NRV Hazard Mitigation Plan 2016 Update Working Group: Geologic Hazards

December 1, 2016, 10:30 am - 12:00 pm

New River Room, New River Valley Business Center
Fairlawn, VA

Agenda

1. Welcome ..... Christy Straight
   New River Valley Regional Commission
2. Data Review ..... Zach Swick
   New River Valley Regional Commission
3. Regional Mitigation Strategy Review ..... Christy Straight
   New River Valley Regional Commission
4. Wrap Up
   a. Question and answer
   b. Next meeting- January 5, 2016 – Human-caused, Wildfires, Drought

HAZARD MITIGATION Working Group – Geologic
Meeting Notes
December 1, 2016

Attending: <see list>

Notes

1. Welcome, Introductions and Recap
    a. Reviewed schedule of future working groups – please send contact information to Christy Straight for any stakeholders and subject matter experts that should be invited to participate – the next meeting will cover human-caused, drought and wildfire
    b. Today's specific hazards are landslides and rockslides, karst, and earthquakes
2. Reviewed data for geologic hazards
    a. Updated Data - updated with more recent information
        i. Geologic Units
        ii. Karst Areas
    b. New Data - included information that wasn't in the previous plan or developed a different way to display previous data
        i. Geologic Fault Lines
        ii. Recent Earthquakes
        iii. Rockfall Hazard per Mile
    c. Old Data - the same from the 2011 plan because there is no more recent data, the dataset is unique and can't be replicated, or the modeling just hasn't yet been performed
        i. Potential Earthquake Damage – The values are from the 2011 plan and adjusted for inflation
        ii. Sinkholes
        iii. Landslide Hazard
        iv. Rockfall Hazard
    d. In discussion during review of the data, participants commented on finding data about rockfall cleanups. One inquired if VDOT's data on rockfall cleanups was available to localities; this would apply to state-maintained roads because localities have their own crews to clean up the roads they maintain. Another noted local 911 centers would have road block reports to track events.
2. Goals and Strategies
    a. Reviewed 2011 goals, objectives and strategies
    b. Group discussion for any changes and additions to the list – changes to the 2011 list are included in this file after the presentation
3. Next Meeting: January 5 at 10:30 AM, New River Room at the NRVBC, Fairlawn; topics – human-caused, drought and wildfire

Adjourned

NRV Hazard Mitigation Plan - 2016 Plan Update

December 1, 2016 - 10:30 am

	Name	Organization/Representing	Email (if new)
1	Will Drake	Town of Christiansburg	
2	Sara Morgan	Town of Christiansburg	
3	Kali Casper	Town of Blacksburg	
4	Kati Howard	Town of Blacksburg	
5	Melissa Skelton	City of Radford	
6	Jenn Whiteis	City of Radford	
7	David Linkous	Virginia Dept of Health	
8	Sara Harrington	Va. Dept of Emergency Management	
9	Willie Richardson	VDEM	
10	Robbie Kiser	Town of Pulaski	
11	Mike Wilson	Appalachian Power Co.	
12	John Ross	Giles County	
13	Christy Stumpf	NRVRC	
14	Zachary Swick	NRVRC	
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			
31			
32			
33			
34			
35			

Regional Hazard Mitigation Plan Update

Working Group – Geologic Hazards

December 1, 2016

Definition

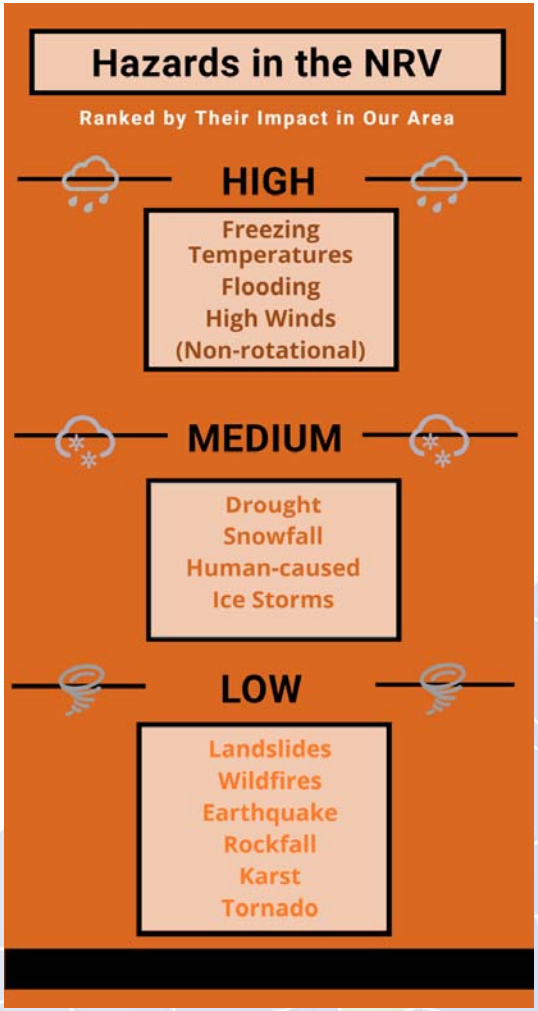
- Hazard Mitigation

…is a sustainable action that will reduce or eliminate injury to citizens, damages to structures and allow continuity of critical society functions…

This is different from response and recovery.

Project overview

- Update every 5 years
- Must be FEMA-approved
  - Maintains participants' eligibility for mitigation funds
- Covers natural hazards with potential impact in NRV
  - Floods, drought, wildfire, geologic hazards, severe weather, etc.
  - And considers human-caused hazards
- Project website - http://nrvrc.org/hazardmitigation/



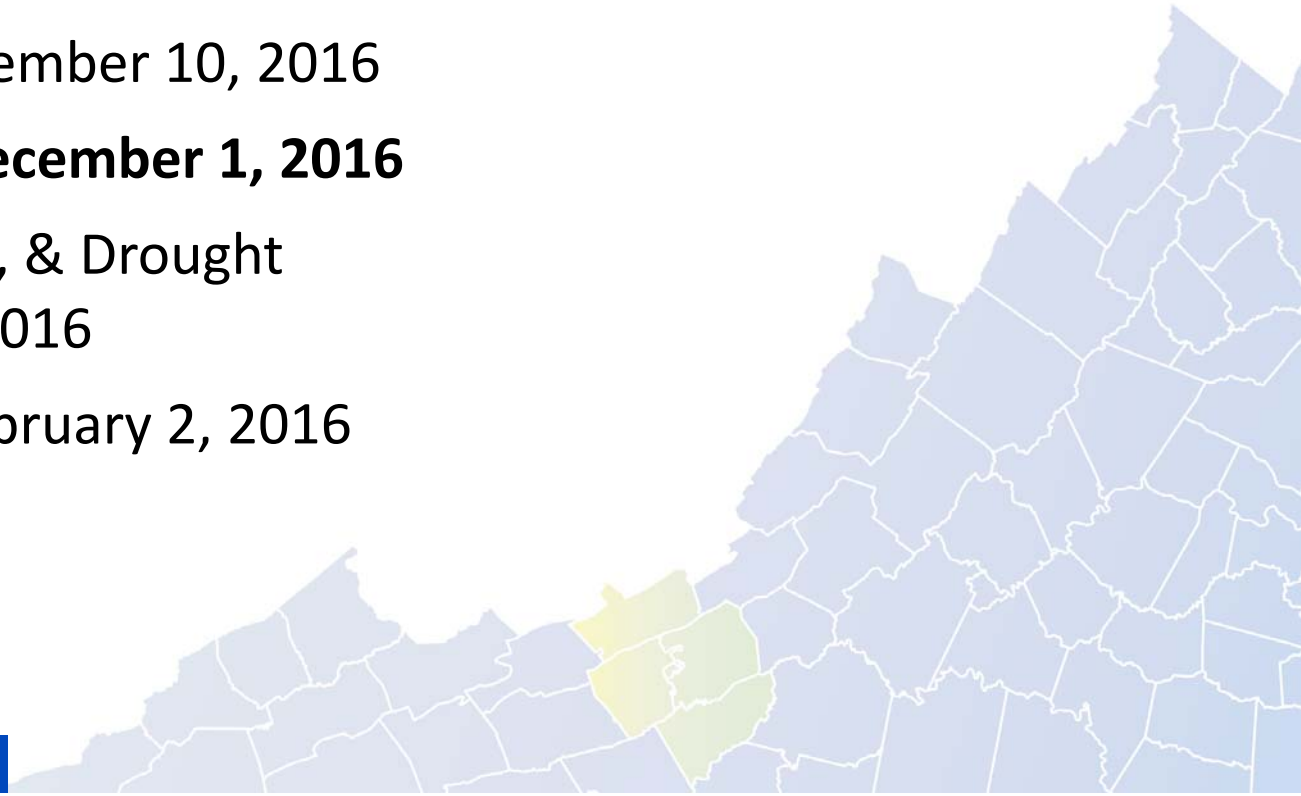
NRVRC
new river valley regional commission

Working groups

- Steering committee and staff will
  - Invite stakeholders with technical expertise
  - Invite community representatives to participate
- Participants will
  - Provide input on hazard issues and impacts
  - Develop mitigation goals and regional strategies
  - Further identification and input on
    - Mitigation options
    - Resources

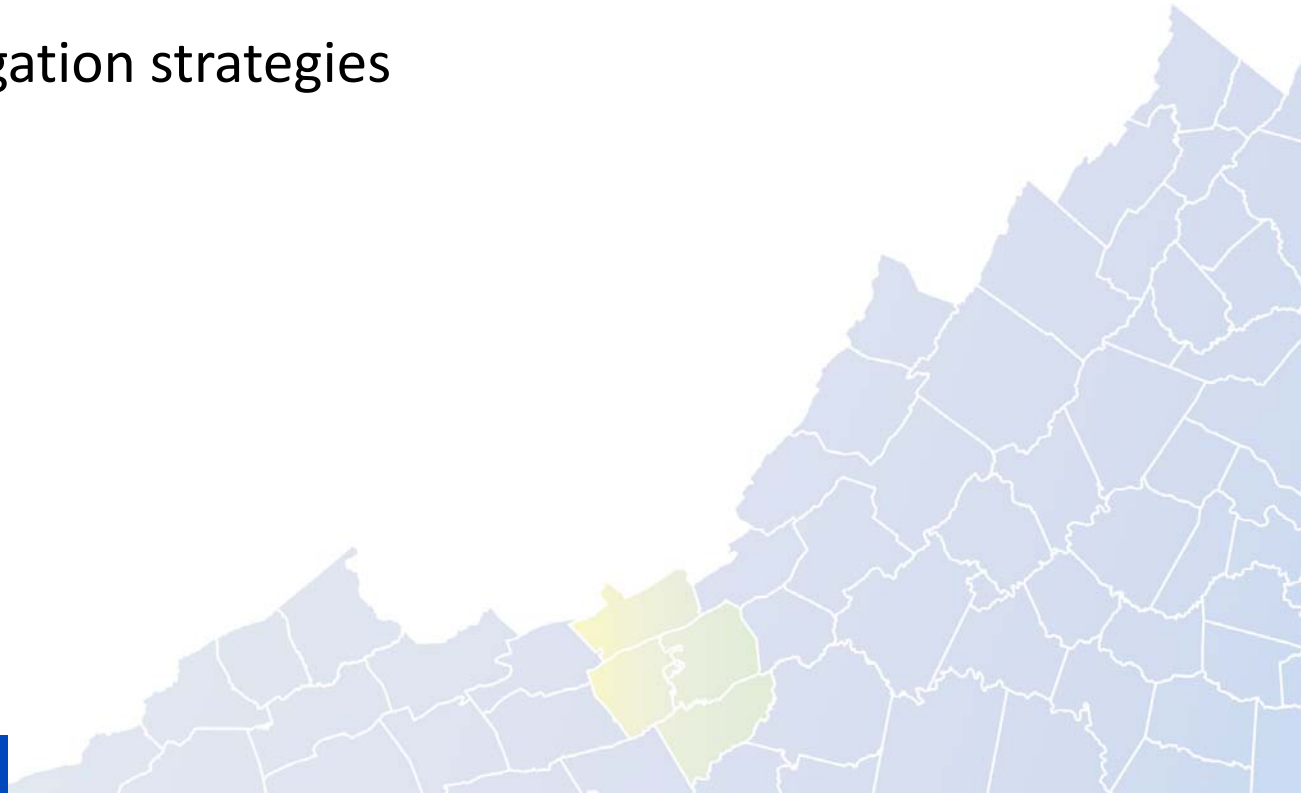
Working groups

- High Wind and Tornado Hazards | October 6, 2016
- Winter Hazards | November 10, 2016
- **Geologic Hazards | December 1, 2016**
- Human-caused, Wildfire, & Drought Hazards | January 5, 2016
- Flooding Hazards | February 2, 2016



Today we will

- Review latest available data
- Review and update mitigation strategies



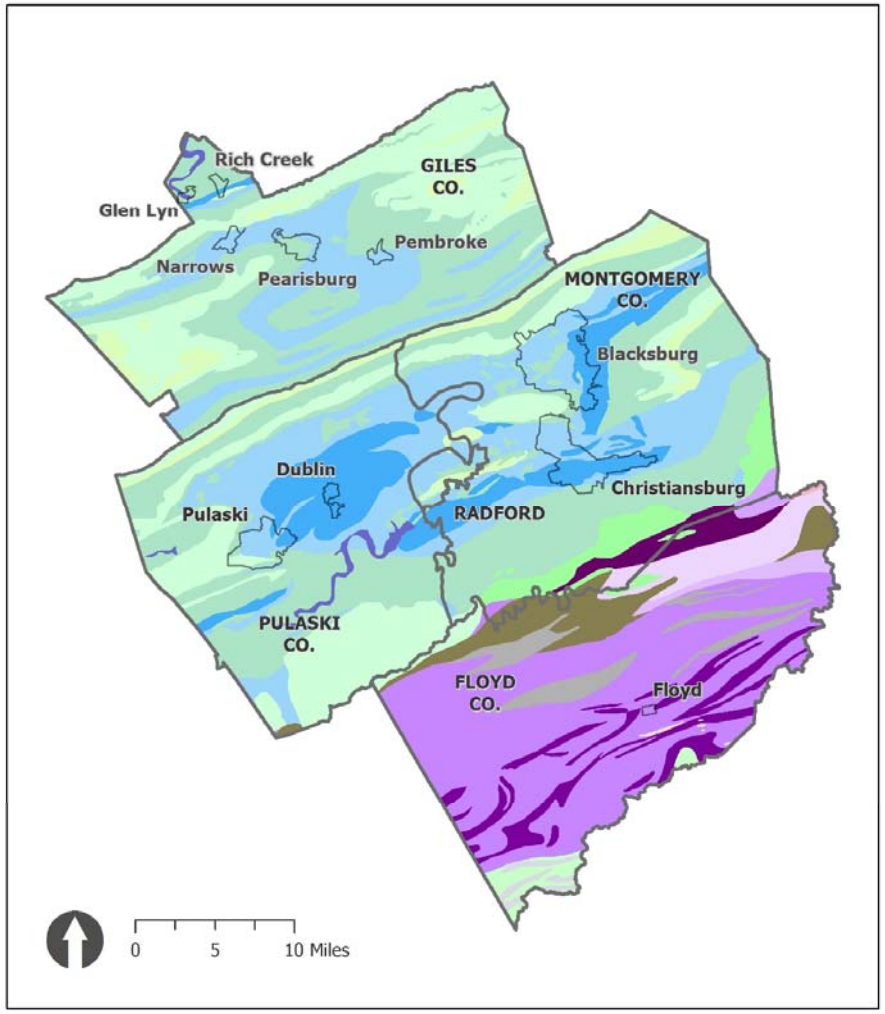
Geologic Hazards

- Landslides
- Rockfall
- Karst
- Earthquakes

Magnitude	Typical Maximum Modified Mercalli Intensity	Shaking
1.0 - 3.0	**I**	Not felt
3.0 - 3.9	**II - III**	Weak
4.0 - 4.9	**IV - V**	Light
5.0 - 5.9	**VI - VII**	Moderate
6.0 - 6.9	**VII - IX**	Strong
7.0 and higher	**VIII** or higher	Very Strong, Severe, etc.

Data

- Updated Data
  - Geologic Units
  - Karst Areas
- Old Data
  - Potential Earthquake Damage
  - Sinkholes
  - Landslide Hazard
  - Rockfall Hazard
- New Data
  - Geologic Fault Lines
  - Recent Earthquakes
  - Rockfall Hazard per Mile



Geologic Units

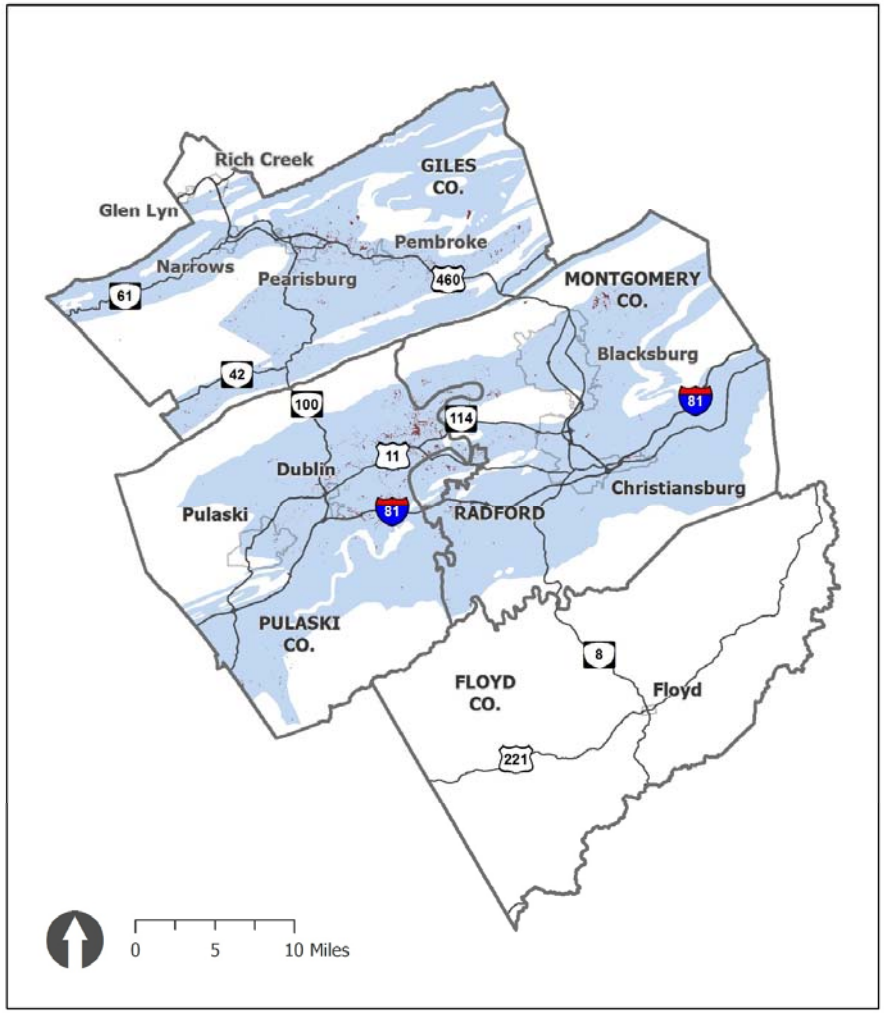
New River Valley

NRVRC
new river valley regional commission

Rock Type

- Amphibolite
- Augen Gneiss
- Biotite Gneiss
- Black Shale
- Dolostone (Dolomite)
- Felsic Gneiss
- Gneiss
- Granite
- Granitic Gneiss
- Granulite
- Limestone
- Meta-Argillite
- Mica Schist
- Quartzite
- Sandstone
- Schist
- Shale
- Ultramafic Rock
- Water

Created by NRVRC, 2016. Sources: U.S. Census Bureau; U.S. Geological Survey; Virginia Geographic Information Network.



Karst Geology and Sinkholes

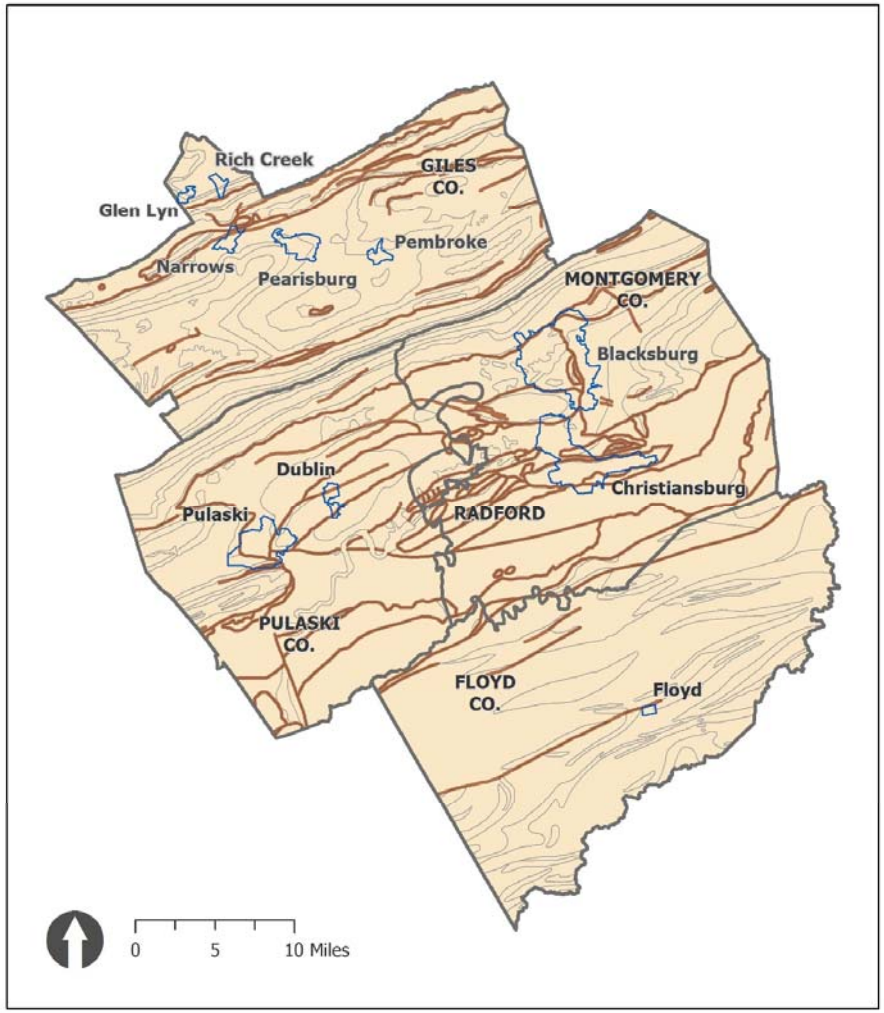
New River Valley

Karst Forming Bedrock

- Carbonate Karst
- Sinkholes

Created by NRVRC, 2016. Sources: U.S. Census Bureau; U.S. Geological Survey; Virginia Geographic Information Network.

NRVRC
new river valley regional commission



Geologic Faults

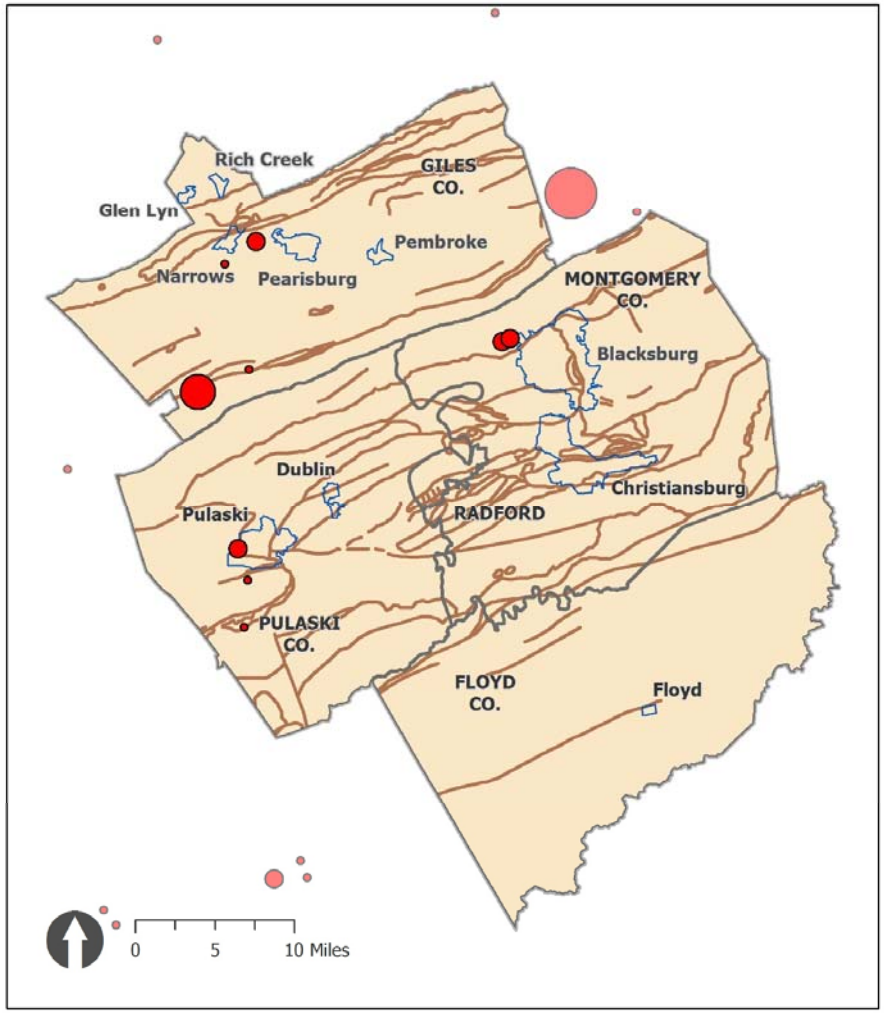
New River Valley

NRVRC
new river valley regional commission

Faults

Geologic Units

Created by NRVRC, 2016. Sources: U.S. Census Bureau; U.S. Geological Survey; Virginia Geographic Information Network.



Earthquakes (1970-2015)

New River Valley

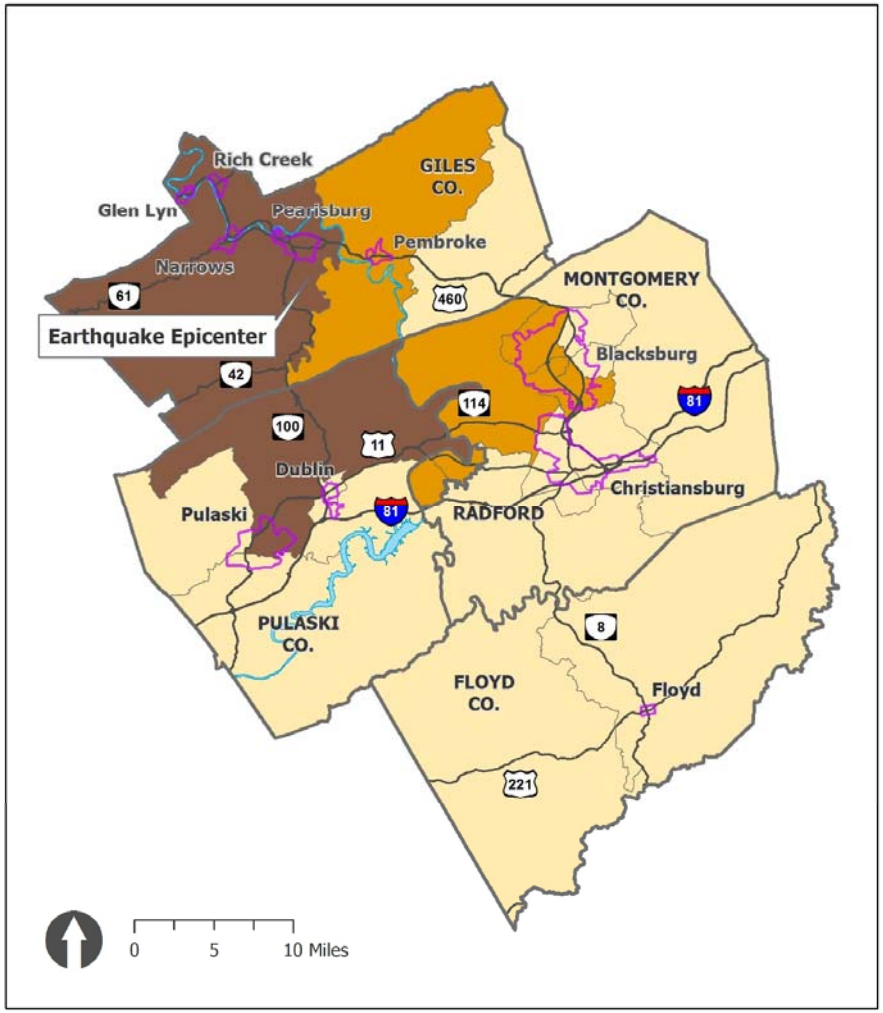
Magnitude

- 2.0 - 2.5
- 2.6 - 3.0
- 3.1 - 3.5
- 3.6 - 3.8
- Faults

Excludes earthquakes with magnitude of less than 2.

Created by NRVRC, 2016. Sources: U.S. Census Bureau; U.S. Geological Survey; Virginia Geographic Information Network.

NRVRC
new river valley regional commission



1897 Earthquake Loss Estimates

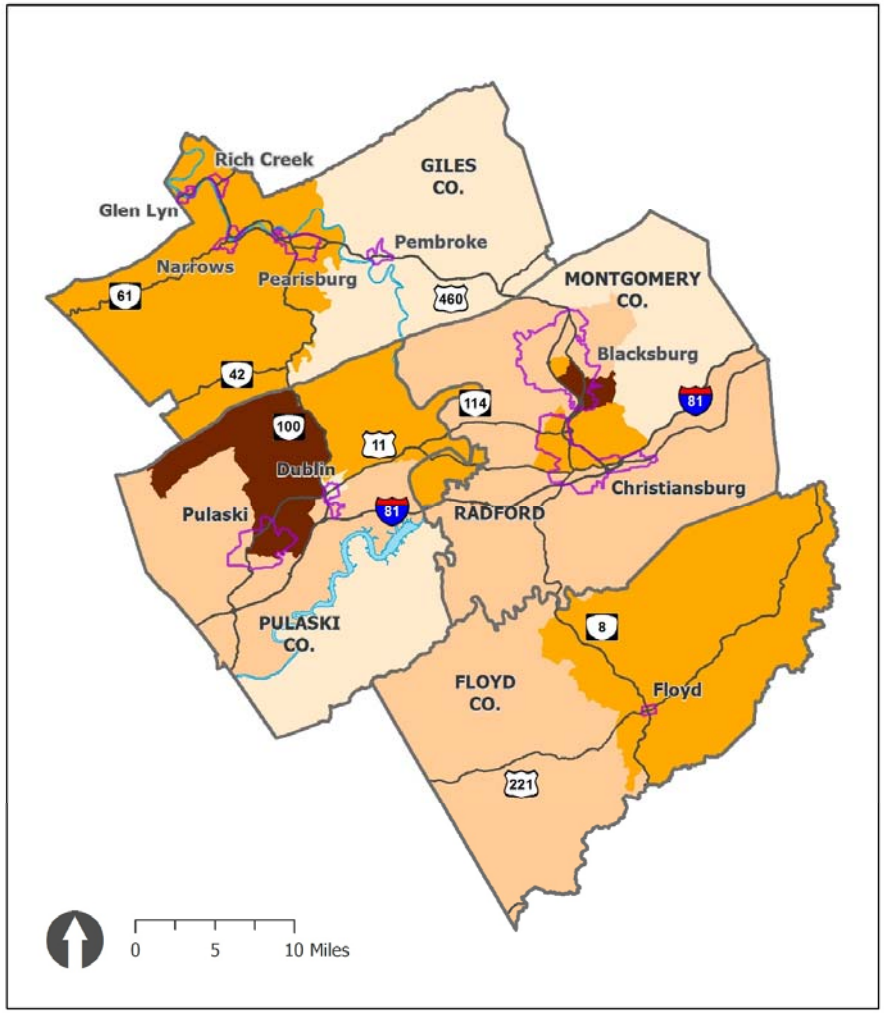
New River Valley

Total Losses in 2016 Dollars

- Less than $20,000,000
- $20,000,000 - $40,000,000
- More than $40,000,000

Created by NRVRC, 2016. Sources: Radford University; U.S. Census Bureau; U.S. Department of Labor; Virginia Geographic Information Network.

NRVRC
new river valley regional commission



Magnitude 5.0 Earthquake Estimated Annualized Loss

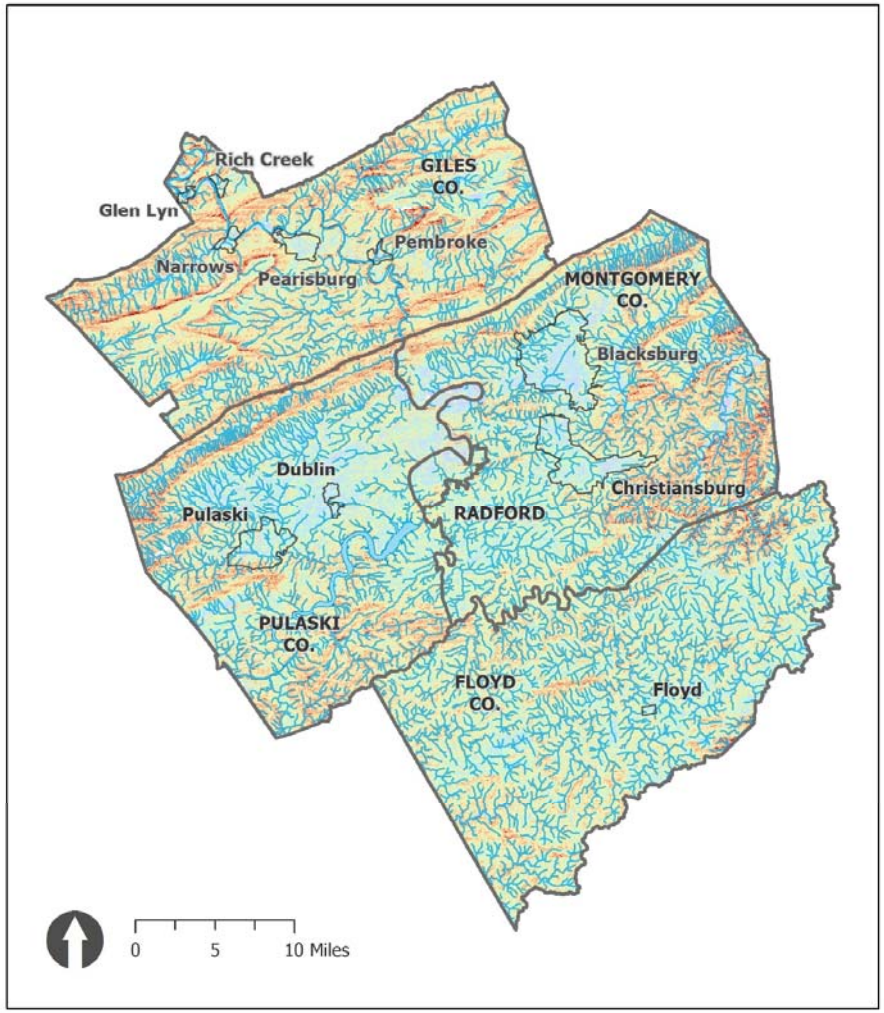
New River Valley

Annualized Loss in 2016 Dollars

- Less than $25,000
- $25,000 - $50,000
- $50,000 - $75,000
- $75,000 - $100,000
- More than $100,000

Created by NRVRC, 2016. Sources: Federal Emergency Management Agency; Radford University; U.S. Census Bureau; U.S. Department of Labor; Virginia Geographic Information Network.

NRVRC
new river valley regional commission



Landslide Hazard Rating

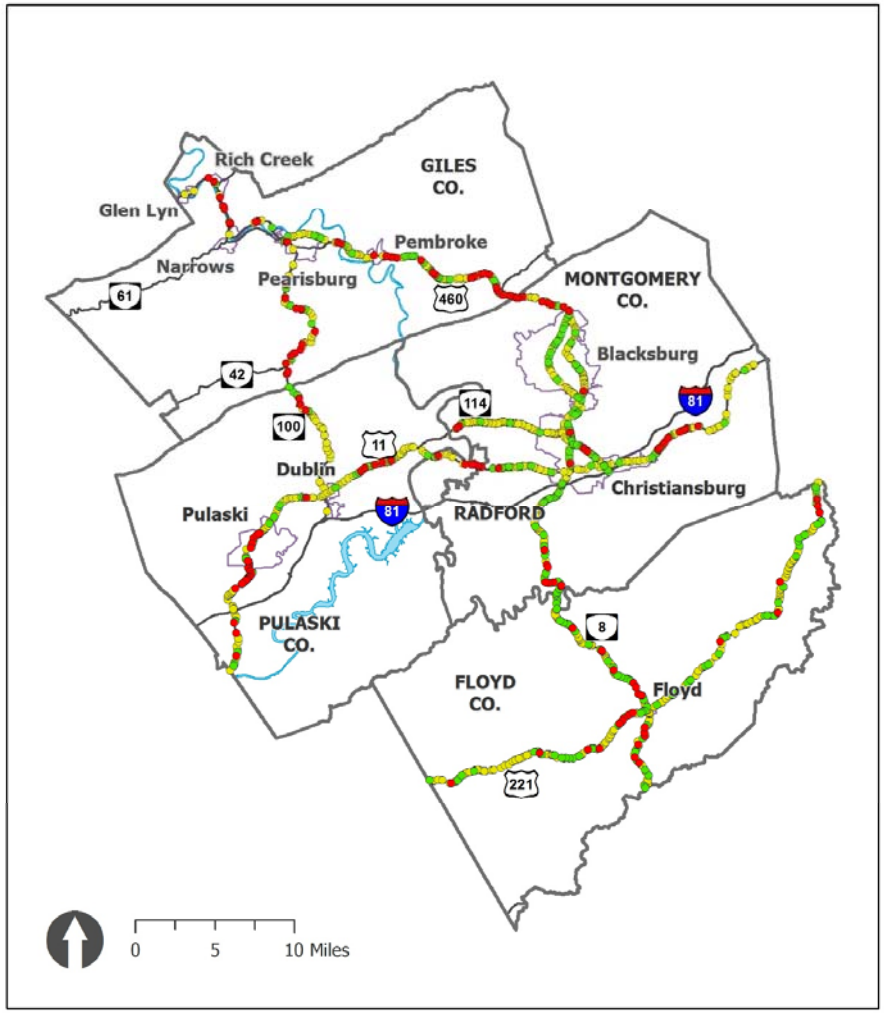
New River Valley

Storm Generated Stability Rating

- 0.19 - 1 (Greatest Risk)
- 1.01 - 2
- 2.01 - 5
- 5.01 - 10
- 10.01 - 50
- 50.01 - 100
- 100.01 - 500
- +500 (Least Risk)
- Hydrology

Created by NRVRC, 2016. Sources: Radford University FEMA Research Project Group; U.S. Census Bureau; U.S. Geological Survey; Virginia Geographic Information Network.

NRVRC
new river valley regional commission



Rockfall Hazard Rating

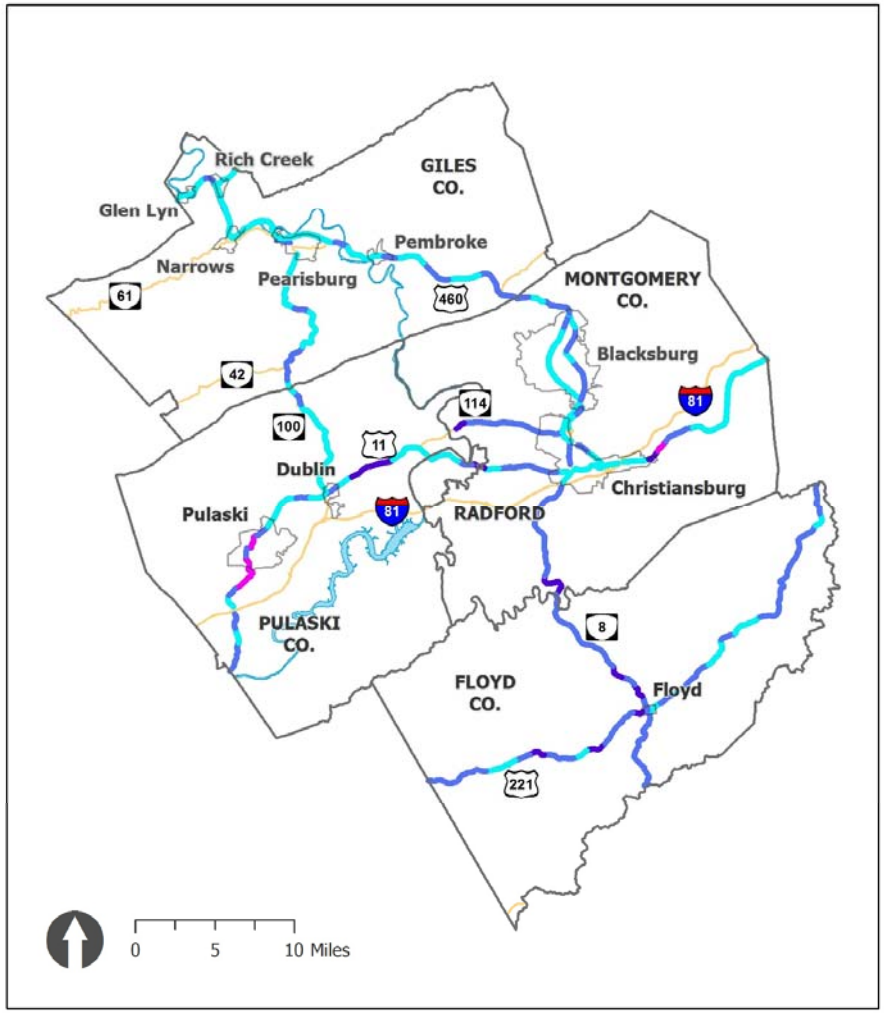
New River Valley

NRVRC
new river valley regional commission

Rockfall Hazard

- Greatest Risk
- Moderate Risk
- Least Risk

Created by NRVRC, 2016. Sources: Radford University; U.S. Census Bureau; Virginia Geographic Information Network.



Rockfall Hazard Rating

New River Valley

Rockfall Hazard Rating per Mile

- Low Risk
- Low-Moderate Risk
- Moderate-High Risk
- High Risk
- Data Not Available

Derived from 2011 Radford University data. Rockfall points joined to road segments within 50 feet. Equal interval distribution.

Created by NRVRC, 2016. Sources: Radford University; U.S. Census Bureau; Virginia Geographic Information Network.

NRVRC
new river valley regional commission

Goals & Strategies

- **Mission:** Minimize the loss of life and property to natural hazards by focusing on likely events, high-risks areas, and cost-effective mitigation opportunities.
- Regional and local strategies in support of goals
- Strategies can include
  - Education
  - Regional Cooperation
  - Capital improvement projects
  - Development and planning guidelines

Wrap up

- Questions?
- Next steps
- Next meeting – January 5, 10:30 am

- Contact information for NRVRC

  Christy Straight (cstraight@nrvrc.org)

  Michael Gottfredson (michaelg@nrvrc.org)

  Zach Swick (zswick@nrvrc.org)

  540.639.9313

Thank you for coming!

Landslides: 2011 Goals, Objectives, Strategies

Minimize structural damage due to landslides.

a. *Develop strategies to protect existing structures from the impacts of landslides and debris flows.*

   i. Identify areas where potential debris flow could be diverted to avoid existing structures.

   ii. Re-vegetate areas in danger of becoming slides.

   iii. Collect data on landslides at locality level.

   ~~ii.~~iv. Prevent landslide damage at sites with known risks [by implementing projects such as completing feasibility studies and determining a suite of solutions].

b. *Develop educational materials and notification systems to better inform residents of landslide hazards.*

   i. Create a database or reporting system for landslides.

   ii. Notify permit applicants of site vulnerability to landslide and debris flow.

   iii. Develop appropriate signage that warns of the danger of landslide and rockfall, especially during heavy rain periods.

   iv. Install warning devices on extremely vulnerable sites that have remote notification for emergency and response personnel.

c. *Encourage planning practices that mitigate the impacts of landslides and rockfall on new and existing developments.*

   i. Ensure that the most accurate data is available and incorporated while making planning decisions (i.e., zoning, subdivisions).

   ii. Restrict future development in landslide prone areas.

   iii. Continue to improve data available for future planning and mitigation.

   iv. Incorporate additional language into ordinances to mitigate impacts from landslides.

   v. Continue to monitor A-rated rockfall cuts for future slope movement.

   vi. Encourage projects that expand catchment areas (i.e., ditches and shoulders) in potential rockfall areas of roads.

   vii. Encourage slope protection, reinforcement and reconstruction projects to prevent future rockfall events.

viii. Engage in pre-demolition activities that control rockfall events.

d. Engage in activities to plan for and avoid future landslide and rockfall impacts.

i. Gather existing route information for detours that may be necessary in the event of a rockfall event.

Earthquakes, Karst: 2011 Goals, Objectives, Strategies

Minimize risks to developments and structures in areas prone to earthquakes and new sinkholes.

a. Encourage activities to protect structures from future events.

i. Continue to ensure ~~Ensure~~ that seismic requirements are included in building codes.

ii. Identify and reinforce ~~Reinforce~~ existing structures and critical facilities to withstand seismic events.

~~ii.~~iii. Within site plan development, address topography and karst risk.

b. Develop educational programs to increase residents' awareness of likelihood of geologic events.

i. Develop and coordinate training/education activities for all interested and responsible parties (including government staff, non-profits, and other organizations involved in hazard response activities) on appropriate response for geologic events.

ii. Maintain awareness of regional seismic activity.

iii. Develop informational materials about potential for sinkholes in vulnerable areas.

~~iii.~~iv. Encourage participation in preparedness events.

c. Engage in planning activities to minimize impacts of earthquakes and sinkholes.

i. Identify and mark known sinkholes.

ii. Conduct aerial surveys of hazardous conditions resulting from sinkholes.

iii. Survey local surveyors, well diggers, septic installers, soil scientists and other local experts to identify new sinkhole locations.

iv. Ensure that identified sinkholes are marked on plats, easements, and building permits.

v. Conduct water quality assessments to determine impacts of sinkholes on water sources.

vi. Encourage further dye tracing to track water as it moves between the surface and below ground.

vii. Ensure that groundwater sources are protected from contamination by requiring septic drainfields to be a minimum distance from a known sinkhole.

viii. Ensure structures are not placed near known sinkholes.

~~viii.~~ ix. Pursue more detailed karst mapping for localities.