

State Technical Committee (STTC) Meeting

April 23, 2025, at 10 am
Farm Bureau Center (Auditorium) and via Microsoft Teams
12580 West Creek Parkway
Richmond, VA 23238

10:00 am	Welcome and Opening Remarks	Dr. Edwin Martínez Martínez, <i>State Conservationist</i>
10:15	Programs Summary Updates	Marian Jordan, <i>ASTC-Programs</i>
10:20	Partnership Updates	John Womack, <i>ASTC-Partnerships and Initiatives</i>
10:30	Ecological Sciences Updates	Clarimer Hernández Vargas, <i>State Resource Conservationist</i>
10:40	Engineering and EWP Updates	Chris Hamilton, <i>State Conservation Engineer</i>
10:50	Farm Service Agency Updates (CRP, ECP)	<i>FSA Farm Program Specialist</i>
11:05	VASWCD Updates	<i>Va. Soil and Water Conservation Districts</i>
11:20	VDACS Updates	<i>Va. Department of Agriculture and Consumer Services</i>
11:35	Wellness Break	ALL
11:45	CIG Project: Identifying Cultural Resource Site Locations in Virginia	Dr. Xutong Niu, <i>Troy University, Troy, AL</i>
12:00 pm	Tidewater and Potomac Sentinel Landscapes	Mary Bennett, <i>Tidewater Sentinel Landscape Coordinator, Virginia Department of Forestry</i>
12:15	Questions and Answer Session	ALL
12:30	Closing Remarks	Dr. Edwin Martínez Martínez, <i>State Conservationist</i>
12:30-1:00	Adjourn/ Lunch – Please bring your own or purchase from the cafeteria and spend time networking with partners.	

Next Planned Meeting – [October 2025]

Sign-in Sheet

State Technical Committee - April 23, 2025

Name	Organization	Position	Email
Claumer Hernandez Vargas	NRCS	SRC	claumer.hernandez@usda.gov
Edwin Martinez	NRCS	STC	edwin.martinez@usda.gov
Dean Curbie	Dept of Forestry	Forest Management Director	dean.curbie@def.virginia.gov
Ken Carter	VA SWCD	Advisor	cluckheadone@gmail.com
Isaac Joseph	UDACS	Policy Analyst	isaac.joseph@vdacs.virginia.gov
JUSTIN BARNES	DOF	FOREST MANAGEMENT COORDINATOR	justinbarnes@def.virginia.gov
Brad Copenhaver	VA Agribusiness Council	govt affairs	brl@mendowinstrategy.com
Rodney Young	FSA	FARM Program Manager	Rodney.Young2@usda.com
Adrienne Kotula	Ches Bay Comm	Virginia Director	akotula@chesbay.us
Kendall Tyree	VASWCD	Executive Director	kendall.tyree@vaswcd.org
Bill Fleming	VaDare SWCD	Director	wbfleming@hotmail.com
Kate Carline	Groundwork RVA	FARM MANAGER	Kate@groundworkrva.org
Matt Kowalski	Chesapeake Bay Foundation	VA Restoration Scientist	mkowalski@cbf.org
Mary Bennett	DOF - Tidewater Sentinel Landscapes	Tidewater Sentinel Landscape Coordinator	mary.bennett@def.virginia.gov
John Womack	NRCS	ASTC- P+I	john.womack@usda.gov
Matt Booher	NRCS-VT	ICA Grassland agronomist	mrbooher@vt.edu
Barbara Gavin	Duchas Unlimited	Private lands Biologist	bgavin@duchis.org
Martha Moore	VA Farm Bureau	Senior V.P. Gov't Relations	martha.moore@vafb.com

Sign-in Sheet

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State Technical Committee Meeting, Virtual Attendance

April 23, 2025

Anderson, Kathleen	Jesse Turner, Jesse
Baskette, Brad	Knight, Marilyn
Becky	Lancaster, Caroline
Braunscheidel, Bridget	Loveday, Rachel
Bugg, Tabitha	Mason, Anastasia
Carter, Lois Custalow (External)	McClean, Kevin
Carter, Michael Jr.	Menefee, Alison
Clark, Cameron	Miller, S.
Coates, Anne	Niu, Xutong
Coffman, Seth	O'Brien, Claire
Dubin, Mark	Plourde-Rogers, Hali
Ellis, Shannon	Rathlev, Natasha
Evans, Jeremy	Schmidt, Leann
Evans, Kristen Hughes	Shepard, Ellen
Evans-Brown, Amelia	Shippen, Jessica
Feaga, Jeff	Sketch, Mary
Flessner, Michael	Tate, Kevin
Franco, Roberto	Thompson, Thomas
Garcia, Beth	Tutmalria, Amelia
Gil, Tatiana	West, Jared
Hancock, Cynthia	Williams, Robert
Havens, Kirk	Wills, Brent
Heath, Tammy	Wood, Payton
Ivins, Charles	



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U.S. DEPARTMENT OF AGRICULTURE

FORWARD. TOGETHER.

Virginia USDA NRCS Highlights



Dr. Edwin Martínez Martínez, Virginia State Conservationist

April 23, 2025

FARM PRODUCTION AND CONSERVATION
FSA | NRCS | RMA | Business Center



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USDA's Natural Resources Conservation Service Turns 90

**Thank you ALL for your support to our agency
conservation mission, vision and efforts!**

Full-Year Continuing Appropriations and Extensions Act, 2025

- We are working under a Continuing Resolution (CR) which will fund the federal government for fiscal year 2025.



Virginia NRCS Profile



\$55M - \$100M State budget trend FY 2012-2024



Virginia NRCS has 4 Areas, 41 Field Offices, and a State Office



~ 137 employees



Staff includes:

District Conservationists
Soil Conservationists
Soil Conservation Technicians
Civil Engineer Technicians

Engineers
Soil Scientist
Agronomists
Foresters

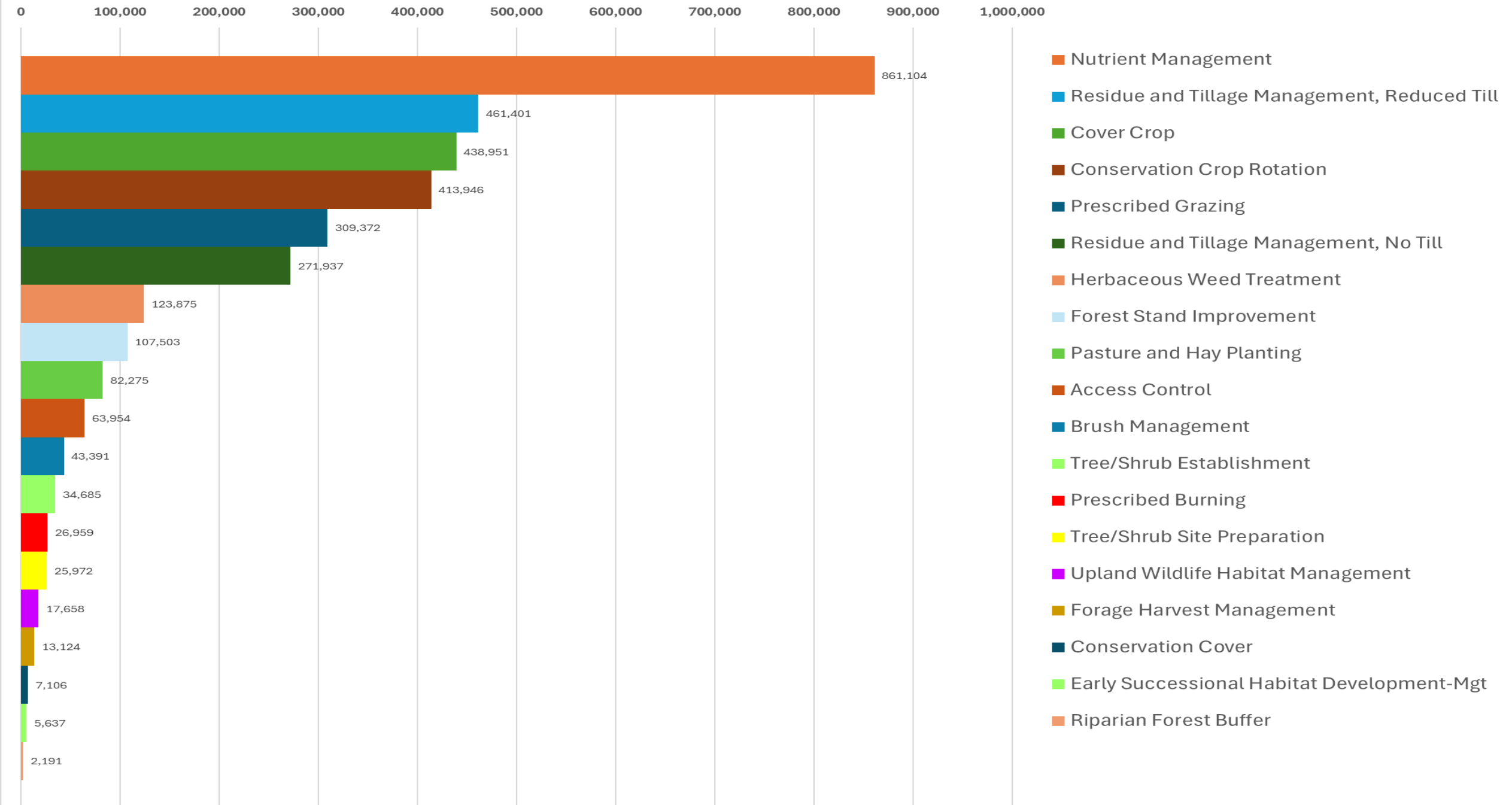
Resource Conservationists
Financial Resource Specialists
Biologists
Economists

Conservation Authorities used in Virginia



- **Farm Bill Programs**
 - Conservation: EQIP, CSP, ALE, RCPP, IRA, etc.
- **Bipartisan Infrastructure Law (BIL)**
 - Watershed Rehabilitation
- **Emergency Watershed Protection Program**
 - Emergency work
- **Chesapeake Bay Watershed Program**
 - Water quality

Virginia Practices by Applied Acres, 2014 - 2024



Virginia NRCS Economic Impact Analysis (2021-2022-2023)



Over a 4-year period **NRCS disbursed \$182 million** in Farm Bill technical and financial assistance.



On average, **NRCS supports 759 jobs** annually across the Commonwealth of Virginia.



As well as **\$196 million** of Value Added to the Virginia economy.



Roughly **173** of these jobs belong to **NRCS** employees.



This resulted in **\$292 million** in total output of the Virginia economy.

- Total output is the total production value of all industries and commodities impacted by NRCS spending.
- Value Added is the contribution of Virginia workers and intermediate inputs that make up the final market price of goods and services; value added is included in total output.

Tribal Financial and Technical Assistance Opportunities

■ Main Virginia Tribal NRCS Practices:

- Forest Management Plans
- Invasive Species Control
- Grade Stabilization Structures
- Brush Management
- Forest Stand Improvement and Herbaceous Weed Treatment
- Filter Strips
- High Tunnels
- Oyster restoration



■ EQIP Fund Poll created for Tribes

- NRCS established a Tribal funding poll in 2022 and have continue to offer this opportunity every FY.

■ Farm Bill Tribal Obligations

- For FY2024, NRCS obligated 1 EQIP contract for \$8,672. From FY2020 to FY2024, 7 EQIP contracts were obligated totaling \$89,900.



Local Work Groups (LWG)

- NRCS Virginia Staff has been asked to participate in a National Review to update the **Title 440 – Conservation Programs Manual, Part 501 – Locally Led Conservation Program Delivery Manual**.
- A team of three NRCS Team members is currently working on this task, including the State Conservationist (STC), Assistant State Conservationist for Partnerships & Initiatives (ASTC-P&I), and a District Conservationist (DC).



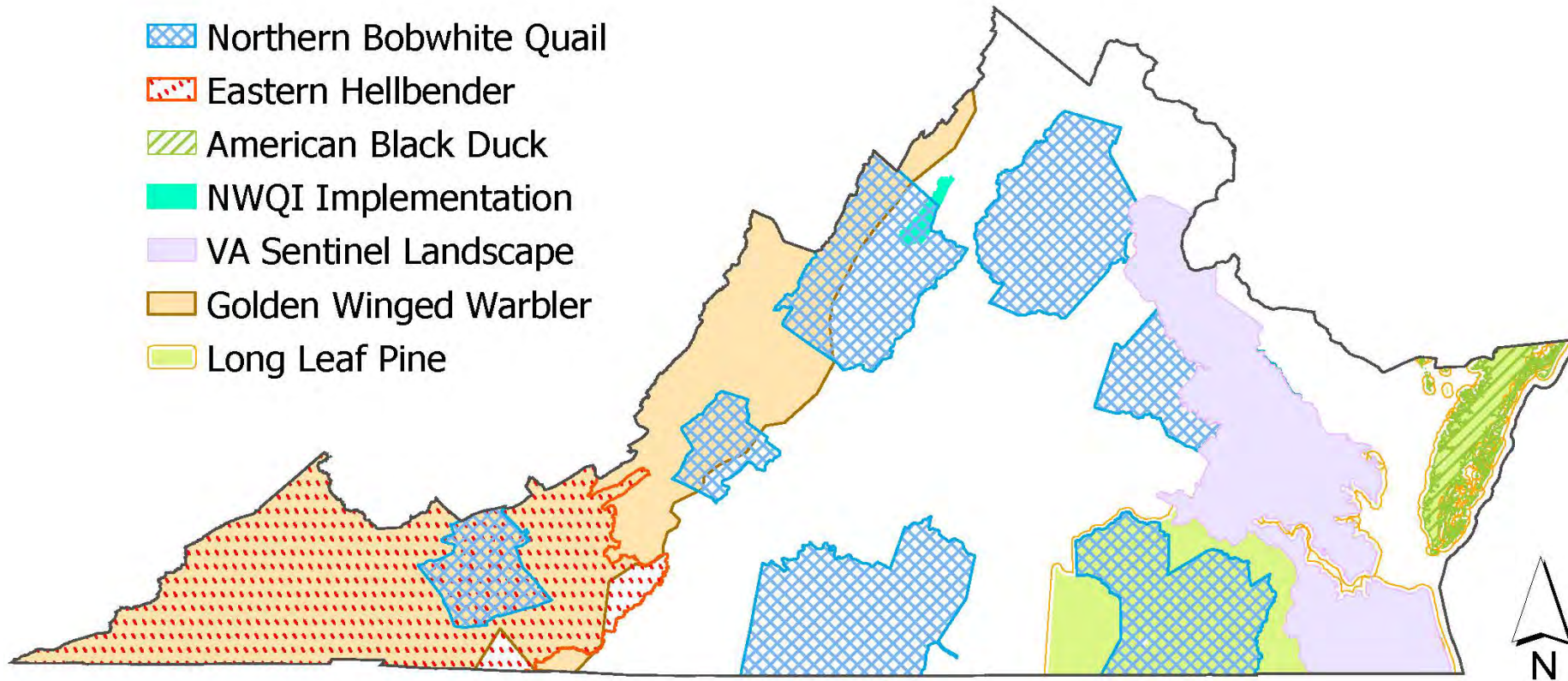
Advancing Markets for Producers (AMP)

On Monday, April 14, the **Partnership for Climate Smart Commodities (PCSC)** was announced as the new **Advancing Markets for Producers (AMP)**. This is an exciting opportunity for our partners to continue to help serve America's Farmers, Ranchers and Foresters through this new, farmer focused initiative.

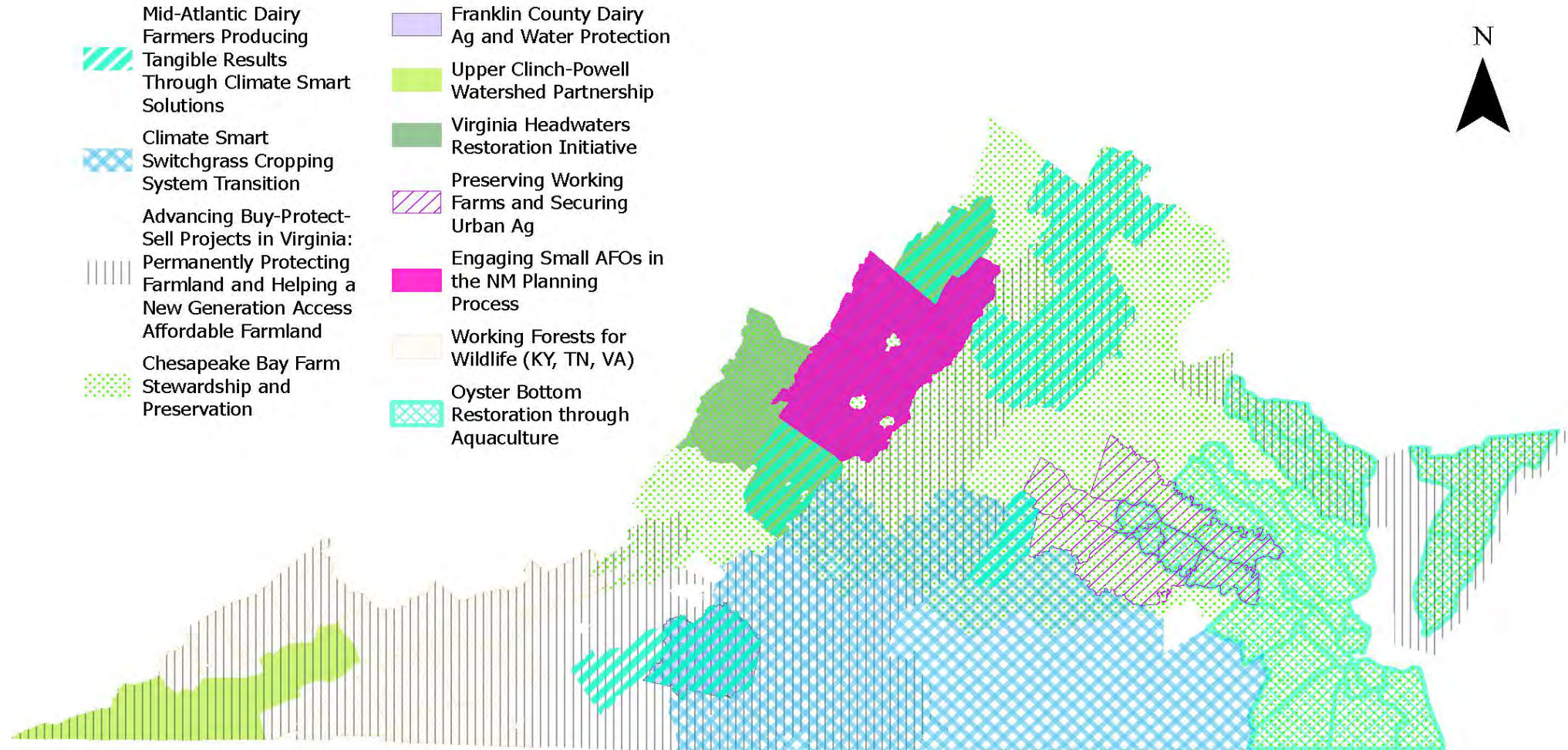
During this time of transition for our Partners from PCSC to AMP, the Office of the Chief will be directly handling all partner questions directly.

As was outlined Tuesday, April 15, please send any and all questions to Colton Buckley, Chief of Staff, at colton.buckley@usda.gov.

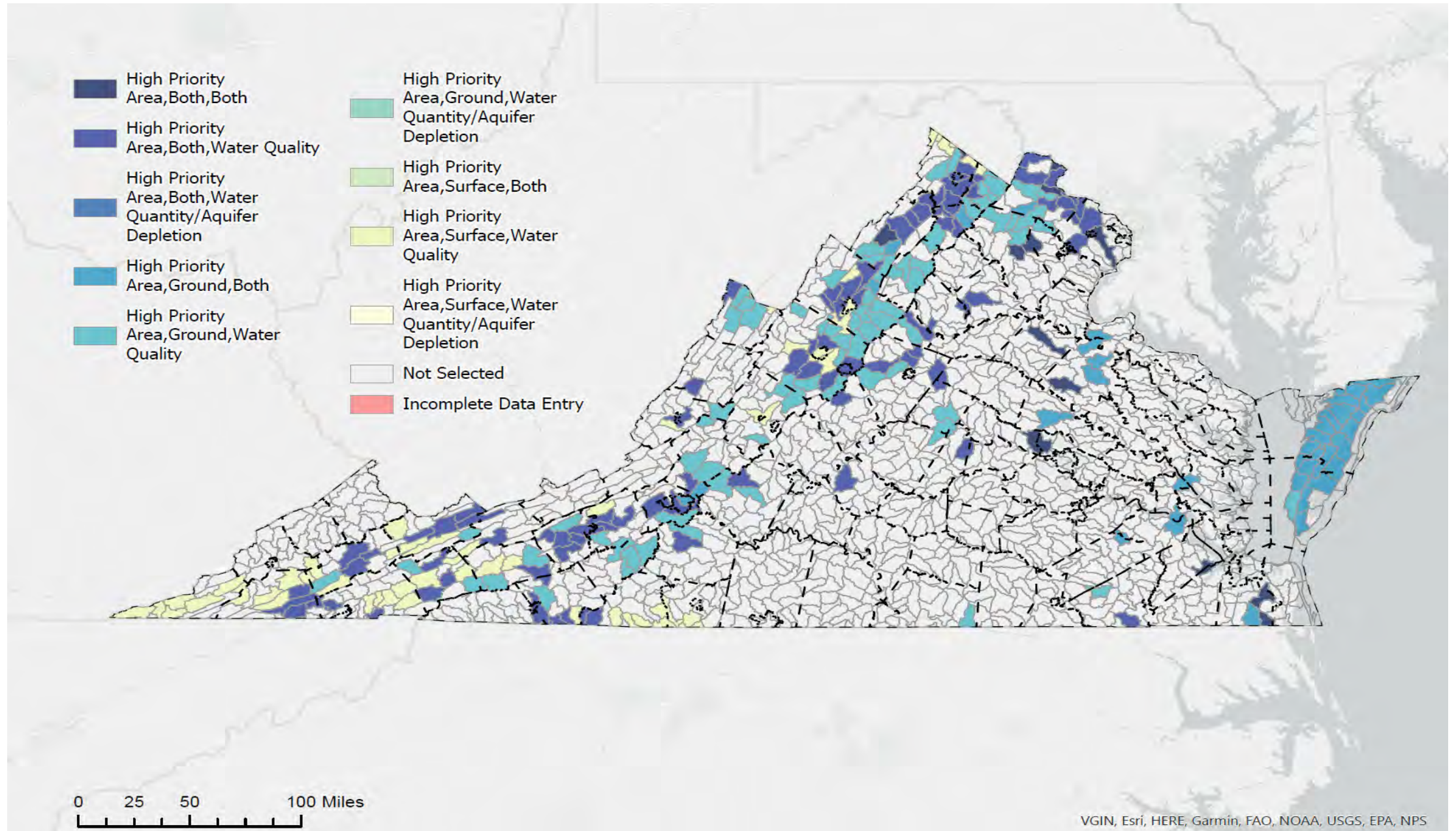
Virginia Conservation Initiatives



Regional Conservation Partnership Program (RCPP)

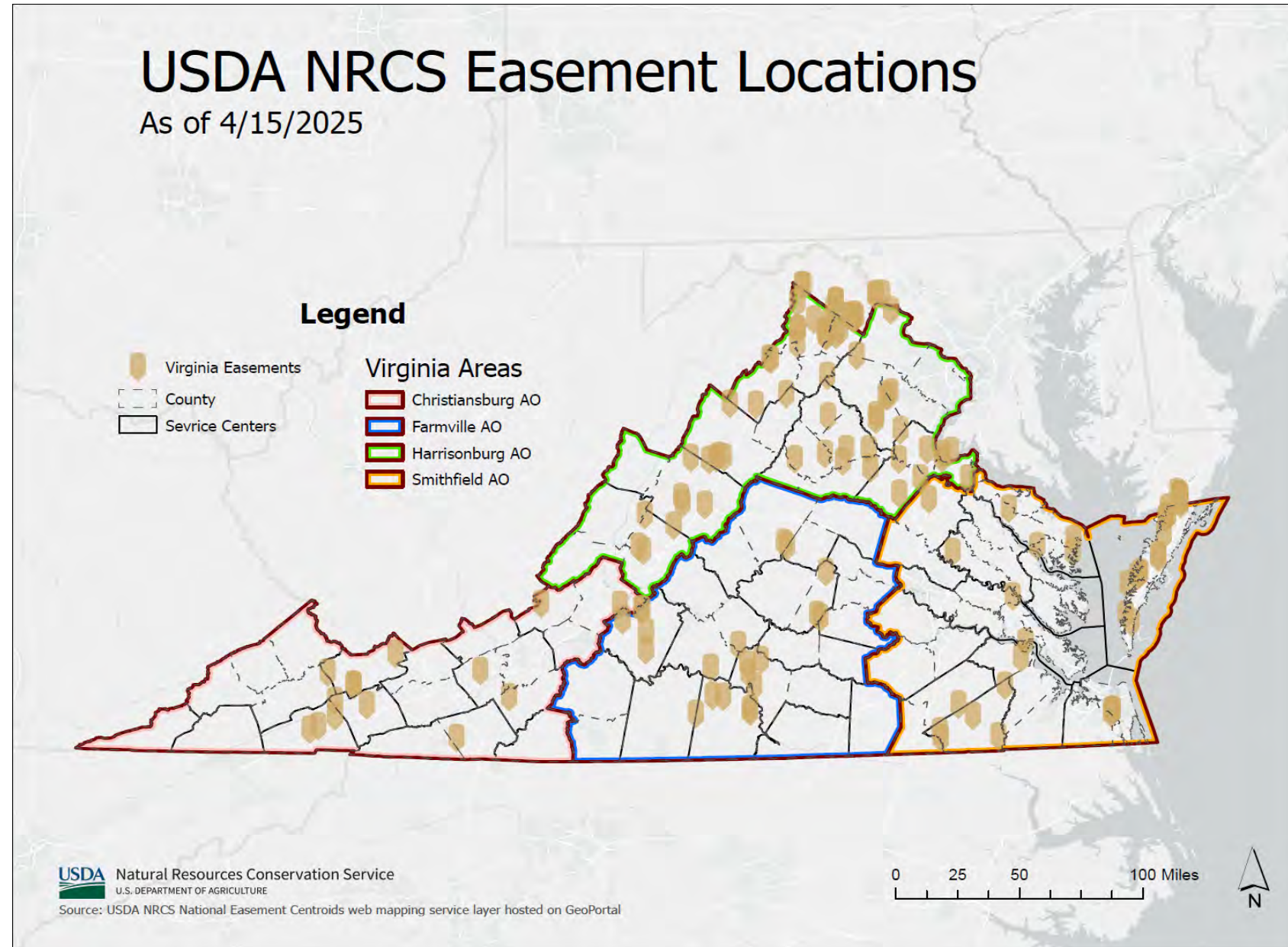


Virginia Source Water Protection Areas (20%)



NRCS Easement Programs and Virginia Locations

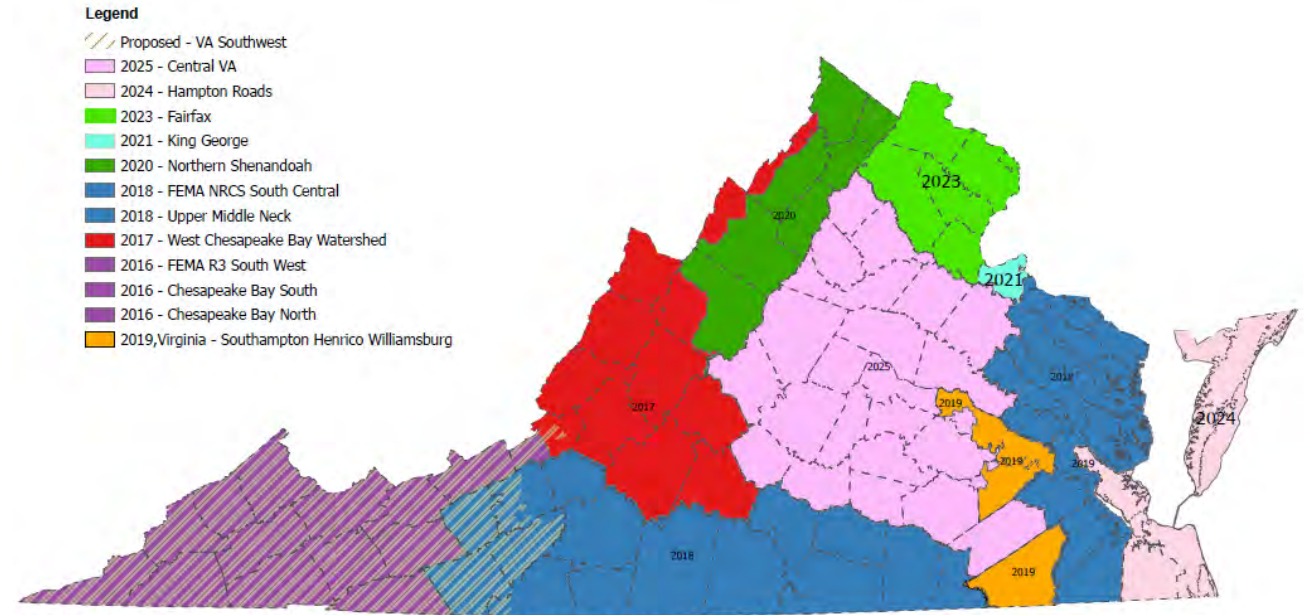
- Agricultural Conservation Easement Program (ACEP)
- Healthy Forests Reserve Program (HFRP)
- Grasslands Reserve Program (GRP)
- Farm and Ranch Land Protection Program (FRPP)
- Wetlands Reserve Program (WRP)



Virginia NRCS LiDAR Imagery Efforts

- Highly Erodible Land Determinations
 - Flow direction, flow accumulation and slope data to create a HEL later for our state model.
- Wetland Determinations
 - Data used by soil scientists to identify saturated areas and drainage lines.
- Dam Rehabilitation
 - Generate sub watershed slopes to delineate inundation zones which assist with design.
- Karst Feature Identification
 - Identify depressions and sinkholes for ground water recharge.
- Conservation Planning – Practice Design
 - Water and Sediment Control Basin (WASCOB)
- Wetland Hydro Geomorphic Types
 - Flow direction, surface hydrology, wetland identification.

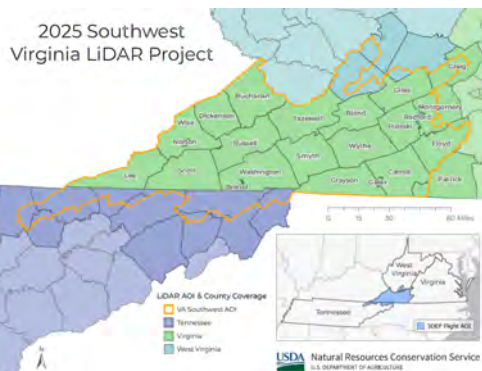
LiDAR Status Update



Date: 3/4/2025

1:3,000,000

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2010- 2024 Conservation Innovation Grants



Figure 1. - Example of biochar and compost amendments to vegetable beds at the Blacksburg Community Garden demonstration plots (top left photo).

Figure 2.- Two Controlled Traffic Innovation: tramlining and chaff lining to improve soil health (top right).



Figure 3. Establishing Forbs: Producer site in Riner at planting and in September (left). The large chicory plant (right) was protected from grazing by the spiny pigweed (bottom left photos).

Categories	Number of Projects	Sum of NRCS Contributions	Minimum Partner Matching Contributions	Minimum Total Value of Projects
Water Quality (legacy sediment mapping, etc.)	1	\$64,010	\$64,010	\$128,020
Small & Speciality Farm Conservation (high tunnel technology, etc.)	2	\$150,000	\$150,000	\$300,000
Livestock mortality management (composting, aboveground burial, etc.)	3	\$97,923	\$97,923	\$195,846
Forestry & Natural Landscapes (Invasive plants, Longleaf pine, buffer agroforestry, pollinator restoration)	4	\$424,923	\$424,923	\$849,846
Enhanced nutrient management (variable rate fertilization, feed management, etc.)	5	\$183,154	\$183,154	\$366,308
Soil health on grassland (grazing systems, silvopasture, conversion to native and/or enhanced	8	\$683,380	\$683,380	\$1,366,760
Soil health on cropland (cover cropping systems, no-till innovations, pests of high residue systems, manure injection, etc.)	21	\$1,738,753	\$1,738,753	\$3,477,506
Soil health on vineyard (under vines, row middles, tire tracks, and undisturbed adjacent soil, etc.)	1	\$200,000	\$200,000	\$400,000
Soil health on cropland (Biochar amendment on soil, biochar availability, education on biochar technical and production aspects, etc.)	1	\$656,074	\$656,293	\$1,312,367
Integrating Livestock and Cover Crop (Livestock management, nutrient management, and grazing cover crops, etc.)	1	\$301,300	\$301,300	\$602,600
Totals	47	\$4,499,517	\$4,499,736	\$8,999,253

Chief Bettencourt Virginia Visit – April 11th



Hurricane Helene NRCS Support

● Emergency Watershed Protection (EWP) Program

- Southwest Virginia Area
- 229 sites have been evaluated.
- 53 Damage survey reports have been completed.
- 16 Municipalities requested NRCS Assistance

- | | |
|----------------------|-----------------------|
| 1. Town of Damascus | 9. Wise County |
| 2. Giles County | 10. Carroll County |
| 3. Grayson County | 11. Tazewell County |
| 4. Smyth County | 12. Albemarle County |
| 5. City of Bristol | 13. Pulaski County |
| 6. Town of Gate City | 14. Montgomery County |
| 7. Washington County | 15. City of Radford |
| 8. Wythe County | 16. Bland County |

■ Environmental Quality Incentives Program (EQIP)

- EQIP disaster assistance has funded **20 applications in 13 counties totaling \$1,625,128.**
- At the moment, all emergency applications have been funded.
- Sign up application deadline is May 2nd.

■ Emergency Conservation Program (ECP)

- The USDA Team has been coordinating technical assistance to assist the Farm Service Agency with hurricane emergency work.

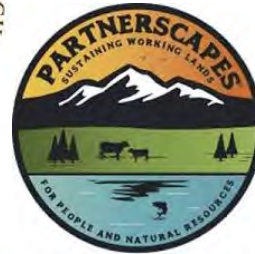


FY24 Funded Agreements

- 8 new & 1 extended agreements
- 8 conservation partners
- \$4.7 million

Expected Outcomes:

- Develop new partnerships
- Identify new landowners
- Technical Assistance
- Technical Expertise
- Staffing Capacity
- Increase conservation implementation



FY23 Funded Agreements

- 7 new, 1 extended agreement
- 9 conservation partners
- \$3.1 million

Expected Outcomes:

- Develop new partnerships
- Identify new landowners
- Technical Assistance
- Technical Expertise
- Staffing Capacity
- Increase conservation implementation



VIRGINIA POLYTECHNIC INSTITUTE
AND STATE UNIVERSITY





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FY25 Programs Update

Marian. Jordan- ASTC-Programs

FARM PRODUCTION AND CONSERVATION
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FY25 -National Outlook

- Nationally, we have to date over 13,000 contracts in \$858 million on over 7 million acres for CSP and EQIP combined alone. Quite the accomplishment!

FY25 Mid-Year Summary

■ Environmental Quality Incentives Program

- IRA FA EQIP: \$ 38.4 million
 - Obligated: ~\$170,000
- FB FA EQIP: \$ 21.2 million
 - Obligated: \$5.4 million
 - \$1.6 million set aside to fund all 20 Disaster Assistance applications received to date; applications still accepted until May 2, 2025

■ Conservation Stewardship Program

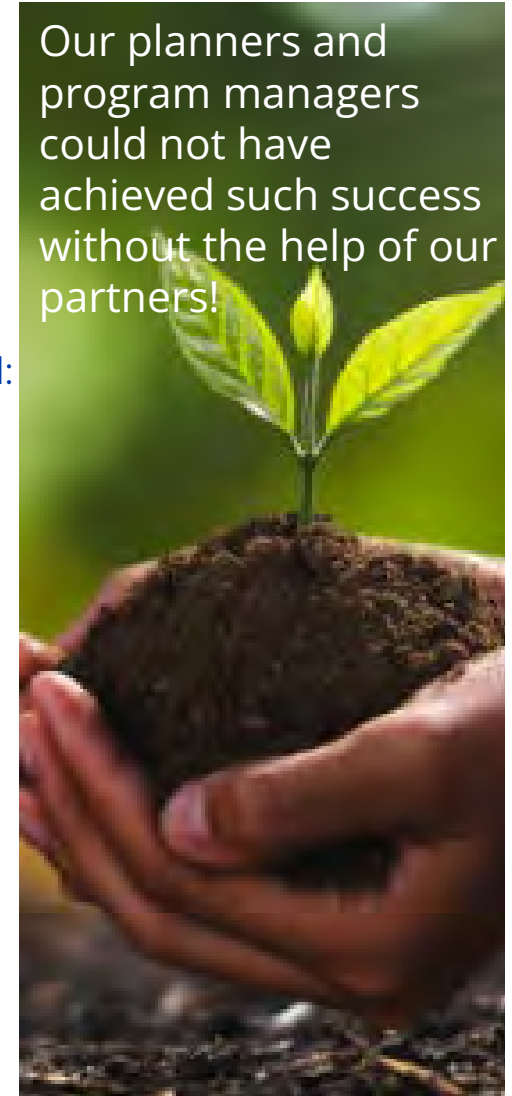
- IRA FA CSP: \$ 9,271,222.00
 - Obligated: \$4.7 million
- FB FA CSP: \$12.5 million
 - Obligated: \$5.9 million

- Total applications received:
 - EQIP- 1434
 - CSP- 582

An additional \$70 million is needed to fund all applications.



Our planners and program managers could not have achieved such success without the help of our partners!



FY25 Mid-Year Summary

■ Agricultural Conservation Easement Program

- FB FA ALE and WRE: \$4.5 million (this includes \$3million that was recently allocated)
 - Obligations: \$100,000

■ Regional Conservation Partnership Program

- FB RCPP: >\$3 million in preapprovals/ selected funding
 - Obligated: \$180,000

■ Conservation Innovation Grant

- FB FA CIG: \$500,000
 - NOFO on pause

- Total applications received:
 - ACEP- 20+
 - RCPP- 50+

An additional \$11 million+ is needed to fund all ACEP applications.





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NRCS P&I Updates

State Technical Committee Meeting



John Womack
Assistant State Conservationist for Partnerships and Initiatives
April 12, 2023

FARM PRODUCTION AND CONSERVATION
FSA | NRCS | RMA | Business Center

FY25 Funded Agreements

- 3 extended agreements
- 3 conservation partners
- \$1.2 million



COLLEGE OF AGRICULTURE AND LIFE SCIENCES
SCHOOL OF PLANT AND
ENVIRONMENTAL SCIENCES
VIRGINIA TECH.



Expected Outcomes:

- Technical Assistance
- Technical Expertise
- Staffing Capacity
- Increase conservation implementation

Virginia Tech School of Plant and Environmental Sciences

- **Type of Agreement:** Cooperative
- Signed in 2023
- **Valid through:** September 2027
- **Budget:** \$1,703,836 (\$572,760 added in FY25)
- **Objectives:**
 - Work directly with farmer clients to enhance their understanding of and to promote adoption of improved soil health management and integrated conservation agronomy (ICA).
 - Identify, recruit, and managing farmer mentors or role models who in turn provide direct outreach & TA to other farmers.



Intertribal Agriculture Council

- **Type of Agreement:** Cooperative - Umbrella
- Signed in 2024
- **Valid through:** September 2027
- **Budget:** \$600,000 (\$300,000 added in FY25)
- **Objectives:**
 - Intertribal Agriculture Council staff will provide training and assistance to NRCS Virginia staff and partners.
 - Staff will assist in the Coordination of the Working Effectively with American Indians Training session scheduled for FY25.



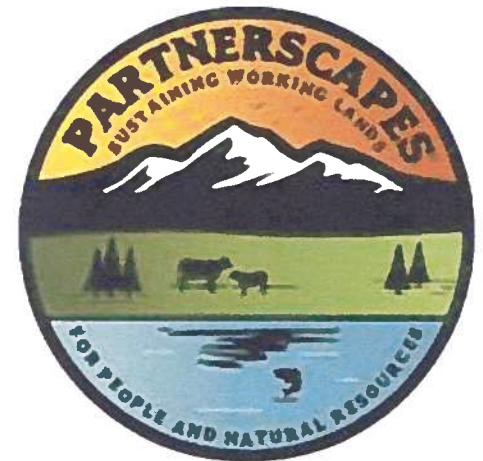
American Farmland Trust (AFT)

- **Type of Agreement:** Cooperative - Umbrella
- Signed in 2024
- **Valid through:** September 2027
- **Budget:** \$834,591 (\$318,030 added in FY25)
- **Objectives:**
 - Develop prescribed grazing plans, focus on Christiansburg Area.
 - Provide follow-up technical assistance to livestock producers.
 - Coordinate and conduct producer outreach and education events



Private Lands Day 2025

- Williamsburg, VA
- October 7-9, 2025
- Private Lands Partners Day is the only national meeting dedicated to celebrating and learning about public-private partnerships and the people and organizations engaged in them.





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Questions?

John Womack
ASTC-P&I
john.womack@usda.gov

www.va.nrcs.gov
Helping People Help the Land

USDA is an equal opportunity provider, employer, and lender.



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Ecological Science Updates

by: Clarimer Hernández Vargas, SRC

FARM PRODUCTION AND CONSERVATION
FSA | NRCS | RMA | Business Center

Ecological Science Team:



Michelle Pope
Farm Bill Program
Assistance



J.B. Daniels
Forage & Grassland
Agronomist



Thomas Burke
State Forester



Amanda McAdams
Business Tool
Coordinator



Nora Sheehan
Archeologist

- ACES:
 - Barry D Harris
 - Marian Moody
 - Bill Patterson
 - Gene Harris
 - Carl Peacock

- VT Partnership
 - Lydia Fitzgerald
 - Matt Booher

Wednesday Webinars

- Currently we offer biweekly webinar training to our staff in various subjects from soil health, erosion, forest practices, to employee benefits.
 - April 2nd: **Building resilient cropland and grazing systems through co-benefits**
 - April 16th: **Grazing Practices Updates**
 - April 30th: **Program Updates**
 - May 14th: **VA Conservation Outcomes**
 - June 11th: **Forestry Practices**
 - June 25th: **EWP Outcomes**
 - July 9th: **Areawide Planning Team and Landscape Conservation Initiatives**

New Conservation Practice Standards Overview

- Review process and chain of review.
 - NHQ to the states; state to the State Technical Committee; State to NHQ.
 - Practices in Virginia are updated every 5 years.

- Practices to be updated this year are:
 - Cover Crop
 - Conservation Cover
 - Woody Residue Treatment
 - Hedgerow Planting
 - Seasonal Water Management for Wildlife
 - Wetland Restoration

Forestry Updates

- We released a charter for the Forestry Subcommittee as a part of the STTC.
 - We currently anticipate about 10 members.
 - For the first year the intent is to meet twice.
- Two new partner positions, Coordinator and Forester, onboarding to support the Golden Winged Warbler Initiative in Area I (Shenandoah Valley).
 - This Initiative works to create and restore habitat for the Golden Winged Warbler



Business Tool Updates

- NRCS uses conservation planning web applications to complete our financial and technical assistance activities.
 - Conservation Desktop (CD)
 - Conservation Assessment Ranking Tool (CART)
- Currently in FY25 NRCS has assisted:
 - 44 New Customers with Brief Technical Assistance
 - 21 of which are now USDA clients and First Time Participants



Cultural Resources Updates

- Federal laws require all federal agencies to consider impacts to cultural resources before implementing any practice or activity.
- NRCS has a programmatic agreement with the State Historic Preservation Office (SHPO) that guides our review process to ensure our practices do not impact significant resources.
- This process includes desktop review to check for previously identified resources, as well as determining the potential for the project to contain unidentified resources, and field investigations as needed.
- Currently in FY25 NRCS has:
 - Completed around 400 reviews for proposed conservation projects for our Farm bill Program as per process established by NRCS programmatic agreement with SHPO.
 - Assessed around 60-70 Emergency Watershed Program (EWP) sites in southwestern VA affected by Hurricane Helene
 - Completed field visits and existing conditions reports for Agriculture Land Easement (ALE) acquisitions



Dr. Kendall Tyree
Executive Director
Virginia Association of Soil & Water Conservation Districts
Kendall.Tyree@vaswcd.org
804-559-0324

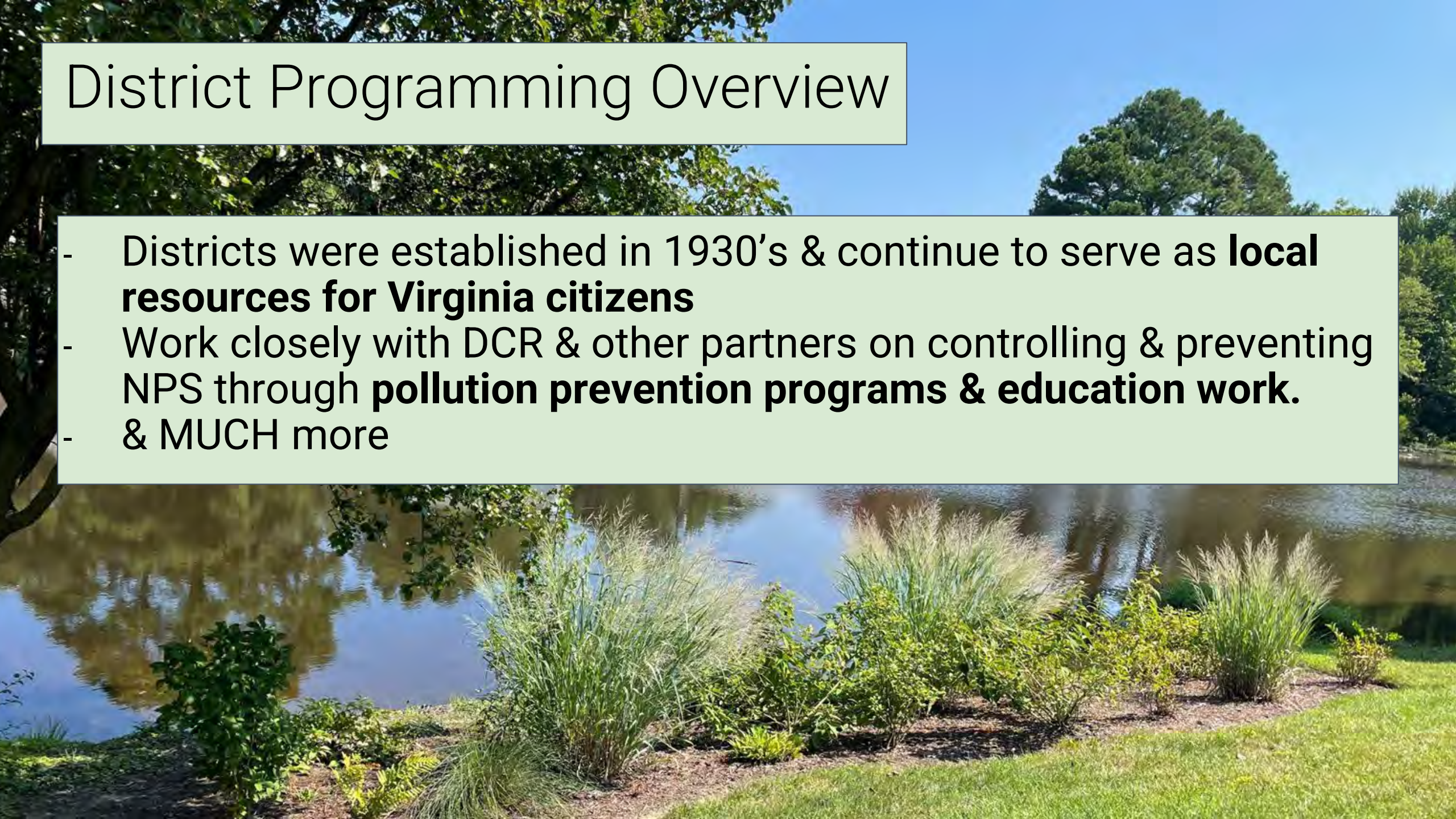


Promoting Conservation Across Virginia's Landscapes



District Programming Overview

- Districts were established in 1930's & continue to serve as **local resources for Virginia citizens**
- Work closely with DCR & other partners on controlling & preventing NPS through **pollution prevention programs & education work.**
- & MUCH more



Soil & Water Conservation District (SWCD) Role:

Code of Virginia establishes SWCDs as the local delivery service for programs that include:

- (i) Provision of technical assistance to advance conservation management services
- (ii) Delivery of educational initiatives targeted at youth and adult groups to further awareness and understanding of water quality issues and solutions
- (iii) Promotion of incentives to encourage voluntary actions by landowners and managers in order to minimize nonpoint source pollution contributions to state waters

SWCD Efforts

And much
more...



Youth Conservation Leadership Institute





LEGISLATIVE OUTREACH & ADVOCACY

- Advocate for district needs through off-season and GA lobbying efforts
- Approve a [Legislative Agenda](#) each December

The VASWCD Represents SWCDs on the following, but is not limited to:

- Governor's Chesapeake Bay Stakeholder Group
- Virginia Soil & Water Conservation Board
- Voluntary AG BMP Survey Stakeholder Group
- VirginiaForever, ViceChair
- Virginia Water Resources Research Center State Advisory Board
- Ag. BMP Technical Advisory Committee
- Soil Health Coalition

The VASWCD works with key partners to further our agenda:

- Agribusiness Council
- Farm Bureau
- Chesapeake Bay Commission
- Virginia Forever
- & Many others



Virginia Conservation Assistance Program

Presented by Virginia Association of Soil & Water Conservation Districts

The Virginia Conservation Assistance Program (VCAP) provides **financial, technical and educational assistance** to property owners installing eligible **stormwater control practices**.

Most practices are eligible for 75% cost-share and some practices provide a flat incentive payment up to the installation cost.



Conservation Landscaping



Impervious Surface Removal



Permeable Pavement Installation



Dry Wells



Rainwater Harvesting



Vegetated Conveyance System



Constructed Wetlands



Bioretention



Rain Gardens



Infiltration



Green Roofs



Living Shorelines



How can VCAP help?

- **Restore** problem areas on properties
- **Treat** stormwater runoff
- **Stabilize** drainage areas
- **Conserve** water within a landscape
- **Control & minimize** erosion
- **Promote** wildlife habitat
- **Revegetate** bare slopes
- **Improve** riparian buffer areas
- Help Virginia meet WIP III Goals



VCAP Update

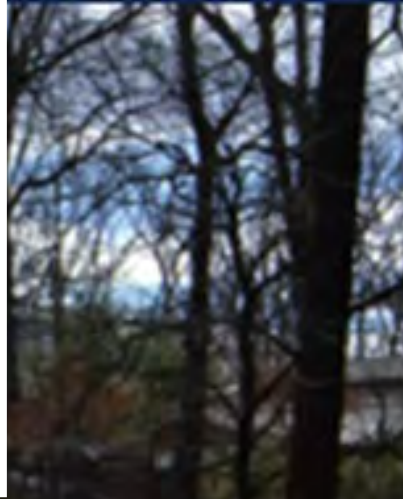
1) *Variable lifespans (5 or 10 year)*

2) *Assignment of Payment Form*

2) *Start Up Payment Program*

Provides up to 50% of cost-share as soon as application is approved

Intended to relieve *some* of the financial strain



VCAP Photo: Infiltration Trench – Northern Virginia SWCD



VCAP Photo: Culpeper SWCD Permeable Pavement (Carver Center)



Excavation



Reservoir and Under Drain



Bedding Stone



- *Manual Changes under Development for July 1, 2025*
- *Call for Steering Committee Members*
- *Call for Technical Advisory Committee Members*
- *VCAP Module incorporation into new CAS build*
- *Join the VCAP Monthly Water Cooler Chat*
- *Welcome Alyssa Geary!*



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LFSWCD 2018



During initial turf herbicide treatment





LFSWCD 2023

BEFORE



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TJ 2022

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TJ2022

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TJ 2022

Virginia Agricultural Cost Share Program (VACS) w/ DCR Updates



GOOD THINGS HAPPEN



**70 + Conservation Practices for
agricultural operations**

**Improve & protect water quality in addition
to providing farm production benefits**



Identify Cultural Resource Site Locations in Virginia

Dr. Xutong Niu, Troy University

April 23, 2025

State Technical Committee Meeting

Objectives

- To further develop the existing GIS-based LASER Tool to accurately identify potential cultural resource features in Virginia.
 - LASER: LiDAR-based Archaeological Site Extraction Recognition
- The LASER method model will show features that can assist cultural resources and field office staff in locating the areas with high probability.
- Duration of the project:
 - September 2018 – September 2024

Strategies

- Identify and study features of currently known cultural resources as samples
- Adjust and refine the existing LASER model with the features from those existing sites
- Processing LIDAR in the testing sites, conduct site verifications, and fine-tune the LASER model
- Processing all the available LIDAR in VA

Project Team Members

Troy University:

- Jason Mann (2018-2020)
- Xutong Niu (2018-2024)
- Graduate Students in Anthropology

VA NRCS:

- Dana Perkins
- Nora Sheehan
- John Harper
- Matthew Salkey

VA SHPO:

- Brad McDonalds
- Jolene Smith

Private Archaeologist/Consultant: Mr. Craig Rose

Deliverables

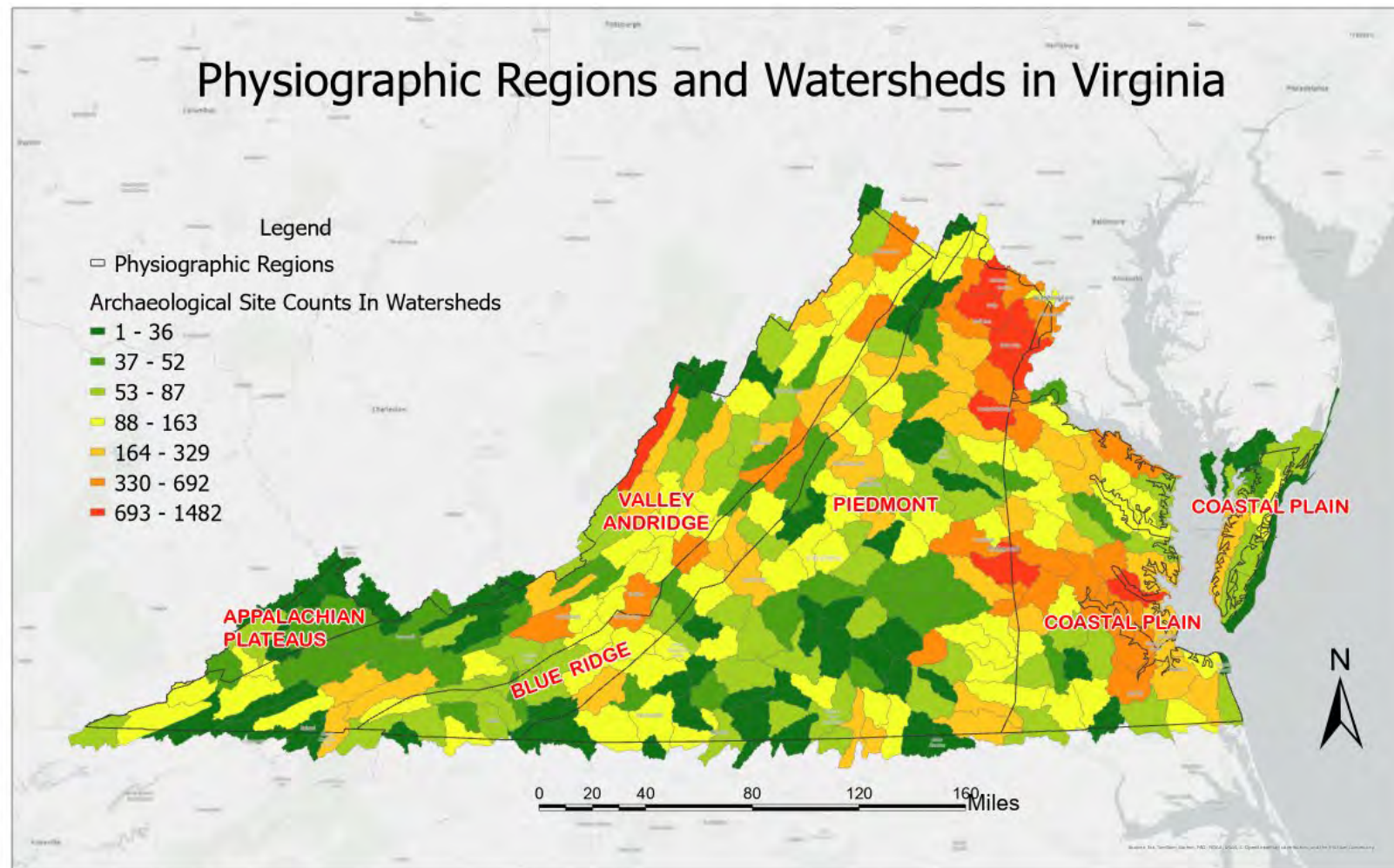
- LASER Tools developed in ArcGIS Pro
- LiDAR DEM, and LASER results
- An ArcGIS tool that use Weight of Evidence (WoE) method to predict cultural resource sites
- Flow Accumulation, Stream Power Index, and one-foot contour lines in Virginia

Study Area

□ Physiographic Region

Archaeological Site Counts

- 1 - 36
- 37 - 52
- 53 - 87
- 88 - 163
- 164 - 329
- 330 - 692
- 693 - 1482



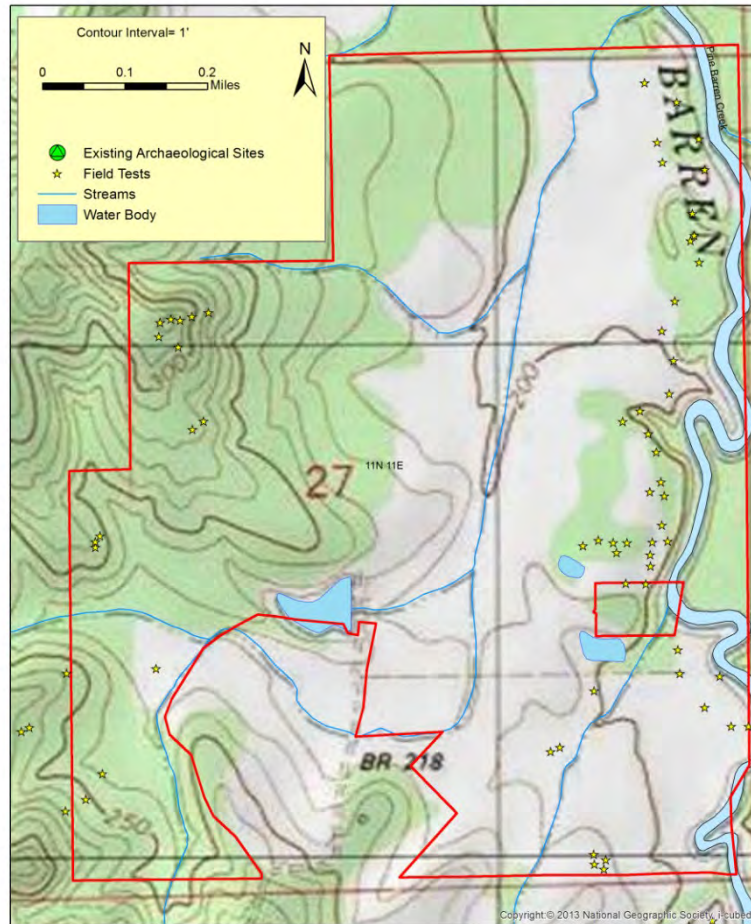
Research Data in Virginia

- LASER Tool:
 - LiDAR Point Clouds and DEM (1-m resolution)
- Weights of Evidence
 - USGS DEM (10 m) and derived products: Slope, Aspect, Range
 - Geological Data: Age and Rock Type
 - Soil: Texture, Total Clay Percentage, Farmland, Drainage Type
 - Distances to Water and Wetland
- Data Sources:

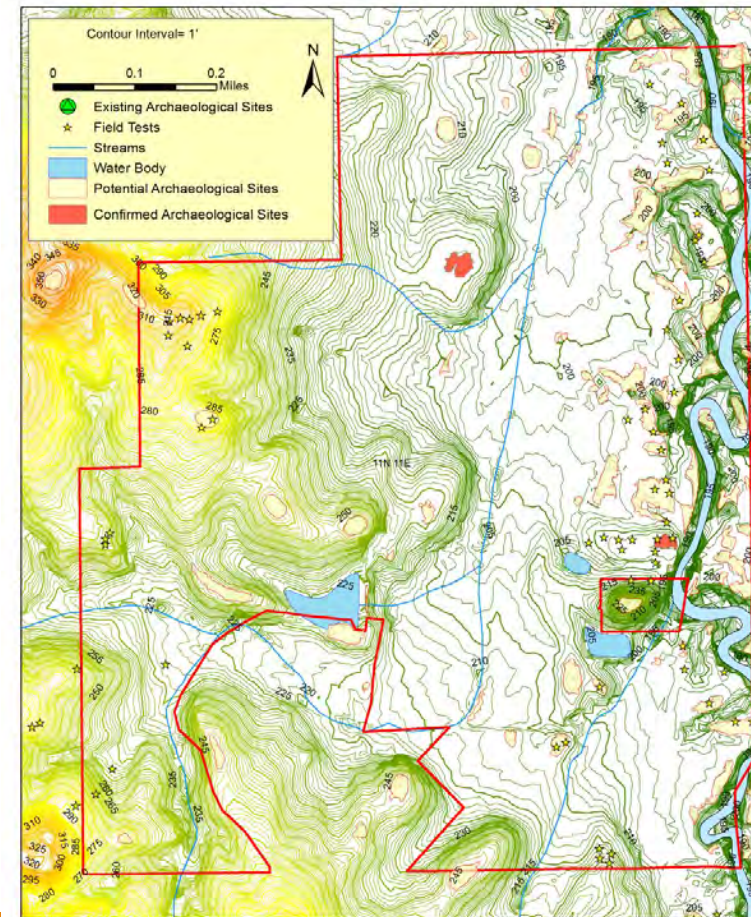
National Map	https://apps.nationalmap.gov/downloader/
Web Soil Survey	https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx
National Wetland Inventory	https://www.fws.gov/program/national-wetlands-inventory/data-download

LiDAR-based Contour Map

Wilcox County, Knight Cattle Farm (WRP)
Township 11N, Range 11E



Wilcox County, Knight Cattle Farm (WRP)
Township 11N, Range 11E



Benefit of Using LiDAR Data

Penetrate through vegetation coverage

Contain tremendous details of terrain variations

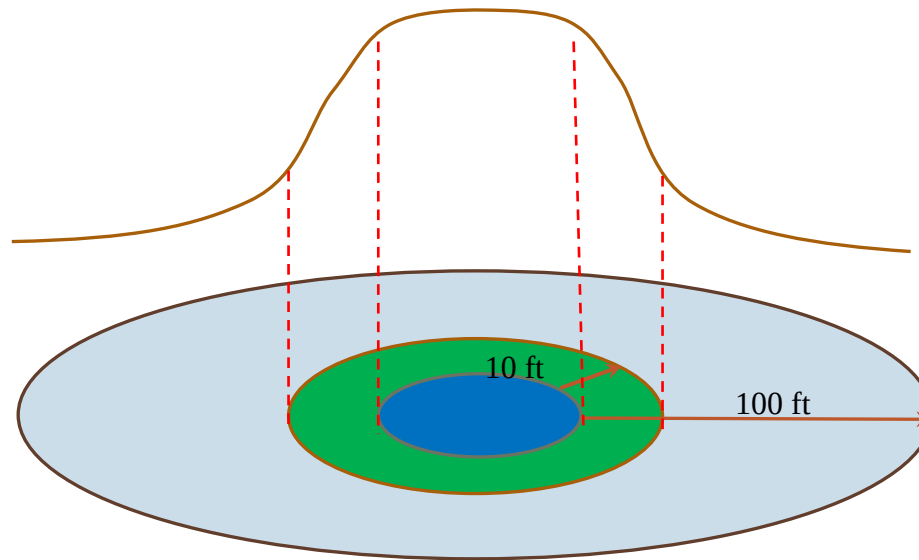
Help to discover potential locations of cultural resources

Challenges:

- Huge Data Volume: hundreds Mega bytes to Giga bytes.
- Large Amount of information to be filtered out.
- Automation of Data Processing and Analysis.

The LASER Method

A **L**iDAR-based **A**rchaeological **S**ite **E**xtraction and **R**ecognition (LASER) method was developed by using a double-buffer terrain model.



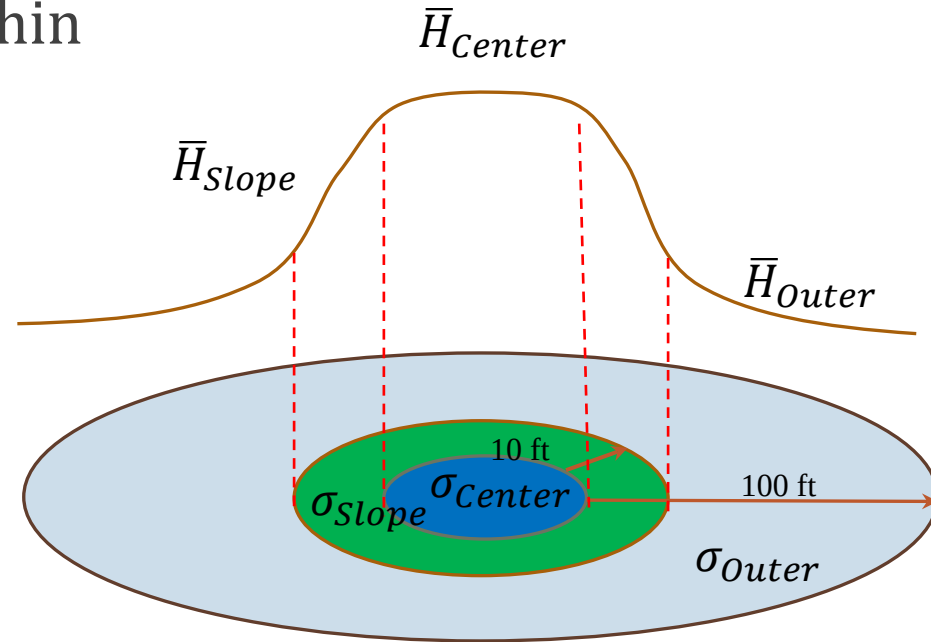
The LASER Method

Statistical Analysis of Elevation within the three regions:

- Center Polygon: $\bar{H}_{Center} \pm \sigma_{Center}$
- Slope Buffer: $\bar{H}_{Slope} \pm \sigma_{Slope}$
- Outer Buffer: $\bar{H}_{Outer} \pm \sigma_{Outer}$

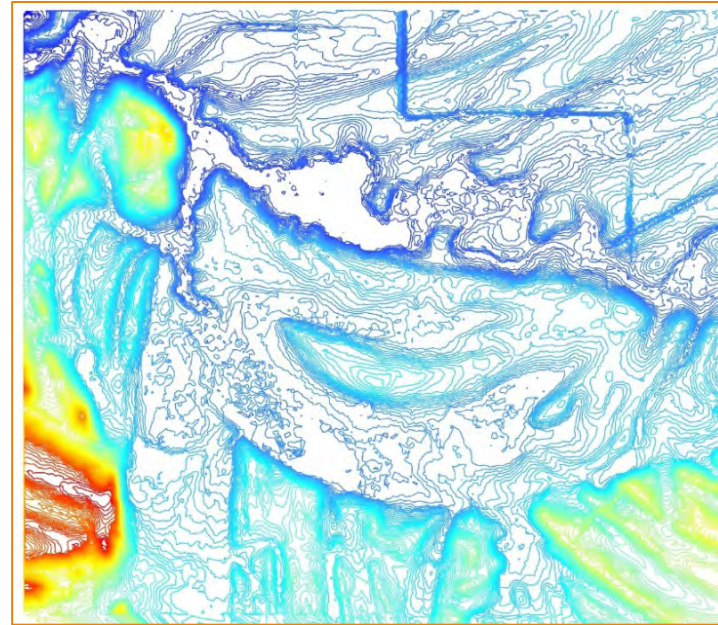
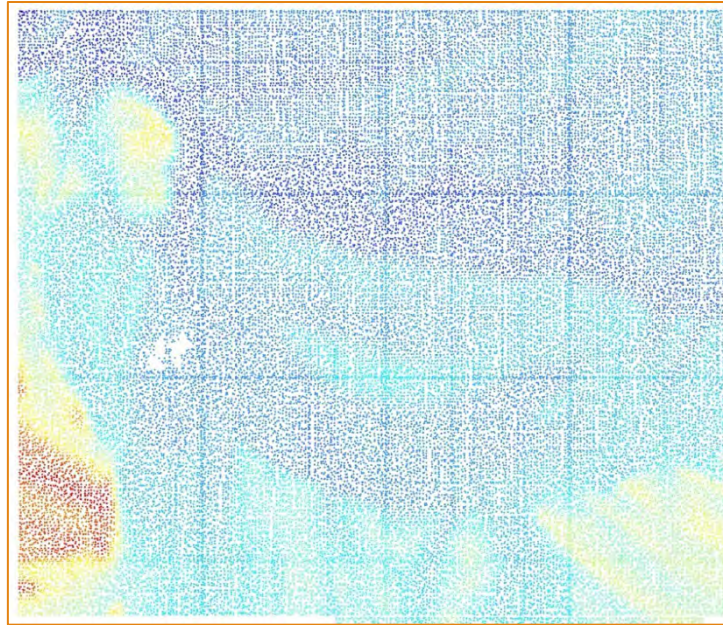
Selection Criteria:

- $\bar{H}_{Center} > \bar{H}_{Slope}$
- $\bar{H}_{Slope} > \bar{H}_{Outer}$
- $\sigma_{Center} < \sigma_{Slope}$
- $\sigma_{Center} < \sigma_{Outer}$



The LASER Method

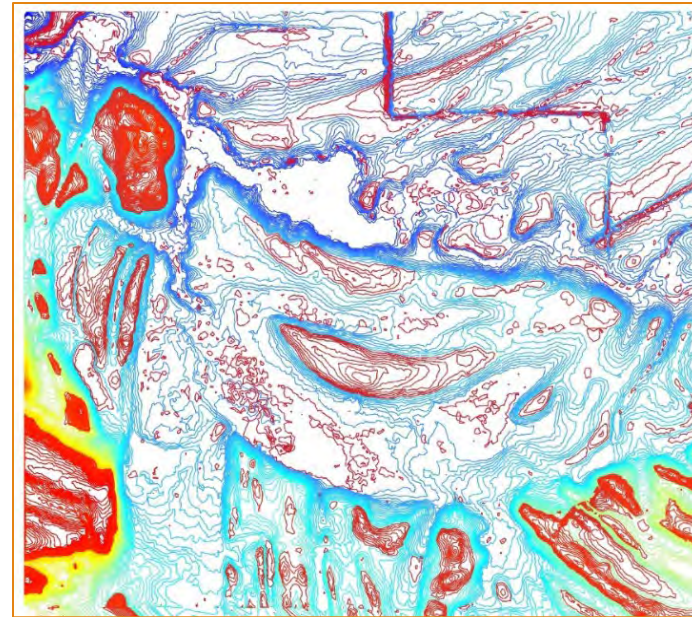
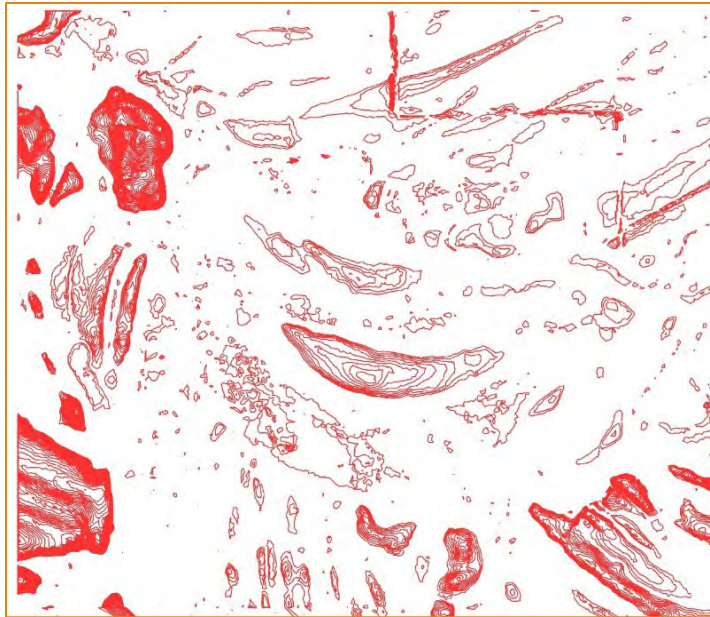
Only ground points were extracted from LiDAR point cloud and converted ground points into contour lines.



The LASER Method

Mound-shape landforms are extracted from contour lines.

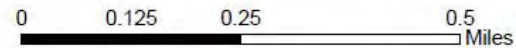
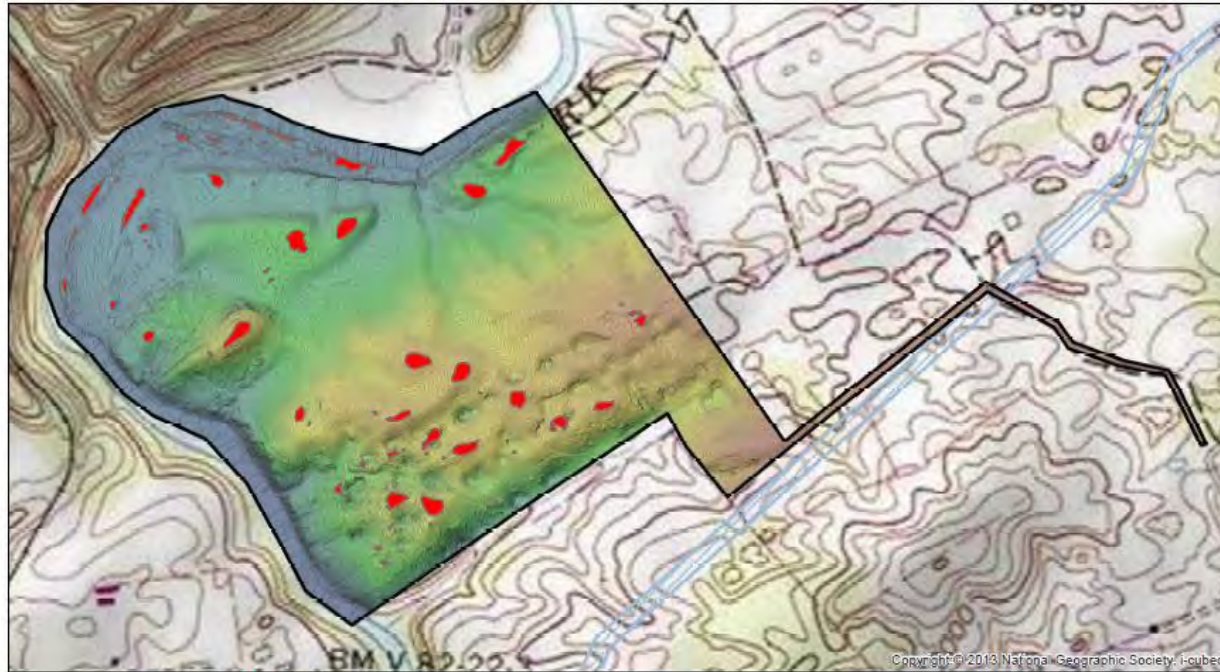
“Sink holes” are filtered.



Results of the LASER Method

Yorktown Battlefield

Washington County Easement LASER Map



Legend

-  LASER Indicated Location
 Virginia Easement

Elevation (Feet)
1179.95

High : 1972.35
Low : 1744.14

TROY UNIVERSITY

Archaeological
Research Center

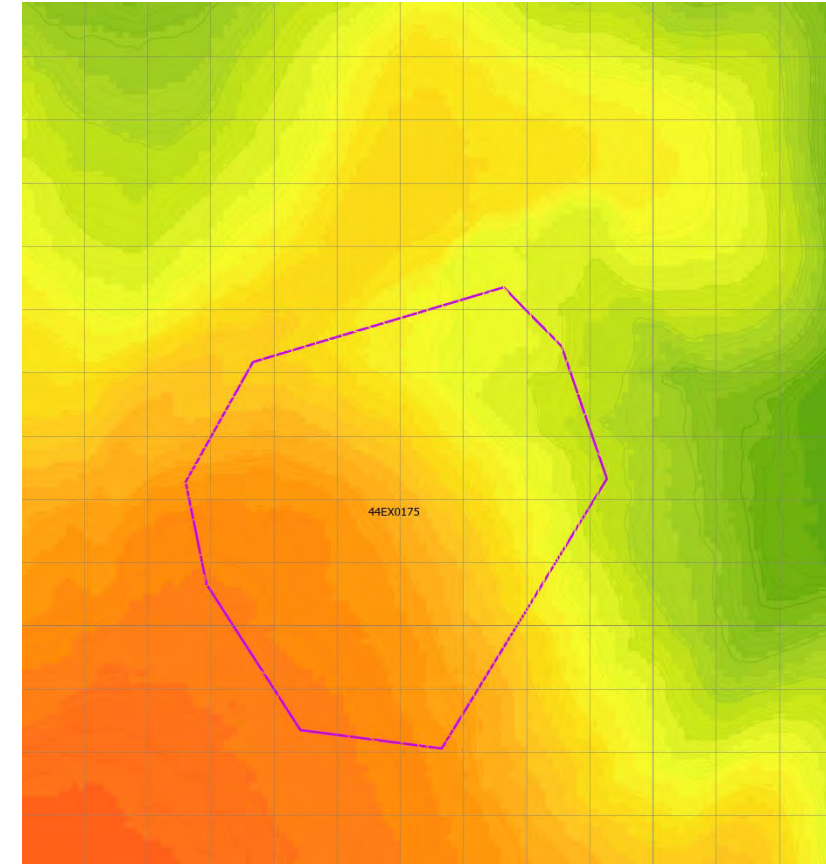
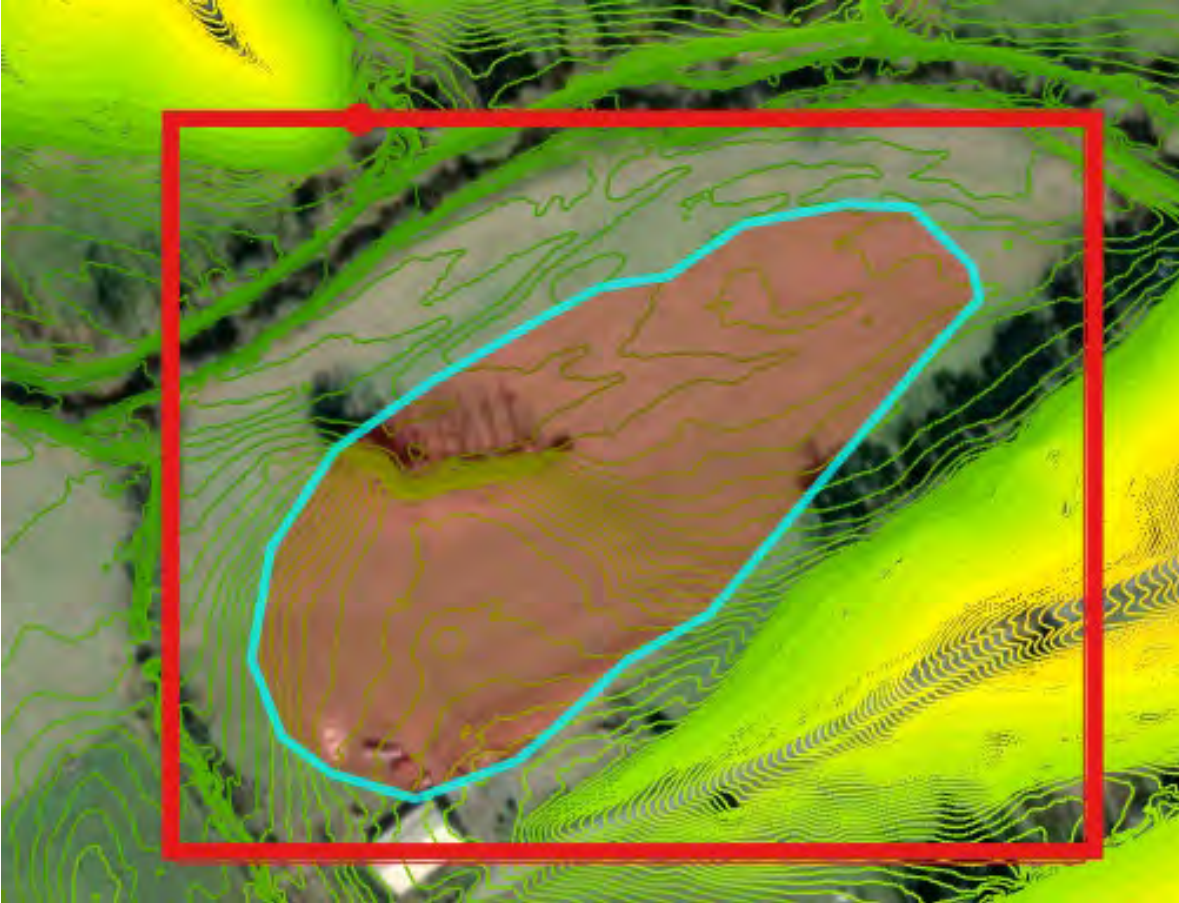
An aerial photograph of a forest floor. Several objects are highlighted with red outlines, including a small red object in the top left, a red object in the center, and a cluster of red objects in the bottom right. Two large green rectangular outlines are also present, one in the top left and one in the bottom right. White outlines highlight a large, elongated shape in the center and a smaller, irregular shape in the bottom right. A person's leg is visible in the bottom center, pointing towards the bottom right.

Topographic map of the study area showing three parcels outlined in green: 44LE0059, 44LE0060, and 44LE0012 15238. The map includes contour lines, roads (Dr. J. M. Mound Dr., Widmore Rd, Dr. Thomas Walker Rd), and a highway (US 58).

0 50 100 200 Meters



Examples of Undetected Sites/Landforms



Improvement to the LASER Method

Challenges:

- Huge Data Volume: hundreds Mega bytes to Giga bytes.
- Large Amount of information to be filtered out.
- Automation of Data Processing and Analysis.

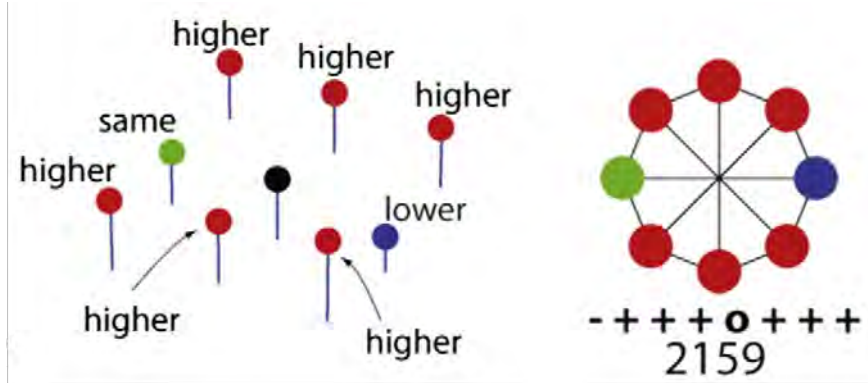
Limitation from Original LASER method:

- Slow speed
- Only extract Mount-shaped landforms

Solutions:

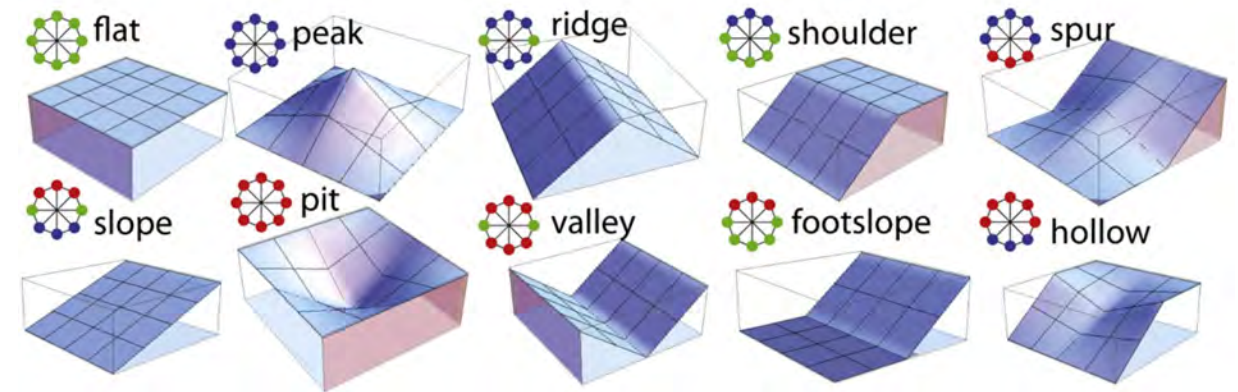
- Used 1-m DEM derived from LiDAR ground points.
 - The DEM data are available from National Map website
 - Automation of Data Downloading Process using National Map Web API
- Adopted Zonal Analysis functions in ArcGIS Pro in the LASER Toolbox that supports GPU-based parallel processing and simplified processing workflow
- Created a new tool based on Geomorphon Landforms

Geomorphon Landforms



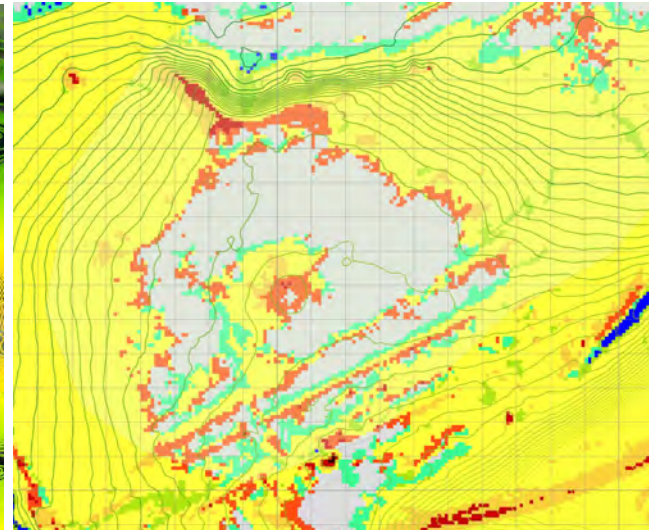
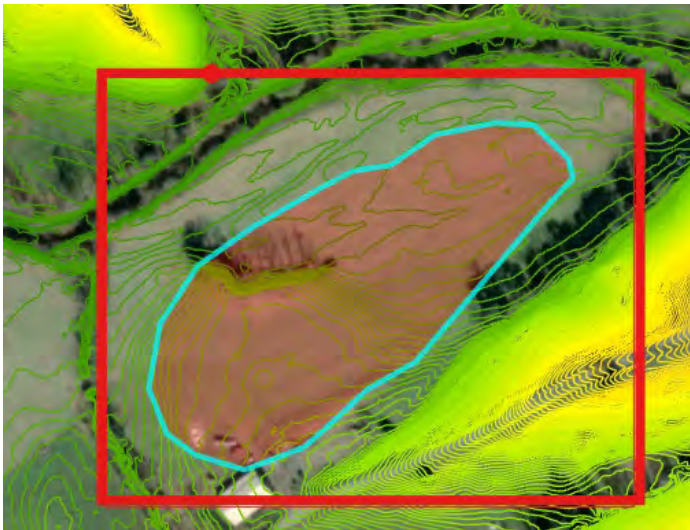
A geomorphon (Jasiewicz and Stepiski, 2013) is a representation of micro-landscape based on a sequence elevation differences between distant locations along eight principal compass directions centering at a target cell. (“+” = Higher; “-” = Lower; and “o” = equal)

Jasiewicz and Stepiski (2013) classified a total of 498 geomorphon patterns into 10 common landform types: flat, peak, ridge, shoulder, spur, slope, hollow, footslope, valley, and pit as shown in figure below:

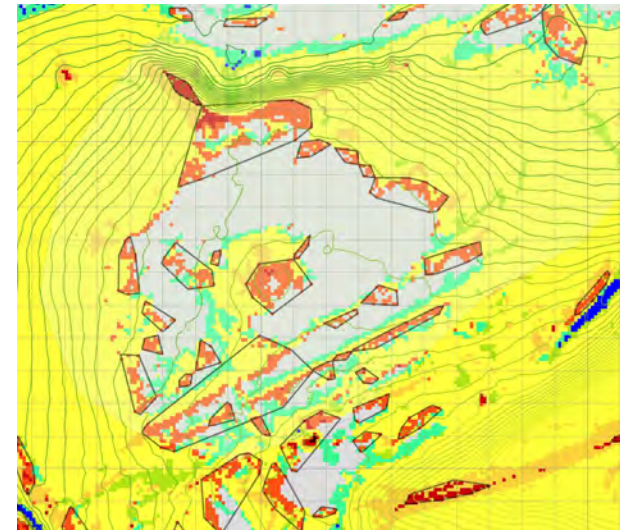


Geomorphon landform-based LASER Tool

1. DEM → Geomorphon Landforms
2. Reclassify Geomorphon Landforms by Grouping Shoulder and Ridge Landforms into Clusters
3. Conduct Statistical Analysis of Landforms within Clusters and Extract Site Candidates as Convex Hulls



Geomorphon Landforms

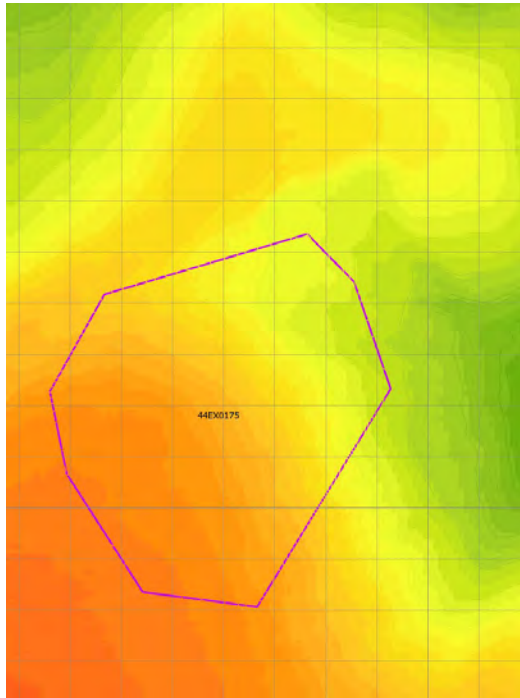


Extracted Clusters of Shoulder and Ridge Landforms

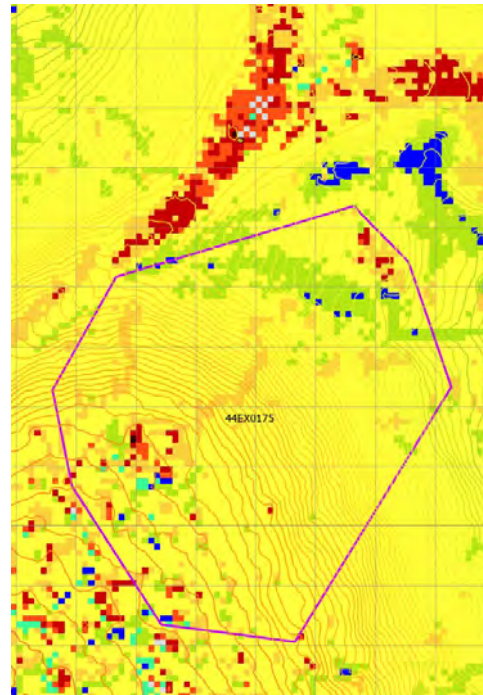


Additional Examples of New LASER Tool

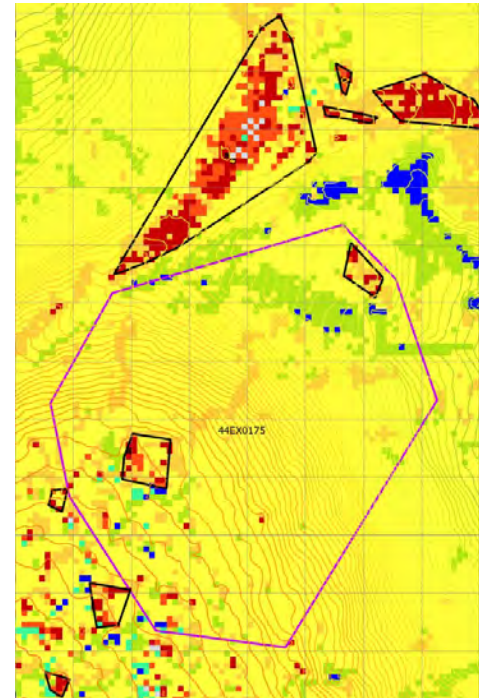
Detection of Platforms on Slope



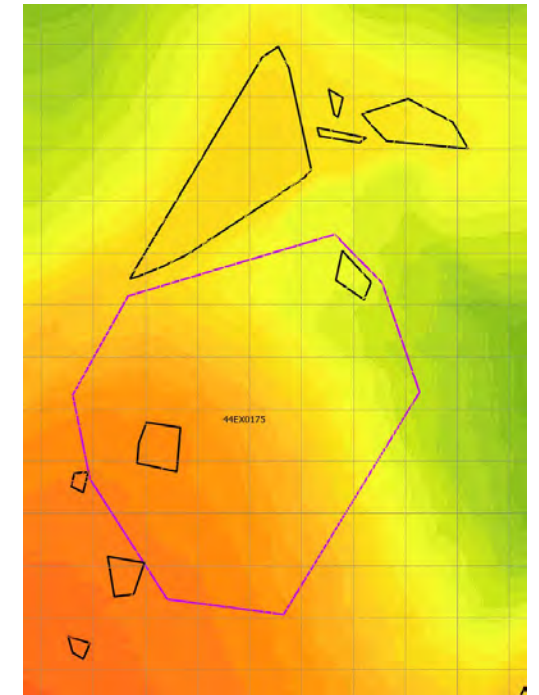
Site boundary and
contours



Geomorphon Landforms

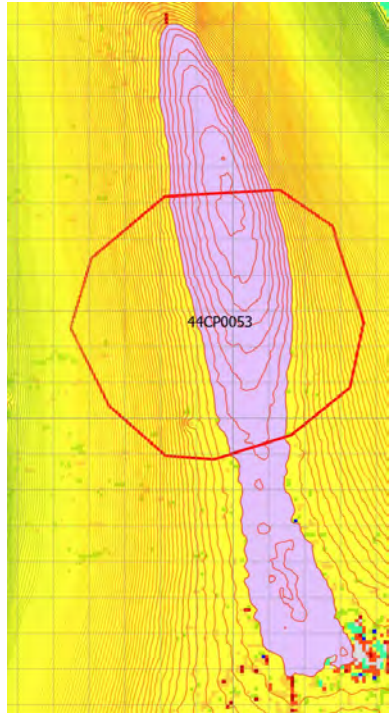


Extracted Clusters

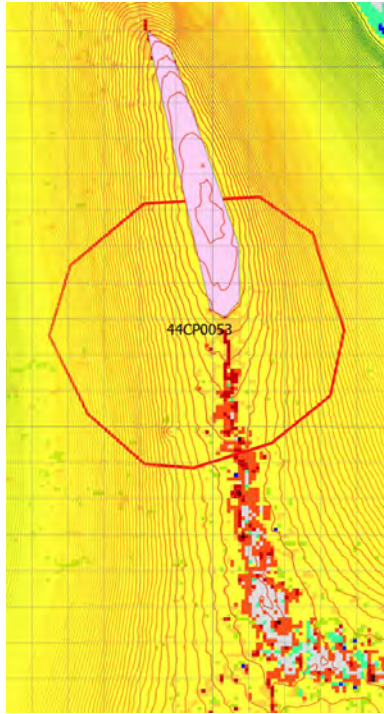


Results of new tool

Additional Examples of New LASER Tool



Site boundary and
contours



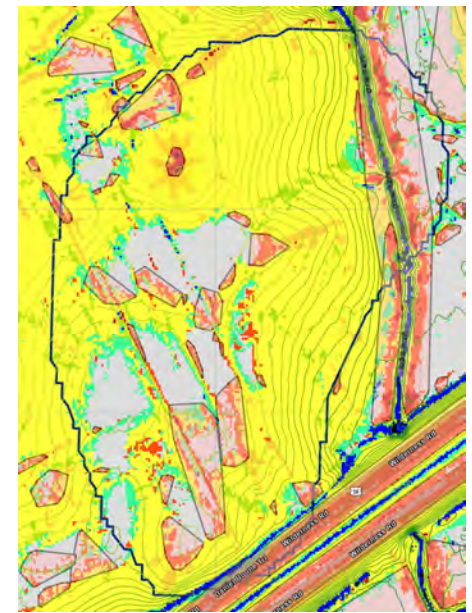
Results of new tool



Site boundary and
contours

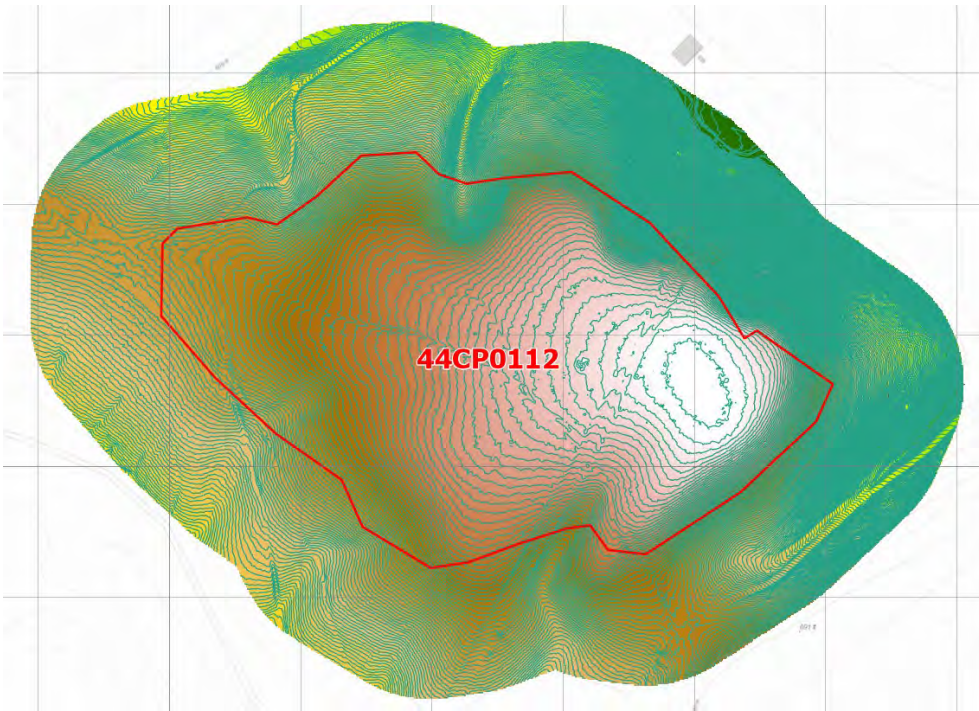


Results of original
tool

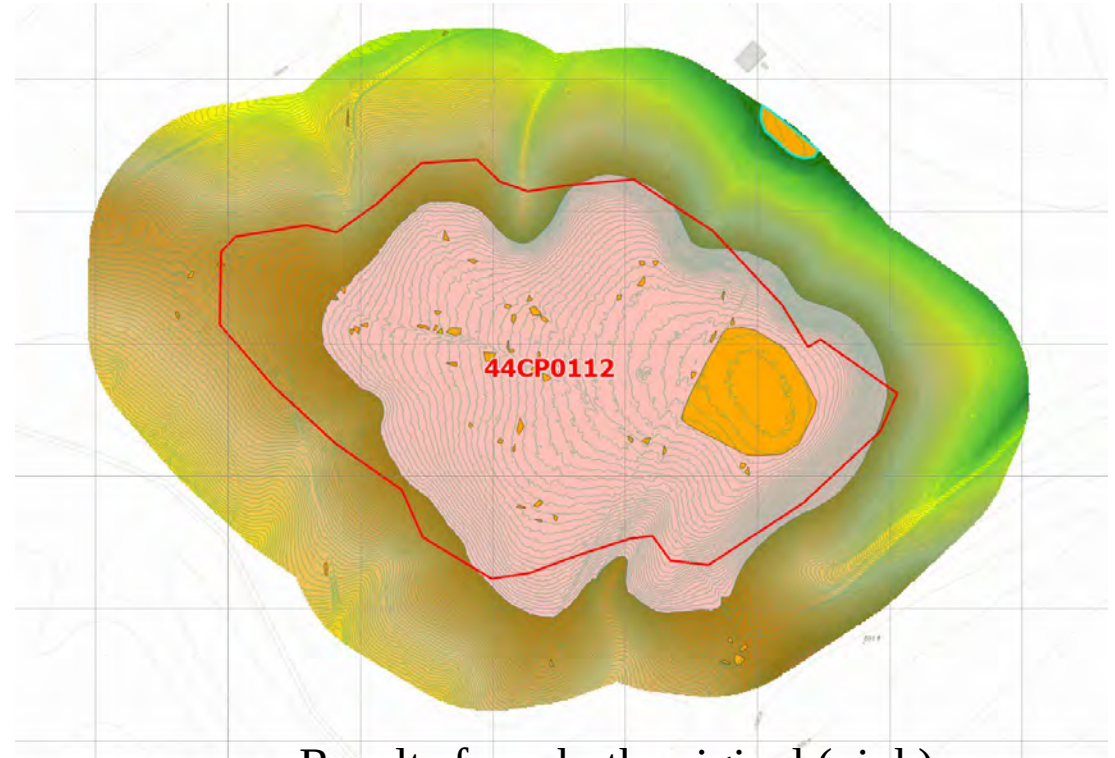


Results of new tool

Additional Examples of New LASER Tool



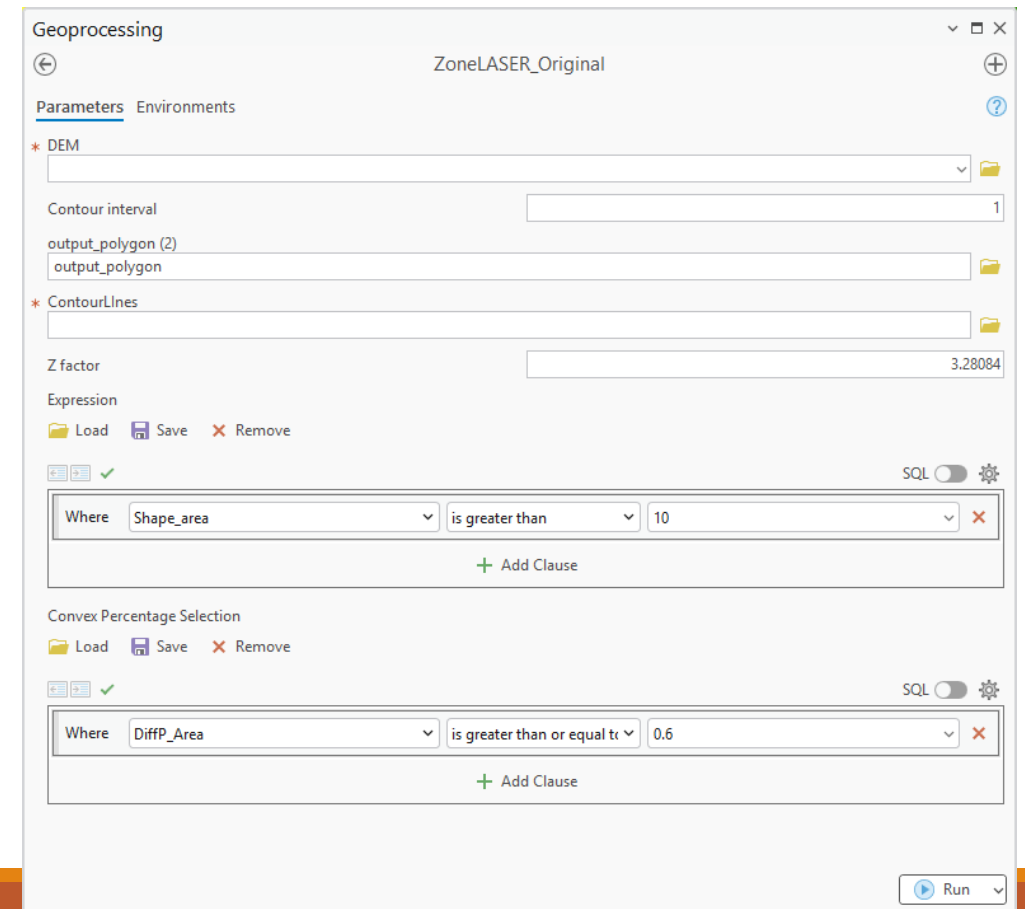
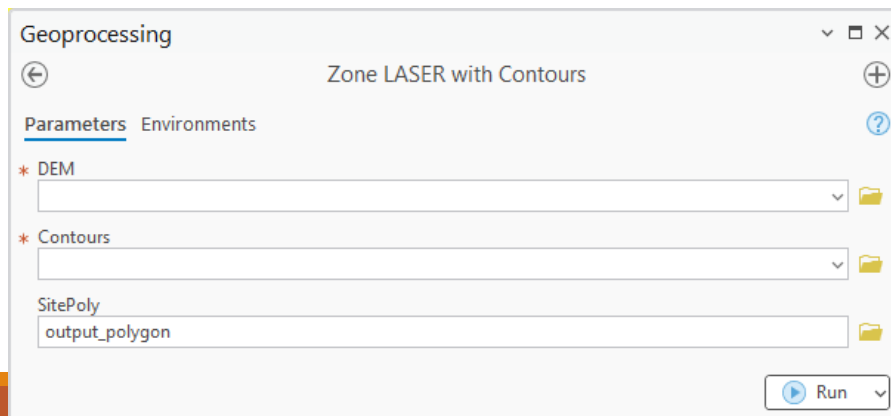
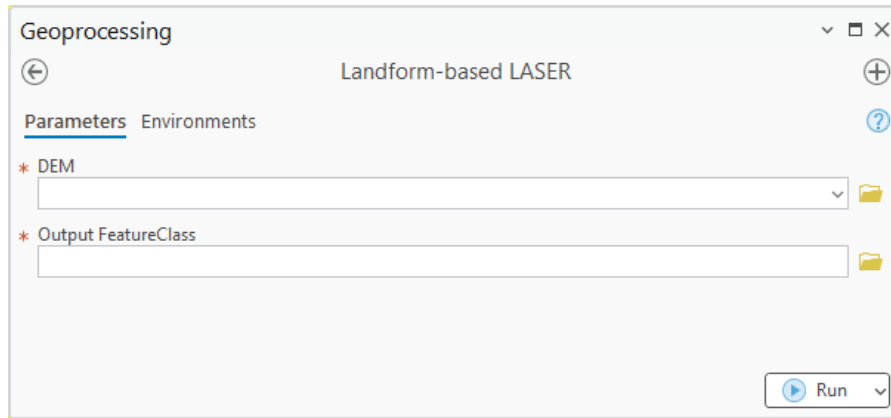
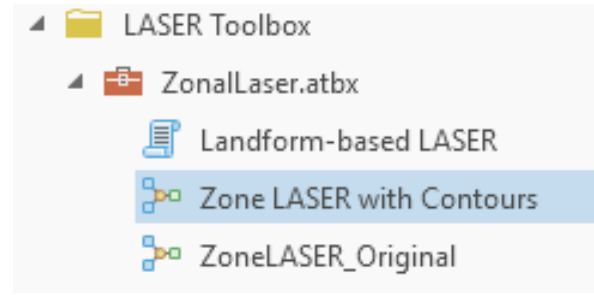
Site boundary and
contours



Results from both original (pink)
and new (orange) tools

LASER Tool Interface

A Toolbox in ArcGIS Pro containing three tools.

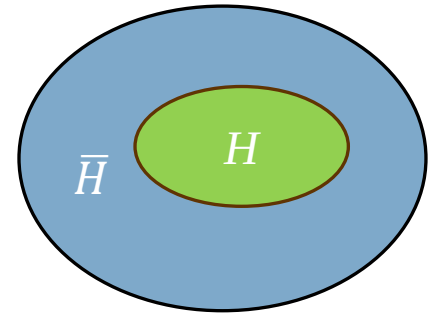


Weight of Evidence (WoE) Method

A statistical method that analyzes impact of different environmental factors on prediction probability of cultural resource sites at certain area based on the logarithm of odds.

$$W(H:E) = \log \frac{P(E|H)}{P(E|\bar{H})}$$

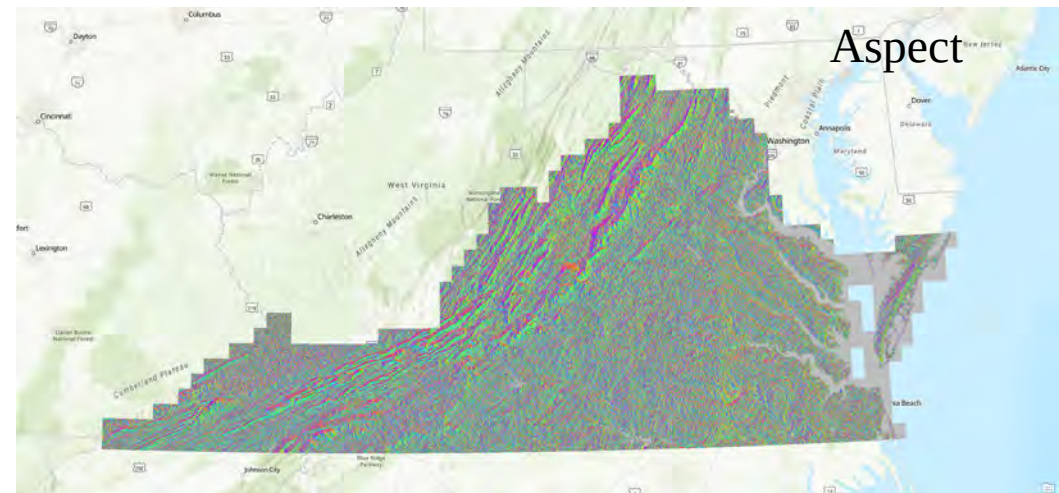
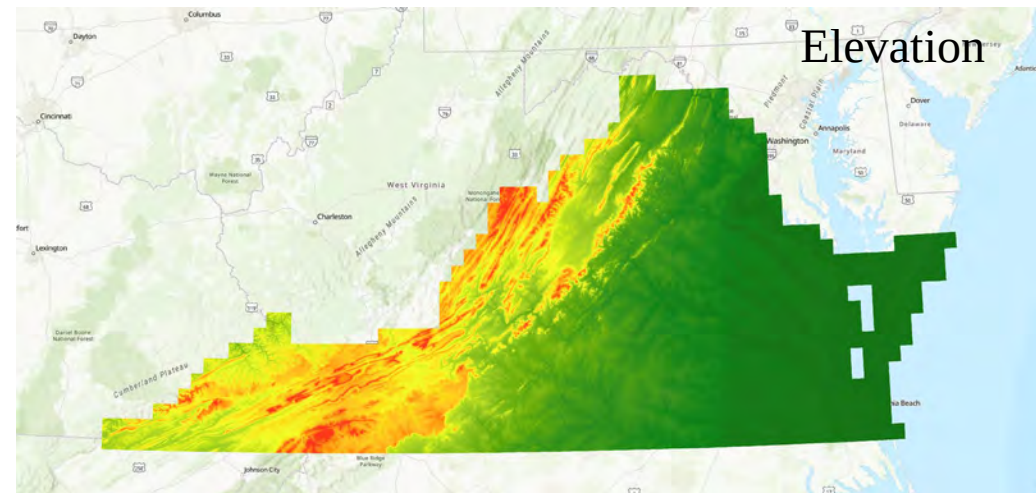
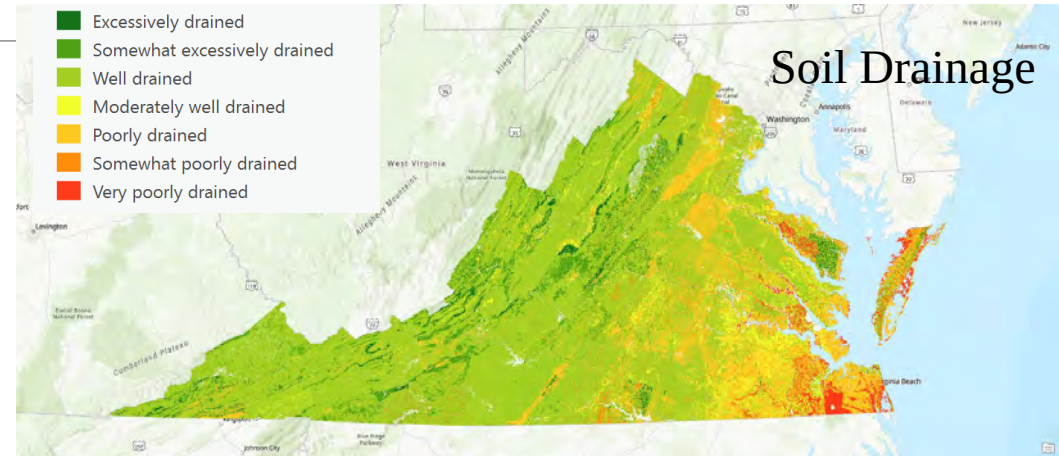
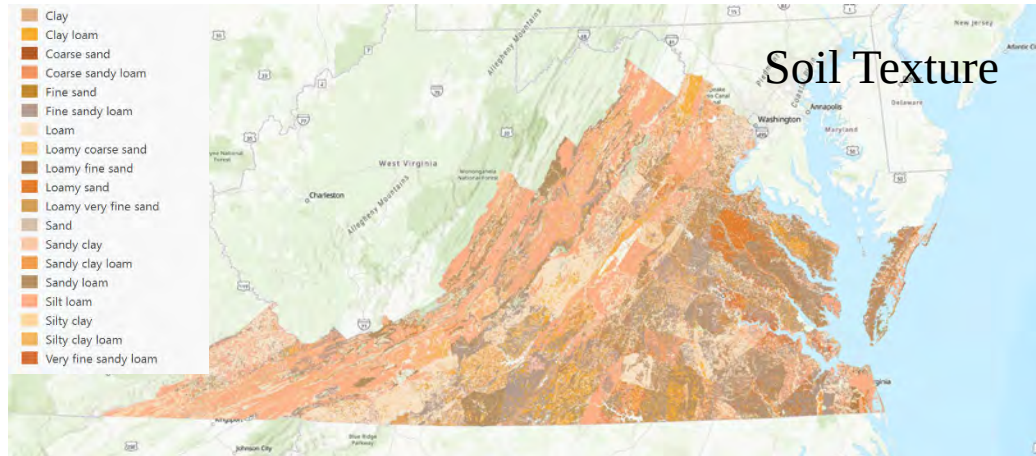
- H : positive event, i.e. an area with sites;
- $\bar{H}$: negative event, i.e., an area without sites;
- E : factor/evidence, including
 - **slope, aspect, range, soil texture, clay percentage, farmland, distance to water or wetland, rock age and type, etc.**
- $W(H:E)$ is the weight of evidence
- $P(E|H)$ is the probability of factor within an area that there are sites.
- $P(E|\bar{H})$ is the probability of factor within an area that there are no sites.



The WoE Method

- A Weight of Evidence tool in the Spatial Data Modeler (Version 5.03) extension (ArcSDM) for ArcGIS Pro
 - Downloadable from GitHub: <https://github.com/gtkfi/ArcSDM>
- Collected all the environmental variable data in all watersheds HUC-10 and calculated all the corresponding weight layers
- Computed Prediction Probability layers in all watersheds in Virginia

Sample Evidence Layers



The WoE Method – Sample Environmental Variables

Value *	Count	Class
1	27319085	0-10%
2	371173115	10-20%
3	380616397	20-30%
4	133517903	30-40%
5	10997069	40-50%
6	36718411	50-60%
7	12424728	60-70%
8	6958855	70-80%
9	112768	>80%

Soil Total Clay

Value	Count	drainagecl
1	657064645	Well drained
2	159119342	Poorly drained
3	74847043	Moderately well drained
4	25172814	Somewhat poorly drain...
5	52095857	Somewhat excessively d...
6	24116557	Excessively drained
7	16390445	Very poorly drained

Soil Drainage

Value	Count	FarmlandClass
1	565862567	Not prime farmland
2	206922568	All areas are prime farmland
3	258151903	Farmland of statewide importance
4	29001194	Prime farmland if drained
5	5018703	Prime farmland if protected from flooding or not frequently flooded during the growing sea
6	1032345	Prime farmland if drained and either protected from flooding or not frequently flooded duri
7	207430	Prime farmland if irrigated
255	20730534	<Null>

Soil: Farmland

The WoE Method – Sample Environmental Variables

Value	Count	Aspect
0	71986301	Flat
1	114548332	North
2	113844128	Northeast
3	131103428	East
4	142327270	Southeast
5	135355752	South
6	124430470	Southwest
7	131263777	West
8	128486915	Northwest

DEM: Aspect

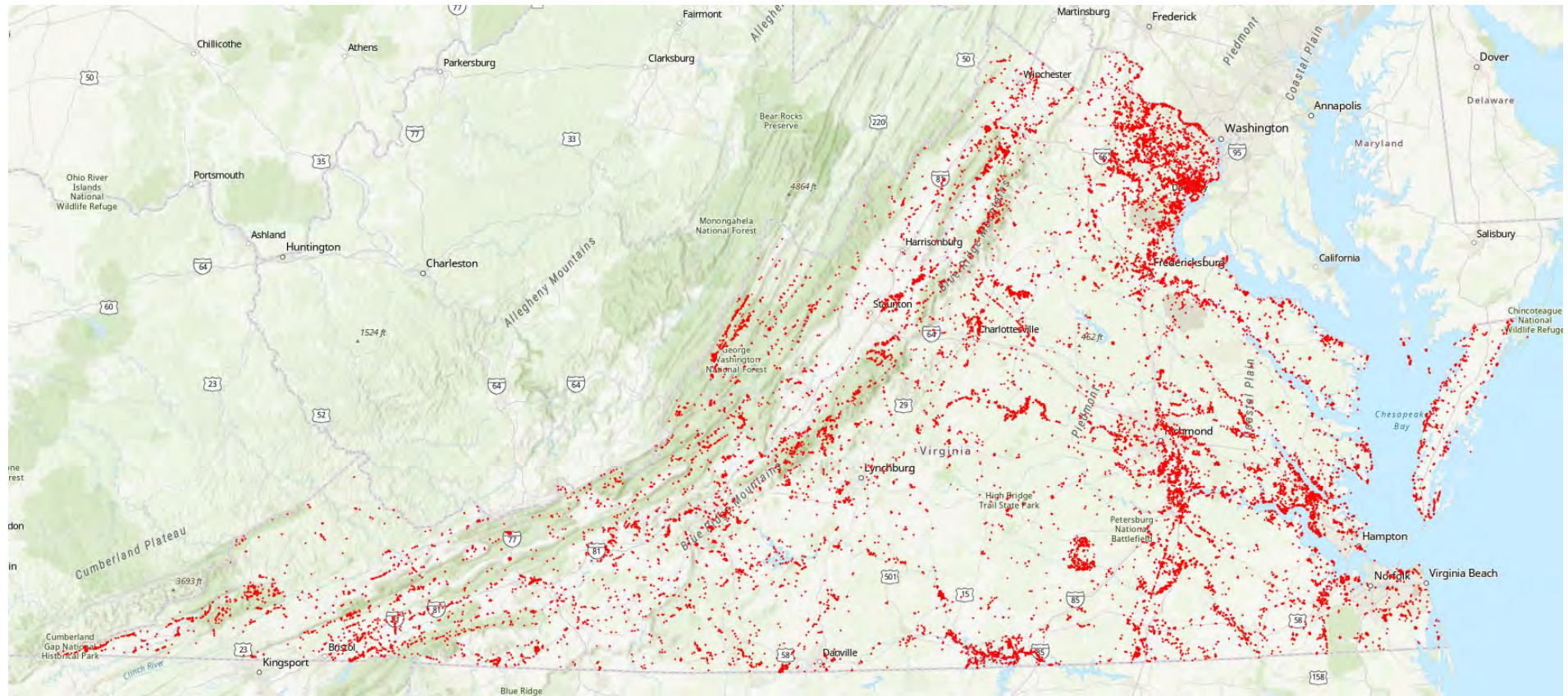
Value	Count	RangeInterval
1	178788226	0-1
2	168001486	1-3
3	153240915	3-5
4	117258336	5-7
5	117051471	7-10
6	115713961	10-15
7	76745742	15-20
8	100888201	20-30
9	64219854	30-50
10	2368965	>50

Range

Value	Count	SlopeInterval
1	311581095	0-2
2	232043417	2-5
3	215268946	5-10
4	114202068	10-15
5	78528573	15-20
6	58708677	20-25
7	41821113	25-30
8	35716038	30-40
9	5166205	40-50
10	292940	50-60
11	17301	60-90

Slope

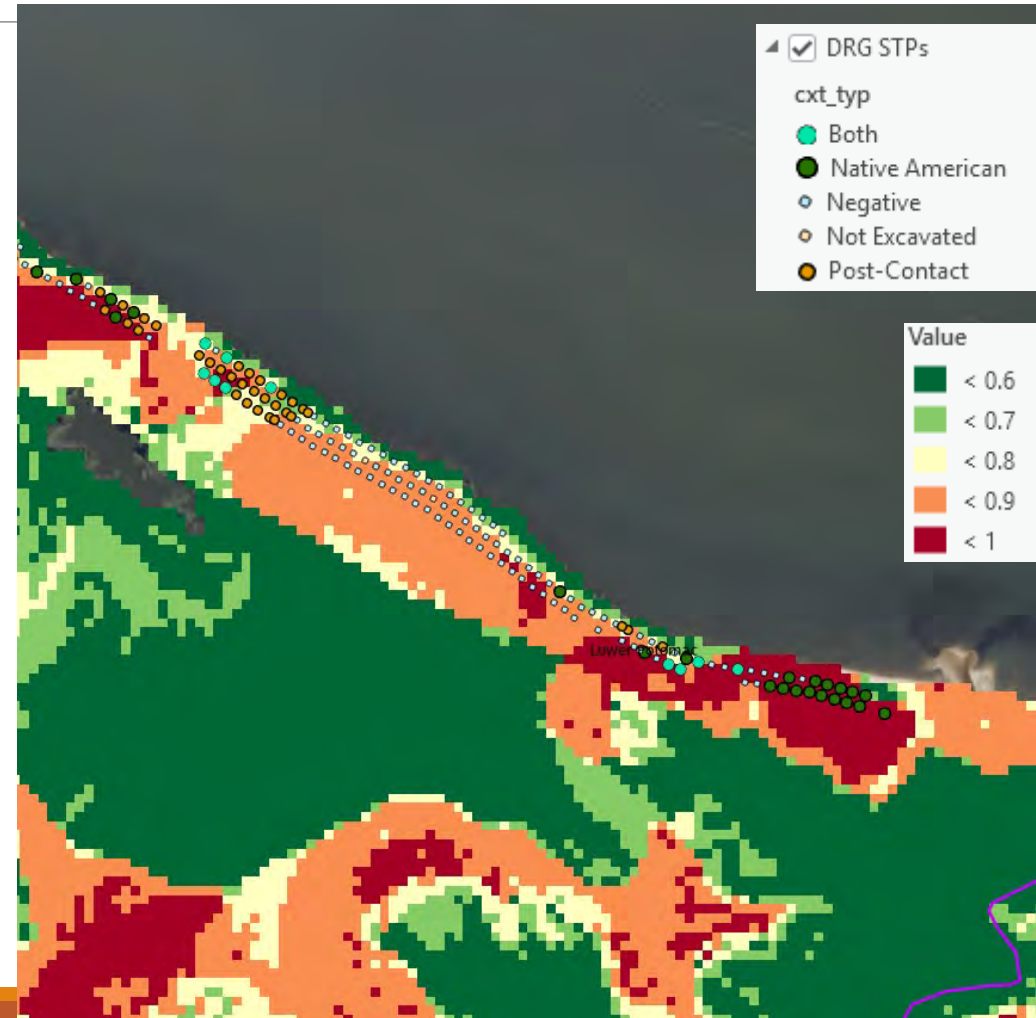
Cultural Resource Sites – Precontact Sites only



The WoE Method Results

All the existing sites have been divided into

- Training Sites: used to calculate weights of evidences
- Testing Sites: used to evaluate the WoE method
- Field test data shown on the right

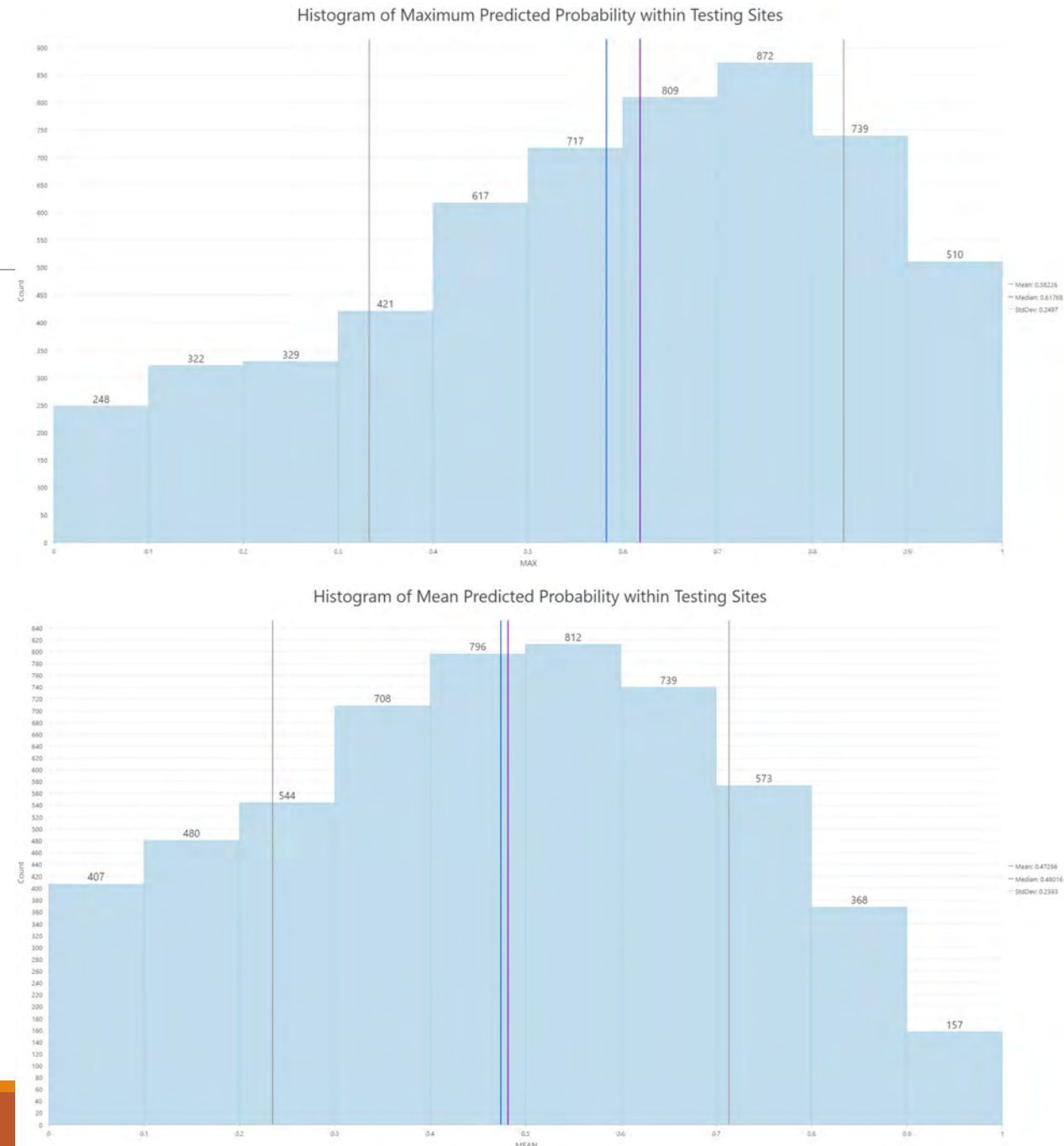


The WoE Method

A total of 5,580 testing sites were chosen state-wide.

- 510 sites contain prediction values of 0.9 (90%) and above;
- 739 sites with 0.8 (80%) and above;
- 872 sites with 0.7 (70%) and above;
- 809 sites with 0.6 (60%) and above; and
- 717 sites 0.5 (50%) and above.

A total of 3,647 sites (65.36% of the testing sites) has prediction probability of 50% and above.



Other Deliverables of the Project

1-m Contour in all watersheds

Flow Accumulation

Stream Power Index



Pamunkey Creek Watershed in the Piedmont Region



Swift Creek Watershed in Coastal Plain Regions

Conclusion and Discussion

- Completed and delivered all the tools and data products.
- Work to be done:
 - Refine new landform-based LASER tool and integrate it with the original model
 - Further analyze weight layers of all environmental variables, especially their spatial distribution patterns, to better understand dominating factors in site detection.
- Lessons that have learned:
 - Complexity of the geographic environments in Virginia.
 - High volume of data involved in this project is overwhelming.
 - Expert knowledge is important when using the tools.
 - Spatial resolution of environmental data, especially soil data, does not match that of LiDAR data.

Thank you!!!

Questions???

Safeguarding Virginia: The Sentinel Landscape



Mary Bennett

Tidewater Sentinel Landscape Coordinator
April 23rd 2025





SENTINEL LANDSCAPES



SENTINEL LANDSCAPE PARTNERSHIP

★ Founded in 2013

- ▶ USDA, DOD, DOI
- ▶ Federal Agencies, State and Local Governments, NGOs, and Landowners

★ The National Defense Authorization Acts

- ▶ 2018, 2022, and 2024



WHAT IS A SENTINEL LANDSCAPE?

- ★ Sentinel landscapes are areas where **conservation, working lands, and national defense** interests converge.
 - ▶ Anchored by High-Value Military Installations
 - ▶ High-Priority Lands for:
 - ▶ USDA, DOD, and DOI



SENTINEL LANDSCAPES



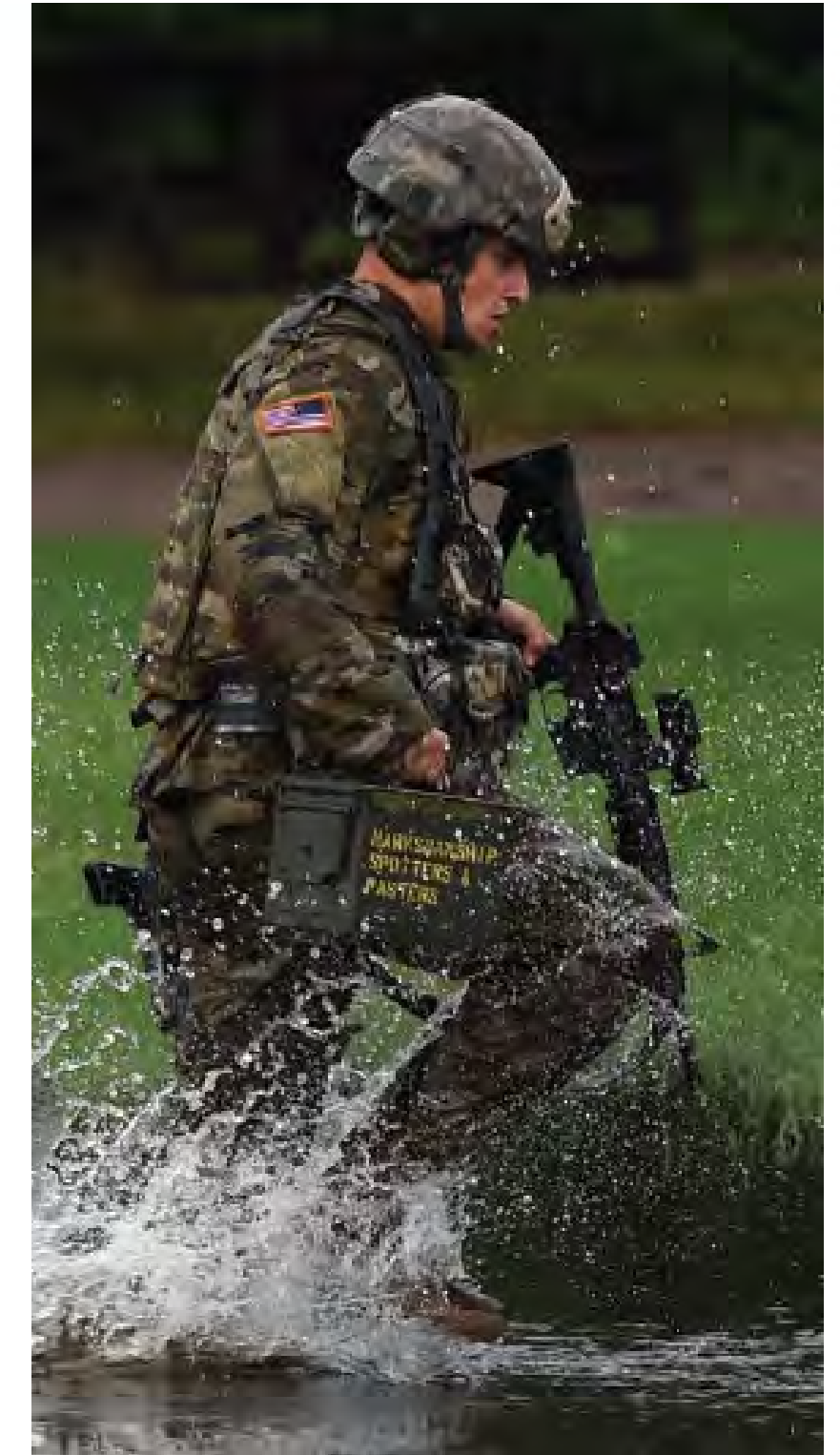
BENEFITS TO NATIONAL DEFENSE

- ★ Address Vulnerabilities to Environmental Threats
- ★ Sustain Compatible Land Use
- ★ Leverage Multiple Resources

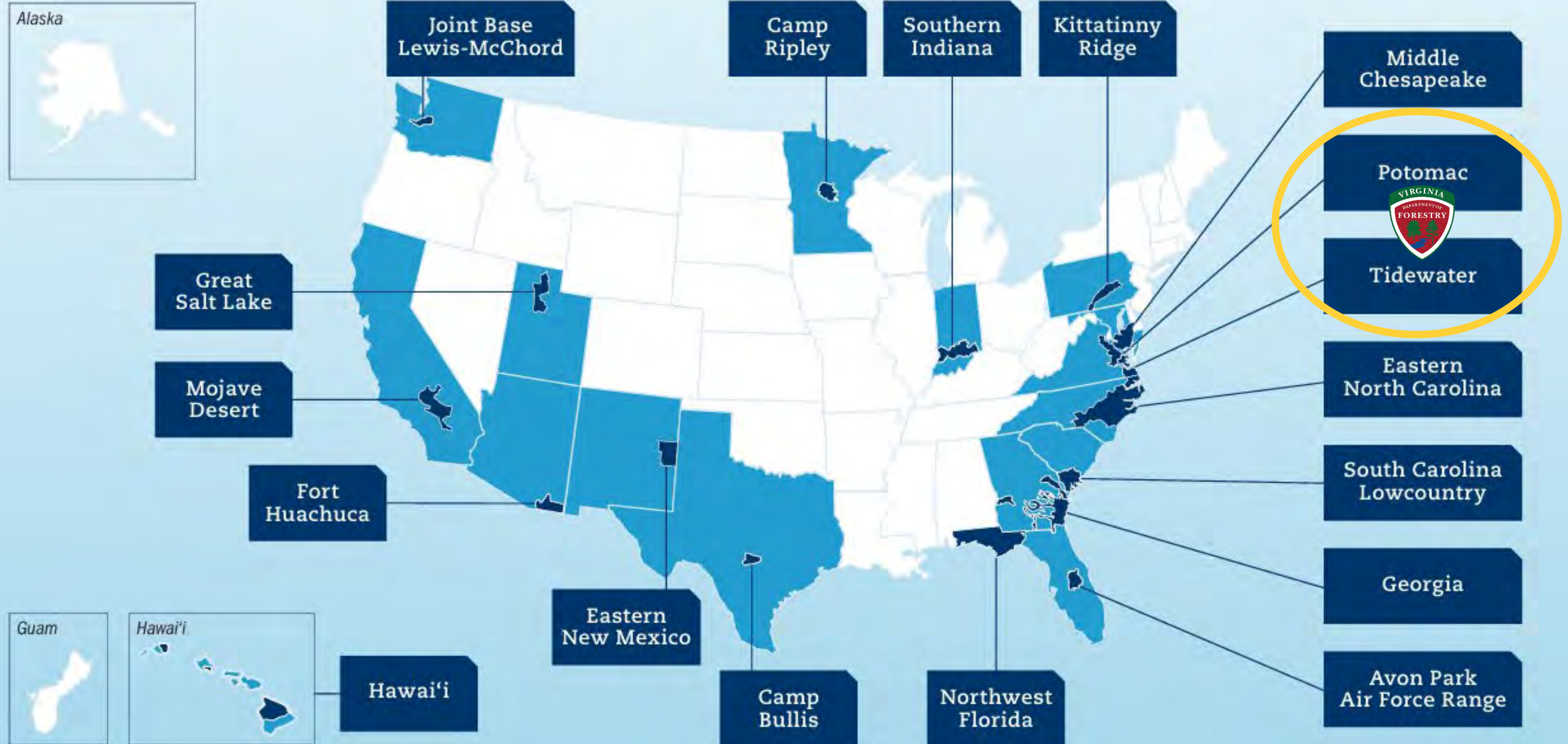


WHY VIRGINIA?

- ★ The **Pentagon** – headquarters of the Department of Defense
- ★ The **National Guard Bureau** – the federal instrument responsible for the administration of the United States National Guard
- ★ **NATO's Allied Command Transformation** – the only NATO headquarters located in the U.S.
- ★ Major headquarters for the **Army, Navy, Air Force, Marines, and Coast Guard**
- ★ The US Navy's East Coast Master Jet Base – **NAS Oceana**
- ★ The largest naval base in the world – **Norfolk Naval Station**
- ★ The Headquarters of Air Combat Command and the longest continuously active air force base in the world – the **Langley** side of Joint Base Langley-Eustis

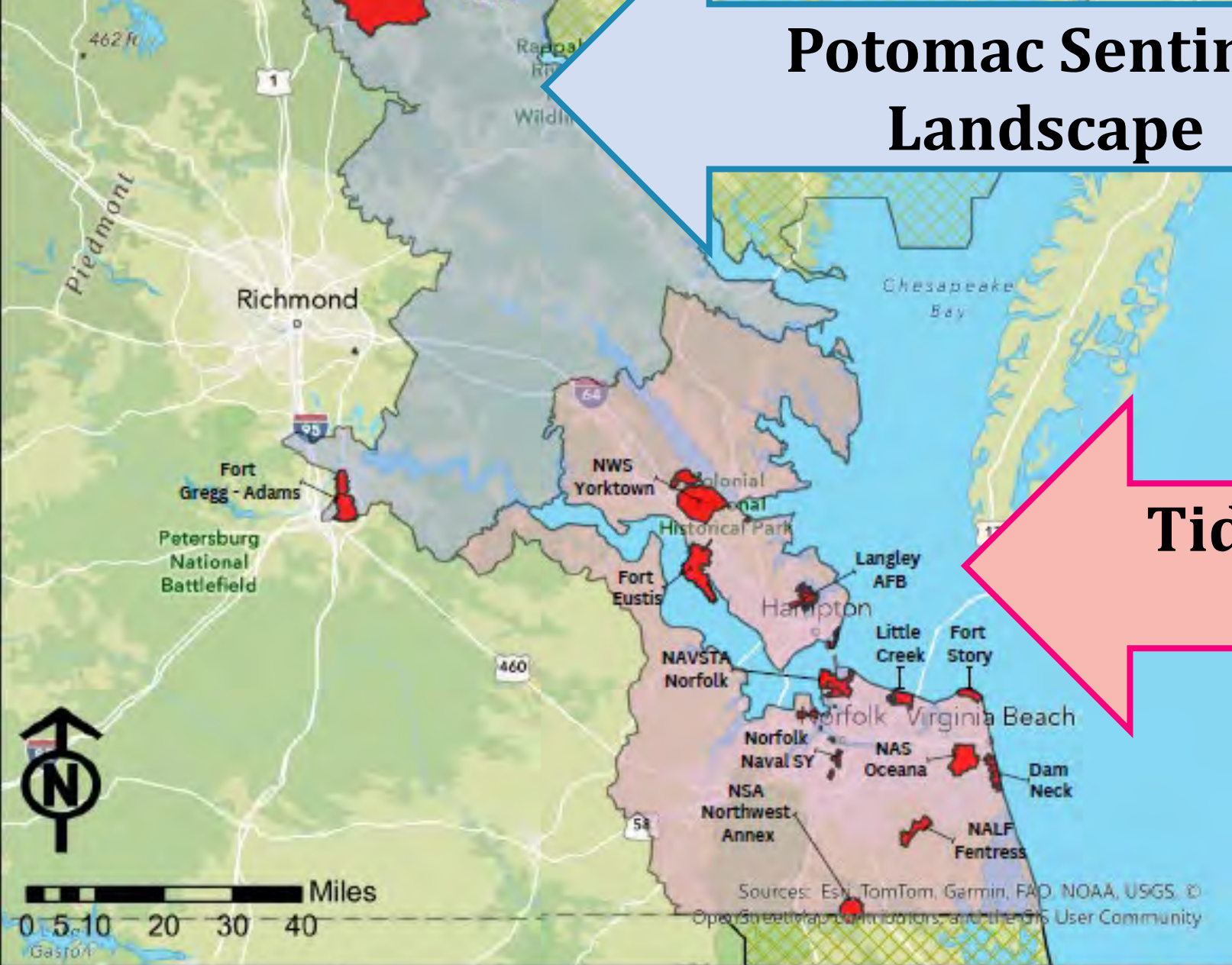


SENTINEL LANDSCAPES





Potomac Sentinel Landscape



Tidewater Sentinel Landscape

VIRGINIA SECURITY CORRIDOR SENTINEL LANDSCAPE



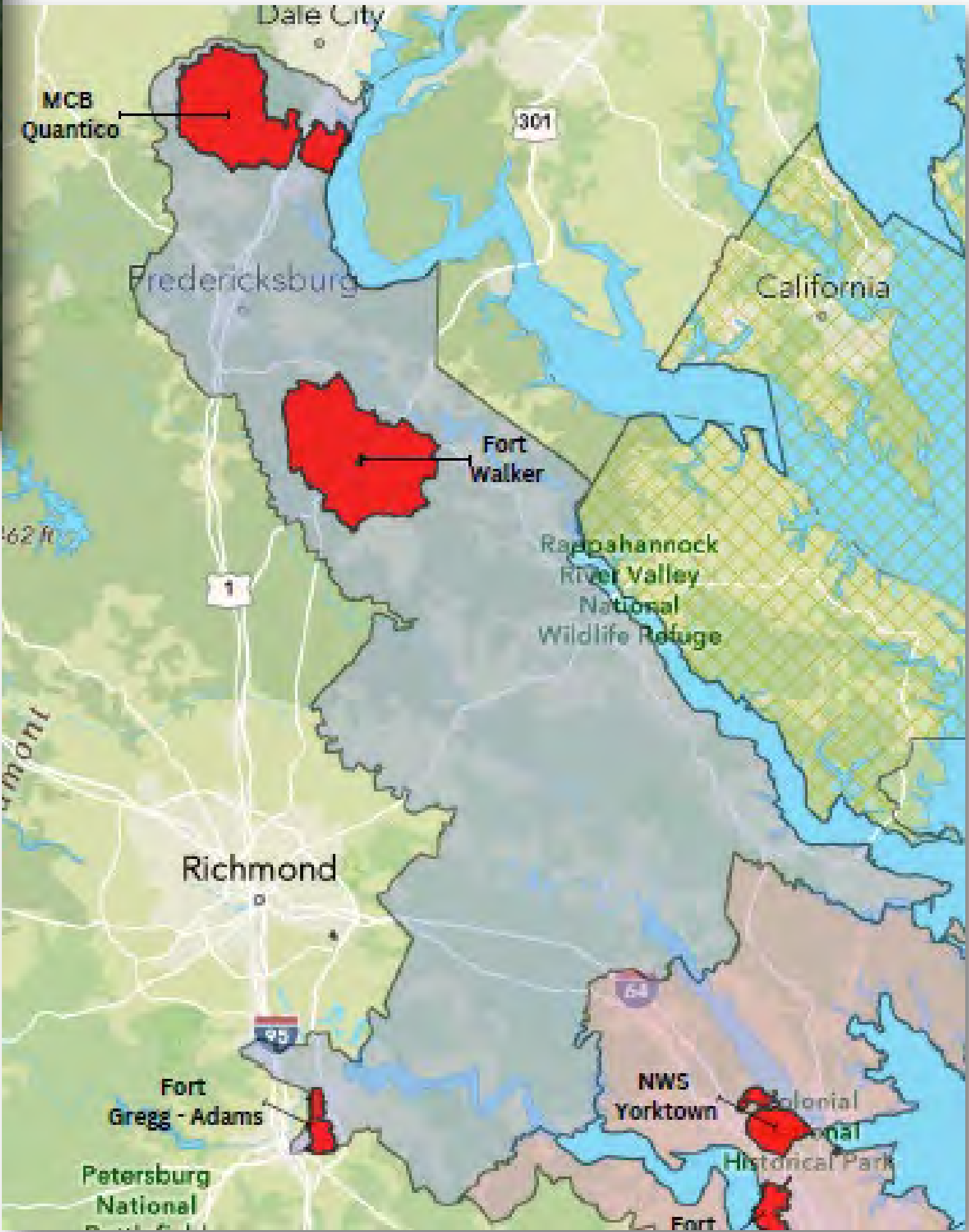
Sentinel Landscapes

- Neighboring Sentinel Landscape
- Virginia Security Corridor - Tidewater
- Virginia Security Corridor - Potomac
- Installations

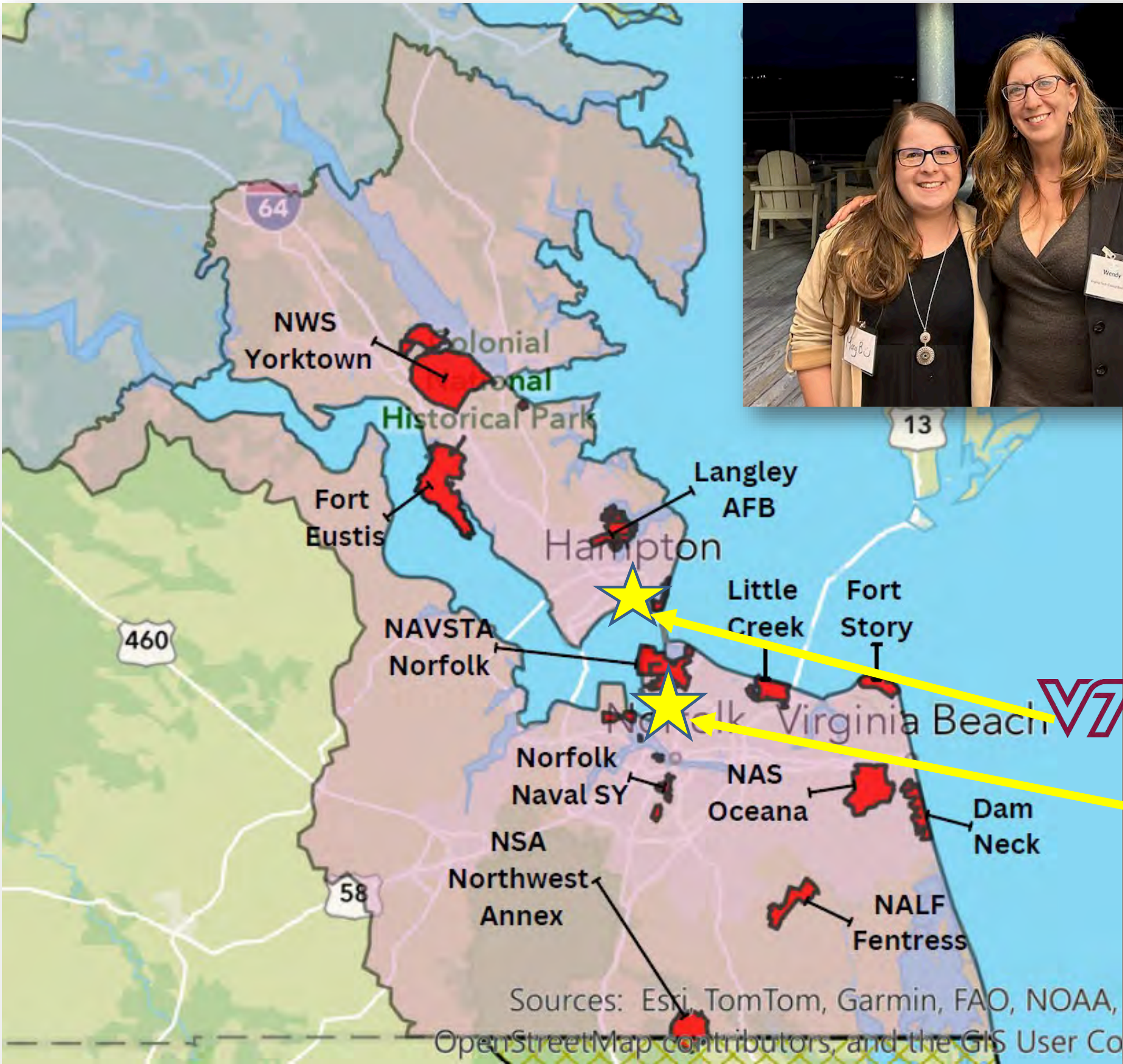
VIRGINIA SECURITY CORRIDOR SENTINEL LANDSCAPE

USDA

FEMA



LOCALITY	Percent in SL
City of Chesapeake	100%
City of Hampton	100%
City of Newport News	100%
City of Norfolk	100%
City of Poquoson	100%
City of Portsmouth	100%
City of Virginia Beach	100%
City of Williamsburg	100%
Gloucester County	100%
James City County	100%
Matthews County	100%
Town of Smithfield	100%
York County	100%
City of Suffolk	67%
Isle of Wight County	48%
Surry County	40%



SENTINEL LANDSCAPES



LINES OF EFFORT

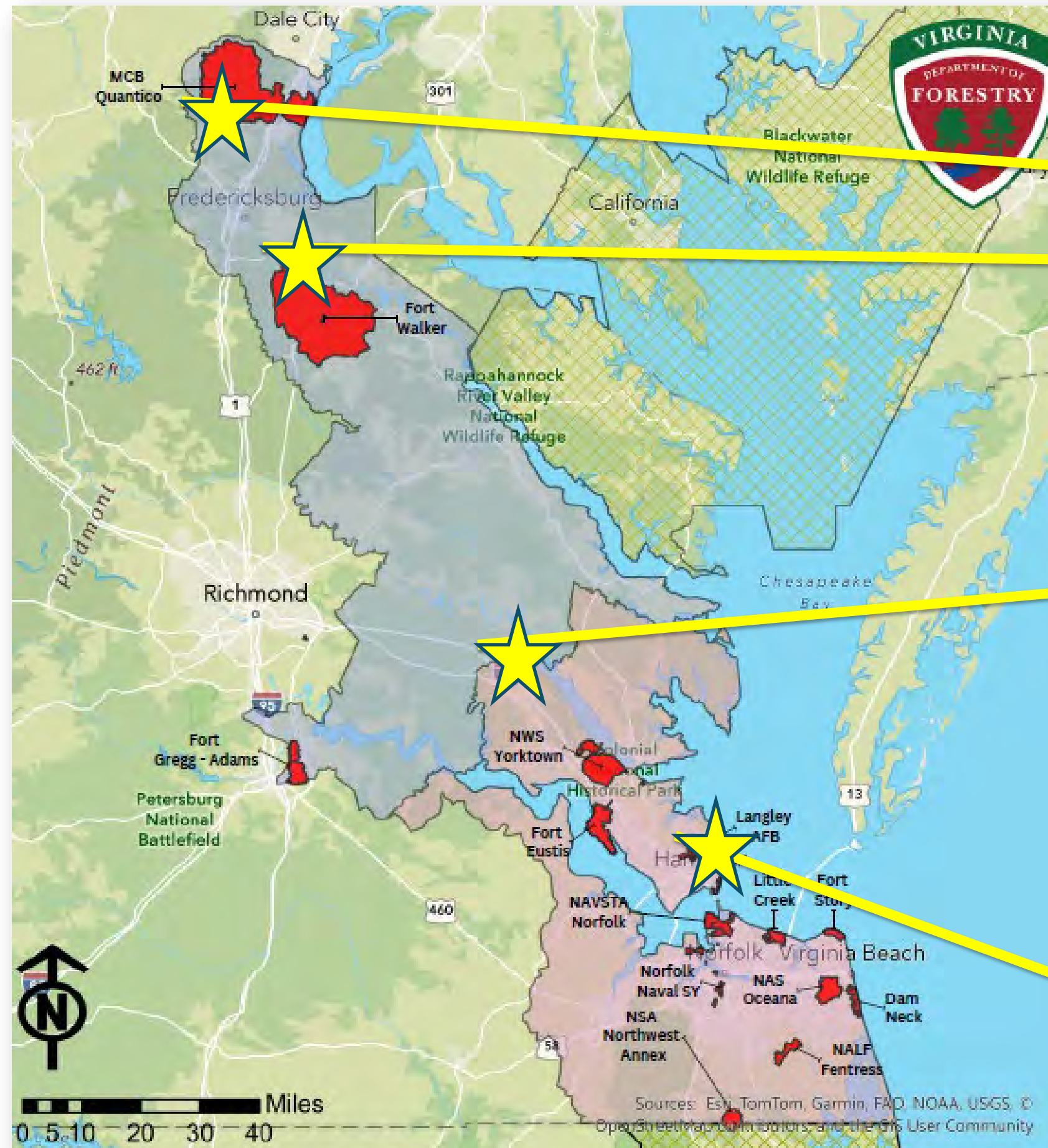
- ★ Prevent Encroachment
- ★ Build Resilience Against Natural Hazards
- ★ Conserve and Restore Key Lands and Environmental Assets
 - ★ To enhance mission readiness while safeguarding water resources and quality



WHY THIS MATTERS

- ★ We're bringing dollars to Virginia
- ★ Providing capacity through two coordinators and associated partnerships
- ★ Making the region more competitive
- ★ And it's working! ***\$6.3 million to VA to date***

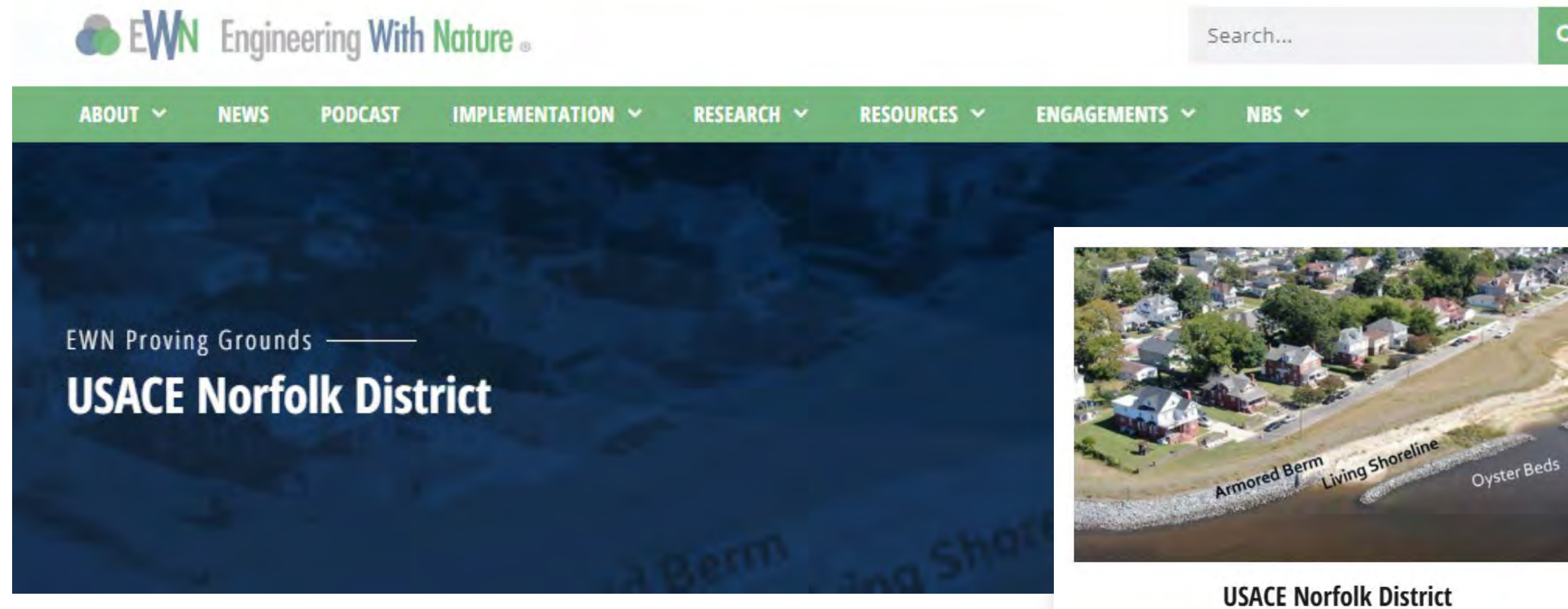
USACE EWN
Proving
Ground



QUANTICO EASEMENTS
FORT WALKER EASEMENTS

MPPPPDC – NWS YORKTOWN
RARI EASEMENT

CITY OF HAMPTON – LANGLEY
NFWF NCRF



“...the **Norfolk District** is uniquely positioned to serve as a **hub for innovative coastal resilience strategies** due to its extensive network of tidal rivers, diverse ecosystems, and the **convergence of urban and rural land uses.**”

Post Construction Image (Oct

York River

Penniman Spit Hybrid Living Sho

King Creek

Hybrid Living Shoreline Design

York River

Penniman Spit Hybrid Living Shoreline

King Creek

200 ft

Nearmap Image



A Robust Network of Support

Capital Region Land Conservancy
Capital Region Military Alliance
Chesapeake Bay Foundation
City of Chesapeake
City of Hampton
City of Norfolk
City of Virginia Beach
Coastal Virginia Conservancy
DEQ-Coastal Zone Management
Department of Defense
DoD Chesapeake Bay Program
Environmental Defense Fund
Fauquier County
Friends of the Lower Appomattox River
Hampton Roads PDC
Hampton Roads Military and Federal
Facilities Alliance

Indigenous Conservation Council
James City County
Middle Peninsula PDC
Northern Neck Land Conservancy
Northern Virginia Conservation Trust
NRCS
Old Dominion University – ICAR
Prince George County
Prince William County
Stafford County
The College of William & Mary
The Conservation Fund
The Living Shoreline Collaborative
The Nature Conservancy
The Pew Charitable Trusts
Trust for Public Land
USDA

US Department of Interior
Virginia Department of Conservation
and Recreation
Virginia Department of Forestry
Virginia Department of Transportation
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Resources
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Virginia Tech Coastal Collaborator
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