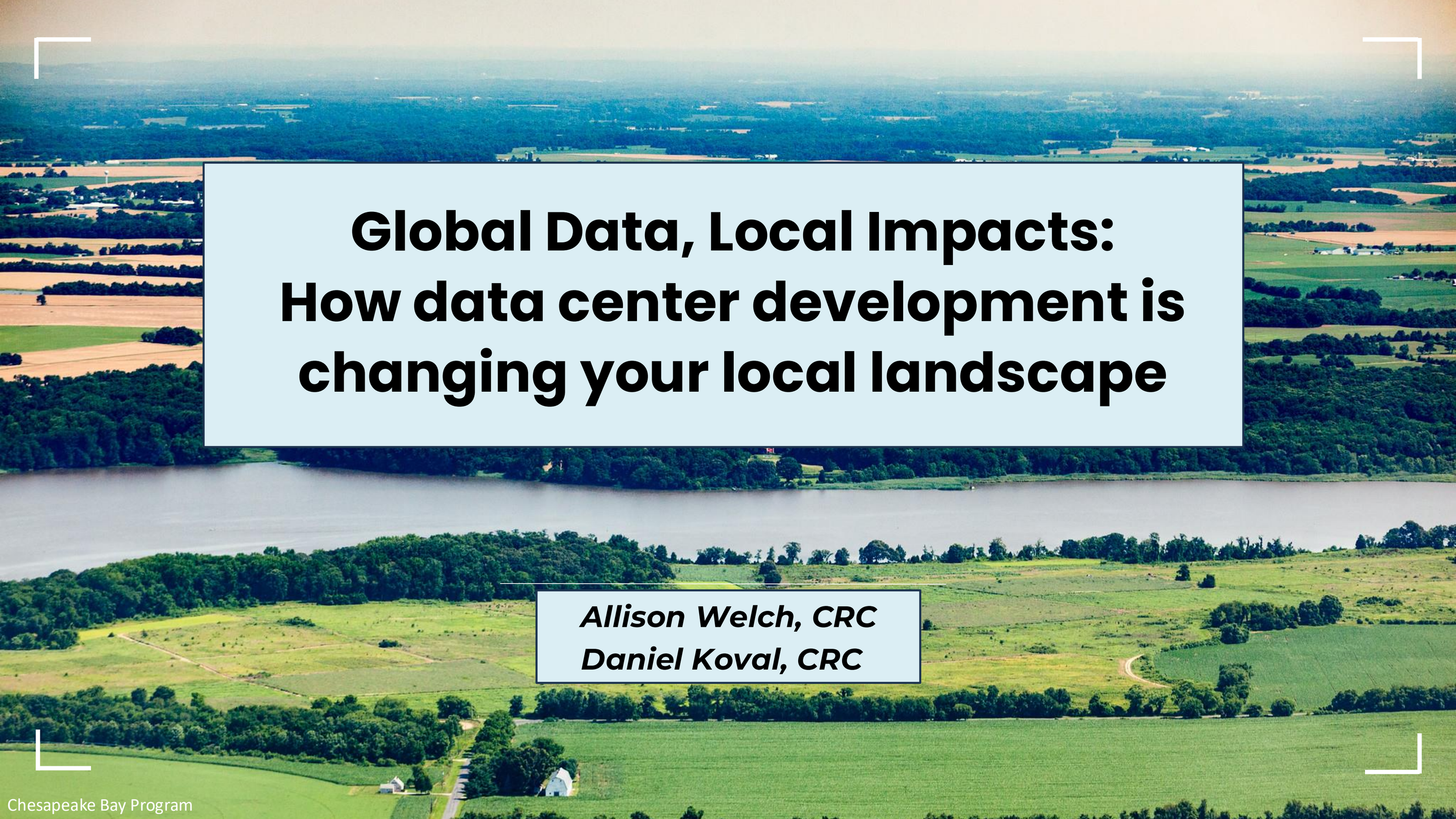


Global Data, Local Impacts: How data center development is changing your local landscape

Allison Welch, CRC
Daniel Koval, CRC

About the Speakers

Allison Welch, Environmental Management Staffer
STAR (Scientific, Technical Assessment and Reporting) Team

Daniel Koval, Environmental Management Staffer
Public Access, Protected Lands, and Workforce Workgroups

Background

Impacts from Data Centers

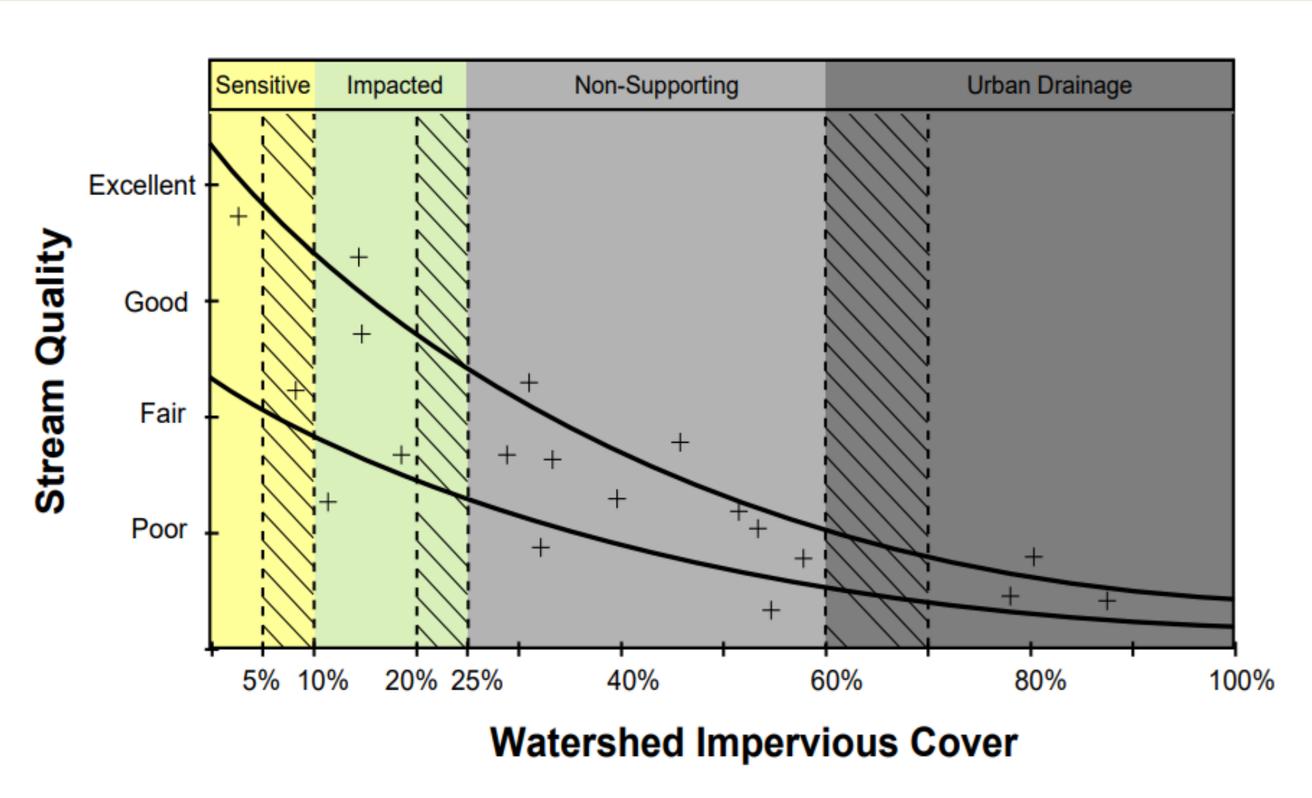
- Water Usage and Quality
- Energy demand
- Transmission Line Expansion Projects
- Community Health
- **Land Use: Impervious Surface**

Scope of Analysis

- HUC 12 (12-digit Hydrologic Unit Code)
- NHDPlus Catchments (National Hydrography Data)
  - Hydrologic Units separated by stream drainage in a hyper-localized area
- Chessie BIBI Stream Health Data: categorizes stream health as “excellent, good, fair, poor, very poor” based on macroinvertebrate sampling

Powhite Creek in Henrico County, Virginia; Will Parson/Chesapeake Bay Program

Impervious Surface Impacts



Source: Center for Watershed Protection and Chesapeake Stormwater Network, 2008

Impervious Surface Model

0-10%: Potential for high stream quality. Other influencing factors may have a higher impact on stream health.

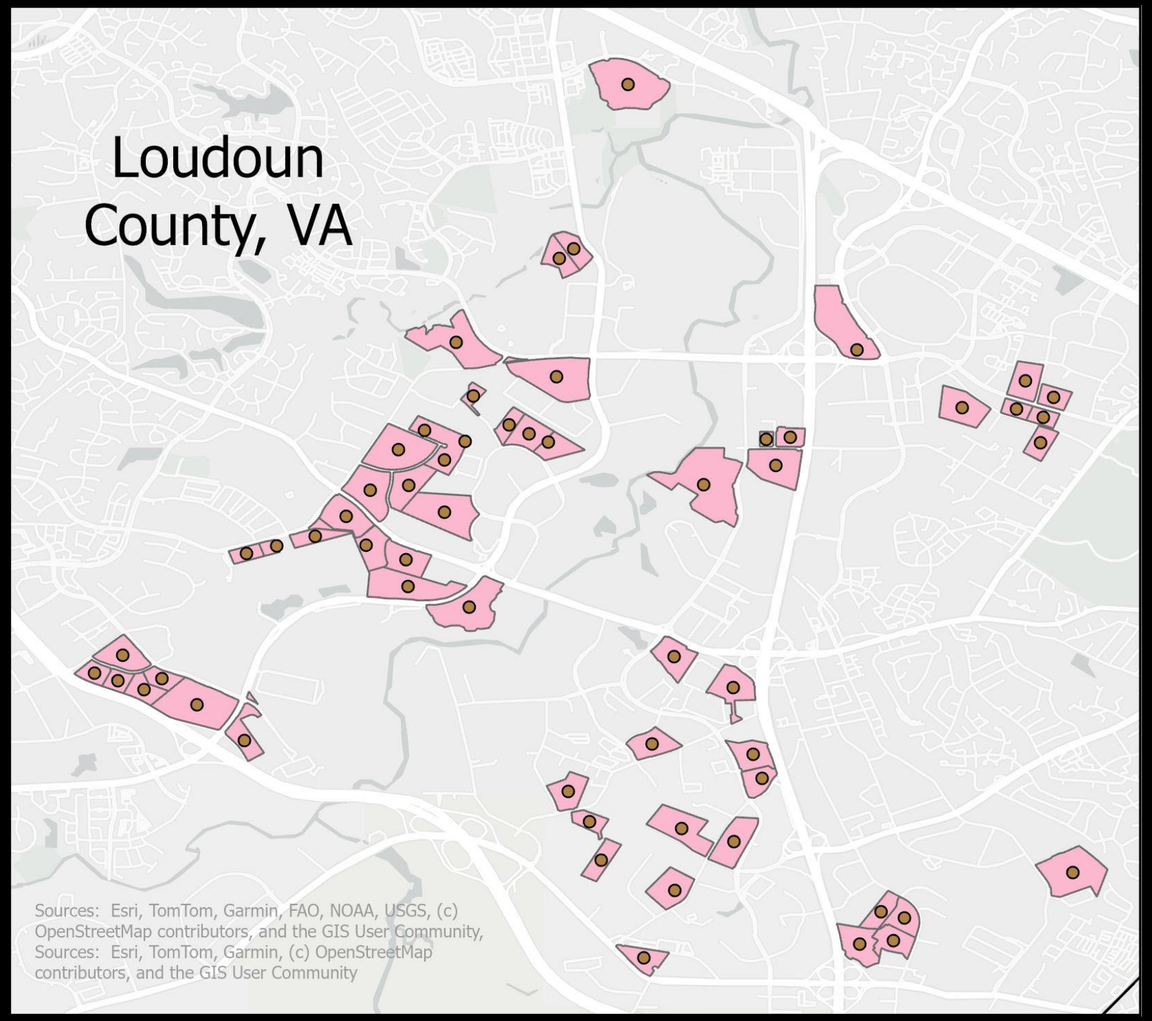
10-25%: Impervious surface has a stronger negative impact on stream quality.

>25%: Inevitable that stream health will be negatively affected by high levels of impervious surface.

Urban Stream Syndrome

- Highlights the negative impacts that development can have on local streams and watersheds
- Causes flash floods, nutrient and contaminant pollution, erosion, and decreased biodiversity

1. Data Centers Obtained from FracTracker Alliance

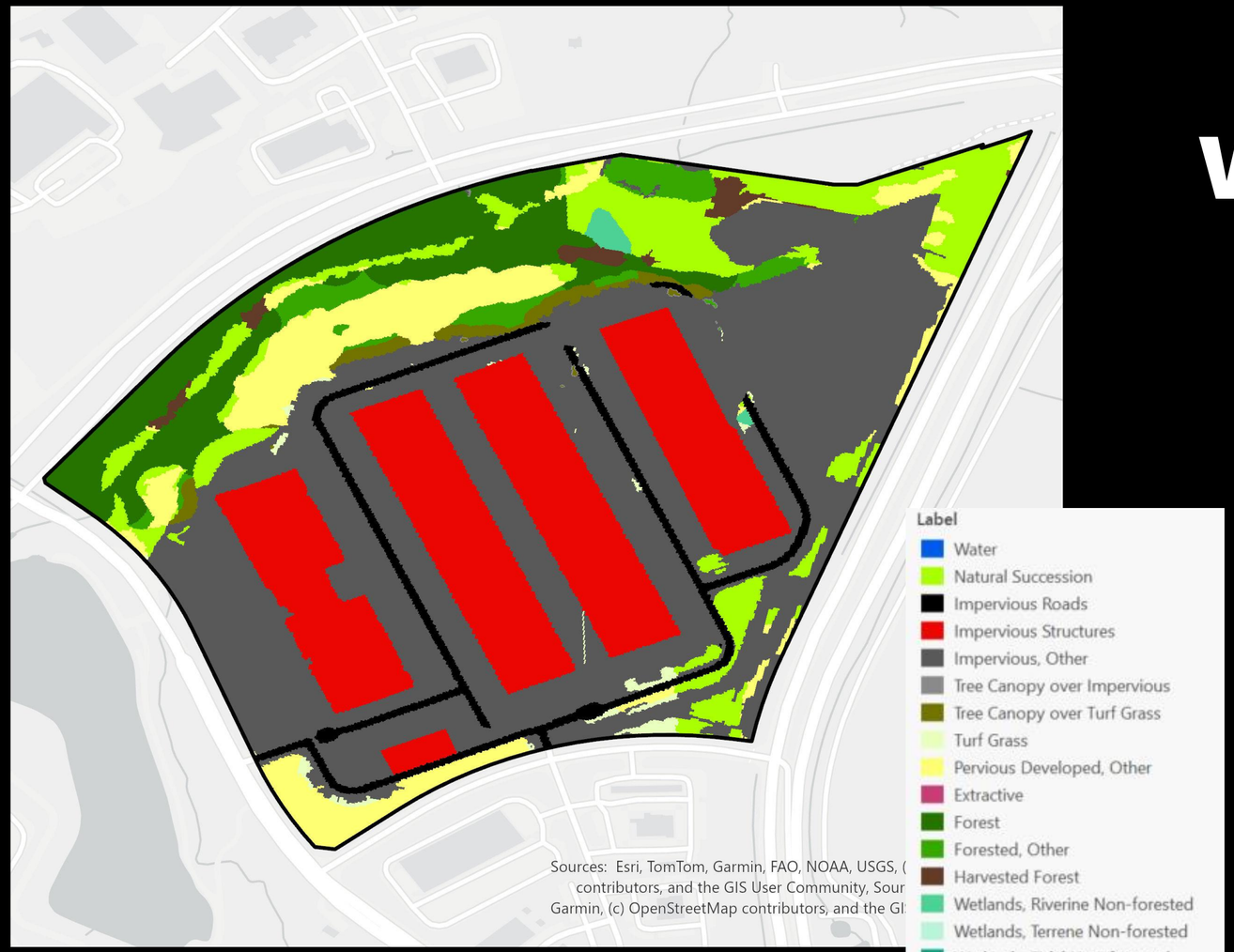


Focused on Data Centers:

- Within the Chesapeake Bay Watershed
- Construction completed by end of 2021

2. Data Center Parcels Analyzed with 2021 CBP Land Use/Land Cover Data

Fadeley Data Center - Loudoun County, VA



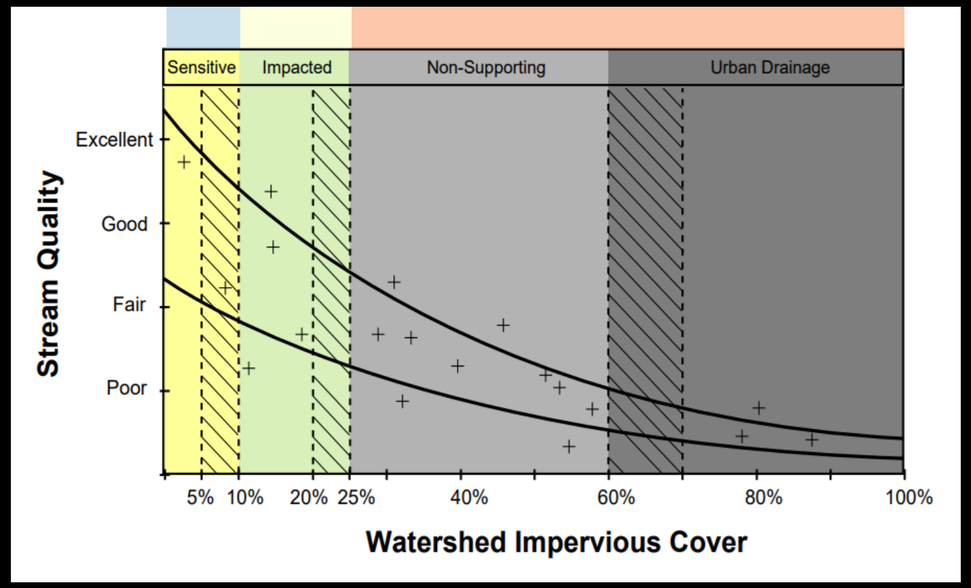
Fadeley Data Center - Loudoun County, VA

Label	Square Meters	Acres
Impervious Roads	**10485**	**2.59**
Impervious Structures	**60606**	**14.98**
Impervious, Other	**120249**	**29.71**
Tree Canopy over Impervious	**94**	**0.02**
Tree Canopy over Impervious	**99**	**0.02**
Total Impervious	**191533**	**47.33**
Tree Canopy over Turf Grass	3096	0.77
Turf Grass	1817	0.45
Pervious Developed, Other	82	0.02
Pervious Developed, Other	31	0.01
Pervious Developed, Other	22506	5.56
Forest	25120	6.21
Forest, Other	6327	1.56
Natural Succession	275	0.07
Natural Succession	25146	6.21
Harvested Forest	1993	0.49
Wetlands	971	0.24
Forested, Other	246	0.06
Forest	521	0.13
Harvested Forest	446	0.11

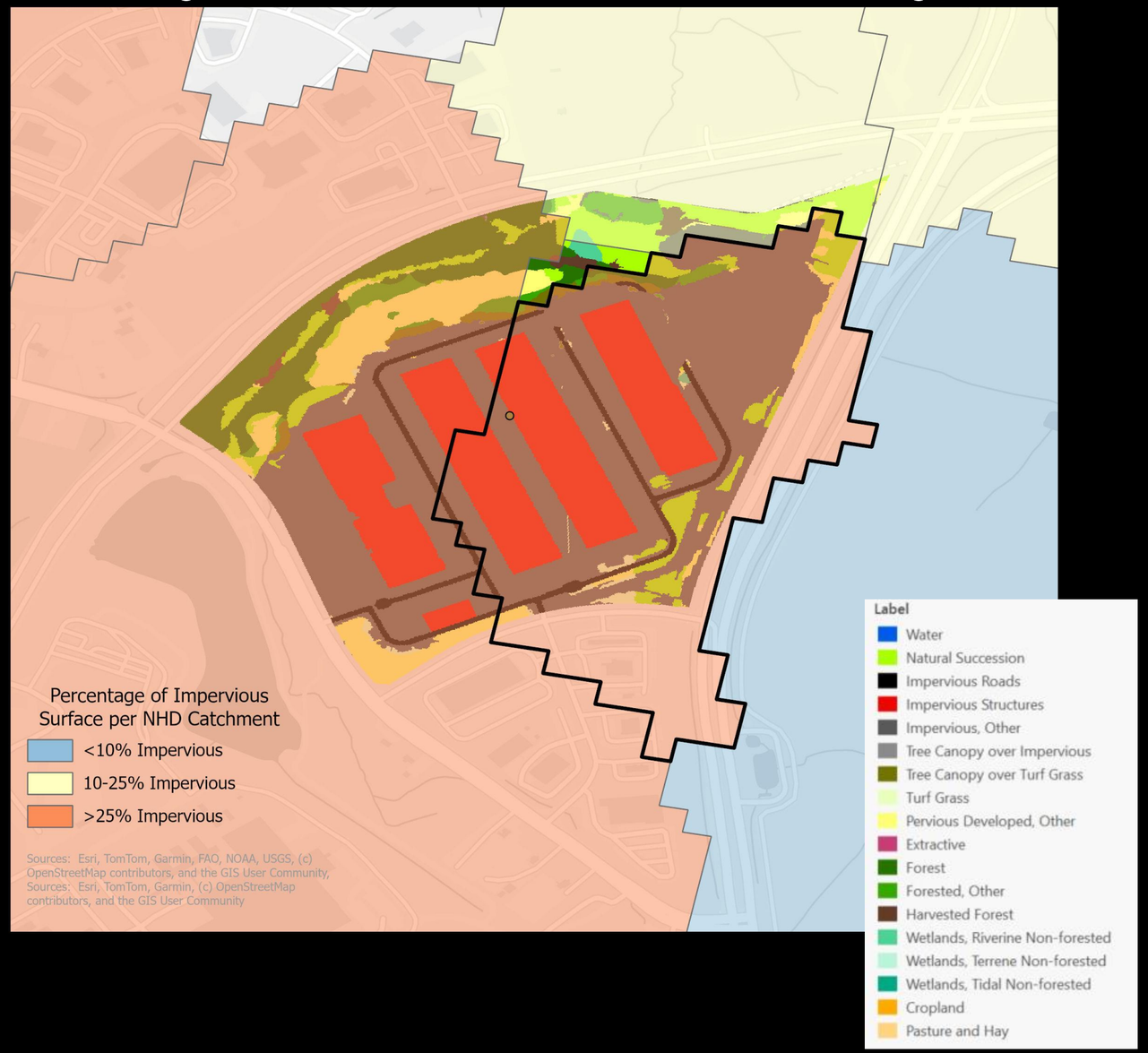
Data Center Name	Acres of Building	Acres of Road	Acres of Other Impervious	Total Acres of Impervious
CYXTERA COLOCATION	3.14	0.02	3.27	**6.44**
CYXTERA DC2 COLOCATION	2.07	0.09	2.86	**5.01**
C1 NORTHERN VA - STERLING I-III	6.70	0.03	5.29	**12.02**
45845 NOKES BLVD	1.83	0.00	2.73	**4.56**
Ashburn 1 LLC	10.74	0.01	1.48	**12.23**
NV-8 Cyrusone	3.98	0.00	3.30	**7.29**
MARIES TECH PARK LLC	5.16	0.00	12.94	**18.10**
VISA USA INC	9.41	0.03	12.14	**21.57**
IAD 115; BEAUMEADE LC PHASE III LLC	3.25	0.00	4.29	**7.54**
DC 21/IAD 98	6.73	0.11	7.91	**14.75**
GI TC 45360 SEVERN WAY LLC	2.63	0.05	3.80	**6.49**
1304 SQUIRE CT	0.81	0.00	1.39	**2.20**
VERISIGN INC	3.06	0.12	6.64	**9.82**
NVA01 STACK INFRASTRUCTURE	4.29	0.05	3.49	**7.83**
IAD76	3.28	0.00	5.17	**8.44**

3. Acres of Impervious Identified for Each Data Center

4. Calculate Impervious Surface Impacts in NHD Catchments from Data Centers

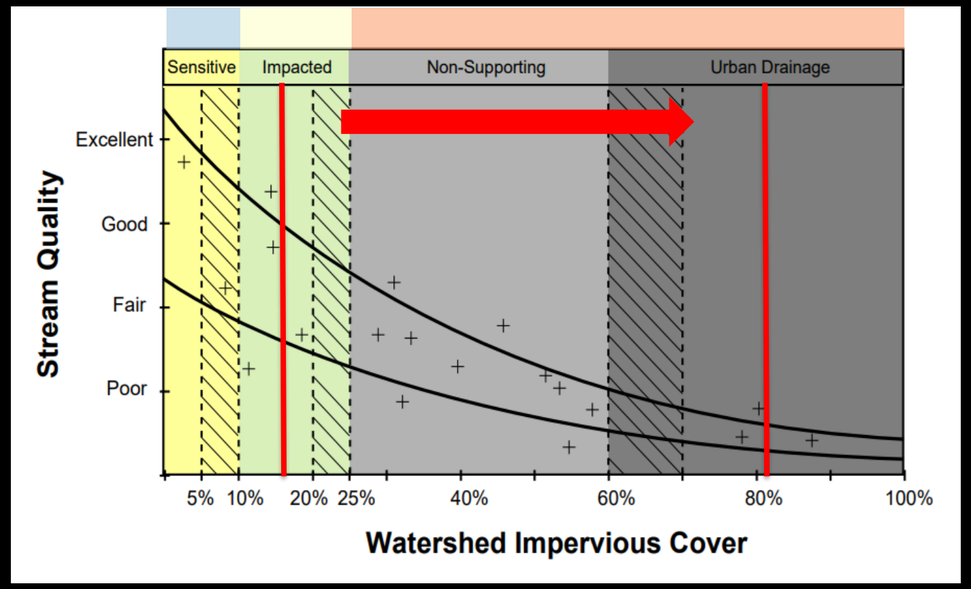


Fadeley Data Center - Loudoun County, VA

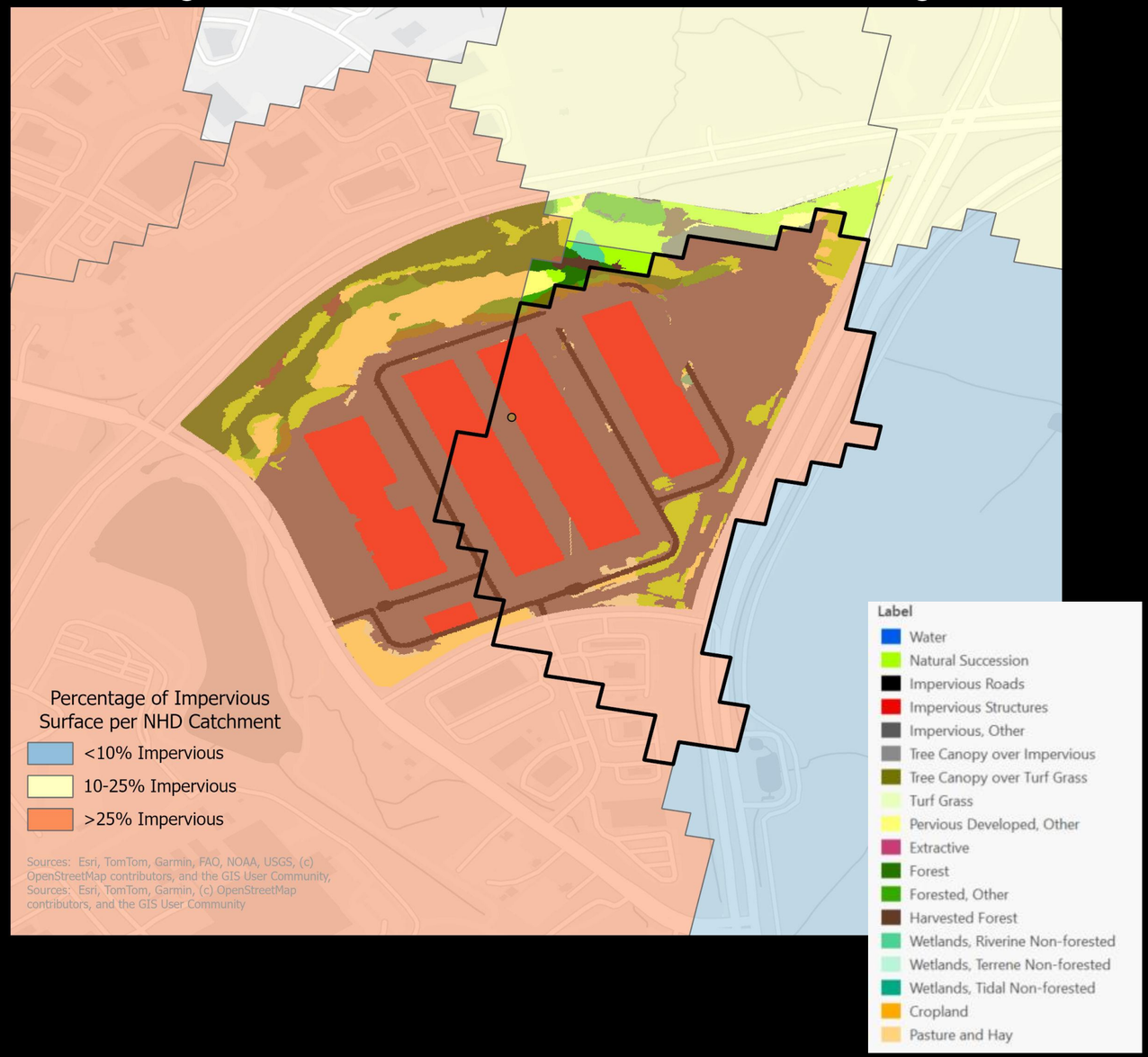


2011
621
Arcola Mills Dr
Sheetz
IHOP
ALDI
Bell Transport
W Perimeter Rd
606

Total Acres	45.81 acres
Total Impervious Acres	37.24 acres
Impervious Acres from Data Center	29.94 acres
Percentage of Impervious in Catchment	81%
Percentage of Impervious without Data Center	16%



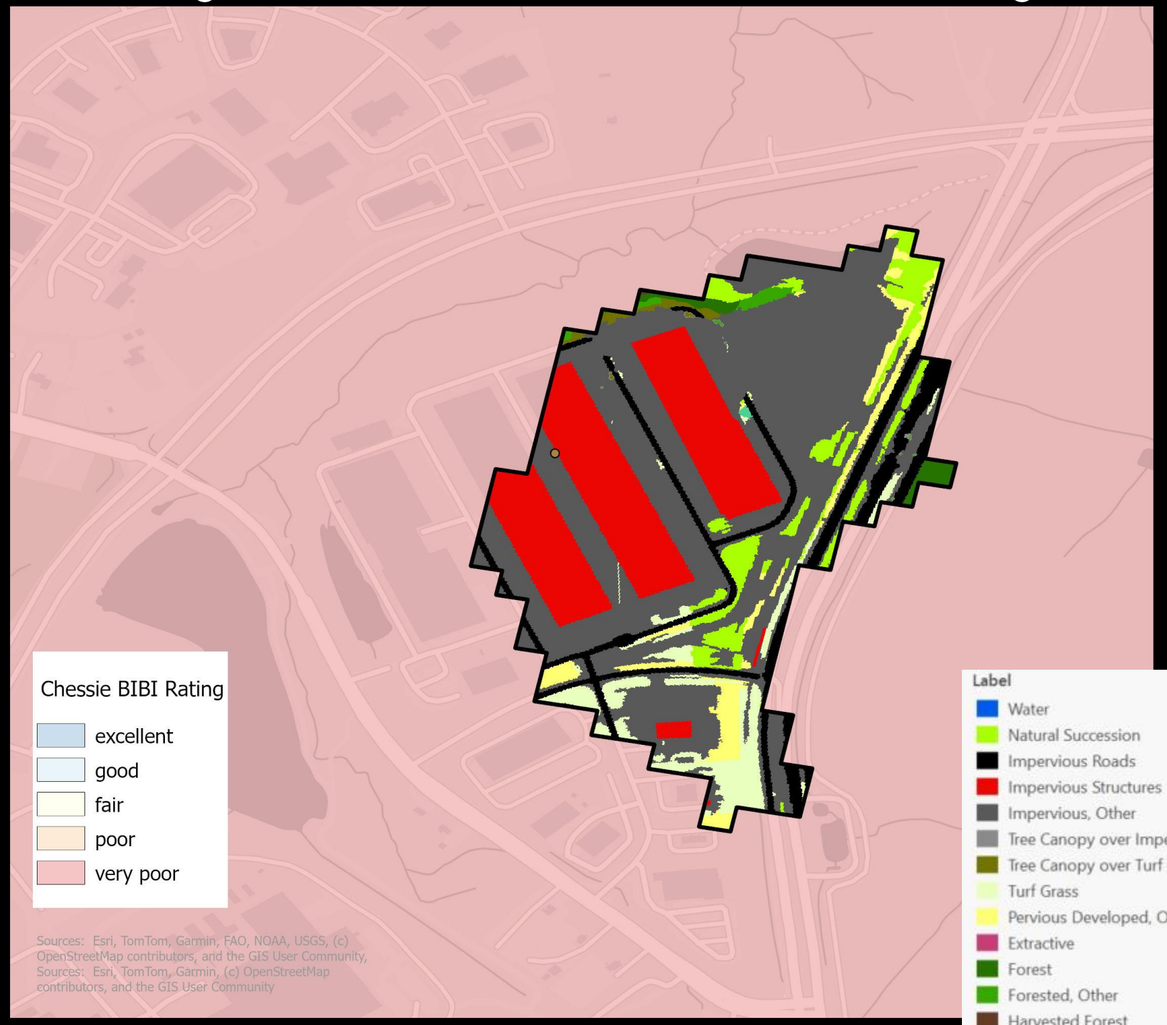
Fadeley Data Center - Loudoun County, VA



5. Compare Data Center Locations to nearby Stream Health Data

Chesapeake Bay Basin-wide Index of Biotic Integrity (Chessie BIBI) 2018-2023

Fadeley Data Center - Loudoun County, VA



NHD Catchment 4507048

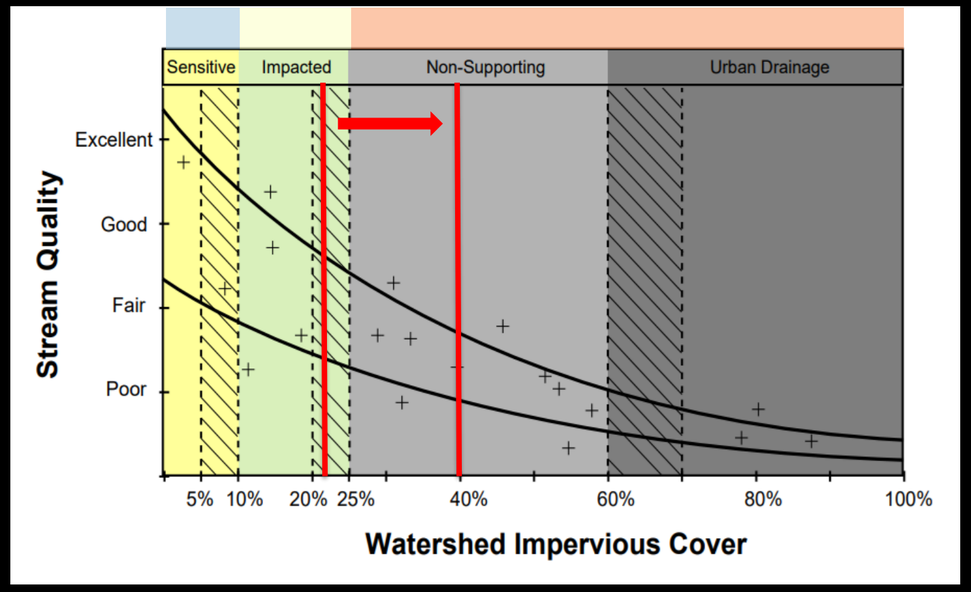
Total Acres	364.1 acres
Total Impervious Acres	141.0 acres
Impervious Acres from Data Centers	58.62 acres

Seven Data Centers in Loudoun County, VA

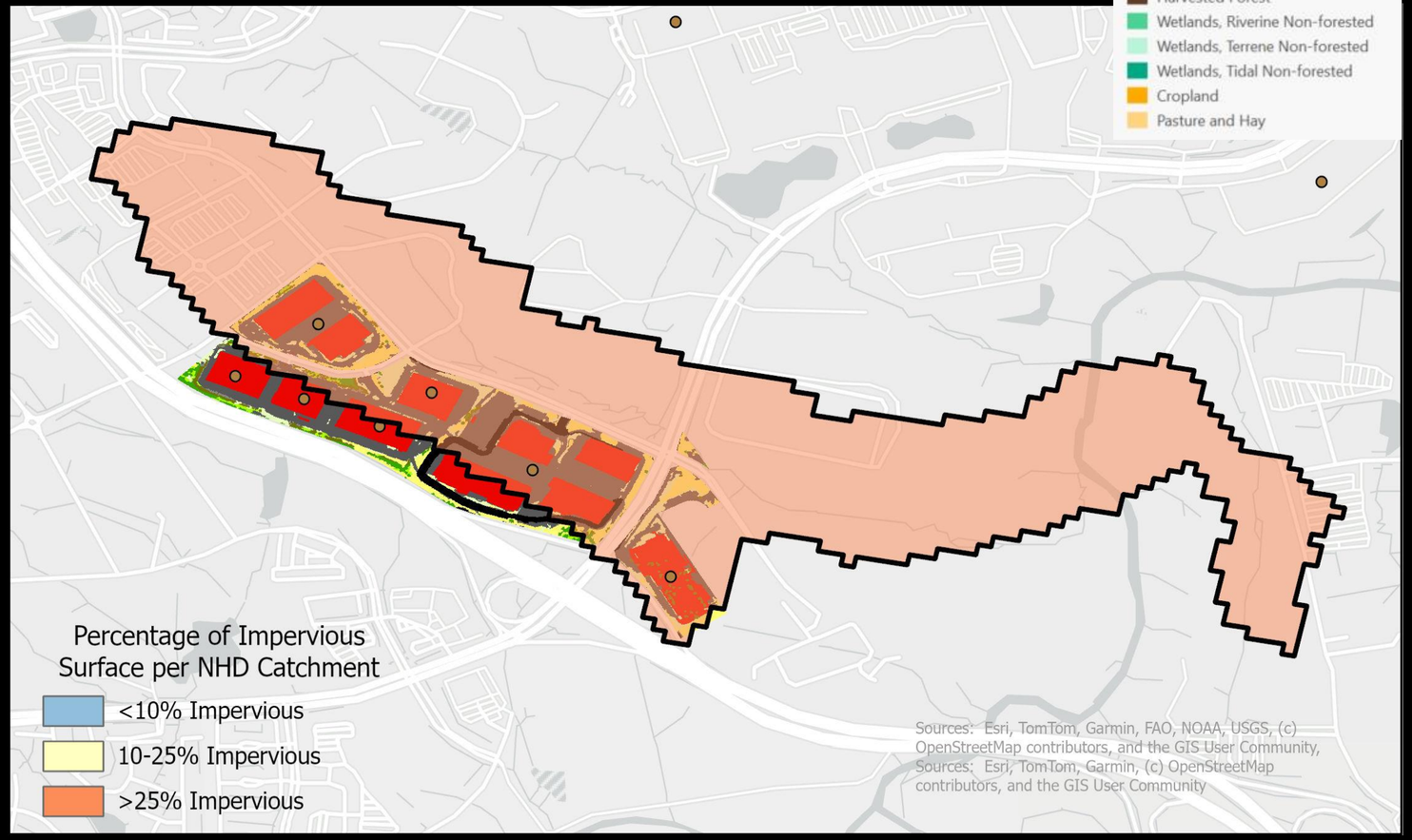
NHD Catchment 4507048

Percentage of Impervious in Catchment **39%**

Percentage of Impervious without Data Centers **23%**

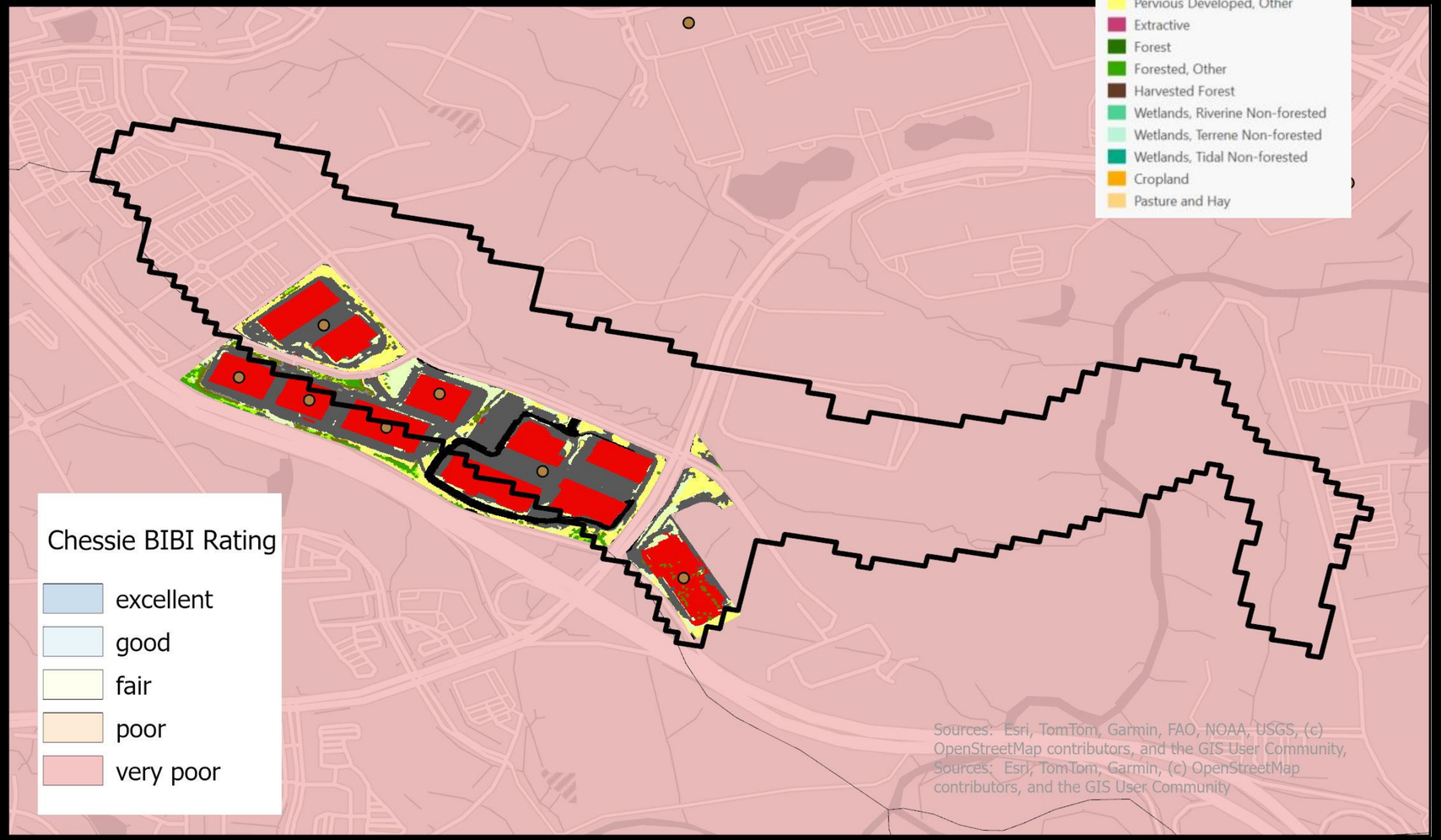


Seven Data Centers in Loudoun County, VA



NHD Catchment 4507048

Seven Data Centers in Loudoun County, VA



Data Center Impacts Through 2021

128 confirmed data centers in the Watershed.

Approximately **1,500** acres of impervious surface from data centers across the Watershed, which is about **twice the size of Central Park.**

11.7 acres of impervious surface from the average data center.

Approximately **770** acres of impervious surface from data centers in **Loudoun County, VA** alone.

229 proposed data centers across the Watershed, as of February 2026 **with 44 in rural counties.**

Data Center in Loudoun County, Virginia; Hugh Kenny, Piedmont Environmental Council

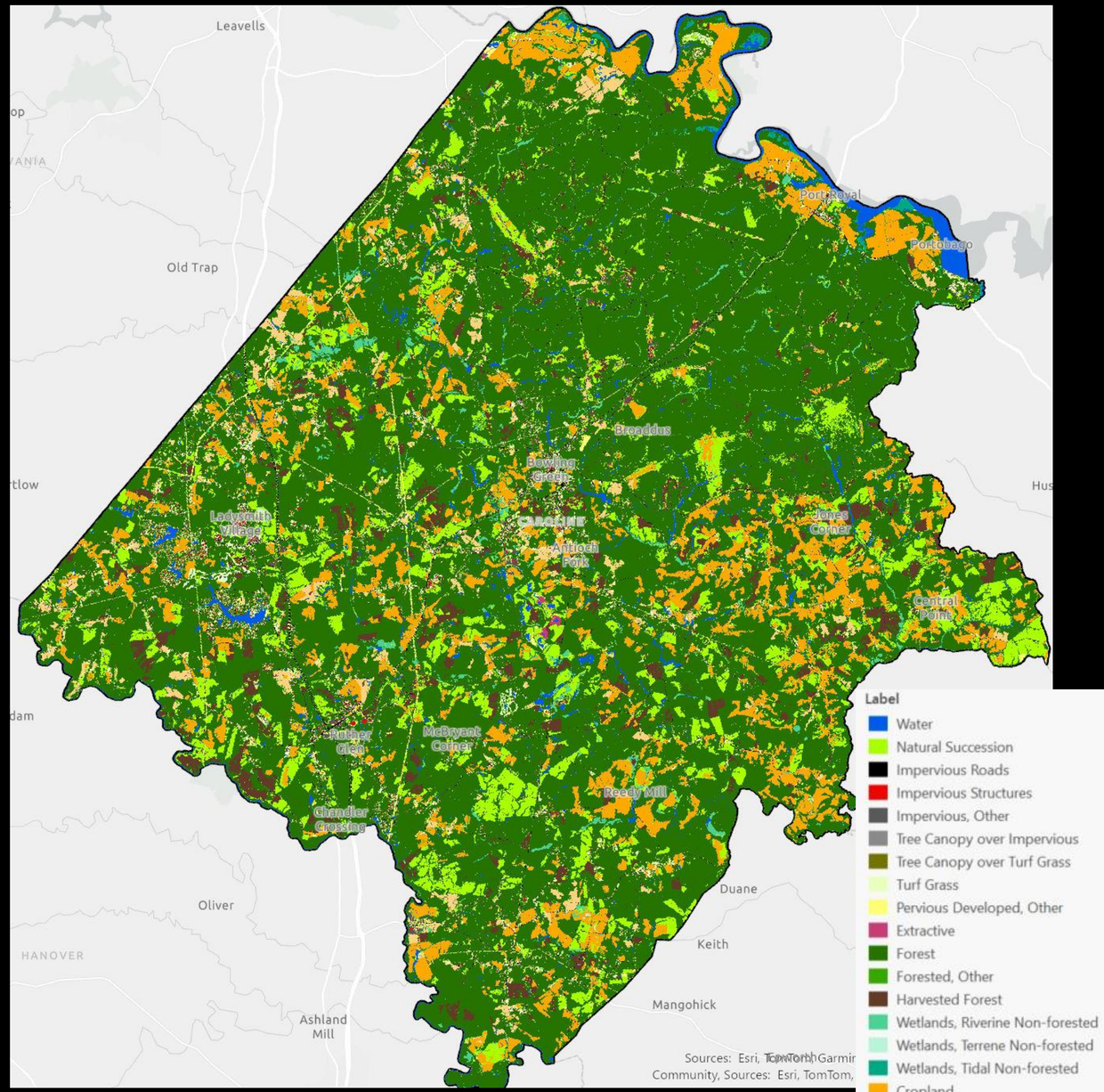
Proposed Data Centers: Caroline County, VA

County demographics:

- 54.1 persons per square mile
  - Loudoun County: 816 persons / sq. mi.
- 35,000 population
- **99.1% Rural**

Land Use Makeup:

- 65% Forest (224,801 acres)
- 10% Cropland (34,324 acres)
- 10% Natural Succession (33,034 acres)
- **2% Impervious Surface** (7,369 acres)

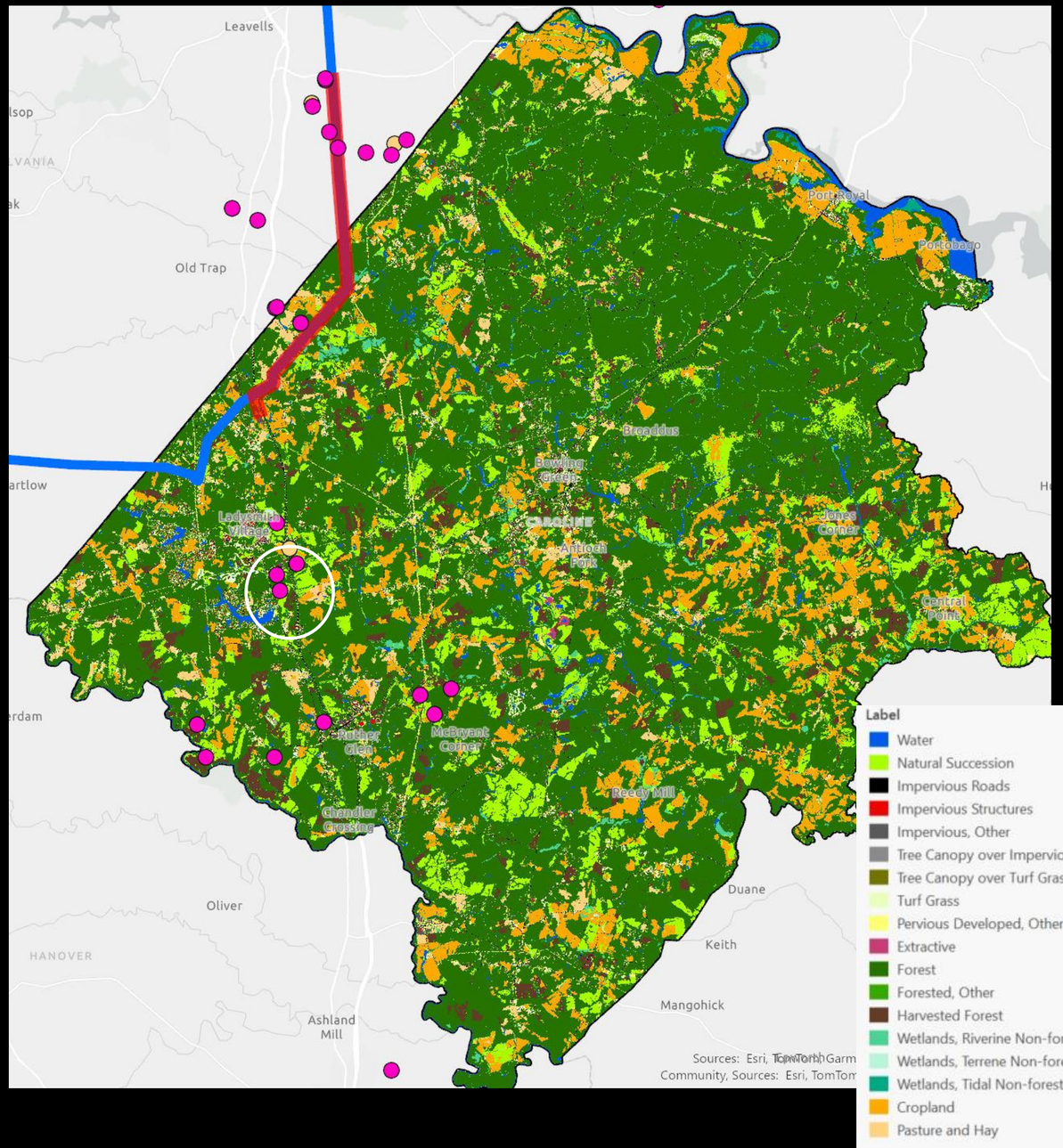


Proposed Data Centers: Caroline County, VA

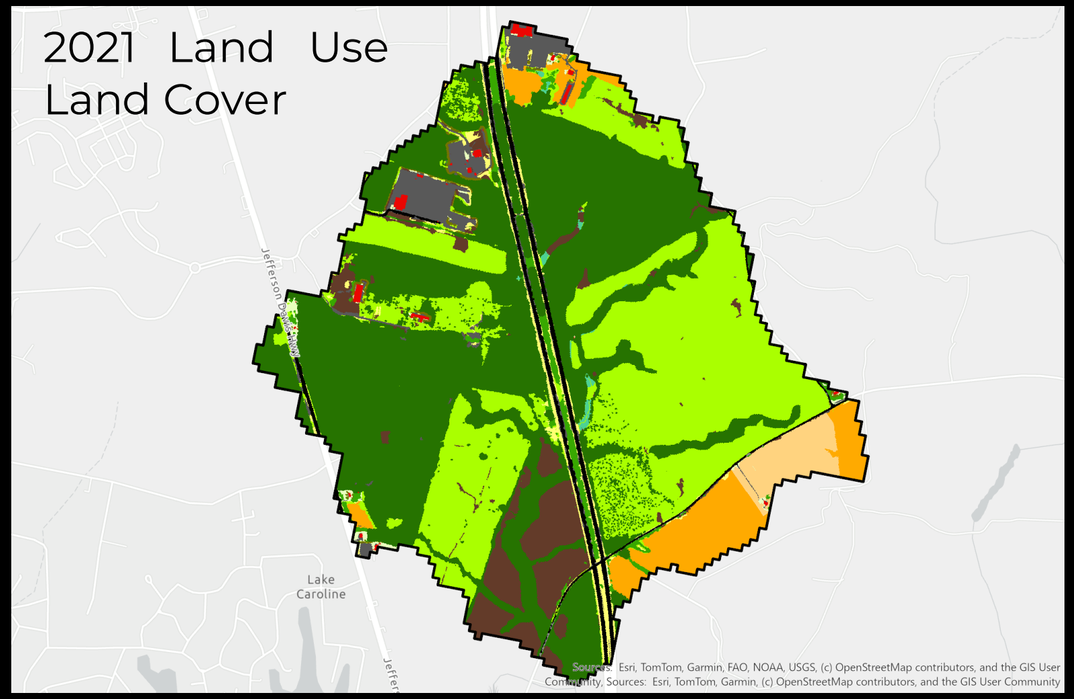
Proposed Projects

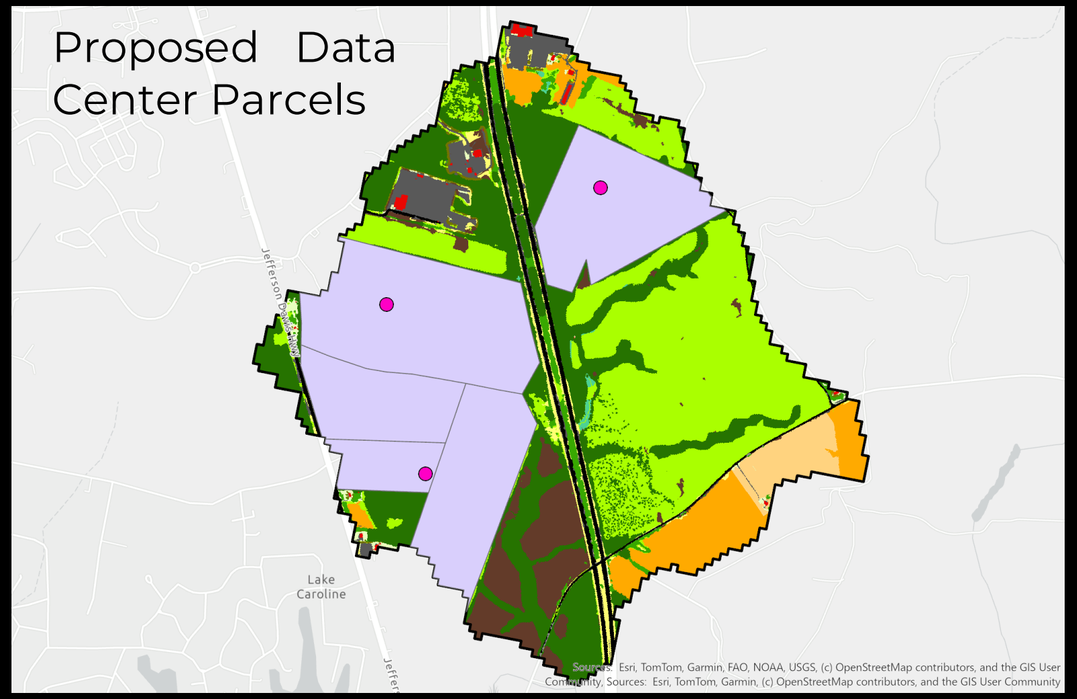
- 12 proposed data centers
  - 12 more directly outside the county

- 2 transmission line expansion projects by PJM Interconnection (regional grid operator)



Caroline County, VA



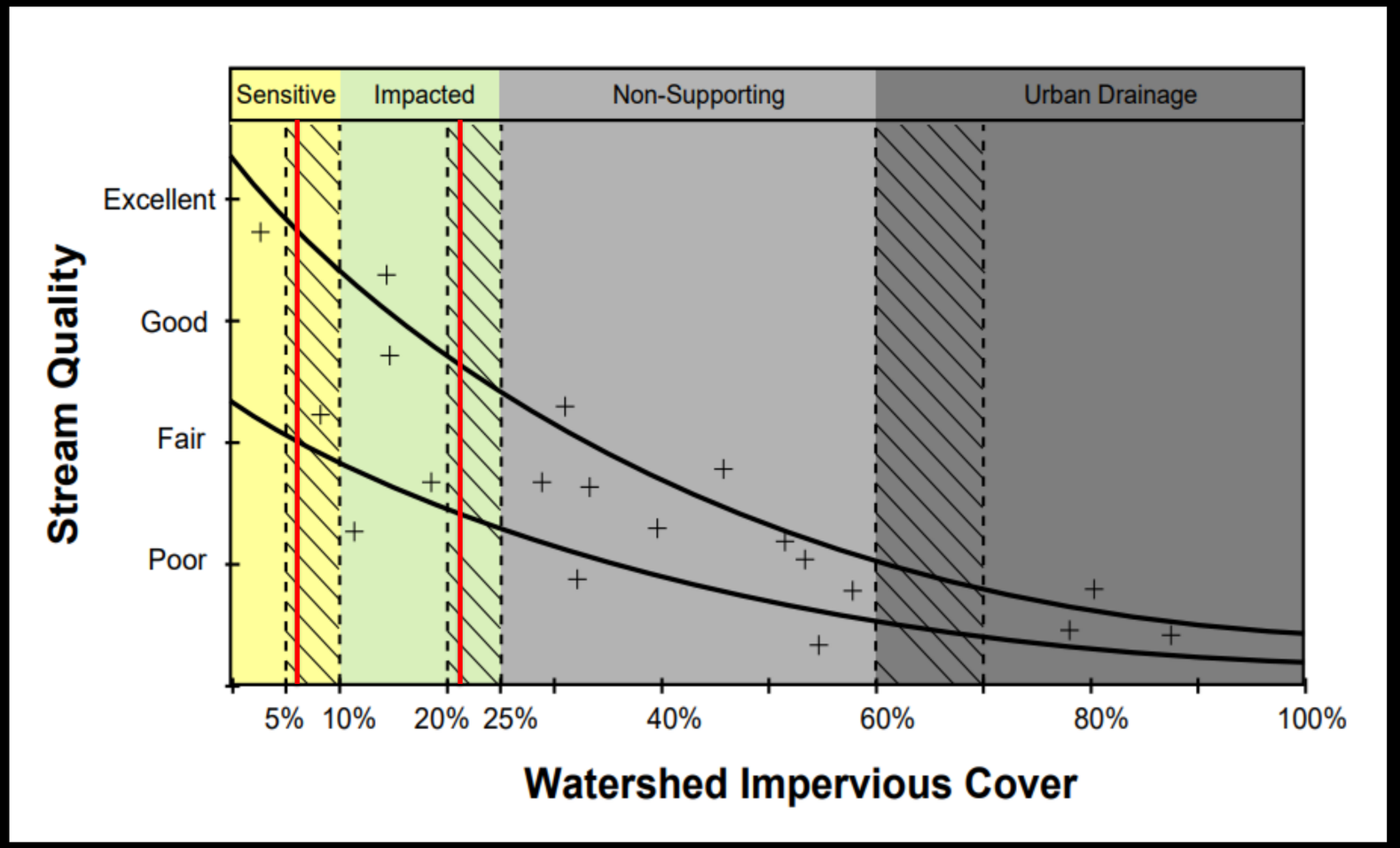


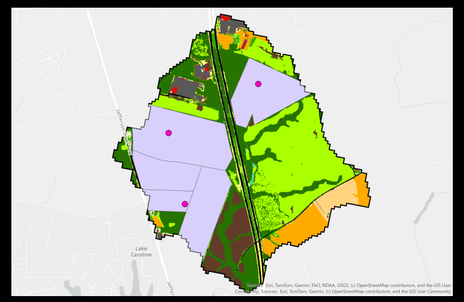
Impervious Acres: 76.14
% Impervious: 6.67%

Impervious Acres: 240.58
% Impervious: 21.08%

+ 164.44 acres of impervious,
identified from the data center development proposals
(increase of 14.41%)

Caroline County, VA





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Impervious Acres: 240.58
% Impervious: 21.08%

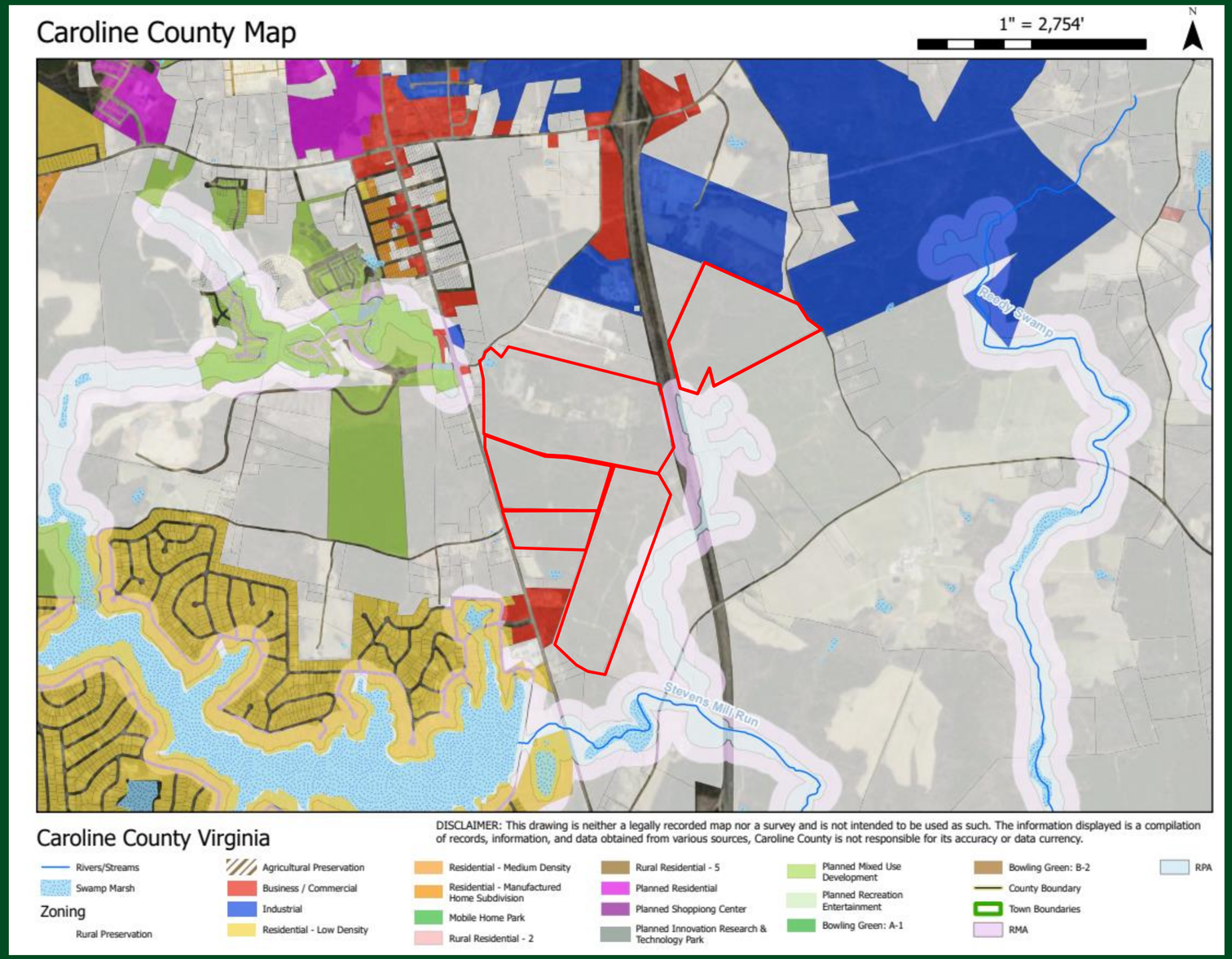
Caroline County Zoning

Parcel Zoning Policies

- Zoned for Rural Preservation
- Contains Resource Management Areas, and adjacent to Resource Protection Areas

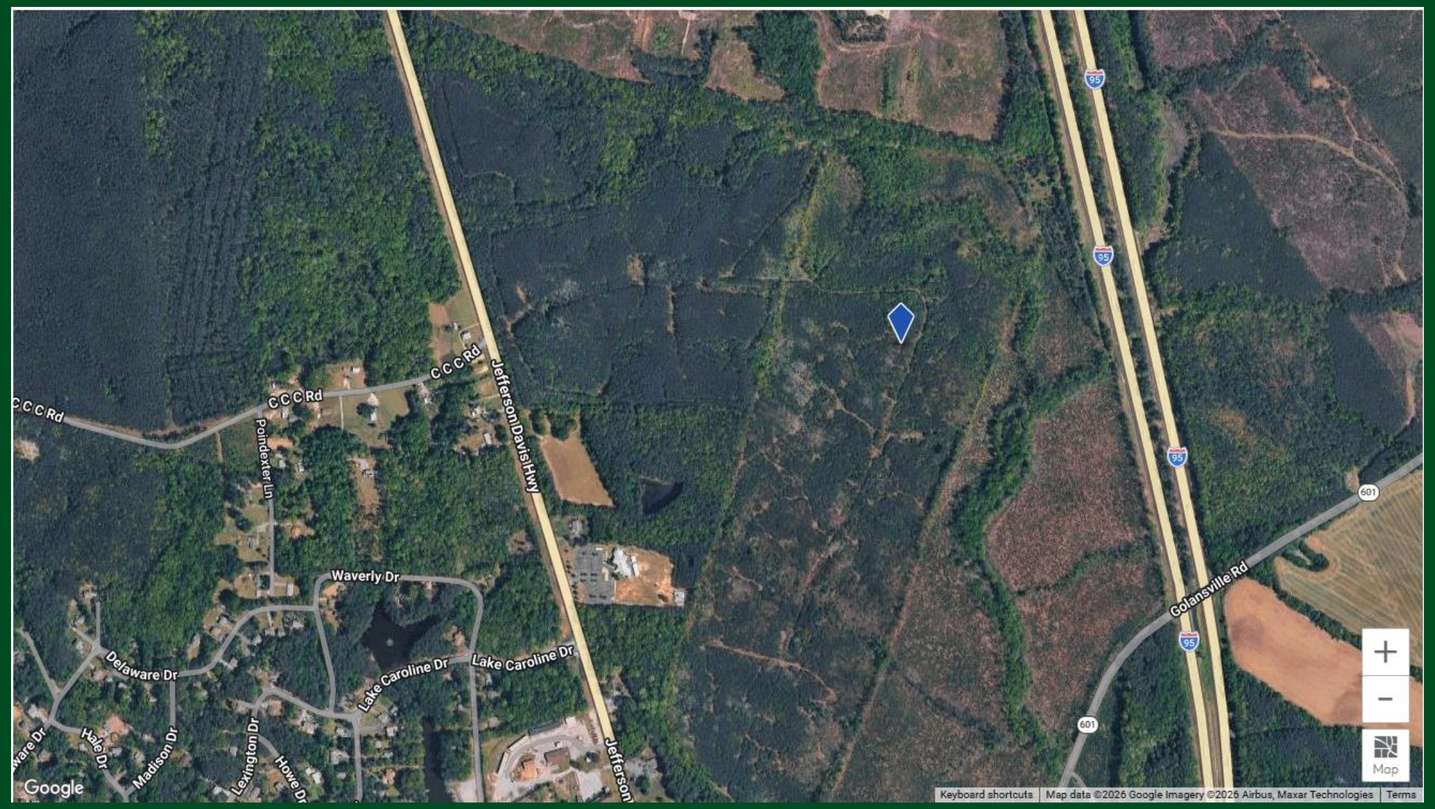
Proposed Asks:

- **Rezone Requests** with Special Exception for data centers
  - → PIRT District (Planned, Innovation, Research & Technology)
  - → M1 Industrial
- **Development on / near wetlands**, Resource Protection Areas, and Resource Management Areas



ADP Ladysmith Data Hub, Caroline County

Airlee Industrial Park, Caroline County



How can local governments best approach proposed data centers?

- **Analyze the entire impervious surface footprint**, not just the building. This includes roads, parking lots, and other energy infrastructure needs.
- **Examine localized impacts from increased surface run-off,** including stream health projections
- **Consider the previous land use zoning** and environmental change that stems from utilizing previously natural lands.
- **Understand and contextualize other impacts beyond land use** including public health, water usage, and energy demand

Chesapeake Bay Program

Increased Surface Run-Off

- Worsened water quality
- Overflowed sewer systems
- Polluted waterways and wildlife habitat
- Increased flashiness of streams

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Presentation Template: SlidesCarnival

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Thank you!

Questions?

Will Parson/Chesapeake Bay Program