Introduction

The *Hazard Analysis* provides information on historical hazard occurrences in the region for the hazards listed below. This includes an assessment of the location and spatial extent of the event as well as best available data regarding the impact on the region.

In developing this section, data from the original Plan was updated using research from a variety of sources, most notably the FEMA National Risk Index. The information gathered was presented to the project stakeholder group at a series of workshops to gather input and review this section for accuracy. Due to differing methodologies, hazard estimates and their rankings may differ from previous Plans, which relied on National Climatic Data Center (NCDC), HAZUS, and other data.

Hazards which may impact the region but have no historical baseline, such as the man-made hazards, or which have negligible scope in the region, such as landslides and radon, may not include a detailed hazard analysis.

To a large extent, historical records are used to identify the level of risk within the region — with the methodological assumption that the data sources cited are reliable and accurate. Information in this section includes, but is not limited to: Number of events (per locality); Injuries or deaths (per locality); Damages (in dollars, per locality); and a history of the more significant events for each hazard.

44 CFR Requirement

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

- **Floods**
- **Hurricanes and Tropical Storms**
- **Thunderstorms (Lightning and Strong Wind)**
- **Tornadoes**
- **Wildfire**
- **Drought**
- **Extreme Heat**
- **Winter Weather and Ice Storms (and Nor'easters)**
- **Erosion**
- **Earthquakes, Sinkholes, and Landslides**
- **Dam/Levee Failure**
- **Technological Hazards**
    - **Hazardous material/chemical spills**
    - **Biological (Bio)-hazards**
    - **Accidents at fertilizer/other chemical facilities**
    - **Accidents at power plants/substations**
    - **Pipeline explosions**
- **Invasive Species**
- **Radon**
- **Pandemic/Infectious Agents**

Floods

Introduction

Flooding in the region is caused by several different sources. The region is drained by two major river basins, the James and the Roanoke. Major rivers and tributaries in the region include:

- The Appomattox River,
- Roanoke/Staunton River,
- Nottoway River,
- Meherrin River (North, Middle, and South),
- James River,
- Bush River,
- Little Nottoway River,
- Little Willis River,
- Willis River,
- North River,
- Sandy River, and
- The Slate River.

In addition to these major rivers, there are numerous branches and creeks in the region that can cause flash flooding in times of heavy rain. Maps showing the flood hazard areas for each county can be found in the Appendices.

Flood Insurance Rate Maps (FIRMs) show the flood hazard areas within counties and jurisdictions. On most of the FIRMs within Planning District 14, there are generally two flood zones that are shown: the 100-year floodplain, and the 500-year floodplain. The area of the 100-year floodplain represents the area that stands a 1% chance of being flooded in any given year. The 500-year floodplain represents the area that stands a 0.2% chance of being flooded in any given year. Detailed information on the flood hazard within a jurisdiction can be found in the local Flood Insurance Study (FIS). Maps showing flood hazard for each county are based on FIRM data.

Table 5.1 lists data on several flood events that have occurred in the region since 1993 as reported by the National Climatic Data Center (NCDC).[1] Details for each event have not been included in the Plan because of the large number of events.

Based on historical evidence alone, it is clear that there is a high level of occurrence with regard to flood events in the region. The floods referenced below resulted in a total of two (2) deaths, and approximately $2,263,500 in reported property damages.

[1] https://www.ncdc.noaa.gov/cdo-web/

Table 5.1 Flood Events Since 1993[2]

Location	Number of Flood Events	Deaths*	Property Damage	Annualized Losses**
Amelia County	6	0	$518	$5,751
Buckingham County	39	1	$42,240	$80,223
Charlotte County	50	2	$102,672	$149,493
Cumberland County	8	0	$20,777	$27,806
Lunenburg County	10	1	$3,211	$4,695
Nottoway County	8	0	$1,178	$3,401
Prince Edward County	6	0	$39,058	$43,666
Regional Totals:	**127**	**4**	**$209,654**	**$315,037**

Approximate numbers are from NCDC Storm Events Database (does NOT include floods in Farmville and Prince Edward County from September 2011, July 2013, or May 2014).
****Estimated value from the FEMA National Risk Index as of 2021***
NOTE: The data for Farmville is included in the data for Prince Edward and Cumberland Counties.

Significant Events (Details from events slightly modified from National Climatic Data Center's storm database):

March 1936 – Successive storms between March 9 and 22 caused extensive flooding from Virginia to Maine. Damages were in the millions, and 150-200 deaths were blamed on this event. Significant amounts of snow fell during the winter. March started with mild temperatures, which were accompanied by heavy rains. Those rains melted the snows, which caused extensive flooding. The first rain, in the second week of March, dumped three inches of rain on top of the melting snow – causing rivers to rise. A second storm, on March 17-18, dumped six more inches of rain across the State. The Appomattox River crested at 17.72 feet in **Farmville** (just above flood stage – 16 feet) on March 18, and 25.27 feet in Mattoax in **Amelia County** (above the flood stage of 21 feet) on March 20.

April 1937 – Heavy rains caused flooding over much of the State. Major damage ensued, including washed out bridges and flooded homes. The Appomattox River crested at 20.28 feet in **Farmville** on April 26, and 29.97 feet at Mattoax on April 28. One person died in **Amelia County** when their car dropped into the river where a bridge approach was washed out.

Hurricane Camille, 1969 – Rain from Camille produced the worst flash flooding in Virginia's history. The James River experienced severe flooding as far east as Richmond, due to the amount of rainfall received in its tributaries and headwaters. More than 100 deaths in Virginia were blamed on Camille, all communication to the outside world was cut off, and damages were estimated at more than $500 million. The James River crested at 30.00 feet in Scottsville – near Route 20 at the **Buckingham County** line (flood stage is 20 feet) and 39.10 feet at Bremo Bluff – near U.S. 15 at the **Buckingham County** line (flood stage is 19 feet) on August 20. The next day, August

[2] Source: National Climatic Data Center, FEMA National Risk Index

21, the river crested at 33.75 feet at Cartersville in northern **Cumberland County** (flood stage is 20 feet).

Hurricane Agnes, 1972 – Some of the worst flooding to ever occur in the region resulted from this storm. The remnants of Agnes dropped heavy rains across the region. The Appomattox River in **Farmville** reached 29.7 feet, a record (flood stage is 16 feet).

Election Day Floods, November 1985 – Excessive flooding was blamed for 22 deaths and caused nearly $800 million in damage across the State. Heavy rains began on November 4, causing flash flooding. The Roanoke River crested at 23 feet in Roanoke on November 5 (Election Day). Flood waters carried significant amounts of debris, taking out bridges and filling channels with rocks. An estimated $8 million worth of tobacco was lost in warehouses along the James River. Fifty jurisdictions in Virginia were declared disaster areas, and 19 polling stations had to be moved because of flooding. The Appomattox River crested at 20.03 feet in **Farmville** on November 5. On November 6, the James River crested at 31.77 feet in Scottsville, 40.70 feet at Bremo Bluff, and 32.60 feet at Cartersville.

Hurricane Fran, 1996 – Rains from Hurricane Fran caused the Appomattox in **Farmville** to crest at 24.5 feet, the second highest level on record. It was estimated that the June 1972 flood was nearly equal to a 100-year event while the August 1940 and September 1996 floods were in the range of a 50-year flood.

September 2011 – Locally heavy rains in the region caused flash flooding in **Farmville** and **Prince Edward County** on September 23. A slow-moving system dumped several inches of rain on the area during the morning hours (according to *The Farmville Herald*, six inches of rain fell during a short period). Out in the County, the dam at Farmville Lake – located south of Town – was breached. There were also reports of several basements in residential and business properties being flooded, and some gravel roads were washed out.

In Farmville, a number of streets – including parts of Third and Fourth Streets – were flooded and impassible for part of the morning after Gross's Branch overflowed its banks. Cars parked at Longwood Landing were partially under water for a time, and there was at least one known instance of sewage backing up in a commercial building near the Appomattox River. According to river data from the National Weather Service, the Appomattox River crested at just under 14 feet during the overnight hours of September 23/24 (Action Stage is 12 feet; Flood Stage is 16 feet).

July 2013 – Heavy rains during the month caused flash flooding in the **Town of Farmville** and surrounding areas. According to WFLO, at the time the area's official observation station for the National Weather Cooperative,[3] 4.17 inches of rain fell during the 24-hour period ended at 7:00 a.m. on July 12 – a new record. By July 12, rainfall for the month at WFLO measured 8.08 – breaking the old record for the month of July, set in 1975, before the month was half over. According to a report in *The Farmville Herald*, at least one street – River Road – was closed by the Town due to flooding and Riverside Park was overtaken by the Appomattox River – prompting the Town to cancel its planned First Friday music event scheduled for July 12. The Appomattox River in Farmville crested at 17 feet, just above flood stage, on July 12.

[3] WFLO served as the area's official observation station for the National Weather Cooperative until it ceased operations in 2021; the observation last produced data in December 2021.

May 2014 – Heavy rains resulted in flooding across the region. Riverside Park in Farmville was completely underwater as the Appomattox River overflowed its banks. The river in **Farmville** crested at 19.81 feet, more than three feet above flood stage, on May 16. A few days later, downriver, the Appomattox River at Mattoax (**Amelia County**), crested at 25.09 feet – more than four feet above flood stage – on May 20. The James River saw some issues as well, with the river at Bremo Bluff (near U.S. 15 in Fluvanna County, across the river from **Buckingham County**) cresting at 23.6 feet – more than three feet above flood stage – on May 16.

December 2015 – Heavy rains in the area caused local flooding during Christmas week, as a low-pressure system moving through the Central United States spawned heavy rains in much of the country – in addition to snows in the Rockies, Upper Midwest, and New England, and tornadoes in the Deep South. Regionally, as a result of the rains, area rivers and streams rose above flood stage. The Appomattox River crested at 17.74 feet in Farmville (nearly two feet above flood stage) on December 24 and 25.17 in Mattoax (more than six feet above flood stage) feet on December 27. In **Amelia County**, the bridge on Route 636 (North Lodore Road) over Flat Creek was overtaken by floodwater from the rains. A van tried to cross the bridge but got stranded (see photo above). It took firefighters from two local companies more than an hour to rescue the two passengers and the Christmas presents on board.

January 2017 – Heavy rains in the area caused local flooding, as parts of the region saw rain for several days at the end of the month (parts of Virginia experienced above-average rainfall and above-average temperatures for the month). In **Amelia County**, Route 607 (West Creek Road) was closed for a day due to the bridge being under water. The bridge over Deep Creek on Route 615 (Namozine Road) was also under water and had to be closed. More than 2 inches fell in Amelia County between January 20 and 24, according to a report in the *Amelia Bulletin-Monitor*.

September 2018 – Tropical storm Florence caused flooding and wind damage in the region. In **Amelia County** gravel and private roadways were destroyed.

October 2018 – Tropical Storm Michael caused flooding and wind damage in several counties in the region. **Amelia County** reported numerous roadways and bridges overtopped (including Patrick Henry Highway at Nibbs Creek and Military Road at Deep Creek) and $43,000 in damages relating to the storm. In **Charlotte County** multiple roads were rendered impassable and required extensive repair. In addition, the Drake's Branch Recycling Center and the Keysville water treatment plant were also damaged by floodwater, the latter of which impacted the water supply. In **Prince Edward County**, historical levels of rainfall led to flooded roads being closed for a week.

Firefighters from two different companies responded to this van stranded in flood waters on Route 636 in Amelia County December 24, 2015. It took the firefighters more than an hour to rescue the passengers and Christmas presents on board. (Photo courtesy of *The Amelia Bulletin Monitor*)

November 2020 – Heavy rain fall west of Prince Edward County in Appomattox County caused flash flooding the night of

November 11th effecting secondary roads along the Appomattox River from **Pamplin** to **Farmville** to flood. The day of the 12th, the crest of the Appomattox River caused Rt. 15 N in to Buckingham and Rt. 45 N in to **Cumberland** to be closed causing residents working in or around **Prince Edward County** to have to use alternate detours to get home. Rt. 15 was opened on the morning of November 13 and Rt. 45 was opened later in the day on November 13. The incident was resolved once the water levels started receding. Response to the incident included working with VDOT for road closers and detours.

Local Flooding Concerns:

Items in **bold** are new concerns as of the last Plan Update.

Amelia County – The following roads have been identified as subject to flooding:

- Route 621 at the Appomattox River
- Route 615 at Deep Creek
- Route 607 at West Creek
- Route 622 at Namozine Creek
- Route 620 at the Appomattox River
- Route 636 at Flat Creek
- Route 643 at Little Bent Creek
- Route 637 at Jones Lake
- Route 657 at Walnut Branch

Buckingham County – The following roads flood periodically:

- Route 636 (from U.S. 15 to Cumberland County Line)
- Route 605 (from Appomattox County Line to the end of the road)
- Route 664 (from Route 604 to Route 737)
- Route 662 (from Route 607 to Route 663)
- Route 741 (from Route 604 to Route 56)
- Route 720 (from Route 20 to the end of the road)
- Route 657 (from Route 659 to Route 658)
- Route 717 (from Route 613 to Route 610)
- Route 15 Prince Edward County Line

Charlotte County – The following roads have flooded over the last 10 to 20 years:

- Route 619 (from Route 746 to Route 645)
- Route 650 (from Route 47 to Route 649)
- Route 650 (from Route 40 to Route 604)
- Route 616 (from Route 727 to Route 672)
- Route 695 (from Route 727 to Route 617)
- Route 648 (from Route 619 to Route 746)
- Route 619 (from Route 637 to Route 645)
- Route 638 (from Route 691 to Appomattox County line)
- Route 691 (from Route 638 to Route 47)
- Route 701 (from Route 691 to Route 736)
- Route 668 (from Route 667 to Route 40)
- Route 638 (from Route 628 to Route 691)

- Route 649 (from Route 619 to Route 678)
- Route 619 (from Route 693 to Route 620)
- Route 701 (from Route 615 to Route 691)
- Route 618 (from Route 40 to Route 749)
- Route 701 (from Route 736 to Route 691)
- Route 649 (from Route 678 to Route 731)

Cumberland County – The following roads have been identified as local concerns:

- Route 600 (between Farmville town limits and Route 702) along the Appomattox River; no crossing
- Route 600 (between Route 677 and Route 657), Green Creek crossing
- Route 602 (between Route 45 and the Willis River); James River, no crossing
- Route 605 (between Route 690 and Route 602); Willis River, James River backwater
- Route 612 (between Route 714 and Route 690); Willis River, smaller stream crossing
- Route 612 (between Route 714 and Route 608); below dam at Trice's Lake
- Route 613 (between Route 672 and Route 608; below dam at Sports Lake
- Route 615 (between Route 45 and Route 663); unnamed stream
- Route 615 (between Route 663 and Route 608); low lying area between two bridges
- Route 620 (between Route 600 and Amelia County line); approach to Appomattox River
- Route 621 (between Route 13 and Amelia County line); approach to Appomattox River
- Route 626 (between Route 624 and Route 623); Bonbrook Creek crossing
- Route 626 (between Route 45 and Route 601); unnamed stream
- Route 644 (between Route 600 and Route 631); Guinea Creek crossing
- Route 647 (between Route 601 and Route 654); small stream into Muddy Creek
- Route 671 (between Route 696 and Route 672); Willis River backwater
- Route 677 (between Route 600 and *End of State Maintenance*); Brown Branch Crossing
- Route 686 (between Route 610 and Route 604); unnamed stream
- Route 690 (between Route 602 and Fluvanna County line); James River, no crossing
- Route 690 (between Route 605 and Route 611); Boston Branch crossing
- Route 695 (between Route 699 and *End of State Maintenance*); Little Guinea Creek crossing

Lunenburg County – The following roads have been identified as subject to **frequent flooding**:

- Route 621 between Route 602 and U.S. 1 (in Mecklenburg County)
- Route 621 between Route 620 and Route 637 (in Brunswick County)
- Route 602 between Route 668 and Route 621

- Route 602 between Route 638 and Route 668
- Route 647 between Route 609 and Route 648
- Route 627 between Route 615 and Route 600
- Route 644 between Route 635 and Route 643
- Route 643 between Route 635 and Route 644
- Route 643 between Route 635 and Route 640
- Route 664 between Route 49 and Route 626
- Route 656 between Route 626 and Route 625
- Route 690 between Route 680 and Route 692
- Route 694 between Route 49 and Route 631
- Route 626 between Route 723 and Route 49
- Route 680 between Route 681 and Route 689

The following roads have been identified as subject to **occasional flooding**:

- Route 635 between Route 641 and Route 659 (in Mecklenburg County)
- Route 636 between Route 640 and Route 654 (in Mecklenburg County)
- Route 697 between Route 40 and Dead End
- Route 607 between Route 609 and Route 1101
- Route 637 between Route 646 and Route 614
- Route 637 between Route 614 and Route 613
- Route 659 between Route 675 and Route 770
- Route 626 between Route 682 and Route 689
- Route 678 between Route 680 and Route 626
- Route 678 between Route 704 and Route 662

Town of Kenbridge – The local wastewater treatment plant floods any time there is a measurable rainfall.

Nottoway County – The following roads have been identified as subject to frequent flooding:

- Route 608 between 153 and 609 at Bland Creek
- Route 611 between 615 and 613 at Deep Creek
- Route 611 between 607 and 625 at Woody Creek
- Route 626 between 49 and 723 at Nottoway River
- Route 633 between 49 and 607 at Lazaretto Creek (During excessive hard rains)
- Route 607 between 460 and 633 at Lazaretto Creek (During excessive hard rains)
- Route 633 between 723 and Dead End at Carys Creek
- Route 629 between 628 and 647 at Flat Creek (During excessive hard rains)

These roads have been identified as topographically inclined for special event flooding:

- Route 307 at Flat Creek and at Little Creek
- Routes 618, 611, and 614 at Deep Creek
- Routes 642 and 633 at their intersection with Lazaretto Creek
- Route 603 at the confluence of Whitestone Creek and the Little Nottoway River
- Route 640 at the Hobbs Mill on Namozine Creek.

- Route 610 at Sweathouse Creek

Town of Crewe – Wastewater treatment plant subject to routine flooding.

Prince Edward County – Frequent flooding along the Bush River, Little Saylers Creek, and the Appomattox River (often causes road flooding during flash floods). The following roads have been identified as subject to frequent flooding:

- Route 665 (Worsham Road) between U.S. 15 and Route 630 at Briery Creek
- Route 636 (Poorhouse Road) between U.S. 460 and Route 740 along the Bush River
- Route 619 (Lockett Road) between Route 726 and Route 618 at Sailor's Creek
- Route 686 (Allen Farm Road) between Route 666 and Route 665 at Buffalo Creek
- Intersection of Route 625 (Featherfin Road) and Route 609 (Peaks Road) at Vaughan's Creek
- Intersection of Route 651 (Chinquapin Road) and Route 608 (First Rock Road) at Plum Creek
- Intersection of Route 634 (New Bethel Road) and Route 721 at the Bush River
- Route 664 (Singleton Road) between Route 659 and Route 658 at Spring Creek
- Route 620 (Scuffletown Road) between Route 619 and Route 600 Sailor's Creek.

Town of Farmville – Experiences the most flooding problems in the region. Town officials identified the following roads/areas as being subject to flooding:

- North Main Street (Appomattox River-Green Front area)
- Second Street, between South Street and Virginia Street (near Gross' Branch and DMV Office)
- North Bridge Street (adjacent to river)
- North Virginia Street (adjacent to river)
- Plank Road (Price Supply area)
- River Road
- South Street
- Fourth Street (adjacent to branch behind First Baptist Church)
- East Third Street (Macado's area, near Gross' Branch)
- West Third Street (adjacent to Fire Dept. and Centra Southside Community Hospital)

Flooding in Farmville November 12, 2020. ***Source: Virginia Preparedness on Facebook.***

Historical Crests of Local Rivers

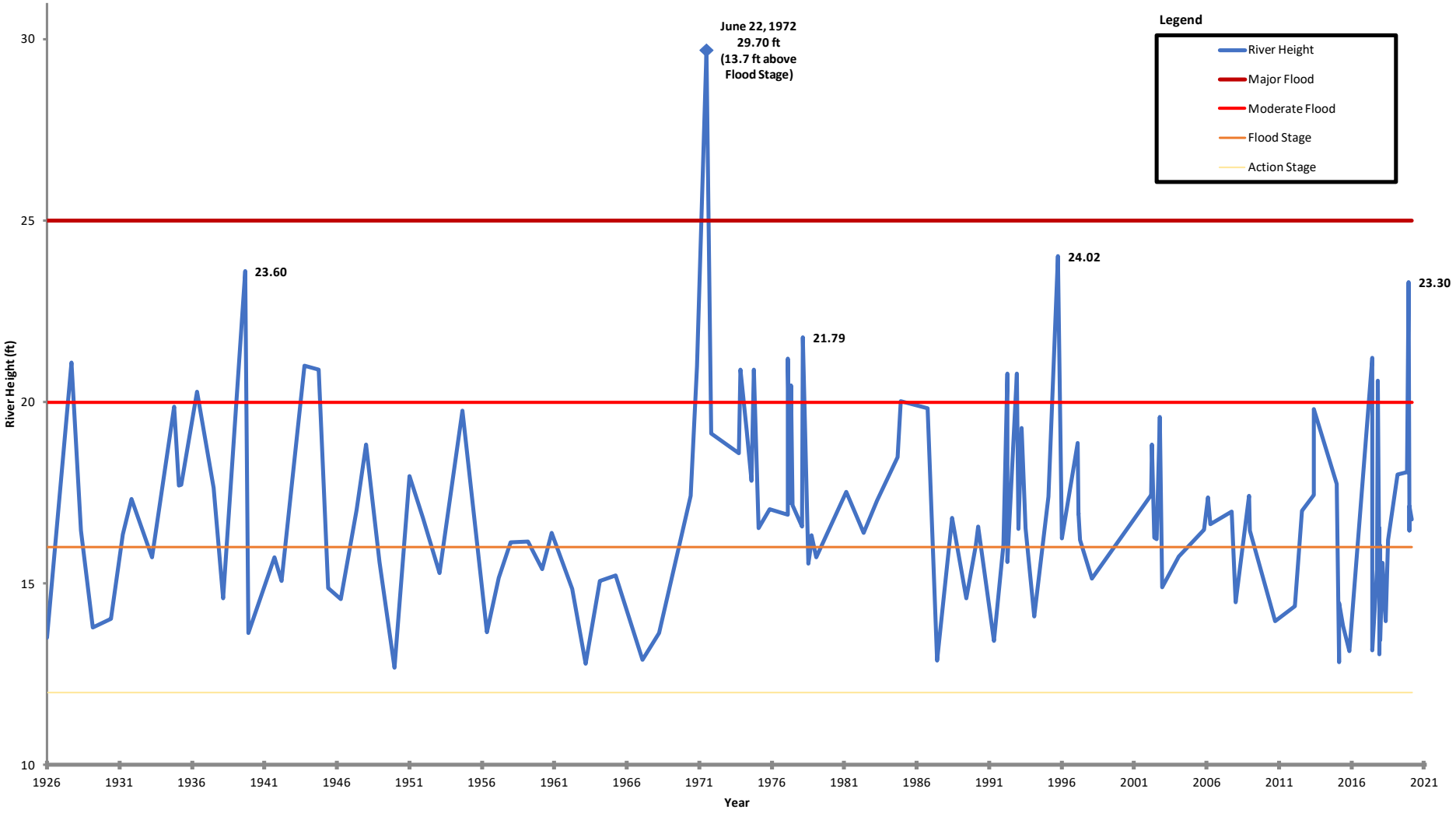
The following shows historic data for "crests" or flood stage events for the five (5) National Weather Service stream gauges along waterways coinciding with counties in the CRC region:[4]

- Appomattox at Farmville,
- Appomattox at Mattoax (Amelia County),
- James at Bremo Bluff (Buckingham County, discontinued),
- James at Cartersville (Cumberland County), and
- James at Scottsville (Buckingham County).

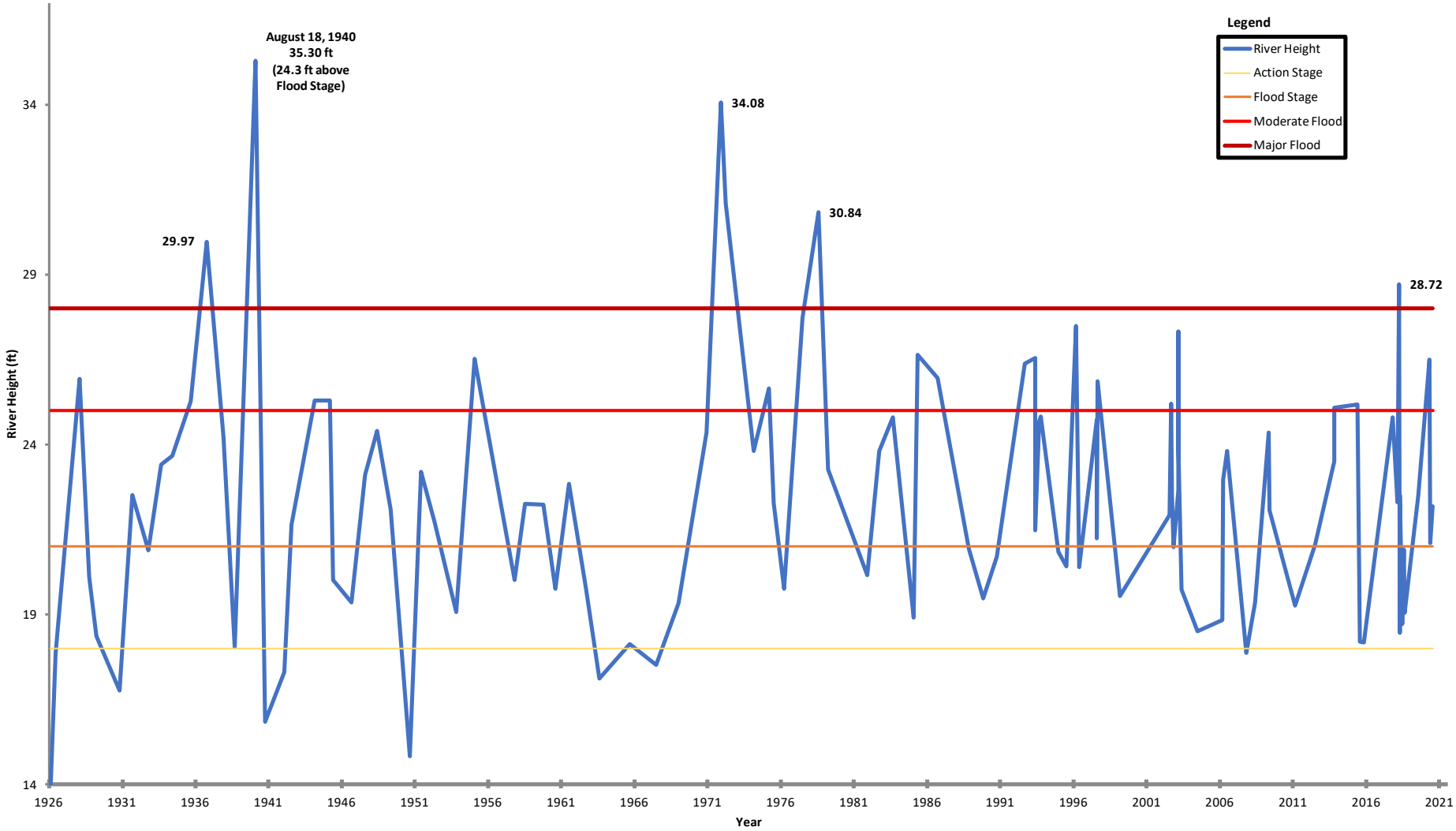
Note that different sections of each river have differing flood stage heights. The largest single flood event for most rivers in Central Virginia was June 22, 1972 from Hurricane Agnes.

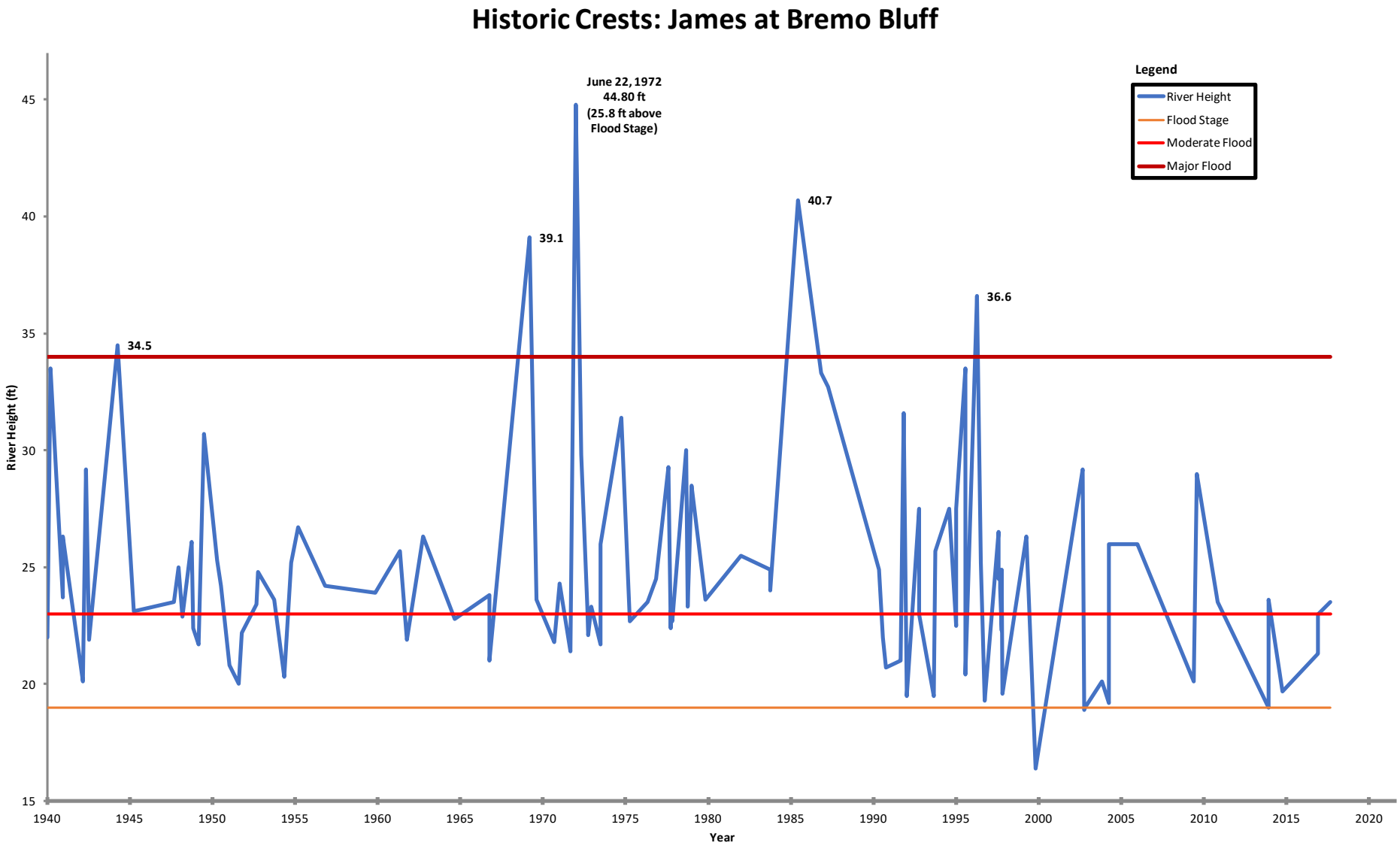
[4] Source: NOAA/National Weather Service

Historic Crests: Appomattox at Farmville

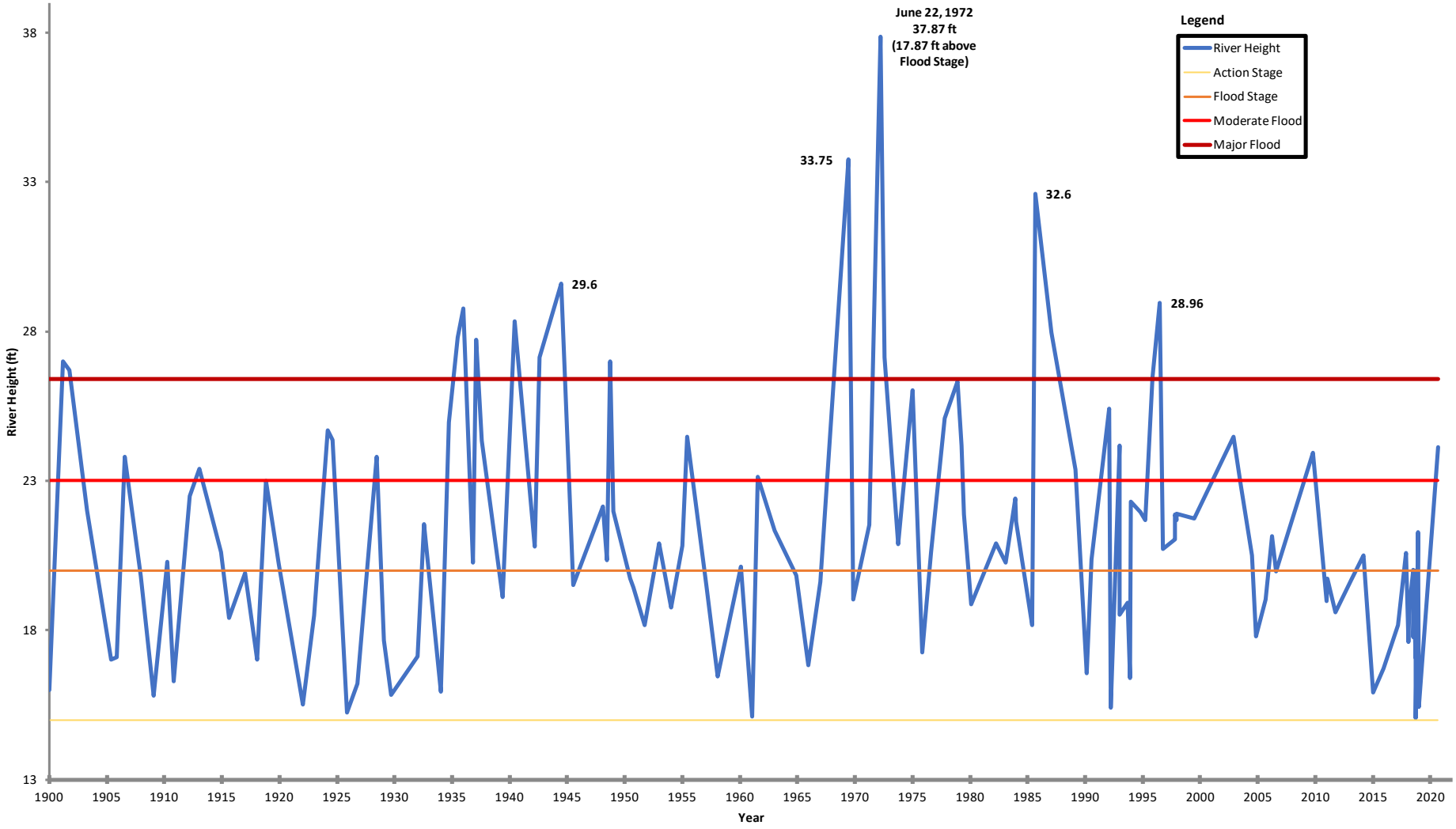


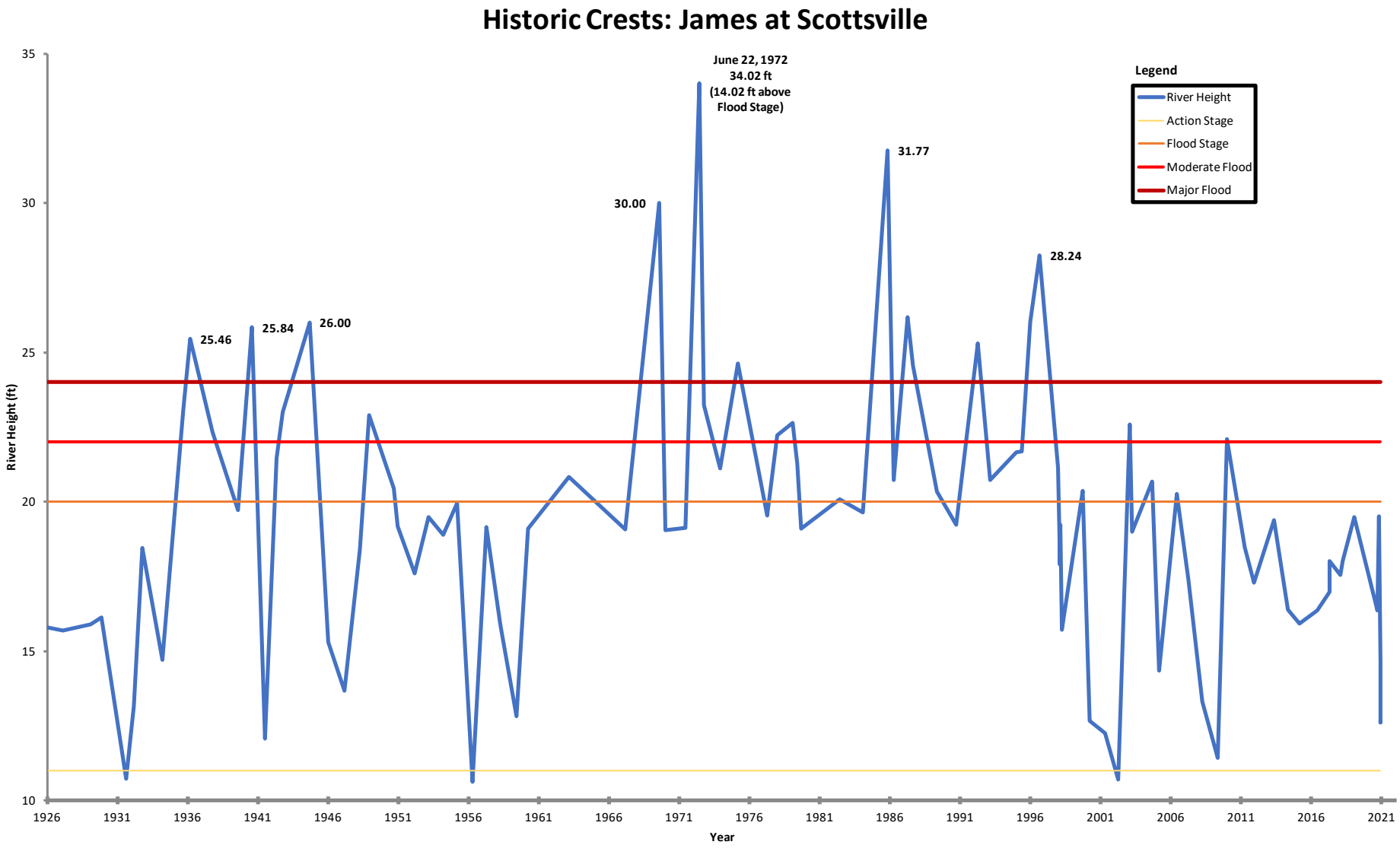
Historic Crests: Appomattox at Mattoax




Historic Crests: James at Bremo Bluff
Legend
River Height
Flood Stage
Moderate Flood
Major Flood
June 22, 1972
44.80 ft
(25.8 ft above
Flood Stage)
34.5
39.1
40.7
36.6
River Height (ft)
Year
45
40
35
30
25
20
15
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
2020

Historic Crests: James at Cartersville




Historic Crests: James at Scottsville
June 22, 1972
34.02 ft
(14.02 ft above
Flood Stage)
30.00
31.77
28.24
25.46
25.84
26.00
Legend
River Height
Action Stage
Flood Stage
Moderate Flood
Major Flood
River Height (ft)
Year
35
30
25
20
15
10
1926
1931
1936
1941
1946
1951
1956
1961
1966
1971
1976
1981
1986
1991
1996
2001
2006
2011
2016
2021

Future Occurrence

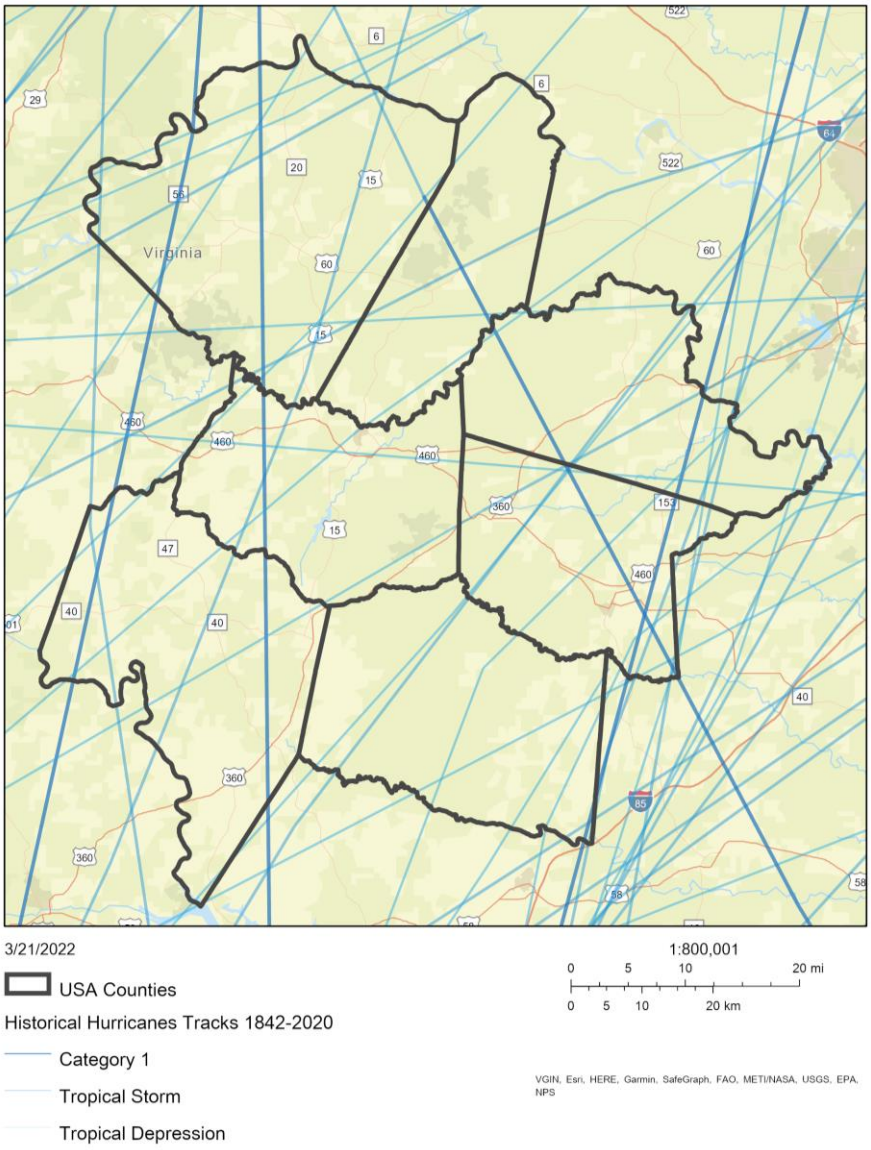
The future occurrence of riverine flooding is described by FEMA's NRI as the number of event-days per year, and ranges from 0.25 (Amelia and Prince Edward Counties) to 2.08 (Charlotte County) event-days per year. It is unknown whether shifting weather patterns due to climate change may increase the likelihood of riverine flooding events, but increased development along rivers might lead to more damages when flooding does occur. For a more detailed look at flooding risk per locality, see Section 6.

Hurricanes and Tropical Storms

Introduction

Since 1851, a number of Category 1 hurricanes (some of which were downgraded as they made landfall) and tropical storms have impacted the region (shown in **Map 5.1** below).[5] More than 70 tropical systems have passed within 75 miles of the region or are otherwise noteworthy in the region's hurricane history. Some of the more significant named hurricanes are listed in **Table 5.2** below.

Map 5.1 Historic Hurricane Tracks through Planning District 14 – 1851-2020[6]



[5] Refer to the *Hazard Identification* section for explanation of the Saffir-Simpson hurricane scale, associated damage classifications and other background information with regard to tropical cyclones.
[6] Source: https://oceanservice.noaa.gov/news/historical-hurricanes/

Table 5.2 Significant Hurricane/Tropical Storm History in Planning District 14 (1851–2020)

Name of Storm	Date of Occurrence
Not Named	1878
Hazel	1954
Camille	1969
Agnes	1972
Bertha	1996
Fran	1996
Dennis	1999
Isabel	2003
Gaston	2004
Frances	2004
Ivan	2004
Ernesto	2006
Hanna	2008
Michael	2018
Zeta	2020

Sources: National Hurricane Center, National Climatic Data Center, National Weather Service and NOAA Coastal Services Center

Table 5.3 Hurricane and Tropical Storm Events Since 1950

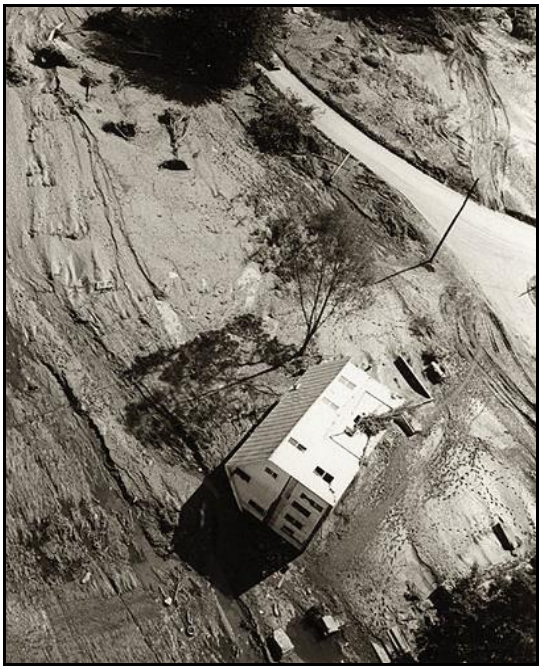
Location	Number of Events	Property Damage*	Crop Damage	Annualized Losses
Amelia County	13	$21,191	$63,325	$95,288
Buckingham County	10	$22,695	$32,573	$70,360
Charlotte County	8	$27,031	$24,217	$60,208
Cumberland County	7	$1,784	$13,204	$23,392
Lunenburg County	15	$20,665	$17,413	$53,317
Nottoway County	15	$30,609	$50,495	$99,698
Prince Edward County	9	$32,049	$19,464	$73,270
Total:	**77**	**$156,023**	**$220,690**	**$475,546**

Source: National Climatic Data Center, FEMA National Risk Index
NOTE: The data for Farmville is included in the data for Prince Edward and Cumberland Counties.

Significant Events:

Unnamed hurricanes, 1878 – Two storms impacted Virginia this year. The first came from the Caribbean and hit southern Florida in September, then drifted around the state and went out over the Atlantic. The storm made a second landfall over South Carolina, and moved through North Carolina and Virginia. At least nine deaths were attributed to the storm, though more is possible. The second storm came from the Caribbean and moved over southeast Florida and the Bahamas, then made a second landfall over North Carolina with winds of 100 mph. The storm moved up the east coast, causing more than $2 million in estimated damages and at least 72 casualties.

Hurricane Hazel, October 1954 – Maintained hurricane force winds up the East Coast and produced a number of record wind gusts. The Town of Blackstone had 63 mph sustained winds with 92-mph gusts. Hundreds of thousands of trees were destroyed. Half of the phone and electric lines in the state were knocked out equaling $2 million in damages. Five to six inches of rain fell in the region causing flooding of small streams. The storm was blamed for 13 deaths in Virginia, and damages were estimated (conservatively) at $15 million.



Rains from Hurricane Camille caused catastrophic flooding and landslides. This aerial view shows a house in Nelson County (just west of Buckingham County) that was removed from its foundation and washed away.

Photo by Bill Whitehead (courtesy The Virginian-Pilot – www.Pilotonline.com)

Hurricane Camille, August 1969 – Made landfall on the Louisiana Coast and maintained hurricane strength for 150 miles up the Mississippi Valley. The storm turned east and headed for Virginia, where it tapped into the warm and humid air over the southern Gulf Stream that drew it northwest toward the Virginia Mountains – triggering heavy rains in Central Virginia. An area 100 miles long and 25 miles wide received more than 10 inches of rain. Rain from Camille produced the worst flash flooding in Virginia's history. The James River experienced severe flooding as far east as Richmond, due to the amount of rainfall received in its tributaries and headwaters. More than 100 deaths in Virginia were blamed on Camille, all communication to the outside world was cut off, and damages were estimated at more than $500 million.

Hurricane Agnes, June 1972 – Made landfall along the Florida panhandle as a category 1 hurricane, then weakened as it moved up the coast (east of the Appalachians) and reorganized as a tropical storm as it passed into Virginia. Agnes caused some of the most devastating flooding in Virginia's recorded history, with severe flooding along the James and Appomattox River Basins. Pressures fell to 29.10" at Norfolk. Langley Air Force Base experienced wind gusts to 54 mph. Approximately 49,000 phones were put out of service by downed lines, 103 highways were destroyed or damaged across the state, and 13 deaths were blamed on the storm. Damages were estimated at $222 million. **Farmville** received its worst flooding in history as a result of this storm. The Appomattox River crested at 29.70 feet (flood stage is 16 feet).

Hurricane Bertha, July 1996 – Made landfall between Wrightsville and Topsail Beaches, North Carolina, then moved up the east coast toward Canada and Greenland. Damage was minimal in Virginia, though there was significant damage in North Carolina and flooding was reported along the storm's path. Eight deaths were blamed on the storm.

Rain from Hurricane Agnes made parts of Farmville impassable by vehicle. In this photo, East Third Street is completely underwater between Main and Virginia Streets. ***Photo courtesy of The Farmville Herald***

Hurricane Fran, September 1996 – Made landfall at Cape Fear on the North Carolina coast and moved north, entering Virginia near Danville. In just one hour, some areas saw 3.5 inches of rain. All rivers in the central part of the State experienced major flooding, and 100 people were rescued from floodwaters caused by Fran's excessive rains. Damages totaled $350 million, and six deaths were blamed on the storm. Rain bands produced tropical storm force winds with gusts as high as 79 mph (Big Meadows) with measured gusts to 60 mph at lower elevation areas. Scattered tree damage occurred throughout much of the state with many trees uprooting from the combination of strong winds and saturated ground. During the height of the storm, 78 primary roads and 853 secondary roads were closed due to flooding and downed trees. Estimated damages to state roads were $37 million. Access to and from isolated communities continued to be a problem for a couple weeks due to washed out bridges and roads. A record number of people (560,000) in Virginia experienced power outages. Agricultural damages appeared to be severe and extensive to what would have been a bumper crop from the cooler, wetter than normal summer. Agricultural damages were estimated in excess of $50 million.

Hurricane Dennis, August/September 1999 – Moved along the southeast U.S. Coast, dumping heavy rains and causing beach erosion in North Carolina, then made landfall and moved through North Carolina and Virginia before continuing through the Mid-Atlantic region. Many parts of Virginia received significant rainfall from the storm (giving the region some much-needed rain on the heels of a summer-long drought), and the southeastern part of the State experienced tropical storm force winds.

Hurricane Isabel, September 2003 – Made landfall in North Carolina, and passed through Central Virginia during the afternoon and evening. The storm caused the loss of electricity and knocked down several large trees across the region, but most of the area was spared any major flooding and/or damage. Damage to agriculture was reported too, but reported losses were minimal. Governor Warner declared a state of emergency, and President Bush issued a federal disaster declaration (**Amelia, Buckingham, Lunenburg, Nottoway**, and **Prince Edward Counties** were covered under this declaration).

Tropical Storm Gaston, August 2004 – The storm skirted the region, causing some localized flooding. Specifically, the **Town of Kenbridge** reported flooding of the sewer plant and Police Department. The tin roof at Mt. Nebo Church in **Nottoway County** was partially blown off and a tree limb damaged a trailer. Several tops of trees were reported damaged in **Nottoway County**. The **Town of Drakes Branch** received 3.5 inches of rain, but reported no local flooding. Several roads in the region were closed and, in some cases, washed out. **Lunenburg County** was the hardest hit in the region. The bridge over the South Meherrin River was submerged by floodwaters and a swift water rescue was performed to rescue two stranded motorists.

Hurricane Frances, September 2004 – Made landfall in Florida as a category 2 hurricane, but weakened to a tropical depression by the time it reached Virginia. Minimal damage was reported in the region. Two mobile homes were damaged in **Buckingham County** and the sewer plant in the **Town of Kenbridge** flooded. A tornado hit Buckingham Branch Railroad seven miles north of **Dillwyn**, near Route 622, at about 5:00 pm. Railroad crews had to clear trees from approximately two miles of track. Otherwise, locally heavy rains fell throughout the region and caused some localized flooding.

Hurricane Ivan, September 2004 – This storm caused a possible tornado in **Prince Edward County**, between **Farmville** and Prospect. A few trees and large limbs were downed. There were areas of heavy downpours that caused flash flooding across the region; otherwise the region was spared any major damage.

Tropical Storm Ernesto, August/September 2006 – Made its first U.S. landfall in southern Florida, then went out over the Atlantic Ocean and made a second U.S. landfall near Long Beach, North Carolina. The storm affected eastern parts of Virginia, causing an estimated $90 million in losses throughout the State. Parts of eastern Virginia received 8-12 inches of rainfall. **Lunenburg County** was one of 25 localities in the State (22 counties and three cities) eligible for public assistance from the federal disaster declaration related to Ernesto.

Hurricane/Tropical Storm Hanna, September 2008 – Strengthened into a hurricane over the Atlantic, then weakened into a tropical storm before making landfall near the North Carolina/South Carolina border. The storm moved across eastern North Carolina,

then turned northeast across the southeastern part of Virginia and eventually moved across the Chesapeake Bay and Delaware and back out over the Atlantic before making a second landfall over Long Island, New York. The storm was blamed for approximately 500 deaths in Haiti. Only minor damage was reported in the U.S., but the storm produced heavy rain and tropical storm force winds across northern and central Virginia. Rainfall amounts totaled around 4 to 8 inches across many locations with locally higher amounts over 9 inches. Numerous roads were closed throughout Northern and Central Virginia due to flash flooding, and the storm downed trees and power lines across northern and central Virginia.

Hurricane Michael, October 2018 – Was the first category 5 hurricane to make landfall in the contiguous United States since 1992. After gaining strength in the Gulf of Mexico and moving through Florida, Georgia, until becoming an extra-tropical cyclone over North Carolina and regaining strength as it passed over the Chesapeake Bay. A federal Disaster Declaration (DR-4411) was declared. In Virginia winds caused seven tornadoes, causing property damage and at least six deaths. Two deaths occurred in **Charlotte County**, in addition to severe flooding and property damage, especially in Drake's Branch. In **Prince Edward County**, homes were without power for 3-10 days. There was region-wide flooding, overtopping roads and bridges.

Hurricane Zeta, October 2020 – Landfall occurred at Cocodrie, LA with maximum sustained winds of 110mph around 5pm ET on October 28th. Through the next 12 hours after landfall, Zeta would only accelerate from its landfall speed of 24 mph to nearly 40 mph by 4am on Thursday October 29. This rapid motion for a tropical system, that was quite abnormal, would provide little time for the wind fields to weaken. Impacts from Zeta's winds were felt well inland of the Louisiana/Alabama/Mississippi coastlines and even into parts of northern Georgia. Wind and rain were particularly strong in East-Central Virginia, dropping 1.5 inches of rain in Richmond and ultimately leaving an estimated 47,000 homes without power.[7]

Future Occurrence

Future hurricane occurrence is described by FEMA's NRI as the percent chance of a hurricane occurrence per year, and ranges from 6.84% (Cumberland County) to 9.76% (Lunenburg County). It is unknown whether shifting climate will affect the future occurrence of hurricanes or their potential for damage. For a more complete breakdown of hurricane risk by locality, see Section 6.

[7] Sources: https://www.weather.gov/tae/zeta2020 and https://www.washingtonpost.com/weather/2020/10/29/zeta-louisiana-georgia-virginia/

Winter Weather and Ice Storms

Introduction

According to the National Climatic Data Center, the counties in Planning District 14 have experienced 434 winter weather events (including winter storms) and 25 ice storm events since 1993. Winter storm and ice storm events together are accountable for a total of approximately $250,000 and $553,000 in reported property damages, respectively.

Table 5.4 Winter Storm Activity in the Region

Location	Number of Events	Property Damage	Crop Damage	Death/Injuries	Annualized Losses
Amelia County	76	$130,000	$15,000	0	$3,988
Buckingham County	31	$0	$0	0	$8,052
Charlotte County	24	$0	$0	0	$7,089
Cumberland County	83	$30,000	$0	0	$3,715
Lunenburg County	67	$30,000	$0	0	$2,473
Nottoway County	68	$30,000	$0	0	$3,100
Prince Edward County	87	$30,000	$0	0	$6,168
Total:	**434**	**$250,000**	**$15,000**	**0**	**$34,585**

Table 5.5 Ice Storm Activity in the Region

Location	Number of Events	Property Damage	Death/Injuries	Annualized Losses
Amelia County	3	$100,000	0	$16,248
Buckingham County	6	$28,000	0	$2,471
Charlotte County	4	$100,000	0	$8,382
Cumberland County	3	$75,000	0	$14,318
Lunenburg County	3	$75,000	0	$14,444
Nottoway County	3	$100,000*	0	$20,279
Prince Edward County	3	$75,000	0	$31,293
Total:	**25**	**$553,000**	**0**	**$107,435**

Source: National Climatic Data Center, FEMA National Risk Index
****Nottoway County representatives indicate that the ice storm event occurring in 2021 resulted in $100,000 in property damages alone, which would increase this total to $150,000***
NOTE: The data for Farmville is included in the data for Prince Edward and Cumberland Counties.

Significant Events

March 13-14, 1993 – The "**Superstorm of March '93**" affected the eastern United States from Florida and Alabama through New England. The storm was blamed for approximately 200 deaths and cost several billion dollars in damages and snow removal. As the storm made its way into Virginia, some weather stations recorded their lowest recorded pressures ever. Unlike most large winter storms that move up the Virginia coast, this storm took a more inland track across Richmond and the Chesapeake Bay. It brought snow, ice, rain and some high winds to the region. The icy conditions caused slick roads and downed power lines, and some portions of the region were without power for 14-15 days. In the State, 11 people died during and immediately following the storm from over-exertion and heart attacks shoveling snow or from exposure and hypothermia. Snow removal and clean-up costs were estimated at $16 million.

December 23 to December 25, 1998 – The **"Christmas Ice Storm"** is estimated to have caused approximately $20 million in damage across several states including Virginia. At least three deaths in Virginia were blamed on the storm – all elderly people who died of hypothermia after they lost power in their homes. Central and Southeast Virginia were hit particularly hard, including many localities in Planning District 14. A prolonged period of freezing rain and sleet resulted in accumulations ranging from ½-inch to one inch in many locations, and ice on trees and power lines resulted in widespread power outages (it is estimated that as many as 400,000 customers in Virginia were without power at one point), some lasting as long as 10 days. Roads and bridges/overpasses were slick, and some secondary roads were rendered impassable due to fallen limbs or – in some cases – entire trees that blocked roadways.

March 2009 – The most significant statewide winter weather event in over 8 years. Most areas received over 4 inches of snow. Amounts range from a dusting in VA Beach to 10-11 inches in Richmond through the Northern Neck area. This caused travel disruptions and widespread power outages. Schools throughout the region were closed, and the Emergency Operations Center was activated in **Charlotte County**.

December 2009 – A winter storm moved from the Gulf Coast through North Carolina and Virginia, dumping heavy snow across the State. Heavy snow began in Virginia around midday on December 18, and snow rapidly accumulated to the point where winter storm warnings were issued for much of the State. Travel was rendered extremely difficult for several days, and numerous vehicle accidents were attributed to this storm. According to NCDC data, final snow totals ranged from less than 6 inches in the southeast part of the State to more than 25 inches in the western and southwestern parts of Virginia. Nearly 50 Virginia localities were directly affected by the ensuing Presidential Disaster Declaration (issued on February 16, 2010).

January 25 and January 30, 2010 – Two storms impacted parts of the region just a few days apart. The first, on January 25, dumped six to 12 inches of snow across Central Virginia. Snowfall amounts varied, with six to 10 inches in **Prince Edward County** and 10 inches in **Cumberland and Amelia Counties**. No damages were reported from this storm, but the snow remained on the ground for several days in many areas due to below-average temperatures. Then, on January 30, a significant ice storm caused an estimated $200,000 in damages across Central and Eastern Virginia. What started out as a mix of snow, sleet, and freezing rain turned into all freezing rain. Ice accumulations ranged from ¼ inch to ¾ inch in **Nottoway and Amelia Counties**. Downed trees and

power lines resulted in widespread power outages (an estimated 285,000 customers in Central Virginia were without power at one point).

February 5-11, 2010 – On the heels of the December 2009 nor'easter and the January 2010 ice storm, another storm dumped record snowfalls across the Mid-Atlantic region and dumped significant snow in parts of Virginia. Deaths in Mexico, New Mexico, Maryland, and Virginia were attributed to this storm. Some parts of Virginia (in particular, Northern Virginia) received between 20 and 40 inches of snow, bringing travel to a halt. To give just one example, rail service south and west of Washington, D.C. was suspended and rail service from Washington to Boston was suspended for a time. In this region, snow totals ranged from two inches in **Lunenburg County** to 10 inches in **Amelia County**. A Presidential Disaster Declaration for this event was issued on April 28, 2010. Locally, **Buckingham County** was included in this declaration.

January 22-24, 2016 – A major snowstorm brought heavy snow to many states along the east cost of the United States. Known as Winter Storm Jonas, it affected an area stretching from Arkansas to New Hampshire. It started as a disturbance in the Pacific Northwest earlier in the week, moved southeast across the Plains, then spawned a weak area of low-pressure over Texas. Then a new area of low pressure formed over the Carolinas and Georgia, and the storm started to move north and rapidly gained strength. Parts of Northern Virginia and along the Blue Ridge Mountains were under a blizzard warning on January 21, just before the storm hit the Commonwealth, and Governor McAuliffe declared a state of emergency for Virginia. The storm was rated a Category 4 or "Crippling" winter storm on NOAA's Northeast Snowfall Impact Scale (NESIS). Areas further north along the coast, including Washington, DC and New York City, reported two to three feet of snow. In this region, totals were not as high but schools and businesses were closed or opened late for a number of days. According to published reports in the local media, snowfall totals ranged from six to 10 inches in **Charlotte County** to 10 inches in **Lunenburg County** and **Farmville** to 11 to 15 inches in **Amelia County**.

January 6-7, 2017 – A weekend snow storm created dangerous travel conditions and led to scattered power outages, with snowfall amounts between five and 10 inches reported across the region and overnight low temperatures near zero over the weekend. The combination of snow and cold temperatures created slick road conditions, with numerous automobile accidents reported but no known serious injuries, and led to the closure of area schools for a few days afterword. In **Lunenburg County**, icy road conditions made responding to a house fire in **Victoria** difficult over the weekend. The Victoria and **Kenbridge** Fire Departments were able to put out the blaze with no injuries, but the house was a total loss. The fire is believed to have started in the area of the house where the wood stove and chimney were located.

February 11-13, 2021 – A severe ice storm that created ½" of ice impacted roads and utilities in every county in the region. The storm left 99% of **Amelia County** without power, and only 50% with power 3 days after the storm. Warming centers during daylight and emergency shelters at night were opened, and road blockages up to 3 days after the storm prevented fuel deliveries to power generators, including at a long-term care facility in Amelia Courthouse. In **Charlotte County** most residents were without power, some for almost two weeks, while emergency shelters were opened and volunteer crews were dispatched to remove debris and deliver food, blankets, and water to residents. All counties in the region experienced road closures and power outages. **Prince Edward County** also opened warming/charging centers and some citizens were out of power for

2 weeks. Similarly, **Lunenburg County** also experienced outages for up to 2 weeks, along with multiple impassable roadways due to debris; the County made an emergency shelter available, along with food, for 12 days. On May 10, 2021, President Biden approved a federal disaster declaration that included six of our seven counties: **Amelia, Cumberland, Charlotte, Lunenburg, Nottoway, and Prince Edward.**

January 2 -3, 2022 – A severe winter storm created dangerous travel conditions and led to scattered power outages, with snowfall amounts between 1.5 and 8 inches reported across the region. Excessive amounts of heavy, wet snow left thousands of residents without power throughout our region. In other parts of the state, there were counties that had 70 to 90% of residents without power. At the peak of the event over 450,000 of Virginia residents were estimated to be without power. In the Counties of Goochland and Louisa, located just north of our region, encountered tree/infrastructure damage similar to damage that was incurred during Hurricane Isabel. In Caroline County, a portion of I-95 as closed due to excessive amounts of heavy wet snow trapping motorist for over 24 hours in plummeting temperatures. On March 11, 2022, President Biden approved a federal disaster declaration that included **Amelia, Buckingham, Cumberland, Charlotte, Nottoway, and Prince Edward Counties.**

Future Occurrence

The likelihood of future winter storm and ice storm events is described by FEMA's NRI as the expected number of event-days per year, and range from 1.57 (Lunenburg County) to 2.89 (Buckingham County) events for winter storms and 1.41 (Prince Edward County) to 1.22 (Lunenburg County) events per year for ice storms. It is unknown whether extra atmospheric energy and shifting temperatures due to climate change will lead to more frequent events. For a more detailed per-locality analysis, see Section 6.

Nor'easters

Introduction

Although nor'easters, like tropical storms, are usually a more coastal phenomenon, larger storms also impact the inland PD-14 region. Unlike hurricanes and tropical storms, which typically come and go within one tidal cycle, nor'easters can linger for days, causing excessive amounts of snow and prolonged freezing weather. Damages and impacts to the region caused by nor'easters are captured by Winter Weather and Ice Storm hazard categories, but it is worth noting the significant blizzard-like events that have historically occurred.

Significant Events

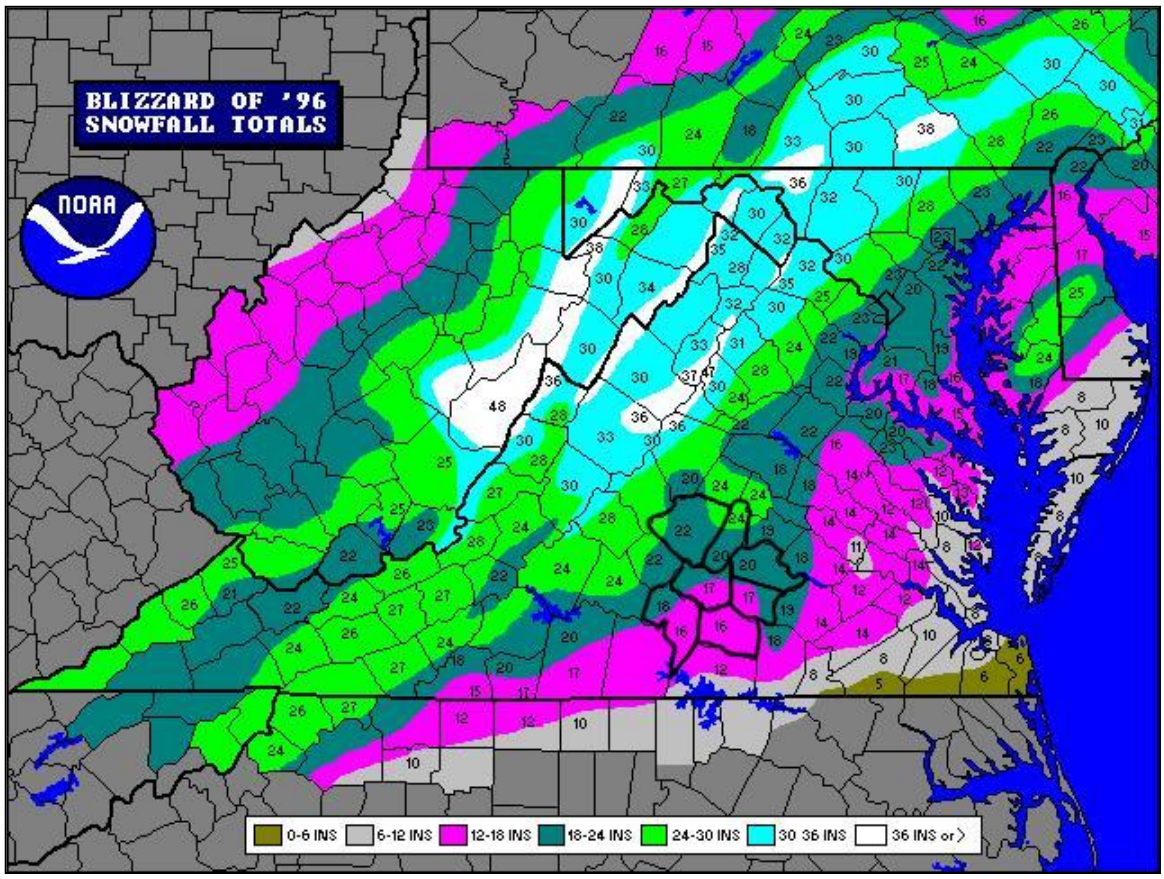
January 23-24, 1940 – One of the largest nor'easters to impact the region dumped 24 inches of snow on **Farmville** in 24 hours. Businesses were closed for a couple of days and some schools were closed for a week. There were 12 deaths attributed to the storm in Virginia and damages statewide were estimated at half a million dollars. With fresh snow on the ground, temperatures fell. On the six days following the storm, low temperatures dropped below zero with the coldest day setting a new all time record of -12°F.

January 30-31, 1966 – A blizzard struck Virginia and the northeast United States. This was the second snowstorm to hit Virginia in a week. The first storm dumped 15 inches in Richmond and 9 inches in Norfolk. With snow still on the ground, arctic air settled in and temperatures dropped into the teens. The second storm dumped 1 to 2 feet of snow over a large part of the state: Lynchburg—11 inches; **Farmville**—23 inches; Partlow—20 inches; Fredericksburg—15.5 inches; Manassas—13 inches; and Arlington—14 inches (this is on top of the previous snow). Lynchburg set a monthly record with almost 32 inches (31.8), and Roanoke set a monthly record with 41.2 inches. Strong winds and drifting snow kept roads closed for several days after the storm. Temperatures dropped into the single digits with some falling below zero, with dangerous wind chills. The Richmond area set a record for the calendar year with 41.6 inches.

Winter of 1995-1996 – Much of the State north and west of Richmond had either a record seasonal snow total or totals in the top three for the century. **Buckingham County** saw 67 inches for the season. Some schools lost as many as 15 days, and school systems compensated by adding hours to their days, adding Saturdays or teacher conference days, or staying in session through most of June.

Blizzard of '96 (January 6-13, 1996) – Part of the winter mentioned above, this storm resulted in snow for every county in the State, and dumped 16 to 24 inches of snow in the region. **Map 5.2** below shows the total snowfall amounts for the state and region. As shown, counties in PD-14 received between 12 to 30 inches of snow.

Map 5.2 Blizzard of '96 Snowfall Totals



November 2009 Nor'easter – Even though this storm did not have a great effect on the region, a state of emergency was declared by Governor Kaine and a number of Virginia localities received federal disaster designations – making the entire State eligible for HMGP funding.

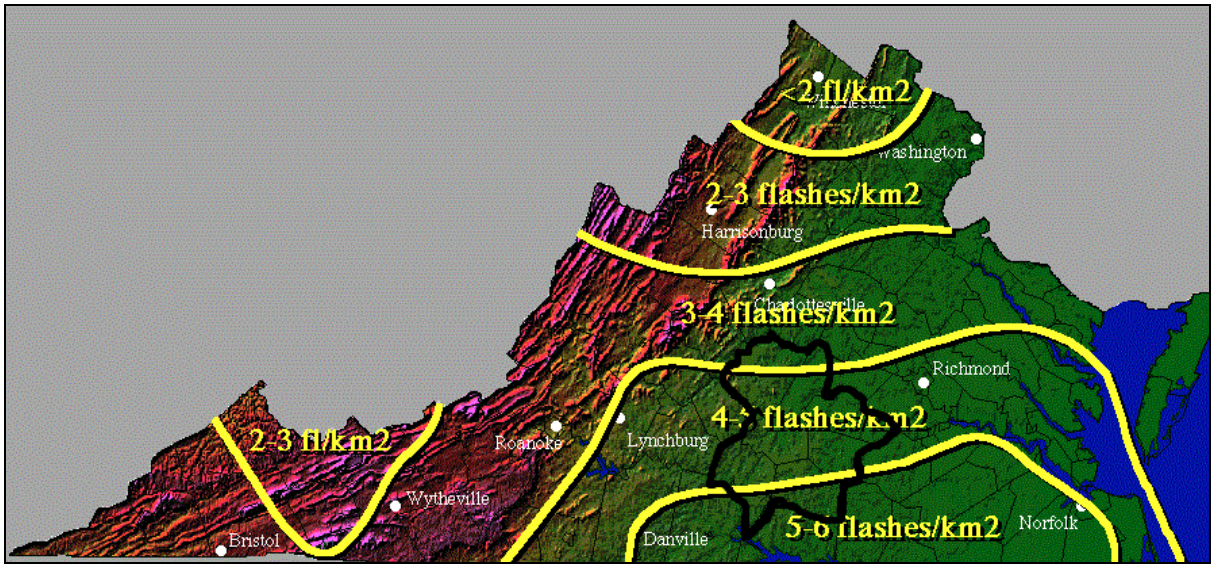
December 18 to December 20, 2009 – A nor'easter dumped heavy snow from North Carolina northward along the Eastern Seaboard to New England and the Canadian Maritime Provinces. Heavy snow began in Virginia around midday on December 18, and snow rapidly accumulated to the point where winter storm warnings were issued for much of the State. Travel was rendered extremely difficult for several days, and numerous vehicle accidents were attributed to this storm. According to NCDC data, final snow totals ranged from less than 6 inches in the southeast part of the State to more than 25 inches in the western and southwestern parts of Virginia. Nearly 50 Virginia localities were directly affected by the ensuing Presidential Disaster Declaration (issued on February 16, 2010).

Thunderstorms (Strong Wind, Lightning, and Hail)

Introduction

Thunderstorms are common throughout the State of Virginia, and have been known to occur during all calendar months. In addition to the high winds associated with these events, thunderstorms can also bring dangerous lightning that can cause fires, property damage and may cause death or serious injury to humans. A thunderstorm with wind gusts in excess of 58 mph (50 knots) and/or hail with a diameter of 0.75 inches or more is classified as a "severe thunderstorm." Hail is another element of this form of inclement weather, and can cause varying degrees of property and crop damage. **Map 5.3** shows lightning strike density in the State of Virginia. **Tables 5.6-5.8** provide summary information of strong wind, lighting, and hail events reported to the National Centers for Environmental Information (NCEI) including annual estimated damages.

Map 5.3 Virginia Lightning Strike Density Map



Note: This map is based upon lightning strike data for the year 1989. Strikes were identified by the detector network established by the Electric Power Research Institute. Source: Virginia State Climatology Office

Table 5.6 Severe Thunderstorm (Strong Wind) Activity in the Region

County	Number of Events	Property Damage	Crop Damage	Deaths/ Injuries[8]
Amelia County	64	$11,932	$16,906	0/1
Buckingham County	86	$31,307	$1,171	1/0
Charlotte County	81	$25,794	$901	0/0
Cumberland County	73	$6,779	$8,726	0/0
Lunenburg County	52	$14,444	$4,353	1/0
Nottoway County	53	$10,510	$7,906	1/2
Prince Edward County	72	$27,065	$5,223	0/0
Total:	**481**	**$127,831**	**$45,186**	**3/3**

Table 5.7 Severe Thunderstorm (Lightning) Activity in the Region

County	Number of Events	Property Damage	Injuries	Annualized Losses
Amelia County	1,332	$2,147	1	$35,183
Buckingham County	1,120	$1,554	4	$66,077
Charlotte County	1,180	$88	1	$23,350
Cumberland County	1,189	$1,571	0	$41,398
Lunenburg County	1,282	$1,760	0	$58,371
Nottoway County	1,361	$760	2	$65,405
Prince Edward County	1,183	$1,101	3	$65,008
Total:	**8,647**	**$8,980**	**10**	**$354,792**

Table 5.8 Hail Events in the Region

County	Number of Events	Property Damage	Crop Damage	Annualized Losses
Amelia County	83	$775	$4,845	$8,368
Buckingham County	94	$6,665	$2,774	$13,671
Charlotte County	113	$1,174	$893	$5,791
Cumberland County	85	$4,778	$2,316	$9,357
Lunenburg County	96	$5,384	$1,121	$9,720
Nottoway County	93	$7,899	$3,197	$14,972
Prince Edward County	102	$12,074	$1,655	$20,160
Total:	**225**	**$38,749**	**$16,800**	**$82,039**

Source: National Centers for Environmental Information, FEMA National Risk Index
NOTE: The data for Farmville is included in the data for Prince Edward and Cumberland Counties.

[8] Source for injury data: NCEI

Significant events:

May 5, 1996 – A storm that the National Weather Service classified as a "microburst" hit **Lunenburg County** late at night. A microburst is a phenomenon that has been compared to a tornado, in that it produces damaging, straight-line winds. The **Town of Kenbridge** suffered some tree damage from this event, and there were widespread power outages throughout the County, but the **Town of Victoria** took the brunt of this storm – which hit after 10:00 that evening. Due to the time of the storm, the streets in Victoria were largely empty. Thus, there were no reports of serious injuries. However, numerous buildings within the Town's business district – which was the hardest hit area – were damaged to varying degrees.

May 22, 2000 – Widespread hail "up to nearly softball size" affected large portions of **Lunenburg County**. Specific reports from spotters and the media indicated hail measuring 2.25 to 2.5 inches in diameter fell in Victoria at 2:50 p.m., hail "up to nearly softball size" just before 3 p.m., and "hail the size of tennis balls and eggs" around 3 p.m. Numerous trees were reported downed by high winds in a swath 2 to 3 miles in width in the Double Bridges area. Many vehicle and business windows were broken by the large hail, resulting in expensive repairs. Six county-owned vehicles were damaged by the storm, including one that was hit by a tree.

October 13, 2011 – A severe thunderstorm came through the region during the morning, causing damage and knocking out power in **Farmville** and the surrounding areas. According to WFLO Radio, nearly 2,000 homes and businesses lost power in and around **Farmville** shortly after 8:30 a.m. when a large tree fell across Plank Road (Route 600) and damaged a power line. Power was restored to about half of those who lost it later in the morning, but WFLO and more than 600 other homes and businesses were without power much of the day. In **Prince Edward County**, flash flooding was reported on Route 651 (Chinquapin Road) when Harris Creek overflowed its banks due to the heavy rain. VDOT estimated that the water on the road and adjacent ground reached three inches deep at one point. Homes in **Prospect**, in the western part of the County, were without power for several hours.

December 2011 – A storm that the National Weather Service classified as a "microburst" hit Charlotte County at night. The storm, which also came with heavy rain, caused significant damage to homes in the **Phenix** and **Madisonville** areas. Damage included storage sheds and a barn that were completely destroyed, damage to the roof of a house, and uprooted trees and downed power lines. According to a report in *The Charlotte Gazette*, a tornado was initially believed to be responsible for the damage but the weather service later determined that it was a microburst.

June 29, 2012 – A storm event known as a "derecho," which had little rain but unusually high winds, barreled through the area resulting in property damage and power losses throughout the region. A derecho is a complex of thunderstorms or a mesoscale convective system that produces large swaths of severe, straight-line wind damage at Earth's surface. This particular storm started in the Midwest and traveled 600 - 700 miles, affecting multiple states. It is believed the derecho was exacerbated by higher-than-average temperatures across the eastern United States. Governor McDonnell declared a state of emergency throughout the State of Virginia as a result of damage from the event.

March 16, 2013 – A windstorm hit **Amelia County** causing widespread damage. According to a report in the *Amelia Bulletin-Monitor*, the National Weather Service said the storm was unique to the County. The weather service reported that the storm, which was accompanied by rain, packed winds of 60 miles per hour. The Amelia County Sheriff's office received calls from the **Amelia Court House**, **Little Patrick**, **Mannboro**, **Scott's Fork**, and **Paineville** areas of the County. The Village area was hit particularly hard, as the roof was torn off one local business and county buildings on the Village suffered minor damage. In addition, the roof was torn off the gymnasium at Amelia Academy. The storm knocked out power to parts of the County – including along Route 628, where a tree fell on a pickup truck (the driver escaped without injury, according to the paper) and the tree cut a power line – the downed line started a small field fire.

June 19, 2017 – A line of strong storms moved through the area, bringing with it heavy rain and wind along with lightning. **Prince Edward County** reported a wire/transformer fire on U.S. 460 and some downed trees as a result of the storm. In **Amelia County**, there were reports of downed trees in a number of areas. They include Route 705 (Mount Olive Lane), which resulted in traffic needing to be detoured until VDOT crews could remove the debris; Route 696 (Locust Dale Lane), which blocked the roadway until it was removed by the property owner; and U.S. 360 eastbound near Route 624 (Whitaker Road). That tree was struck by two passenger vehicles and a tractor trailer (the tractor trailer was able to miss the two passenger vehicles, but not the tree). All three vehicles suffered damage, with one of the passenger vehicles estimated to be a total loss.

April 15, 2019 – A derecho event in **Lunenburg County** resulted in a tree falling on a home in Victoria, causing the death of a woman residing in the home.

Future Occurrence

Future occurrence for severe storm events is categorized by FEMA's NRI, and describes the expected annual frequency in number of event-days per year. These range from 1.61 (Lunenburg County) and 2.69 (Buckingham County) strong wind events, 50.88 (Buckingham County) to 61.82 (Nottoway County) lightning events, and 83 (Amelia County) to 113 (Charlotte County) hail events per year. There are no definitive upward trends for storm events in the region, but it can be expected that higher total atmospheric energy and temperature swings as a result of climate change might lead to more frequent or more damaging events. See Section 6 for a more complete analysis by locality.

Tornadoes

Introduction

According to the U.S. National Climatic Data Center/National Weather Service Storm Prediction Center, Virginia ranked 28th in the Nation in number of tornado events, and 25th in tornado deaths, based upon data collected for all states and territories for tornado events between 1950 and 2005. According to NOAA's National Centers for Environmental Information (NCEI), the covered localities have experienced a total of 43 tornado events from 1950 through 2020.[9] These events are reported to have caused no deaths, but did cause a total of two (2) injuries and approximately $12,977,000 in property damage.[10]

Significant Events:

April-May 2000 – A string of tornadoes hit parts of the state, including counties in this region. Governor Gilmore declared a state of emergency, which was later amended to include **Prince Edward County**.

April 2011 – Tornadoes hit the State, and the region, during two separate events:

On **April 16, 2011**, a line of severe thunderstorms came through Virginia during the afternoon, spawing at least 10 tornadoes statewide. This system started in the Southern Plains of the U.S. two days earlier, spawning tornadoes from Oklahoma eastward. In Virginia, the storms were blamed for at least five deaths and Governor McDonnell declared a statewide emergency. At least one tornado struck Lunenburg County, near Victoria, causing significant damage to one house (which had to be condemed) and varying degress of damage to several other homes and a couple of other buildings. Total damages were estimated at approximately $100,000.

Less than two weeks later, on **April 27**, a line of severe storms came through the State during the day. This system started in the same region of the country as the April 16 storm, and spawned tornadoes in several states from Texas to New York. According to published reports, the storms were blamed for more than 300 deaths across six states – making this the deadliest outbreak of tornadoes in the United States since 1932. The large majority of fatalities were in Alabama. According to National Weather Service estimates, the system touched off a total of 312 tornadoes during a 24-hour period from 8:00 a.m. on April 27 to 8:00 a.m. on April 28, a new record (the previous record was 148, recorded during the April 3-4, 1974 tornado event).

At least 15 tornadoes were confirmed in Virginia from this event, killing five people. Governor McDonnell declared a statewide emergency. One confirmed tornado struck **Prince Edward County**, near **Farmville**. The funnel cloud was seen from parts of Farmville, including Longwood University.

[9] Source: NOAA Storm Events Database

[10] Total property damage estimates are variable, based on the methodology used, but range from $2,722,232 to $12,977,000.

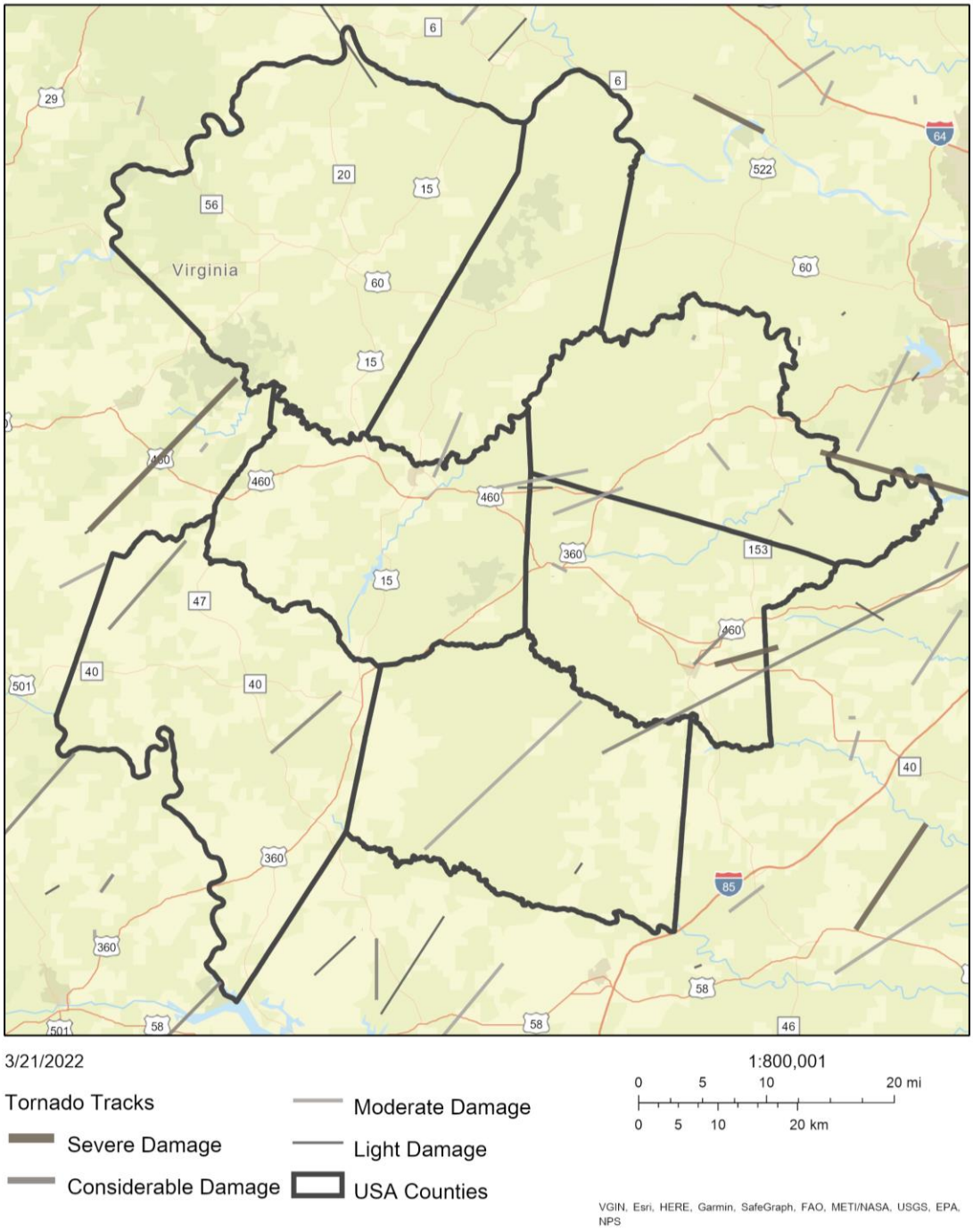
Longwood University student Amelia Perry took this photo of the tornado that came through Farmville on April 27, 2011 (courtesy The Farmville Herald)

On **October 11, 2018,** a tornado resulting from the effects of Tropical Storm Michael severely damaged three residential structures in **Amelia County**.

Future Occurrence

Tornado event occurrence is described by FEMA's NRI as the expected number of tornado events per year. These numbers range from 0.14 events (Cumberland County, Prince Edward County) to 0.21 events (Buckingham County) for localities in the region. See Section 6 for a more complete look at the expected annual frequency by locality. Clear increasing trends over time so far are not apparent, and it is unknown whether tornado events will increase due to the effects of climate change.

Map 5.4 Historic Tornado Tracks in the Region – 1950-2020[11]



[11] Source: ESRI Living Atlas, NOAA Storm Prediction Center

Table 5.9 Most Damaging Tornado Events in the Region (1950–2021)

County	Date	F Scale	Injuries/ Deaths*	Property Damage
Lunenburg, Nottoway	8/6/1993	F2	0	$5,000,000
Charlotte	5/8/1984	F2	0	$2,500,000
Amelia	5/4/1990	F3	0	$2,500,000
Nottoway	11/2/1966	F2	0	$250,000
Nottoway	5/22/1983	F3	0	$250,000
Prince Edward	10/13/1983	F1	0	$250,000
Nottoway	10/13/1983	F1	0	$250,000
Amelia	10/13/1983	F1	0	$250,000
Charlotte	10/13/1983	F2	0	$250,000
Charlotte	10/14/1986	F3	0	$250,000
Amelia	11/16/1989	F0	0	$250,000
Amelia	10/11/2018	EF2	0	$250,000
Nottoway	10/11/2018	EF1	0	$150,000
Lunenburg	4/16/2011	EF1	0	$100,000

Source: National Climatic Data Center
Deaths were reported for some events, including 4 during the August 6, 1993 event, but none in the PD-14 region.

Table 5.10 Total Tornado Events in the Region (1950-2020)

County	Number of Events	Property Damage	Expected Annualized Losses
Amelia County	10	$3,367,000	$141,566
Buckingham County	2	$55,000	$114,979
Charlotte County	1	$3,050,000	$85,957
Cumberland County	2	$65,000	$91,322
Lunenburg County	4	$5,165,000	$117,201
Nottoway County	9	$1,020,000	$156,761
Prince Edward County	2	$255,000	$192,004
Total:	**30**	**$12,977,000**	**$899,790**

Source: FEMA National Risk Index
NOTE: The data for Farmville is included in the data for Prince Edward and Cumberland Counties.

Wildfire

Introduction

According to the Virginia Department of Forestry (VDOF), there were 2,478 recorded wildfires in the region from 1994 through June 2015. Total damages from these events were estimated at more than $4.8 million. Causes included debris burning, smoking, equipment use, children and lightning. There are no known records of any deaths or injuries attributed to a wildfire event in the region.

Table 5.11 Occurrences of Wildfire in the Region – 1994 through June 2015[12]

Location	Number of Wildfire Events	Total Amount of Damage
Amelia County	311	$130,200
Buckingham County	488	$1,010,305
Charlotte County	395	$441,777
Lunenburg County	449	$2,137,755
Nottoway County	524	$858,225
Prince Edward County	311	$238,745
Total:	**2,478**	**$4,817,007.00**

Source: Virginia Department of Forestry (VDOF), 2017 CRC Regional Hazard Mitigation Plan
NOTE: The data for Farmville is included in the data for Prince Edward and Cumberland Counties.

Significant Events

Fall 2001, Spring/Summer 2002 – Drought conditions were blamed for busier than normal fire seasons. In 2001, more than 2,200 fires were reported across the State burning more than 19,000 acres. This prompted the VDOF to request help from the U.S. Forest Service and Florida Department of Forestry. In addition, FEMA provided wildfire funding assistance. Drought conditions continued into 2002, causing an early start to the Spring Fire Season. After a brief respite from March and April rains, drought conditions returned in the summer. For all of 2002, the VDOF managed more than 1,600 wildfires consuming more than 13,000 acres. Locally, in October 2001, a fire burned 949 acres in **Lunenburg** and **Nottoway Counties**.

February 2008 – Multiple wildfires were reported in 62 counties across the State. The fires were fueled by high winds, making them difficult to contain. As many as 300 fires were reported statewide at one point, some as large as 1,000 acres or more. The VDOF, State Police, and National Guard (among other groups) provided assistance to firefighters in many localities. Among localities in Planning District 14, fires were reported in **Buckingham, Charlotte, Lunenburg, Nottoway** and **Prince Edward Counties**. Local emergencies were declared in **Charlotte** and **Lunenburg**.

[12] According to VDOF, 1994 was the year their new database program was initiated. Therefore, data for 1994 may not include the entire year. This Plan Update does not include data for events after 2015.

April 2008 – A wildfire in northern **Buckingham County** burned about 600 acres near Routes 622 and 676. No houses were damaged, but a significant amount of timber was lost. All five of the County's fire departments and VDOF personnel battled the blaze, which was brought under control after about nine hours. One VDOF employee was sent to the University of Virginia Medical Center with upper-body burns, and two other firefighters were treated locally for smoke inhalation.

February 2011 – Multiple wildfires were reported in more than 50 counties across the State, as abnormally dry conditions combined with high winds to spark (and spread) many blazes. Fires were reported in each county within Planning District 14, according to local reports and the Virginia Emergency Operations Center.

At **Fort Barfoot** (formerly known as Fort Pickett), an estimated 2,000 acres burned between February 14 and February 21. That fire was contained, and no structures were damaged. **Amelia County** reported seven fires between February 17 and 21, all grass and woodland fires. According to county officials, several structures were threatened but none burned. **Lunenburg County** reported a few fires, with one – started when a brush fire set by a local resident got out of control due to high winds – destroying a shed and damaging two other buildings. Other fires burned open land, including a 10-acre brush fire that resulted from a downed power line, but there were no other reports of building damage. Three fire departments responded to that blaze. **Charlotte County** reported a number of fires between February 14 and February 21. There was no known damage to buildings from these events, as these were field and brush fires.

Other parts of the State did not fare as well. During this period, fires in Louisa, Shenandoah, and Goochland Counties destroyed a small number of houses. Additionally, Interstate 64 in New Kent County near Interstate 295 (east of Richmond) was closed for several hours on February 19 by a brush fire that was fueled by high winds. Traffic was diverted onto U.S. 60 while firefighters battled the blaze.

Future Occurrence

Wildfire annualized risk is described by FEMA's NRI, and ranges from a 0.007% annual chance (Amelia County) to a 0.023% chance (Buckingham County). Wildfires have many different causes, very often including human negligence, so it is not apparent whether the effects of climate change will have an effect on future wildfire frequency.

Drought

Introduction

From 1993 to 2015, there were 38 periods of drought recorded for the localities in the Region, according to the National Climatic Data Center. Using the methodology from the FEMA National Risk Index, based on the University of Nebraska-Lincoln Drought Monitor, there have been 203 to 252 drought events in the region per county from January 2000 to the end of 2017. Damage to crops was extensive and caused major hardship to farmers in the region.

Table 5.12 Occurrences of Drought in the Region – Jan. 2000 through Dec. 2017

County	Number of Events	Historic Crop Damage	Expected Annualized Losses
Amelia	203	$4,980,000	$2,503,915.03
Buckingham	217	$1,035,000	$35,129.79
Charlotte	217	$10,440,000	$435,569.71
Cumberland	210	$8,120,000	$1,759,889.86
Lunenburg	252	$0	$685,069.07
Nottoway	203	$4,220,000	$2,341,949.64
Prince Edward	210	$6,280,000	$1,195,271.13
Total:	**1,512**	**$39,075,000**	**$8,956,794.23**

Source: National Climatic Data Center, FEMA National Risk Index
NOTE: The data for Farmville is included in the data for Prince Edward and Cumberland Counties.

Significant Events

Summer 2001-Summer 2002 – A drought, caused by abnormally low rainfall, gripped much of the state. Below normal rainfall made dry conditions that started back during the late 1990s even worse, resulting in rivers and streams – as well as reservoirs – dropping to dangerously low levels. Virginia recorded the driest 12-month period on record from August 2001 to August 2002. Conditions statewide prompted Governor Warner to declare a state of emergency. Locally, private well failures and disruptions to local water supplies were reported across the region. In **Farmville**, water levels on the Appomattox River dropped so low in the fall of 2002 that there was uncertainty as to whether the Town would be able to supply water for Longwood University.

Summer/Fall 2007 – Governor Kaine declared a statewide emergency and imposed a statewide burning ban due to dry conditions caused by lower than average rainfall across the state. **Amelia, Nottoway**, and **Prince Edward Counties** were included in federal disaster designations related to this event.

Summer 2010 – Lower than average rainfall across the State and above-normal temperatures led to abnormally dry conditions that affected water supplies and diminished agricultural production in a number of localities. All seven counties in **Planning District 14** were included in a subsequent federal disaster declaration, which

made farmers in the region eligible for low-interest loans and other related assistance that might be approved by Congress.

Future Occurrence

Occurrences of drought are described by the FEMA NRI as the number of drought-days per year, and range from 9.92 (Nottoway County) to 11.8 (Lunenburg County). Unless weather patterns shift to provide the region with more precipitation, these numbers are likely to increase due to the effects of climate change.

Extreme Heat

Introduction

Extreme heat describes periods of abnormally and uncomfortably hot and unusually humid weather typically lasting two or more days with temperatures outside the historical averages for a given area. The classification of these temperatures is based on National Weather Service data broken down by Census tract, so it will vary considerably even within counties. In addition, it is difficult to ascribe injuries or deaths purely to heat waves when there are almost certainly multiple confounding health factors.

However, it is known that extreme heat has a detrimental effect on physical and mental health, especially for more vulnerable populations, especially the elderly. Many counties in the PD-14 region have aging populations and should be cognizant of the risks. **Table 5.13** summarizes the number of extreme heat events in the covered localities based on the NCEI Storm Events Database and the annualized losses based on NRI data, which is extrapolated from data from the years 2005 to 2017.

Table 5.13 Extreme Heat Events in the Region

County	Number of Events	Annualized Losses
Amelia	9	$28,748.67
Buckingham	7	$8,024.53
Charlotte	3	$8,762.32
Cumberland	8	$19,291.49
Lunenburg	7	$20,703.64
Nottoway	8	$30,020.04
Prince Edward	7	$37,253.87
Total:	**49**	**$152,804.55**

Source: FEMA National Risk Index, National Weather Service data

NOTE: The data for Farmville is included in the data for Prince Edward and Cumberland Counties.

Future Occurrence

The risk of future occurrence of extreme heat events is described by the FEMA NRI, and ranges from a 16.52% annual chance (Buckingham County) to a 74.14% chance (Amelia County). These numbers are extrapolated from past events, and will likely increase in the future due to the effects of climate change. See Section 6 for a more complete breakdown by locality.

Erosion

Introduction

There is no database of historic erosion events, and no known scale to measure the extent of erosion. However, areas of steep slopes and numerous rivers, streams, and creeks that run through the region, as well as the large tracks of farmland in the region present conditions that are favorable for erosion to take place.

Future Occurrence

Because this data is not collected at any level of government for regions outside of coastal areas, it is difficult to assess future risk. Areas with steep slopes near streams and waterways should be assumed to be at higher risk for erosion incidents and monitored accordingly.

Earthquakes

Introduction

According to data from the Virginia Department of Energy, approximately 500 earthquakes have been reported in or near the State of Virginia since 1774 (the earliest year an earthquake was documented in the State). Less than 20 percent were strong enough to be felt. Two areas in the state known for seismic activity are Giles County (in the Western part of the state) and in central Virginia (roughly located around Richmond and Charlottesville). A small part of this region is located in the central Virginia area (see **Map 5.5**). However, the effects from the earthquakes that occur in both of these seismic areas could be felt throughout the region.

Some minor quakes have been experienced in the region over the last 10 years. A minor tremor was experienced in the region on December 9, 2003. The earthquake measured 4.5 on the Richter Scale and was centered close to Maidens, east of the region. It was felt strongly in the region. Minor damage was reported in the **Town of Victoria**, as some homeowners reported cracked windows and sheetrock from the quake. An earthquake was recorded less than five miles southwest of the **Town of Dillwyn** on December 16, 2009. It registered 2.2 on the Richter Scale, and no damage was reported.

In July 2010, an earthquake registering 3.6 magnitude shook the Washington, DC, area causing windows to rattle but no reported damage. The quake, the strongest felt in the DC area on record at that time, was centered northwest of DC in Rockville, MD. In this region, there were a few reports of people seeing things on their shelves rattle but no reports of damage or injuries.

More recently, an earthquake measuring 5.8 on the Richter Scale struck Louisa County (just north of Planning District 14) on the afternoon of August 23, 2011. The quake was centered near Mineral, in the eastern part of the County, and was less than four miles deep. It was felt all up and down the east coast of the United States, and even in to southern Canada. Louisa County suffered considerable damage to houses and businesses, and the High School had to be closed (and classes held in other locations) because of damage there. According to the blog on the VDEM web site, damage was reported in more than 1,400 homes in Louisa County. Some damage that was initially reported as minor became worse as a result of more than 40 subsequent aftershocks. Damage was reported in Washington, DC and points north. In this region, only minor damage was reported.

A minor quake struck the area in May 2014, and another one in November 2015. The May 2014 quake was centered in the northern part of Amelia County. It registered 3.2 on the Richter Scale, and little or no damage was reported. The November 2015 quake was centered in **Buckingham County**, just north of **Dillwyn.** It was 4.7 miles deep (according to published reports), and registered 2.6 on the Richter Scale. Little or no damage was reported from this quake.

Approximately two-thirds of Virginia is subject to earthquakes, with the western and central regions most vulnerable to an earthquake resulting in some damage. **Table 5.14** lists notable earthquake events that have occurred in the region since 1875 (compiled from National Geophysical Data Center records). **Map 5.5** shows the relative long-term seismic hazard assessment for the United States, and **Map 5.6** shows notable events.

Map 5.5 Long-term Seismic Hazard Map (2018)

Hazard assessment of peak ground accelerations having a 2 percent probability of being exceeded in 50 years, for a firm rock site.[13]

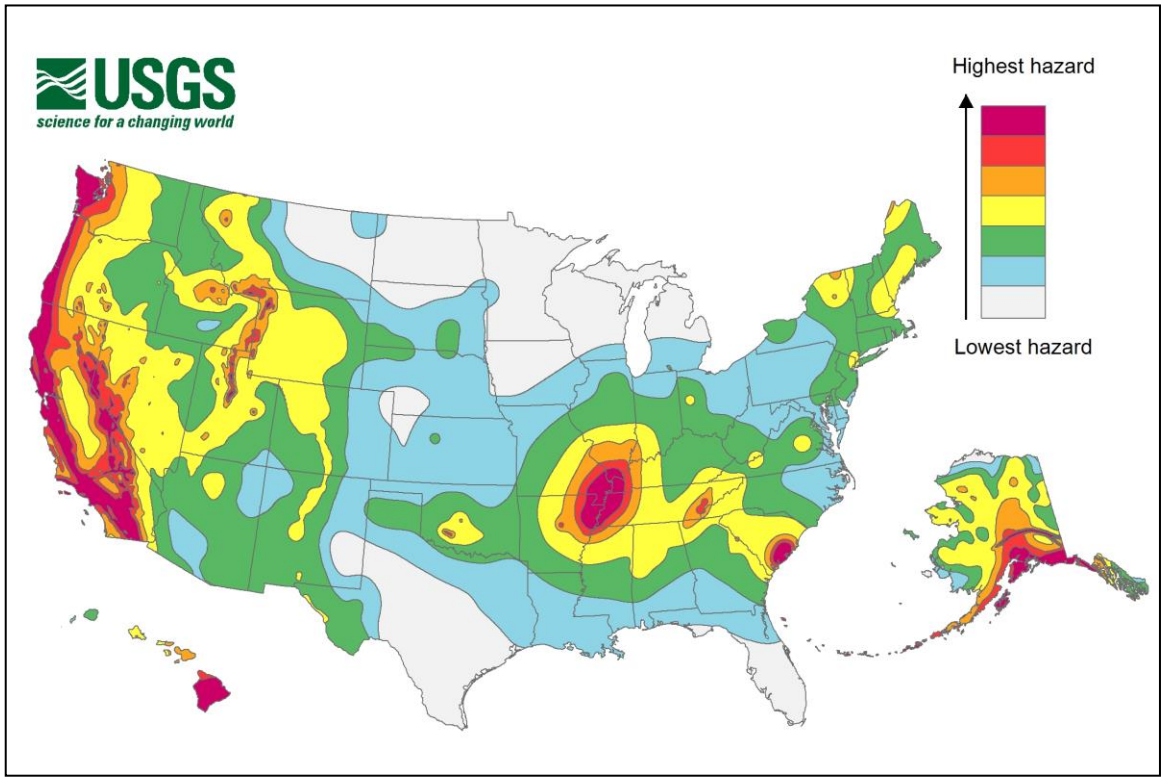


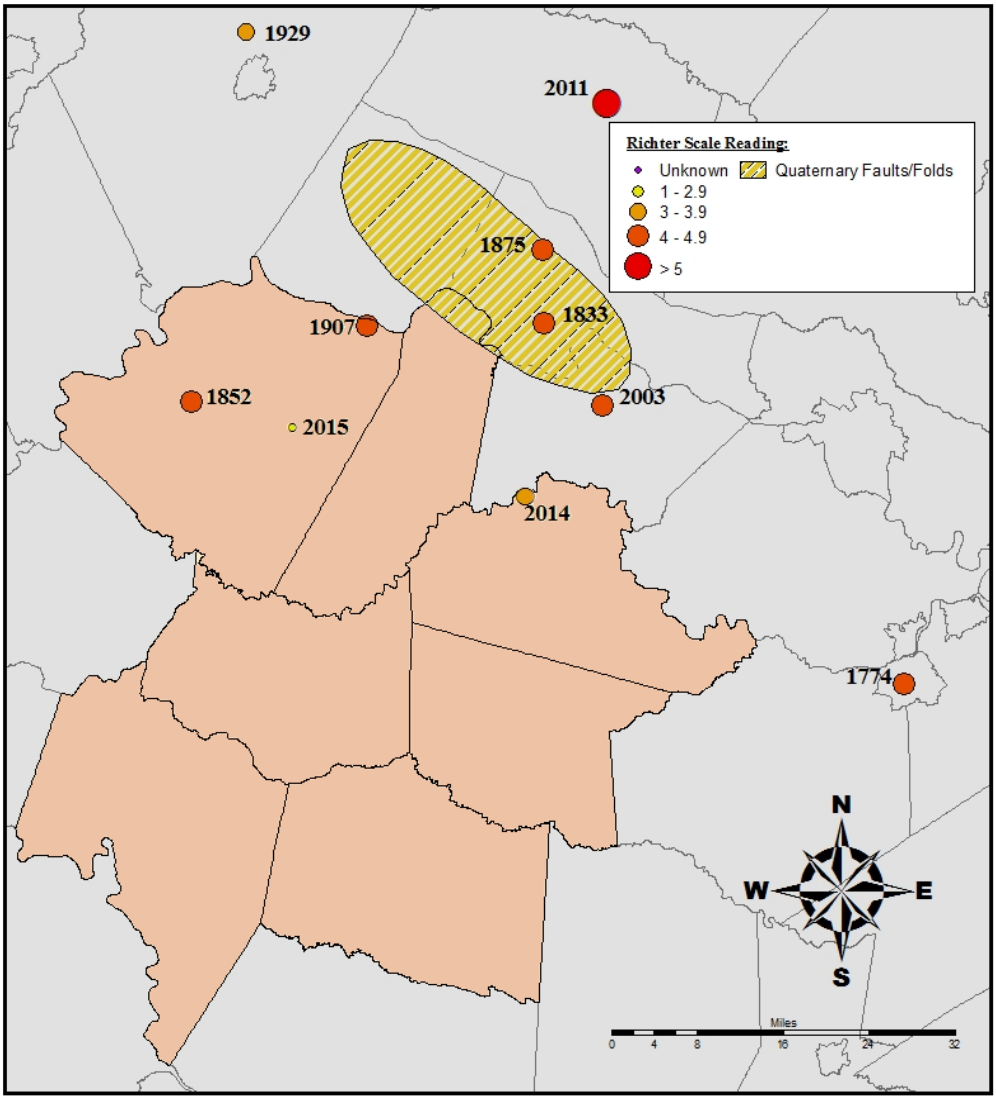
Table 5.14 Significant Seismic Events Impacting Planning District 14

Date	Location	Miles from Epicenter	Mercalli Intensity
08/07/1921	Dillwyn	29	Not reported
01/05/1932	Dillwyn	Not reported	Not reported
10/07/1942	Farmville	Not reported	Not reported
10/1945	Dillwyn	Not reported	Not reported
01/05/1948	Farmville, Dillwyn, Crewe	Not reported	Not reported
11/26/1950	Dillwyn	Not reported	Not reported
01/17/1955	Farmville	Not reported	Not reported
05/31/1966	Farmville	47	IV – V
11/20/1969	Farmville	230	III – IV
02/11/1981	Farmville	46	III – IV
08/17/1984	Farmville	66	III – V
08/23/2011	Regionwide (centered in Louisa Co.)	56 (from Farmville)	VII

Source: National Geophysical Data Center. This table does NOT include the May 2014 or November 2015 Earthquakes, as they caused little or no damage.

[13]Source: USGS (https://www.usgs.gov/media/images/2018-long-term-national-seismic-hazard-map)

Map 5.6 Significant Earthquakes in and around Region, 1568 - 2021[14]



Map created by VDEM/CGIT (updated by CRC – March 2022)

Future Occurrence

The Virginia statewide Hazard Mitigation Plan notes that earthquakes are impossible to predict, but that there are certain expectations of ground acceleration in certain areas. The Commonwealth Regional Council region localities lie generally within the Central Virginia Seismic Zone, and should expect a fair number of earthquakes of different magnitudes compared to other regions in Virginia.[15] Earthquake risk is marked by annualized frequency in the FEMA NRI, and ranges from a 0.03% to 0.06% annual chance for localities in the region. See Chapter 6 for a more complete analysis.

[14] The last significant earthquake to hit the region was the August 23, 2011 earthquake which impacted Virginia and Washington D.C.
[15] UVA (https://news.virginia.edu/content/earthquake-history-finding-faults-virginia)

Sinkholes

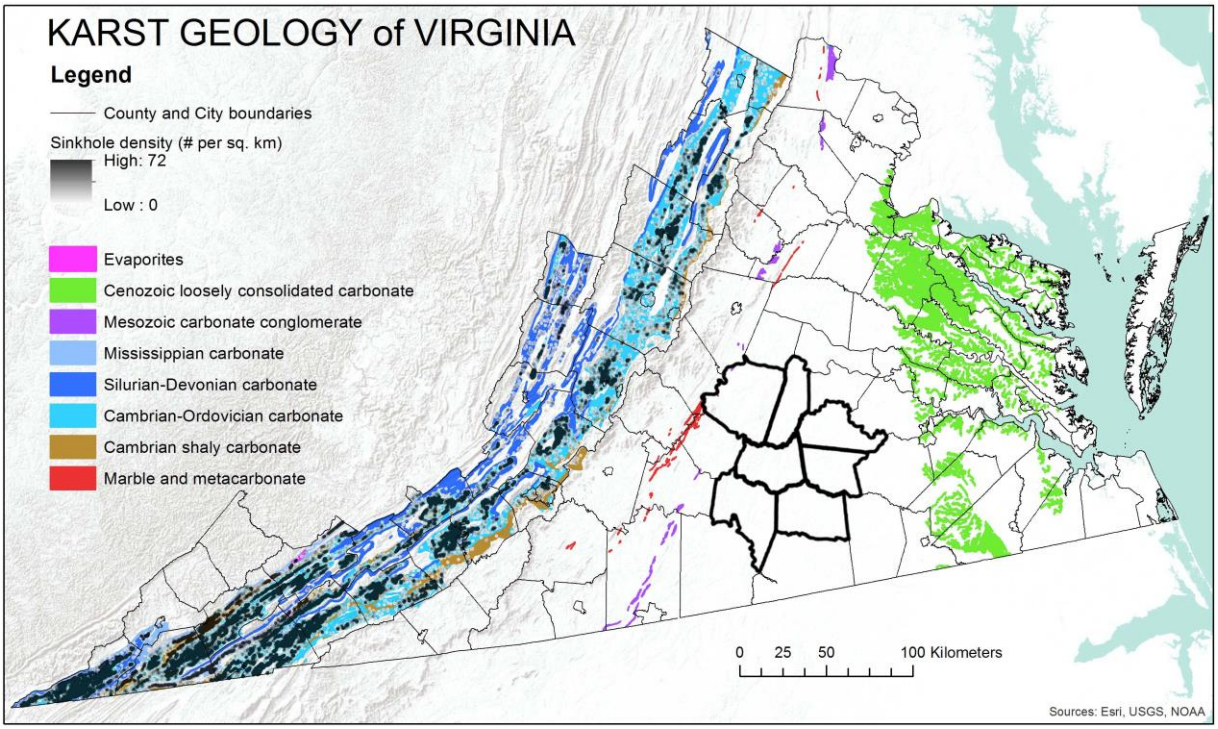
Introduction

Sinkholes (also known as Karst) do not pose an extremely significant risk within the region. The soil types are not conducive to creating sinkholes, although there have been a few reported instances of sinkholes in the area. **Farmville** Town officials noted that they sometimes experience sinkholes for which they can usually determine the cause (loss of groundwater, pipe failure, etc.). However, there have been occurrences of sinkholes where the cause was undetermined. Although soil or road collapses caused by erosion are not technically defined as sinkholes by geologists, as they are not related to the dissolution of carbonate rock, and there are no known karst forming geologic formations in the region, the potential for sinkholes or related soil collapse exists.

No maps of past occurrences are available for the sinkhole hazard due to the fact that there have been very few incidents reported within the planning area. Additionally, other than information from the State Hazard Mitigation Plan, no known sources of sinkhole probability data exist for the region at the time of this writing. **Map 5.7**, shows known landslide (karst) regions and historical subsidence throughout the state.

At least one sinkhole occurred in Meherrin in Prince Edward County off U.S. 360 in March 2021, likely exacerbated by non-natural causes, but which led to a crater nearly 30' wide and 30' deep.

Map 5.7 Karst Regions and Historical Subsidence[16]



[16] Source: DCR (https://www.dcr.virginia.gov/natural-heritage/vcbsinkholes)

Future Occurrence

Sinkholes are more or less random, even when they occur because of known causes (underground infrastructure failure, etc.). Because they are so few and far between, and because the Commonwealth Regional Commission region does not fall in areas known to be prone to them, it is difficult to extrapolate the risk into the future.

Landslides

Introduction

Portions of Planning District 14 are susceptible to landslides. However, according to national base maps provided by the U.S. Geological Survey and maps in the State Hazard Mitigation Plan, most of the region is located in a low landslide hazard area. Portions of **Buckingham County** are located in a higher landslide hazard area and represent the only portions of the region that fall under the high landslide hazard area classification. There are no known historical occurrences of landslides in the region.

Future Occurrence

Because there are no known historical landslide incidents, it is difficult to extrapolate to determine future risks. Landslides can occur for different reasons, including oversized rain events and earthquakes, and should be considered alongside those events as a percentage of risk of coinciding hazards.

Dam/Levee Failure

Introduction

According to the National Inventory of Dams and the U.S. Army Corps of Engineers, there are 245 state-regulated dams in Planning District 14. Of those, 38 are high-hazard dams and 23 are significant-hazard dams; the remainder are low-hazard dams.

In late September 2011, there was a dam failure in **Prince Edward County**. Due to heavy rains in the region, the dam at Farmville Lake failed. As seen in the picture below, a section of the road that goes over the spillway was taken out. This was a partial failure, not a total breach.

Heavy rains from a slow-moving system that came through the area on September 23, 2011 caused a breach in the Farmville Lake dam. The failure of the spillway took out a section of the road that passes over it. ***Source: T. Jordan Miles, III courtesy of Facebook***

Elsewhere in the region, there was a close call in 2003 with a private pond near one of the wells for the public water system in **Amelia County** (specifically, the Courthouse Village area). This dam required emergency maintenance in the aftermath of Hurricane Isabel to keep it from failing. Had it failed, it would have contaminated one of the wells for the public water supply. Since there are multiple wells feeding the system, the loss of one well would not have been a significant problem. However, had it happened without the knowledge of local officials, the contaminated well could have pushed contaminated water into the entire system.

A list of high, significant and low hazards dams for each county in Planning District 14 can be found in Section 6. High hazard dams are those dams that will probably cause the loss of at least one life in the event of a breach and economic, environmental and lifeline losses. Significant hazard dams are those dams that will also cause economic, environmental and lifeline losses, but no deaths are expected in the event of a breach.

Future Occurrence

Dams in Virginia are built to withstand certain hydrological events determined by the downstream effects of a failure. The Virginia Department of Conservation and Recreation - Division of Dam Safety & Floodplain Management observes an annual risk of failure for the Low, Significant, and High hazard categories for dams based upon design and associated hydrologic risk. Based on the expected rainfall events that would cause a hydrologic failure that dams in each category are designed to withstand – if properly maintained to design standards – these annual risk of failure rates are 1% for

Low hazard dams, 0.0001% for Significant hazard dams, and 0.000001% for High hazard dams. Increased precipitation or seasonal snow melt due to climate change may affect these probabilities in the future. It is expected that further considerations and information for dam failure risk, including probability of future dam failure, will be established within the forthcoming statewide Virginia Hazard Mitigation Plan update, and the Commonwealth Regional Council region and its localities will defer to that Plan with respect to further defining probably of future dam failure.

It is important to acknowledge that the Virginia Soil and Water Conservation Board (VS&WCB) proactively works to reduce the probability of future dam failures through the issuances of certificates to the owner of each regulated dam for a period of six years. If a dam has some deficiency but does not pose imminent danger, the Board may issue a two-year *conditional certificate* during which time the owner is to correct the deficiency. After a dam is certified by the Board, periodic inspections by an engineer are required. This procedure makes dam owners accountable, reducing the likelihood of dam failure, and makes local emergency management officials aware of deficient conditions in advance of potential hazards.

Technological Hazards

Hazardous Materials (HazMat) Spills

Hazmat substances, because of their chemical nature, can pose a danger to life, health or property if released. Hazmat spills can happen during production, storage, transportation, use or disposal of these substances. Virginia's hazardous materials officers typically receive 2,000 notifications of hazmat incidents a year, according to the Virginia Department of Emergency Management.

Significant event – July 2002: A transport tanker holding tar (liquid asphalt) spilled near the **Lunenburg/Nottoway County** Line, resulting in more than 5,000 gallons of tar flowing into the Nottoway River beneath the dam at Nottoway Falls. The tanker, delivered to a job site in advance of a road project in the area, was parked in a gravel lot near the river. During the afternoon of July 2, 2002, a motorist driving through the area noticed something flowing into the river. This individual discovered the leaking tanker, and immediately notified officials in the **Town of Victoria** – which uses the river as a source of drinking water. Even though Victoria's water system was not affected (the water intake for the Town is above the dam), the Town switched to an alternate water source for a few days as a precaution. The spill was contained before it reached the Reservoir which supplies water to the **Town of Blackstone**. Local wildlife, however, did not fare as well. Some snakes, turtles, fish, and other animals that depend on the river died from exposure to the tar. The spill is believed to be an intentional act, as the cap to the tanker's piping was found in a nearby wooded area, but no arrests have been made as of March 1, 2022.

Significant event – January 2011: A propane tanker, owned by Synergy Gas, overturned on Friendship Church Road near Fort Mitchell Road in the eastern part of Charlotte County. According to published media reports, the tanker was travelling toward U.S. 360 (just east of Drakes Branch) when it hit an icy patch in the road and slid into a ditch before overturning. The driver escaped without injury. A small amount of propane leaked from the tanker, but the leak was contained by firefighters who responded to the scene and the propane was transferred to another tanker.

Accidents at Fertilizer/Chemical Facilities

Fertilizer and chemical plants and storage facilities are prone to accidents that can have a significant impact on the facility as well as the surrounding community. Accidents at these facilities can be caused by inadequate process hazards analysis, use of inappropriate or poorly-designed equipment, inadequate indications of process condition, and other factors. For significant accidents tracked by the U.S. Environmental Protection Agency and Occupational Safety and Health Administration, issues of note include installation of emissions or pollution control equipment (occurred prior to a number of accidents, which highlight the need for stronger systems for management of change) and similar accidents, near-misses, or low-level failures occurring just before a major accident (indicating the need for more attention to lessons-learned implementation and more thorough company investigation of near-misses and low-level failures). There are no known reports of such incidents in the region.

Biological (Bio-) Hazards

Bio-hazards can pose a threat to people, animals, and the environment when biological agents are accidentally or intentionally released into the air or water. Samples of bio-hazards include medical waste, samples of a microorganism, virus or toxin (from a biological source). There are no known reports of such incidents in the region.

Accidents at Power Plants

Nuclear reactors cannot explode like a nuclear bomb, since they use different materials and structures, and nuclear power plants are designed to prevent the release of radioactive materials and include multiple protective barriers placed around reactors. However, accidents do sometimes occur at nuclear power plants that result in the release of radioactive materials into the atmosphere or nearby water sources. There are no nuclear power plants located in Planning District 14. However, there are two such facilities in the State of Virginia that are close enough to the region that an incident could affect the area. They are the North Anna Power Station, located in Louisa County; and the Surry Power Station, located in Surry County. While the Surry County Station is located in the southeastern part of the State (near Williamsburg), the North Anna Power Station is located less than 50 miles from **Amelia County** and **Buckingham County**.

While there are no known incidents involving either facility, there have been instances where a reactor at the facility had to be shut down. In May 2010, Unit 2 at the North Anna plant was shut down after a cooling water pump failed. This followed a problem with the reactor a couple of months before, when what was supposed to be a routine refueling outage took longer than expected (it took seven weeks to get the reactor back to full speed; normally, refueling outages last about four weeks). Back in October 2009, Unit 1 at the plant had to be shut down after leaks were detected in a water pipe at the reactor. In June 2010, Unit 1 at the Surry power plant had to be shut down after a power supply inverter failed, triggering a series of subsequent valve failures which resulted in an automatic reactor trip. It should be noted that neither of these incidents posed any danger to plant workers or the public.

Other types of power plants (coal fired, gas fired) and electric substations can sometimes experience accidents or malfunctions that can cause injury or death to plant workers and disrupt the flow of electricity for homes and businesses in the area. There are numerous power plants and substations across Planning District 14. There are no known reports of incidents in the region involving “conventional” power plants.

Pipeline Explosions/Accidents at Above-ground Storage Facilities

A number of pipelines, carrying gas and petroleum products, run through Planning District 14. Colonial Pipeline Company, Plantation Pipeline Company, and Williams Transco Pipeline own pipelines that run through the region. An additional pipeline, the Atlantic Coast Pipeline, was planned to run through the Planning District, and survey work was being performed and permits were being sought, until the project was cancelled in July 2020.

While pipelines are considered the safest way to move gas, petroleum, and other hazardous materials, they can sometimes malfunction and even explode. If corrosion

controls fail to properly function, and/or corrosion is not repaired in a timely manner, then the pipeline could explode. An explosion can cause serious injury, even death, and significant damage to property. Storage tanks for gas, oil, and other chemicals can sometimes experience "catastrophic failure" and explode. This can occur when flammable vapors are ignited, causing a break in either the shell-to-bottom or side seam of the tank. Sometimes, workers performing maintenance or other operations can introduce an ignition source.

There are no records of pipeline explosions within Planning District 14; however, there was a recent incident in a nearby locality. On September 14, 2008, a section of gas pipeline owned by Williams Gas Company and located in eastern Appomattox County – less than 20 miles from the **Buckingham County** Line and Appomattox-Buckingham State Forest – ruptured (it was one of three pipelines running side-by-side in the area). The force of the rupture sent rocks and dirt flying through the air, and knocked a 30-foot section of pipe – 30 inches in diameter – out of the ground and across Virginia Primary Route 26. The force of the gas pouring out of the ruptured pipeline also knocked loose a nearby power line, causing it to fall to the ground. The ensuing spark ignited the gas, causing an explosion that destroyed two homes and damaged several others, injured five people, blew a crater in the ground near the accident site, and resulted in a number of area residents being displaced for several days.

Storage tanks for gas, oil, and other chemicals can sometimes experience "catastrophic failure" and explode. This can occur when flammable vapors are ignited, causing a break in either the shell-to-bottom or side seam of the tank. Sometimes, workers performing maintenance or other operations can introduce an ignition source. This type of accident can cause injury or death to workers, and release harmful chemicals into the atmosphere. Such accidents can happen anywhere, but are more of a concern in cases where the tanks were built before 1950 or tanks are poorly maintained, rarely inspected, or repaired without attention to the tank's design. The only storage tank facilities in the region are located at the Mitchell Junction Tank Farm and Pumping Station in northern Cumberland County near the **Buckingham County** line (owned by Colonial Pipeline).

Future Occurrence

Even if data about the condition of pipelines, power plants, and storage tanks were collected at the local level, there is not a simple way to calculate the rate of future occurrences of technological hazards. They are often a consequence of multi-system failures, or circumstances that cannot be captured in numbers. Historical incidents are more or less random, and future incidents will be a factor of the level of investment in the infrastructure these facilities depend on. Failures ranging from nuisance to potentially catastrophic should be expected and planned for wherever these facilities are present.

Invasive Species

Introduction

Although unlikely to lead to a loss of life or injury or to create a situation necessitating emergency response, invasive species have the potential to cause agricultural damage and damage to personal property in Virginia. The available data on historic occurrences of invasive species in the region is largely a matter of historical record, and individual species were introduced both purposefully and accidentally. Short of an attack by an aggressive insect species, there is typically no situation involving invasive species that requires emergency response. However, the threat to agricultural lands and livestock feed is significant, and long-term planning measures should be taken to prevent the spread of harmful invasives.

Future Occurrence

There is a growing awareness of the need to prevent the spread of invasive species, and the Virginia Department of Conservation and Recreation tracks species of concern to monitor growing concerns. There is little data on the rate of new invasive species introduction, partly because some species appear benign or do not occupy native plant ecosystem niches until they are established, sometimes decades later. That been said, it should be noted that none of the invasive species identified in the Commonwealth of Virginia Hazard Mitigation Plan have been found within Planning District 14.

Climate change may influence the migration of plant and animal species northward as higher latitudes become warmer. Global trade, the horticultural industry, and oblivious or malicious species introductions are still a threat to be aware of, and news and information on species of concern should be shared for awareness and preparedness.

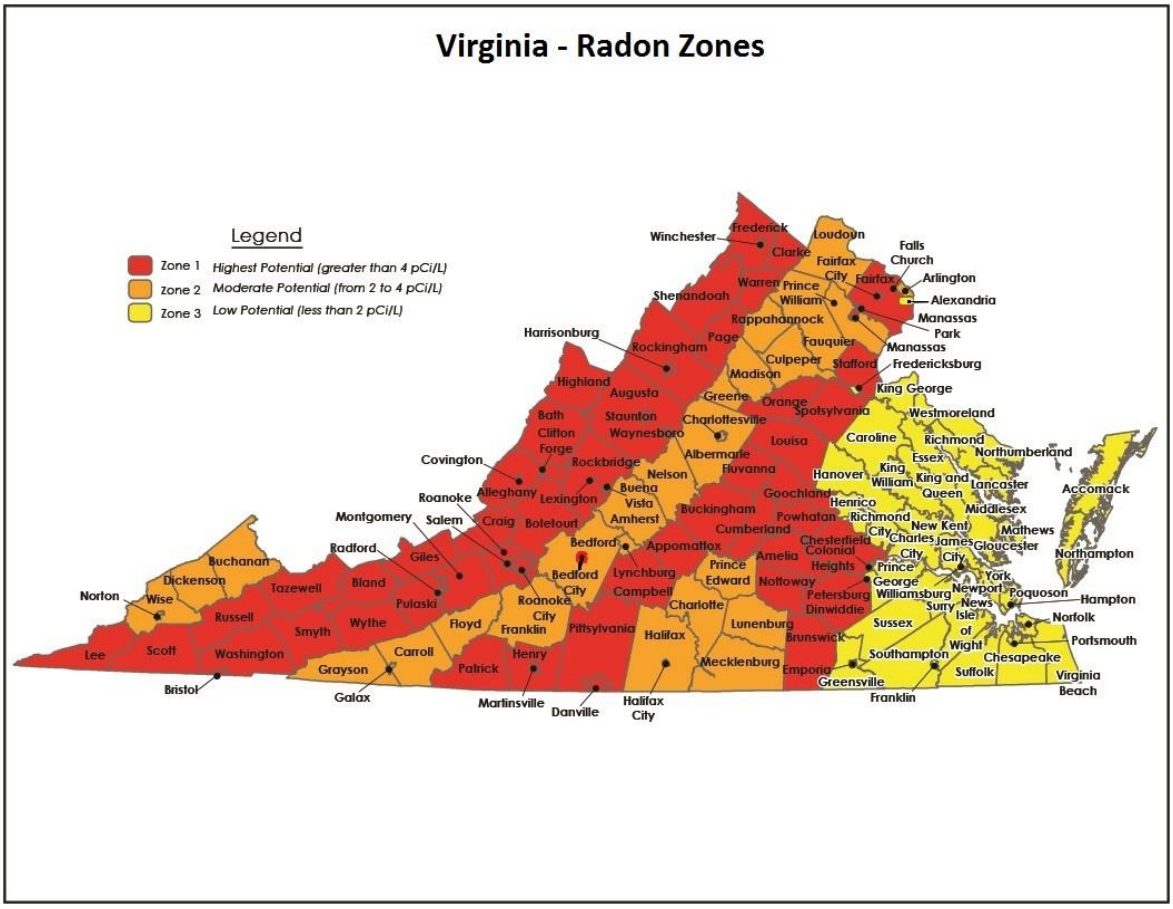
Radon

Introduction

Radon is a significant health hazard, as it is second only to smoking as the leading cause of lung cancer. The U.S. Environmental Protection Agency (EPA) estimates as many as 21,000 lung cancer deaths may be associated with radon exposure, with as many as 700 of these cases occurring in Virginia.

Location and Extent

Map 5.8 Radon Zones in Virginia



Source: Virginia Department of Health, EPA (1994)

According map above, counties in Planning District 14 are located within the following zones:

- **Zone 1** (Highest Potential – greater than 4.0 pCi/L):
  - Buckingham, Cumberland, Amelia, Nottoway
- **Zone 2** (Moderate Potential – between 2.0 and 4.0 pCi/l):
  - Prince Edward, Lunenburg, Charlotte

Future Occurrence

Radon exposure is inevitable given the present soil, geologic, and geomorphic factors across Virginia. Residents who live in developments within areas where radon levels previously have been found to be significantly high will continue to be more susceptible to exposure. And new incidents of exposure may occur with future development and/or deterioration of older buildings.

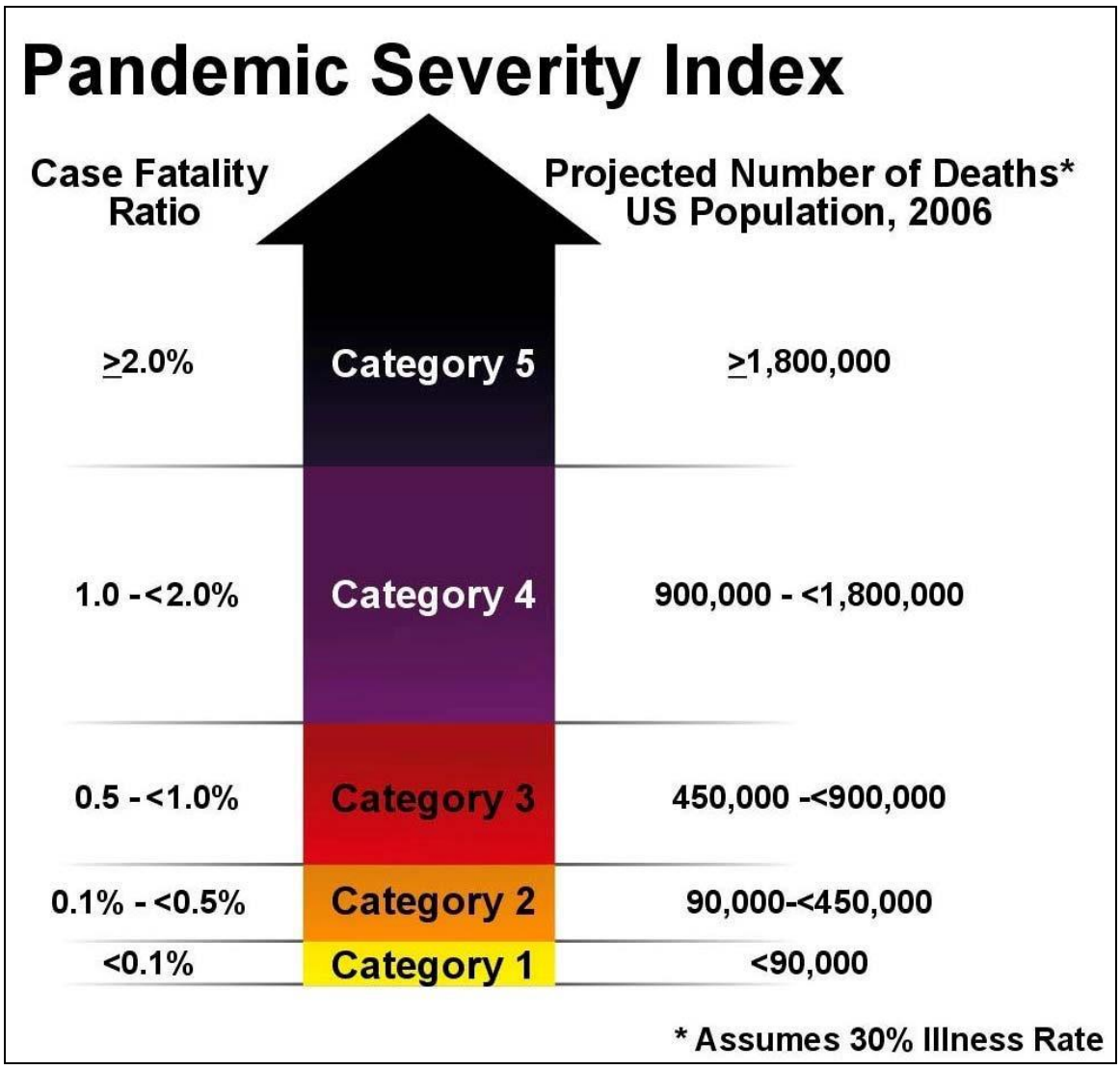
Although radon may not currently be a significant risk to the region, future occurrences of exposure can be limited by **conducting proper testing** within existing *and* future developments, as well as **implementing appropriate mitigation measures**:

- *Testing:* All homes with or without basements should be tested for radon. Affordable DIY radon test kits are available online and at home improvement/hardware stores, or even hiring a professional, qualified radon tester.
- *Fixing:* The EPA recommends taking corrective action to fix radon levels at or above 4.0 pCi/L and contacting a qualified radon-reduction contractor.

Pandemic

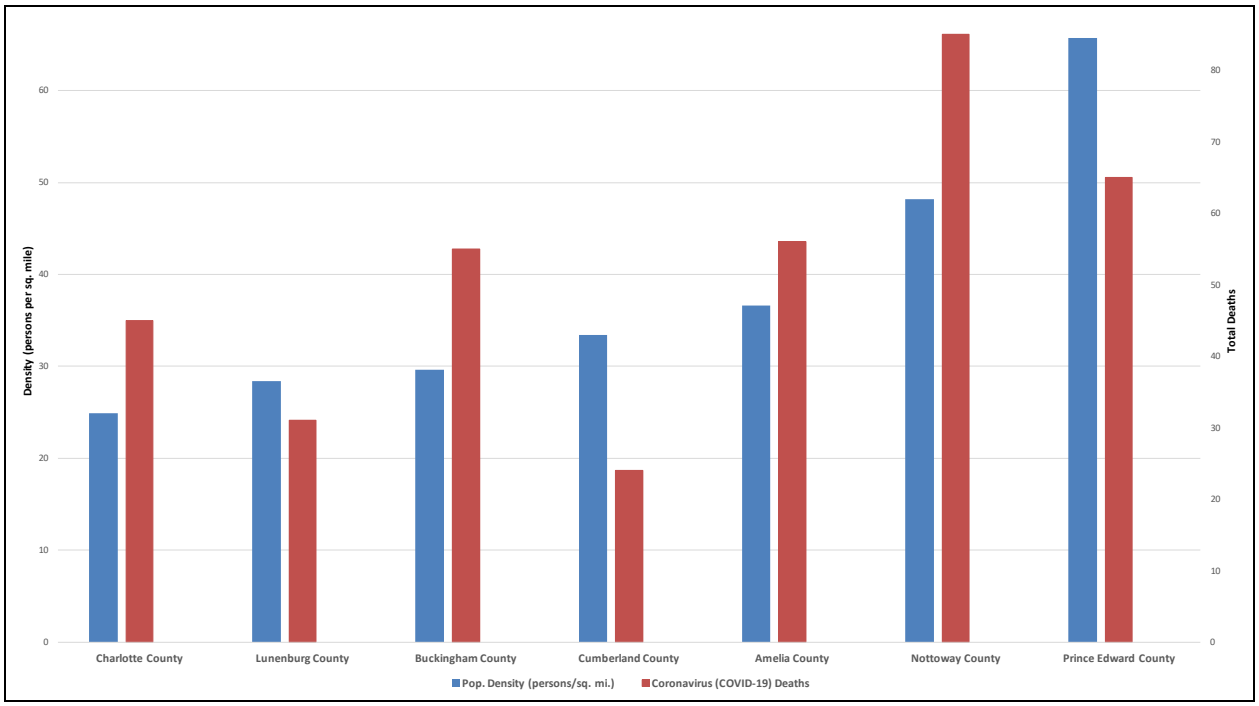
Introduction

Pandemics can have broad-reaching implications on both human health and the economy. The epidemiological trajectory of a pandemic is complicated and based upon a myriad of factors, but the main predictors for any given outbreak's effect on a region are the infectious agent's Case Fatality Ratio (CFR), or what percentage of confirmed cases result in death, and the population density of the area involved. The figure below describes death estimates for the U.S. based on a disease's CFR.

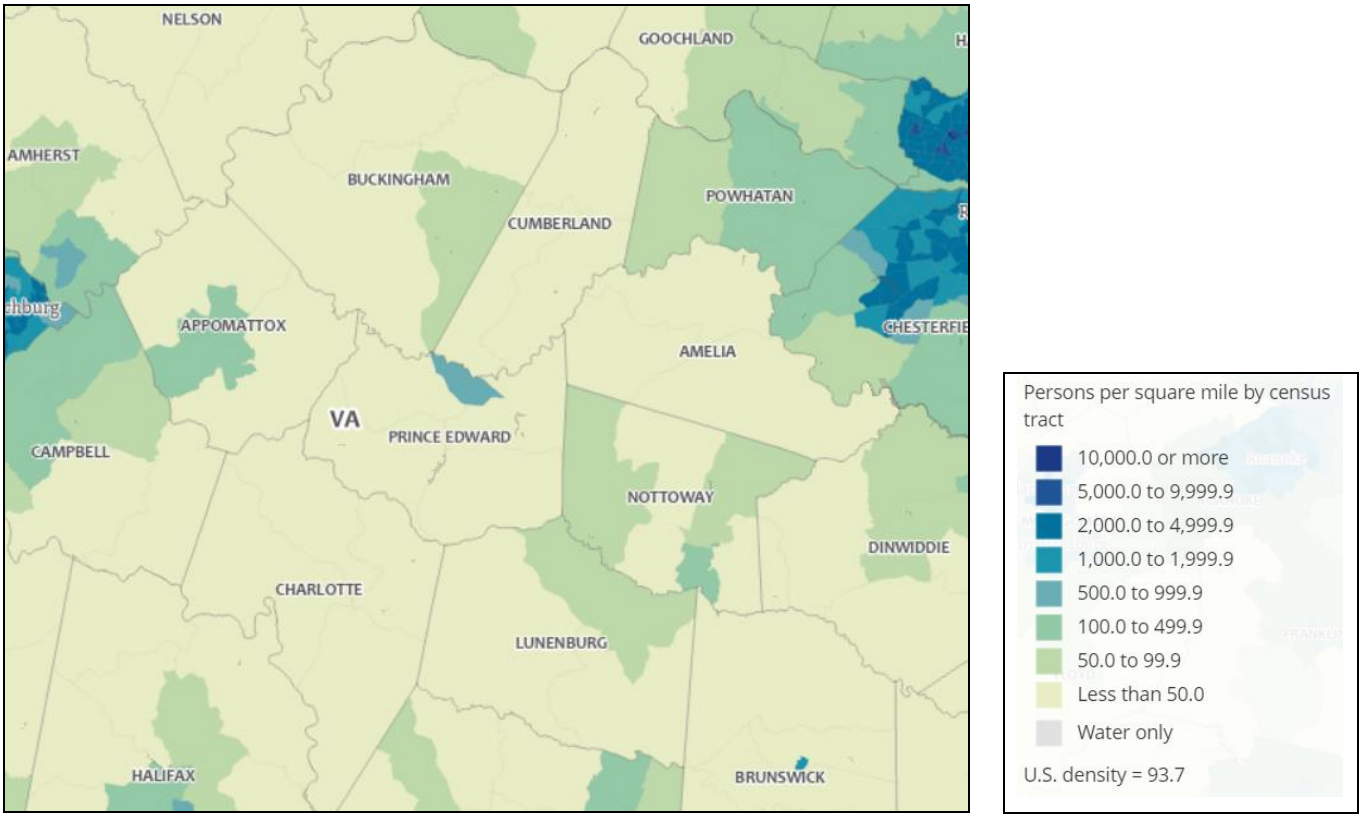


Likewise, the figure on the next page shows how total deaths roughly correlate with overall population density. **Map 5.9** below it shows the correlation more accurately, based on the number of densely populated Census tracts in a given county, which helps to explain the disparate impact on the counties of Buckingham and Nottoway.

Coronavirus Deaths and Population Density (2020)



Map 5.9 Population Density in PD-14 by Census Tract (2020)



Source: U.S. Census Bureau

Significant Events

Historic pandemic outbreaks within the last 100 years which affected the United States include the 1918 Spanish flu, diphtheria from 1921-1925, the polio virus from 1916-1955, the 1957 H2N2 flu, endemic measles outbreaks from 1981-1991, swine flu in 2009, 2010 and 2014 measles outbreaks, and the 2020 novel SARS-Cov-2 worldwide coronavirus pandemic ("COVID-19"). During the 2020 novel SARS-Cov-2 coronavirus pandemic, Governor Ralph Northam declared a Virginia Disaster Declaration from January 20, 2020 to May 11, 2023.

Responses from counties in the PD-14 region often required the use of EMS and fire personnel, and ad hoc teams consisting of county leadership and emergency coordinators were formed. Emergency services departments also participated in vaccination events during the early stages of vaccine rollout. However, due to the nature of the pandemic, business closures, and stay at home recommendations, the majority of the response consisted of navigating state health orders and daily interactions with the public. Disinfection procedures and protective protocols were developed to help mitigate the effect on emergency services.

Future Occurrence

It is difficult if not impossible to predict when another pandemic situation may arise, as breakouts are shaped by events at both the microscopic and global scale, but it is almost certain that another disease will affect large portions of the population again at some point. Nearly every decade a disease of global concern spreads through the world, and governments at all levels should be prepared to respond using lessons from previous events.