

# DIGITAL MAPPING TECHNIQUES 2022

The following was presented at DMT'22  
May 22 - 25, 2022

The contents of this document are provisional

See Presentations and Proceedings  
from the DMT Meetings (1997-2022)

<http://ngmdb.usgs.gov/info/dmt/>

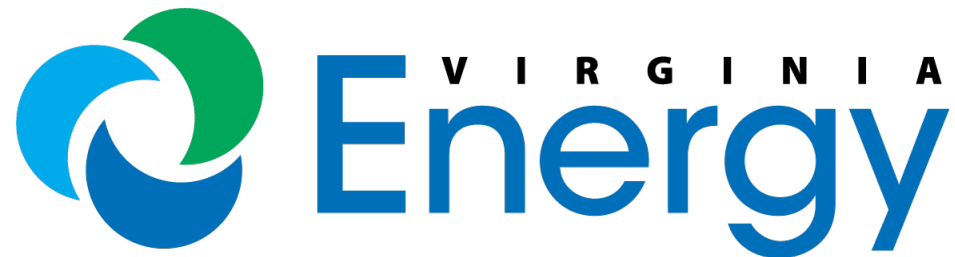
# GeMS Implementation in Large Scale Geologic Compilations

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(VIRGINIA GEOLOGICAL SURVEY)

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# Talk Outline:

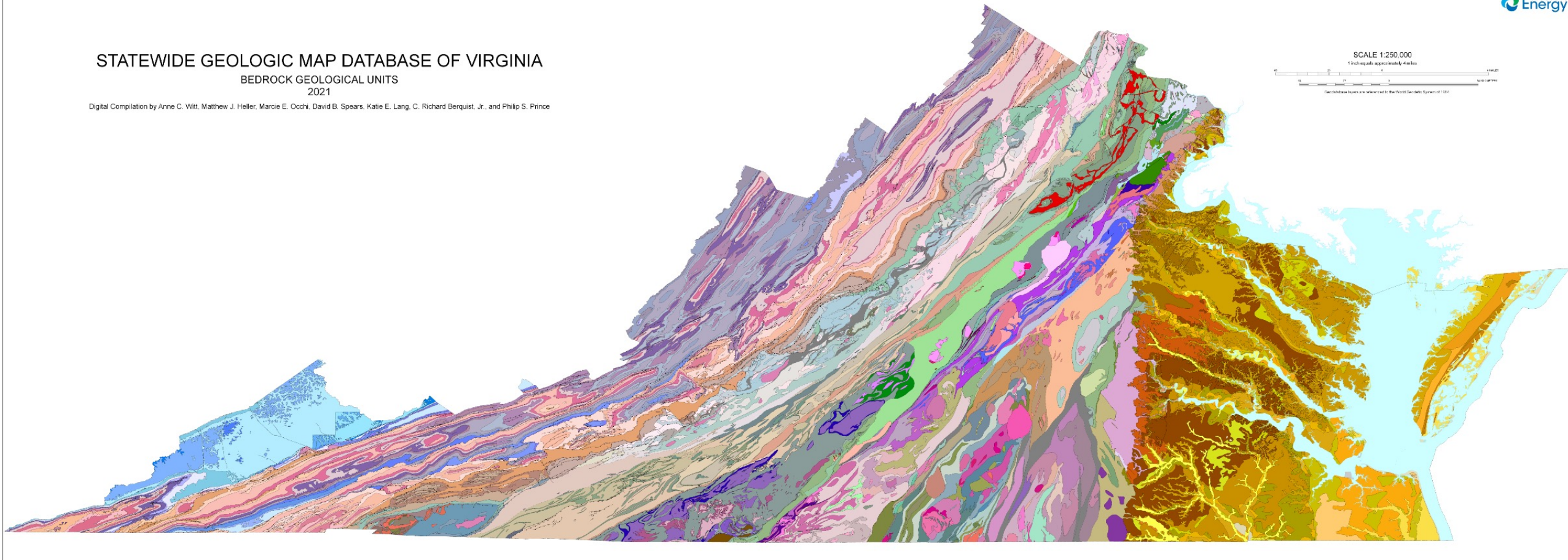
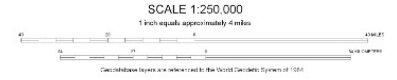
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- What are large scale compilations in VA? What do the GeMS products look like?
- Virginia's approach to large compilations: Our Criteria
- FY20 and FY21 project examples
- GeMS Compilation topics for the future

# 1:250K Geologic Bedrock Map Compilation in VA:

## STATEWIDE GEOLOGIC MAP DATABASE OF VIRGINIA BEDROCK GEOLOGICAL UNITS 2021

Digital Compilation by Anne C. Witt, Matthew J. Heller, Marcie E. Occhi, David B. Spears, Katie E. Lang, C. Richard Berquist, Jr., and Philip S. Prince



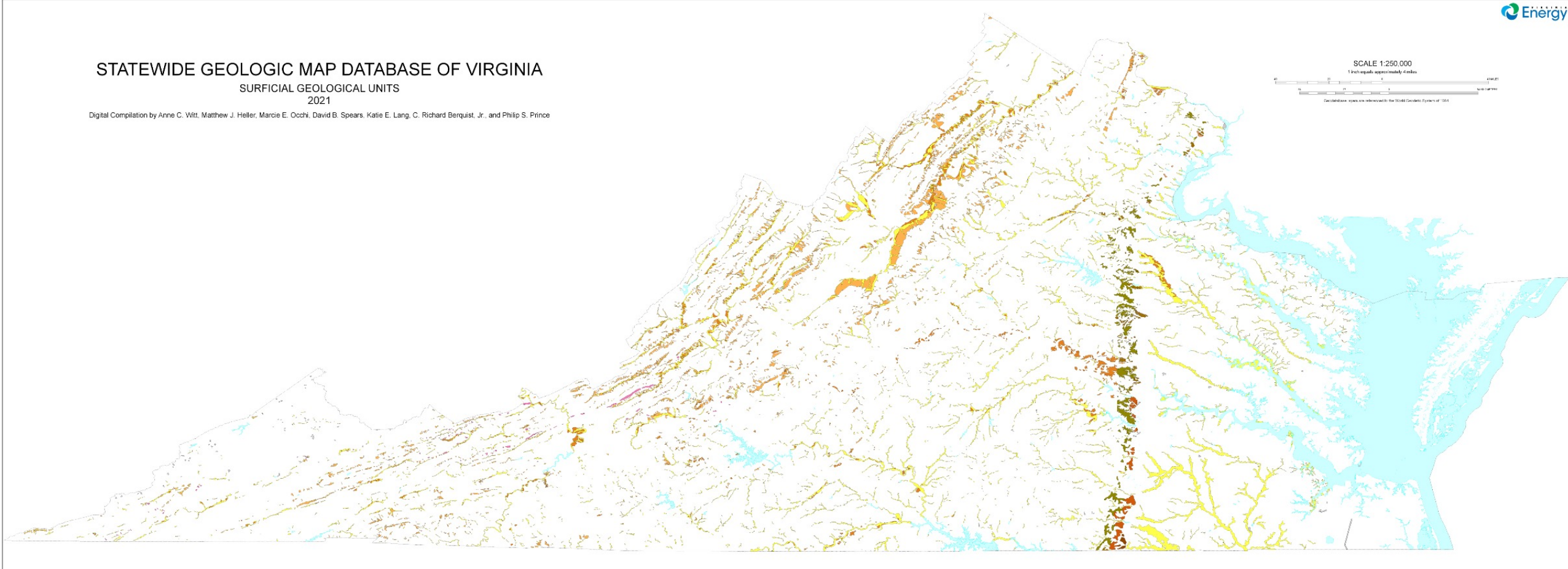
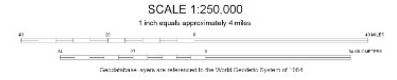
➤ *Delivered as a FY20 GeMS level 2 compliant geodatabase*

# 1:250K Geologic Surficial Map Compilation in VA:



## STATEWIDE GEOLOGIC MAP DATABASE OF VIRGINIA SURFICIAL GEOLOGICAL UNITS 2021

Digital Compilation by Anne C. Witt, Matthew J. Heller, Marcie E. Occhi, David B. Spears, Katie E. Lang, C. Richard Berquist, Jr., and Philip S. Prince



➤ *Delivered as a FY20 GeMS level 2 compliant geodatabase*

# 100k Scale Compilation Workflow and Criteria:

- Use the 5m Lidar base to draw surficial deposits
- Compile bedrock mapping from 1:24K, 1:100K, 1:250K
- Main new mapping component: surficial geology!
  - Developed a workflow for checking surficial units w/ Strabospot
- GeMS attribution & validation
- Geologic interpretation review
- GeMS database review
- Metadata review

# Digitization Guides in VA:

If Mapping at this scale:	1: 24k Maps	1:100K Maps	1:250K Maps (Statewide Compilation)
Map features that are clearly visible at this scale	10K-12K	50K	100-125K
Digitize features while zoomed to this scale	4K-6K	10K-15K	24K
Minimum fault and dike length	500 ft	2000 ft	5000 ft
Minimum fold axis length	2000 ft	8000 ft	Only major fold axes
Minimum map thickness for polygon map unit	150 ft	600 ft	1200 ft
Minimum polygon size for overlay polys	200 x 200 ft	400 x 400 ft	1000 x 1000 ft
Show the following mineral resource sites	All known sites	All sites visible on basemap at 24K	All sites visible on basemap at 100K
Show the following karst features	>100ft <sup>2</sup> as points >30,000 ft <sup>2</sup> as lines	>400ft <sup>2</sup> as points >120,000 ft <sup>2</sup> as lines	Not shown
Show the following coal beds	All coal beds	Major coal beds	Not shown

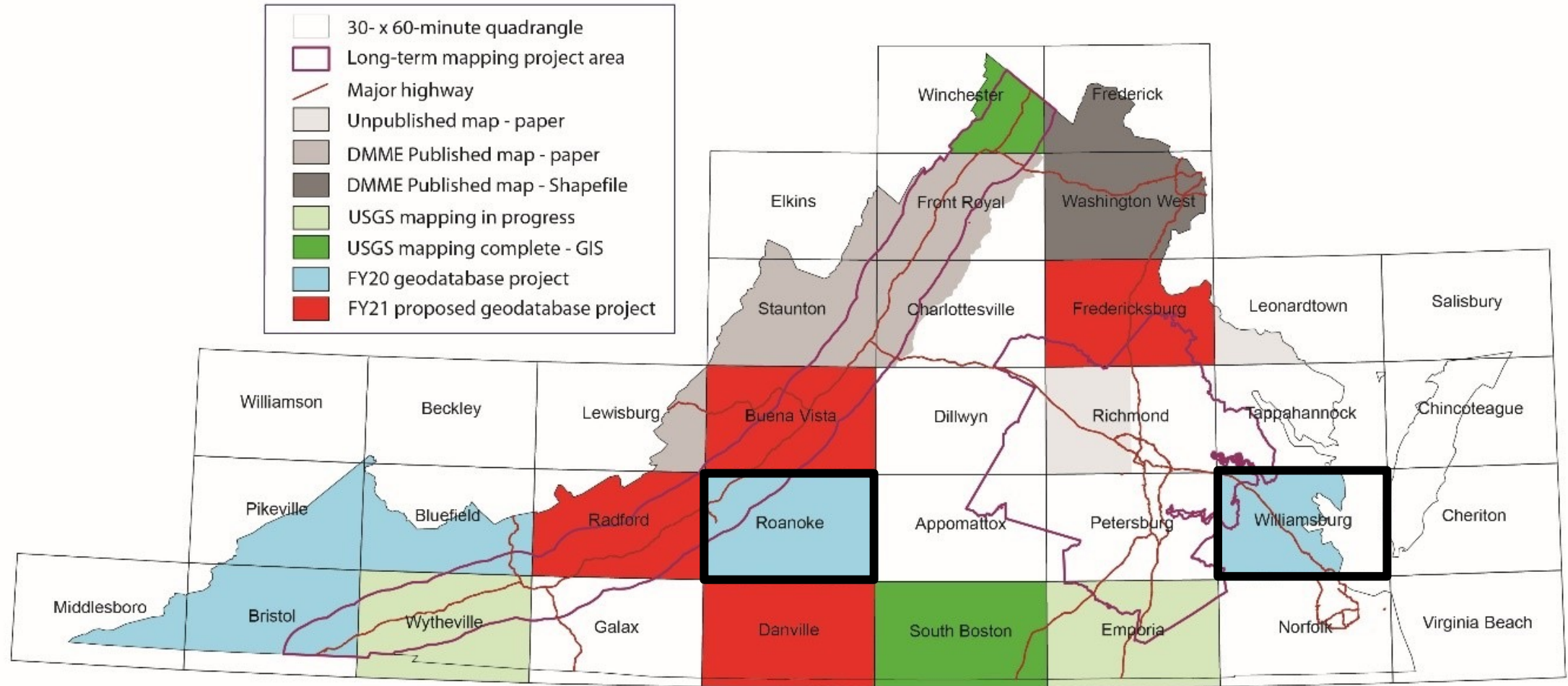
# Master DAS ID list in VA:

DAS ID	Source/ Citation
DAS009	Andrews, L.E., Jr., 1952, Structure of the area north of Roanoke, Virginia [Ph.D. dissertation]: Johns Hopkins University, Baltimore, Maryland, 126 p.
DAS010	Averitt, P., 1941, The Early Grove gas field, Scott and Washington counties, Virginia: Virginia Geological Survey Bulletin 56, 50 p.
DAS011	Badger, R.L. and Sinha, A.K., 1988, Age and Sr isotopic signature of the Catoctin volcanic province: Implications for subcrustal mantle evolution: <i>Geology</i> , v. 16, p. 692-695.
DAS012	Bailey, C.M. and Simpson, C., 1993, Extensional and contractional deformation in the Blue Ridge Province, Virginia: <i>Geological Society of America Bulletin</i> , v. 105, n. 4, p. 411-422.

- *Master DASID list for all GeMS deliverables in VA (800+ sources and counting)*
- *This list was a by product of our Statewide compilation*
- *Have a similar list for all glossary terms*



# 100K Scale Quadrangles in Virginia FY20:



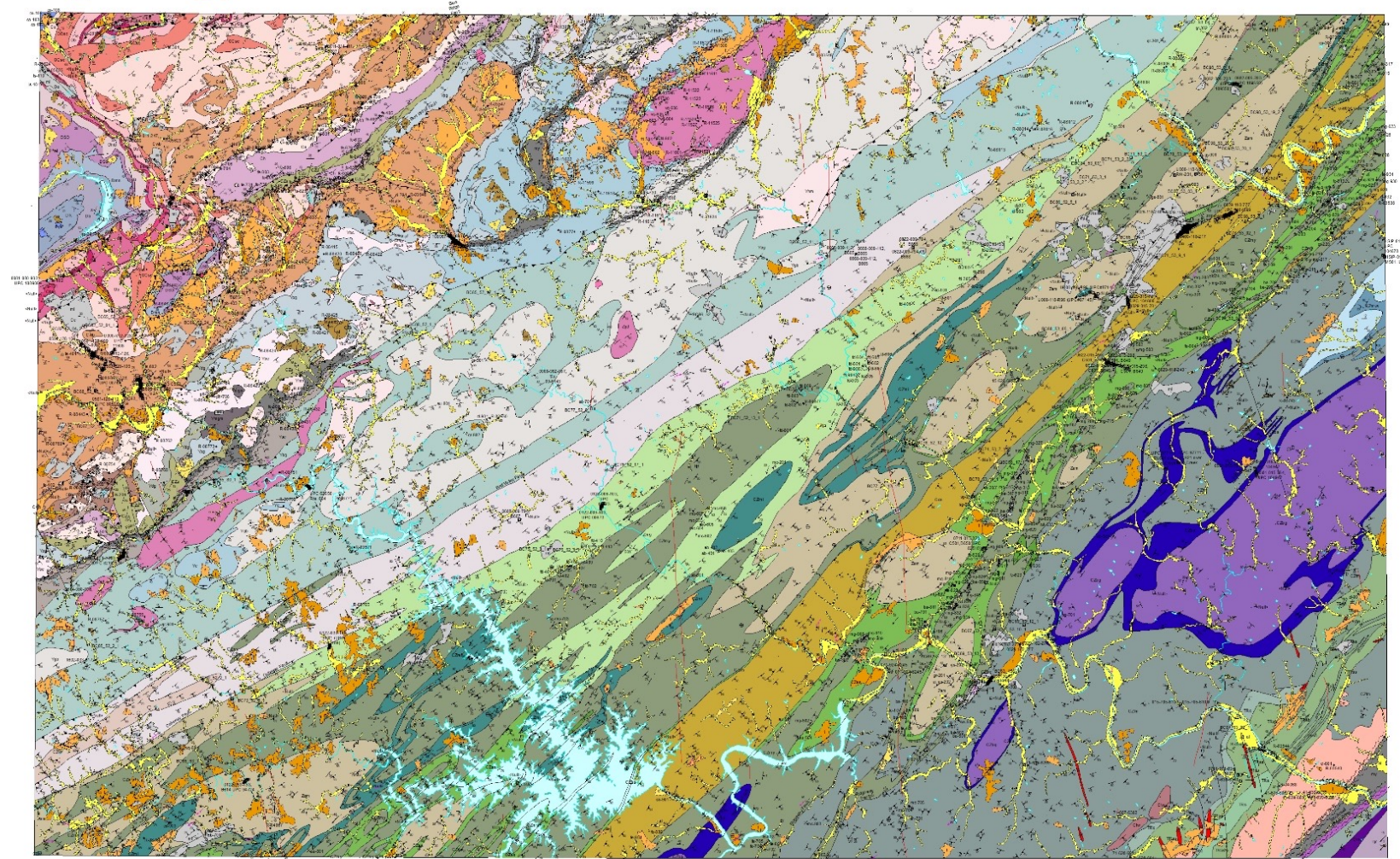
# GEOLOGIC MAP DATABASE OF THE ROANOKE 30 X 60 MINUTE QUADRANGLE



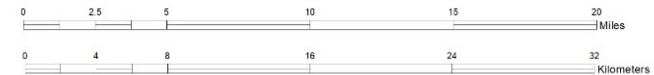
Bedrock Geology by William S. Ilenika  
Surficial Geology by Holly E. Mangum and Jeffrey B. Stewart  
Digital compilation by Holly E. Mangum and Matt J. Heller

# Roanoke 100K Compilation:

- Mini-map collar
- 2 layer GeMS map
- Draft until published, coming soon!



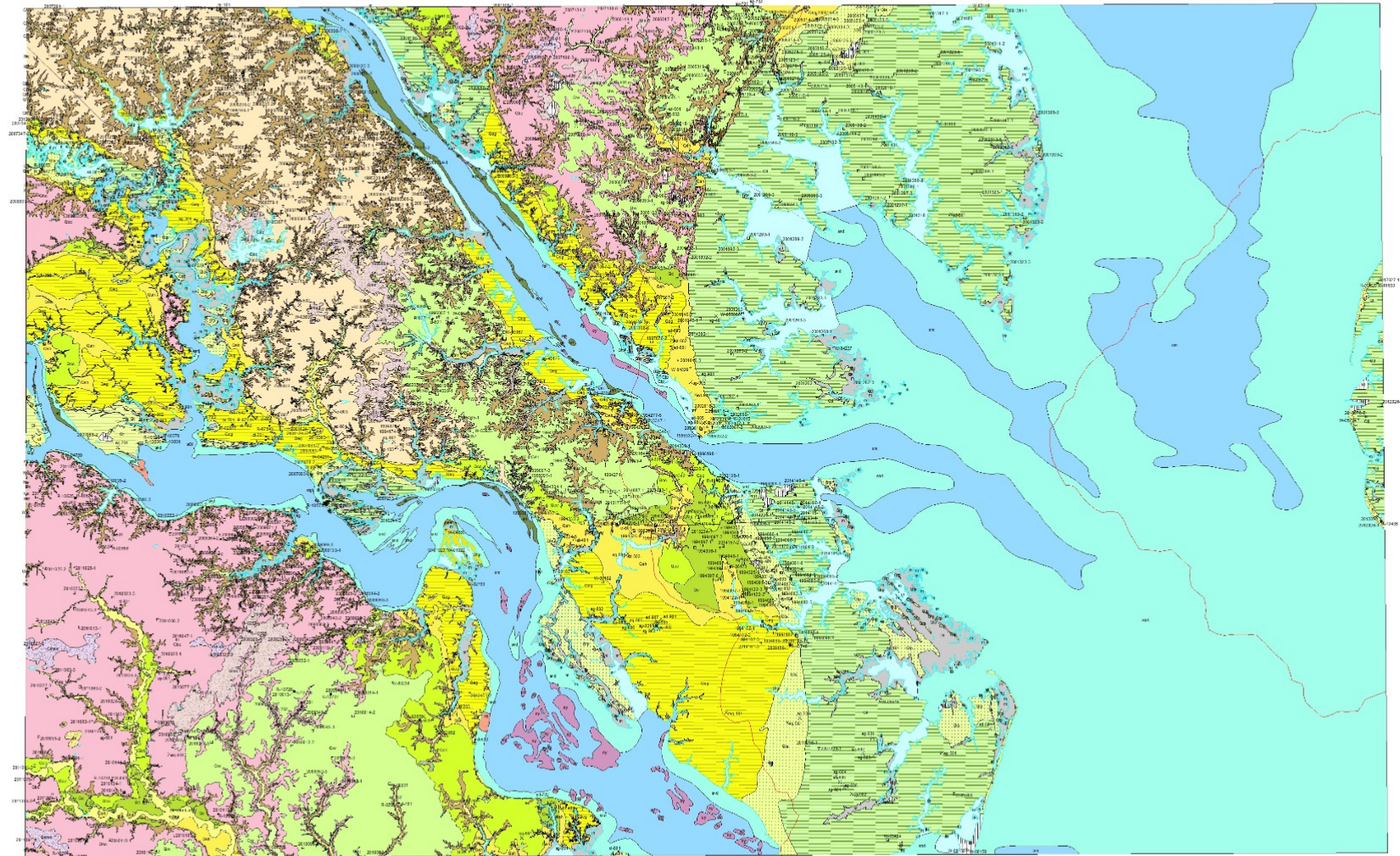
Geodatabase Layers Projected in NAD 1983  
State Plane Virginia South FIPS 4502 Feet



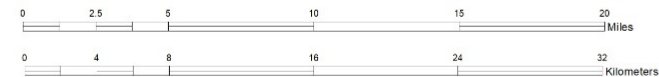


# Williamsburg 100K Compilation:

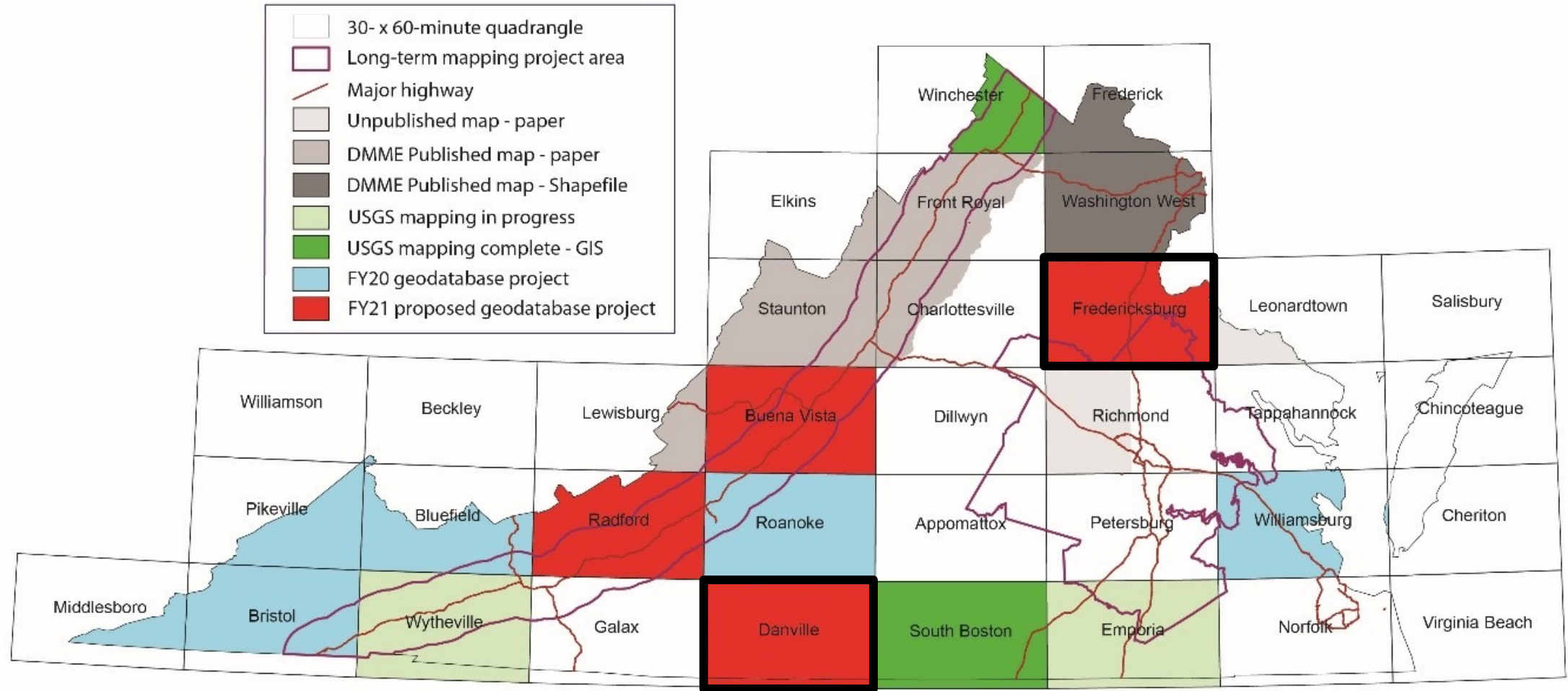
- Mini-map collar
- 1 layer GeMS map
- Draft until published, coming soon!



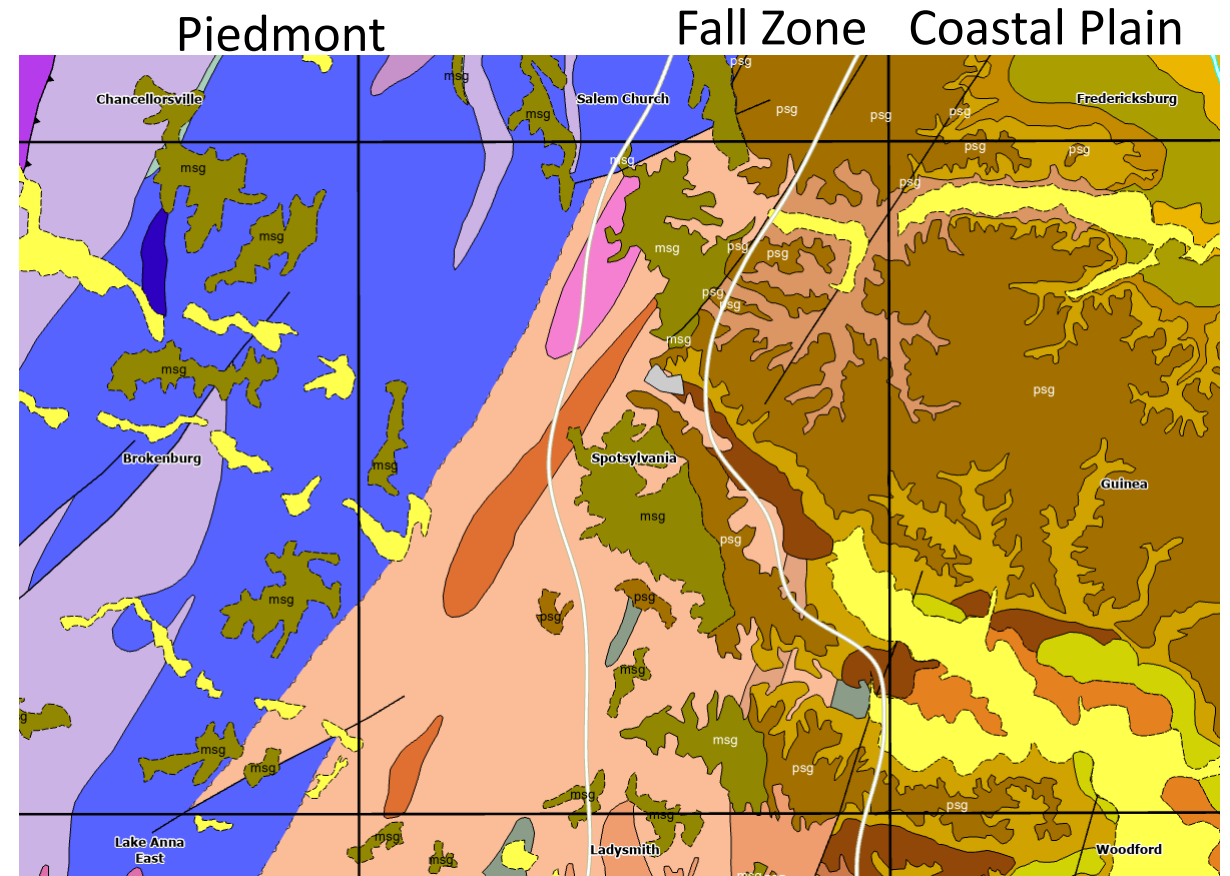
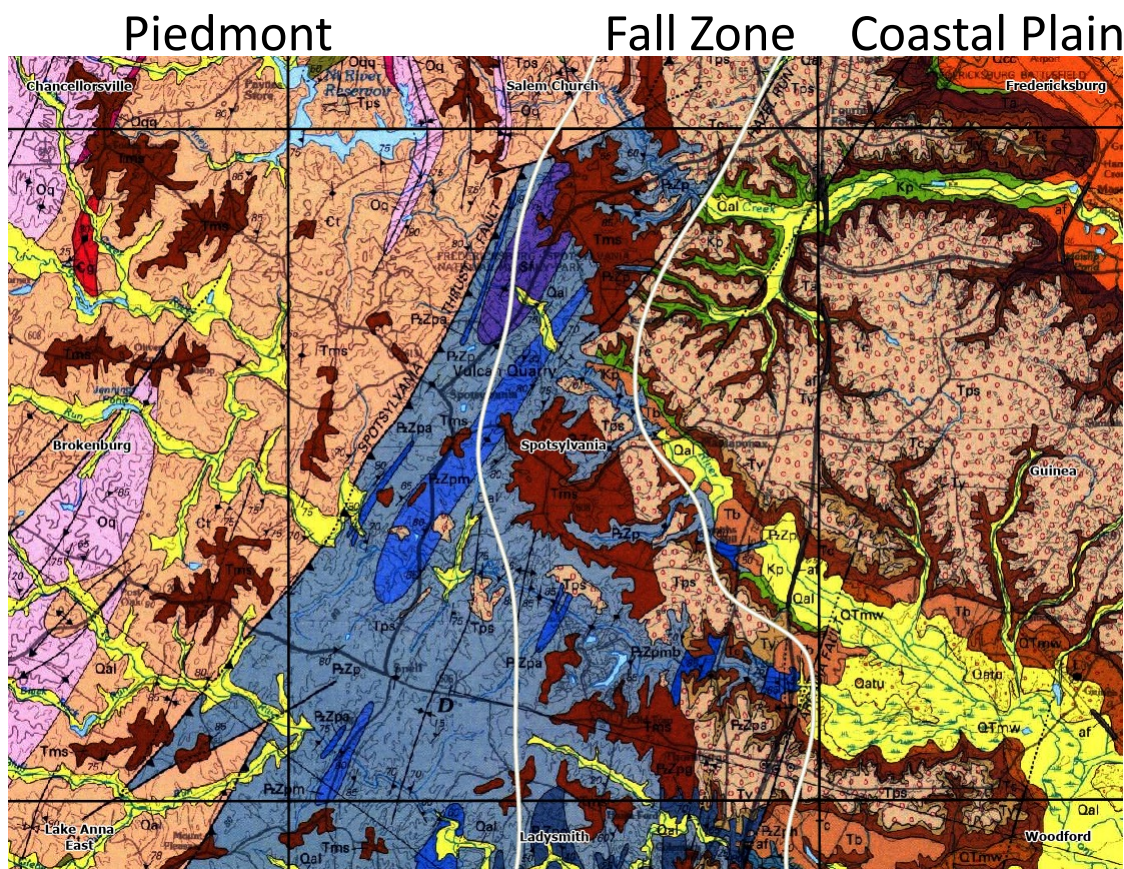
Geodatabase Layers Projected in NAD 1983  
State Plane Virginia South FIPS 4502 Feet



# 100K Scale Quadrangles in Virginia FY 21:



# Fredericksburg 100K Compilation:



➤ *Should there be a standard approach to the Fall Zone units in GeMS? (MUP vs MUOPs)*

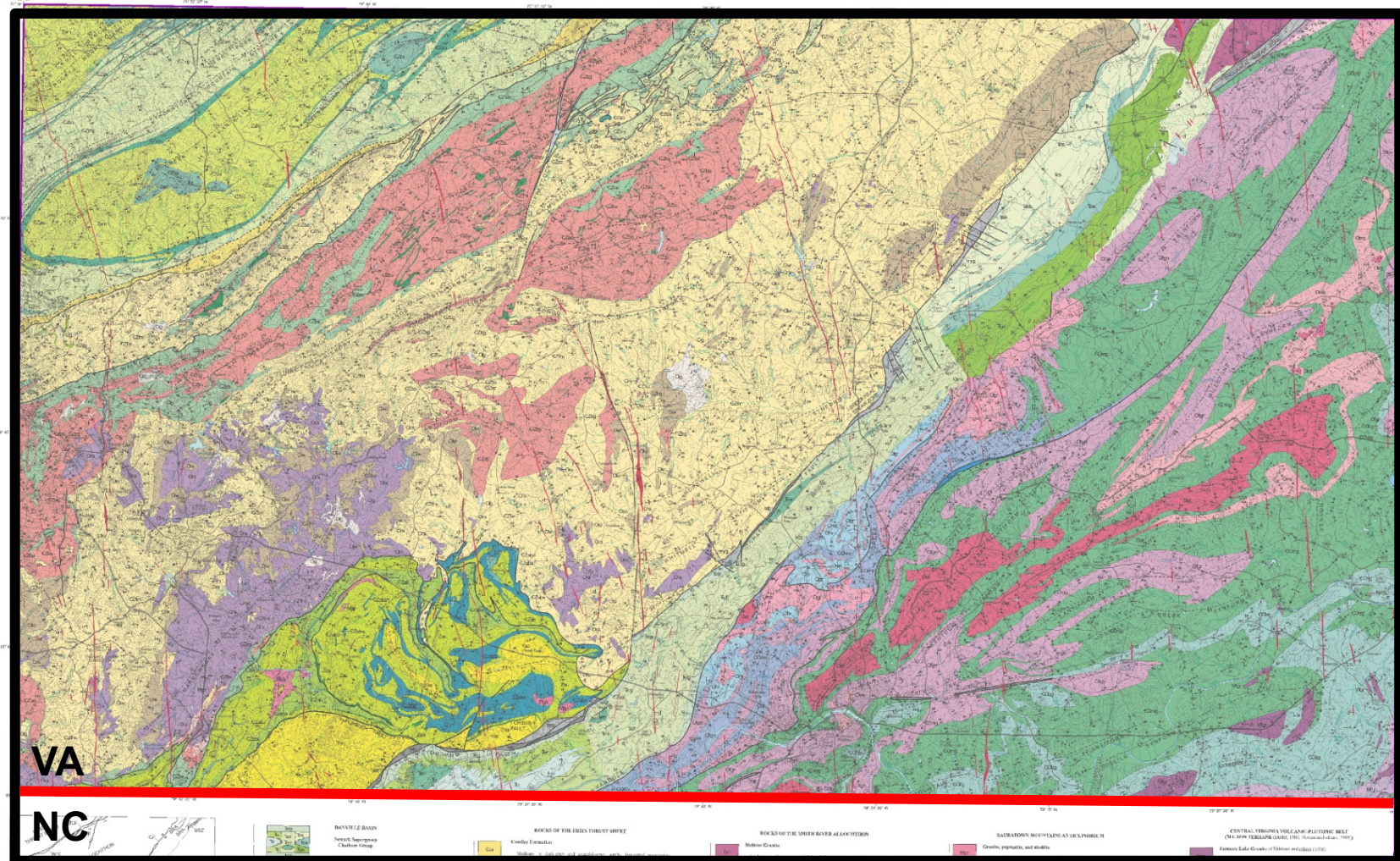
# Danville 100K Compilation:

- FY21 2 layer map
- GeMS Level 3 compliant geodatabase
- Interstate project with North Carolina!
  - VA: surficial mapping
  - NC: bedrock mapping
- In progress, to be delivered this fall

COMMONWEALTH OF VIRGINIA  
DEPARTMENT OF MINES, MINERALS AND ENERGY  
DIVISION OF MINERAL RESOURCES

GEOLOGIC MAP OF THE VIRGINIA PORTION OF THE DANVILLE 30 X 60 MINUTE QUADRANGLE

Geology compiled by William S. Henika  
2002



2002 Danville 30 x 60 minute map

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# Grid tiles for Surficial fieldwork:

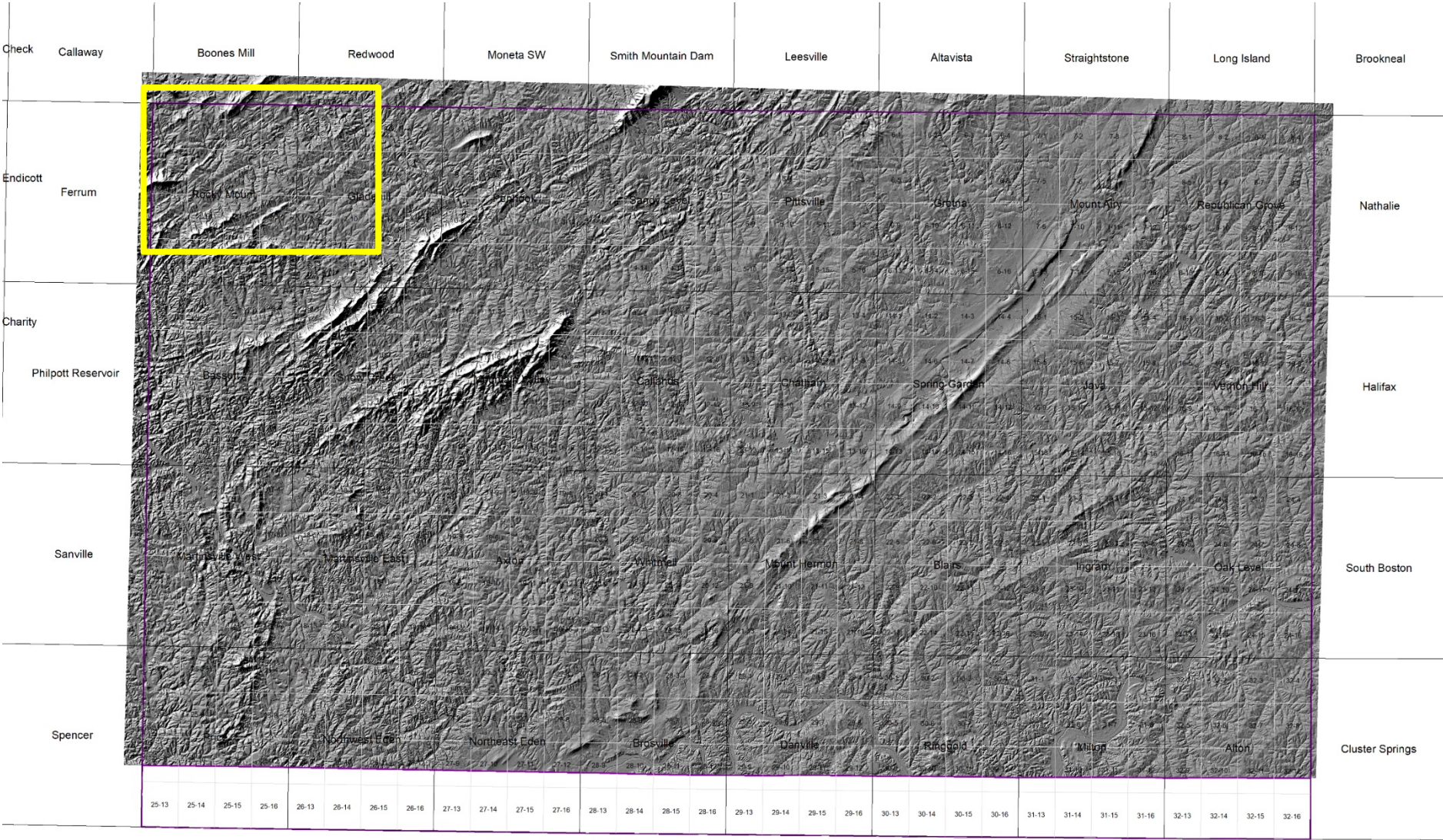
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1-5	1-6	1-7	1-8	2-5	2-6	2-7	2-8	3-5	3-6	3-7	3-8	4-5	4-6	4-7	4-8	5-5	5-6	5-7	5-8	6-5	6-6	6-7	6-8	7-5	7-6	7-7	7-8	8-5	8-6	8-7	8-8
Rocky Mount				Gladehill				Penhook				Sandy Level				Pittsville				Gretna				Mount Airy				Republican Grove			
1-9	1-10	1-11	1-12	2-9	2-10	2-11	2-12	3-9	3-10	3-11	3-12	4-9	4-10	4-11	4-12	5-9	5-10	5-11	5-12	6-9	6-10	6-11	6-12	7-9	7-10	7-11	7-12	8-9	8-10	8-11	8-12
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Bassett				Snow Creek				Mountain Valley				Callands				Chatham				Spring Garden				Java				Vernon Hill			
9-9	9-10	9-11	9-12	10-9	10-10	10-11	10-12	11-9	11-10	11-11	11-12	12-9	12-10	12-11	12-12	13-9	13-10	13-11	13-12	14-9	14-10	14-11	14-12	15-9	15-10	15-11	15-12	16-9	16-10	16-11	16-12
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Martinsville West				Martinsville East				Axton				Whitmell				Mount Hermon				Blairs				Ingram				Oak Level			
17-9	17-10	17-11	17-12	18-9	18-10	18-11	18-12	19-9	19-10	19-11	19-12	20-9	20-10	20-11	20-12	21-9	21-10	21-11	21-12	22-9	22-10	22-11	22-12	23-9	23-10	23-11	23-12	24-9	24-10	24-11	24-12
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25-5	25-6	25-7	25-8	26-5	26-6	26-7	26-8	27-5	27-6	27-7	27-8	28-5	28-6	28-7	28-8	29-5	29-6	29-7	29-8	30-5	30-6	30-7	30-8	31-5	31-6	31-7	31-8	32-5	32-6	32-7	32-8
Price				Northwest Eden				Northeast Eden				Brosville				Danville				Ringgold				Milton				Alton			
25-9	25-10	25-11	25-12	26-9	26-10	26-11	26-12	27-9	27-10	27-11	27-12	28-9	28-10	28-11	28-12	29-9	29-10	29-11	29-12	30-9	30-10	30-11	30-12	31-9	31-10	31-11	31-12	32-9	32-10	32-11	32-12
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Virginia

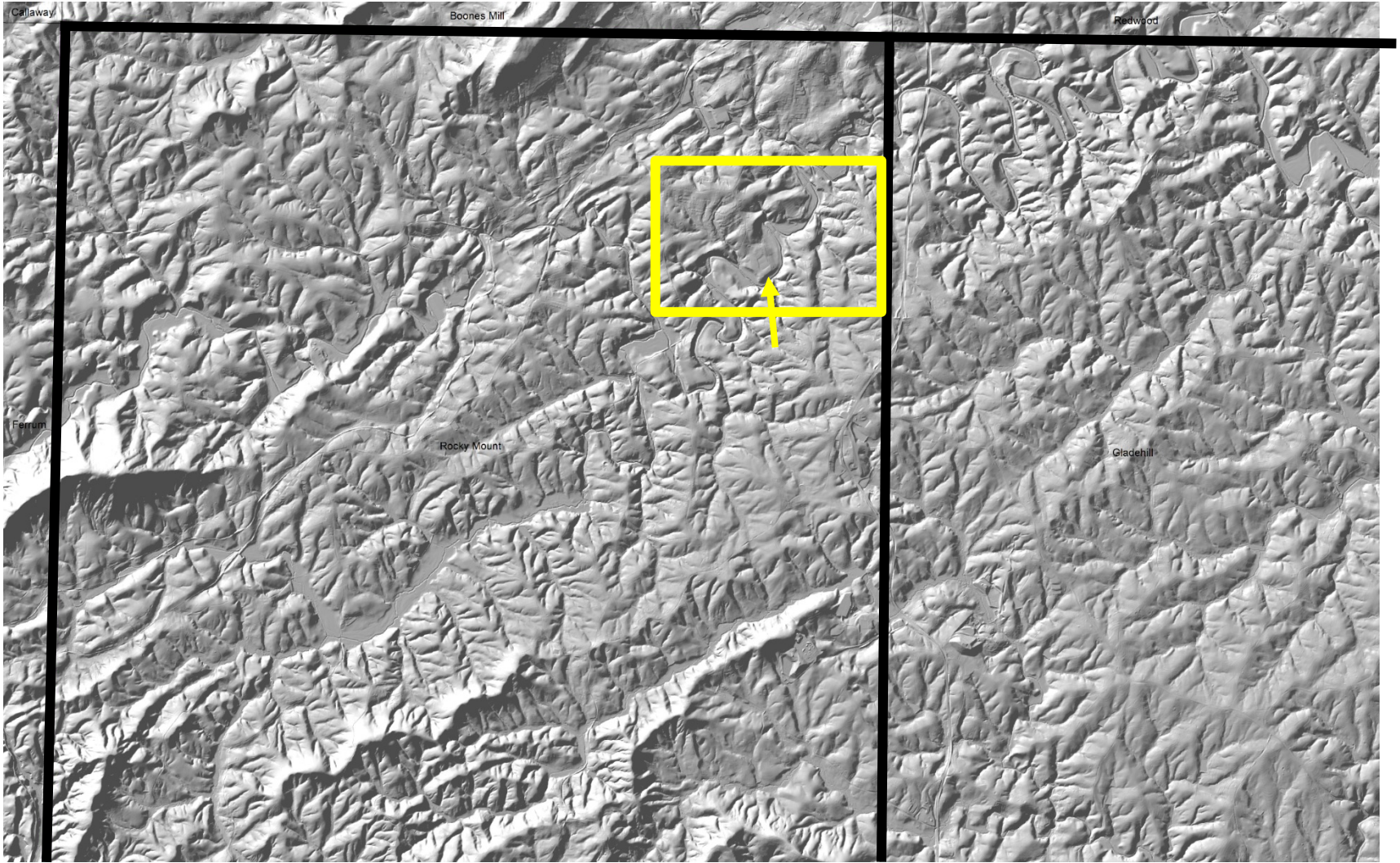
North Carolina



# Grid tiles for Surficial fieldwork:



1:50K

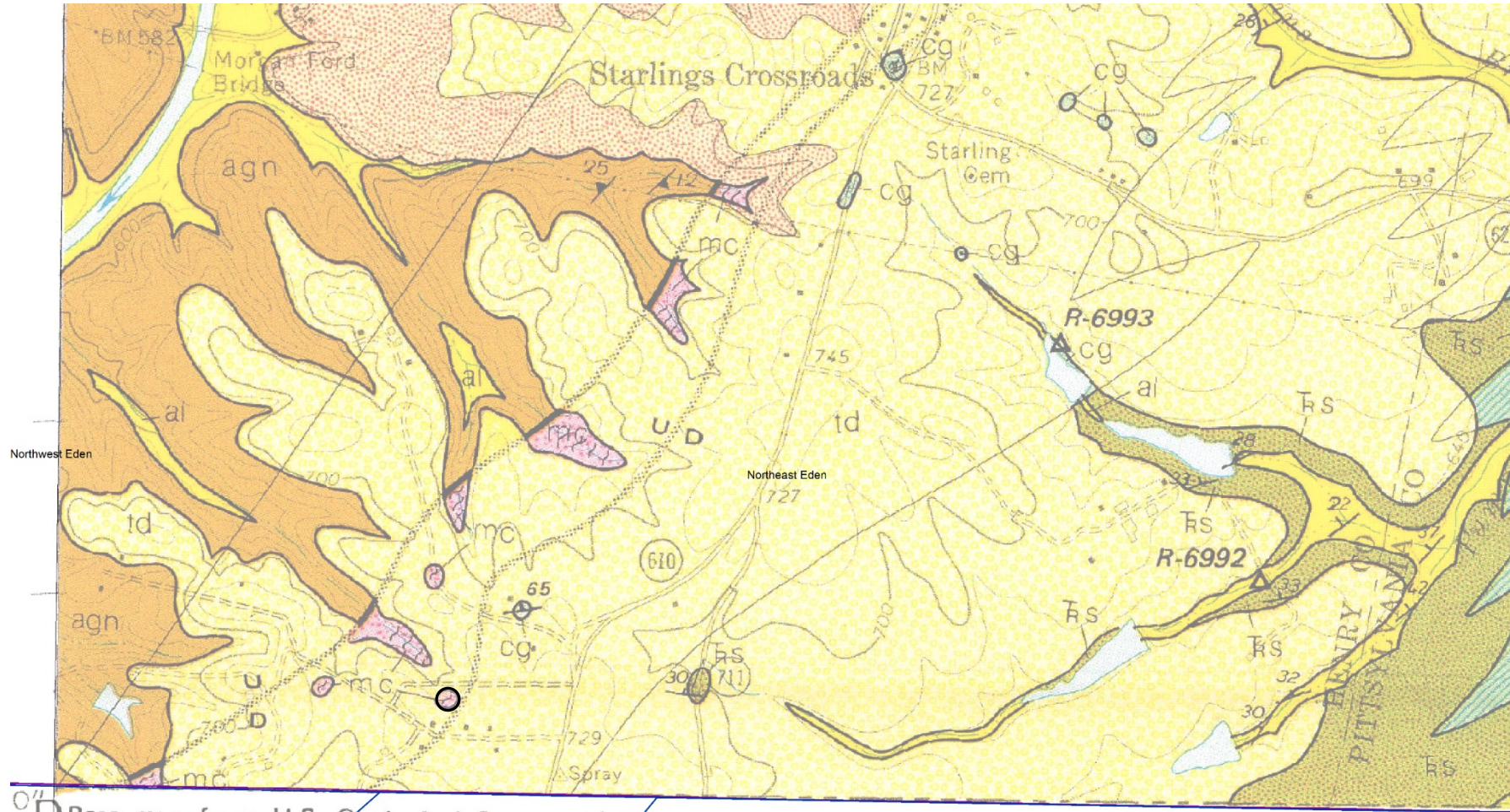


1:10K



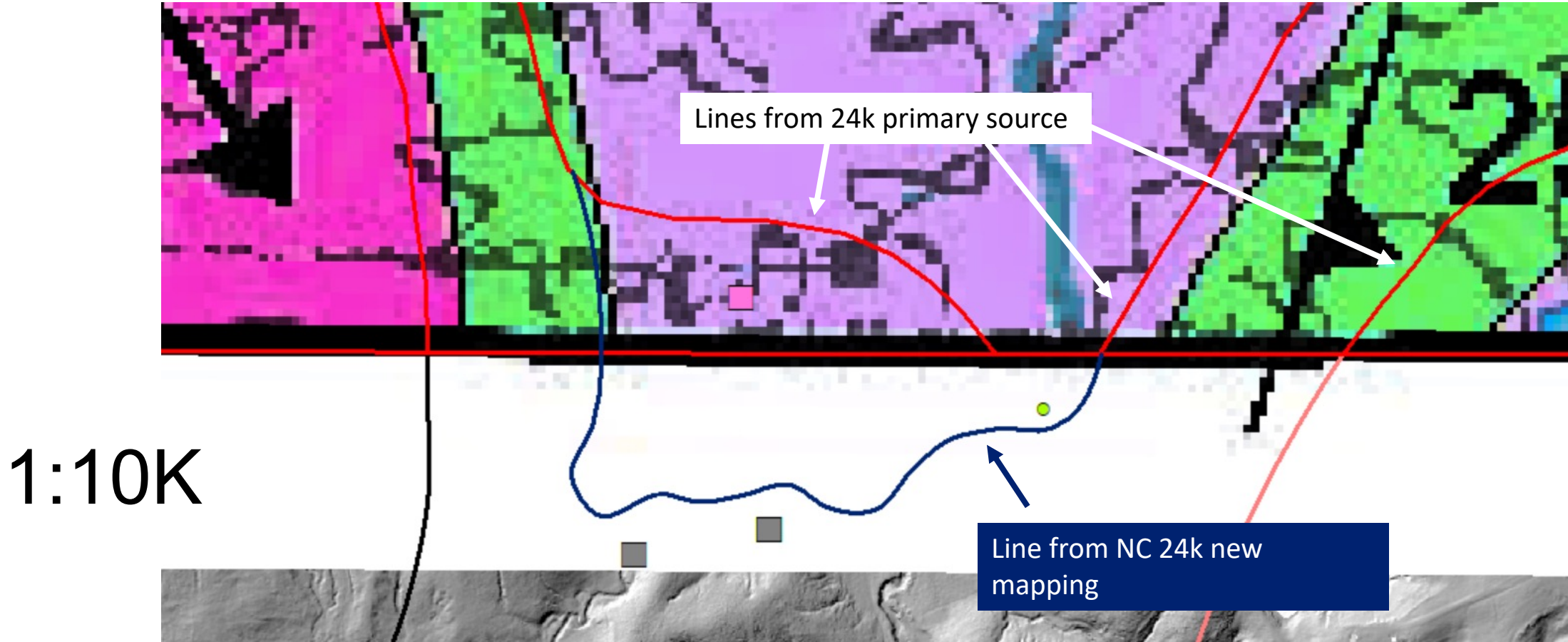
Gladehill

# Danville Interstate Collaboration w/ VA and NC



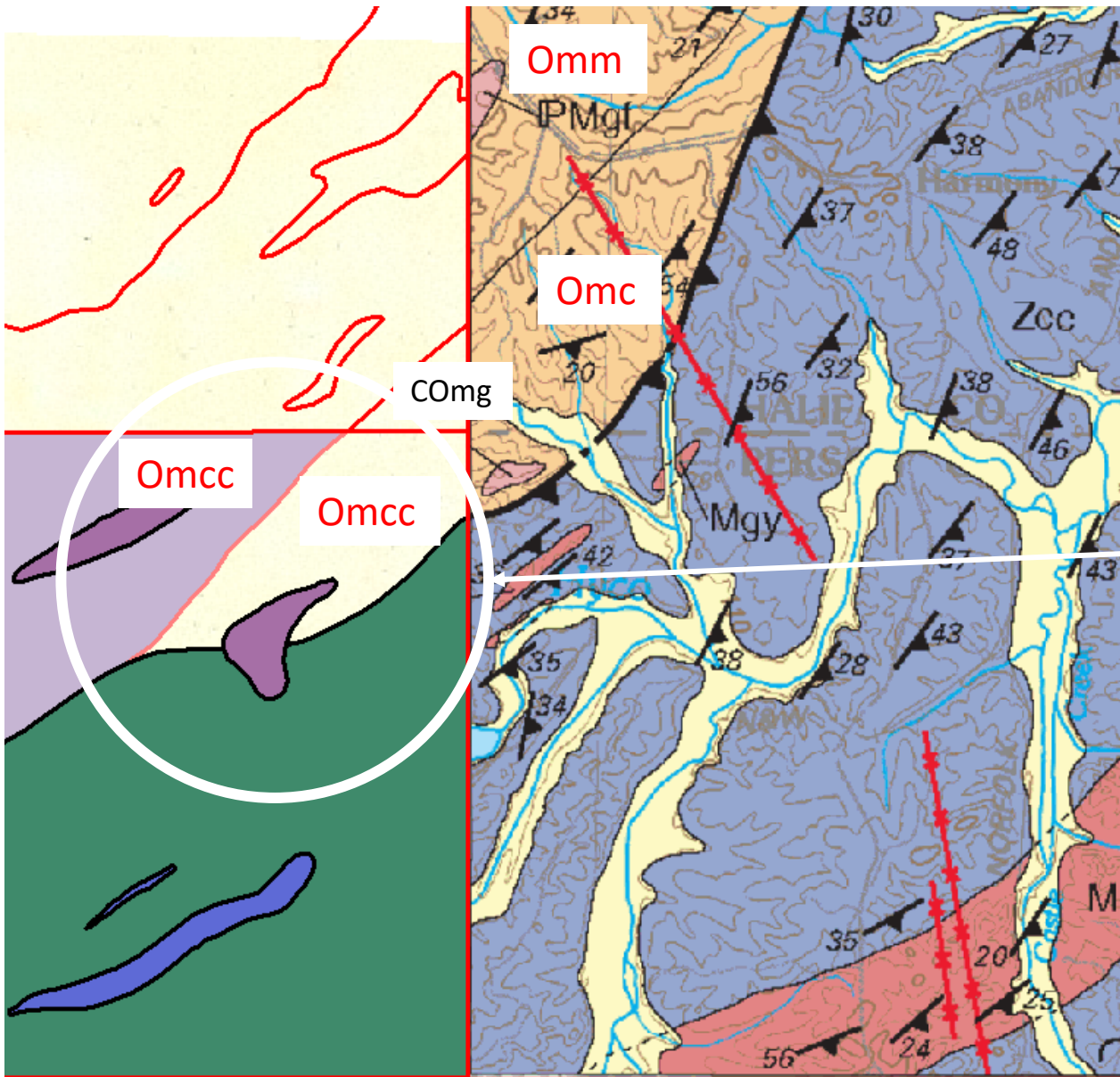
011  
D Base map from U.S. Geological Survey, 1965  
Axton and 1965 (79 PR) Northeast Eden Quadrangles,  
7 1/2 Minute Series

# Danville Edgematching:



*Note: Images on this slide provided from ongoing communications and mapping with North Carolina Geological Survey, and are still in draft stages.*

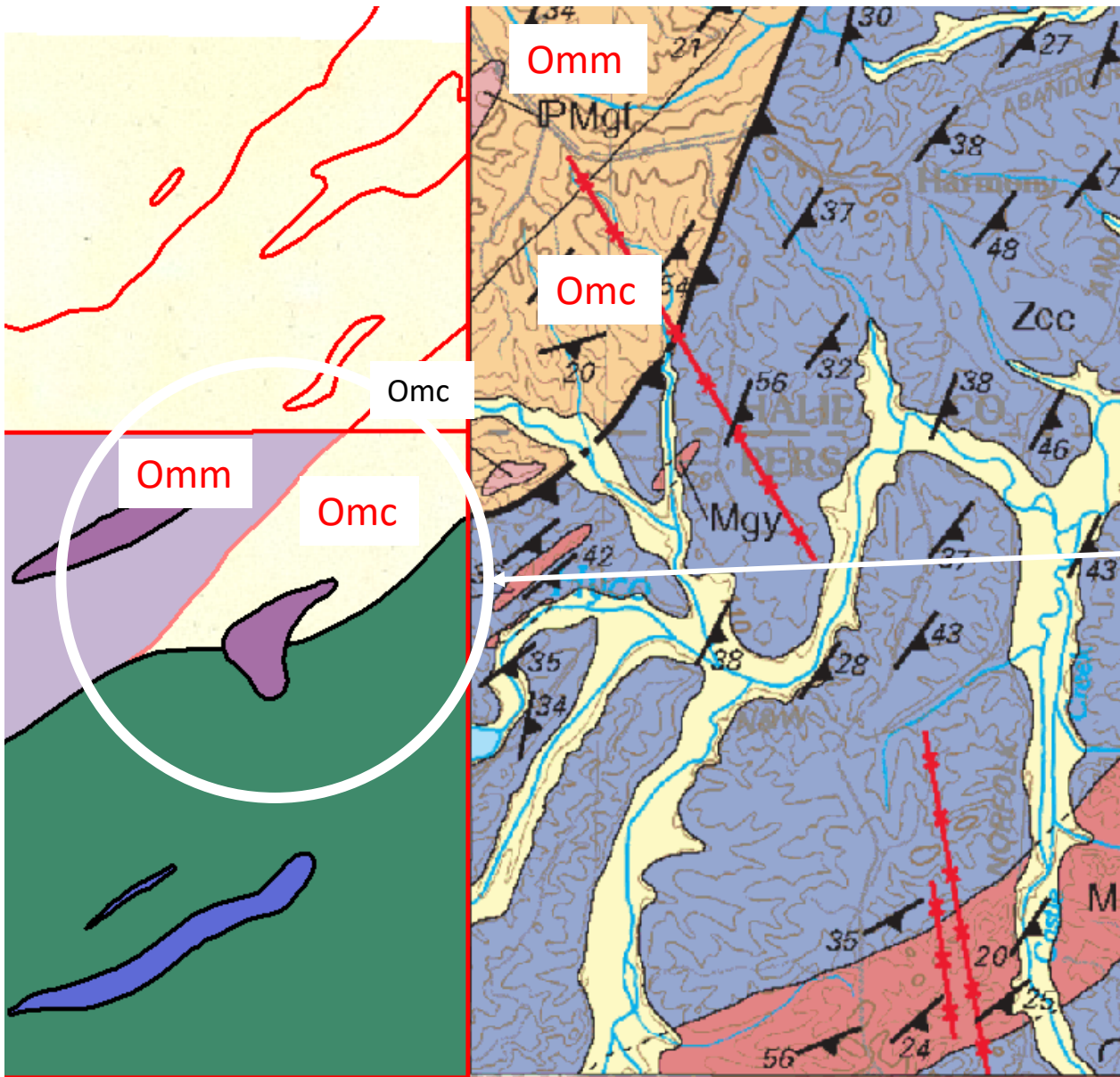
# Edgematching 100K maps:



South Boston	Hibbard	Henika
<b>Omm</b> [Biotite gneiss and schist of Cedar Grove of the Cunningham Complex]; <b>Omc</b> [Biotite gneiss of Halifax]	<b>Omcc</b> [Cunningham Complex]	<b>COmg</b> [Chopawomsic upper unit]

Note: Images on this slide provided from ongoing communications and mapping with North Carolina Geological Survey, and are still in draft stages.

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Note: Images on this slide provided from ongoing communications and mapping with North Carolina Geological Survey, and are still in draft stages.

# Summary and Conclusions:

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- GeMS is more applicable to 7.5 min quads
- Try figuring out frameworks for scale, Data Sources, and Glossary terms early
- Implement geodatabase reviews at different points along the project cycle
- States facing similar compilation projects at this scale – let's work together!
- These large compilation maps begin stratigraphic reconciliation between states and the Geolex nomenclature & bedrock edge-matching



*The Danville Team: Holly Mangum, Catherine Brown, Phil Bradley, Emily Michael, and Katie Lang*



# Acknowledgements:

- DMT organizers and hosts: Thank you for a wonderful conference!
- Thank you to the incredible staff at the Virginia Geological Survey (VA Dept. of Energy, Geology and Mineral Resources Program) on these large compilations: Holly Mangum, Catherine Brown, Lauren Williams, Anne Witt, Matt Heller, Marcie Occhi, David Spears, Bill Swanger
- Past geologists (VA, NC, USGS, & Universities) who have created our primary sources and geologic maps
- Phil Bradly and Emily Michael at the North Carolina Geological survey
- USGS for the STATEMAP funding
- The creators and editors of the GeMS code and tools – we appreciate all of the updates, office hours, and other help as we learn this new framework



*The Danville Team at the VA – NC state line! VA and the VA geologists to the left, NC and the NC geologists on the right.*

# Questions?

*Contact me:*

Katie E. Lang

**[katie.lang@energy.virginia.gov](mailto:katie.lang@energy.virginia.gov)**

Virginia Department of Energy, Geology and  
Mineral Resources Program (Virginia Geological  
Survey)



**Pictured: Terrace gravels in Danville, VA**