



Wildfire & Flood Hazard Data



11/16/17

Flood Regional Vulnerability Assessment

- HAZUS Flood Modeling
- HAZUS Inventory
- Flood Depth Grids
- Population Density
- Residential Flood Exposure
- Commercial Flood Exposure
- Industrial Flood Exposure
- Critical Facilities and Utilities
- Dam Inventory & Classification
- Estimated Losses
- Planning Applications



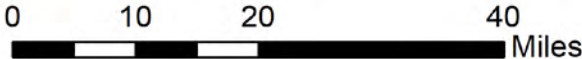
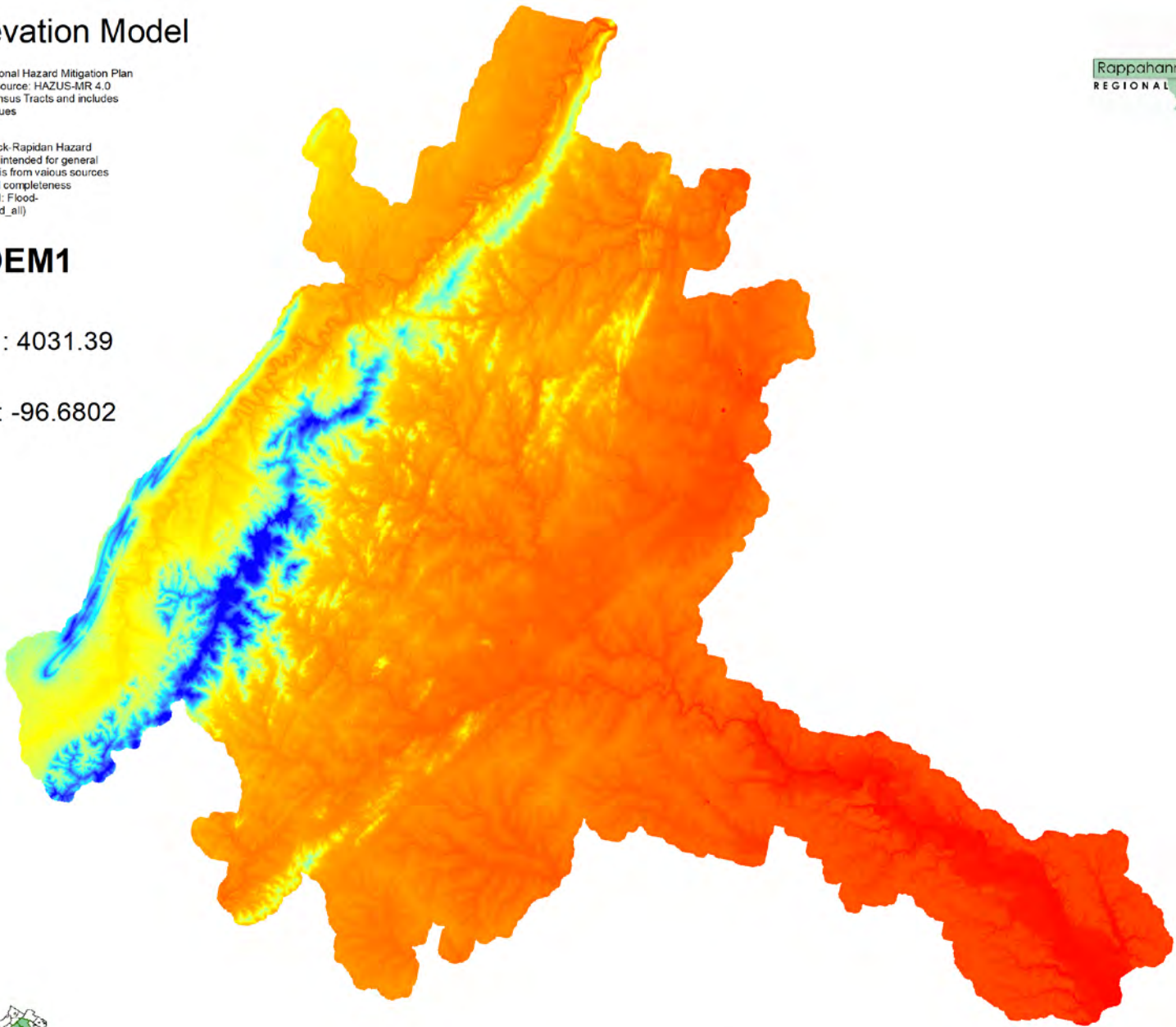
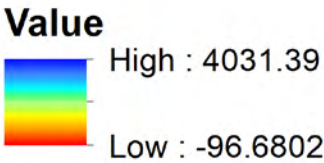
Digital Elevation Model

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Residential Dollar Exposure Source: HAZUS-MR 4.0
Data is shown using 2010 Census Tracts and includes building stock and content values



Map created for Rappahannock-Rapidan Hazard Mitigation Plan Update and is intended for general planning purposes only. Data is from various sources and may vary in accuracy and completeness.
Data: 11/2017 File: Hazus-MH: Flood-RapRapRegion (Flood_Hazard_all)

Region DEM1



Stream Network Generated from DEM

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Residential Dollar Exposure Source: HAZUS-MR 4.0
Data is shown using 2010 Census Tracts and includes
building stock and content values

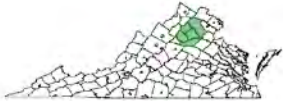
Map created for Rappahannock-Rapidan Hazard
Mitigation Plan Update and is intended for general
planning purposes only. Data is from various sources
and may vary in accuracy and completeness
Data: 11/2017 File: Hazus-MH; Flood-
RapRapRegion (Flood_Hazard_all)



Stream Network Used to Delineate Floodplain

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Residential Dollar Exposure Source: HAZUS-MR 4.0
Data is shown using 2010 Census Tracts and includes building stock and content values

Map created for Rappahannock-Rapidan Hazard Mitigation Plan Update and is intended for general planning purposes only. Data is from various sources and may vary in accuracy and completeness
Data: 11/2017 File: Hazus-MH; Flood-RapRapRegion (Flood_Hazard_all)



Analysis type: Full Suite of Return Periods Fill Down

Output cell size: 24.8356750189616

River reaches

Reach ID	Return Periods (yrs)	n-value
23	10, 25, 50, 100, 500	0.033
31	10, 25, 50, 100, 500	0.033
32	10, 25, 50, 100, 500	0.033
34	10, 25, 50, 100, 500	0.033
36	10, 25, 50, 100, 500	0.033
37	10, 25, 50, 100, 500	0.033
38	10, 25, 50, 100, 500	0.033
39	10, 25, 50, 100, 500	0.033
51	10, 25, 50, 100, 500	0.160
52	10, 25, 50, 100, 500	0.160
57	10, 25, 50, 100, 500	0.160
58	10, 25, 50, 100, 500	0.160
60	10, 25, 50, 100, 500	0.160
61	10, 25, 50, 100, 500	0.160
64	10, 25, 50, 100, 500	0.160

OK Cancel

Replacement Cost RES1 Replacement Cost

Replacement Cost

	Occupancy	HazusDefinition	OccupancyExample	MeansCost
1	RES1	Single Family Dwelling	Refer to hzRES1ReplCost	
2	RES2	Manufactured Housing	Manufactured Housing	41.97
3	RES3A	Multi Family Dwelling sm	Duplex	113.69
4	RES3B	Multi Family Dwelling sm	Triplex/Quads	99.95
5	RES3C	Multi Family Dwelling me	5-9 units	179.48
6	RES3D	Multi Family Dwelling me	10-19 units	168.80
7	RES3E	Multi Family Dwelling lar	20-49 units	184.58
8	RES3F	Multi Family Dwelling lar	50+ units	173.83
9	RES4	Temp. Lodging	Hotel, medium	189.42
10	RES5	Institutional Dormitory	Dorm, medium	203.86
11	RES6	Nursing Home	Nursing home	207.02
12	COM1	Retail Trade	Dept Store, 1 st	109.60
13	COM2	Wholesale Trade	Warehouse, medium	106.43
14	COM3	Personal and Repair Serv	Garage, Repair	129.25
15	COM4	Professional/ Technical/	Office, Medium	175.24
16	COM5	Banks	Bank	253.94
17	COM6	Hospital	Hospital, Medium	335.67
18	COM7	Medical Office/Clinic	Med. Office, medium	241.31
19	COM8	Entertainment & Recreati	Restaurant	223.98
20	COM9	Theaters	Movie Theatre	167.98
21	COM10	Parking	Parking garage	76.21
22	IND1	Heavy	Factory, small	130.37
23	IND2	Light	Warehouse, medium	106.43

Next >

Close

Print



Analysis type: Full Suite of Return Periods

Fill Down

Output cell size: 24.8356750189616

River reaches

Reach ID	Return Periods (yrs)	n-value
23	10, 25, 50, 100, 500	0.033
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36	10, 25, 50, 100, 500	0.033
37	10, 25, 50, 100, 500	0.033
38	10, 25, 50, 100, 500	0.033
39	10, 25, 50, 100, 500	0.033
51	10, 25, 50, 100, 500	0.160
52	10, 25, 50, 100, 500	0.160
57	10, 25, 50, 100, 500	0.160
58	10, 25, 50, 100, 500	0.160
60	10, 25, 50, 100, 500	0.160
61	10, 25, 50, 100, 500	0.160
64	10, 25, 50, 100, 500	0.160

OK

Cancel

Square Footage

Select County to display:

Culpeper, VA (51047)

☐ Show Scenario Census Blocks

	CensusBlock	RES1	RES2	RES3A	RES3B	RES3C	RES3D
1	510479301011000	230.51	19.18	1.89	0.00	0.00	0.0
2	510479301011001	0.00	0.00	0.00	0.00	0.00	0.0
3	510479301011002	0.00	0.00	0.00	0.00	0.00	0.0
4	510479301011003	0.00	0.00	0.00	0.00	0.00	0.0
5	510479301011004	133.35	11.28	1.89	0.00	0.00	0.0
6	510479301011005	125.73	10.15	1.89	0.00	0.00	0.0
7	510479301011006	0.00	0.00	0.00	0.00	0.00	0.0
8	510479301011007	5.72	1.13	0.00	0.00	0.00	0.0
9	510479301011008	0.00	0.00	0.00	0.00	0.00	0.0
10	510479301011009	0.00	0.00	0.00	0.00	0.00	0.0
11	510479301011010	19.05	1.13	0.00	0.00	0.00	0.0
12	510479301011011	0.00	0.00	0.00	0.00	0.00	0.0
13	510479301011012	3.81	0.00	0.00	0.00	0.00	0.0
14	510479301011013	5.72	1.13	0.00	0.00	0.00	0.0
15	510479301011014	112.40	9.02	1.89	0.00	0.00	0.0
16	510479301011015	1.91	0.00	0.00	0.00	0.00	0.0
17	510479301011016	0.00	0.00	0.00	0.00	0.00	0.0
18	510479301011017	9.53	1.13	0.00	0.00	0.00	0.0
19	510479301011018	1.91	0.00	0.00	0.00	0.00	0.0
20	510479301011019	3.81	0.00	0.00	0.00	0.00	0.0

Close

Map

Print

Analysis type: Full Suite of Return Periods Fill Down

Output cell size: 24.8356750189616

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60	10, 25, 50, 100, 500	0.160
61	10, 25, 50, 100, 500	0.160
64	10, 25, 50, 100, 500	0.160

OK

Cancel

First Floor Elevations

Default User-defined

☐ Use user-defined values

	FFEID	Foundation	FirstFloorHeight	Notes
1	1	Pile	7.00	PRE-FIRM construction in census blocks with
2	2	Pier	5.00	Riverine construction
3	3	Solid W'all	7.00	(e.g., HazardType = 1)
4	4	Basement/Garden	4.00	
5	5	Crawl Space	3.00	
6	6	Fill	2.00	
7	7	Slab on Grade	1.00	
8	8	Pile	8.00	POST-FIRM construction in census blocks with
9	9	Pier	6.00	Riverine construction
10	10	Solid W'all	8.00	(e.g., HazardType = 1)
11	11	Basement/Garden	4.00	
12	12	Crawl Space	4.00	
13	13	Fill	2.00	
14	14	Slab on Grade	1.00	
15	15	Pile	7.00	PRE-FIRM construction in census blocks with
16	16	Pier	5.00	Coastal construction
17	17	Solid W'all	7.00	(e.g., HazardType = 2)
18	18	Basement/Garden	4.00	
19	19	Crawl Space	3.00	
20	20	Fill	2.00	
21	21	Slab on Grade	1.00	
22	22	Pile	8.00	POST-FIRM construction in census blocks with
23	23	Pier	6.00	Coastal construction

Cancel

OK

Analysis type: Full Suite of Return Periods Fill Down
 Output cell size: 24.8356750189616

River reaches

Reach ID	Return Periods (yrs)	n-value
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60	10, 25, 50, 100, 500	0.160
61	10, 25, 50, 100, 500	0.160
64	10, 25, 50, 100, 500	0.160

OK Cancel

Building Count
 By Occupancy By Building Type

Select County to display:

Culpeper, VA (51047)

☐ Show Scenario Census Blocks

	CensusBlock	Total	Wood	Steel	Masonry	Concrete	ManufacturedHc
1	510479301011000	144	93	2	32	0	
2	510479301011001	0	0	0	0	0	
3	510479301011002	0	0	0	0	0	
4	510479301011003	0	0	0	0	0	
5	510479301011004	82	53	1	18	0	
6	510479301011005	80	51	2	18	0	
7	510479301011006	0	0	0	0	0	
8	510479301011007	4	2	0	1	0	
9	510479301011008	0	0	0	0	0	
10	510479301011009	0	0	0	0	0	
11	510479301011010	13	8	1	3	0	
12	510479301011011	0	0	0	0	0	
13	510479301011012	3	2	0	1	0	
14	510479301011013	4	2	0	1	0	
15	510479301011014	76	47	3	17	1	
16	510479301011015	1	1	0	0	0	
17	510479301011016	0	0	0	0	0	

Close Map Print

Analysis type: Full Suite of Return Periods

Fill Down

Output cell size: 24.8356750189616

River reaches

Reach ID	Return Periods (yrs)	n-value
23	10, 25, 50, 100, 500	0.033
31	10, 25, 50, 100, 500	0.033
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37	10, 25, 50, 100, 500	0.033
38	10, 25, 50, 100, 500	0.033
39	10, 25, 50, 100, 500	0.033
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52	10, 25, 50, 100, 500	0.160
57	10, 25, 50, 100, 500	0.160
58	10, 25, 50, 100, 500	0.160
60	10, 25, 50, 100, 500	0.160
61	10, 25, 50, 100, 500	0.160
64	10, 25, 50, 100, 500	0.160

OK

Cancel

By Occupancy

By Building Type

Table Type:

General Occupancy Type

Culpeper, VA (51047)

☐ Show Scenario Census Blocks

	CensusBlock	Total	Residential	Commercial	Industrial	Agriculture	Relig
1	510479301011000	144	139	3	1	1	
2	510479301011001	0	0	0	0	0	
3	510479301011002	0	0	0	0	0	
4	510479301011003	0	0	0	0	0	
5	510479301011004	83	81	1	1	0	
6	510479301011005	81	76	3	1	1	
7	510479301011006	0	0	0	0	0	
8	510479301011007	4	4	0	0	0	
9	510479301011008	0	0	0	0	0	
10	510479301011009	0	0	0	0	0	
11	510479301011010	13	11	1	1	0	
12	510479301011011	0	0	0	0	0	
13	510479301011012	2	2	0	0	0	
14	510479301011013	4	4	0	0	0	
15	510479301011014	75	68	6	0	1	
16	510479301011015	1	1	0	0	0	
17	510479301011016	0	0	0	0	0	

Sqft Factors

Close

Map

Print

100-Year Flood Zone

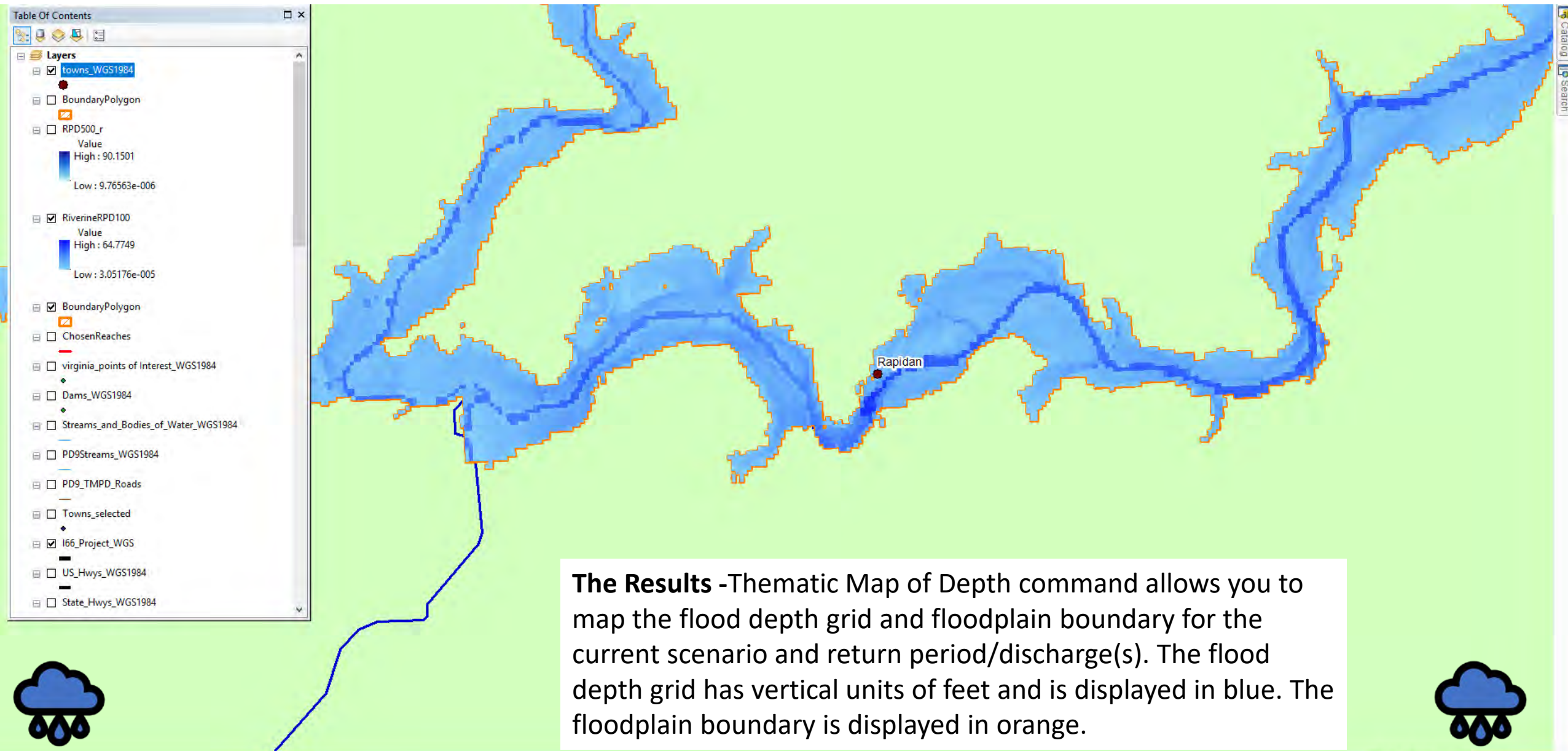
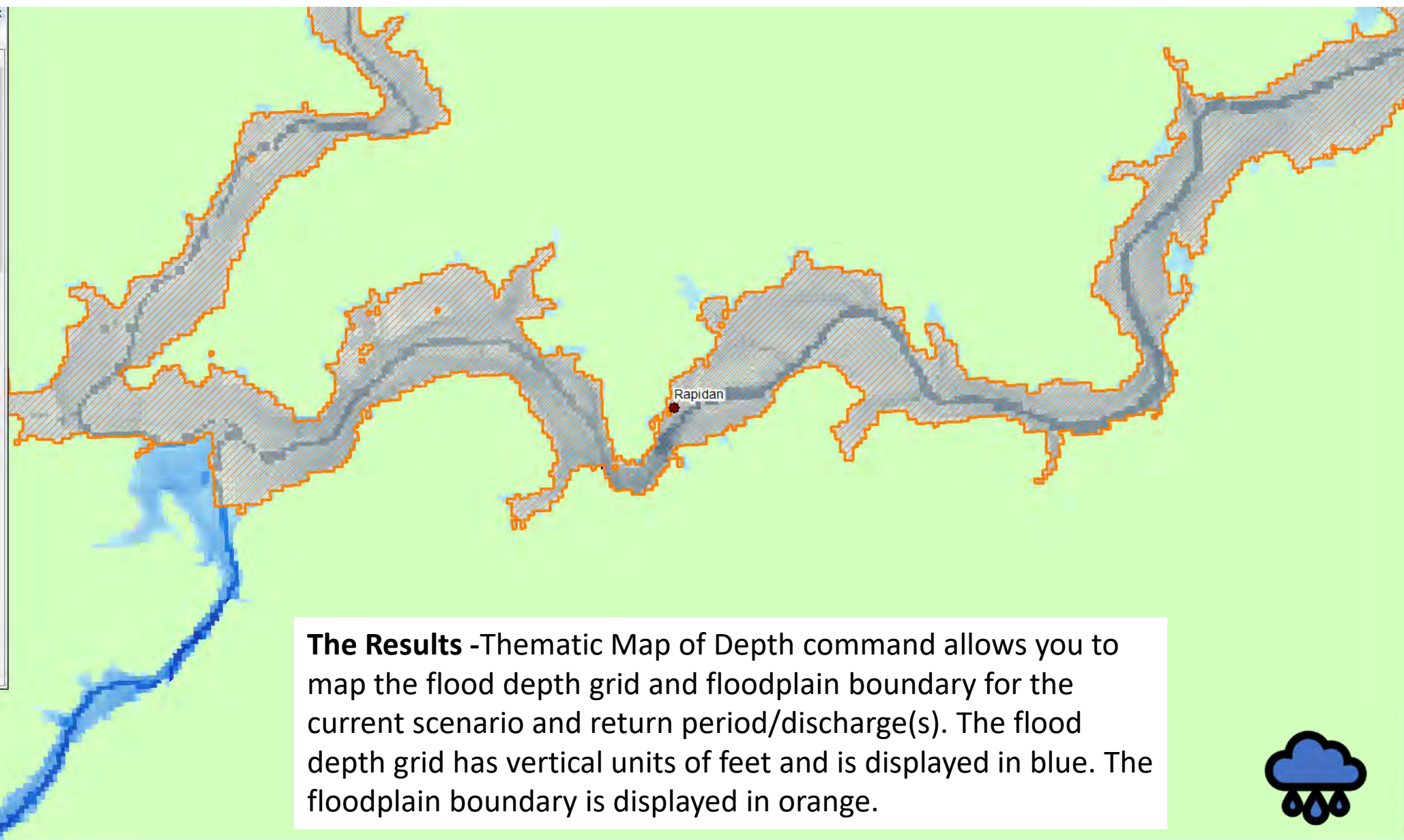


Table Of Contents

- Layers
 - ☒ towns_WGS1984
 - ☒ BoundaryPolygon
 - ☒ RiverineRPD100
 - Value
 - High : 64.7749
 - Low : 3.05176e-005
 - ☒ RPD500_r
 - Value
 - High : 90.1501
 - Low : 9.76563e-006
 - ☐ BoundaryPolygon
 - ☐ ChosenReaches
 - ☐ virginia_points of Interest_WGS1984
 - ☐ Dams_WGS1984
 - ☐ Streams_and_Bodies_of_Water_WGS1984
 - ☐ PD9Streams_WGS1984
 - ☐ PD9_TMPD_Roads
 - ☐ Towns_selected
 - ☒ I66_Project_WGS
 - ☐ US_Hwys_WGS1984
 - ☐ State_Hwys_WGS1984



The Results -Thematic Map of Depth command allows you to map the flood depth grid and floodplain boundary for the current scenario and return period/discharge(s). The flood depth grid has vertical units of feet and is displayed in blue. The floodplain boundary is displayed in orange.



Population Density | 2010 U.S. Census

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Population Density by Census Block Group,
2010 U.S. Census

1 Dot = 10

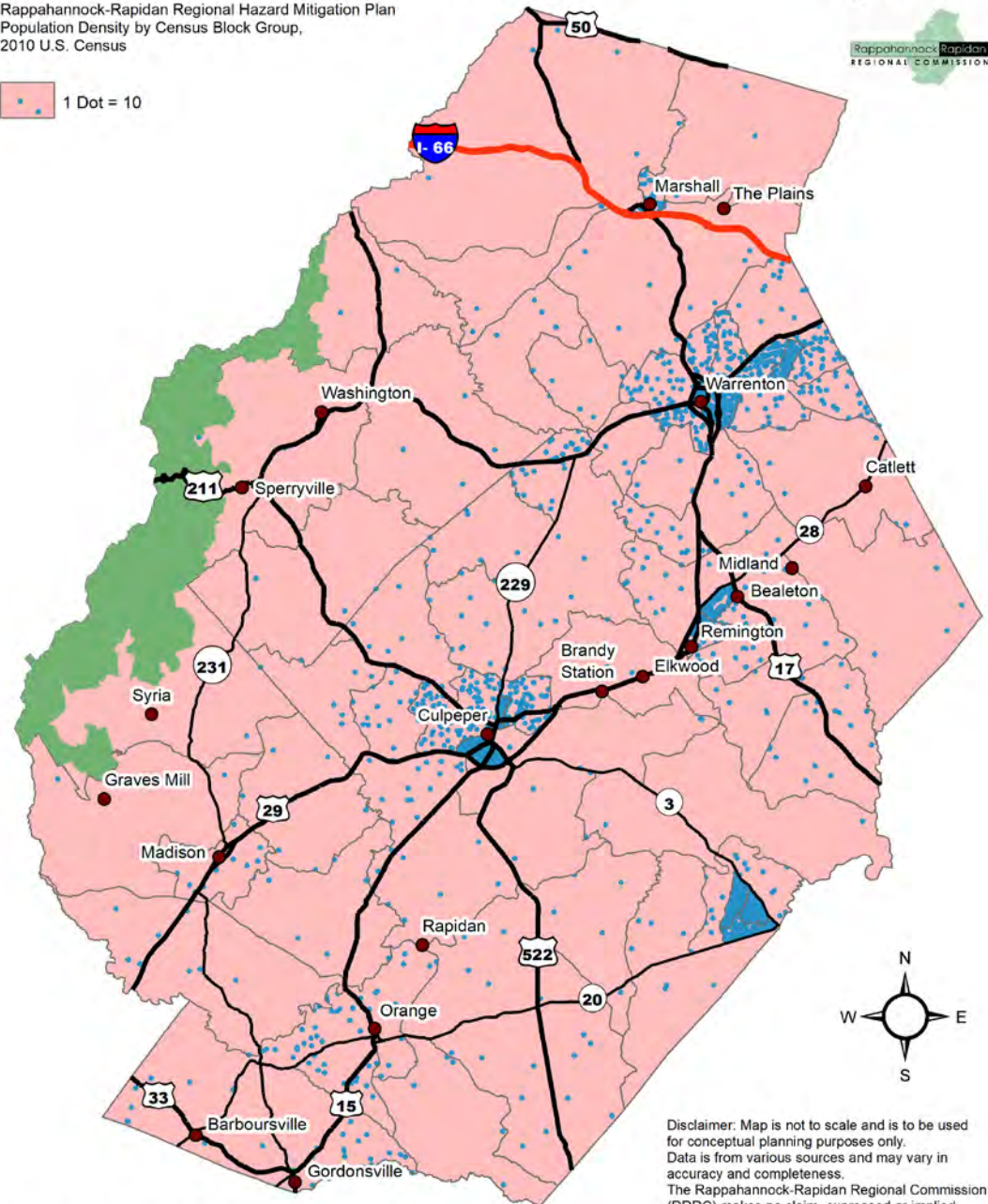


Figure 6.2



Disclaimer: Map is not to scale and is to be used for conceptual planning purposes only. Data is from various sources and may vary in accuracy and completeness. The Rappahannock-Rapidan Regional Commission (RRRC) makes no claim, expressed or implied.

Population Density | 2010 U.S. Census

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Population Density by Census Block Group,
2010 U.S. Census

Census Block Groups
Population/ SQMI2

- < 50
- 50-100
- 100-250
- 250-500
- > 500

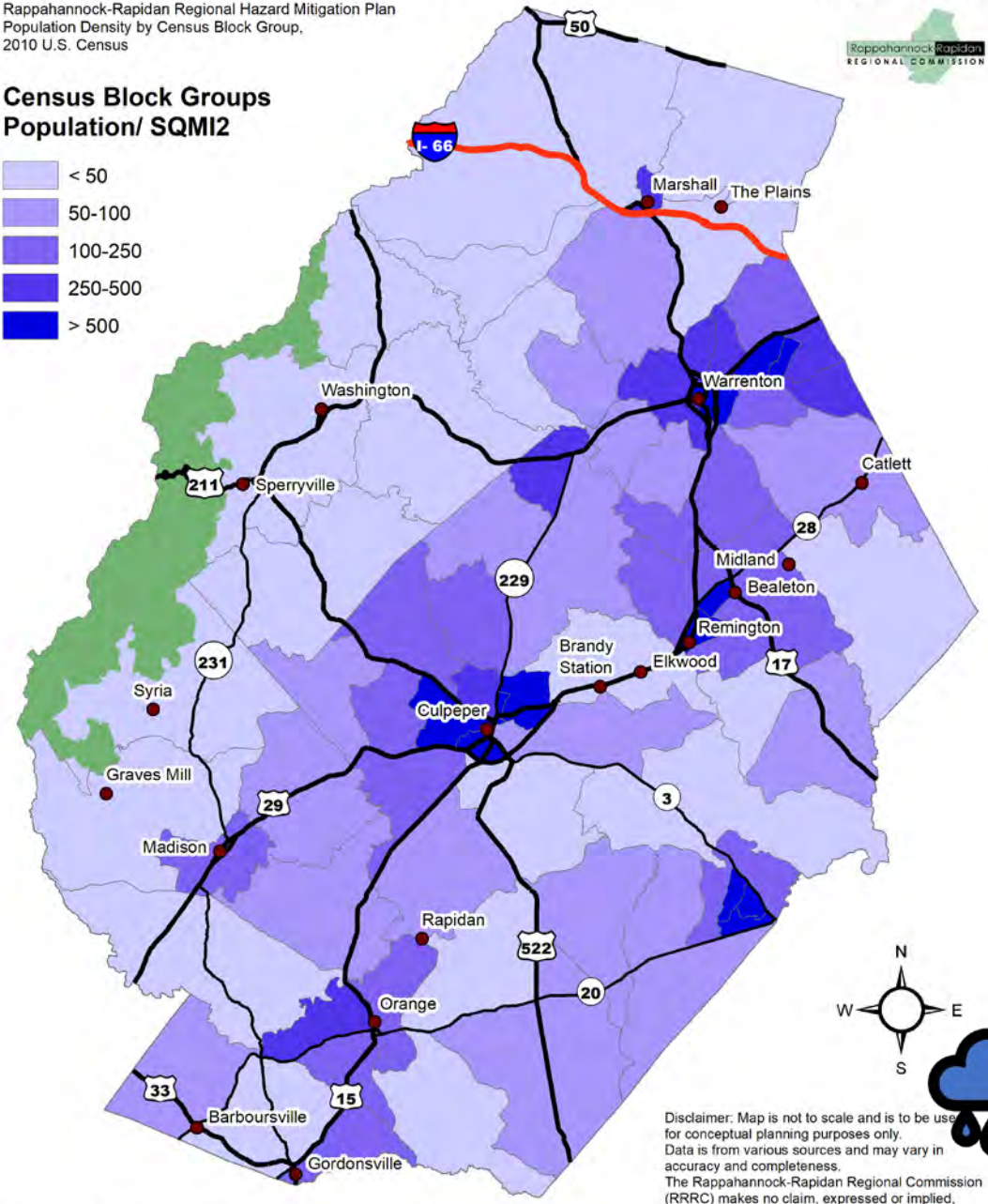


Figure 6.2



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Residential Flood Exposure by Census Tract

Figure 6.3

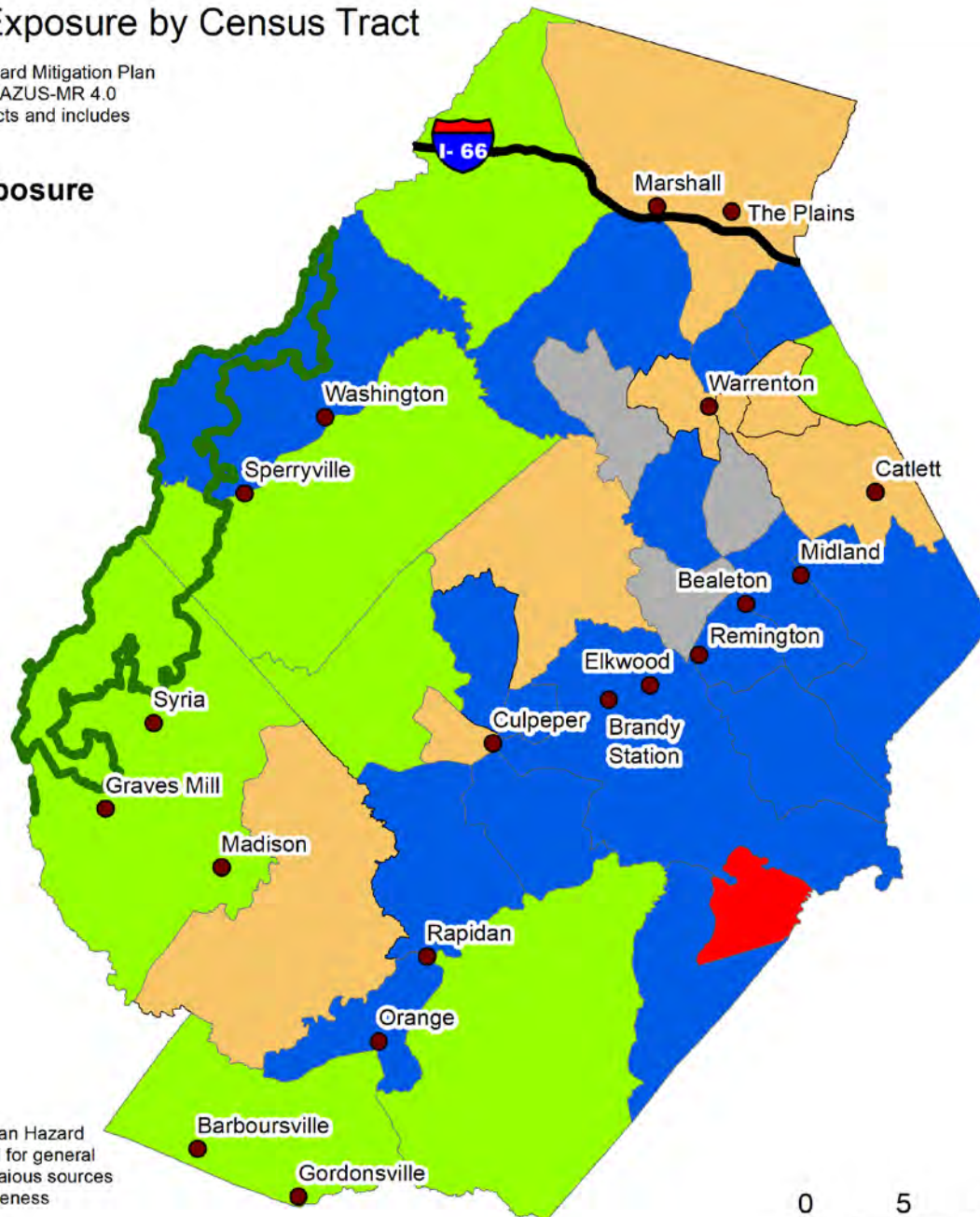
Rappahannock-Rapidan Regional Hazard Mitigation Plan
Residential Dollar Exposure Source: HAZUS-MR 4.0
Data is shown using 2010 Census Tracts and includes
building stock and content values

Residential Dollar Exposure by Census Tract

- <\$250 Million
- \$250M-\$500M
- \$500M-\$750M
- \$750M- \$1B
- >\$1Billion



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Data: 11/2017 File: Hazus-MH: Flood-
RapRapRegion (Flood_Hazard_all)



0 5 10 20
Miles



Commercial Flood Exposure by Census Tract

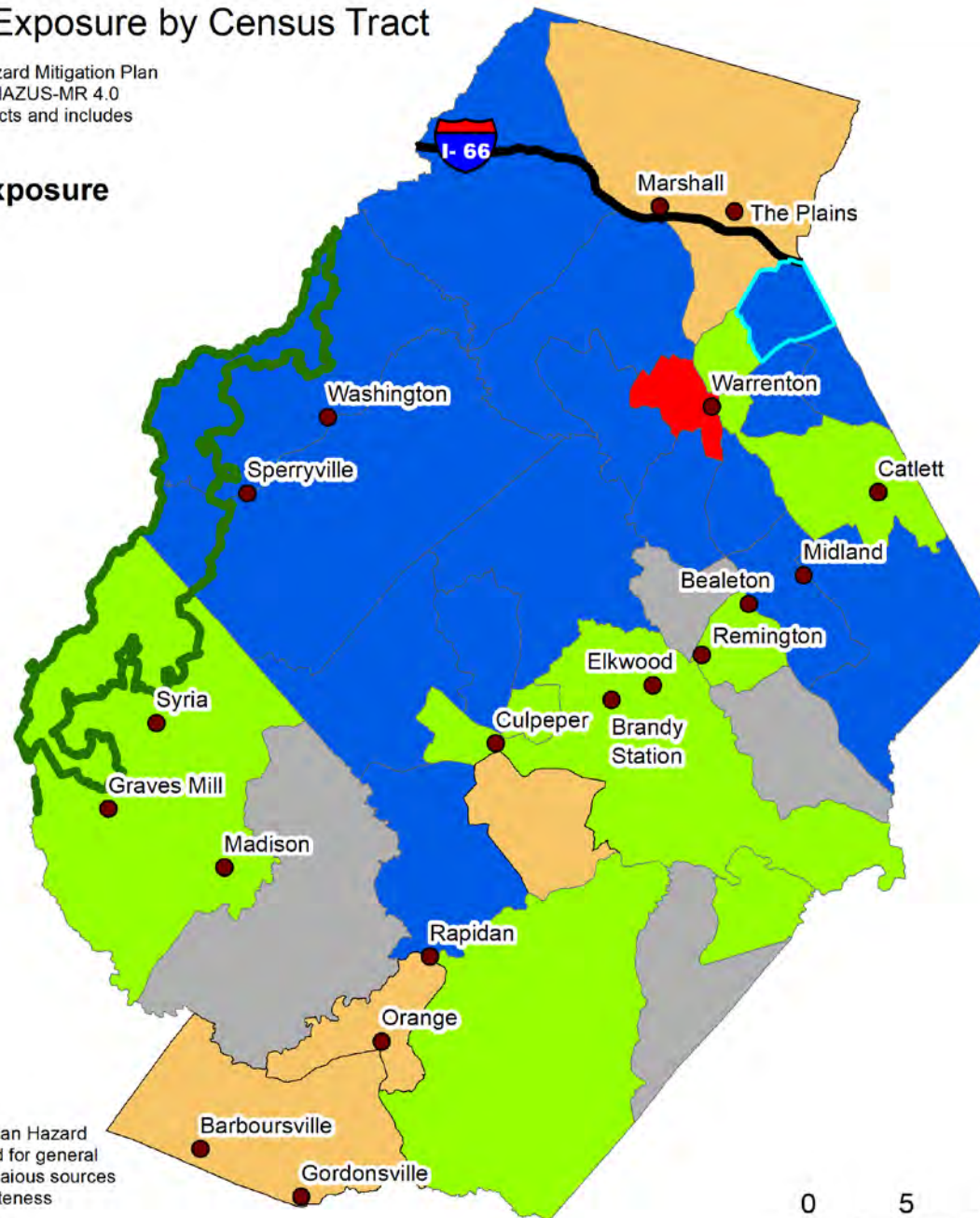
Figure 6.4

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Residential Dollar Exposure Source: HAZUS-MR 4.0
Data is shown using 2010 Census Tracts and includes
building stock and content values

Commercial Dollar Exposure by Census Tract



Map created for Rappahannock-Rapidan Hazard Mitigation Plan Update and is intended for general planning purposes only. Data is from various sources and may vary in accuracy and completeness
Data: 11/2017 File: Hazus-MH: Flood-RapRapRegion (Flood_Hazard_all)



0 5 10 20 Miles

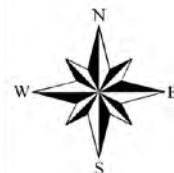


Industrial Flood Exposure by Census Tract

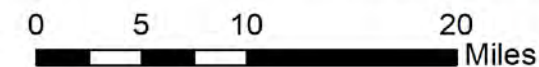
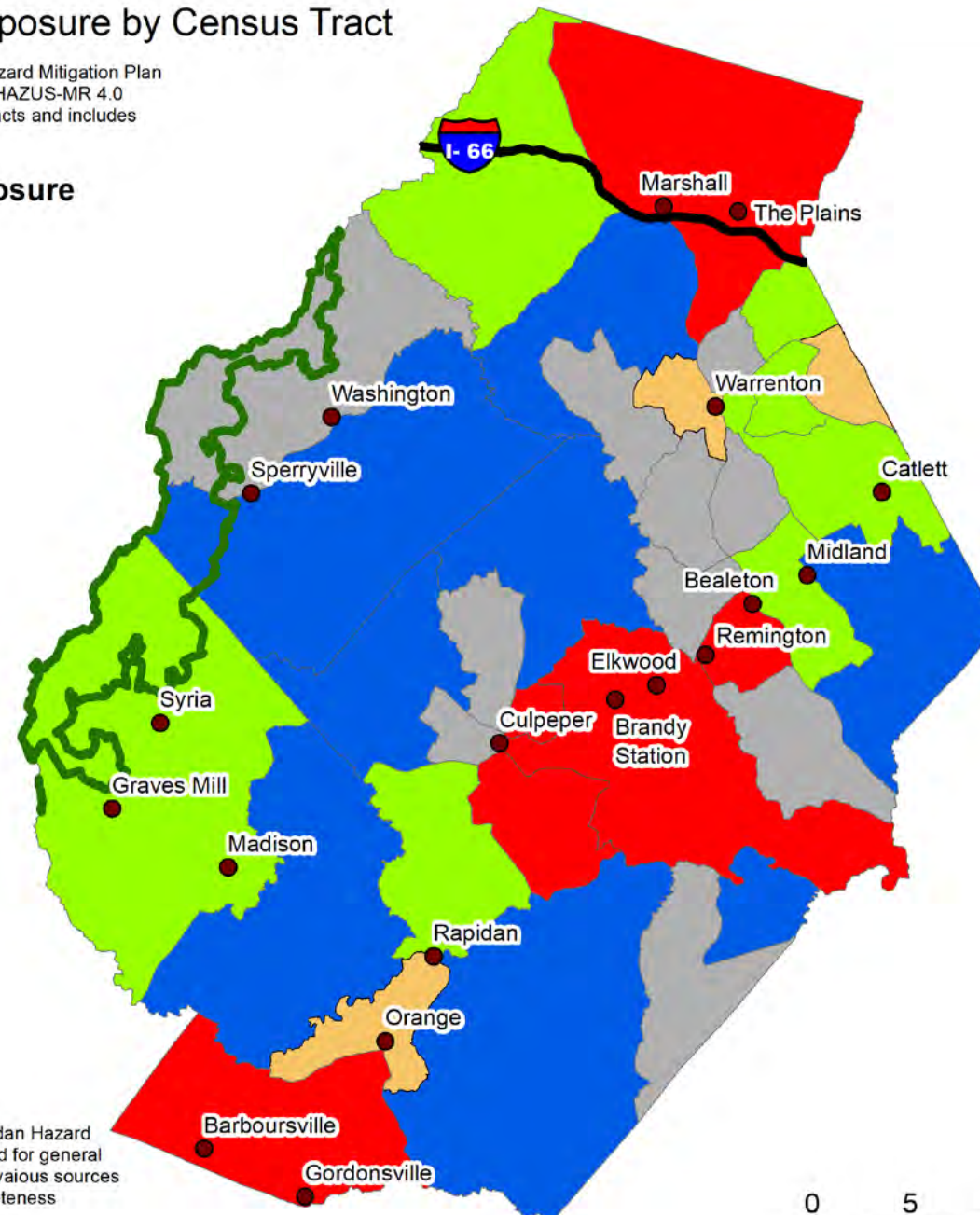
Figure 6.5

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Residential Dollar Exposure Source: HAZUS-MR 4.0
Data is shown using 2010 Census Tracts and includes
building stock and content values

Industrial Dollar Exposure by Census Tract










Map created for Rappahannock-Rapidan Hazard Mitigation Plan Update and is intended for general planning purposes only. Data is from various sources and may vary in accuracy and completeness
Data: 11/2017 File: Hazus-MH: Flood-RapRapRegion (Flood_Hazard_all)

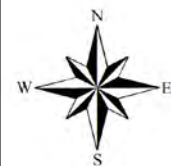


Critical Facilities

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Critical Facilities include fire stations, police stations, schools
and hospitals identified by HAZUS-MH 4.0
Data is shown using 2010 Census Tracts

Legend

-  Schools
-  Hospitals
-  Police Stations
-  Fire Stations
-  Shenandoah National Park
-  Census Tracts
-  Counties



Map created for Rappahannock-Rapidan Hazard Mitigation Plan Update and is intended for general planning purposes only. Data is from various sources and may vary in accuracy and completeness data: 11/2017
File: Hazus-MH: Flood-RapRapRegion (Flood_Hazard_all)

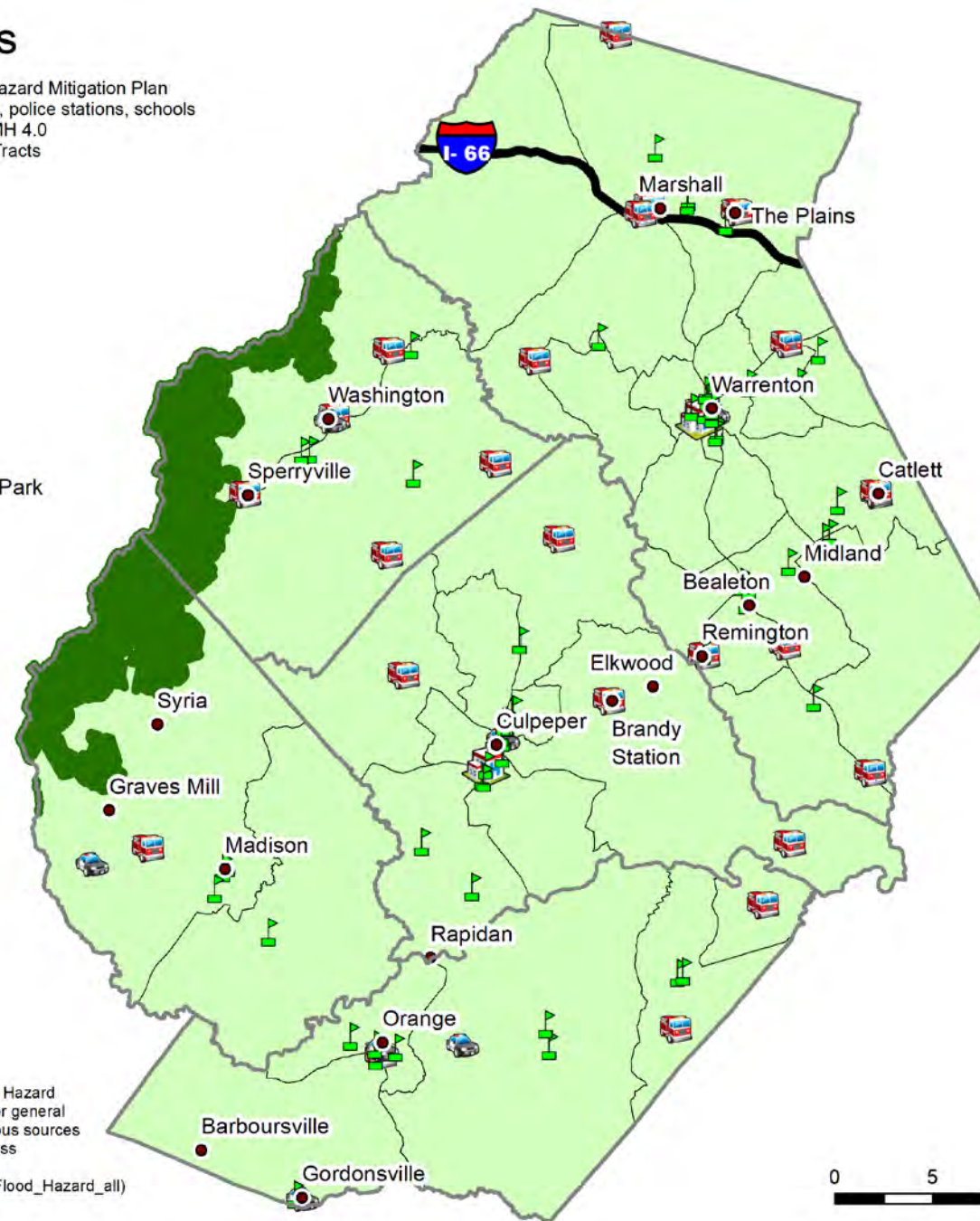


Figure 6.6





0 5 10 20 Miles

Critical Utilities

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Critical Utilities include Water, Wastewater, Oil, Electric,
Natural Gas and Communications facilities
identified by HAZUS-MH 4.0
Data is shown using 2010 Census Tracts

Legend

-  Communications Facility
-  Electric Power Facility
-  Natural Gas Facility
-  Oil Facility
-  Waste Water Facility
-  Potable Water Facility
-  Shenandoah National Park
-  Census Tracts
-  Counties



Map created for Rappahannock-Rapidan Hazard Mitigation Plan Update and is intended for general planning purposes only. Data is from various sources and may vary in accuracy and completeness data: 11/2017
File: Hazus-MH: Flood-RapRapRegion (Flood_Hazard_all)

Figure 6.7



0 5 10 20 Miles

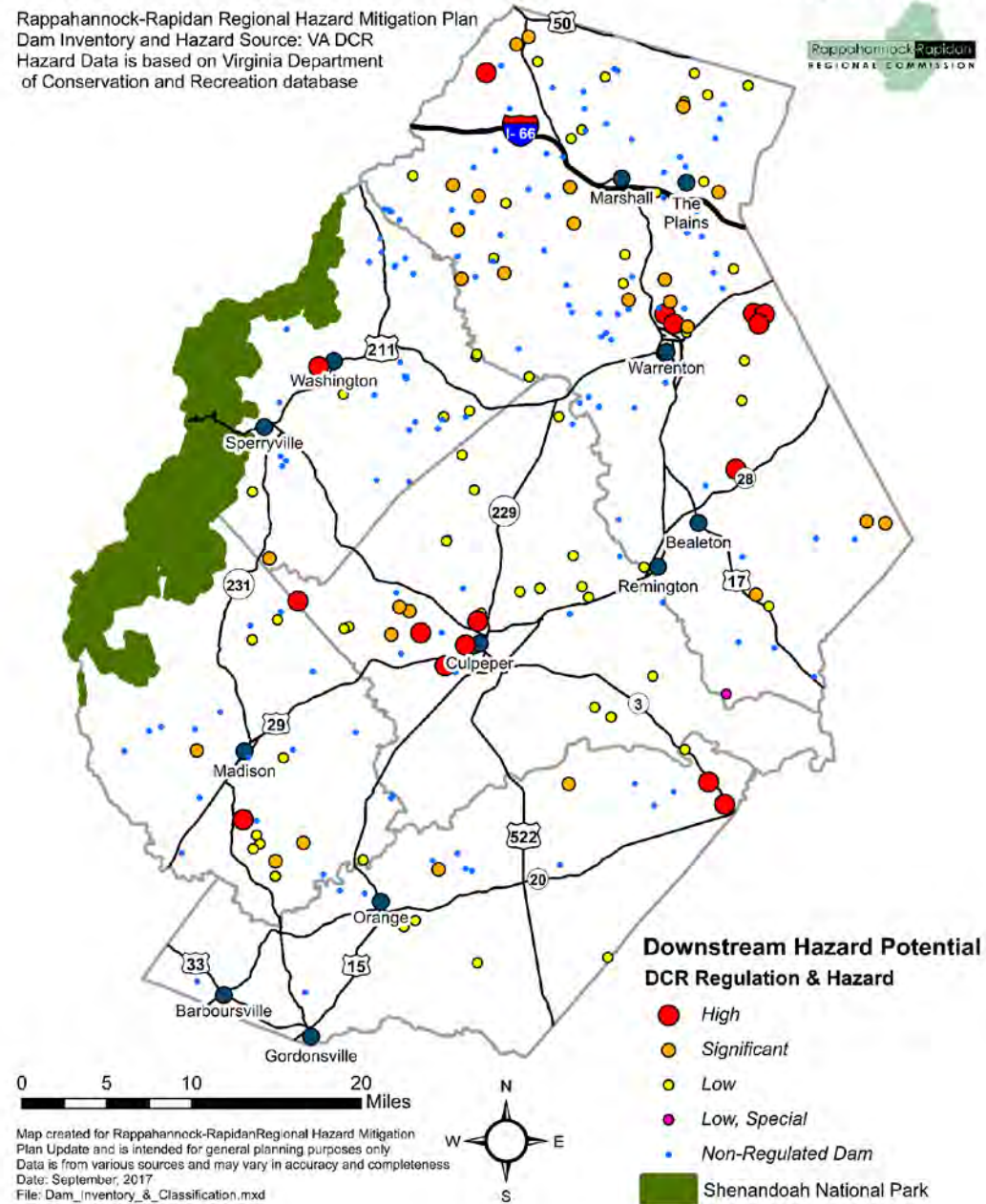


Dam Inventory & Classification

Figure 5.23

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Dam Inventory and Hazard Source: VA DCR
Hazard Data is based on Virginia Department
of Conservation and Recreation database

Rappahannock-Rapidan
REGIONAL COMMISSION



General Description of Region

Appendix B: Regional Population and Building Value Data

	Population	Building Value (thousands of dollars)		
		Residential	Non-Residential	Total
Virginia				
Madison	13,308	1,470,929	149,703	1,620,632
Culpeper	46,689	4,597,580	932,647	5,530,227
Orange	33,481	3,433,089	623,595	4,056,684
Fauquier	65,203	8,421,630	1,619,543	10,041,173
Rappahannock	7,373	1,033,776	143,930	1,177,706
Total	166,054	18,957,004	3,469,418	22,426,422
Total Study Region	166,054	18,957,004	3,469,418	22,426,422



Approximately 92.11% of the buildings (and
84.53% of the building value)
Are associated with residential housing

500 Year Flood	Total Damage Cost (buildings and content)	Moderately Damaged buildings count	Completely Destroyed buildings count	Essential Facilities Damage
Total	\$219 million	201	45	0

		# Facilities		
Classification	Total	At Least Moderate	At Least Substantial	Loss of Use
Fire Stations	34	0	0	0
Hospitals	2	0	0	0
Police Stations	14	0	0	0
Schools	61	0	0	0

153 hospital beds available!

Natural Infrastructure for Water Management

Investing in nature for multiple objectives



Natural or semi-natural infrastructure provides services for water resources management with equivalent or similar benefits to conventional (built) 'grey' water infrastructure.

The composition, structure, and function of natural infrastructure assets in river basins, and the way they interplay with built 'grey' infrastructure will determine the primary services and co-benefits produced.



Further information can be found in UNEP (2014) *Green Infrastructure Guide for Water Management: Ecosystem-based management approaches for water related-infrastructure projects*.



Wildfire Regional Vulnerability Assessment

- Wildfire Incidents
- Risk Maps
- Overlay agricultural and forestal districts
- Planning Applications



		County	# of Incidents 2002-2009	Total Acres
		Culpeper	87	159
		Fauquier	69	111
		Madison	95	221
		Orange	103	101
		Rappahannock	46	82
		Total	400	674

County	# of Incidents 2010-2016	Total Acres
Culpeper	23	88
Fauquier	76	350
Madison	52	79
Orange	40	143
Rappahannock	24	148
Total	215	808

Wildfire Risk Assessment

Figure 5.16

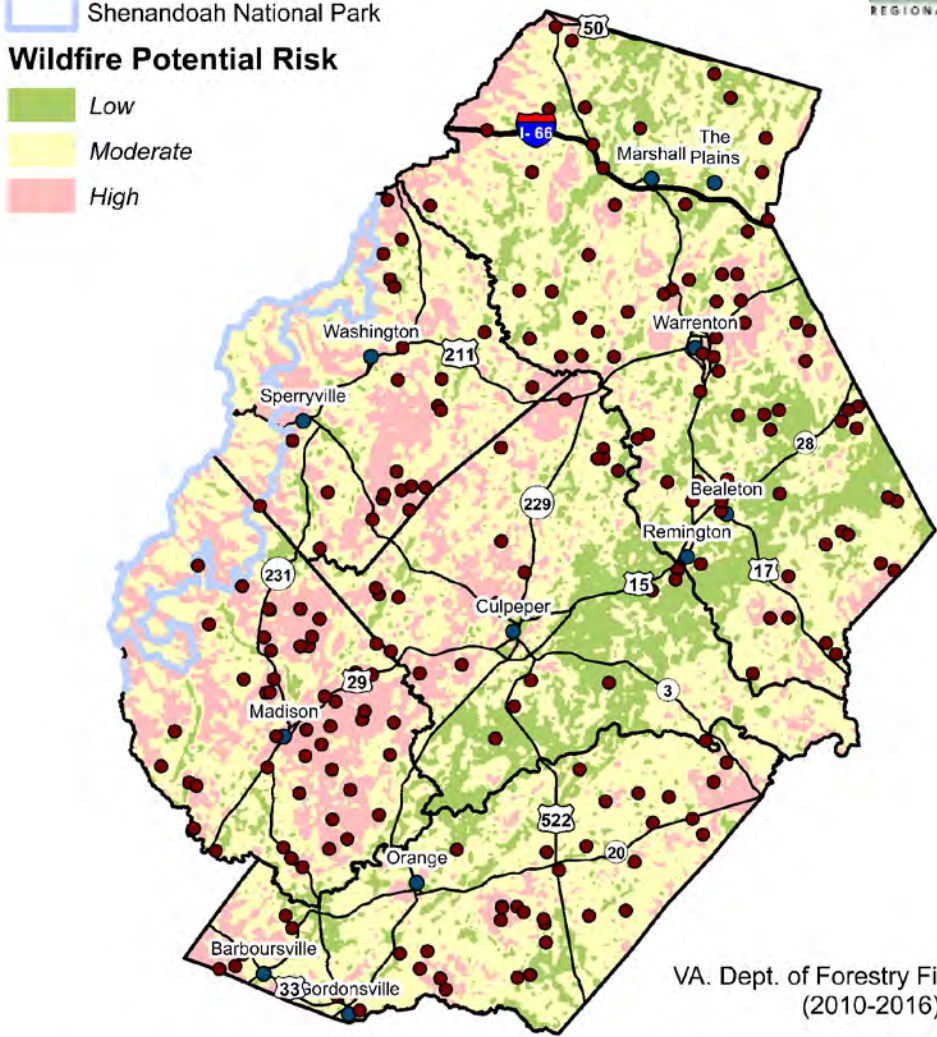
Rappahannock-Rapidan Regional Hazard Mitigation Plan
Wildfire Risk Data Source: Va. Dept. of Forestry

● VA DEPT OF FORESTRY FIRE INCIDENTS (2010-2016)

▭ Shenandoah National Park

Wildfire Potential Risk

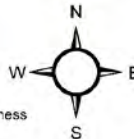
- Low
- Moderate
- High



VA. Dept. of Forestry Fire Incidents
(2010-2016)

County	Number	Total Acres
Culpeper	23	87.5
Fauquier	76	350.1
Madison	52	79.4
Orange	40	143.2
Rappahannock	24	148.2

0 5 10 20 Miles



Map created for Rappahannock-Rapidan Regional Hazard Mitigation Plan Update and is intended for general planning purposes only. Data is from various sources and may vary in accuracy and completeness. Date: September, 2017 File: wildfire_risk_assessment.mxd



County	# of Incidents in High Risk Area (2002-2016)	# of Incidents in Moderate Risk Area (2002-2016)	# of Incidents in LowRisk Area (2002-2016)
Culpeper	28	60	23
Fauquier	27	87	31
Madison	90	51	6
Orange	32	97	14
Rappahannock	30	39	1

Agriculture and Forestal Districts

Rappahannock-Rapidan Regional Hazard Mitigation Plan
Wildfire Risk Data Source: Va. Dept. of Forestry

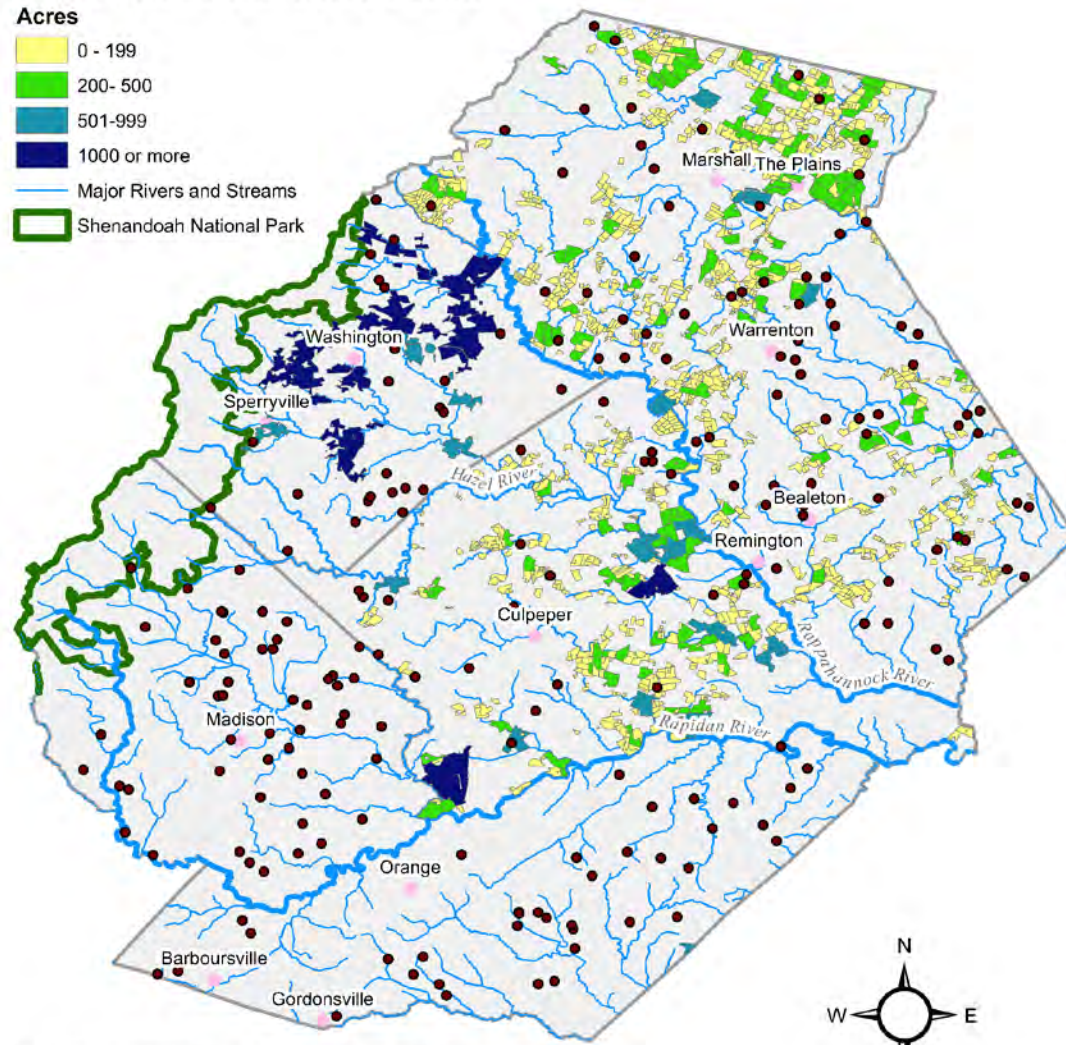


● VA DEPT OF FORESTRY FIRE INCIDENTS (2010-2016)

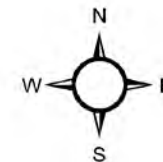
Virginia Agricultural & Forestal Districts

Acres

- 0 - 199
- 200- 500
- 501-999
- 1000 or more
- Major Rivers and Streams
- Shenandoah National Park



Fire Incidents (2010-2016)	Within Agricultural or Forestal Districts
215	13



0 5 10 20 Miles

Map created for Rappahannock-Rapidan Regional Hazard Mitigation Plan Update and is intended for general planning purposes only.
Data is from various sources and may vary in accuracy and completeness.
Date: September, 2017 File: Ag_&_forestal_districts



Examples of Community Tools

Landscaping Regulations require property owners to manage hazardous vegetation and maintain their properties.

Watershed Management Plans reduce wildfire through fuel treatments, protecting vital water resources.

Forest Management Projects reduce fuels within the wildland-urban interface (WUI).

Building Codes require ignition-resistant construction materials for new developments and retrofits.

Land Preservation Tools encourage agricultural lands to buffer development from wildfires.

Steep Slope Ordinances restrict development within high wildfire-risk areas.

Land Use and Development Codes incentivize developers to plan open space and recreational trails, creating fuel breaks.

Subdivision Design Standards require risk reduction features, such as minimum road widths, secondary access, and adequate water supply.

Local Governments support fire adapted communities through good land use planning.



Wildfire Regional Vulnerability Assessment

- Overlay zoning?
- Overlay land use?
- Overlay DCR Endangered Species layer?



Planning Can Help Mitigate Impacts of Wildfires & Floods !

- Transportation plan
- Comprehensive Land Use Plans
- Zoning Ordinance
- Building Code
- Fire code
- Evacuation Plan
- Open Space Preservation
- Disaster Recovery Plan

- Floodplain Management Plan
- Stormwater Management Plan
- Floodplain Management Plan
- Emergency Operations Plan
- Continuity of Operations Plan
- Riparian Buffer/Wetland Preservation
- Flood Damage Prevention Ordinance



Planning Can Help Mitigate Impacts of Wildfires & Floods !

- Prevention

- Drainage System Maintenance
- Hazard Mapping

- Protection of Personal Property

- Building Elevation
- Insurance
- Retrofitting

- Natural Resource Protection

- Riparian Buffers
- Fire Resistant Landscaping
- Habitat Preservation
- Floodplain Protection

- Structural Projects

- Reservoirs/Dam Stabilization
- Storm Sewer Management

- Emergency Services

- Warning systems
- Search and Rescue

- Information

- Training
- Outreach and Education

