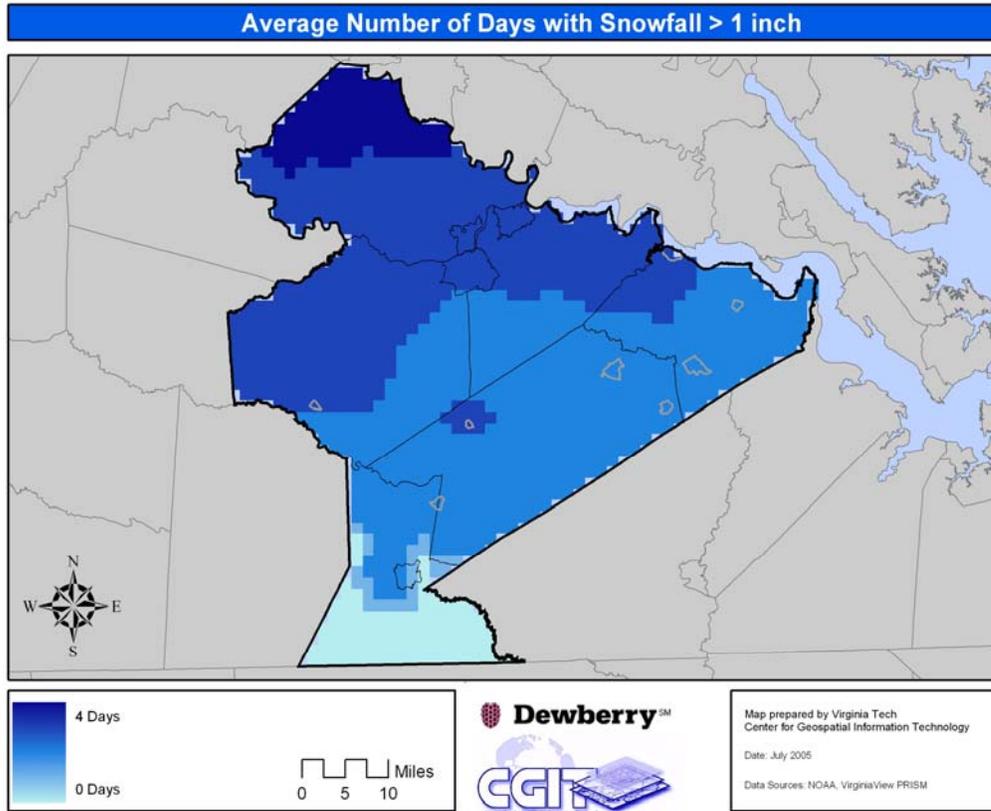


Figure V-11. Average Number of Days with Snowfall > 1 inch

Ice Potential

Another challenge with winter weather in Virginia and the Crater region is the amount of ice that often comes as part of winter weather. Snowfall and ice potential are generated based on the percentage difference between the total precipitation from November to April and the corresponding liquid equivalent snowfall depth. Since snowfall is in a frozen state, it does not accumulate on the surface the same way that liquid rainfall would. In order to account for this difference, there are characteristic snow/rain relationships that have been created. For example, a value of 1 would mean that all of the precipitation at the location falls as liquid rainfall, and a value of 0.5 would mean that half of the precipitation falls as liquid rainfall and half falls as frozen precipitation. It is assumed that the lower this percentage is, the greater potential that precipitation within these months is falling as snow. The values in the middle of the two extremes would represent regions that favor ice conditions over rain and snow. A five quantile distribution was applied to the output statewide grid to split the percentages into five characteristic climatological winter weather categories (snow, snow/ice, ice, rain/ice, and rain). Figure V-12 shows the statewide map and Figure V-13 show the Crater region map.

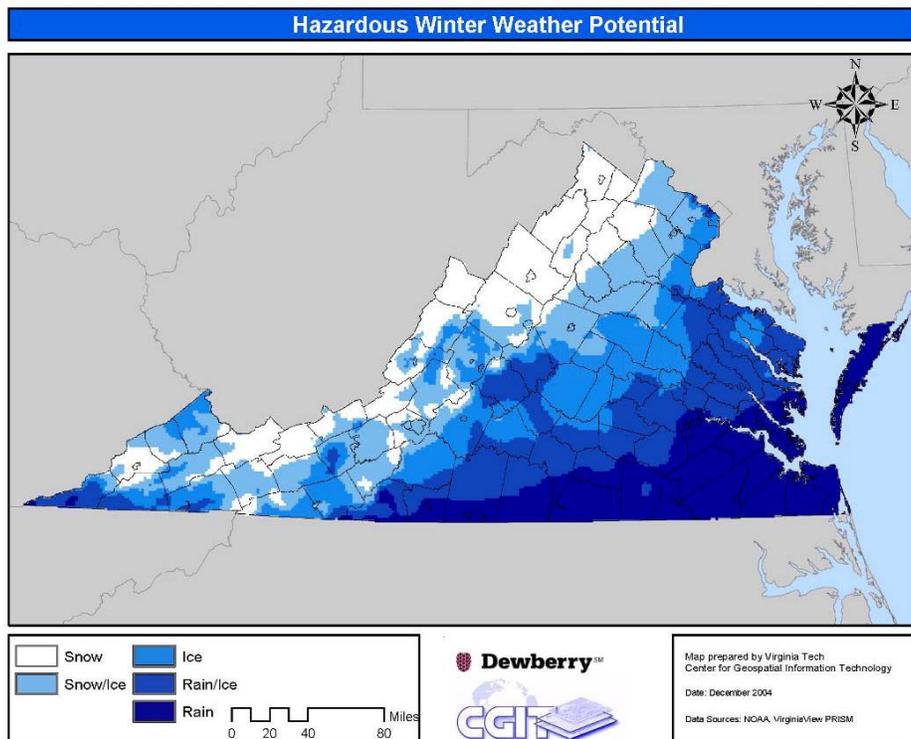


Figure V-12. Virginia Hazardous Winter Weather Potential Based on LEQ Precipitation

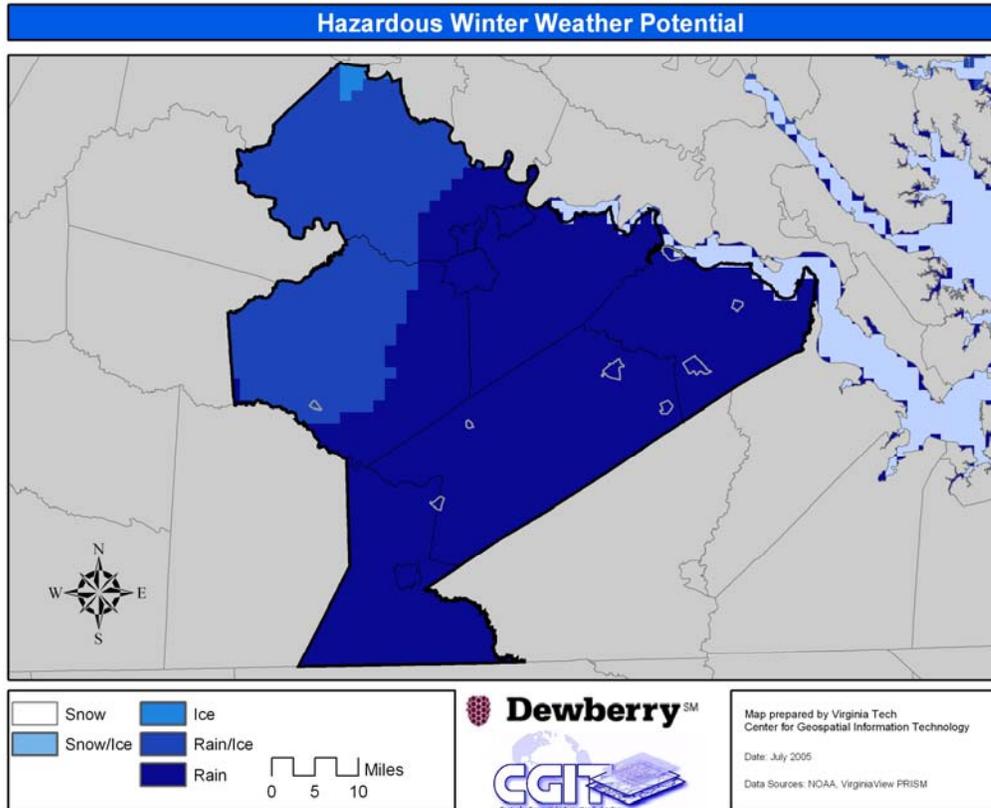


Figure V-13. Hazardous Winter Weather Potential Based on LEQ Precipitation

Vulnerability Analysis

Figures V-12 and V-13 showed the overall winter weather and the ice potential for the Crater region. Figure V-14 and V-15 show relative risk or vulnerability based on these previous maps. These were developed by assigning a high risk to those census blocks within the regions with the greatest potential for snowy days (> 1 in of snow) or ice. Division into high, medium and low were based on the levels predicted from potential maps. Tables V-17 and V-18 show the population in each county impacted by the overall snowfall and ice risks.

In Appendix C, Figure C-26 shows the local comments regarding areas of concern to the City of Petersburg. Table C-11 summarizes the problem spot locations that are denoted on Figure C-26. Future revision of this plan will need to develop a method to calculate the potential loss from these winter storms.

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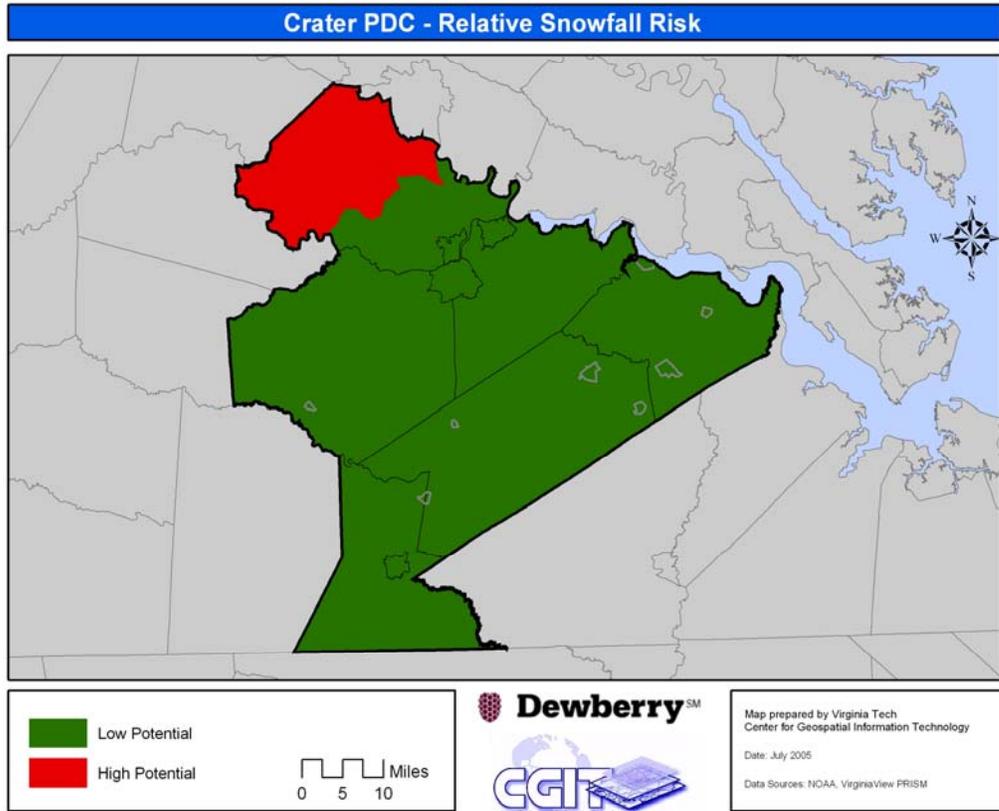


Figure V-14. Crater Snowfall Relative Risk

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Table V-17. Crater Population Snowfall Relative Risk (from 2000 Census)

Community	Low	Medium	High	TOTAL
Chesterfield County	66,194	0	193,709	259,903
Colonial Heights City	16,897	0	0	16,897
Dinwiddie County	24,533	0	0	24,533
<i>*McKenney, Town of</i>	<i>441</i>	<i>0</i>	<i>0</i>	<i>441</i>
Emporia City	5,665	0	0	5,665
Greensville County	11,560	0	0	11,560
<i>*Jarratt, Town of</i>	<i>589</i>	<i>0</i>	<i>0</i>	<i>589</i>
Hopewell City	22,354	0	0	22,354
Petersburg City	33,740	0	0	33,740
Prince George County	33,047	0	0	33,047
Surry County	6,829	0	0	6,829
<i>*Claremont, Town of</i>	<i>343</i>	<i>0</i>	<i>0</i>	<i>343</i>
<i>*Dendron, Town of</i>	<i>297</i>	<i>0</i>	<i>0</i>	<i>297</i>
<i>*Surry, Town of</i>	<i>262</i>	<i>0</i>	<i>0</i>	<i>262</i>
Sussex County	12,504	0	0	12,504
<i>*Stony Creek, Town of</i>	<i>202</i>	<i>0</i>	<i>0</i>	<i>202</i>
<i>*Wakefield, Town of</i>	<i>1,038</i>	<i>0</i>	<i>0</i>	<i>1,038</i>
<i>*Waverly, Town of</i>	<i>2,309</i>	<i>0</i>	<i>0</i>	<i>2,309</i>
Total	233,323	0	193,709	427,032
*Denotes town values that also are included in totals for the respective County.				

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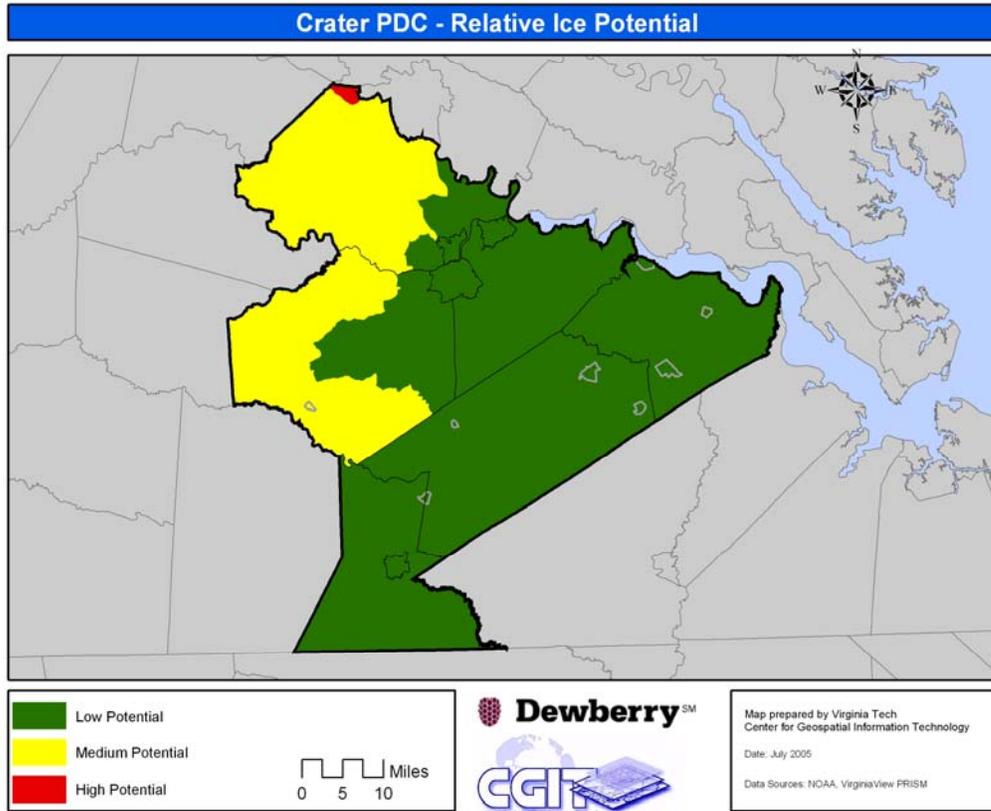


Figure V-15. Crater Ice Relative Risk (from 2000 Census)

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Table V-18. Crater Population Ice Relative Risk (from 2000 Census)

Community	Low	Medium	High	TOTAL
Chesterfield County	38,256	217,233	4,414	259,903
Colonial Heights City	16,897	0	0	16,897
Dinwiddie County	15,627	8,906	0	24,533
<i>*McKenney, Town of</i>	<i>0</i>	<i>441</i>	<i>0</i>	<i>441</i>
Emporia City	5,665	0	0	5,665
Greensville County	11,560	0	0	11,560
<i>*Jarratt, Town of</i>	<i>589</i>	<i>0</i>	<i>0</i>	<i>589</i>
Hopewell City	22,354	0	0	22,354
Petersburg City	33,740	0	0	33,740
Prince George County	33,047	0	0	33,047
Surry County	6,829	0	0	6,829
<i>*Claremont, Town of</i>	<i>343</i>	<i>0</i>	<i>0</i>	<i>343</i>
<i>*Dendron, Town of</i>	<i>297</i>	<i>0</i>	<i>0</i>	<i>297</i>
<i>*Surry, Town of</i>	<i>262</i>	<i>0</i>	<i>0</i>	<i>262</i>
Sussex County	12,504	0	0	12,504
<i>*Stony Creek, Town of</i>	<i>202</i>	<i>0</i>	<i>0</i>	<i>202</i>
<i>*Wakefield, Town of</i>	<i>1,038</i>	<i>0</i>	<i>0</i>	<i>1,038</i>
<i>*Waverly, Town of</i>	<i>2,309</i>	<i>0</i>	<i>0</i>	<i>2,309</i>
Total	196,479	226,139	4,414	427,032
*Denotes town values that also are included in totals for the respective County.				

Drought (Limited Ranking)

Hazard History

Table V-19 includes descriptions of major droughts that have occurred in the Crater region. Drought conditions generally occur over a region or larger area rather than in a single jurisdiction.

Table V-19. Drought Hazard History	
Date	Damages
December 2001 – November 2004	Beginning in the winter of 2001, the mid-Atlantic began to show long-term drought conditions. The National Weather Service made reports of moisture starved cold fronts that would continue throughout the winter. Stream levels were below normal with record lows observed at gages for the York, James, and Roanoke River Basins. By November 2002, the US Secretary of Agriculture had approved 45 counties for primary disaster designation, while 36 requests remained pending.
June & July 1998	A heat wave over the southeast produced warm and dry conditions over much of Virginia. Although the news reported stories of a drought in Virginia, the Drought Monitoring Team never stated in a report that these conditions were indicative of a drought. Palmer Drought Index values were above -2.
November 1976 – September 1977	Ten months of below average precipitation. The drought began in November of 1976 when rainfall totaled to only 50 to 75% of normal. During the rest of the winter, the storms tracked across the gulf. During the Spring and Summer the storms tracked across the Great Lakes. These weather patterns created significant drought throughout most of Virginia.

Hazard Profile

A drought can be characterized in several different ways depending on the impact. The most common form of drought is agricultural. Agricultural droughts are characterized by unusually dry conditions during the growing season. Meteorological drought is an extended period of time (6 or more months) with precipitation less than 75 percent of the normal precipitation. Severity of droughts often depends on the community reliance on a specific water source. The probability of a drought is difficult to predict given the number of variables involved. As seen in the table above, drought conditions appear to make an appearance at least once a decade.

Many problems can arise at the onset of a drought, some of which include diminished water supplies and quality, livestock and wildlife becoming undernourished, crop damage, and possible wildfires. Secondary impacts from droughts pose problems to farmers with reductions in income, while food prices and lumber prices could drastically increase.

The impact of excessive heat is most prevalent in urban areas, where urban heat island effects prevent inner-city buildings from releasing heat built up during the daylight hours. Secondary impacts of excessive heat are severe strain on the electrical power system and potential brownouts or blackouts.

Table V-20 provides a summary of drought categories and impacts. Notice that water restrictions start off as voluntary and then become mandatory. For excessive heat, the National Weather Service utilizes heat index thresholds as criteria for the issuance of heat advisories and excessive heat warnings.

Table V-20. Drought Severity Classification		
Category	Description	Possible Impacts
D0	Abnormally Dry	Going into drought: short-term dryness slowing planting, growth of crops or pastures; fire risk above average. Coming out of drought: some lingering water deficits; pastures or crops not fully recovered.
D1	Moderate Drought	Some damage to crops, pastures; fire risk high; streams, reservoirs, or wells low, some water shortages developing or imminent, voluntary water use restrictions requested
D2	Severe Drought	Crop or pasture losses likely; fire risk very high; water shortages common; water restrictions imposed
D3	Extreme Drought	Major crop/pasture losses; extreme fire danger; widespread water shortages or restrictions

Vulnerability Analysis

The 1990 Census contained detailed information about source of water per census block group. Table V-21 provides a summary of the 1990 population in three categories of drought vulnerability. Figure V-16 show these categories for the region.

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Table V-21. Crater Population Drought Risk (from 1990 Census).

Jurisdiction	% Population with Public/Private Water Systems			
	< 25%	25% - 50%	> 50%	Total
Chesterfield	7,896	7,303	194,075	209,274
Colonial Heights	0	0	16,064	16,064
Dinwiddie	13,288	1,520	6,152	20,960
Emporia	0	0	5,306	5,306
Greensville	1,727	6,862	264	8,853
Hopewell	0	0	23,101	23,101
Petersburg	0	0	38,386	38,386
Prince George	7,302	6,522	13,570	27,394
Surry	3,224	1,358	1,563	6,145
Sussex	3,341	1,692	5,215	10,248
Total	36,778	25,257	303,696	365,731

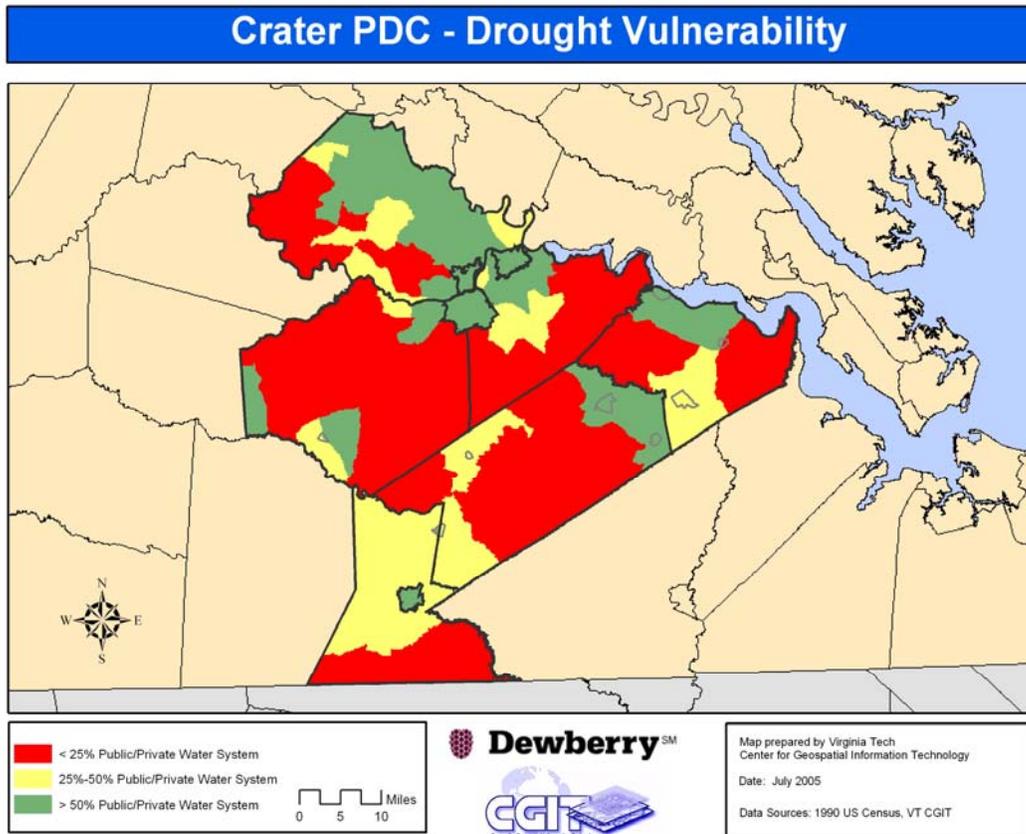


Figure V-16. Crater PDC Drought Vulnerability

Tornado (Limited Ranking)

Hazard History

Table V-22 includes descriptions of major tornado events that have touched down in the Crater region. Events have been broken down by the date of occurrence and when available, by individual community descriptions. When no community specific description is available, the general description applies to the entire planning area.

Table V-23. Tornado Hazard History	
Date	Damages
May 8, 1984	<p>On May 8, a severe storm system tracked across Virginia producing a tornado near Cavalier Square Shopping Center tracked through downtown Hopewell to Appomattox Manor in City Point. Damage was primarily to businesses than homes and was estimated at 1.36 million.</p> <p><i>(Source: The Progress-Index)</i></p>
August 6, 1993	<p>On August 6, a severe storm system tracked across southern Chesterfield County through the Tri-Cities and Prince George County and north into Charles City. This storm produced several tornadoes across the Tri-Cities area: Colonial Heights (F2), Petersburg (F3), Dinwiddie County, Sussex County and Hopewell (F1). On Pocahontas Island, a tornado damaged 58 residences. The island lost power and sewage treatment. An estimated 7.8 million gallons of sewage flowed into the Appomattox River.</p> <p><u>Chesterfield County:</u> A tornado uprooted trees in Matoaca and overturned tractor trailers on the I-295 bridge connecting Henrico and Chesterfield Counties causing hours of delays. Interstate 95 was shut down.</p> <p><u>Colonial Heights City:</u> A tornado destroyed the Wal-Mart, severely damaged other major retail stores in the area and damaged 25 stores in the Southpark Mall area. Vehicles in the parking lot were piled on top of each other. Three deaths and 200 injuries were reported at Wal-Mart. Estimated damages above \$11 million.</p> <p><u>Dinwiddie County:</u> High windstorms and tornadoes generated damage in Church Road, Ford and Old Pine. In Ford, a high wind storm knocked down trees, power lines and debris damaging cars and homes from Wells Road to Baltimore Road. The roof of a mobile home was removed. In Old Pine, a farmhouse imploded. In the county these events caused some injuries, destroyed three homes and damaged eight others. Large sections of the county were without power.</p> <p><u>Greensville County:</u> In Greensville County, high winds and torrential rains ripped through Jarratt. Damages included demolished trailers and power outages.</p>

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Table V-23. Tornado Hazard History

Date	Damages
	<p><u>Hopewell City:</u> A F1 tornado hit a 20 block area in the northwest corner of Hopewell causing damage to industrial buildings and causing heavy damage to Riverside Park Apartments. 100 people were evacuated and 60 people were homeless. Estimated damages: greater than \$1.2 million.</p> <p><u>Petersburg City:</u> A tornado generating winds topping 206 mph produced massive damage to the Old Towne and surrounding areas. Gas, electric, telephone and sewage service was disrupted. In Old Towne, the tornado leveled several buildings, blew out windows on cars and tossed roofs and electrical lines. The South Side Station Flea Market and Mini-Mall, restaurants and businesses were in ruins. Roofs were blown off of several businesses on the Old Town fringe. Many people at lumberyard were injured. 36 buildings were severely damaged in Old Towne. In Petersburg, 120 businesses and 50 homes were damaged. 140 people were evacuated from an apartment complex. Estimated damages greater than \$11.1 million in Petersburg with \$10 million in Old Towne,.</p> <p><u>Prince George County:</u> In Prince George County, a tornado collapsed a concrete plant in Tarmac severely injuring one person.</p> <p><u>Sussex County:</u> In Sussex County, a tornado in Waverly snapped and uprooted trees, damaged homes and buildings from one end of town to the other. A peanut warehouse on Route 460 was destroyed. Power was disrupted in Stony Creek and Waverly.</p> <p><i>(Source: The Progress-Index, The Sussex-Surry Dispatch and The Independent Messenger)</i></p>
May 5, 2002	<p>On May 1, coupled with a thunderstorm, a tornado approached from Brunswick County and touched down several places in Greensville County along Route 301 and Emporia. This thunderstorm continued to the Tri-Cities area producing heavy rain and wind gusts up to 80 mph. In the Tri-Cities area trees and power lines were knocked down, street lights were out.</p> <p><u>Colonial Heights City:</u> Pressure from the storm punched a hole in the sidewall of a store.</p> <p><u>Emporia City:</u> The tornado touched down around the Dry Bread-Allentown Road area damaging two site-built houses and damaging 14 other homes. An industrial plant had its roof torn off and a garage door fell on a pickup truck. Fourteen apartments and more than 30 trees toppled at the Gardens of Emporia Cemetery. 40 tombstones were damaged. Two mobile homes in a trailer park were destroyed. Two other mobile homes received major damage and 18 others had minor damage. Three minor injuries were reported. Numerous trees and power lines fell. I-95 was blocked from fallen trees. A transfer truck was overturned. 19 families were displaced and the Red Cross</p>

Table V-23. Tornado Hazard History

Date	Damages
	<p>housed 46 people. Estimated damages approximately \$700,000.</p> <p>Greensville County: Estimated damages less than \$1 million in Greensville County.</p> <p><i>(Source: The Progress-Index and The Independent Messenger)</i></p>

Hazard Profile

Damaging winds typically are associated with tornadoes or hurricanes. Isolated “downburst” or “straight-line” winds associated with any common thunderstorm can also cause extensive property damage.

Tornadoes are classified as a rotating column of wind that extends between a thunderstorm cloud and the earth’s surface. Winds are typically less than 100 mph, with severe tornado wind speeds exceeding 250 mph. The rotating column of air often resembles a funnel shaped cloud. The widths of tornados are usually several yards across, with infrequent events being over a mile wide. Tornadoes and their resultant damage can be classified into six categories using the Fujita Scale. This scale assigns numerical values for wind speeds inside the tornado according to the type of damage and degree of the tornado. Most tornadoes are F0 and F1, resulting in little widespread damage. Tornado activity normally spans from April through July but tornados can occur at any time throughout the year. In Virginia, peak tornado activity is in July. Hot, humid conditions stimulate tornado growth.

Strong tornadoes may be produced by thunderstorms and often are associated with the passage of hurricanes. On average, about seven tornadoes are reported in Virginia each year. The total number may be higher as incidents may occur over areas with sparse populations, or may not cause any property damage.

Tornado damage is computed using the Fujita Scale, as seen in Figure V-24. Classification is based on the amount of damage caused by the tornado, where the measure of magnitude is based on the impact.

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Table V-23. Fujita Tornado Intensity Scale (From National Weather Service)

Classification	Max. Winds (mph)	Path Length (mi.)	Path Width (mi)	Damage
F0	less than 73	less than 1.0	less than 0.01	Chimneys damaged, trees broken
F1	73-112	1.0-3.1	0.01-0.03	Mobile homes moved off foundations or overturned
F2	113-157	3.2-9.9	0.03-0.09	Considerable damage, mobile homes demolished, trees uprooted
F3	158-206	31-Oct	0.10-0.29	Roof and walls torn down, trains overturned, cars thrown
F4	207-260	32-99	0.30-0.90	Well-constructed walls leveled
F5	261-318	100-315	1.0-3.1	Homes lifted off foundations and carried some distance, cars thrown as far as 300 ft

The classification of the tornado gives an approximate depiction of what the corresponding damage of the tornado will be. A majority of Virginia’s tornadoes since 1950 were F0 and F1 on the Fujita Scale, seen in Table V-24. These result in minimal extensive damage. Damage that is likely to occur would be damage to trees, shrubbery, signs, antennas, with some damage to roofs and unanchored trailers.

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Table V-24. Virginia Tornado Statistics 1950-2001

Fujita Scale	Class.	MPH	Damage Description	# in VA	% of total	Deaths / Injuries	Damages
							(\$ Mil)
F0	Weak	40-72	Light damage. Tree branches snapped; antennas and signs damaged.	99	26	0 / 0	7
F1	Moderate	73-112	Moderate damage. Roofs off; trees snapped; trailers moved or overturned.	186	50	1 / 85	57
F2	Strong	113-157	Considerable damage. Weak structures and trailers demolished; cars blown off road.	66	18	3 / 72	75
F3	Severe	158-206	Roofs and some walls torn off well constructed buildings; some rural buildings demolished; cars lifted and tumbled.	23	6	19 / 102	140
F4	Devastating	207-260	Houses leveled leaving piles of debris; cars thrown some distance.	2	0.1	4 / 248	50
F5	Incredible	261-318	Well built houses lifted off foundation and disintegrated with debris carried some distance.	0	0	N/A	N/A

Table V-25 and Figure V-17 show tornado occurrences in the Crater region since 1950. Since tornadoes are so infrequent for the region, the Hurricane Wind analysis covers more probable high wind occurrences.

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Table V-25. Crater PDC Tornado Touchdowns (1950-2004)

County	F0	F1	F2	F3	Total
Chesterfield County	2	5	3	0	10
Colonial Heights	0	0	1	0	1
Hopewell	1	0	0	1	2
Petersburg	0	0	1	1	2
Prince George	2	0	4	0	6
Surry	1	2	0	1	4
Sussex	2	1	1	1	5
Dinwiddie	1	5	0	1	7
Emporia	1	0	1	0	2
Greensville	1	2	0	0	3
Total	11	15	11	5	42

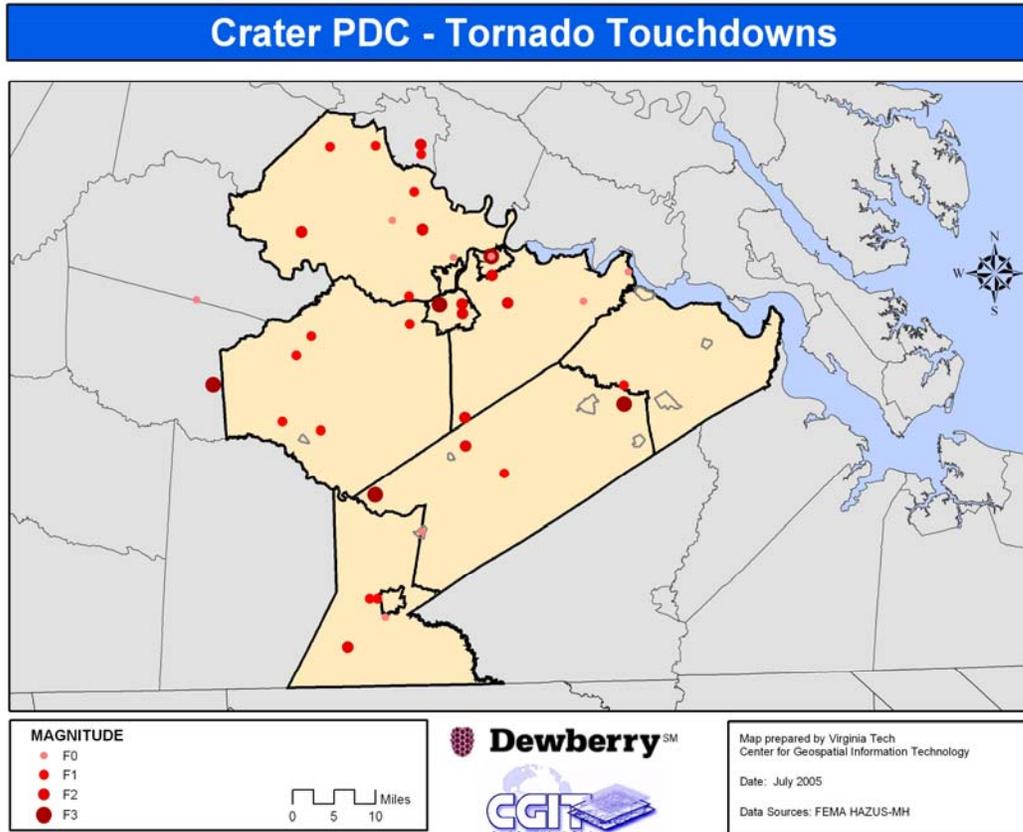


Figure V-17. Crater PDC Tornado Touchdowns (1950-1992)

Wildfire (Limited Ranking)

Hazard History

The Virginia Department of Forestry (VDOF) website provided fire incidence data for fire years 1995-2001. The data provided by VDOF was summarized into the following tables. Table V-26 provides information on the number of wildfire per county. Table V-27 is a summary of the number of acres and total damages of wildfires in the Crater region. There were no wildfires indicated for any of the cities. Table V-28 illustrates the cause of fire, broken down by county. It can be noted that 33% of fires were caused by debris burning, followed by 18% miscellaneous conditions and 16% caused by children.

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Table V-26. Number of Wildfires by Fire Year (1995-2001)

County	1995	1996	1997	1998	1999	2000	2001	Total
Chesterfield	33	18	29	22	29	12	22	165
Dinwiddie	14	11	6	11	12	9	31	94
Greensville	6	4	11	3	7	5	17	53
Prince George	12	4	9	7	8	6	19	65
Surry	11	3	6	5	7	2	4	38
Sussex	22	9	11	13	13	2	22	92
Grand Total	98	49	72	61	76	36	115	507

Table V-27. Wildfire Summary 1995-2001 (from VDOF).

Fire Year	1995		1996		1997		1998	
County	Total Acres	Total Damage	Total Acres	Total Damage	Total Acres	Total Damage	Total Acres	Total Damage
Chesterfield	50.6	\$600	32.1	\$1,275	86.9	\$2,020	64	\$3,400
Dinwiddie	36.4	\$1,800	8.95	\$500	12.8	\$1,500	9.9	\$10,500
Greensville	6	\$2,000	12.1	\$400	17.9	\$15,275	6	\$100
Prince George	92.05	\$1,350	1.55	\$100	64.95	\$7,000	54.05	\$3,000
Surry	14.6	\$1,600	21.25	\$200	11.2	\$0	34.75	\$2,700
Sussex	157.45	\$17,775	15.6	\$710	7.85	\$685	94.1	\$6,650
Total	357.1	\$25,125	91.55	\$3,185	201.6	\$26,480	262.8	\$26,350

Fire Year	1999		2000		2001		Acres Total	Damages Total
County	Total	Total	Total	Total	Total	Total		

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	Acres	Damage	Acres	Damage	Acres	Damage		
Chesterfield	42.5	\$3,400	27.5	\$1,675	56.4	\$4,700	360	\$15,280
Dinwiddie	72.4	\$17,200	30.6	\$0	100.9	\$52,500	271.95	\$84,000
Greensville	15	\$400	5.6	\$2,500	71.35	\$4,800	133.95	\$25,475
Prince George	77	\$1,500	1.4	\$3,190	29.1	\$1,500	320.1	\$17,640
Surry	12.2	\$11,350	1.1	\$500	9	\$1,000	104.1	\$17,350
Sussex	153.7	\$15,675	39	\$0	267.7	\$34,150	735.4	\$75,645
Grand Total	372.8	\$49,525	105.2	\$7,865	534.45	\$98,650	1925.5	\$235,390

Table V-28. Wildfire Causes 1995-2001 (from VDOF).

County	Lightning	Campfire	Smoking	Debris	Incend.	Equip. Use	R/R	Children	Misc.	Grand Total
Chesterfield	1	3	14	44	23	3	2	58	17	165
Dinwiddie		2	3	36	6	5	8	8	26	94
Greensville	5		3	19	9	6	1	3	7	53
Prince George	3		5	28	6	1		8	14	65
Surry	2	1	4	20	1	3		2	5	38
Sussex	11	2	10	22	13	7	3	2	22	92
Total	22	8	39	169	58	25	14	81	91	507

Hazard Profile

Wildfire is a unique hazard in that it can be significantly altered based on efforts to control its course during the event. VDOF indicates that there are three principle factors that can lead to the formation of wildfire hazards: topography, fuel, and weather. The environmental conditions that exist during fire season exacerbate the hazard. When relative humidity is low and high winds are coupled with a dry forest floor (brush, grasses, leaf litter), wildfires may easily ignite. Years of drought can lead to environmental conditions that promote wildfires. Accidental or intentional setting of fires by humans is the largest contributor to

wildfires. Residential areas or “woodland communities” that expand into wildland areas also increase the risk of wildfire threats.

Fire Seasons

Spring (March and April) and fall (October and November) are the two seasons when wildfires are most likely to occur.

Secondary Effects

Secondary effects from wildfires can pose a significant threat to the communities surrounding the hazard. During a wildfire, the removal of groundcover that serves to stabilize soil can lead to hazards such as landslides, mudslides, and flooding. In addition, the leftover scorched and barren land may take years to recover and the resulting erosion can be problematic and extensive.

Hazard Areas

Figure V-18 shows the wildfire hazard map developed by VDOF. In 2002 and 2003, VDOF examined which factors influence the occurrence and advancement of wildfires and how these factors could be represented in a GIS model. VDOF determined that historical fire incidents, land cover (fuels surrogate), topographic characteristics, population density, and distance to roads were critical variables in a wildfire risk analysis. The resulting high, medium, and low risk category reflect the results of this analysis.

Vulnerability Analysis

VDOF defines "woodland home communities as “clusters of homes located along forested areas at the wildland-urban interface that could possibly be damaged during a nearby wildfire incident.”ⁱⁱⁱ Table V-29 illustrates the number of woodland communities while Table V-30 illustrates the number of homes in woodland communities, as designated by Virginia Department of Forestry. In the Crater region, 47% of Crater PDC woodland communities are in a high risk zone, while 35% of the woodland homes are considered at high risk. As can be seen in Table V-29 and V-30 and Figure V-18, both Chesterfield County and Prince George County have a considerable number of communities and homes at high risk to wildfire.

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Table V-29. Number of Woodland Communities by Fire Rank

County	Low Potential	Medium Potential	High Potential	Grand Total	% High Risk
Chesterfield	82	140	190	412	46%
Dinwiddie	2	5	6	13	46%
Greensville	6	5	2	13	15%
Prince George	8	9	26	43	60%
Surry	0	0	2	2	100%
Sussex	0	0	1	1	100%
Total	98	159	227	484	47%

Table V-30. Number of Woodland Homes by Fire Rank

County	Low Potential	Medium Potential	High Potential	Grand Total	% High Risk
Chesterfield	20,697	27,146	25,217	73,060	35%
Dinwiddie	166	144	378	688	55%
Greensville	325	149	76	550	14%
Prince George	1,035	303	1,543	2,881	54%
Surry	0	0	36	36	100%
Sussex	0	0	43	43	100%
Total	22,223	27,742	27,293	77,258	35%

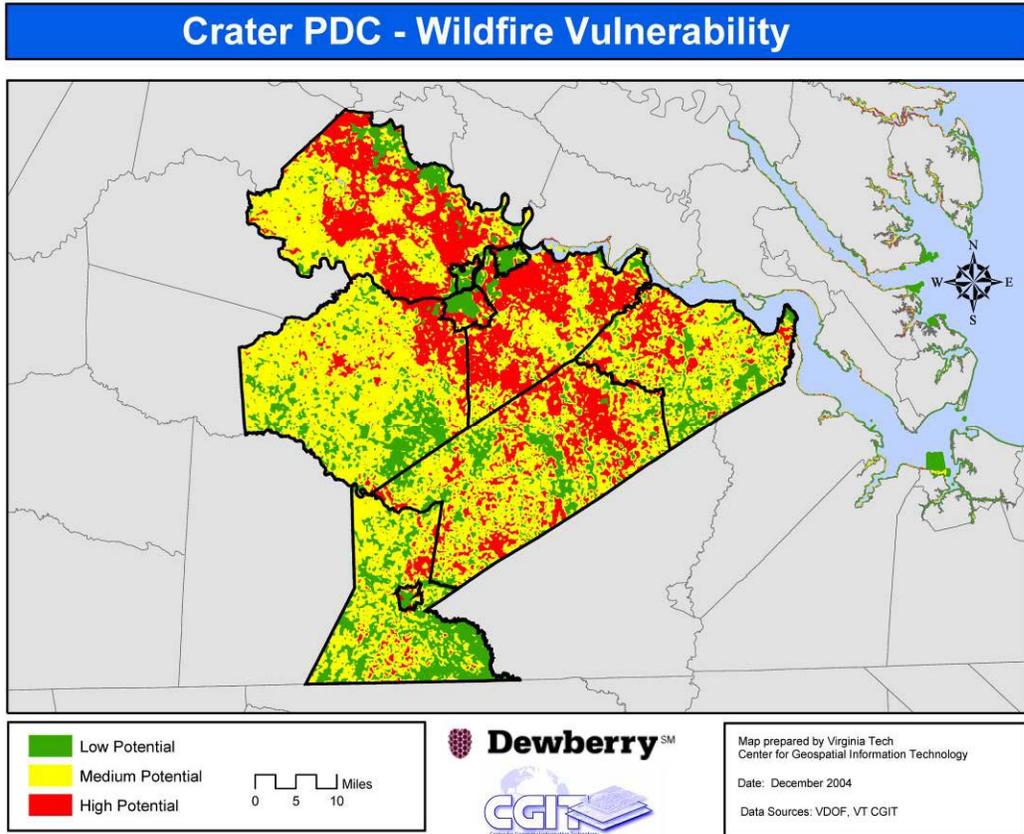


Figure V-18. Wildfire Vulnerability (from VDOF)

Structures at Risk

Table V-31 shows the percentages of critical facilities in fire risk zones, with 12% in the high risk category. Figure V-19 shows locations of critical facilities in relation to fire risk zones.

Crater PDC - Wildfire Vulnerability & Critical Facilities

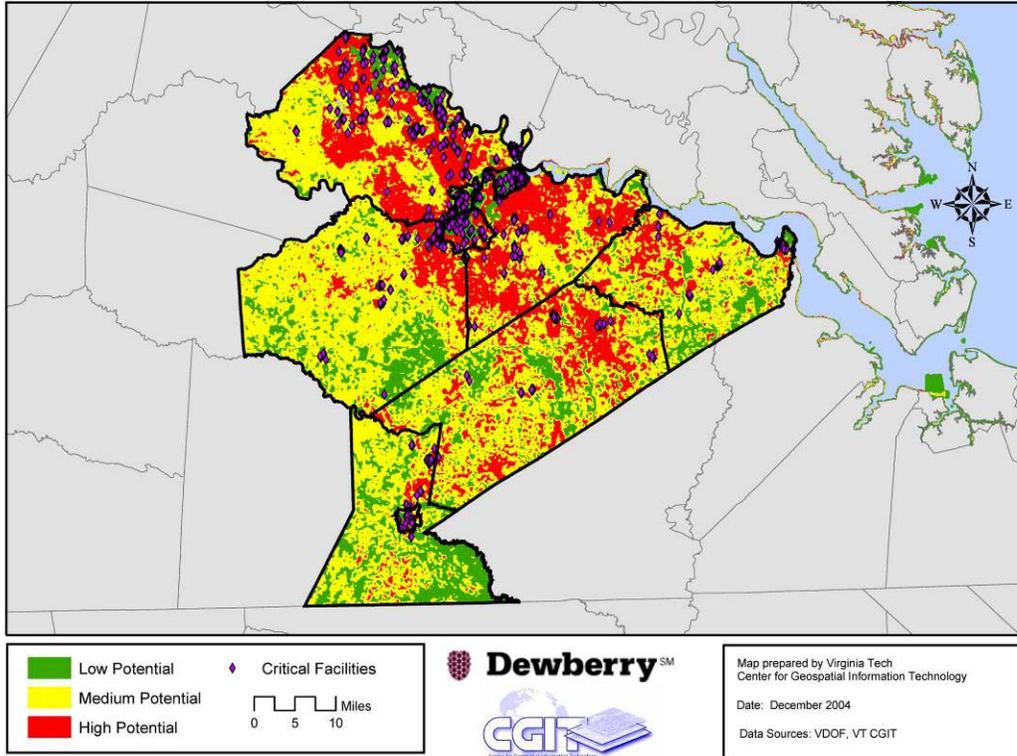


Figure V-19. Wildfire Vulnerability and Critical Facilities (from VDDOF)

Table V-31. Number of Critical Facilities by Fire Rank					
County	Low Potential	Medium Potential	High Potential	Grand Total	% High Risk
Chesterfield	865	496	186	1,547	12%
Colonial Heights	26	8	0	34	0%
Dinwiddie	51	158	118	327	36%
Emporia	19	14	1	34	3%
Greensville	57	49	11	117	9%
Hopewell	431	32	3	466	1%
Petersburg	61	86	13	160	8%

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Table V-31. Number of Critical Facilities by Fire Rank

County	Low Potential	Medium Potential	High Potential	Grand Total	% High Risk
Prince George	98	159	27	284	10%
Surry	186	96	5	287	2%
Sussex	43	47	36	126	29%
Total	1,837	1,145	400	3,382	12%

Section VI. Capability Assessment

Introduction

This portion of the Plan assesses the current capacity of the communities of the Crater Planning District's to mitigate the effects of the natural hazards identified in Section V of the plan. This assessment includes a comprehensive examination of the following local government capabilities:

- ❖ *Staff and Organizational Capability*
- ❖ *Technical Capability*
- ❖ *Fiscal Capability*
- ❖ *Policy and Program Capability*
- ❖ *Legal Authority*
- ❖ *Political Capability*

The purpose of conducting the capability assessment is to identify potential hazard mitigation opportunities available to the Crater Planning District's local governments, specifically

<u>Counties</u>	<u>Cities</u>	<u>Towns</u>
❖ Chesterfield County	❖ Colonial Heights	❖ Claremont
❖ Dinwiddie County	❖ Emporia	❖ Dendron
❖ Greensville County	❖ Hopewell	❖ Jarratt
❖ Prince George County	❖ Petersburg	❖ McKenney
❖ Surry County		❖ Stony Creek
❖ Sussex County		❖ Surry
		❖ Wakefield
		❖ Waverly

Careful analysis should detect any existing gaps, shortfalls, or weaknesses within existing governmental activities that could exacerbate a community's vulnerability. The assessment also will highlight the positive measures already in place or being completed at the local level, which should continue to be supported and enhanced, if possible, through future mitigation efforts.

The capabilities assessment serves as the foundation for designing an effective hazard mitigation strategy. It not only helps establish the goals and objectives for the Planning District to pursue under this Plan, but assures that those goals and objectives are realistically achievable under given local conditions.

Technical, Fiscal, and Administrative Capabilities

Staff and Organizational Capability

As described previously, the planning area is comprised of six counties (which include eight towns) and four cities. Counties and cities in Virginia are independent entities and do not share any governmental responsibilities. Counties, however, may provide services for residents in incorporated towns within the county.

The counties operate under a Board of Supervisors - County Administrator/Manager system. In this form of government, the elected board of supervisors hires a county administrator who oversees daily operations of the county. Within the planning area, the size of the Board of Supervisors varies from jurisdiction to jurisdiction. Greenville has the smallest board with four members and the remaining counties have six-member Boards of Supervisors.

The incorporated towns must have an elected governing body. Towns have zoning and planning authority though they may choose to use the county planning commission as their town planning commission. Towns have the ability to issue general obligation and revenue bonds. In addition, towns of over 5,000 may appoint an emergency services director and exercise emergency powers separate from the county.

The cities in the planning area operate under the City Council – City Manager system. The city council is an elected body. Emporia has an eight-member council and the other cities have seven member councils. The council, in turn, appoints a city manager who acts as the city's chief executive officer.

Under the County Administrator or City Manager, each jurisdiction has numerous departments and boards that are responsible for the various functions of local government.

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The following table highlights the departments in each jurisdiction that could facilitate the implementation of this hazard mitigation plan.

Table VI-1. Key Departments	
<i>Jurisdiction</i>	<i>Departments</i>
<i>Chesterfield County</i>	<ul style="list-style-type: none"> • Fire Administration
<i>Colonial Heights</i>	<ul style="list-style-type: none"> • Building Inspections • Fire and EMS • Planning & Community Development • Public Works • Recreation and Parks
<i>Dinwiddie County</i>	<ul style="list-style-type: none"> • Building Permits • Code Enforcement • Economic Development • Parks & Recreation • Planning and Zoning • Public Safety / EMS / Emergency Services
<i>Emporia</i>	<ul style="list-style-type: none"> • Building Official • Code Enforcement • Emergency Services • Facilities Management • Fire Chief • Public Utilities • Public Works • Zoning Administrator
<i>Greensville County</i>	<ul style="list-style-type: none"> • Administration • Building Department • Emergency Services • Planning Department
<i>Hopewell</i>	<ul style="list-style-type: none"> • Administration • Development • Fire • Public Information • Public Works
<i>Petersburg</i>	<ul style="list-style-type: none"> • Economic Development • Fire, Rescue and Emergency Services • Planning • Public Works
<i>Prince George County</i>	<ul style="list-style-type: none"> • Administration • Building Officials Office • Economic Development • Parks and Recreation

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	<ul style="list-style-type: none"> • Planning Office
<i>Surry County</i>	<ul style="list-style-type: none"> • Administration • Building Inspections • Emergency Management • Parks & Recreation • Planning & Community Development
<i>Sussex County</i>	<ul style="list-style-type: none"> • Administration • Building Inspections • Planning

In Table VI-1, the bolded departments are represented on the Mitigation Advisory Committee. These representatives have been involved in the development of this mitigation plan in order to identify gaps, weaknesses or opportunities for enhancement with existing mitigation programs.

Representatives of these departments have been involved in the development of this mitigation plan in order to identify gaps, weaknesses or opportunities for enhancement in existing mitigation programs. Although exact responsibilities differ from jurisdiction to jurisdiction, the general duties of the departments highlighted in Table VI-1 are described below.

The Building Inspections office or department enforces the Virginia Uniform Statewide Building Code (VUSBC). This code includes implications for floodplain management.

Community Development departments are typically responsible for managing grant programs funded by the U.S. Department of Housing and Urban Development. These grant programs include the Community Development Block Grant Program and the HOME Program. Community Development departments also may develop residential and commercial revitalization plans for older areas, serve as a resource on housing and community development issues and undertake special redevelopment projects.

Economic Development departments concentrate on ensuring the growth and prosperity of existing businesses. These departments often administer small business loan programs, state economic development programs, and workforce training programs. They also may recruit new businesses.

The Department of Emergency Management is responsible for the mitigation, preparedness, response and recovery operations that deal with both natural and man-made disaster events. The Department of Public Safety encompasses building inspections, emergency management, and fire safety. Fire/EMS departments provide medical aid and fire suppression at the scene

of accidents and emergencies. These departments are often responsible for responding to hazardous materials incidents.

Parks and Recreation departments may be responsible for open space programs. If acquisition projects are undertaken, coordination with this department becomes critical.

The Planning Department (or Department of Development) addresses land use planning. This department, depending on the jurisdiction, may enforce the National Flood Insurance Program requirements and other applicable local codes.

In some jurisdictions, the Public Utilities department oversees community water facilities or natural gas provision. In others, the Public Works Department oversees the maintenance of infrastructure including roadways, sewer and stormwater facilities, and the community's water treatment facilities. This department also may review new development plans, ensure compliance with Chesapeake Bay Protection and other environmental regulations, and work with VDOT on road issues. Depending on the jurisdiction, the Department of Public Works may enforce the National Flood Insurance Program requirements.

For the most part, it was determined that the departments are adequately staffed, trained, and funded to accomplish their missions.

Mitigation cuts across disciplines. For a successful mitigation program, it is necessary to have a broad range of people involved with diverse backgrounds. These people include planners, engineers, building inspectors, zoning administrators, floodplain managers, and people familiar with Geographic Information Systems (GIS). It is also important that mitigation be assigned a specific responsibility to a department or person. Table VI-2 provides information on each jurisdiction's staff and organizational capabilities.

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Table VI-2. Staff and Organizational Capability

Jurisdiction	Mitigation assigned to specific department?	Intergovernmental cooperation?	Adequate zoning staff?	Floodplain management staff	Building inspectors	Fire inspectors	Overall administrative capabilities
<i>Chesterfield County</i>	Environmental engineering Planning Building inspections	Yes	Yes	18	35	15	Moderate
<i>Colonial Heights</i>	Engineering Public works Fire department Building official	Yes	Yes	1	3	1	Moderate
<i>Dinwiddie County</i>	No	Yes	No	Unknown	3	1	Moderate
<i>Emporia</i>	Emergency management	Yes	No	No	2	0*	Moderate
<i>Greensville County</i>	No	Yes	No	Yes	2	1	Moderate
<i>Hopewell</i>	Development	Yes	No	Yes	2	1	Moderate
<i>Petersburg</i>	No	Moderate	Yes	No	4	4	Moderate
<i>Prince George County</i>	No	Yes	No	No	6	0	Low
<i>Surry County</i>	Emergency Services Planning and Development	Yes	Yes	Yes	1	1	High
<i>Sussex County</i>	Public safety Planning and zoning	Yes	No	No	2	1	Low

Technical Capability

Technical capability, in this plan, refers to the technology available to the jurisdictions to support mitigation programs and projects. A Geographic Information System (GIS) is critical in identifying potential vulnerable areas and for managing spatial information. Internet sites can be a powerful way to communicate with community members. Public education is an important element of a successful mitigation program.

GIS systems can best be described as a set of tools (hardware, software and people) used to collect, manage, analyze and display spatially-referenced data. Many local governments are now incorporating GIS systems into their existing planning and management operations. GIS is invaluable in identifying areas vulnerable to hazards. Access to the Internet can facilitate plan development, public outreach, and project implementation.

Table VI-3 summarizes the technical capabilities of the jurisdictions.

Table VI-3. Technical Capabilities			
Jurisdiction	GIS capabilities	Website	Overall technical capabilities
<i>Chesterfield County</i>	Yes	Yes	Moderate
<i>Colonial Heights</i>	No	Yes	Low
<i>Dinwiddie County</i>	Yes	Yes	Low
<i>Emporia</i>	No	Yes	Low
<i>Greensville County</i>	Yes	Yes	Moderate
<i>Hopewell</i>	Yes	Yes	High
<i>Petersburg</i>	Yes	Yes	Moderate
<i>Prince George County</i>	Yes	Yes	Low
<i>Surry County</i>	Yes	Yes	Moderate
<i>Sussex County</i>	No	Yes	Low

Most of the jurisdictions have GIS capabilities. All of the jurisdictions have government websites that could be utilized to promote hazard mitigation. Interestingly, five of the communities assess themselves as having low technical capabilities.

Chesterfield County was acknowledged in the Governor's Post-Hurricane Isabel report as one of only two counties to have reported using GIS in a post-disaster environment. Chesterfield County used power outage information from Virginia Power and cross-referenced this with information on the County's utility system. By doing this, the County was able to identify where people with private wells and no power were located. The fire department was then able to prioritize delivery of drinking water to these homes. The County also used their GIS system to link damage assessment photos with parcel information.¹

In addition, Prince George County used GIS after Hurricane Isabel to track damage assessment information. They provided this information to the state and FEMA, which quickened their ability to receive aid.

Fiscal Capability

The local jurisdictions in the planning area receive most of their revenue through state and local sales tax, local services, and through restricted intergovernmental contributions (federal and state pass through dollars). It is unlikely that any of the communities could easily afford to provide the local match for the existing hazard mitigation grant programs. This is a significant and growing concern considering the current budget deficits at both the state and local government level in Virginia, combined with the apparent increased reliance on local accountability by the federal government.

Under DMA 2000, FEMA has made special accommodations for "small and impoverished communities," who will be eligible for a 90% federal share, 10% non-Federal cost share for projects funded through the Pre-Disaster Mitigation (PDM) grant program. The definition is restricted to "communities of 3,000 or fewer individuals that is identified by the State as a rural community." According to the current Interim Final Rule for Section 322 of the Act, none of the counties and cities in the planning area will qualify as a small and impoverished community.

The counties and cities in the planning area were asked to identify if funding was available for mitigation and assess the overall fiscal capabilities of the jurisdiction. As can be seen in

¹ Stipek, Larry. "The Role of GIS in Hurricane Isabel." *Virginia Review*. March/April 2004.

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Table VI-4, four jurisdictions responded that funding was available for mitigation. Overall, only three jurisdictions believed that their overall fiscal capabilities were above the level of “low”.

Table VI-4. Fiscal Capability by Jurisdiction		
Jurisdiction	Funding for mitigation available?	Overall fiscal capabilities
<i>Chesterfield County</i>	Yes	Moderate
<i>Colonial Heights</i>	Limited	Low
<i>Dinwiddie County</i>	No	Low to moderate
<i>Emporia</i>	No	Moderate
<i>Greensville County</i>	No	Low
<i>Hopewell</i>	Yes	Low
<i>Petersburg</i>	Limited	Moderate
<i>Prince George County</i>	No	Low
<i>Surry County</i>	No	Low
<i>Sussex County</i>	No	Low

Past participation in federal funding programs may mean that jurisdictions have the capacity to undertake the grant matching requirements, the capability to seek and administer federal grants, and familiarity with the grant process and requirements. A lack of participation, however, does not mean communities cannot or will not seek or receive future funding. As seen in Table VI-5, only one jurisdiction in the planning area had received Hazard Mitigation Grant Program (HMGP) funds in the past, while none have received Flood Mitigation Assistance (FMA) grants. Six jurisdictions have received Emergency Management Performance Grants (EMPG). Four communities have received grants from or participated in projects with the U.S. Army Corps of Engineers (US COE).

Table VI-5. Participation in Federal Funding Programs				
Jurisdiction	EMPG	HMGP	FMA	US COE
<i>Chesterfield County</i>	Yes	No	No	No

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Table VI-5. Participation in Federal Funding Programs

Jurisdiction	EMPG	HMGP	FMA	US COE
<i>Colonial Heights</i>	Yes	Yes	—	Yes (study)
<i>Dinwiddie County</i>	No	No	No	Yes
<i>Emporia</i>	Yes	No	No	No
<i>Greensville County</i>	No	No	No	No
<i>Hopewell</i>	Yes	No	No	No
<i>Petersburg</i>	No	No	No	Yes (dredging)
<i>Prince George County</i>	Yes	No	No	Yes (wetlands impact)
<i>Surry County</i>	Yes	No	No	No
<i>Sussex County</i>	No	No	No	N/A

Policy and Program Capability

Emergency Operations Plan

A comprehensive Emergency Operations Plan (EOP) typically predetermines actions to be taken by government agencies and private organizations in response to an emergency or disaster event. The plan describes the jurisdiction’s capabilities to respond to emergencies and establishes the responsibilities and procedures for responding effectively to the actual occurrence of a disaster. Hazard mitigation is incorporated into the various operational phases. For instance, Chesterfield County Emergency Operations Plan includes the following bullet as part of the normal operations activities: “Define and encourage hazard mitigation activities which will reduce the probability of the occurrence of a disaster and/or reduce its effects.”

Hazard mitigation is included as a functional annex to the Emergency Operations Plans developed by the participating jurisdictions. Generally, the annex describes the responsibilities of various departments and agencies, private businesses, and the public. The annex outlines a concept of operations that explains what activities will be undertaken before and after a disaster. Specific tasks are assigned to the Board of Supervisors/City Council (or other local governing body), Department of Emergency Services, Department of Health, Building Officials/County Engineer/Planning and Zoning, Law Enforcement, Fire

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Department and Emergency Crew, Superintendent of Schools, and Public Information Officer.

Many of the mitigation annexes do not provide specific detail on risk or vulnerability nor do they provide information about mitigation projects. Some jurisdictions, such as the City of Colonial Heights, include a qualitative assessment of the risk from various hazards (similar to the hazard identification and ranking process used in this plan).

Chesterfield County includes a disaster recovery plan as part of its Emergency Operations Plan. Although hazard mitigation is not specifically included in the plan, some of the included actions can be seen as mitigation. For instance, Economic Development is tasked with assisting businesses and industry with pre-disaster planning. Mitigation should be included as a concept to consider when returning services and the community to pre-disaster conditions.

Floodplain Management

Communities that regulate development in floodplains are able participate in the National Flood Insurance Program (NFIP). In return, the NFIP makes federally-backed flood insurance policies available for properties in the community. Table VI-6 shows when each of the jurisdictions began participating in NFIP. The table also provides the date of the Flood Insurance Rate Map (FIRM) in effect in each community. These maps were developed by FEMA or its predecessor and show the boundaries of the 100 year and 500 year flood. As the table shows, ten of the thirteen FIRMs in effect in the planning area are over fifteen years old, and eight are over twenty years old. Much of the planning area has experienced dramatic growth over the past two decades that is not reflected in the FIRM. This difference may mean that the actual floodplain varies from that depicted on the map.

Table VI-6. NFIP Entry and FIRM Date			
<i>Jurisdiction</i>	<i>Entry into NFIP</i>	<i>Date of Current FIRM</i>	<i>Stand alone or part of zoning ordinance?</i>
<i>Chesterfield County</i>	3/16/1983	5/2/1994	Zoning
<i>City of Colonial Heights</i>	9/2/1981	10/18/1988	Stand alone
<i>Dinwiddie County</i>	1/17/1979	1/17/1979	Stand alone
<i>Town of McKenney</i>	11/20/1981	NSFHA	-

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<i>City of Emporia</i>	9/30/1977	2/2/1989	Zoning
<i>Greensville County</i>	9/29/1978	9/29/1978	Zoning
<i>Town of Jarratt</i>	10/8/1982	10/8/1982	-
<i>City of Hopewell</i>	9/5/1979	9/5/1979	Zoning
<i>City of Petersburg</i>	3/16/1981	3/16/1981	Stand alone
<i>Prince George County</i>	5/1/1980	5/1/1980	Zoning
<i>Surry County</i>	11/2/1990	11/2/1990	Zoning
<i>Town of Claremont</i>	10/16/1990	11/2/1990	-
<i>Sussex County</i>	3/2/1983	3/2/1983	Zoning
<i>Town of Stony Creek</i>	9/16/1982	9/16/1982	-

Virginia State statutes provide cities and counties the land use authority. In particular, issues such as floodwater control, are empowered through §15.2-2223 and §15.2-2280. All of the jurisdictions in the planning area have adopted a local floodplain ordinance as a requirement of participation in the National Flood Insurance Program. Table VI-5 shows if the community has adopted a stand alone ordinance or if it has incorporated floodplain regulations into its zoning ordinance.

The Community Rating System (CRS) was implemented in 1990 as a program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. Residents of communities that participate in CRS receive a reduction in the flood insurance premium. There are ten CRS classes: class 1 requires the most credit points and gives the largest premium reduction; class 10 receives no premium reduction. None of the jurisdictions in this hazard mitigation plan are members of the CRS.

One of the CRS requirements is a community floodplain management plan. The Crater hazard mitigation plan is intended to fulfill the CRS planning requirement should the planning jurisdictions decide to enter the CRS.

Comprehensive Plan

A community's comprehensive plan provides the future vision for the community regarding growth and development. Hazard mitigation planning is not specifically addressed as a goal or objective in any of the comprehensive plans in the study area. Only one comprehensive plan includes a hazard mitigation strategy. However, many of the plans include land use or

environmental protection goals that could support future mitigation efforts. These goals generally address flood-prone areas. There also may be opportunities to include hazard mitigation in revisions to the comprehensive plans and to link to existing goals. For example, limiting development in the floodplain (which can be considered mitigation) also may help meet open space goals laid out in a plan.

Appendix D provides excerpts and greater detail on each jurisdiction's comprehensive plan. Table VI-7 presents a summary of the various plans used by the jurisdictions in the planning area and a self-evaluation of how the plans support hazard mitigation.

Chesterfield County

Chesterfield County's comprehensive plan consists of thirteen small area plans, five corridor plans, and various other special plans including bikeway and waterfront plans. The overall plan calls for growth to follow an orderly pattern while promoting the conservation of natural resources. The plan also recognizes the need to preserve the quality of the waterways within the County.

The review of the components of the Chesterfield County Comprehensive Plan focused on the four major planning areas: Southern and Western, Central, Northern, and Consolidated Eastern. The Northern and the Eastern Area Plans explicitly include provisions related to development in the floodplain but the other two area plans do not. Though the Appomattox River creates the southern boundary of the County, the small area plan for that portion of the County does not address flood concerns. A number of provisions do address water quality and visual access.

The waterfront plan does not address floodplains specifically but it does contain an environmental protection goal and a public access goal. Consideration should be given to including floodplains specifically in a revision to the plan. In addition, open space acquisition/public access creation could be coordinated with floodplain acquisition thereby achieving multiple objectives.

Colonial Heights

The comprehensive plan for the City of Colonial Heights has an extensive set of goals, objectives and strategies related to environmental protection. In particular, the plan calls for future land use to reflect the physical limitations of the land. Growth should be directed away from floodplains, steep topography and other sensitive areas. The plan also suggests that Resource Conservation Districts be created along all river, creek and lake shorelines. Uses would be strictly limited within these districts. In addition, the plan recommends the use of cluster developments to encourage protection of environmental features.

Dinwiddie County

The Dinwiddie County Comprehensive Plan opens with several policy statements that address safe environs and environmental protection. These statements can be interpreted to support hazard mitigation, the purpose of which is to decrease the impact of natural hazards (therefore making a safer community) and it is often achieved by protecting floodplains and other natural features.

Several goals and objectives in the Dinwiddie County Comprehensive Plan could be seen as supporting hazard mitigation. In particular, Open Space Objective 3a calls for protecting and conserving natural features including the floodplain. Another example is Environment Objective B, “assure that new development minimizes adverse impacts on the natural and/or build environment.”

Sound land use practices are fundamental to hazard mitigation. The Dinwiddie Comprehensive plan calls for the County to implement sound land use and development practices. In addition, the plan suggests that the Planning Department be expanded to more effectively address planning needs.

Emporia

The Comprehensive Plan for the City of Emporia contains few provisions that can be interpreted as supporting hazard mitigation. The plan does call for an optimal pattern of open space. Open space and acquisition of hazard-prone areas often can be coordinated and mutually supportive. In addition, the plan suggests that overhead utilities be buried. While this suggestion is made for aesthetic reasons, underground placement of utilities reduces their vulnerability to wind events.

Greensville County

Greensville County specifically addresses flooding in its comprehensive plan. One objective identified in the Soils and Environmental Issues section states that buildings within the 100-year floodplain should not be used for purposes that would be damaged if the building were flooded. The plan calls for severe limitations to be placed on uses within the floodplain. In addition, the plan calls for residential growth to occur in areas best suited to accommodate it with public services. This could be expanded to address natural hazards. The plan also contains policies regarding substandard housing stock.

Hopewell

The physical constraints placed on development by the land are recognized in the City of Hopewell’s Comprehensive Land Use Plan. The plan calls for future development to

consider the physical nature of the topography within the City. Floodplains are protected primarily through the Chesapeake Bay Preservation Resource Management Area.

Petersburg

One recommendation in the Petersburg Comprehensive Plan 2000 is to rezone the area along the Appomattox River as a conservation district, which would limit the intensity of use along the river and provide a riparian buffer. The plan recognizes the need to protect the natural resources of the City. One objective calls for mitigating the effect of stormwater on developed properties. In addition, the plan suggests that an acquisition program for flood-prone structures be created.

Prince George County

The Comprehensive Plan of Prince George County specifically states that development should be discouraged in flood hazard areas. In addition, the plan calls for the value of open space to be maximized by planning for multiple objectives, such as recreation and environmental protection. Specifically, the plan suggests that floodplains be used as natural conservation areas.

Surry County

A balanced land development pattern is the primary goal of the proposed Surry County Comprehensive Plan. The plan encourages the preservation of flood plains and other sensitive areas. A purchase of development rights program is proposed as one means to preserve such areas. In addition, the plan states that land use development should result in the best possible environmental impact.

Sussex County

The Sussex County Comprehensive Plan recommends that a comprehensive planning process be developed to logically and consistently guide growth in the County. As with the other plans in the Crater region, the goals in the plan that most directly relate to hazard mitigation address flooding. The plan calls for reserving flood hazard areas for relatively low impact uses such as open space, forest, water and agricultural uses.

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Table VI-7. Plan Effectiveness and Adoption Date

Jurisdiction	Haz Mit Plan	Disaster Recovery Plan	Comp. Plan	Floodplain Management Plan	Stormwater Management Plan	EOP	Other
<i>Chesterfield County</i>	N/A	Low – 2000	N/A	High – 1983	N/A ²	1988	COOP, 2003 Evacuation plan Transportation Plan, 1989 Wetlands preservation program Open space program Riparian buffers
<i>Colonial Heights</i>	Yes ³	High ⁴	1997	High – 1988	Yes	2004 ⁵	Historic preservation ordinance Chesapeake Bay Preservation program (wetlands)
<i>Dinwiddie County</i>	N/A	Moderate - 1995	Low - 2003	No	No	1995	
<i>Emporia</i>	Yes ⁶	No	Yes - 1990	No	No	2004	Transportation plan, 1984

2 Will be adopting state plan

3 Annex to EOP

4 Annex to EOP

5 Includes COOP and evacuation

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Table VI-7. Plan Effectiveness and Adoption Date

Jurisdiction	Haz Mit Plan	Disaster Recovery Plan	Comp. Plan	Floodplain Management Plan	Stormwater Management Plan	EOP	Other
<i>Greensville County</i>	N/A	Low – 2003	Low	No	No	20037	Erosion control and sediment ordinance
<i>Hopewell</i>	Yes	High – 2001	Low	No ⁸	Yes – 2002	2001	COOP, 2001 Evacuation plan
<i>Petersburg</i>	N/A	No	Yes	No	Yes	19999	Transportation Plan Chesapeake Bay Preservation ordinance Riparian buffers Open space program and plan
<i>Prince George County</i>	Yes - 2002 ¹⁰	Yes - 2002 ¹¹	High	High – 1992	Moderate	2002 ¹²	Chesapeake Bay preservation program Riparian buffers

6 Annex to EOP

7 Includes evacuation

8 Addressed in EOP

9 Includes recovery information

10 Part of EOP

11 Part of EOP

12 Includes COOP, evacuation, and transportation

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Table VI-7. Plan Effectiveness and Adoption Date

Jurisdiction	Haz Mit Plan	Disaster Recovery Plan	Comp. Plan	Floodplain Management Plan	Stormwater Management Plan	EOP	Other
<i>Surry County</i>	No	No	Yes	Yes	No	1992	Chesapeake Bay preservation program Evacuation plan
<i>Sussex County</i>	No	No	High	High – 1992	No	1997	Evacuation plan Transportation plan, 1997
Yes = Plan exists, no assessment of relationship to hazard mitigation No = No plan exists			Assessment provided by community: High = Specifically includes hazard mitigation Medium = Elements could be used to support hazard mitigation Low = No mention of hazard mitigation. Does not contain elements that would support hazard mitigation or includes elements that would hinder hazard mitigation				

Legal Authority

Local governments in Virginia have a wide range of tools available to them for implementing mitigation programs, policies and actions. A hazard mitigation program can utilize any or all of the four broad types of government powers granted by the State of Virginia, which are: (a) regulation, (b) acquisition, (c) taxation, and (d) spending. The scope of this local authority is subject to constraints; however, as all of Virginia's political subdivisions must not act without proper delegation from the state. All power is vested in the state and can only be exercised by local governments to the extent it is delegated. Thus, this portion of the capabilities assessment will summarize Virginia's enabling legislation which grants the four types of government powers listed above within the context of available hazard mitigation tools and techniques.

Regulation

General Police Power

Virginia local governments have been granted broad regulatory powers in their jurisdictions. Virginia State Statutes bestow the general police power on local governments, allowing them to enact and enforce ordinances which define, prohibit, regulate or abate acts, omissions, or conditions detrimental to the health, safety, and welfare of the people, and to define and abate nuisances (including public health nuisances). Since hazard mitigation can be included under the police power (as protection of public health, safety and welfare), towns, cities and counties may include requirements for hazard mitigation in local ordinances. Local governments also may use their ordinance-making power to abate "nuisances," which could include, by local definition, any activity or condition making people or property more vulnerable to any hazard.

All of the jurisdictions in the planning area have enacted and enforce regulatory ordinances designed to promote the public health, safety, and general welfare of its citizenry. Appendix D provides excerpts and greater detail on each jurisdiction's relevant ordinances including zoning, subdivision, and floodplain management ordinances.

Land Use

Regulatory powers granted by the state to local governments are the most basic manner in which a local government can control the use of land within its jurisdiction. Through various land use regulatory powers, a local government can control the amount, timing, density, quality, and location of new development. All these characteristics of growth can determine the level of vulnerability of the community in the event of a natural hazard. Land use regulatory powers include the power to engage in planning, enact and enforce zoning

ordinances, floodplain ordinances, and subdivision controls. Each local community possesses great power to prevent unsuitable development in hazard-prone areas.

Planning

According to State Statutes, local governments in Virginia may create or designate a planning agency. The planning agency may perform a number of duties, including:

- ❖ Make studies of the area;
- ❖ Determine objectives;
- ❖ Prepare and adopt plans for achieving those objectives;
- ❖ Develop and recommend policies, ordinances, and administrative means to implement plans; and
- ❖ Perform other related duties.

The importance of the planning powers of local governments is illustrated by the requirement that zoning regulations be made in accordance with a comprehensive plan. While the ordinance itself may provide evidence that zoning is being conducted “in accordance with a plan,” the existence of a separate planning document ensures that the government is developing regulations and ordinances that are consistent with the overall goals of the community. All but one of the jurisdictions (City of Emporia) within the planning area have planning departments and comprehensive plans.

Zoning

Zoning is the traditional and most common tool available to local governments to control the use of land. Broad enabling authority is granted for municipalities and counties in Virginia to engage in zoning. Land “uses” controlled by zoning include the type of use (e.g., residential, commercial, and industrial) as well as minimum specifications that control height and bulk such as lot size, building height and set backs, and density of population. Local governments are authorized to divide their territorial jurisdiction into districts, and to regulate and restrict the erection, construction, reconstruction, alteration, repair or use of buildings, structures, or land within those districts. Districts may include general use districts, overlay districts, and special use or conditional use districts. Zoning ordinances consist of maps and written text.

Chesterfield and Greensville Counties and the City of Emporia implement their floodplain regulations via the zoning ordinance. An overlay district is used to impose additional requirements on properties within the designated floodplain area.

Subdivision Regulations

Subdivision regulations control the division of land into parcels for the purpose of building development or sale. Flood-related subdivision controls typically require that sub-dividers install adequate drainage facilities and design water and sewer systems to minimize flood damage and contamination. They also may prohibit the subdivision of land subject to flooding unless flood hazards are overcome through filling or other measures, and they prohibit filling of floodway areas.

Most of the jurisdictions in the study area have adopted a subdivision ordinance. The majority of the ordinances require that land be suited for development, and specifically that land platted for residential use not be subject to flooding. The City of Emporia and Surry County require that utilities be buried underground. Greenville and Sussex Counties and the City of Emporia require stormwater management or flood control plans.

Floodplain Regulation

All of the communities in the study area have adopted floodplain regulations that meet the minimum requirements of the National Flood Insurance Program. Seven communities have chosen to implement the floodplain ordinance as a zoning district (regular or overlay).

Six of the jurisdictions delineate allowable uses in the floodplain. All but Sussex County set design criteria for utilities and other public infrastructure. Seven of the ordinances describe procedures for structures built before the regulations were in place.

Most of the jurisdictions include restrictions on manufactured home parks. These restrictions include the need for manufactured homes to be elevated and/or anchored to a permanent foundation. Chesterfield County prohibits new manufactured home parks while Greenville County prohibits new manufactured homes unless located in an existing park.

Other Ordinances

Virginia also is a signatory to the Chesapeake Bay Agreement, a unique regional partnership aimed at restoration of the Chesapeake Bay. Communities in certain parts of the state are required to implement local land use controls to minimize runoff and other adverse impacts to the water quality of the Bay. Six of the ten jurisdictions in the study area are considered part of the Tidewater area and therefore are required to have a local Bay Act program. These jurisdictions are Chesterfield, Prince George and Surry Counties and the Cities of Colonial Heights, Hopewell, and Petersburg.

A local Bay Act program has two phases: Phase I elements include the designation of local Chesapeake Bay Preservation Areas (including Resource Protection Areas and Resource

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Management Areas that often include floodplains) and adoption of local ordinances that include the required performance criteria. Phase II requires local governments to adopt a comprehensive plan or plan element that addresses the protection of water quality through the discussion of a number of policy areas. Table VI-8 summarizes the status of the Tidewater communities in meeting the two phases of the local program.

Table VI-8. Chesapeake Bay Act Element Status

<i>Jurisdiction</i>	<i>Phase I</i>	<i>Phase II</i>
<i>Chesterfield County</i>	Inconsistent, 6/21/2004	Consistent 3/24/2003
<i>Colonial Heights</i>	Consistent, 6/21/2004	Consistent, 9/15/1997
<i>Hopewell</i>	Consistent, with condition 6/21/2004 compliance deadline of 9/30/2005	Consistent, 3/18/2002
<i>Petersburg</i>	Consistent, 3/25/1993	Consistent w/ 4 conditions, 3/19/2001, compliance deadline of 12/31/2003
<i>Prince George County</i>	Consistent, 6/21/2004	Consistent, 3/19/2001
<i>Surry County</i>	Consistent, 5/6/1992	Consistent, 9/18/2000

Building Codes and Building Inspection

Many structural mitigation measures involve constructing and retrofitting homes, businesses and other structures according to standards designed to make the buildings more resilient to the impacts of natural hazards. Many of these standards are imposed through building codes. All of the jurisdictions have adopted the Uniform Virginia Building Code.

Local governments in Virginia also are empowered to carry out building inspections. It empowers cities and counties to create an inspection department, and enumerates their duties and responsibilities, which include enforcing state and local laws relating to the construction of buildings, installation of plumbing, electrical, and heating systems; building maintenance; and other matters. Most of the jurisdictions in the planning area have established a Building Inspections Office or have designated a Building Official to carry out building inspections.

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Fire Codes

Virginia has a statewide fire code that is enforced by state fire marshals. The code establishes statewide standards to safeguard life and property from the hazards of fire or explosion arising from the improper maintenance of life safety and fire prevention and protection materials, devices, systems and structures. Localities may choose to adopt stricter standards and/or employ their own fire marshals.

Table VI-9 summarizes the various ordinances that are in effect in the jurisdictions in the study area.

Table VI-9. Ordinance Effectiveness and Adoption Date					
Jurisdiction	<i>Zoning Ordinance</i>	<i>Subdivision Ordinance</i>	<i>Floodplain Management Ordinance</i>	<i>Building Codes</i>	<i>Fire Code</i>
<i>Chesterfield County</i>	High – 1945	High – 1960	High – 1983	1950	2003
<i>Colonial Heights</i>	Low – 1975	Low – 1975	High - 1988	When USBC was adopted	1991
<i>Dinwiddie County</i>	Moderate	—	Yes	—	—
<i>Emporia</i>	Yes – 1972	Yes – 1972	No	1983	1994
<i>Greensville County</i>	Yes – 1981	Low – 1967	Yes – 1978	1973	1999
<i>Hopewell</i>	Moderate – 1972	Moderate – 1963	Yes	1963	2001
<i>Petersburg</i>	1947	High – 1974	Yes	1973	1973
<i>Prince George County</i>	High – 1965	Yes – 1965	No	1963	Yes
<i>Surry County</i>	Yes - 1975	Yes	No	Yes	Yes
<i>Sussex County</i>	High - 1988	High - 1962	Yes - 1983	1976	Yes
Yes = Ordinance exists, no assessment of relationship to hazard mitigation No = No ordinance exists Assessment provided by community: High = Specifically includes hazard mitigation Moderate = Elements could be used to support hazard mitigation Low = No mention of hazard mitigation and does not contain elements that would support hazard mitigation or includes elements that would hinder hazard mitigation					

Acquisition

The power of acquisition can be a useful tool for pursuing local mitigation goals. Local governments may find the most effective method for completely “hazardproofing” a particular piece of property or area is to acquire the property (either in fee simple or a lesser interest, such as an easement), thus removing the property from the private market and eliminating or reducing the possibility of inappropriate development occurring. Virginia legislation empowers cities, towns, and counties to acquire property for public purpose by gift, grant, devise, bequest, exchange, purchase, lease or eminent domain.

Acquisition has not been used by any of the communities in the planning area though it has been used successfully in other parts of Virginia. Development of an acquisition program is proposed in the City of Petersburg Comprehensive Plan.

Taxation

The power to levy taxes and special assessments is an important tool delegated to local governments by Virginia law. The power of taxation extends beyond merely the collection of revenue, and can have a profound impact on the pattern of development in the community. Communities have the power to set preferential tax rates for areas which are more suitable for development in order to discourage development in otherwise hazardous areas. Local units of government also have the authority to levy special assessments on property owners for all or part of the costs of acquiring, constructing, reconstructing, extending or otherwise building or improving flood protection works within a designated area. This can serve to increase the cost of building in such areas, thereby discouraging development.

Because the usual methods of apportionment seem mechanical and arbitrary, and because the tax burden on a particular piece of property is often quite large, the major constraint in using special assessments is political. Special assessments seem to offer little in terms of control over land use in developing areas. They can, however, be used to finance the provision of necessary services within municipal or county boundaries. In addition, they are useful in distributing to the new property owners the costs of the infrastructure required by new development.

Localities in Virginia collect a 1% sales tax. In addition, all of the jurisdictions in the planning area levy property taxes.

Spending

The fourth major power that has been delegated from the Virginia General Assembly to local governments is the power to make expenditures in the public interest. Hazard mitigation

principles should be made a routine part of all spending decisions made by the local government, including the adoption of annual budgets and the Capital Improvement Plan (CIP).

A CIP is a schedule for the provision of municipal or county services over a specified period of time. Capital programming, by itself, can be used as a growth management technique, with a view to hazard mitigation. By tentatively committing itself to a timetable for the provision of capital to extend services, a community can control growth to some extent, especially in areas where the provision of on-site sewage disposal and water supply are unusually expensive.

In addition to formulating a timetable for the provision of services, a local community can regulate the extension of and access to services. A CIP that is coordinated with extension and access policies can provide a significant degree of control over the location and timing of growth. These tools can also influence the cost of growth. If the CIP is effective in directing growth away from environmentally sensitive or high hazard areas, for example, it can reduce environmental costs.

Political Capability

While large-scale natural disasters are not common in the planning area, recent events such as Tropical Storm Gaston have made residents more aware of the potential hazards that their community faces. It is expected that the current and future political climates will be favorable for supporting and advancing future hazard mitigation strategies. Political willpower to implement hazard mitigation programs should be strong.

In general, several obstacles can make hazard mitigation difficult to implement at the local level. Desirable areas for development, such as waterfront properties, are often also hazardous places to build. Local government must balance the economic benefits and demand for building in such places with the public and private costs that future disasters could inflict. In addition, in areas that are already developed, implementing mitigation actions can be costly. Part of this hazard mitigation plan will be to weigh the costs and benefits of such retrofitting projects to ensure that only those that are cost-effective will be chosen.

Hazard mitigation also may not be judged as high a community priority as other projects such as school building or utility improvement. This makes it particularly important to demonstrate how hazard mitigation should be integrated into all community decision-making as opposed to a stand-alone issue.

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Summary

Much of the information in this capability assessment was provided by the jurisdictions in the study area via a capability assessment survey. Table VI-10 provides a summary of this self-assessment.

Table VI-10. Capability Self-Assessment				
Jurisdiction	Administrative Capability	Technical Capability	Planning and Regulatory Capability	Fiscal Capability
<i>Chesterfield County</i>	Moderate	Moderate	High	Moderate
<i>Colonial Heights</i>	Moderate	Low	Moderate	Low
<i>Dinwiddie County</i>	Moderate	Low	Moderate	Low to moderate
<i>Emporia</i>	Low	Low	Low to Moderate	Low
<i>Greensville County</i>	Moderate	Moderate	Low	Low
<i>Hopewell</i>	Moderate	High	Moderate	Low
<i>Petersburg</i>	Moderate	Moderate	Low to Moderate	Moderate
<i>Prince George County</i>	Low	Low	Moderate to High	Low
<i>Surry County</i>	High	Moderate	Moderate	Low
<i>Sussex County</i>	Low	Low	Moderate	Low

Section VII. Mitigation Strategy

This section of the Hazard Mitigation Plan describes the most challenging part of any such planning effort – the development of a Mitigation Strategy. It is a process of:

1. Setting mitigation goals,
2. Considering mitigation alternatives,
3. Identifying objectives and strategies, and
4. Developing a mitigation action plan.

Setting Mitigation Goals

The hazard mitigation planning process conducted by the Mitigation Advisory Committee (MAC) is a typical problem-solving methodology:

- Describe the problem (Hazard Identification),
- Estimate the impacts the problem could cause (Vulnerability Assessment),
- Assess what safeguards exist that might already or could potentially lessen those impacts (Capability Assessment), and
- Using this information, determine what, if anything, can be done, and select those actions that are appropriate for the community in question (Develop an Action Plan).

When a community decides that certain risks are unacceptable and that certain mitigation actions may be achievable, the development of *goals* and *objectives* takes place. Goals and objectives help to describe what actions should occur, using increasingly narrow descriptors. Initially, long-term and general statements known as broad-based goals, are developed. Goals then are accomplished by meeting objectives, which are specific and achievable in a finite time period. In most cases there is a third level, called *strategies*, which are detailed and specific methods to meet the objectives. When developing the goals and objectives for this plan, the MAC was provided with the model below as an example of this relationship. The example was taken from a plan developed for Holden Beach, North Carolina.

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GOAL	
Improve public awareness.	
Objectives	
Educate the public about hazards prevalent to their area.	Maintain and publicize current evacuation routes
Actions	
Hold a Town-sponsored hazard mitigation seminar for the community residents, including information on preparedness for all hazards significant to Holden Beach.	The Town should publicize, on the Town's website, maps of evacuation routes which will facilitate the evacuation of Holden Beach in case of a hazardous event.

The MAC discussed goals and objectives for this plan at two points in the planning process. First, the MAC attended a workshop on January 13, 2005, to discuss the results of the hazard identification and risk assessments and begin developing the mitigation strategy by discussing mitigation goals. These goals were broad and applicable to the region. Then, each jurisdiction determined if additional individual goals and objectives were required.

Strategies, or actions, were developed as a logical extension of the plan's objectives. Most of these actions are dynamic and can change. These actions have been organized into a Mitigation Action Plan for the Planning District and its member jurisdictions.

Data collection supports the goals, objectives and recommended actions in two ways. First, the Hazard Identification and Risk Assessment data identifies areas exposed to hazards, at-risk critical facilities, and future development at risk. Second, the Capability Assessment data identifies areas for integration of hazard mitigation into existing polices and plans.

The MAC members used the results of the data collection efforts to develop goals and prioritize actions for the region and their jurisdiction. The priorities differ somewhat from jurisdiction to jurisdiction. Each jurisdiction's priorities were developed based on past damages, existing exposure to risk, other community goals, and weaknesses identified by the local government capability assessments.

The following goals and their associated objectives form the basis for the development of mitigation strategies and individual Action Plans for each jurisdiction and the region.

Public Safety

- PS-1. Reduce the loss of life and personal injuries from all hazards.
- PS-2. Ensure public health and safety within the Crater planning region before, during, and following hazardous events.
- PS-3. Ensure continued functionality of all critical services necessary to protect the citizens of the region.

Property Protection

- PP-1. Promote disaster-resilient future development and upgrade existing structures in need.
- PP-2. Implement effective hazard mitigation measures that would minimize the impact of natural hazards on life and property.
- PP-3. To the extent feasible, reduce potential damage and loss to existing community assets including structures, critical facilities, and infrastructure due to floods, severe weather (i.e., wind, tornado, hurricane, rain, ice and snow), and wildfire.

Public Awareness

- PA-1. Develop a regional public awareness program to inform and educate the public on natural hazards for the protection of public health, safety and welfare.

Local Capacity

- LC-1. Continue to assess and enhance understanding of the extent of our vulnerability to natural hazards.
- LC-2. Enhance the capabilities of local government to lessen the impacts of future disasters.
- LC-3. Improve hazard assessment information to make recommendations encouraging preventive measures for new and existing development in areas vulnerable to natural hazards.
- LC-4. Seek to obtain resources to meet natural disaster mitigation goals.

Institutionalization

- I-1. Incorporate hazard awareness and risk reduction principles into the daily activities, processes, functions, and policies of the community.
- I-2. Encourage leadership and cooperation between the public and private sectors to prioritize and implement local and regional mitigation activities.

Considering Mitigation Alternatives

During the presentation of findings meeting, the MAC reviewed and commented on the draft Plan’s HIRA. Discussions held during the meeting resulted in the generation of a range of potential mitigation goals and actions to address the hazards. A range of alternatives were then identified and provided to the MAC for consideration. These alternatives are presented in Appendix E.

The MAC also was provided with a copy of *Tools and Techniques: An Encyclopedia of Strategies to Mitigate the Impacts of Natural Hazards* to use as a resource to identify potential mitigation actions.

Prioritizing Alternatives

The MAC used the STAPLE/E (Social, Technical, Administrative, Political, Legal, Economic, and Environmental) Criteria to select and prioritize the most appropriate mitigation alternatives for the Planning District communities. This methodology requires that social, technical, administrative, political, legal, economic, and environmental considerations be taken into account when reviewing potential actions for the area’s jurisdictions to undertake. This process was used to help ensure that the most equitable and feasible actions would be undertaken based on a jurisdiction’s capabilities.

Table VII-1, below, provides information regarding the review and selection criteria for alternatives.

Table VII-1. STAPLE/E Review And Selection Criteria For Alternatives	
Social	<ul style="list-style-type: none">• Is the proposed action socially acceptable to the community(s)?• Are there equity issues involved that would mean that one segment of a community is treated unfairly?• Will the action cause social disruption?
Technical	<ul style="list-style-type: none">• Will the proposed action work?• Will it create more problems than it solves?• Does it solve a problem or only a symptom?• Is it the most useful action in light of other community(s) goals?
Administrative	<ul style="list-style-type: none">• Can the community(s) implement the action?• Is there someone to coordinate and lead the effort?• Is there sufficient funding, staff, and technical support available?

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Table VII-1. STAPLE/E Review And Selection Criteria For Alternatives

<ul style="list-style-type: none"> • Are there ongoing administrative requirements that need to be met?
Political
<ul style="list-style-type: none"> • Is the action politically acceptable? • Is there public support both to implement and to maintain the project?
Legal
<ul style="list-style-type: none"> • Is the community(s) authorized to implement the proposed action? Is there a clear legal basis or precedent for this activity? • Are there legal side effects? Could the activity be construed as a taking? • Is the proposed action allowed by a comprehensive plan, or must a comprehensive plan be amended to allow the proposed action? • Will the community(s) be liable for action or lack of action? • Will the activity be challenged?
Economic
<ul style="list-style-type: none"> • What are the costs and benefits of this action? • Do the benefits exceed the costs? • Are initial, maintenance, and administrative costs taken into account? • Has funding been secured for the proposed action? If not, what are the potential funding sources (public, non-profit, and private)? • How will this action affect the fiscal capability of the community(s)? • What burden will this action place on the tax base or local economy? • What are the budget and revenue effects of this activity? • Does the action contribute to other community goals, such as capital improvements or economic development? • What benefits will the action provide?
Environmental
<ul style="list-style-type: none"> • How will the action affect the environment? • Will the action need environmental regulatory approvals? • Will it meet local and state regulatory requirements? • Are endangered or threatened species likely to be affected?

Ranking was completed in order of relative priority based on the STAPLE/E criteria, as well as the strategy’s potential to reduce vulnerability to natural hazards.

Identifying Objectives and Strategies

Goals, Objectives, and Strategies

Through a series of local government workshops and public meetings, the following goals, objectives, and strategies for the Planning District were accepted by the MAC. The goals, objectives, and strategies form the basis for the development of a Mitigation Action Plan and

specific mitigation projects to be considered for the Planning District. The process consisted of 1) setting goals, 2) considering mitigation alternatives, 3) identifying objectives and strategies, and 4) developing an action plan.

The Mission of the Hazard Mitigation Plan

Develop and maintain a community that is more resilient to natural disasters.

The overarching mission statement is intended to clearly state the intent of the participating jurisdictions and their purpose in participating in this plan. The statement provides a framework for the following goals, objectives, and strategies to fit into. Community officials should consider the goals that follow before making community policies, public investment programs, economic development programs, or community development decisions for their communities.

Objectives have been developed for each goal. The objectives state a more specific outcome that the jurisdictions of the Crater region expect to accomplish over the next five years. The objectives provide an overall sense of what exactly is desired. The strategies will outline the specific steps necessary to achieve that end.

Public Safety

- Goal PS-1. Reduce the loss of life and personal injuries from all hazards.
 - Objective PS-1.1. Increase public access to warnings regarding hazardous weather events.
 - Strategy PS-1.1.1. Encourage purchase of NOAA radios. Provide NOAA weather radios to public facilities.
 - Strategy PS-1.1.2. Investigate, develop or enhance Reverse 911 system or other public notification system. Investigate possible funding sources. (also PA-1)
 - Strategy PS-1.1.3. Develop a more advanced flood warning system to increase the ability to locally and specifically forecast flood events and flood depths. Partner with other organizations including the National Weather Service, United States Geological Survey and local watershed organizations.
 - Objective PS-1.2. Reduce the number of injuries and deaths due to driving through floodwaters.
 - Strategy PS-1.2.1 Increase flood warning capabilities including identification of alternative, safe routes.

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- Strategy PS-1.2.2 Work with the National Weather Service to promote the “Turn Around, Don’t Drown” public education campaign.
- Strategy PS-1.2.3 Establish flood level markers along bridges and other structures to indicate the rise of water levels along creeks and rivers in potential flood-prone areas. Work with VDOT and other jurisdictions as needed.
- o Objective PS-1.3. Improve ability of mobile home parks residents to access wind shelters.
 - Strategy PS-1.3.1. Encourage mobile home parks to construct community wind shelters or to identify and publicize nearby shelters for residents.
- Goal PS-2. Ensure public health and safety within the Crater planning region before, during, and following hazardous events.
 - o Objective PS-2.1. Address needed improvements to decrease road closure times during and after storm events.
 - Strategy PS-2.1.1. Identify funding opportunities to replace vulnerable or undersized culvert stream crossings with bridges or larger culverts to reduce flood hazards.
 - Strategy PS-2.1.2. Evaluate at-risk roads and implement mitigation measures (e.g., elevation, re-design.) Work with VDOT if needed.
 - Strategy PS-2.1.3. Initiate (or encourage) road clearing efforts early in wind and winter storms. Develop plan for quick deployment of road clearing equipment.
- Goal PS-3. Ensure continued functionality of all critical services necessary to protect the citizens of the region.
 - Objective PS-3.1. Ensure that governmental functions continue in a post-disaster environment.
 - Strategy PS-3.1.1. Develop Continuity of Operations plan.
 - o Objective PS-3.2. Ensure that electricity and other resources are available to continue providing critical facilities during and after a disaster.
 - Strategy PS-3.2.1. Consider providing necessary electrical hook-up, wiring, and switches to allow readily accessible connections to emergency generators at key critical public facilities.

- Strategy PS-3.2.2. Identify need for backup generators, communications and/or vehicles at critical public facilities. Develop means to address shortfall identified.
- Strategy PS-3.2.3. Investigate all public utility lines to evaluate their resistance to flood, wind, and winter storm hazards.
- Strategy PS-3.2.4. Work with VDOT, and private utilities and/or private homeowners to trim or remove trees that could down power lines.
- Strategy PS-3.2.5. Initiate discussions with private utility companies to discuss incorporating mitigation measures into new and pre-existing development and repairs for infrastructure.

Property Protection

- Goal PP-1. Promote disaster-resilient future development and upgrade existing structures in need.
 - Objective PP-1.1. Use a combination of incentives, requirements and public example to encourage implementation of hazard mitigation actions.
 - Strategy PP-1.1.1. Investigate using non-conforming or substantial damage provisions to require hazard retrofitting of existing development.
 - Strategy PP-1.1.2. Incorporate hazard mitigation techniques into new community facilities to minimize damages. (also PP-2)
 - Strategy PP-1.1.3. Investigate providing incentives for property owners to implement mitigation measures. (also PP-3)
- Goal PP-2. Implement effective hazard mitigation measures that would minimize the impact of natural hazards on life and property.
 - Objective PP-2.1. Identify ways to reduce risk by improving natural and man-made stormwater management systems.
 - Strategy PP-2.1.1. Investigate or develop and implement a channel maintenance program consisting of routine inspections and subsequent debris removal to ensure free flow of water in local streams and watercourses. Identify funding opportunities.
 - Strategy PP-2.1.2. Inspect and clear debris (or encourage VDOT to) from stormwater drainage system.

- Strategy PP-2.1.3. Work with VDOT to identify opportunities to remove debris from private property. [This measure, by removing potential fuel or projectiles, also addresses future risk from wildfire and wind events.]
- Strategy PP-2.1.4. Evaluate existing stormwater system to determine if it is adequate for existing (or future) flood hazard.
- Strategy PP-2.1.5. Identify program of corrective actions to improve stormwater systems capacity to handle major rain events.
- Strategy PP-2.1.6. Implement (or encourage VDOT to implement) a program to seal and vent or raise storm water system components (i.e. manhole covers that are located in the 100-year flood plain or other areas identified as highly probable for flooding).
- o Objective PP-2.2. Reduce the number of at-risk structures within the floodplain.
 - Strategy PP-2.2.1. Use fee simple and/or permanent easement to prevent development in the highest priority undeveloped floodplain (and/or wetlands) areas. Use these areas as public open space for passive recreational uses.
 - Strategy PP-2.2.2. Evaluate built-upon areas within the flood zone for possible relocation and/or acquisition. In particular, target FEMA's Repetitive Loss Properties throughout the Crater Region for possible relocation and/or acquisition.
 - Strategy PP-2.2.3. Identify existing flood-prone structures that may benefit from mitigation measures such as elevation.
- Goal PP-3. To the extent feasible, reduce potential damage and loss to existing community assets including structures, critical facilities, and infrastructure due to floods, severe weather (i.e., wind, tornado, hurricane, rain, ice and snow), and wildfire.
 - o Objective PP-3.1. Conduct facility assessments to determine the resistance of critical facilities to natural hazards.
 - Strategy PP-3.1.1. Investigate all primary and secondary schools to evaluate their resistance to all natural hazards. Prioritize schools that are used as community shelters.
 - Strategy PP-3.1.2. Investigate critical community facilities, such as county administrative offices, shelters (non-school buildings), fire stations and police stations, to evaluate their resistance to flood and wind hazards. Particular

attention will be given to the HVAC system and structural integrity of the buildings. Prioritize facilities in known hazard areas (e.g., floodplains).

Public Awareness

- Goal PA-1. Develop a regional public awareness program to inform and educate the public on natural hazards for the protection of public health, safety and welfare.
 - Objective PA-1.1. Develop and deliver hazard mitigation and preparedness information on specific topics or to specific audiences.
 - Strategy PA-1.1.1. Distribute information packets to raise awareness regarding the risks present in the Crater region and provide disaster preparedness information.
 - Strategy PA-1.1.2. Publicize the location of local shelters and emergency phone numbers. Include a map of shelters in local phonebooks and/or on county/city websites.
 - Strategy PA-1.1.3. Inform the public of and/or encourage the purchase of flood and/or sewer back-up insurance.
 - Strategy PA-1.1.4. Educate homeowners about flood insurance and ICC (Increased Cost of Compliance) coverage.
 - Strategy PA-1.1.5. Target FEMA's Repetitive Loss Properties for specialized outreach and mitigation activities.
 - Objective PA-1.2. Deliver formal training or structured education materials to adults and children within the Crater region.
 - Strategy PA-1.2.1. Partner with Parent Teacher Associations and local schools to implement existing curriculum related to natural hazards (e.g., Masters of Disaster, Risk Watch).
 - Strategy PA-1.2.2. Work with local home improvement stores to provide workshops to residents on mitigation techniques.
 - Objective PA-1.3. Use a diverse collection of means to deliver public education.
 - Strategy PA-1.3.1. Utilize schools, various city or county services, newspapers, and/or Chamber of Commerce to deliver public information.
 - Strategy PA-1.3.2. Work with local media outlets to increase awareness of natural hazards. Implement seasonal hazard awareness weeks or days (e.g., hurricane preparedness week, winter weather awareness day).

- Strategy PA-1.3.3. Place flyers and brochures at selected locations throughout the region.
- Strategy PA-1.3.4. Prepare an advisory pamphlet and distribute to occupants of housing units or business known to be in the floodplain advising them of the potential hazards of the area and of evacuation plans in the event of an emergency.
- o Objective PA-1.4. Participate in programs that recognize the efforts of local government to prepare for natural disasters.
 - Strategy PA-1.4.1. Consider participating in the StormReady program sponsored by the National Weather Service.
 - Strategy PA-1.4.2. Consider participating in FEMA's Community Rating System (CRS). (Also Goal LC-2).

Local Capacity

- Goal LC-1. Continue to assess and enhance understanding of the extent of our vulnerability to natural hazards.
 - o Objective LC-1.1. Enhance spatial information related to natural hazards.
 - Strategy LC-1.1.1. Coordinate with the state to update and digitize community Flood Insurance Rate Maps (FIRMs).
 - Strategy LC-1.1.2. Include an assessment and associated mapping of the municipality's vulnerability to location-specific hazards and make appropriate recommendations for the use of these hazard areas in a future Comprehensive Plan. (also I-1)
- Goal LC-2. Enhance the capabilities of local government to lessen the impacts of future disasters.
 - o Objective LC-2.1. Improve staff capabilities to implement hazard mitigation policies and programs.
 - Strategy LC-2.2.1. Provide training opportunities to county/municipal enforcement staff. Educate them re: damage assessment, mitigation techniques, and other related topics.
 - Strategy LC-2.2.2. Staff Emergency Management Office, Building Inspections Office and/or Zoning Office at adequate levels.
 - o Objective LC-2.3. Utilize regulations to implement hazard mitigation

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- Strategy LC-2.3.1. Continue to enforce zoning and building codes to prevent/control construction within the floodplain.
- Strategy LC-2.3.2. Evaluate the floodplain manager's roles and responsibilities in each local jurisdiction.
- Strategy LC-2.3.3. Evaluate the potential costs versus benefits of implementing a freeboard requirement for all new structures in the 100-year floodplain.
- Strategy LC-2.3.4. Investigate implementation of cumulative damage provision as part of floodplain ordinance.
- Strategy LC-2.3.5. Review and revise, if needed, local floodplain ordinances. Work with the state to coordinate a Community Assistance Visit to identify potential improvements or enhancements to existing floodplain management program.
- Strategy LC-2.3.6. Develop a new Zoning Ordinance or investigate revising the existing Zoning Ordinance to include separate zones or districts with appropriate development criteria for known hazard areas. (Also Goal I-1)
- Strategy LC-2.3.7. Review and revise, if needed, existing Subdivision Ordinances to include hazard mitigation-related development criteria in order to regulate the location and construction of buildings and other infrastructure in known hazard areas. (Also Goal I-1)
- Goal LC-3. Improve hazard assessment information to make recommendations encouraging preventive measures for new and existing development in areas vulnerable to natural hazards.
 - Objective LC-3.1. Increase data available for decision-making.
 - Strategy LC-3.1.1. Develop and/or maintain a detailed building inventory for all structures in the jurisdiction, in a GIS-based format, which catalogues information regarding assets such as value of structure, age, location (latitude and longitude), etc. Ensure integration of GIS in any existing jurisdictional databases.
 - Strategy LC-3.1.2. Identify means to coordinate, collect and store damage assessment data in GIS format for each natural hazard event, which causes death, injury and or property damage.
 - Strategy LC-3.1.3. Identify training opportunities for staff to enhance ability to use GIS for emergency management needs.
- LC-4. Seek to obtain resources to meet natural disaster mitigation goals.

- Objective LC-4.1. Identify funding sources to ensure implementation of mitigation projects.
 - Strategy LC-4.1.1. Develop recommendations for short-term and long-term funding sources for mitigation, planning, and projects.

Institutionalization

- Goal I-1. Incorporate hazard awareness and risk reduction principles into the daily activities, processes, functions, and policies of the community.
 - Objective I-1.1. Identify opportunities to integrate hazard mitigation principles into local decision-making.
 - Strategy I-1.1.1. Incorporate (or continue to incorporate) mitigation principles into local comprehensive, emergency management, and recovery plans.
 - Strategy I-1.1.2. Integrate the jurisdiction's mitigation plan into current capital improvement plans to ensure that development does not encroach on known hazard areas. (also Goals PP-1, LC-2)
- Goal I-2. Encourage leadership and cooperation between the public and private sectors to prioritize and implement local and regional mitigation activities.
 - Objective I-2.1. Formalize existing partnerships related to hazard mitigation.
 - Strategy I-2.1.1. Obtain official recognition of the Mitigation Advisory Committee by the jurisdictions in the Planning District in order to help institutionalize and develop an ongoing mitigation program. Use the committee to review mitigation projects and coordinate multi-jurisdictional grant applications.

In formulating a mitigation strategy, a wide range of activities were considered in order to help achieve the goals and to lessen the vulnerability of the Crater Planning District area to the effects of natural hazards. The following matrix shows the strategies that each jurisdiction selected as appropriate for its community.

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Starred items indicate on-going activities. Items in italics are regional in nature.

Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greensville County
<i>I-2.1.1. Obtain official recognition of the Mitigation Advisory Committee by the jurisdictions in the Planning District in order to help institutionalize and develop an ongoing mitigation program. Use the committee to review mitigation projects and coordinate multi-jurisdictional grant applications.</i>	✓	✓	✓	✓	✓
I-1.1.1. Incorporate (or continue to incorporate) mitigation principles into local comprehensive, emergency management, and recovery plans.	✓*	✓	✓	✓*	✓*
LC-2.3.6. Develop a new Zoning Ordinance or investigate revising the existing Zoning Ordinance to include separate zones or districts with appropriate development criteria for known hazard areas.	✓		✓	✓	✓*
LC-2.3.7. Review and revise, if needed, existing Subdivision Ordinances to include hazard mitigation-related development criteria in order to regulate the location and construction of buildings and other infrastructure in known hazard areas.	✓		✓	✓	✓*
I-1.1.2. Integrate the jurisdiction’s mitigation plan into current capital improvement plans to ensure that			✓	✓	

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Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greenville County
development does not encroach on known hazard areas.					
<i>LC-1.1.1. Coordinate with the state to update and digitize community Flood Insurance Rate Maps (FIRMs).</i>	✓*	✓	✓	✓	✓
LC-1.1.2 Include an assessment and associated mapping of the municipality’s vulnerability to location-specific hazards and make appropriate recommendations for the use of these hazard areas in a future Comprehensive Plan.	✓			✓	✓*
LC-2.2.1. Provide training opportunities to county/municipal enforcement staff. Educate them re: damage assessment, mitigation techniques, and other related topics.	✓*	✓	✓	✓	✓*
LC-2.2.2. Staff Emergency Management Office, Building Inspections Office and/or Zoning Office at adequate levels.	✓			✓	✓*
PA-1.4.2. Consider participating in FEMA’s Community Rating System (CRS).		✓	✓	✓	✓
LC-2.3.1. Continue to enforce zoning and building codes to prevent/control construction within the floodplain.	✓*	✓	✓	✓*	✓*
LC-2.3.2. Evaluate the floodplain manager’s roles and responsibilities in each local jurisdiction.	✓*	✓	✓	✓	✓*

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Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greenville County
LC-2.3.3. Evaluate the potential costs versus benefits of implementing a freeboard requirement for all new structures in the 100-year floodplain.	✓*			✓	✓
LC-2.3.4. Investigate implementation of cumulative damage provision as part of floodplain ordinance.	✓			✓	✓
LC-2.3.5. Review and revise, if needed, local floodplain ordinances. Work with the state to coordinate a Community Assistance Visit to identify potential improvements or enhancements to existing floodplain management program.	✓		✓	✓	✓*
LC-3.1.1. Develop and/or maintain a detailed building inventory for all structures in the jurisdiction, in a GIS-based format, which catalogues information regarding assets such as value of structure, age, location (latitude and longitude), etc. Ensure integration of GIS in any existing jurisdictional databases.	✓	✓	✓	✓*	✓*
LC-3.1.2. Identify means to coordinate, collect and store damage assessment data in GIS format for each natural hazard event, which causes death, injury and or property damage.	✓	✓	✓	✓*	✓

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Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greensville County
LC-3.1.3. Identify training opportunities for staff to enhance ability to use GIS for emergency management needs.	✓*	✓	✓	✓	✓*
<i>LC-4.1.1. Develop recommendations for short-term and long-term funding sources for mitigation, planning, and projects.</i>	✓	✓	✓	✓	✓
<i>PA-1.1.1. Distribute information packets to raise awareness regarding the risks present in the Crater region and provide disaster preparedness information.</i>	✓	✓	✓		
PA-1.2.1. Partner with Parent Teacher Associations and local schools to implement existing curriculum related to natural hazards (e.g., Masters of Disaster, Risk Watch).	✓*	✓	✓	✓	✓
<i>PA-1.3.3. Place flyers and brochures at selected locations throughout the region.</i>	✓*	✓	✓	✓*	✓*
PA-1.1.2. Publicize the location of local shelters and emergency phone numbers. Include a map of shelters in local phonebooks and/or on county/city websites.	✓	✓		✓*	✓*
PA-1.3.1. Utilize schools, various city or county services, newspapers, and/or Chamber of Commerce to deliver public information.	✓	✓	✓*	✓*	

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Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greensville County
<i>PA-1.2.2. Work with local home improvement stores to provide workshops to residents on mitigation techniques.</i>	✓	✓			
<i>PA-1.3.2. Work with local media outlets to increase awareness of natural hazards. Implement seasonal hazard awareness weeks or days (e.g., hurricane preparedness week, winter weather awareness day).</i>	✓	✓*	✓*	✓*	✓*
PA-1.1.3. Inform the public of and/or encourage the purchase of flood and/or sewer back-up insurance.	✓*		✓	✓*	✓*
PA-1.1.4. Educate homeowners about flood insurance and ICC (Increased Cost of Compliance) coverage.	✓*	✓		✓*	✓*
PA-1.3.4. Prepare an advisory pamphlet and distribute to occupants of housing units or business known to be in the floodplain advising them of the potential hazards of the area and of evacuation plans in the event of an emergency.	✓*		✓	✓	✓
PA-1.1.5. Target FEMA's Repetitive Loss Properties for specialized outreach and mitigation activities.	✓*	✓			✓
PA-1.4.1. Consider participating in the StormReady program sponsored by the National Weather Service.	✓	✓	✓		✓
PS-1.1.2. Investigate, develop or enhance Reverse 911			✓		✓

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Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greenville County
system or other public notification system. Investigate possible funding sources					
PP-1.1.1. Investigate using non-conforming or substantial damage provisions to require hazard retrofitting of existing development.			✓	✓*	✓
PP-1.1.2. Incorporate hazard mitigation techniques into new community facilities to minimize damages.	✓*			✓*	✓*
PP-1.1.3. Investigate providing incentives for property owners to implement mitigation measures.	✓*				
PP-2.1.1. Investigate or develop and implement a channel maintenance program consisting of routine inspections and subsequent debris removal to ensure free flow of water in local streams and watercourses. Identify funding opportunities.	✓*	✓*		✓*	
PP-2.1.2. Inspect and clear debris (or encourage VDOT to) from stormwater drainage system.	✓*	✓*		✓*	✓
PP-2.2.2. Evaluate built-upon areas within the flood zone for possible relocation and/or acquisition. In particular, target FEMA's Repetitive Loss Properties throughout the Crater Region for possible relocation and/or acquisition.	✓*			✓	✓

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Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greensville County
PP-2.1.4. Evaluate existing stormwater system to determine if it is adequate for existing (or future) flood hazard.	✓*	✓*		✓	
PP-2.2.3. Identify existing flood-prone structures that may benefit from mitigation measures such as elevation.				✓	✓*
PP-2.1.5. Identify program of corrective actions to improve stormwater systems capacity to handle major rain events.	✓*	✓		✓	✓
PP-2.1.6. Implement (or encourage VDOT to implement) a program to seal and vent or raise storm water system components (i.e. manhole covers that are located in the 100-year flood plain or other areas identified as highly probable for flooding).				✓	✓*
PP-2.2.1. Use fee simple and/or permanent easement to prevent development in the highest priority undeveloped floodplain (and/or wetlands) areas. Use these areas as public open space for passive recreational uses.	✓*	✓		✓	
PP-2.1.3. Work with VDOT to identify opportunities to remove debris from private property.					
PP-3.1.1. Investigate all primary and secondary schools to evaluate their resistance to all natural hazards. Prioritize	✓			✓*	

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Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greensville County
schools that are used as community shelters.					
PP-3.1.2. Investigate critical community facilities, such as county administrative offices, shelters (non-school buildings), fire stations and police stations, to evaluate their resistance to flood and wind hazards. Particular attention will be given to the HVAC system and structural integrity of the buildings. Prioritize facilities in known hazard areas (e.g., floodplains).	✓			✓*	✓*
PS-1.1.1. Encourage purchase of NOAA radios. Provide NOAA weather radios to public facilities.	✓*	✓		✓*	✓
PS-1.2.1 Increase flood warning capabilities including identification of alternative, safe routes.	✓	✓		✓*	✓
PS-1.2.2. <i>Work with the National Weather Service to promote the “Turn Around, Don’t Drown” public education campaign.</i>	✓	✓	✓		✓
PS-1.2.3. Establish flood level markers along bridges and other structures to indicate the rise of water levels along creeks and rivers in potential flood-prone areas. Work with VDOT and other jurisdictions as needed.	✓*	✓			✓

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Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greenville County
PS-1.3.1. Encourage mobile home parks to construct community wind shelters or to identify and publicize nearby shelters for residents.	✓			✓*	✓
PS-1.1.3. Develop a more advanced flood warning system to increase the ability to locally and specifically forecast flood events and flood depths. Partner with other organizations including the National Weather Service, United States Geological Survey and local watershed organizations.				✓*	✓
PS-2.1.1. Identify funding opportunities to replace vulnerable or undersized culvert stream crossings with bridges or larger culverts to reduce flood hazards.	✓*	✓		✓	✓
PS-2.1.2. Evaluate at-risk roads and implement mitigation measures (e.g., elevation, re-design.) Work with VDOT if needed.	✓	✓	✓	✓	✓
PS-3.2.1. Consider providing necessary electrical hook-up, wiring, and switches to allow readily accessible connections to emergency generators at key critical public facilities.	✓*			✓*	✓
PS-3.1.1. Develop Continuity of Operations plan.			✓	✓	✓

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Strategy	Chesterfield County	Colonial Heights	Dinwiddie County	Emporia	Greensville County
PS-3.2.2. Identify need for backup generators, communications and/or vehicles at critical public facilities. Develop means to address shortfall identified.	✓*			✓*	✓*
PS-3.2.3. Investigate all public utility lines to evaluate their resistance to flood, wind, and winter storm hazards.	✓*	✓*	✓	✓*	
PS-3.2.4 Work with VDOT, and private utilities and/or private homeowners to trim or remove trees that could down power lines.	✓*			✓	
PS-3.2.5. Initiate discussions with private utility companies to discuss incorporating mitigation measures into new and pre-existing development and repairs for infrastructure.	✓*	✓	✓	✓	✓*
PS-2.1.3 Initiate (or encourage) road clearing efforts early in wind and winter storms. Develop plan for quick deployment of road clearing equipment.			✓	✓*	✓

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
<i>I-2.1.1.1. Obtain official recognition of the Mitigation Advisory Committee by the jurisdictions in the Planning District in order to help institutionalize and develop an ongoing mitigation program. Use the committee to review mitigation projects and coordinate multi-jurisdictional grant applications.</i>	✓	✓	✓	✓	✓
I-1.1.1. Incorporate (or continue to incorporate) mitigation principles into local comprehensive, emergency management, and recovery plans.	✓	✓	✓	✓*	✓*
LC-2.3.6. Develop a new Zoning Ordinance or investigate revising the existing Zoning Ordinance to include separate zones or districts with appropriate development criteria for known hazard areas.				✓*	✓*
LC-2.3.7. Review and revise, if needed, existing Subdivision Ordinances to include hazard mitigation-related development criteria in order to regulate the location and construction of buildings and other infrastructure in known hazard areas.			✓	✓	

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
I-1.1.2. Integrate the jurisdiction’s mitigation plan into current capital improvement plans to ensure that development does not encroach on known hazard areas.	✓	✓		✓	✓
<i>LC-1.1.1. Coordinate with the state to update and digitize community Flood Insurance Rate Maps (FIRMs).</i>	✓	✓	✓	✓	✓
LC-1.1.2 Include an assessment and associated mapping of the municipality’s vulnerability to location-specific hazards and make appropriate recommendations for the use of these hazard areas in a future Comprehensive Plan.		✓	✓	✓	✓
LC-2.2.1. Provide training opportunities to county/municipal enforcement staff. Educate them re: damage assessment, mitigation techniques, and other related topics.	✓	✓	✓	✓*	✓*
LC-2.2.2. Staff Emergency Management Office, Building Inspections Office and/or Zoning Office at adequate levels.	✓		✓	✓	✓
PA-1.4.2. Consider participating in FEMA’s	✓	✓	✓	✓	✓

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
Community Rating System (CRS).					
LC-2.3.1. Continue to enforce zoning and building codes to prevent/control construction within the floodplain.	✓	✓	✓	✓	✓*
LC-2.3.2. Evaluate the floodplain manager's roles and responsibilities in each local jurisdiction.	✓	✓	✓	✓*	✓*
LC-2.3.3. Evaluate the potential costs versus benefits of implementing a freeboard requirement for all new structures in the 100-year floodplain.	✓	✓	✓	✓	✓
LC-2.3.4. Investigate implementation of cumulative damage provision as part of floodplain ordinance.	✓			✓	✓*
LC-2.3.5. Review and revise, if needed, local floodplain ordinances. Work with the state to coordinate a Community Assistance Visit to identify potential improvements or enhancements to existing floodplain management program.	✓	✓	✓	✓*	✓*
LC-3.1.1. Develop and/or maintain a detailed building inventory for all structures in the jurisdiction, in a GIS-based format, which catalogues information regarding assets such as value of	✓	✓	✓	✓	✓

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
structure, age, location (latitude and longitude), etc. Ensure integration of GIS in any existing jurisdictional databases.					
LC-3.1.2. Identify means to coordinate, collect and store damage assessment data in GIS format for each natural hazard event, which causes death, injury and or property damage.	✓		✓*	✓	
LC-3.1.3. Identify training opportunities for staff to enhance ability to use GIS for emergency management needs.	✓	✓	✓	✓*	
<i>LC-4.1.1. Develop recommendations for short-term and long-term funding sources for mitigation, planning, and projects.</i>	✓	✓	✓	✓	✓
<i>PA-1.1.1. Distribute information packets to raise awareness regarding the risks present in the Crater region and provide disaster preparedness information.</i>	✓	✓	✓	✓	
PA-1.2.1. Partner with Parent Teacher Associations and local schools to implement existing curriculum related to natural hazards (e.g., Masters of Disaster, Risk Watch).	✓	✓*	✓	✓	

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
<i>PA-1.3.3. Place flyers and brochures at selected locations throughout the region.</i>	✓	✓	✓	✓*	✓
PA-1.1.2. Publicize the location of local shelters and emergency phone numbers. Include a map of shelters in local phonebooks and/or on county/city websites.		✓	✓		✓
PA-1.3.1. Utilize schools, various city or county services, newspapers, and/or Chamber of Commerce to deliver public information.	✓	✓	✓	✓	✓
<i>PA-1.2.2. Work with local home improvement stores to provide workshops to residents on mitigation techniques.</i>	✓	✓*			
<i>PA-1.3.2. Work with local media outlets to increase awareness of natural hazards. Implement seasonal hazard awareness weeks or days (e.g., hurricane preparedness week, winter weather awareness day).</i>	✓*	✓	✓	✓*	✓
PA-1.1.3. Inform the public of and/or encourage the purchase of flood and/or sewer back-up insurance.	✓	✓	✓	✓*	✓*
PA-1.1.4. Educate homeowners about flood insurance and ICC (Increased Cost of Compliance)	✓	✓	✓	✓*	✓*

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
coverage.					
PA-1.3.4. Prepare an advisory pamphlet and distribute to occupants of housing units or business known to be in the floodplain advising them of the potential hazards of the area and of evacuation plans in the event of an emergency.	✓	✓	✓	✓	✓*
PA-1.1.5. Target FEMA’s Repetitive Loss Properties for specialized outreach and mitigation activities.	✓		✓	✓	✓
PA-1.4.1. Consider participating in the StormReady program sponsored by the National Weather Service.		✓	✓	✓	✓
PS-1.1.2. Investigate, develop or enhance Reverse 911 system or other public notification system. Investigate possible funding sources		✓	✓	✓	✓*
PP-1.1.1. Investigate using non-conforming or substantial damage provisions to require hazard retrofitting of existing development.			✓	✓*	✓*
PP-1.1.2. Incorporate hazard mitigation techniques into new community facilities to minimize damages.	✓	✓	✓	✓	✓

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
PP-1.1.3. Investigate providing incentives for property owners to implement mitigation measures.		✓*		✓	
PP-2.1.1. Investigate or develop and implement a channel maintenance program consisting of routine inspections and subsequent debris removal to ensure free flow of water in local streams and watercourses. Identify funding opportunities.		✓		✓	
PP-2.1.2. Inspect and clear debris (or encourage VDOT to) from stormwater drainage system.	✓*	✓		✓*	✓
PP-2.2.2. Evaluate built-upon areas within the flood zone for possible relocation and/or acquisition. In particular, target FEMA’s Repetitive Loss Properties throughout the Crater Region for possible relocation and/or acquisition.		✓		✓	✓
PP-2.1.4. Evaluate existing stormwater system to determine if it is adequate for existing (or future) flood hazard.		✓	✓*	✓	✓
PP-2.2.3. Identify existing flood-prone structures that may benefit from mitigation measures such as elevation.		✓	✓		

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
PP-2.1.5. Identify program of corrective actions to improve stormwater systems capacity to handle major rain events.				✓	✓
PP-2.1.6. Implement (or encourage VDOT to implement) a program to seal and vent or raise storm water system components (i.e. manhole covers that are located in the 100-year flood plain or other areas identified as highly probable for flooding).	✓	✓			
PP-2.2.1. Use fee simple and/or permanent easement to prevent development in the highest priority undeveloped floodplain (and/or wetlands) areas. Use these areas as public open space for passive recreational uses.	✓	✓		✓	
PP-2.1.3. Work with VDOT to identify opportunities to remove debris from private property.			✓	✓	
PP-3.1.1. Investigate all primary and secondary schools to evaluate their resistance to all natural hazards. Prioritize schools that are used as community shelters.		✓	✓*	✓*	

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
PP-3.1.2. Investigate critical community facilities, such as county administrative offices, shelters (non-school buildings), fire stations and police stations, to evaluate their resistance to flood and wind hazards. Particular attention will be given to the HVAC system and structural integrity of the buildings. Prioritize facilities in known hazard areas (e.g., floodplains).	✓	✓	✓*	✓*	✓
PS-1.1.1. Encourage purchase of NOAA radios. Provide NOAA weather radios to public facilities.		✓	✓	✓	
PS-1.2.1 Increase flood warning capabilities including identification of alternative, safe routes.	✓	✓	✓	✓	✓*
PS-1.2.2. <i>Work with the National Weather Service to promote the “Turn Around, Don’t Drown” public education campaign.</i>	✓	✓	✓	✓	✓
PS-1.2.3. Establish flood level markers along bridges and other structures to indicate the rise of water levels along creeks and rivers in potential flood-prone areas. Work with VDOT and other jurisdictions as needed.	✓	✓	✓*	✓	✓*

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
PS-1.3.1. Encourage mobile home parks to construct community wind shelters or to identify and publicize nearby shelters for residents.			✓	✓	✓
PS-1.1.3. Develop a more advanced flood warning system to increase the ability to locally and specifically forecast flood events and flood depths. Partner with other organizations including the National Weather Service, United States Geological Survey and local watershed organizations.				✓	✓
PS-2.1.1. Identify funding opportunities to replace vulnerable or undersized culvert stream crossings with bridges or larger culverts to reduce flood hazards.		✓	✓	✓	✓
PS-2.1.2. Evaluate at-risk roads and implement mitigation measures (e.g., elevation, re-design.) Work with VDOT if needed.		✓	✓	✓	✓
PS-3.2.1. Consider providing necessary electrical hook-up, wiring, and switches to allow readily accessible connections to emergency generators at key critical public facilities.				✓	✓

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Strategy	Hopewell	Petersburg	Prince George County	Surry County	Sussex County
PS-3.1.1. Develop Continuity of Operations plan.	✓			✓	
PS-3.2.2. Identify need for backup generators, communications and/or vehicles at critical public facilities. Develop means to address shortfall identified.		✓		✓	✓
PS-3.2.3. Investigate all public utility lines to evaluate their resistance to flood, wind, and winter storm hazards.	✓	✓		✓	
<i>PS-3.2.4 Work with VDOT, and private utilities and/or private homeowners to trim or remove trees that could down power lines.</i>	✓	✓		✓	✓*
PS-3.2.5. Initiate discussions with private utility companies to discuss incorporating mitigation measures into new and pre-existing development and repairs for infrastructure.	✓*		✓	✓	✓
PS-2.1.3 Initiate (or encourage) road clearing efforts early in wind and winter storms. Develop plan for quick deployment of road clearing equipment.				✓*	✓

Jurisdiction-specific Strategies

Dinwiddie County

- Improve coordination between state and local agencies regarding road closures and other disaster-related events.
- Encourage public notification through cooperative use of NOAA and jurisdiction-defined means (e.g., website, radio).
- Establish NOAA notification protocols to ensure EOC real time information.
- Develop debris management strategy. Work with state agencies to develop agreements and/or procedures to address debris removal from private property.

Hopewell

- Develop a debris removal plan.
- Work with CSX and Norfolk Southern to improve railroad culvert crossings.

Prince George

- Identify means to mitigate stormwater runoff and subsequent landslides in eastern portion of the County.
- Encourage developers to give easements on flood prone and steep slope areas to land conservancy for permanent protection. Create list of potential easement holders.

Surry County

- Investigate enhancing the interoperability of communications between jurisdictions within the Crater Region.

Sussex County and Town of Stony Creek

- Continue to pursue a federal/state project to elevate I-95 bridge and widen channel at Stony Creek.

Town of Claremont

- Work with VDOT to develop an alternative ingress/egress to Claremont Beach.

Developing a Mitigation Action Plan

Strategies were ranked by each community. Ranking was completed in order of relative priority based on the STAPLE/E criteria, as well as the strategy's potential to reduce vulnerability to natural hazards. Regional actions were ranked by the MAC during their March 17, 2005, meeting. The committee used a multi-voting system to prioritize the

regional actions. Each member present received six votes to distribute among the proposed actions.

Mitigation action plans were developed for all of the regional activities and the high priority actions for each jurisdiction. The following action plans were designed to achieve the goals and objectives identified in this multi-jurisdictional all-hazards mitigation plan. Each proposed action includes:

- (1) the appropriate category for the mitigation technique (these categories are described in Appendix E),
- (2) the hazard it is designed to mitigate,
- (3) the objective(s) it is intended to help achieve,
- (4) general background information,
- (5) the priority level for its implementation (high, moderate, or low),
- (6) potential funding sources, if applicable,
- (7) the agency/person assigned responsibility for carrying out the strategy, and
- (8) a target completion date.

Regional Actions

The strategies on the following pages can be undertaken as a regional effort. Together, these comprise a regional action plan.

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Strategy I-2.1.1: Obtain official recognition of the Mitigation Advisory Committee by the jurisdictions in the Planning District in order to help institutionalize and develop an ongoing mitigation program. Use the committee to review mitigation projects and coordinate multi-jurisdictional grant applications.

Affected Jurisdictions	All
Category	N/A
Hazard	All Hazards
Objective(s) addressed	I-2.1
Background and Supplemental Information	<p>The Disaster Mitigation Act of 2000 (DMA2K) required local governments to develop and to adopt all hazards mitigation plans to be eligible for certain types of future disaster assistance including funds for mitigation activities.</p> <p>The Crater PDC formed a multi-jurisdictional committee to oversee hazard mitigation planning efforts for the Crater Region. Each of the participating jurisdictions was represented on the committee.</p> <p>One way to increase the effectiveness of such committees and ensure long-term plan implementation is to bestow official status to them. In addition, a formalized committee will aid in plan implementation by allowing communities to share the workload when implementing regional activities.</p>
Priority	High
Funding sources	N/A
Responsible party	Mitigation Advisory Committee; Crater Planning District Commission; individual jurisdictions
Completion date	Immediately following plan approval

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Strategy LC-4.1.1: Develop recommendations for short-term and long-term funding sources for mitigation, planning, and projects.

Affected Jurisdictions	All
Category	N/A
Hazard	All Hazards
Objective(s) addressed	LC-4.1
Background and Supplemental Information	<p>Mitigation planning and projects are an ongoing process that requires continual funding. Application needs to be made to the funding available at the State and Federal level. Each year this process needs to be reviewed to ensure funding is appropriate and sufficient.</p> <p>Sources of funding could include:</p> <p><i>Pre-Disaster:</i></p> <ul style="list-style-type: none"> - Emergency Watershed Protection; USDA, Natural Resources Conservation Service (NRCS) - Water Resources; USDA, NRCS - Watershed Protection and Flood Prevention Program; USDA, NRCS - River Basin Project; USDA, NRCS - Land Protection; USDA, NRCS - Business and Industrial Loan Program; USDA, Rural Business Service - Watercourse Navigation; US Army Corps of Engineers - Pre-disaster Mitigation Program (PDM); FEMA - Wetlands Protection – Development Grants; EPA - Clean Water Act, Section 319 Grants; EPA <p><i>Post-disaster:</i></p> <ul style="list-style-type: none"> - Economic Adjustment Program; Economic Development Administration - Flood and Post-Flood Response, Emergency

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	<p>Operations; US Army Corps of Engineers</p> <ul style="list-style-type: none"> - Hazard Mitigation Grant Program (HMGP); FEMA - Public Assistance (406 projects); FEMA - Transportation: Emergency Relief Fund; Department of Transportation
Priority	High
Funding sources	N/A
Responsible party	Mitigation Advisory Committee
Completion date	On-going

Strategy PS-3.2.*: Convene a regional working group that will address tree trimming or removal to protect power and other utility lines.

Affected Jurisdictions	All
Category	Prevention; Natural Resource Protection
Hazard	Wind; winter storm
Objective(s) addressed	PS-3.2
Background	<p>Severe wind and heavy ice or snow loads can bring down tree limbs or entire trees. Trees are particularly vulnerable if they have been recently impacted by drought or previous storm events.</p> <p>An aggressive tree trimming and removal program that ensures right of ways are clear of potential hazards could be effective in reducing future risk of damages. Such a program cannot be undertaken by one organization alone because of the scope of the project, the complexities of coordinating between land owners, and public perception.</p> <p>A regional working group should be convened that would bring together the various stakeholders (e.g.,</p>

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Hazard Mitigation Plan

	<p>VDOT, Verizon, Comcast, Dominion VA Power, Natural Resources Conservation Service, USDA Extension Service, environmental groups, landowner groups) to develop a coordinated system to identify trees with structural weaknesses and develop a means to communicate between responsible parties so that potential problem spots can be addressed as they are identified.</p> <p>A public education campaign likely will be needed, because tree trimming may affect the existing tree canopy and resulting community appearance. In addition, some of the trees identified as needing trimming or removal may be located on private property.</p>
Priority	High
Funding sources	Public/Private partnerships, Local funds
Responsible party	Counties/cities (public works), Dominion Power, Comcast, Verizon, VDOT, Natural Resources Conservation Service, USDA Extension Service, environmental groups, landowner groups
Completion date	On-going

Strategy LC-1.1.1: Coordinate with the state to update and digitize community Flood Insurance Rate Maps (FIRMs).

Affected Jurisdictions	All
Category	Public Information and Awareness
Hazard	Flooding
Objective(s) addressed	LC-1.1

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Background and Supplemental Information	<p>Flood Insurance Rate Maps (FIRMs) are developed by FEMA after a detailed flood risk assessment. Many of the FIRMs in the Crater Region are over 15 years old and no longer reflect the true flood risk to the area. In addition, the maps are not readily available in a digital format, complicating their effective use for planning and education purposes.</p> <p>Since these products are used by private citizens, insurance agents, and brokers to locate properties/buildings and identify the risk for flood damage, it is crucial that they be accurate and up-to-date. The maps also are used by community officials to administer floodplain management regulations and mitigate flood damage. In addition, lending institutions and federal agencies use the FIRMS to determine when flood insurance is required for loans or grants involving the purchase or construction of buildings.</p> <p>The MAC should work with state floodplain management officials to ensure the communities within the Crater PDC are prioritized when funds for updating flood maps become available.</p>
Priority	Medium
Funding sources	FEMA Map Modernization; Cooperating Technical Partners (CTP)
Responsible party	Mitigation Advisory Committee, Community floodplain managers, Virginia Geographic Information Network (VGIN), VA Department of Conservation and Recreation (VA DCR)
Completion date	4 th quarter of 2008

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Strategy PA-1.1.1: Distribute information packets to raise awareness regarding the risks present in the Crater region and provide disaster preparedness information.

Affected Jurisdictions	All
Category	Public Information and Awareness
Hazard	All Hazards
Objective(s) addressed	PA-1.1
Background and Supplemental Information	<p>The Crater region is growing rapidly and has many people moving into the area who are not familiar with the hazards of the area. The area is prone to flooding, hurricanes and other severe weather.</p> <p>It is imperative that new residents are informed of preparedness information on how to prepare. In addition, it is important to remind the population of the area that may have become complacent of the hazards and how to prepare for them.</p> <p>Key messages to include are whom to call for information in the event of an impending disaster or after a disaster, what things to include in a disaster preparedness kit, and simple hazard specific mitigation measures each resident can take to reduce their risk.</p>
Priority	Medium
Funding sources	FEMA/Hazard Mitigation Grant Program (HMGP) 5% funds, business community sponsors
Responsible party	Mitigation Advisory Committee; County/City Public Information Officer
Completion date	On-going

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Strategy PA-1.4.1: Work with the Wakefield office of the National Weather Service to promote the “Turn Around, Don’t Drown” public education campaign.

Affected Jurisdictions	All
Category	Public Information and Awareness
Hazard	Flood
Objective(s) addressed	PA-1.4
Background and Supplemental Information	<p>Flooding causes more deaths than any other severe weather related hazard. Many of the deaths occur in automobiles as they are swept away by floodwaters. The Crater region has seen its share of driver and passenger fatalities.</p> <p>The National Weather Service has developed a public education campaign, “Turn Around, Don’t Drown,” to educate drivers about the hazards flood waters pose.</p> <p>A range of public education materials, such as brochures, signs, and Public Service Announcements, already have been developed by the National Weather Service for use by its local office and local government. Local jurisdictions should identify commonly flooded intersections and prioritize signage for these areas to inform drivers of the risks.</p>
Priority	Medium
Funding sources	National Weather Service
Responsible party	Mitigation Advisory Committee; Crater Planning District Commission; County/City Public Information Officer
Completion date	Six months after plan approval

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Strategy PA-1.2.2: Work with local home improvement stores to provide workshops to residents on mitigation techniques.

Affected Jurisdictions	All
Category	Public Information, Training and Preparedness
Hazard	All Hazards
Objective(s) addressed	PA-1.2
Background and Supplemental Information	<p>Many home improvement stores (i.e., Home Depot and Lowes) currently offer classes to customers on a variety of topics. Workshops on mitigation techniques for the home are an obvious follow-on to an already successful classroom process. Such mitigation workshops have been held successfully across the United States.</p> <p>Groups like the American Red Cross, Federal Emergency Management Agency Region 3, and the Virginia Department of Emergency Management may be available to jointly sponsor such workshops.</p> <p>More information can be found at: http://www.homedepot.com/HDUS/EN_US/corporate/corp_respon/prepare_respond.shtml</p>
Priority	Low
Funding sources	N/A
Responsible party	Mitigation Advisory Committee
Completion date	On-going

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Strategy PA-1.3.2: Work with local media outlets to increase awareness of natural hazards. Implement seasonal hazard awareness weeks or days (e.g., hurricane preparedness week, winter weather awareness day).

Affected Jurisdictions	All
Category	Public Information and Awareness
Hazard	All Hazards
Objective(s) addressed	PA-1.3
Background and Supplemental Information	<p>A 2004 study sponsored by the American Red Cross and Wirthlin, a survey research firm, found that while Americans recognize the importance of being personally prepared for disaster, fewer than two in ten U.S. adults characterize themselves as very prepared.</p> <p>For people to take the steps to become prepared for disaster, they first must be aware of their risk. Media outlets (e.g., television, radio, print) can play an important role in raising awareness and encouraging personal responsibility to minimize the loss of life and property during a disaster.</p> <p>Public education campaigns can be tied to specific events (e.g., anniversary of a disaster) or to a particular hazard and time of year (e.g., hurricane preparedness week in the early summer).</p>
Priority	Low
Funding sources	FEMA/HMGP 5% funds, VDEM, local government operating budgets, private sources
Responsible party	Mitigation Advisory Committee; County/City Public Information Officer
Completion date	On-going

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Individual Actions

Each jurisdiction selected and prioritized its mitigation strategies. The top five to seven strategies for each jurisdiction are described be more in more detail. These strategies, combined with the regional strategies above, comprise the action plan for each jurisdiction.

Chesterfield County

Strategy PS-3.2.2: Identify need for backup generators, communications and/or vehicles at critical public facilities. Develop means to address shortfall identified.

Affected Jurisdictions	Chesterfield County
Category	Emergency Services
Hazard	All hazards
Objective(s) addressed	PS-3.2
Background	<p>The ability to recover quickly after a disaster rests, in part, on the community’s ability to maintain critical functions during response and recovery. An important part of maintaining these critical functions is ensuring that the facilities and resources needed are available after a disaster.</p> <p>An inventory and assessment should be completed for critical community facilities (e.g., Emergency Operations Center, Emergency Communications Center, public shelters), examining the need for backup generators, communications and/or vehicles. Needs should be ranked and a plan developed to address the most critical needs first.</p>
Priority	High
Funding sources	Capital Improvements Program, FEMA HMGP 5% funds, PDM
Responsible party	Department of Emergency Management, Risk Management

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Completion date	2 nd quarter of 2006
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Strategy PS-3.2.1: Consider providing necessary electrical hook-up, wiring, and switches to allow readily accessible connections to emergency generators at key critical public facilities.	
Affected Jurisdictions	Chesterfield County
Category	Emergency Services
Hazard	All Hazards
Objective(s) addressed	PS-3.2
Background	<p>Weather conditions throughout the year can cause unexpected power outages that affect critical public facilities. These outages can happen during thunder storms, hurricanes, winter storms and many other events.</p> <p>Generators are key to providing reliable, immediate and full-strength power when primary power systems fail. Standby power is required health care facilities, operations centers, food storage, essential building operations, correctional and security systems, water pumping stations, and 911 call centers.</p> <p>Generator hook ups allow the county to have a supply of mobile generators that can be assigned based on needs (as opposed to buying a generator for each facility). In addition, this ensures that if a generator is sent somewhere it can actually be used because it can be hooked-up.</p>
Priority	High
Funding sources	Department of Homeland Security (DHS)/Homeland Security Grant Program (HSGP); Capital Improvements Plan; PDM

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Responsible party	Department of Emergency Management, Public Works
Completion date	2 nd quarter of 2006

Strategy PS-2.1.1: Continue to identify funding opportunities to replace vulnerable or undersized culvert stream crossings with bridges or larger culverts to reduce flood hazards.

Affected Jurisdictions	Chesterfield County
Category	Structural Projects
Hazard	Flood
Objective(s) addressed	PS-2.1
Background	<p>Culvert road crossings, over water bodies such as streams, can be vulnerable to flooding. Numerous roads in the County use culvert-style crossings to span small streams. If these culverts are too small to handle floodwaters or become clogged with debris, flooding of the road can result.</p> <p>Specific areas that should be evaluated include:</p> <ul style="list-style-type: none"> - Beach Road at Route 10 - Jeff Davis Highway and Bellwood Road - Hull Street between Brandermill and Wood Lake
Priority	High
Funding sources	Capital Improvements Plan, PDM, HMGP
Responsible party	Environmental Engineering
Completion date	4 th quarter of 2009

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Strategy PP-1.1.1: Continue to investigate opportunities to provide incentives for property owners to implement mitigation measures.

Affected Jurisdictions	Chesterfield County
Category	Property Protection
Hazard	All hazards
Objective(s) addressed	PP-1.1
Background	It may be hard to convince property owners to undertake mitigation measures such as hurricane clips, defensible space, or structure elevation, because of the up-front costs. The county should investigate ways to provide incentives to property owners to persuade them to implement hazard mitigation measures. Incentives could include public grants (pass through from federal and state sources), tax relief, or in-kind donation (e.g., debris pick-up).
Priority	High
Funding sources	HMGP, PDM
Responsible party	Emergency Management, Planning
Completion date	On-going

Strategy PS-3.2.4: Work with VDOT and private utilities to trim or remove trees that could down power lines.

Affected Jurisdictions	Chesterfield County
Category	Prevention; Natural Resource Protection
Hazard	Wind; winter storm

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Objective(s) addressed	PS-3.2
Background	<p>Severe wind and heavy ice or snow loads can bring down tree limbs or entire trees. Trees are particularly vulnerable if they have been recently impacted by drought or previous storm events.</p> <p>An aggressive tree trimming and removal program should be undertaken to ensure that power line right of ways are clear of potential hazards. A system to identify trees with structural weaknesses should be developed. In addition, a means to communicate between responsible parties should be established so that potential problem spots can be addressed as they are identified by County and other staff.</p> <p>Because tree trimming may affect the existing tree canopy and resulting community appearance, it may require a public education campaign to explain the need for a tree trimming program.</p>
Priority	High
Funding sources	Public/Private partnerships, Local funds
Responsible party	Environmental Engineering, Dominion Power, Comcast, Verizon, VDOT
Completion date	On-going

Colonial Heights

Strategy I-2.1.1: Obtain official recognition of the Mitigation Advisory Committee by the jurisdictions in the Planning District in order to help institutionalize and develop an ongoing mitigation program. Use the committee to review mitigation projects and coordinate multi-jurisdictional grant applications.

Affected Jurisdictions	City of Colonial Heights
Category	N/A

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Hazard	All Hazards
Objective(s) addressed	I-2.1
Background and Supplemental Information	<p>The Disaster Mitigation Act of 2000 (DMA2K) required local governments to develop and to adopt all hazards mitigation plans to be eligible for certain types of future disaster assistance including funds for mitigation activities.</p> <p>The Crater PDC formed a multi-jurisdictional committee to over see hazard mitigation planning efforts for the Crater Region. Each of the participating jurisdictions was represented on the committee.</p> <p>One way to increase the effectiveness of such committees and ensure long-term plan implementation is to bestow official status to them. Implementation is to bestow official status to them. In addition, a formalized committee will aid by allowing communities to share the workload when implementing regional activities.</p>
Priority	High
Funding sources	N/A
Responsible party	City Council
Completion date	Immediately following plan approval

Strategy LC-2.3.1: Continue to enforce zoning and building codes to prevent/control construction within the floodplain.

Affected Jurisdictions	City of Colonial Heights
Category	Prevention
Hazard	Flood
Objective(s) addressed	LC-2.3

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Background and Supplemental Information	<p>Zoning and building codes are powerful tools used to ensure that development does not occur in hazardous areas and that development is built safely. However, these regulations are only as good as they are implemented.</p> <p>A lack of enforcement of zoning regulations and building inspections is believed to have contributed to the extensive destruction caused by Hurricane Andrew in 1990.</p> <p>Enforcement of zoning and building codes is essential to maintain eligibility for future grants and other financial assistance. In addition, enforcement of the building code contributes to the Building Code Effectiveness Grading Schedule, conducted by the Insurance Services Organization. The score received on this schedule ultimately affects the personal insurance rates in a community.</p>
Priority	Medium
Funding sources	City budget
Responsible party	Planning and Community Development
Completion date	On-going

Strategy PP-2.1.2: Inspect and clear debris from stormwater drainage system.

Affected Jurisdictions	City of Colonial Heights
Category	Prevention
Hazard	Flood
Objective(s) addressed	PP-2.1
Background and Supplemental Information	Over time, stormwater systems can become clogged with debris and sediment (e.g., sand, gravel, etc.) causing

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	<p>flooding in local streets and buildings. Proper maintenance of the system is important to prevent flooding and surface water pollution during storms.</p> <p>The City's Department of Public Works has an on-going effort to inspect and clear the stormwater drainage system. The system consists of catch basins, storm drain lines, and sumps.</p>
Priority	High
Funding sources	Departmental budget
Responsible party	Public Works
Completion date	On-going

Strategy I-1.1.1: Incorporate (or continue to incorporate) mitigation principles into local comprehensive, emergency management, and recovery plans.

Affected Jurisdictions	City of Colonial Heights
Category	Prevention
Hazard	All
Objective(s) addressed	I-1.1
Background and Supplemental Information	<p>While mitigation is a phase of the emergency management cycle, it can not be successfully implemented by emergency managers alone. The departments and agencies involved span planning, public works, economic development, and public safety. For mitigation to be truly successful, it must become part of local planning and decision-making. Mitigation concepts should be (or continue to be) integrated into local comprehensive, emergency management and recovery plans. As goals, objectives, and strategies are identified for these types of plans, efforts should be made to include mitigation explicitly and implicitly.</p>

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	<p>For example, the Environmental Element of the City of Colonial Heights' Comprehensive Plan includes the following:</p> <p style="padding-left: 40px;">“Objective 1: Direct future growth and development away from all identified...floodplains,...steep topography, highly erodible soils,...and other environmentally sensitive areas of the City.”</p> <p>This objective speaks directly to the need to limit development in hazardous areas. Objectives such as these should continue to be included in the City's Comprehensive Plan.</p> <p>This mitigation plan can be adopted as an annex to the existing Emergency Operations Plan. This will help to ensure that mitigation is considered in the post-disaster environment.</p>
Priority	High
Funding sources	N/A
Responsible party	City Administration, Planning, Emergency Management, Public Works, Risk Management
Completion date	On-going

Strategy PS-2.1.1: Identify funding opportunities to replace vulnerable or undersized culvert stream crossings with bridges or larger culverts to reduce flood hazards.

Affected Jurisdictions	City of Colonial Heights
Category	Structural Projects
Hazard	Floods
Objective(s) addressed	PS-2.1
Background and Supplemental Information	Flooded roads present one of the most dangerous hazards during a flood event. Many people underestimate the danger of driving through

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	<p>floodwaters, and many die or are injured after attempting to drive through them. While flooded roads are not widespread in the City of Colonial Heights, there are several areas of repetitive street closures that should be addressed. These vulnerable areas include culvert-style crossings to span small streams. If these culverts are too small to handle floodwaters or become clogged with debris, flooding of the road can result.</p> <p>Specific road and intersections that have been identified to be considered for mitigation are:</p> <ul style="list-style-type: none"> - Wrights Avenue - Jefferson Davis Highway and Swift Creek at the Chesterfield County line - Branders Bridge Road at the Chesterfield County line
Priority	High
Funding sources	Capital Improvements Plan, PDM, HMGP
Responsible party	Engineering, Public Works
Completion date	4 th quarter of 2009

Dinwiddie County

Strategy PS-1.. Establish NOAA notification protocols to ensure EOC real time information.**

Affected Jurisdictions	Dinwiddie County
Category	Emergency Services
Hazard	All hazards
Objective(s) addressed	PS-1
Background and Supplemental Information	Dinwiddie County would like to improve its access to real-time information regarding meteorological events. Coordination between the County and NOAA is needed

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	to ensure that the County receives information before it is released to the public to ensure that the County can adequately respond to information requests from the public.
Priority	High
Funding sources	NOAA, County funds
Responsible party	Public Safety
Completion date	4 th quarter of 2008

Strategy PS-2.1.2: Work with VDOT to evaluate at-risk roads and implement mitigation measures (e.g., elevation, re-design.).

Affected Jurisdictions	Dinwiddie County
Category	Structural Projects
Hazard	Flood
Objective(s) addressed	PS-2.1
Background and Supplemental Information	<p>Flooded roads present one of the most dangerous hazards during a flood event. Many people underestimate the danger of driving through floodwaters, and many die or are injured after attempting to drive through them. There are several areas of repetitive street closures that should be addressed including the roads along Hatcher Run, Route 1 and I-85.</p> <p>Roads subject to repeated flooding should be evaluated to determine the extent of the flooding (i.e., short-term nuisance flooding versus long-term, road damaging flooding) and to identify potential structural mitigation measures.</p>
Priority	High

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Funding sources	VDOT, FEMA 406 funds (post-disaster), HMGP, PDM
Responsible party	County Highway Department, VDOT
Completion date	2 nd quarter of 2007

Strategy PS-2.1.1: Identify funding opportunities to replace vulnerable or undersized culvert stream crossings with bridges or larger culverts to reduce flood hazards.

Affected Jurisdictions	Dinwiddie County
Category	Structural Projects
Hazard	Floods
Objective(s) addressed	PS-2.1
Background and Supplemental Information	One reason why roads flood is because the culverts used to cross stream are unable to handle floodwaters, either because their design capacity has been exceeded or because the culvert has become clogged with debris, flooding of the road can result.
Priority	High
Funding sources	Capital Improvements Plan, PDM, HMGP
Responsible party	County Highway Department, VDOT
Completion date	4 th quarter of 2009

Strategy PS-1.1.2: Investigate and develop appropriate emergency communication system for citizens.

Affected Jurisdictions	Dinwiddie County
Category	Emergency Services, Public Information

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Hazard	All hazards
Objective(s) addressed	PS-1.2; PA-1
Background and Supplemental Information	Reverse 911 systems are appropriate for some but not all communities. Dinwiddie County plans to explore other types of mass notification systems that can be used to communicate with its residents and provide public warning during emergency events. Options include low-power FM or AM radio stations, Internet-based warning systems, and on-demand text or voice notification systems.
Priority	High
Funding sources	Homeland Security Grant Program
Responsible party	Public Safety
Completion date	1 st quarter of 2007

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Strategy LC-1.1.1: Coordinate with the state to update and digitize community Flood Insurance Rate Maps (FIRMs).	
Affected Jurisdictions	Dinwiddie County
Category	Public Information and Awareness
Hazard	Flooding
Objective(s) addressed	LC-1.1
Background and Supplemental Information	<p>Flood Insurance Rate Maps (FIRMs) are developed by FEMA after a detailed flood risk assessment. Dinwiddie County’s FIRM dates from 1978 and no longer reflects the true flood risk to the area. In addition, the maps are not readily available in a digital format, complicating their effective use for planning and education purposes.</p> <p>Since these products are used by private citizens, insurance agents and brokers to locate properties/buildings and identify the risk for flood damage, it is crucial that they be accurate and up-to-date. The maps also are used by community officials to administer floodplain management regulations and mitigate flood damage. In addition, lending institutions and federal agencies use the FIRMS to determine when flood insurance is required for loans or grants involving the purchase or construction of buildings.</p> <p>The MAC should work with state floodplain management officials to ensure the communities within the Crater PDC are prioritized when funds for updating flood maps become available.</p>
Priority	High
Funding sources	FEMA Map Modernization, CTP
Responsible party	Community floodplain manager, MAC

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Completion date	4 th quarter of 2008
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Emporia

Strategy LC-2.3.6: Develop a new Zoning Ordinance or revise the existing Zoning Ordinance to include separate zones or districts with appropriate development criteria for known hazard areas.

Affected Jurisdictions	City of Emporia
Category	Prevention
Hazard	All hazards
Objective(s) addressed	2.3
Background	<p>Zoning is an effective tool for controlling the location, density, and type of development that occurs within a locality. In terms of hazard mitigation, zoning is most effective with respect to new development and in areas that are experiencing growth (as opposed to built out communities).</p> <p>A community might create an overlay zone for high-hazard districts that establishes mitigation requirements for development in those districts. An example is Emporia's floodplain district overlay, which regulates development in the 100-year floodplain. Overlay districts also could be used for areas subject to landslides or wildfires.</p>
Priority	High
Funding sources	City budget
Responsible party	Planning/Zoning Official
Completion date	4 th quarter of 2006

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Hazard Mitigation Plan

Strategy LC-2.3.1: Continue to enforce zoning and building codes to ensure construction is in compliance within the floodplain.

Affected Jurisdictions	City of Emporia
Category	Prevention
Hazard	Flood
Objective(s) addressed	LC-2.3
Background	<p>Zoning and building codes are powerful tools used to ensure that development does not occur in hazardous areas and that development is built safely. These regulations are only as good as they are implemented however.</p> <p>A lack of enforcement of zoning regulations and building inspections is believed to have contributed to the extensive destruction caused by Hurricane Andrew in 1990.</p> <p>Enforcement of zoning and building codes is essential to maintain eligibility for future grants and other financial assistance. In addition, enforcement of the building code contributes to the Building Code Effectiveness Grading Schedule, conducted by the Insurance Services Organization. The score received on this schedule ultimately affects the personal insurance rates in a community.</p>
Priority	High
Funding sources	City budget
Responsible party	Planning/Zoning Official, Building Inspections
Completion date	On-going

Crater Planning District Commission
Hazard Mitigation Plan

Strategy LC-2.3.5: Review and revise, if needed, local floodplain ordinances. Work with the state to coordinate a Community Assistance Visit to identify potential improvements or enhancements to existing floodplain management program.

Affected Jurisdictions	City of Emporia
Category	Prevention
Hazard	Flood
Objective(s) addressed	2.3
Background	<p>The City of Emporia entered the National Flood Insurance Program (NFIP) in 1977. The floodplain ordinance required as part of participation in the NFIP is about 30 years old. While the current ordinance meets the minimum standards of the NFIP, there may be opportunities for improvement or enhancement.</p> <p>During a Community Assistance Visit, state and local officials review current local ordinances, the number of floodplain insurance policies in the community, floodplain administration, permitting and annexation issues.</p>
Priority	High
Funding sources	City budget, VDEM
Responsible party	Planning
Completion date	4 th quarter of 2006

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Strategy PP-2.2.2: Evaluate built-upon areas within the floodplain for possible relocation and/or acquisition. In particular, target FEMA’s Repetitive Loss Properties throughout the Crater Region for possible relocation and/or acquisition.

- Specific areas under consideration include the homes on the river side of Center Street.

Affected Jurisdictions	City of Emporia
Category	Property Protection
Hazard	Flood
Objective(s) addressed	2.2
Background	<p>Possibly the most effective means of mitigating developed areas against flood is to remove the vulnerable structure from the floodplain. Relocation and acquisition are the two most common ways of achieving this goal.</p> <p>Relocation involves moving a building or facility to a less hazardous area, on either the same parcel or another parcel. Acquisition involves the purchasing of a property that is cleared and permanently held as open space.</p> <p>Repetitive loss properties often make good candidates for relocation and/or acquisition because the benefits versus the costs are easy to demonstrate. Grant funding is more often available for these repetitive loss properties. The residences along Center Street have been repeatedly affected by floodwaters. [Note: these residences are not listed in FEMA’s Repetitive Flood Loss data received from VDEM.]</p> <p>Typically, participation in either of these types of activities is voluntary. Communication and care is needed when discussing these options with homeowners.</p>

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Priority	High
Funding sources	HMGP; PDM; Flood Mitigation Assistance (FMA) program
Responsible party	Emergency Management; Planning
Completion date	4 th quarter of 2008

Strategy PP-2.1.4: Evaluate existing stormwater system to determine if it is adequate for existing (or future) flood hazard.

Affected Jurisdictions	City of Emporia
Category	Prevention
Hazard	Flood
Objective(s) addressed	PP-2.1
Background	Stormwater systems are used to hold back stormwater runoff to control flooding and settle out pollutants and debris, thereby improving water quality. The systems have many elements including catch basins, manholes, pipes, drywells, and detention systems. A stormwater system is designed for a certain capacity based on the projected runoff. As communities grow, the amount of runoff may increase and eventually exceed the amount that the system was designed to handle. Additional capacity may be needed to handle the increased runoff.
Priority	High
Funding sources	Capital Improvements Program
Responsible party	Public Utilities
Completion date	4 ^{2nd} quarter of 2006

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Hazard Mitigation Plan

Greenville County

Strategy LC-1.1.1: Coordinate with the state to update and digitize community Flood Insurance Rate Maps (FIRMs).	
Affected Jurisdictions	Greenville County
Category	Public Information and Awareness
Hazard	Flooding
Objective(s) addressed	LC-1.1
Background and Supplemental Information	<p>Flood Insurance Rate Maps (FIRMs) are developed by FEMA after a detailed flood risk assessment. Greenville County’s FIRM dates from 1978 and no longer reflects the true flood risk to the area. In addition, the maps are not readily available in a digital format, complicating their effective use for planning and education purposes.</p> <p>Since these products are used by private citizens, insurance agents and brokers to locate properties/buildings and identify the risk for flood damage, it is crucial that they be accurate and up-to-date. The maps also are used by community officials to administer floodplain management regulations and mitigate flood damage. In addition, lending institutions and federal agencies use the FIRMS to determine when flood insurance is required for loans or grants involving the purchase or construction of buildings.</p> <p>The MAC should work with state floodplain management officials to ensure the communities within the Crater PDC are prioritized when funds form updating flood maps become available.</p>
Priority	High
Funding sources	FEMA Map Modernization, CTP
Responsible party	Community floodplain manager, MAC

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Hazard Mitigation Plan

Completion date	4 th quarter of 2008
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Strategy LC-3.1.2: Identify means to coordinate, collect and store damage assessment data in GIS format for each natural hazard event, which causes death, injury and or property damage.

Affected Jurisdictions	Greensville County
Category	Emergency Services
Hazard	All hazards
Objective(s) addressed	LC-3.1
Background and Supplemental Information	<p>Collecting and managing damage assessment information is essential to an effective response and mitigation effort. By determining what happened and what the impacts are, communities are in a better position to respond initially to a disaster and to request additional assistance (e.g., state or federal). GIS systems can be used to effectively manage data and provide maps for emergency response planning and decision-making. This data analysis will help ensure that equipment and personnel can be better used, and assistance can be provided more quickly.</p> <p>This damage assessment information also can be used in future mitigation planning efforts. By capturing locally-specific accurate loss data, future hazard identification and risk assessments can be more detailed and accurate.</p>
Priority	High
Funding sources	Departmental funds, HMGP 5% funds
Responsible party	Emergency Services, Planning Department, Building Department
Completion date	On-going

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Strategy PA-1.3.4: Consider preparing an advisory pamphlet and distribute to occupants of housing units or business known to be in the floodplain advising them of the potential hazards of the area and of evacuation plans in the event of an emergency.

Affected Jurisdictions	Greenville County
Category	Public Information and Awareness
Hazard	Flood
Objective(s) addressed	PA-1.3
Background and Supplemental Information	<p>Because flood insurance is required for structures in the floodplain, homeowners may be aware that they are located in the floodplain, but this may not be true for occupants of rental units. Since there is not a similar insurance requirement for business owners, there is potential that they may not know of the risk.</p> <p>A targeted public education campaign could be conducted to raise awareness regarding the risk of living and/or working in the floodplain. The information distributed could include preparedness information including evacuation plans. Other information on floodproofing or other flood mitigation measures also should be included.</p>
Priority	High
Funding sources	FEMA (HMGP 5% funds), VDEM, local government operating budgets, private sources (e.g., insurance companies)
Responsible party	County Public Information Officer, Emergency Management
Completion date	4th quarter of 2005

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Strategy PP-2.1.2: Encourage VDOT to inspect and clear debris from stormwater drainage systems.

Affected Jurisdictions	Greensville County
Category	Prevention
Hazard	Flood
Objective(s) addressed	PP-2.1
Background and Supplemental Information	<p>Over time, stormwater systems can become clogged with debris and sediment (e.g., sand, gravel, etc.) causing flooding in local streets and buildings. The system consists of catch basins, storm drain lines, and sumps. Proper maintenance of the system is important to prevent flooding and surface water pollution during storms.</p> <p>Maintenance of the system is the responsibility of VDOT. The county needs to work with the department to develop a timely maintenance schedule and identify ways the County can assist with the process.</p>
Priority	High
Funding sources	Departmental Funds
Responsible party	County Engineer, MAC
Completion date	On-going

Strategy PP-1.1.2: Incorporate hazard mitigation techniques into new community facilities to minimize damages.

Affected Jurisdictions	Greensville County
Category	Property Protection

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Hazard	All Hazards
Objective(s) addressed	PP-1.1, PP-2
Background and Supplemental Information	As a component of encouraging private property owners to incorporate mitigation techniques into their structures, County government should consider the potential impacts of natural hazards when new community facilities are in the design stage. County officials should ensure that builders of new community facilities are aware of mitigation techniques and incorporate them as appropriate into construction of new community facilities.
Priority	High
Funding sources	PDM, HMGP, FEMA 406 funds (post-disaster), Capital Improvement Budget
Responsible party	County Engineer
Completion date	On-going

Hopewell

Strategy I-1.1.1: Incorporate (or continue to incorporate) mitigation principles into local comprehensive, emergency management, and recovery plans.

Affected Jurisdictions	City of Hopewell
Category	Prevention
Hazard	All hazards
Objective(s) addressed	I-1.1
Background and Supplemental Information	While mitigation is a phase of the emergency management cycle, it can not be successfully implemented by emergency managers alone. The departments and agencies involved span planning, public works, economic development, and public safety. For

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	<p>mitigation to be truly successful, it must become part of local planning and decision-making. Mitigation concepts should be (or continue to be) integrated into local comprehensive, emergency management and recovery plans. As goals, objectives, and strategies are identified for these types of plans, efforts should be made to include mitigation explicit and implicitly.</p> <p>For example, the City of Hopewell’s Comprehensive Plan addresses development within the Chesapeake Bay Protected Areas. To the extent that floodplains are included within these areas, they receive protection from excessive development. Efforts could be made, in the next revision to the plan, to more explicitly address mitigation. This may include policies regarding acquisition of flood-prone properties or policies regarding stormwater management.</p> <p>This mitigation plan can be adopted as an annex to the existing Emergency Operations Plan. This will help to ensure that mitigation is considered in the post-disaster environment.</p>
Priority	High
Funding sources	N/A
Responsible party	City Administration, Planning, Emergency Management, Public Works, Risk Management
Completion date	On-going

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Strategy PP-3.1.2: Investigate critical community facilities, such as county administrative offices, shelters (non-school buildings), fire stations and police stations, to evaluate their resistance to flood and wind hazards. Particular attention will be given to the HVAC system and structural integrity of the buildings. Prioritize facilities in known hazard areas (e.g., floodplains).

Affected Jurisdictions	City of Hopewell
Category	Property Protection
Hazard	All Hazards
Objective(s) addressed	PP-3.1
Background and Supplemental Information	<p>The ability to recover quickly after a disaster rests, in part, on the community's ability to maintain critical functions during response and recovery. Efforts should be undertaken to ensure that community critical facilities can withstand the impact of various hazards.</p> <p>The first step of the process is to identify the critical community facilities in the city. Examples of buildings to evaluate are:</p> <ul style="list-style-type: none"> ▪ Fire stations ▪ Police stations ▪ Sewage treatment plants ▪ Water treatment plants and pumping stations ▪ Hospitals ▪ Retirement homes and senior care facilities ▪ Day care centers ▪ Critical utility sites such as telephone switching stations or electrical transformer ▪ Hazardous material storage areas <p>Data to collect includes:</p> <ul style="list-style-type: none"> ▪ General building design and construction information, including age, geometry, materials, roof design, foundation type, window type,

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	<p>detailing and damage history.</p> <ul style="list-style-type: none"> ▪ Status of the building connections, maintenance and other characteristics that increase or decrease structural vulnerability. <p>Particular systems to consider when assessing vulnerability:</p> <ul style="list-style-type: none"> ▪ HVAC ▪ Roof ▪ Windows ▪ Electricity, water and communications ▪ Access <p>Use this information to assess the ability of the structure to withstand various hazards including wind, flood, and winter storm. Rank the facilities according to greatest needs.</p> <p>Action steps:</p> <ul style="list-style-type: none"> ▪ Particular attention should be given to the Virginia American Water Systems low service station and the gas pipelines in the City.
Priority	High
Funding sources	HMGP 5% funds
Responsible party	Engineering, Emergency Management, Risk Management
Completion date	3 rd quarter of 2006

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Strategy LC-1.1.1: Coordinate with the state to update and digitize community Flood Insurance Rate Maps (FIRMs).	
Affected Jurisdictions	City of Hopewell
Category	Public Information and Awareness
Hazard	Flooding
Objective(s) addressed	LC-1.1
Background and Supplemental Information	<p>Flood Insurance Rate Maps (FIRMs) are developed by FEMA after a detailed flood risk assessment. The City of Hopewell's FIRM dates from 1979 and no longer reflects the true flood risk to the area. In addition, the maps are not readily available in a digital format, complicating their effective use for planning and education purposes.</p> <p>Since these products are used by private citizens, insurance agents and brokers to locate properties/buildings and identify the risk for flood damage, it is crucial that they be accurate and up-to-date. The maps also are used by community officials to administer floodplain management regulations and mitigate flood damage. In addition, lending institutions and federal agencies use the FIRMS to determine when flood insurance is required for loans or grants involving the purchase or construction of buildings.</p> <p>The MAC should work with state floodplain management officials to ensure the communities within the Crater PDC are prioritized when funds for updating flood maps become available.</p>
Priority	High
Funding sources	FEMA Map Modernization, CTP
Responsible party	Community floodplain manager, MAC

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Completion date	4 th quarter of 2008
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Strategy PS-3.1.1: Develop Continuity of Operations plan.	
Affected Jurisdictions	City of Hopewell
Category	N/A
Hazard	All Hazards
Objective(s) addressed	PS-3.1
Background and Supplemental Information	<p>The ability of state and local governments to carry out their executive, legislative and judicial functions effectively and efficiently during or following a disaster or emergency is dependent on sound preparedness and planning. The development and maintenance of a viable Continuity of Operations Plan (COOP) and capability at each level of government is critical to save lives and protect the public health and well-being, protect property and preserve assets, maintain functionality, and maintain essential government operations and services.</p> <p>The City of Hopewell does not have a Continuity of Operations Plan. This plan can be developed as a stand alone product and integrated into the next rewriting of the City's Emergency Operations Plan.</p> <p>The City may want to consider establishing a steering committee to facilitate development of the plan. Once the plan is written, it should be validated with a series of exercises.</p>
Priority	High
Funding sources	Departmental budget. DHS HSGP
Responsible party	Emergency Management
Completion date	2 nd quarter of 2006.

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Strategy PP-2.1.2: Inspect and clear debris (or encourage VDOT to) from stormwater drainage system.

Affected Jurisdictions	City of Hopewell
Category	Prevention
Hazard	Flood
Objective(s) addressed	PS-2.1
Background and Supplemental Information	<p>The stormwater system consists of catch basins, storm drain lines, and sumps. Over time, stormwater systems can become clogged with debris and sediment (e.g., sand, gravel, etc.) causing flooding in local streets and buildings. Proper maintenance of the system is important to prevent flooding and surface water pollution during storms.</p> <p>The City's Department of Public Works has an on-going effort to inspect and clear the stormwater drainage system.</p>
Priority	High
Funding sources	Departmental budget
Responsible party	Public Works
Completion date	On-going

Petersburg

Strategy I-2.1.1: Obtain official recognition of the Mitigation Advisory Committee by the jurisdictions in the Planning District in order to help institutionalize and develop an ongoing mitigation program. Use the committee to review mitigation projects and coordinate multi-jurisdictional grant applications.

Affected Jurisdictions	City of Petersburg
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Category	N/A
Hazard	All Hazards
Objective(s) addressed	I-2.1
Background	<p>The Disaster Mitigation Act of 2000 (DMA2K) required local governments to develop and to adopt all hazards mitigation plans to be eligible for certain types of future disaster assistance including funds for mitigation activities.</p> <p>The Crater PDC formed a multi-jurisdictional committee to over see hazard mitigation planning efforts for the Crater Region. Each of the participating jurisdictions was represented on the committee.</p> <p>One way to increase the effectiveness of such committees and ensure long-term plan implementation is to bestow official status to them. In addition, a formalized committee will aid by allowing communities to share the workload when implementing regional activities.</p>
Priority	High
Funding sources	N/A
Responsible party	City Council
Completion date	Immediately following plan approval

Strategy PP-2.1.4: Evaluate existing stormwater system to determine if it is adequate for existing (or future) flood hazard.

Affected Jurisdictions	City of Petersburg
Category	Prevention
Hazard	Flood

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Objective(s) addressed	PP-2.1
Background	<p>Stormwater systems are used to hold back stormwater runoff to control flooding and settle out pollutants and debris, thereby improving water quality. The systems have many elements including catch basins, manholes, pipes, drywells, and detention systems. A stormwater system is designed for a certain capacity based on the projected runoff. As communities grow, the amount of runoff may increase and eventually exceed the amount that the system was designed to handle. Additional capacity may be needed to handle the increased runoff.</p> <p>As the City’s website notes, Petersburg was incorporated almost 300 years ago. The existing stormwater drainage system is quite old and in some cases undersized. Additionally, much of the southern and eastern portions of the city are built adjacent to very flat areas bordering the Blackwater Swamp, further complicating drainage problems.</p>
Priority	High
Funding sources	Capital Improvements Program
Responsible party	Public Works
Completion date	1 st quarter of 2007

Strategy PP-2.1.1: Develop and implement a channel maintenance program consisting of routine inspections and subsequent debris removal to ensure free flow of water in local streams and watercourses.

Affected Jurisdictions	City of Petersburg
Category	Natural Resource Protection, Prevention
Hazard	Flood

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Objective(s) addressed	PP-2.1
Background	Waterways should be cleared of debris to allow for the free flow of water during a flood event. If streams or rivers are clogged with debris, damming could occur. As a result, areas upstream and adjacent to the unintended dam can receive unanticipated higher flood levels. In addition, downstream areas may be vulnerable to higher flooding if and when the dam breaks.
Priority	High
Funding sources	City funds
Responsible party	Public Works
Completion date	On-going

Strategy PS-1.2.3: Place flood level markers along bridges and other structures to indicate the rise of water levels along creeks and rivers in potential flood-prone areas. Work with VDOT and other jurisdictions as needed.

Affected Jurisdictions	City of Petersburg
Category	Public Awareness and Information
Hazard	Flood
Objective(s) addressed	PS-1.2
Background	<p>Many of the deaths that occur during flood events occur when people attempt to drive through floodwaters. Roads subject to flooding should be clearly marked with a gauge showing flood depths.</p> <p>There are several sections of roads in the City of Petersburg that are subject to localized flooding during heavy rains. Particular areas include: Bank Street, River Street, Walnut Hill area, Washington Street and Wythe Street.</p>

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Priority	High
Funding sources	HMGP, VDOT, City funds
Responsible party	Public Works
Completion date	4 th quarter of 2006

Strategy PS-2.1.1: Identify funding opportunities to replace vulnerable or undersized culvert stream crossings with bridges or larger culverts to reduce flood hazards.

Affected Jurisdictions	City of Petersburg
Category	Structural Projects
Hazard	Flood
Objective(s) addressed	PS-2.1
Background	<p>Particularly vulnerable to flooding are the parts of roads that cross water bodies such as streams. Numerous roads in the City use culvert-style crossings to span small streams. If these culverts are too small to handle floodwaters or become clogged with debris, flooding of the road can result.</p> <p>Particular areas to consider include: Bank Street, River Street, Walnut Hill area, Washington Street and Wythe Street.</p>
Priority	High
Funding sources	FEMA, VDOT
Responsible party	Public Works
Completion date	4 th quarter of 2009

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Prince George County

Strategy PP-2.1.3: Work with VDOT to identify opportunities to remove debris from private property.	
Affected Jurisdictions	Prince George County
Category	All Hazards
Hazard	Wind, Winter Storm, Wildfire, Flood
Objective(s) addressed	PP-2.1
Background and Supplemental Information	<p>While the county provides debris removal for storm-related tree debris up to a certain size, there remains a need for additional assistance to remove debris from private property. The County often accepts debris at County landfills for no charge after a disaster.</p> <p>VDOT removes debris from the road right-of-way but not from private property. Discussions should be initiated with VDOT to address concerns regarding liability and capacity to remove debris from private property. A proactive effort should be made to secure agreement on what and how debris will be removed after an event.</p>
Priority	High
Funding sources	County, VDOT, FEMA
Responsible party	VDOT, County Engineer, Public Works, Refuse and Recycling
Completion date	2 nd quarter of 2006 (re-evaluate after an event)

Strategy PS-2.1.1: Identify funding opportunities to replace vulnerable or undersized culvert stream crossings with bridges or larger culverts to reduce flood hazards.	
Affected Jurisdictions	Prince George County

Crater Planning District Commission
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Category	Structural Projects
Hazard	Flood
Objective(s) addressed	PS-2.1
Background and Supplemental Information	Particularly vulnerable to flooding are the parts of roads that cross water bodies such as streams. Numerous roads in the County use culvert-style crossings to span small streams. If these culverts are too small to handle floodwaters or become clogged with debris, flooding of the road can result.
Priority	High
Funding sources	PDM, VDOT
Responsible party	VDOT, County Engineer
Completion date	4th quarter of 2007

Strategy PS-2.1.2: Work with VDOT to evaluate at-risk roads and implement mitigation measures (e.g., elevation, re-design.).

Affected Jurisdictions	Prince George County
Category	Structural Projects
Hazard	Flood
Objective(s) addressed	PS-2.1
Background and Supplemental Information	Flooded roads present one of the most dangerous hazards during a flood event. Many people underestimate the danger of driving through floodwaters, and many die or are injured after attempting to drive through them. There are several areas of repetitive street closures that should be addressed including Golf Course Drive, Baxter Road, and Route 460.

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	Roads subject to repeated flooding should be evaluated to determine the extent of the flooding (i.e., short-term nuisance flooding versus long-term, road damaging flooding) and to identify potential structural mitigation measures.
Priority	High
Funding sources	VDOT, FEMA 406 funds (post-disaster), HMGP, PDM
Responsible party	VDOT, County Engineer
Completion date	2 nd quarter of 2007

Strategy PP-2.1.*: Identify means to mitigate stormwater runoff and subsequent landslides in eastern portion of the County.

Affected Jurisdictions	Prince George County
Category	Prevention, Structural Projects
Hazard	Flood, Landslide
Objective(s) addressed	PP-2.1, PP-1.1
Background and Supplemental Information	In the eastern part of the County, several subdivisions have been built close to steep slopes and do not provide the appropriate runoff protection. The subsequent stormwater runoff causes erosion, which leads to landslides. Areas vulnerable to such an occurrence should be identified. Plans should be developed to improve storm drainage in these areas.
Priority	High
Funding sources	PDM, HMGP
Responsible party	County Engineer
Completion date	4 th quarter of 2007

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*Strategy not included in overall list.

Strategy LC-4.1.1: Develop recommendations for short-term and long-term funding sources for mitigation, planning, and projects.

Affected Jurisdictions	Prince George County
Category	N/A
Hazard	All Hazards
Objective(s) addressed	LC-4.1
Background and Supplemental Information	In addition to the funding sources provided in the regional action plan, the County should determine if and how mitigation can be incorporated into capital improvement programming. In addition, the County could consider local revenue sources such as County bonds, proffers, or programmatic fees.
Priority	High
Funding sources	FEMA, DHS, State of Virginia, NGO's,
Responsible party	County Administration, Planning, Emergency Management
Completion date	On-going

Strategy PA-1.1.4: Educate homeowners about flood insurance and ICC (Increased Cost of Compliance) coverage.

Affected Jurisdictions	Prince George County
Category	Public Information and Awareness
Hazard	Flood
Objective(s) addressed	PA-1.1

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Background and Supplemental Information	<p>The County can use GIS to determine which residences and businesses are located in the flood plains. Owners of these properties can be sent informational packets about flood insurance and ICC coverage.</p> <p>ICC coverage provides, after a flood, up to \$30,000 to bring an affected structure into compliance with their community's floodplain ordinance. This coverage is automatically included in flood insurance premiums, however, many property owners are not aware it is available.</p>
Priority	High
Funding sources	NFIP
Responsible party	Floodplain manager, County Public Information Officer
Completion date	On-going

Strategy PA-1.3.4: Prepare an advisory pamphlet and distribute to occupants of housing units or business known to be in the floodplain advising them of the potential hazards of the area and of evacuation plans in the event of an emergency

Affected Jurisdictions	Prince George County
Category	Public Information and Awareness
Hazard	Flood
Objective(s) addressed	PA-1.3
Background and Supplemental Information	<p>Because flood insurance is required for structures in the floodplain, homeowners may be aware that they are located in the floodplain, but this may not be true for occupants of rental units. Since there is not a similar insurance requirement for business owners, there is potential that they may not know of the risk.</p> <p>A targeted public education campaign could be</p>

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	conducted to raise awareness regarding the risk of living and/or working in the floodplain. The information distributed could include preparedness information including evacuation plans. Other information on floodproofing or other flood imitation measures also should be included.
Priority	High
Funding sources	FEMA (HMGP 5% funds), VDEM, local government operating budgets, private sources
Responsible party	County Public Information Officer, Emergency Management
Completion date	4th quarter of 2005

Surry County

Strategy LC-1.1.1: Coordinate with the state to update and digitize community Flood Insurance Rate Maps (FIRMs).

Affected Jurisdictions	Surry County
Category	Public Information and Awareness
Hazard	Flooding
Objective(s) addressed	LC-1.1
Background and Supplemental Information	<p>Flood Insurance Rate Maps (FIRMs) are developed by FEMA after a detailed flood risk assessment. Many of the FIRMs in the Crater Region are over 15 years old and no longer reflect the true flood risk to the area. The FIRM for Surry County was last updated in 1990. In addition, the maps are not readily available in a digital format, complicating their effective use for planning and education purposes.</p> <p>Since these products are used by private citizens, insurance agents and brokers to locate properties/buildings and identify the risk for flood</p>

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	<p>damage, it is crucial that they be accurate and up-to-date. The maps also are used by community officials to administer floodplain management regulations and mitigate flood damage. In addition, lending institutions and federal agencies use the FIRMS to determine when flood insurance is required for loans or grants involving the purchase or construction of buildings.</p> <p>The MAC should work with state floodplain management officials to ensure the communities within the Crater PDC are prioritized when funds for updating flood maps become available.</p>
Priority	Medium
Funding sources	FEMA Map Modernization; Cooperating Technical Partners (CTP)
Responsible party	Mitigation Advisory Committee, Community floodplain manager, Virginia Geographic Information Network (VGIN), VA Department of Conservation and Recreation (VA DCR)
Completion date	4 th quarter of 2008

Strategy PS-2.1.2: Work with VDOT to evaluate at-risk roads and implement mitigation measures (e.g., elevation, re-design.).

Affected Jurisdictions	Surry County
Category	Structural Projects
Hazard	Flood
Objective(s) addressed	PS-2.1
Background and Supplemental Information	Flooded roads present one of the most dangerous hazards during a flood event. Many people underestimate the danger of driving through floodwaters, and many die or

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	<p>are injured after attempting to drive through them. There are several areas of repetitive flooding including the areas of Chasehunt Bead, Suntick Meadows, Guilford Heights, Scotland Wharf, and Chestnut Farm.</p> <p>Roads subject to repeated flooding should be evaluated to determine the extent of the flooding (i.e., short-term nuisance flooding versus long-term, road damaging flooding) and to identify potential structural mitigation measures.</p>
Priority	High
Funding sources	VDOT, FEMA 406 funds (post-disaster), HMGP, PDM
Responsible party	VDOT, County Engineer
Completion date	2 nd quarter of 2007

Strategy PS-3.2.1: Consider providing necessary electrical hook-up, wiring, and switches to allow readily accessible connections to emergency generators at key critical public facilities.

Affected Jurisdictions	Surry County
Category	Emergency Services
Hazard	All Hazards
Objective(s) addressed	PS-3.2
Background and Supplemental Information	<p>Weather conditions throughout the year can cause unexpected power outages that affect critical public facilities. These outages can happen during thunder storms, hurricanes, winter storms and other events.</p> <p>Generators are essential to providing reliable, immediate and full-strength power when primary power systems fail. Standby power is required by health care facilities, operations centers, food storage, essential building</p>

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	<p>operations, correctional and security systems, water pumping stations, and 911 call centers.</p> <p>Generator hook-ups allow the county to have a supply of mobile generators that can be assigned based on needs (as opposed to buying a generator for each facility). In addition, this ensures that if a generator is sent somewhere it can actually be used because it can be hooked-up.</p>
Priority	High
Funding sources	Homeland Security Grant Program; Capital Improvements Plan; PDM
Responsible party	Department of Emergency Management, Public Works
Completion date	2nd quarter of 2006

Strategy PS-1.1.2: Investigate, develop, or enhance Reverse 911 system or other appropriate emergency communication system for citizens.

Affected Jurisdictions	Surry County
Category	Emergency Services, Public Information
Hazard	All hazards
Objective(s) addressed	PS-1.2; PA-1
Background and Supplemental Information	<p>Reverse 911 systems have a variety of functions including the ability to provide public warning during emergency events. This information can be targeted to a particular geographic area or to people with common characteristics (e.g., Community Emergency Response Team members). Some systems also allow you to provide text messages to pagers and other wireless devices.</p> <p>This system greatly increases a community's ability to quickly and efficiently provide warnings to its citizens. Information can be delivered in a variety of languages</p>

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	and means.
Priority	High
Funding sources	Homeland Security Grant Program
Responsible party	Office of Emergency Management; Police; Fire/EMS
Completion date	1 st quarter of 2007

Strategy PA-1.3.2: Work with local media outlets to increase awareness of natural hazards. Implement seasonal hazard awareness weeks or days (e.g., hurricane preparedness week, winter weather awareness day).

Affected Jurisdictions	Surry County
Category	Public Information and Awareness
Hazard	All Hazards
Objective(s) addressed	PA-1.3
Background and Supplemental Information	<p>A 2004 study sponsored by the American Red Cross and Wirthlin, a survey research firm, found that while Americans recognize the importance of being personally prepared for disaster, fewer than two in ten U.S. adults characterize themselves as very prepared.</p> <p>For people to take the steps to become prepared for disaster, they first must be aware of their risk. Media outlets (e.g., television, radio, print) can play an important role in raising awareness and encouraging personal responsibility to minimize the loss of life and property during disaster.</p> <p>Public education campaigns can be tied to specific events (e.g. anniversary of a disaster) or to a particular hazard and time of year (e.g., hurricane preparedness week in the early summer).</p>

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Priority	High
Funding sources	FEMA (HMGP 5% funds), VDEM, local government operating budgets, private sources
Responsible party	Mitigation Advisory Committee; County/City Public Information Officer
Completion date	On-going

Sussex County

Strategy PA-1.3.2: Work with local media outlets to increase awareness of natural hazards. Implement seasonal hazard awareness weeks or days (e.g., hurricane preparedness week, winter weather awareness day).

Affected Jurisdictions	Sussex County
Category	Public Information and Awareness
Hazard	All Hazards
Objective(s) addressed	PA-1.3
Background and Supplemental Information	<p>A 2004 study sponsored by the American Red Cross and Wirthlin, a survey research firm, found that while Americans recognize the importance of being personally prepared for disaster, fewer than two in ten U.S. adults characterize themselves as very prepared.</p> <p>For people to take the steps to become prepared for disaster, they first must be aware of their risk. Media outlets (e.g., television, radio, print) can play an important role in raising awareness and encouraging personal responsibility to minimize the loss of life and property during disaster.</p> <p>Public education campaigns can be tied to specific events (e.g. anniversary of a disaster) or to a particular hazard and time of year (e.g., hurricane preparedness week in the early summer).</p>

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Priority	High
Funding sources	FEMA (HMGP 5% funds), VDEM, local government operating budgets, private sources
Responsible party	Mitigation Advisory Committee; County/City Public Information Officer
Completion date	On-going

Strategy PS-1.1.2: Investigate, develop, or enhance Reverse 911 system or other appropriate emergency communication system for citizens.

Affected Jurisdictions	Sussex County
Category	Emergency Services, Public Information
Hazard	All hazards
Objective(s) addressed	PS-1.2; PA-1
Background and Supplemental Information	<p>Reverse 911 systems have a variety of functions including the ability to provide public warning during emergency events. This information can be targeted to a particular geographic area or to people with common characteristics (e.g., Community Emergency Response Team members). Some systems also allow you to provide text messages to pagers and other wireless devices.</p> <p>This system greatly increases a community's ability to quickly and efficiently provide warnings to its citizens. Information can be delivered in a variety of languages and means.</p>
Priority	High
Funding sources	Homeland Security Grant Program
Responsible party	Office of Emergency Management; Police; Fire/EMS

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Completion date	1 st quarter of 2007
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Strategy PS-3.2.1: Consider providing necessary electrical hook-up, wiring, and switches to allow readily accessible connections to emergency generators at key critical public facilities.	
Affected Jurisdictions	Sussex County
Category	Emergency Services
Hazard	All Hazards
Objective(s) addressed	PS-3.2
Background and Supplemental Information	<p>Weather conditions throughout the year can cause unexpected power outages that affect critical public facilities. These outages can happen during thunder storms, hurricanes, winter storms and other events.</p> <p>Generators are essential to providing reliable, immediate and full-strength power when primary power systems fail. Standby power is required by health care facilities, operations centers, food storage, essential building operations, correctional and security systems, water pumping stations, and 911 call centers.</p> <p>Generator hook-ups allow the county to have a supply of mobile generators that can be assigned based on needs (as opposed to buying a generator for each facility). In addition, this ensures that if a generator is sent somewhere it can actually be used because it can be hooked-up.</p>
Priority	High
Funding sources	Homeland Security Grant Program; Capital Improvements Plan; PDM
Responsible party	Department of Emergency Management, Public Works

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Completion date	2nd quarter of 2006
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SECTION VIII. PLAN MAINTENANCE PROCEDURES

The long-term success of the Crater Planning District’s mitigation plan depends in large part on routine monitoring, evaluating, and updating of the plan so that it will remain a valid tool for the communities to use. The first step in ensuring that the plan’s activities will be implemented is obtain official recognition of the Mitigation Advisory Committee (MAC) as proposed in Mitigation Strategy I-2.1.1, and assign the responsibility for updating the plan to the MAC.

Plan Adoption, Implementation And Maintenance

Formal Plan Adoption

Eighteen local governments in eastern Virginia participated in this planning process and formally adopted this plan by resolution of its governing Board. These local governments are the counties of Chesterfield, Dinwiddie, Greensville, Prince George, Surry, and Sussex; the cities of Colonial Heights, Emporia, Hopewell, and Petersburg; and the towns of Claremont, Dendron, Jarratt, McKenney, Stony Creek, Surry, Wakefield, and Waverly.

The plan was completed under the auspices of the Crater Planning District. Sample adoption language was provided to the participating jurisdictions to facilitate the adoption process (see Appendix A).

The adoption process itself took several months, as significant coordination by the Mitigation Advisory Committee was necessary in order to 1) place the plan review and adoption on the appropriate meeting agendas in each jurisdiction, 2) produce and provide copies in official meeting packets, 3) facilitate the actual adoption, 4) collect the adoption resolutions, and 5) incorporate the adopted resolutions into the final Hazard Mitigation Plan.

The Crater Planning District appreciates the willingness that both Virginia Department of Emergency Management and FEMA Region III demonstrated by reviewing this plan concurrently and providing comments for revision *prior* to the adoption process. Not having done so would clearly have added more months to the adoption process.

Implementation

Upon adoption, the plan faces the biggest test: ***implementation***. While this plan puts forth many worthwhile and “High” priority recommendations, the decision of which action to undertake first will be the primary issue that the Crater Planning District communities face.

Funding is always an important and critical issue. Therefore, pursuing low or no-cost high-priority recommendations may be one approach that a community chooses to take. An

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example of a low-cost, high-priority recommendation would be to work with local media outlets to raise awareness about the risks posed by natural hazards and educate citizens on means to reduce their vulnerability.

Another implementation approach is to prioritize those actions that can be completed in a relatively short amount of time. Being able to publicize a successful project can build momentum to implement the other parts of the plan. An example of an effective but easy-to-implement strategy is to purchase NOAA weather radios for school administrative offices.

It is important to the long-term implementation of the plan that the underlying principles of this Hazard Mitigation Plan are incorporated into other community plans and mechanisms, such as:

- Comprehensive Planning
- Capital Improvement Budgeting

The capability assessment section of this plan provides insight into the current comprehensive plans for each community. Communities should work to ensure that the appropriate information from this plan is incorporated into the next update of its comprehensive plan. Information from the hazard identification and risk assessment as well as mitigation goals and strategies can be directly included as a comprehensive plan element. Projects that require large investments, such as acquisition or road retrofits are candidates for inclusion in capital improvement plans.

Mitigation is most successful when it is incorporated within the day-to-day functions and priorities of government and development. This integration is accomplished by a constant effort to network and to identify and highlight the multi-objective, “win-win” benefits to each program, the communities and constituents. This effort is achieved through the often tedious actions of monitoring agendas, attending meetings, and sending memos.

Simultaneous to these efforts, it will be important to constantly monitor funding opportunities that can be utilized to implement some of the higher cost recommended actions. This will include creating and maintaining a repository of ideas on how any required local match or participation requirement can be met. Then, when funding does become available, the Crater Planning District communities will be in a position to take advantage of an opportunity. Funding opportunities that can be monitored include special pre- and post-disaster funds, special district budgeted funds, state or federal ear-marked funds, and grant programs, including those that can serve or support multi-objective applications.

With adoption of this plan, the Crater Planning District communities commit to:

- Pursuing the implementation of the high-priority, low/no-cost recommended actions.
- Keeping the concept of mitigation in the forefront of community decision-making by identifying and stressing the recommendations of the Hazard Mitigation Plan when other community goals, plans and activities are discussed and decided upon.
- Maintaining a constant monitoring of multi-objective, cost-share opportunities to assist the participating communities in implementing the recommended actions of this plan for which no current funding or support exists.

Maintenance

Plan maintenance requires an ongoing effort to monitor and evaluate the implementation of the plan, and to update the plan as progress, roadblocks, or changing circumstances are recognized.

This monitoring and updating will take place through:

- Annual progress reports from each jurisdiction on Mitigation Action Plan,
- An annual review by the MAC, and
- A 5-year written update to be submitted to the state and FEMA Region III, unless disaster or other circumstances (e.g., changing regulations) lead to a different time frame.

The Executive Director of the Crater PDC will be responsible for monitoring this plan. The MAC representative from each jurisdiction will make annual updates to the Crater PDC on the progress of the implementation of the Mitigation Action Plans. The timing of the yearly reports should coincide with either the anniversary of the approval date of this plan or another date chosen by the committee, such as the anniversary of a significant event (e.g., Hurricane Isabel). The annual progress reports will be reviewed by the MAC who will determine what action is needed.

The MAC will be responsible for setting annual measures of success and a five-year measure of success for each strategy. These indicators can be used to measure the progress and success of implementation of the mitigation plan. The MAC can use this information to determine if corrective action needed. In addition, the MAC should review the composition of the committee annually and add members if needed.

The MAC will determine at the annual meeting, if an update of the plan is needed. At a minimum, the plan will be updated every five years. Factors to consider when determining if an update is necessary include:

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- Lessened vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or,
- Increased vulnerability as a result of new development (and/or annexation).
- New state/federal laws, policies, or programs
- Changes in resource availability
- Applicability of goals/objectives/strategies

A major event, such as a Presidentially-declared disaster, may trigger a need to review the plan. If such an event occurs in the Crater region, the MAC will coordinate to determine how best to review and update the plan. The updating of the plan will be by written changes and submissions, as the Crater Planning District communities and MAC deem appropriate and necessary. Major changes to the plan will be submitted to the state and to FEMA Region III.

Public notice will be given and public participation will be invited, at a minimum, through available web postings and press releases to the local media outlets, primarily newspapers and radio stations. In addition, an annual event will be held to publicize progress on implementing the mitigation plan. This event could be timed to coincide with the anniversary of a significant event or annual awareness event (i.e., Hurricane Preparedness Week). Jurisdictions also should provide annual updates to the governing body to keep them informed about plan implementation.

Evaluation of progress can be achieved by monitoring changes in the vulnerability identified in the plan. Changes in vulnerability can be identified by noting:

- Lessened vulnerability as a result of implementing recommended actions,
- Increased vulnerability as a result of failed or ineffective mitigation actions, and/or,
- Increased vulnerability as a result of new development (and/or annexation).

Updating of the plan will be by written changes and submissions, as the Crater Planning District communities and MAC deem appropriate and necessary.

Section IX. References

Other Mitigation Plans

- Virginia Department of Emergency Management (VDEM) Commonwealth of Virginia's Standard Hazard Mitigation Plan (2004).
- Cumberland Plateau (VA) Mitigation Plan
- New River Valley (VA) Mitigation Plan
- Wyoming County (WV) Mitigation Plan

Websites

- US Census Bureau, American Fact Finder - <http://www.census.gov>
- Virginia Department of Forestry - www.dof.virginia.gov

Software

- FEMA HAZUS software
- ESRI data and software
- Data provided by Ian Birnie (GIS CPDC)
- FEMA Flood Insurance Study (FIS) – for community descriptions and flooding/hurricane events
- VirginiaView PRISM data

Newspapers

- *Crater News*
- *Rappahannock Record*
- *The Progress-Index*
- *Independent-Messenger*
- *Sussex-Surry Dispatch*
- *The Gazette*
- *The Tidewater News*
- *The News-Journal*

ⁱ The Natural Communities of Virginia - <http://www.dcr.virginia.gov/dnh/ncoverview.htm>

ⁱⁱ The Natural Communities of Virginia

ⁱⁱⁱ Virginia Department of Forestry. *Virginia Woodland Homes Communities*. Retrieved from <http://www.dof.virginia.gov/gis/dwnld-whc-faq.shtml> on May 2, 2005.