

DIGITAL MAPPING TECHNIQUES 2023

The following was presented at DMT'23

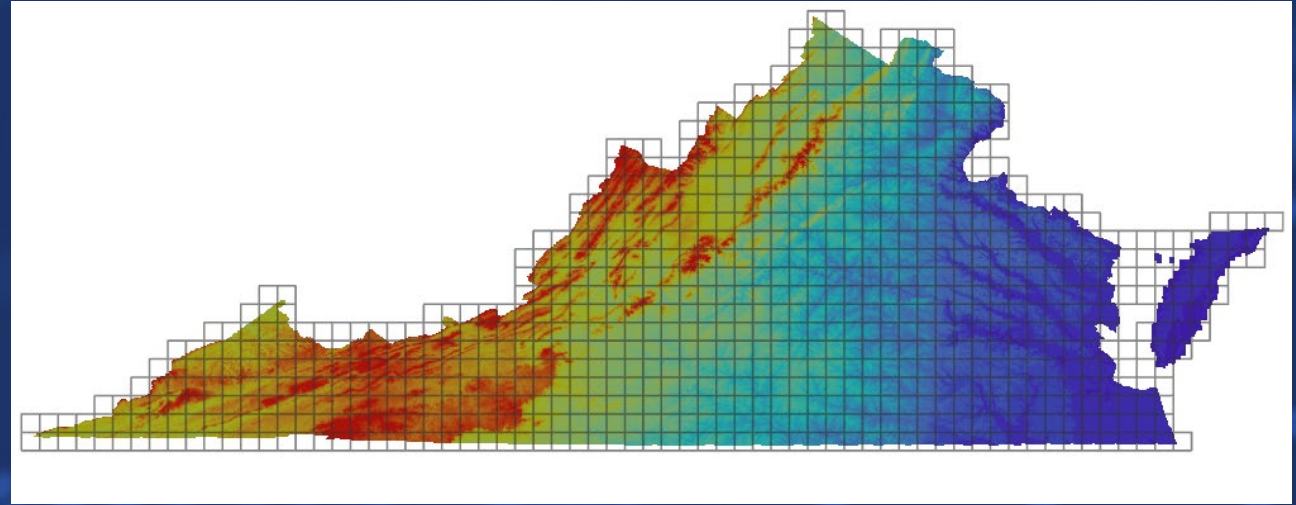
May 21 - 24, 2023

The contents of this document are provisional

See Presentations and Proceedings
from the DMT Meetings (1997-2023)

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

GEOLOGIC MAP PRIORITIZATION



DEVELOPMENT OF A QUADRANGLE RANKING SYSTEM

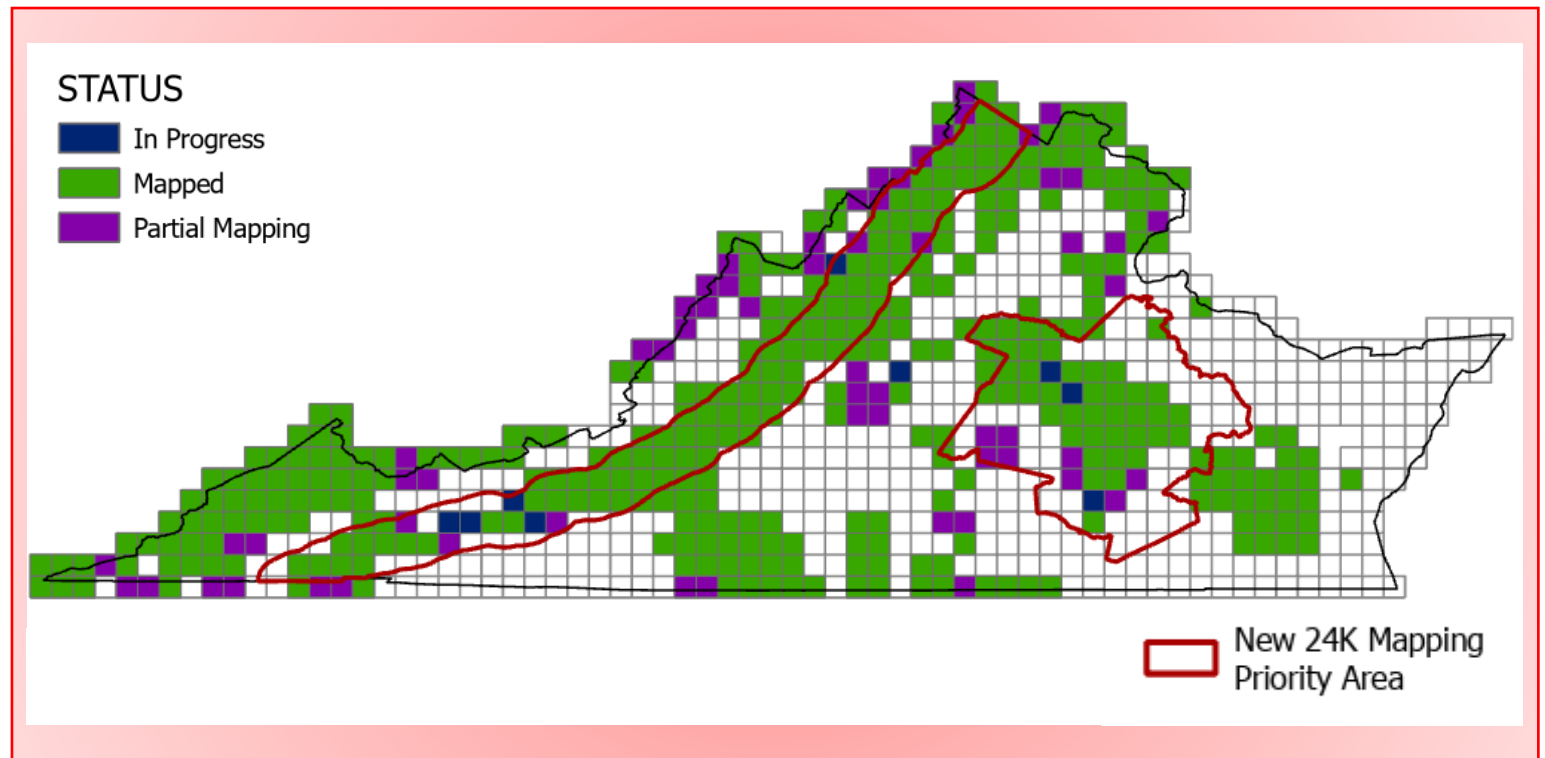
Lauren Williams, Matt Heller, Marcie Occhi and Patrick Finnerty
Geology and Mineral Resources Program, Virginia Department of Energy
DMT 2023, May 23, 2023



GEOLOGIC MAP PRIORITIZATION: DEVELOPMENT OF A QUADRANGLE RANKING SYSTEM

WHAT BROUGHT ABOUT THIS EXERCISE?

- Short term: Need for a long-range plan for GeMS compilation and conversions
- Long term: For new mapping, will need new priority areas
- This report was completed as a Statemap deliverable



DEVELOPING THE SYSTEM

- Met with our SMAC and presented potential criteria to be considered and received feedback.
- Staff collectively:
 - Discussed feedback from SMAC
 - Developed and categorized criteria
 - Selected relevant criteria datasets
 - Performed geospatial analysis
 - Developed weighted scoring system

PRIORITIZATION CRITERIA

➤ Natural Resources

Mineral Resources
Water Resources

➤ Geologic Hazards

Coastal Inundation
Earthquakes
Landslides
Karst

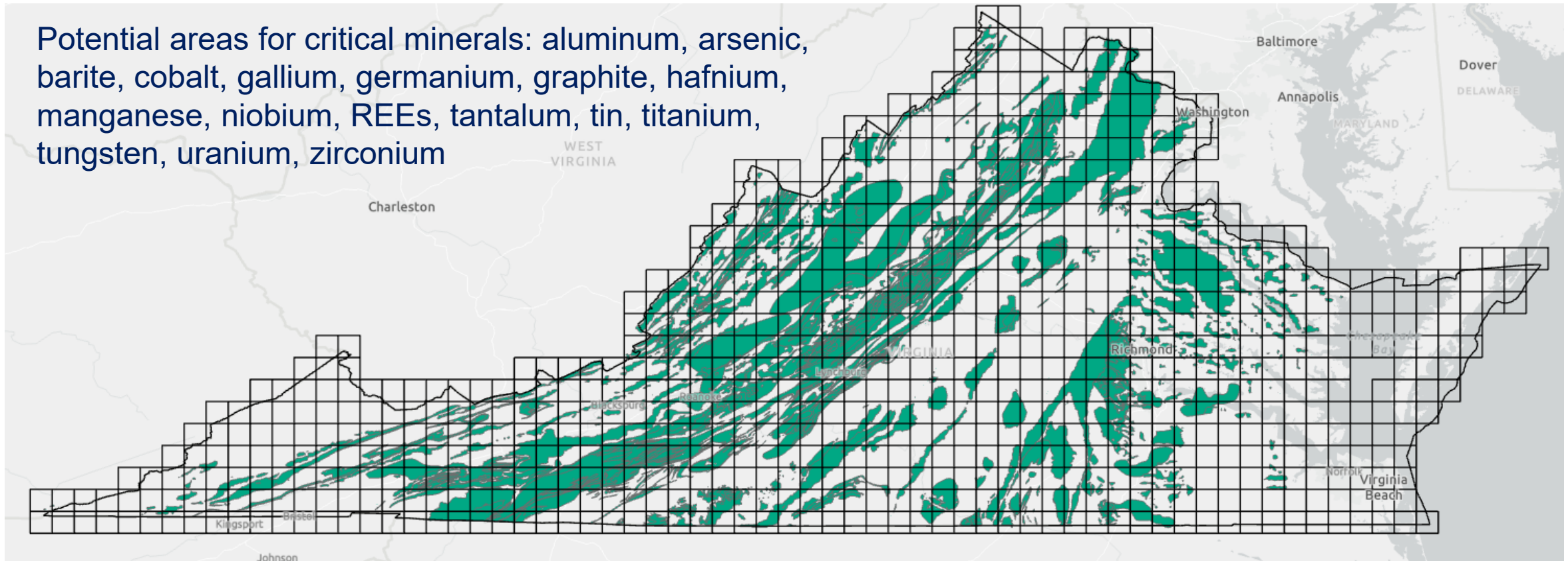
➤ Social, Environmental, and Economic Factors

Social Vulnerability Index
Development Vulnerability
Population Growth
Economic Opportunity Zones

GEOLOGIC MAP PRIORITIZATION: DEVELOPMENT OF A QUADRANGLE RANKING SYSTEM

NATURAL RESOURCES: **MINERAL RESOURCES**

Potential areas for critical minerals: aluminum, arsenic, barite, cobalt, gallium, germanium, graphite, hafnium, manganese, niobium, REEs, tantalum, tin, titanium, tungsten, uranium, zirconium



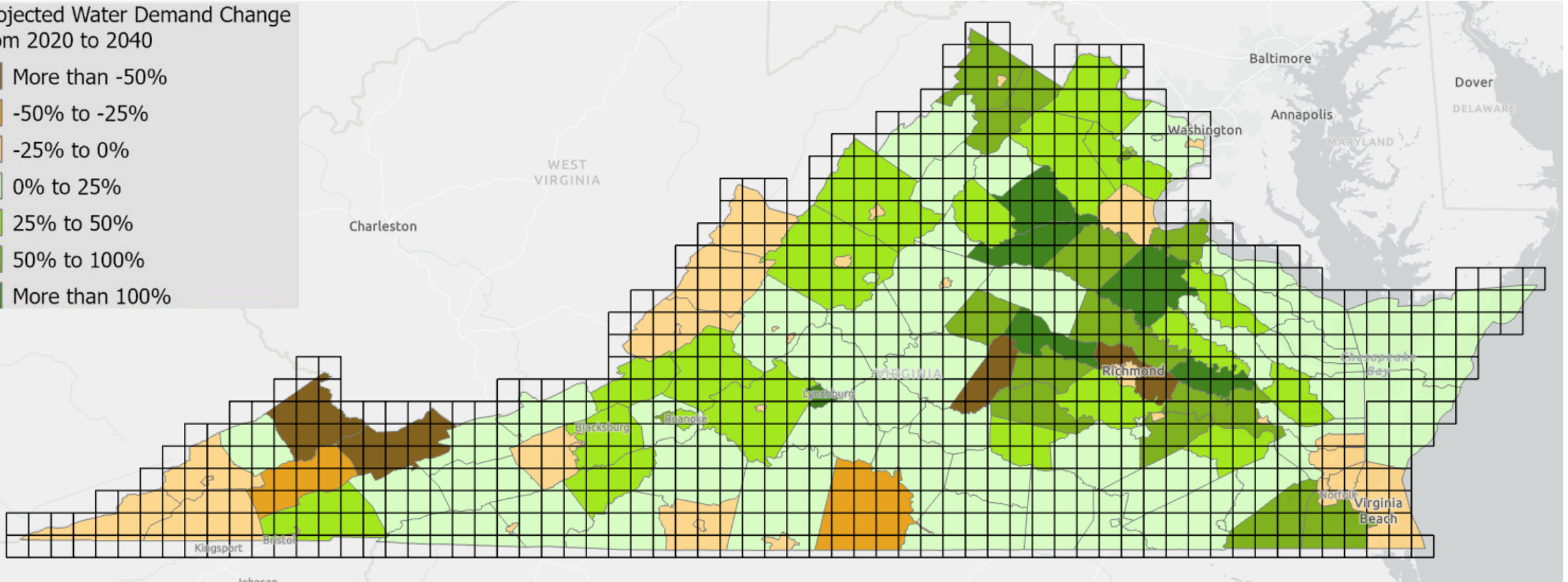
Mineral resource polygons developed in 2021 by DGMR Economic Geology section

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NATURAL RESOURCES: **WATER RESOURCES**

Projected Water Demand Change
from 2020 to 2040

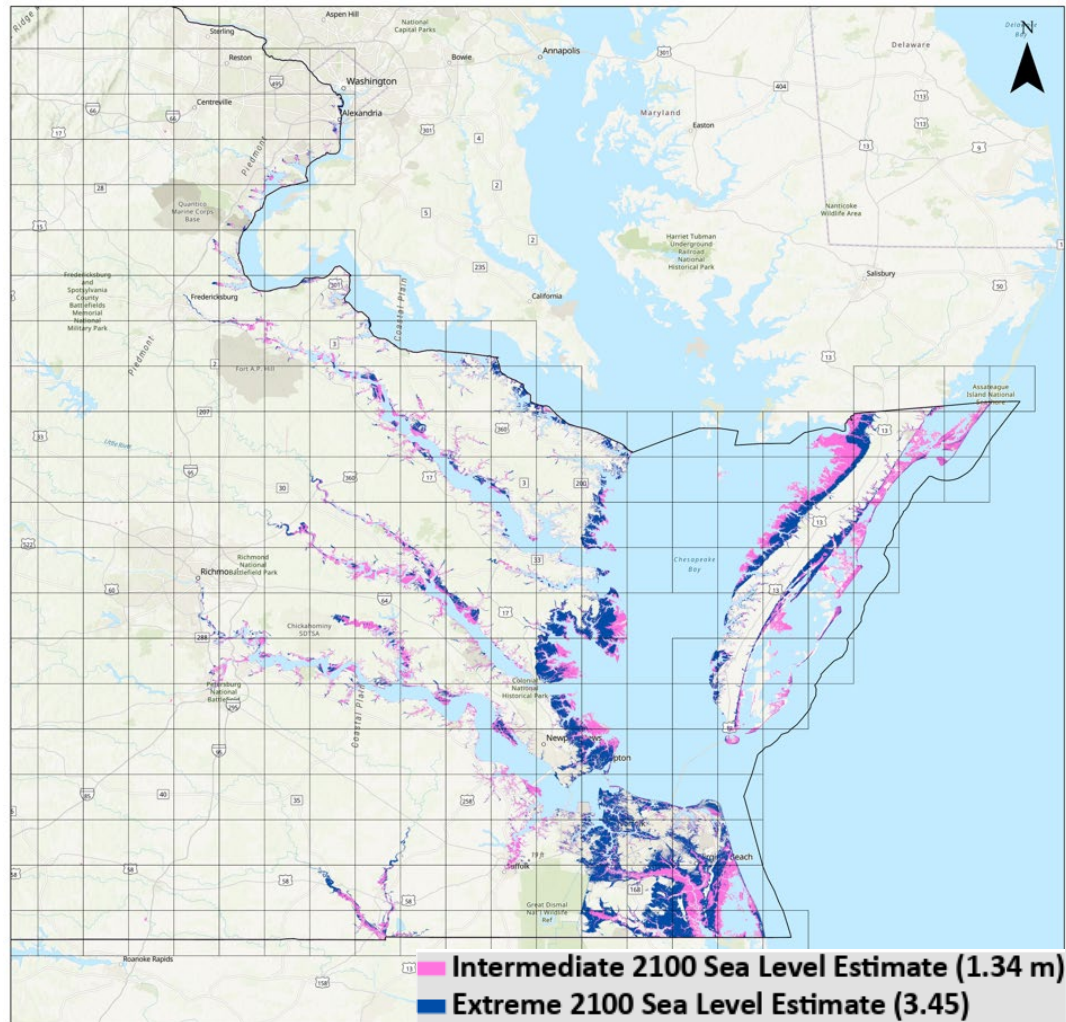
- More than -50%
- 50% to -25%
- 25% to 0%
- 0% to 25%
- 25% to 50%
- 50% to 100%
- More than 100%



Virginia Department of Environmental Quality, 2021, Draft Virginia Water Resources Plan

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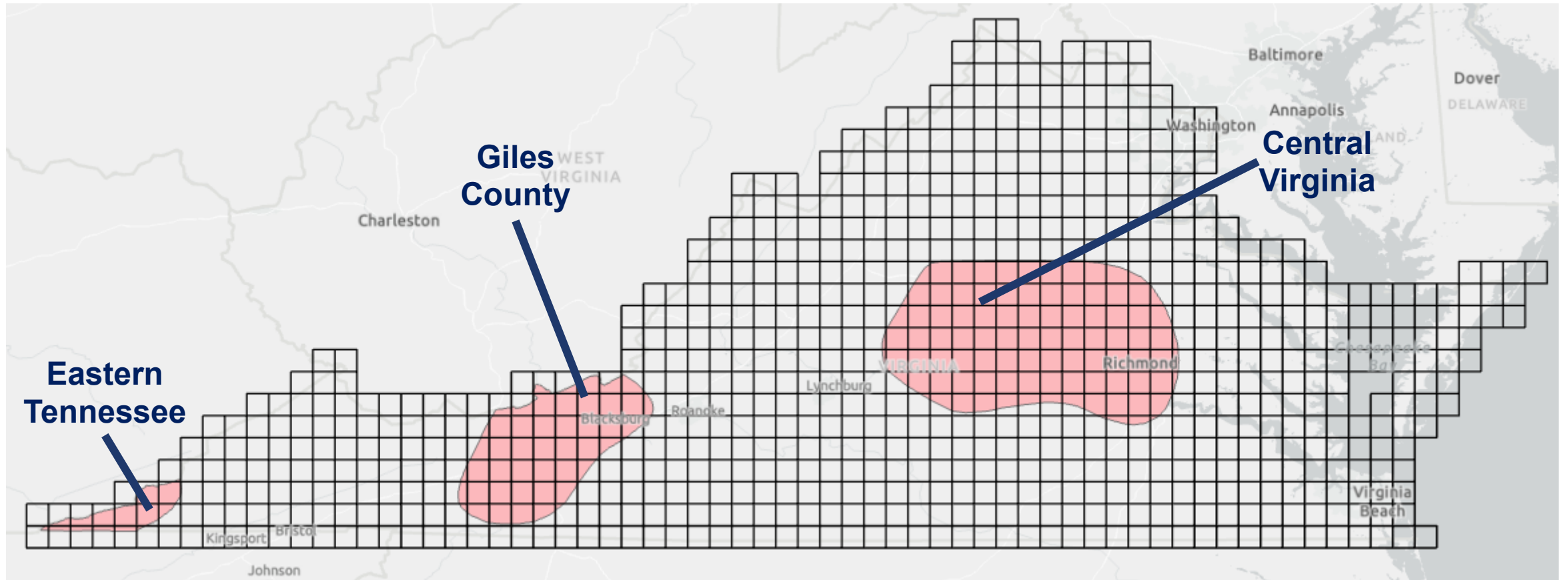
GEOLOGIC HAZARDS: COASTAL INUNDATION



Intermediate and extreme scenarios for Sewells Point, Virginia from Sweet and others, 2017; USACE, 2021

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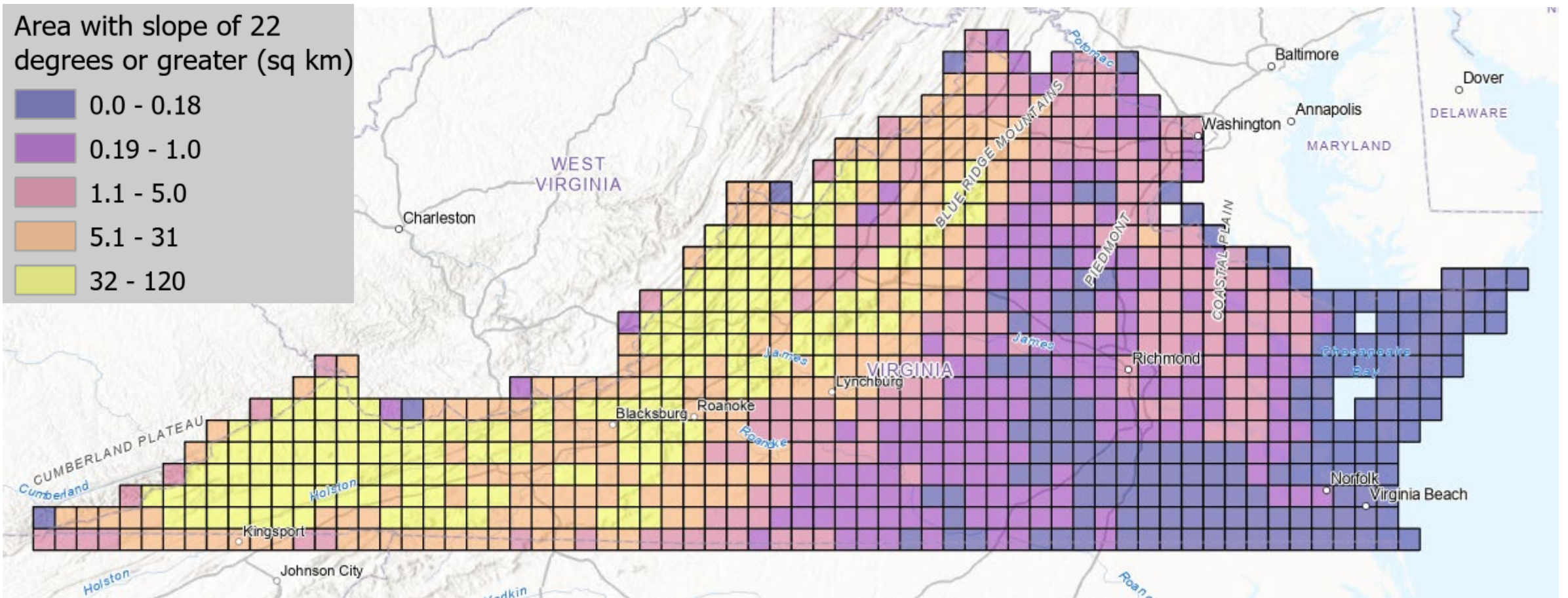
GEOLOGIC HAZARDS: EARTHQUAKES



Active seismic zones identified based on the density of historic earthquakes (Kelly and others, 2017)

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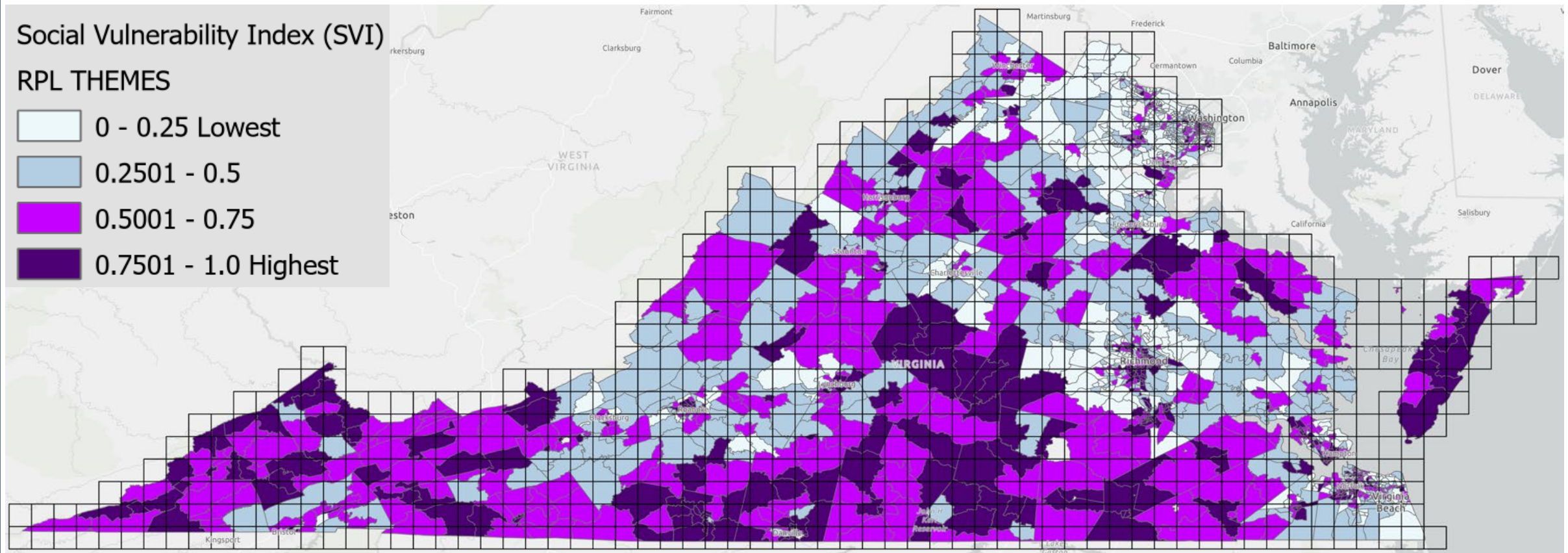
GEOLOGIC HAZARDS: **LANDSLIDES**



Area of 7.5-minute quadrangle (km²) with 22° slope or greater based on 5-meter DEM

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SOCIAL, ENVIRONMENTAL AND ECONOMIC FACTORS: **SOCIAL VULNERABILITY INDEX**



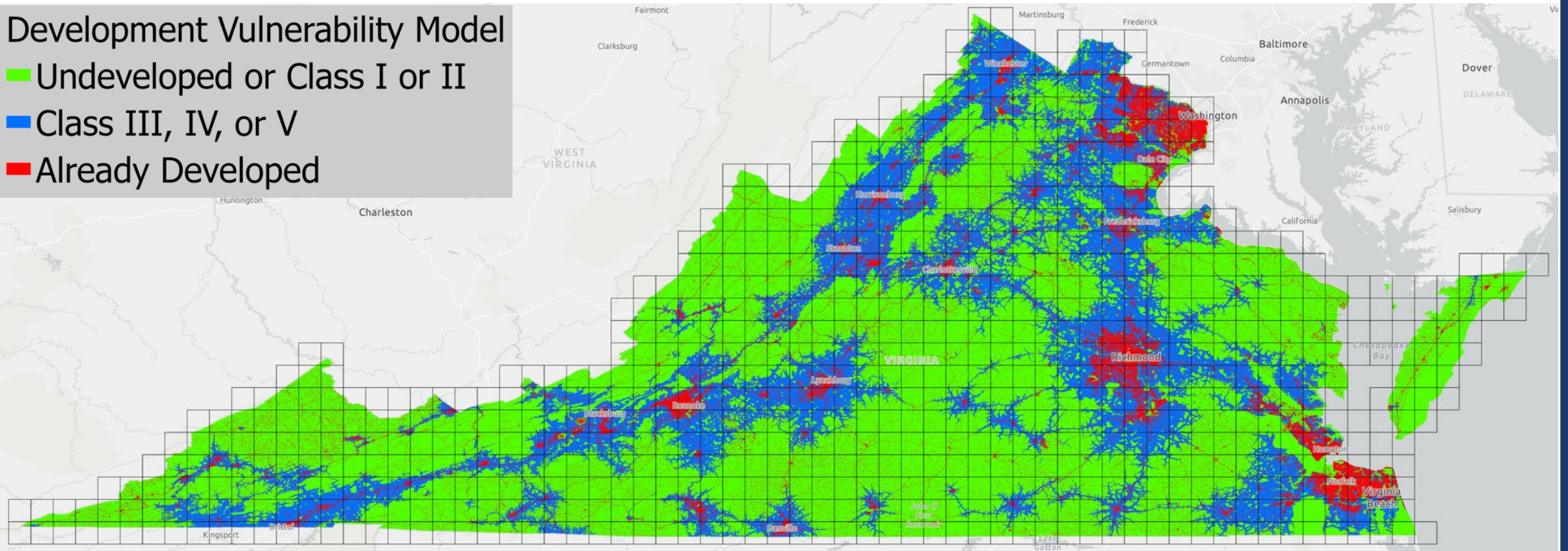
Social vulnerability in Virginia using the Social Vulnerability Index (CDC, 2018)

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SOCIAL, ENVIRONMENTAL AND ECONOMIC FACTORS: **DEVELOPMENT VULNERABILITY**

Development Vulnerability Model

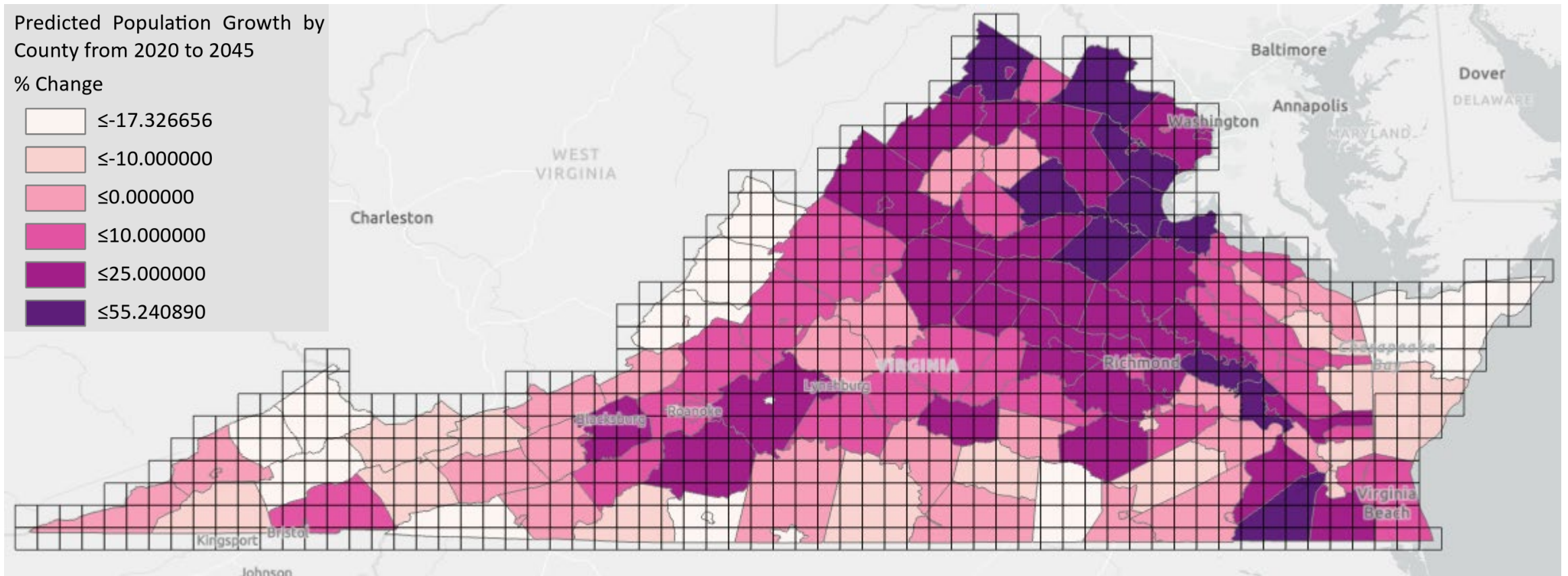
- Undeveloped or Class I or II
- Class III, IV, or V
- Already Developed



Model of vulnerability to development (VDCR, 2015)

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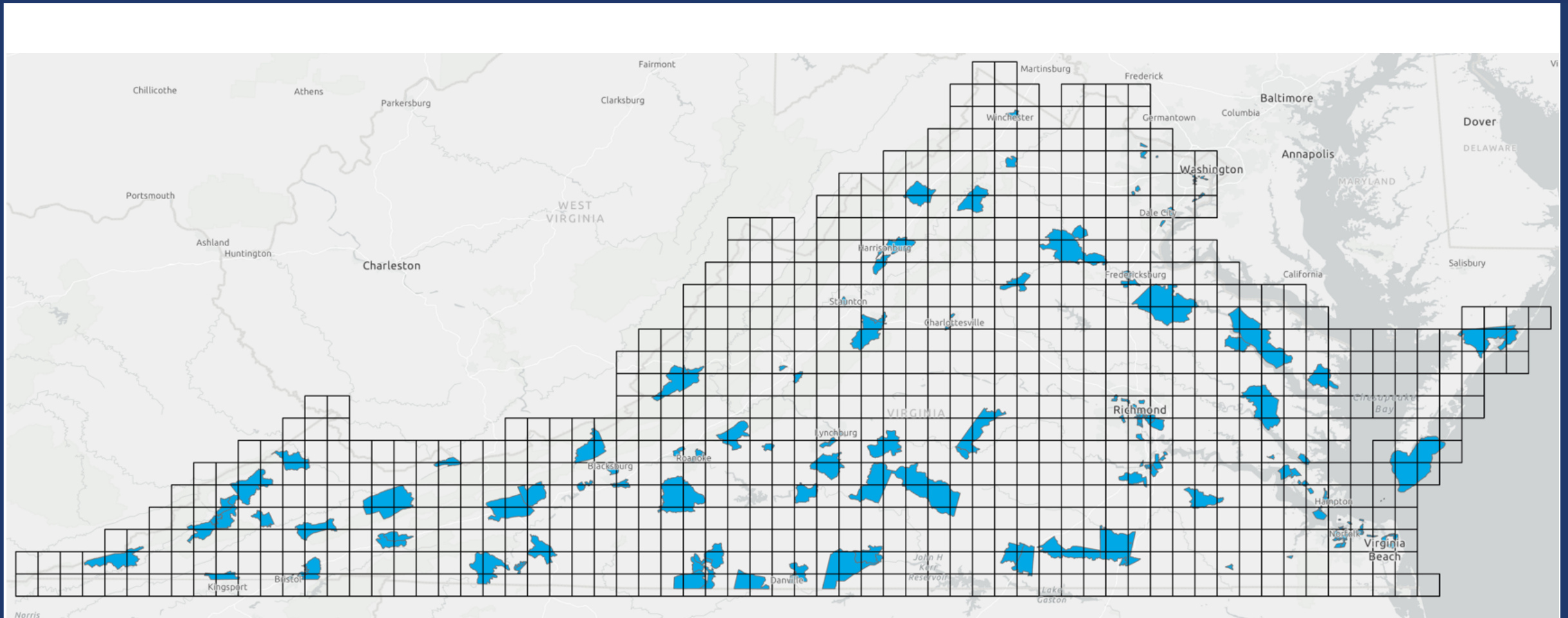
SOCIAL, ENVIRONMENTAL AND ECONOMIC FACTORS: **POPULATION GROWTH**



Projected population growth through 2045 (Weldon Cooper Center, 2019, 2020)

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SOCIAL, ENVIRONMENTAL AND ECONOMIC FACTORS: **ECONOMIC OPPORTUNITY ZONES**



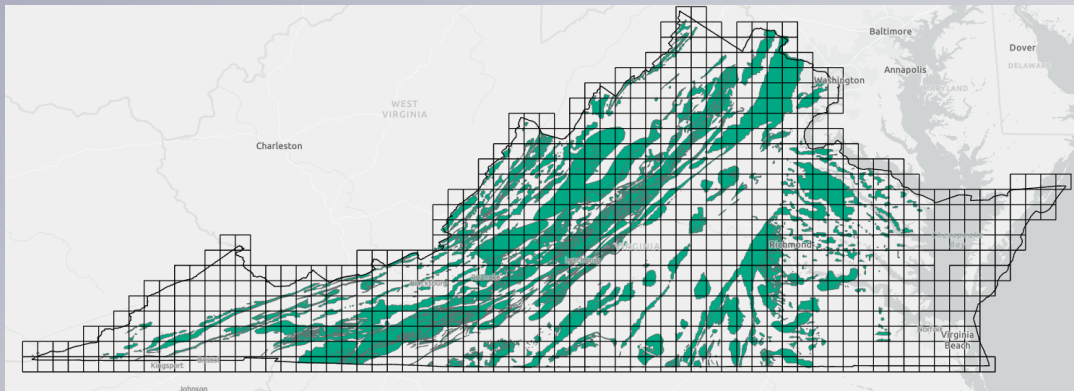
Economic Opportunity Zones in Virginia (HUD, 2020)

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NATURAL RESOURCES: 0 TO 1 SCORE

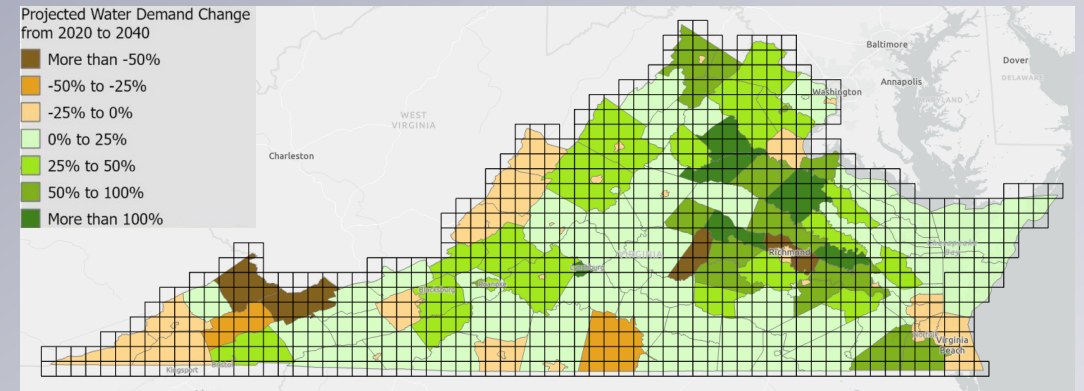
Mineral Resources

Potential for critical minerals - 0.5
No potential for critical minerals - 0



Water Resources

25% of greater expected water demand increase - 0.5
Less than 25% projected water demand increase - 0



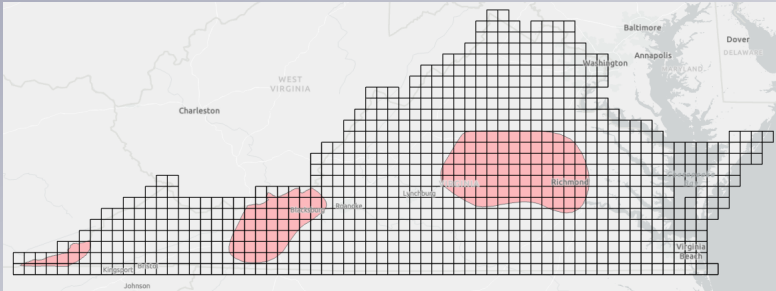
GEOLOGIC MAP PRIORITIZATION: DEVELOPMENT OF A QUADRANGLE RANKING SYSTEM

GEOLOGIC HAZARDS: 0 TO 1 SCORE

Earthquakes

In seismic zone - 0.25

Not in seismic zone - 0



Karst

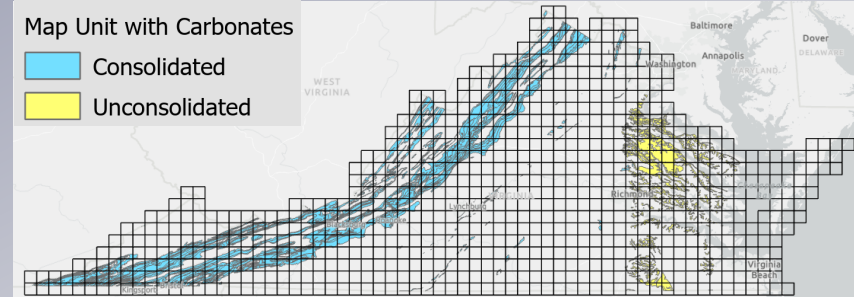
Presence of carbonate map unit(s) - 0.25

No carbonate map units - 0

Map Unit with Carbonates

Consolidated

Unconsolidated



Landslides

5 km² or more with 22° slope or greater - 0.25

Less than 5 km² area with 22° slope or greater - 0

Area with slope of 22 degrees or greater (sq km)

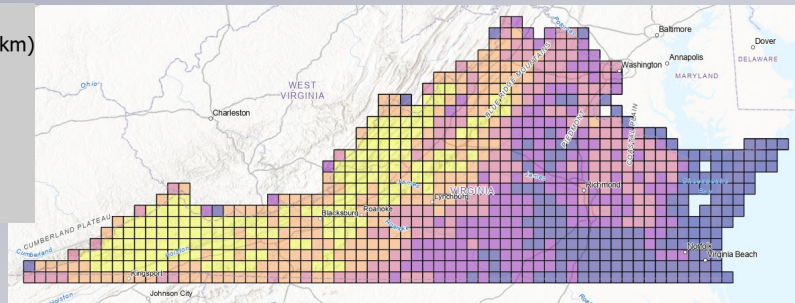
0.0 - 0.18

0.19 - 1.0

1.1 - 5.0

5.1 - 31

32 - 120



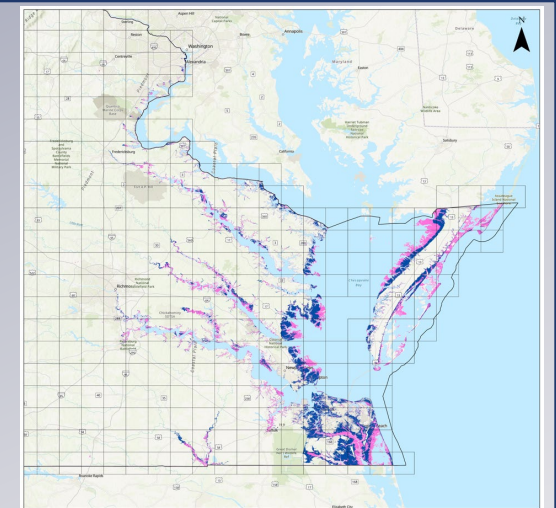
Coastal Inundation

Inundation in extreme scenario - 0.25

No inundation in extreme scenario - 0

Intermediate 2100 Sea Level Estimate (1.34 m)

Extreme 2100 Sea Level Estimate (3.45)



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SOCIAL, ENVIRONMENTAL AND ECONOMIC FACTORS: 0 TO 1 SCORE

Social Vulnerability Index

SVI > 0.5 – 0.25

SVI ≤ 0.5 - 0

Social Vulnerability Index (SVI)

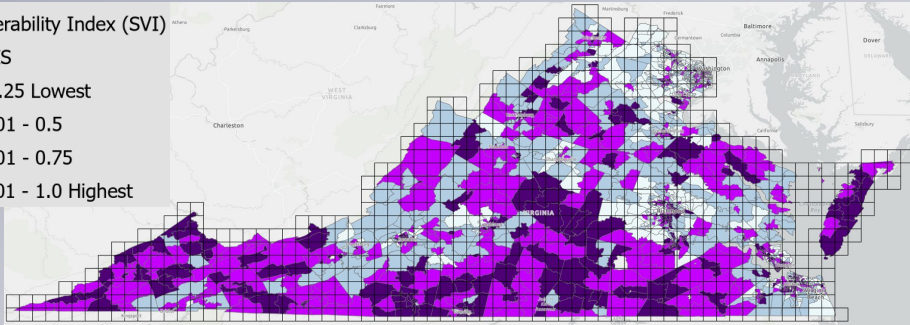
RPL THEMES

0 - 0.25 Lowest

0.2501 - 0.5

0.5001 - 0.75

0.7501 - 1.0 Highest



Development Vulnerability

Class III, IV, V – 0.25

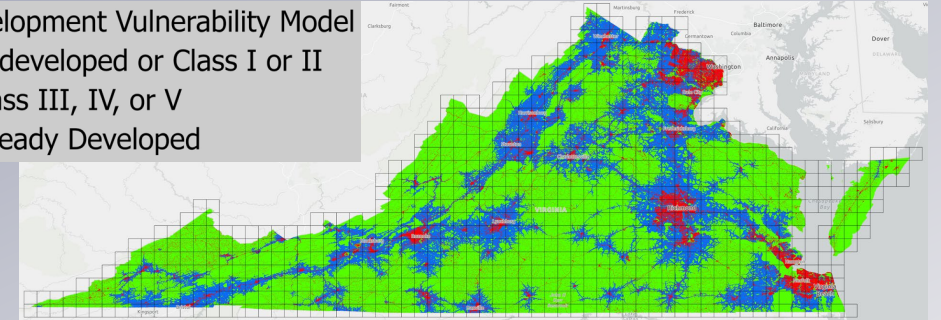
All other categories - 0

Development Vulnerability Model

Undeveloped or Class I or II

Class III, IV, or V

Already Developed



Population Growth

Predicted population growth ≥ 10% - 0.25

Predicted population growth < 10% - 0

Predicted Population Growth by
County from 2020 to 2045

% Change

≤-17.326656

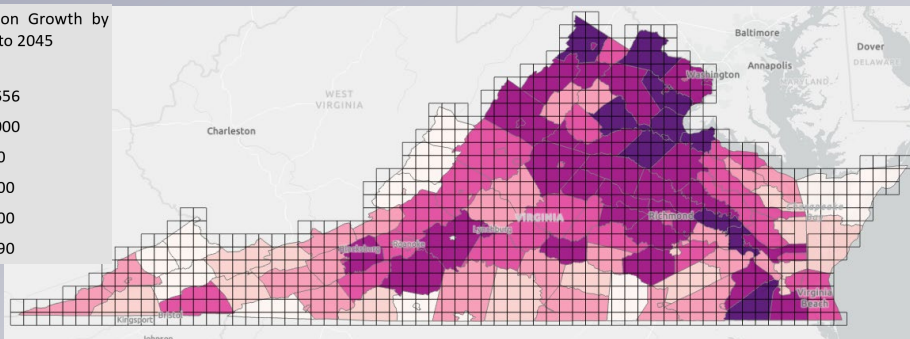
≤-10.000000

≤0.000000

≤10.000000

≤25.000000

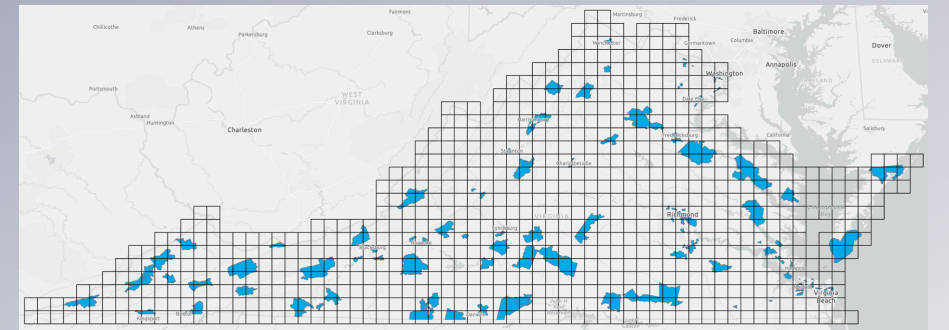
≤55.240890



Economic Opportunity Zones

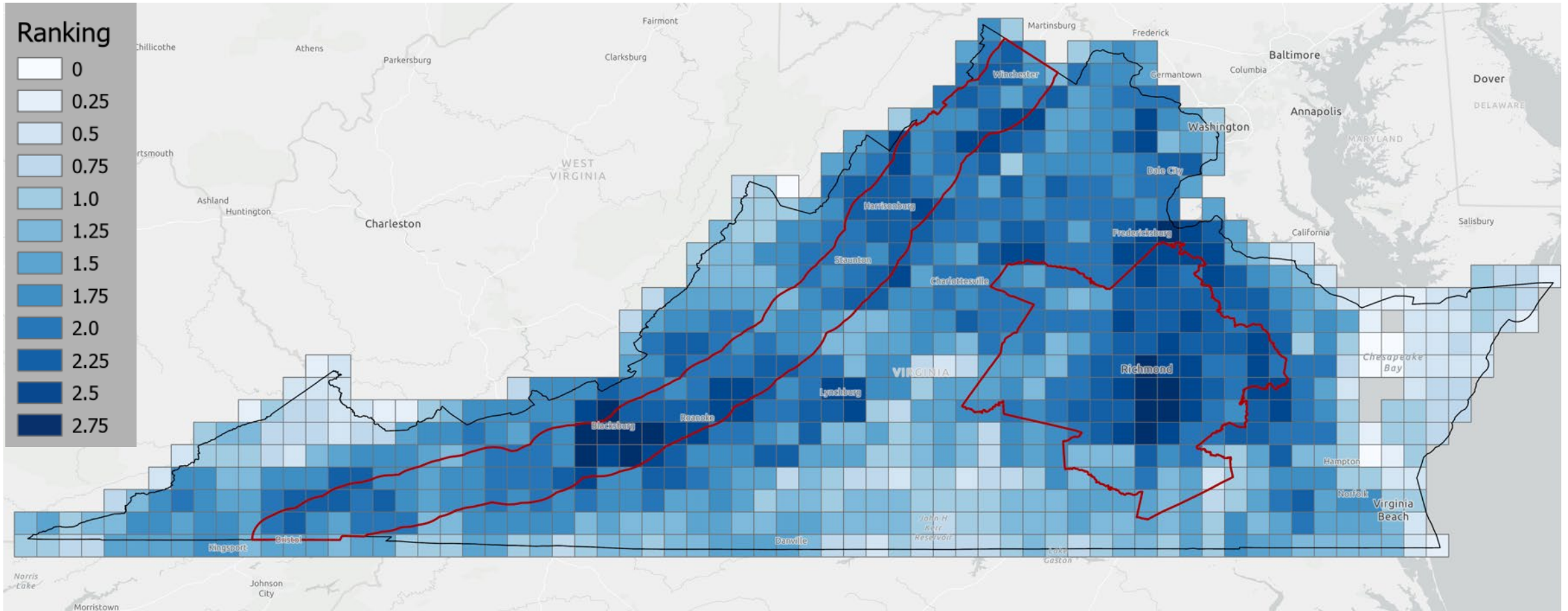
Presence of an Economic Opportunity Zone – 0.25

No Economic Opportunity Zone – 0



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RESULTS



GEOLOGIC MAP PRIORITIZATION: DEVELOPMENT OF A QUADRANGLE RANKING SYSTEM

FUTURE PLANS: UPDATES

- New data sets:
 - 2020 Census data –Population growth prediction update
 - 2020 Social Vulnerability Index
 - 2021 new statewide geologic map for Virginia
 - 2022 Development Vulnerability Model
- Is there any potential for updated data sets to change our scores?

FUTURE PLANS: SYSTEM EVALUATION

- Potential redundancy
- Variation in density of data used
- 3-point system simplicity
- Presence/absence and cutoff validity
- Other relevant measures overlooked or better datasets
- Additional or changing stakeholder/customer needs

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QUESTIONS?

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