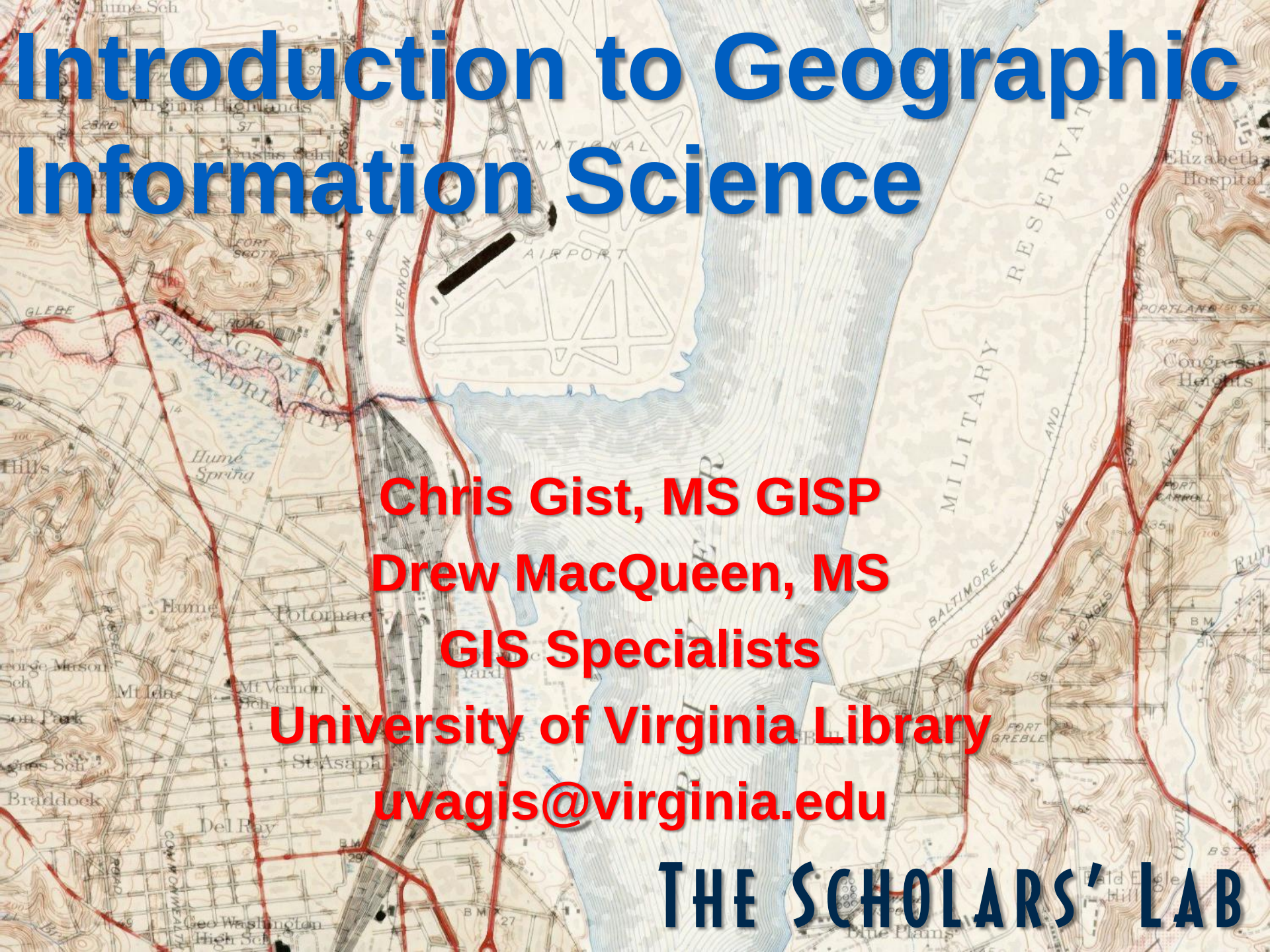


Introduction to Geographic Information Science



Chris Gist, MS GISP
Drew MacQueen, MS
GIS Specialists

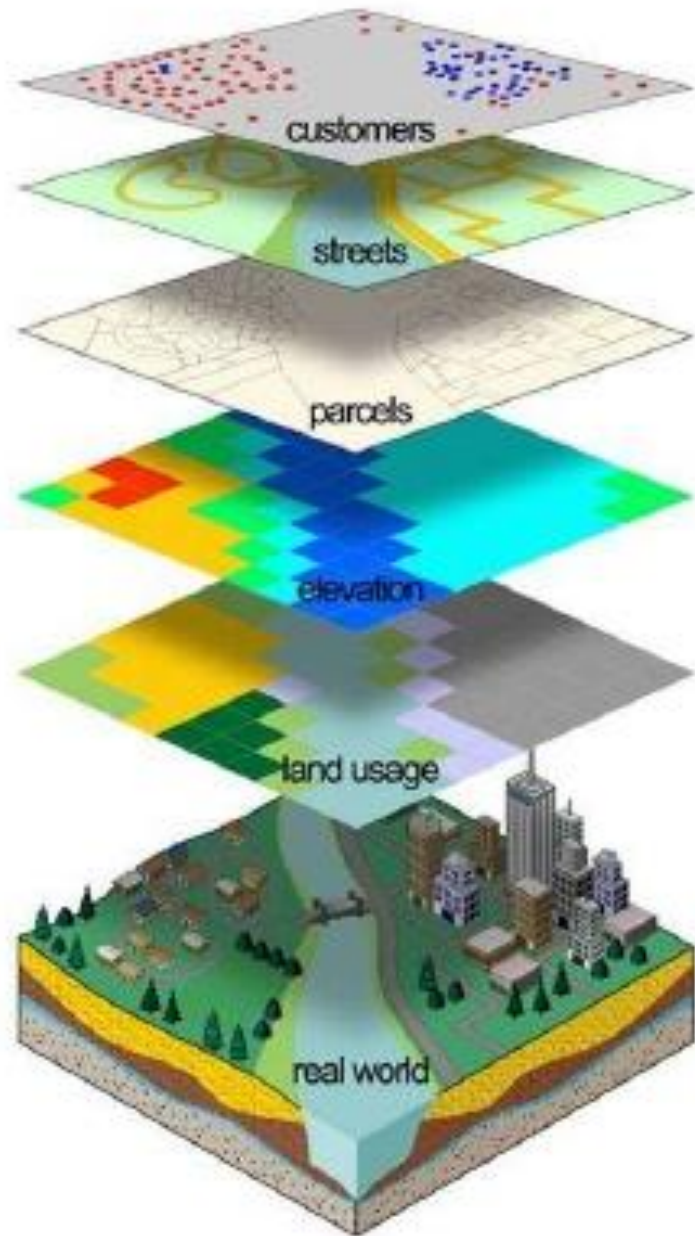
University of Virginia Library
uvagis@virginia.edu

THE SCHOLARS' LAB

What is a GIS?

“An organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced data.”
(Understanding GIS, 1997)

What is GIS?



- A technology
Hardware, software & analysis tools
- An information handling strategy
- The objective: to improve overall decision making by visualizing data and seeing new patterns.

Why is GIS unique?

- GIS handles SPATIAL information
 - Information referenced by its location in space
- GIS makes connections between activities based on spatial proximity
- Creates relationships between otherwise unrelatable data



GIS concepts are not new!

London Cholera Epidemic 1854



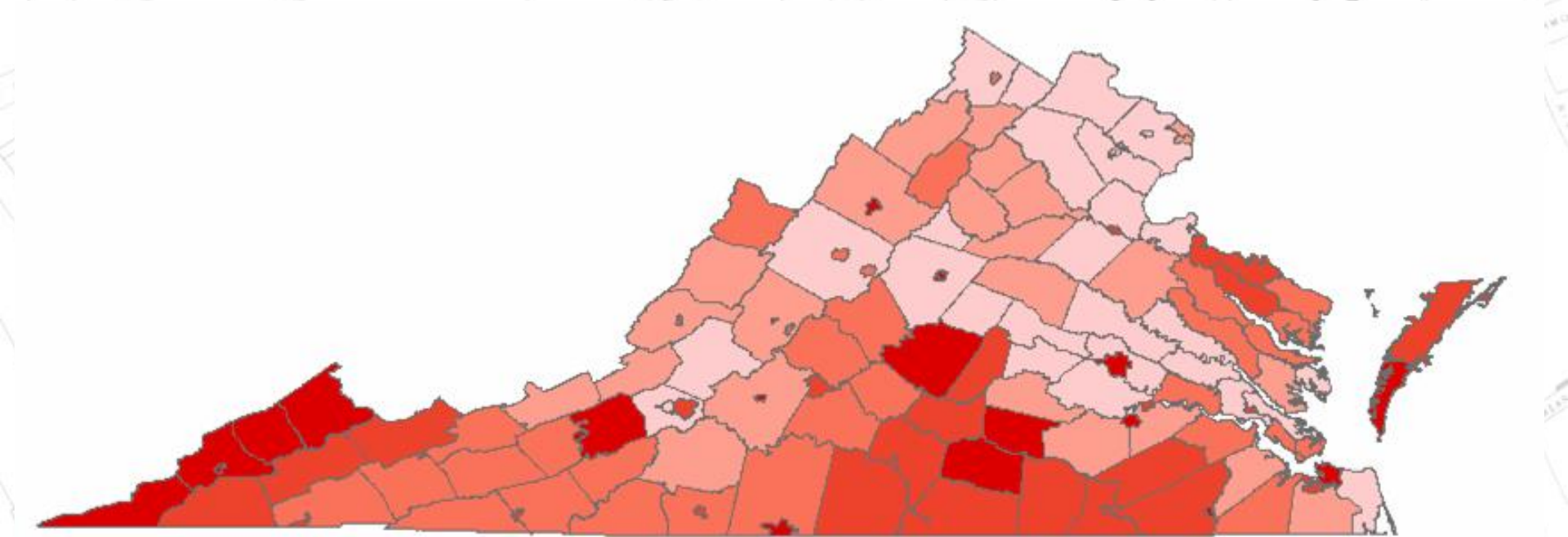
Soho

- + Cholera death
- Water pump

Visualizing Data

FIPS_1	NAME_1	TOTPOP	PERAA	PERINATIVE	PERASIAN	PEROTHER	PERMALE	PERFEMALE	PERLT5	PERGT65	PERPOV
51163	Rockbridge County, Virginia	20808	2.72	0.06	0.59	1.24	50.34	49.66	5.27	15.61	9.59
51143	Pittsylvania County, Virgini	61745	23.66	0.17	0.12	1.03	48.65	51.35	5.68	14.26	11.75
51105	Lee County, Virginia	23589	0.43	0.44	0.35	0.82	48.75	51.25	5.8	15.49	23.92
51019	Bedford County, Virginia	60371	5.94	0.23	0.96	1.19	49.8	50.2	5.78	12.86	7.11
51027	Buchanan County, Virginia	26978	2.34	0	0.2	0.4	50.87	49.13	4.87	11.39	23.17
51185	Tazewell County, Virginia	44598	2.17	0.07	0.5	0.87	47.51	52.49	5.36	15.37	15.30
51051	Dickenson County, Virginia	16395	0.3	0.09	0.16	0.53	49	51	5.42	14.49	21.31
51021	Bland County, Virginia	6871	4.58	0.22	0.23	0	54.37	45.63	4.48	14.76	12.36
51155	Pulaski County, Virginia	35127	5.65	0.29	0.07	1.51	49.41	50.59	5.74	15.35	13.09
51067	Franklin County, Virginia	47286	9.55	0.11	0.19	1.22	49.28	50.72	5.37	14.27	9.70
51195	Wise County, Virginia	40123	1.57	0.17	0.26	1.04	48.91	51.09	5.67	14	19.99
51121	Montgomery County, Virginia	83629	3.89	0.19	3.75	1.95	52.21	47.79	4.83	8.64	23.24
51197	Wythe County, Virginia	27599	2.64	0.12	0.43	1.37	47.52	52.48	5.49	15.79	11.05
51077	Grayson County, Virginia	17917	6.89	0.09	0.02	1.93	51.81	48.19	4.71	17	13.62
51167	Russell County, Virginia	30308	2.97	0.16	0.09	1.01	50.54	49.46	5.23	13.35	16.35
51173	Smyth County, Virginia	33081	2	0.24	0.1	0.93	48.24	51.76	5.34	16.31	13.33
51720	Norton city, Virginia	3904	5.97	0.15	1.08	2.64	43.78	56.22	5.48	15.7	22.76
51191	Washington County, Virginia	51103	1.54	0.12	0.43	0.7	48.45	51.55	5.06	15.33	10.93
51169	Scott County, Virginia	23403	0.87	0.27	0.06	0.54	48.16	51.84	5.06	17.75	16.76
51520	Bristol city, Virginia	17367	5.2	0.13	0.41	1.61	45.17	54.83	5.11	20.45	16.24
51023	Botetourt County, Virginia	30496	3.67	0.15	0.39	0.97	49.8	50.2	5.7	13.23	5.19
51045	Craig County, Virginia	5091	0.26	0.12	0.33	0.2	50.95	49.05	5.17	13.67	10.26
51071	Giles County, Virginia	16657	1.56	0.01	0.16	1.09	48.83	51.17	5.58	16.65	9.55
51750	Radford city, Virginia	15859	7.49	0.06	1.26	2.3	45.15	54.85	3.73	9.79	31.35
51005	Alleghany County, Virginia	12926	2.54	0	0.56	0.39	50.31	49.69	5.6	15.7	7.14
51580	Covington city, Virginia	6303	13.1	0	0.4	1.6	47.18	52.82	6.38	20.45	12.89
51678	Lexington city, Virginia	6867	10.27	0.19	1.09	1.78	56.53	43.47	3.07	16.37	21.57
51161	Roanoke County, Virginia	85778	3.15	0.15	1.16	1.42	47.31	52.69	5.25	15.82	4.46
51515	Bedford city, Virginia	6299	22.84	0.13	0.51	1.51	47.28	52.72	5.64	21.84	19.68
51770	Roanoke city, Virginia	94911	26.75	0.28	1.06	2.85	46.76	53.24	6.52	16.4	15.95
51775	Salem city, Virginia	24747	5.72	0.15	1.03	1.26	47.38	52.62	4.87	16.92	6.71
51063	Floyd County, Virginia	13874	1.33	0	0.15	1.74	49.06	50.94	5.72	15.79	11.72
51035	Carroll County, Virginia	29245	0.71	0.1	0.22	1.85	49.96	50.04	5.59	17.18	12.46
51141	Patrick County, Virginia	19407	6.81	0.1	0.45	1.59	48.96	51.04	5.82	16.46	13.41
51089	Henry County, Virginia	57930	22.88	0.37	0.27	2	48.68	51.32	5.3	14.89	11.65
51640	Galax city, Virginia	6837	7.3	0.12	0.23	6.1	47.68	52.32	5.47	18.62	18.61
51690	Martinsville city, Virginia	15416	41.84	0.06	0.45	1.58	44.81	55.19	5.76	20.87	19.19
51590	Danville city, Virginia	48411	44.19	0.3	0.5	1.26	45.4	54.6	5.9	19.68	19.96
51017	Bath County, Virginia	5048	5.74	0	0.32	0.69	49.76	50.24	4.46	17.12	7.79
51091	Highland County, Virginia	2536	0.08	0.24	0	0.35	49.92	50.08	3.67	20.19	12.56
51003	Albemarle County, Virginia	79236	9.72	0.2	3.1	1.75	48.15	51.85	6.29	12.5	6.74
51033	Caroline County, Virginia	22121	34.61	0.8	0.48	1.43	50.13	49.87	6.09	13.07	9.35

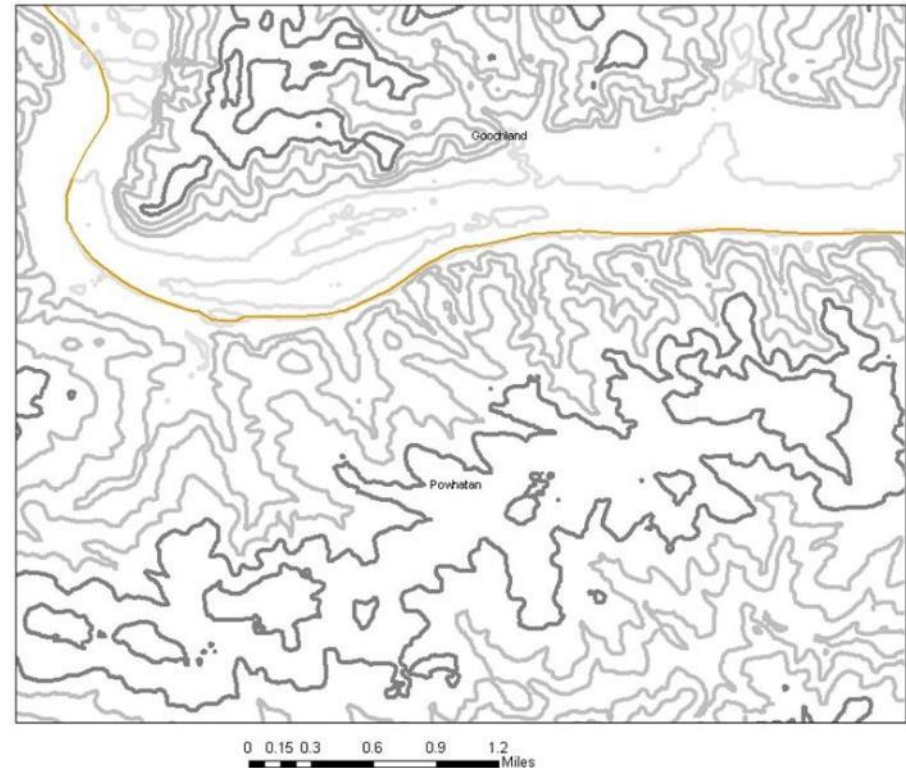
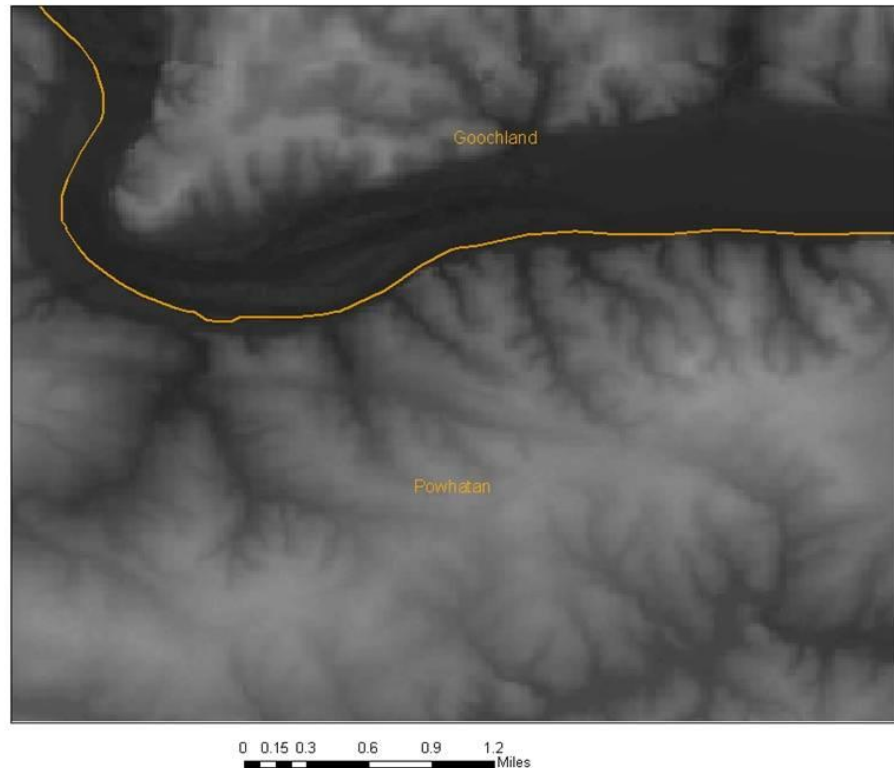
Visualizing Data



Types of Geographic Data

Raster

Vector



Types of Geographic Data

Vector

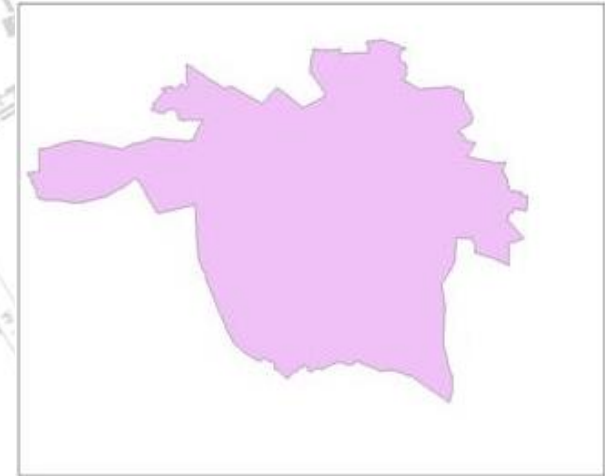
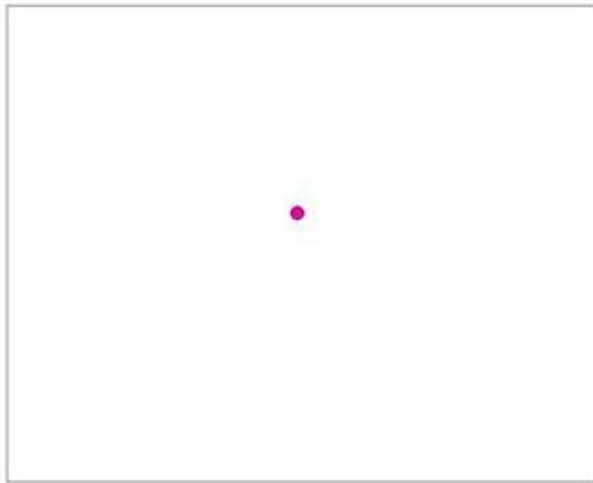
Point



Arc(Polyline)



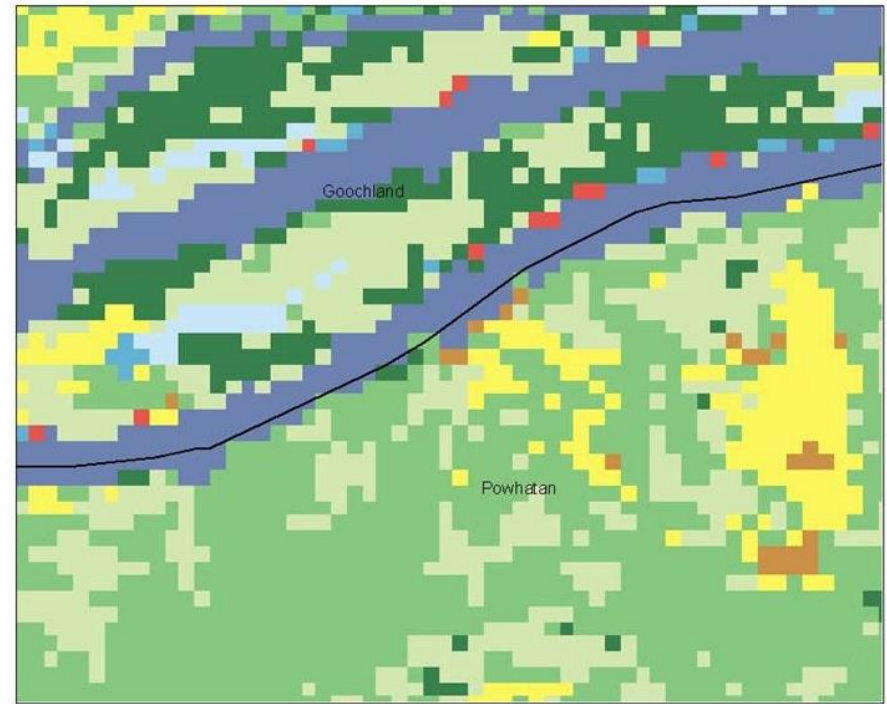
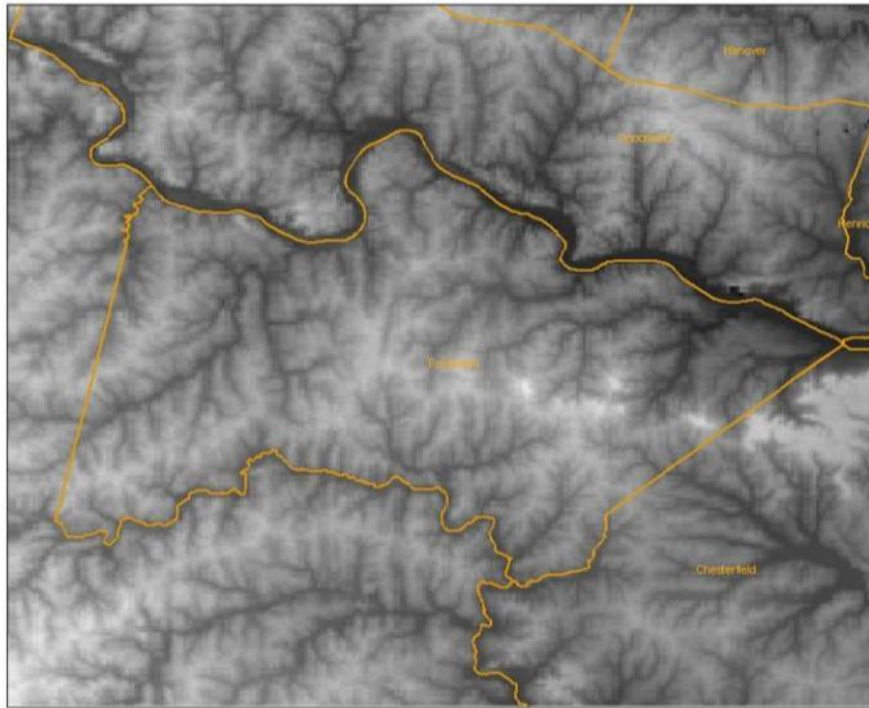
Polygon



Types of Geographic Data

Raster

Collection of cells or pixels, each with a specific value

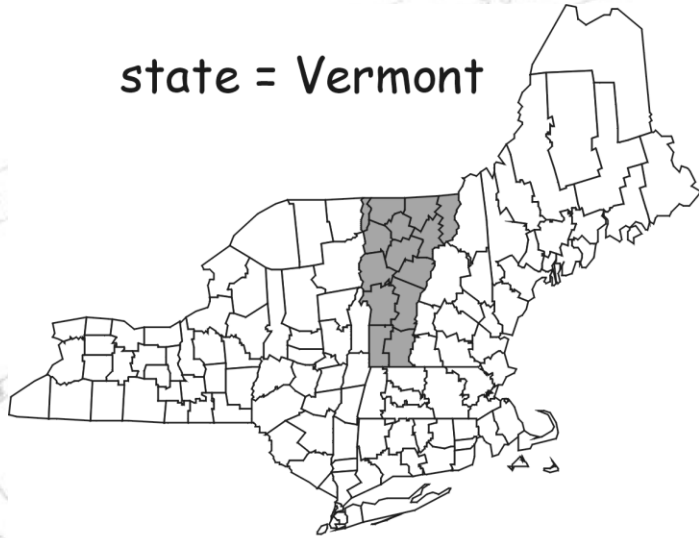


Core Spatial Analysis

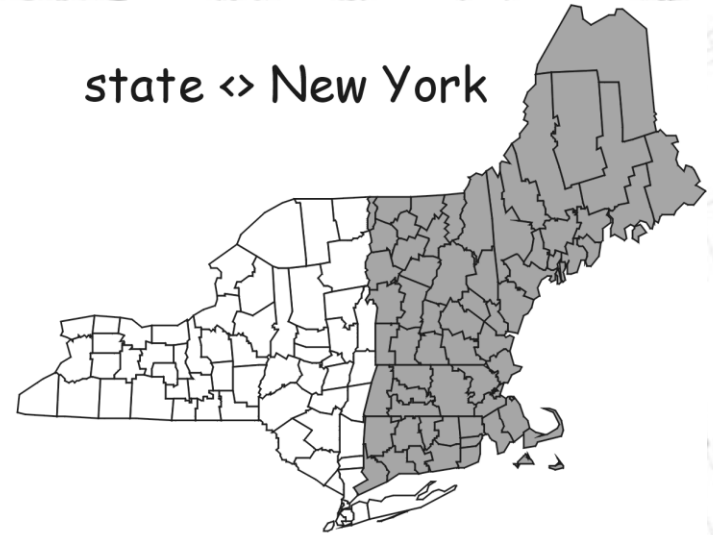
- Selection and Classification
- Proximity and Buffering
- Overlay
 - Clip
 - Intersection
 - Union
- Network Analysis
- Extract by Point

Selection and Classification

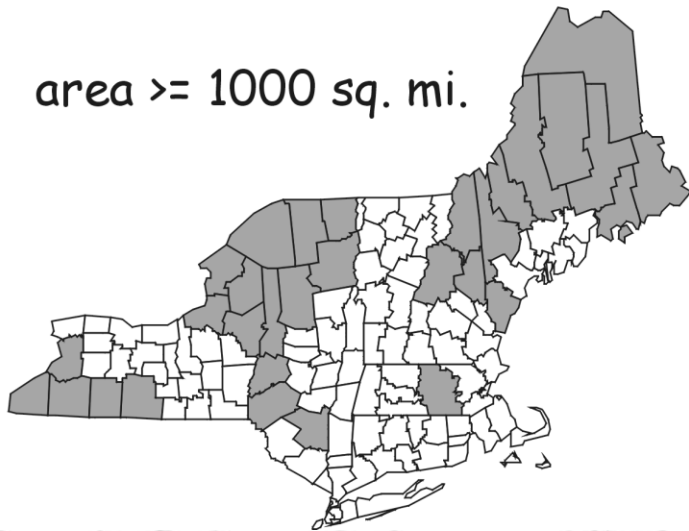
state = Vermont



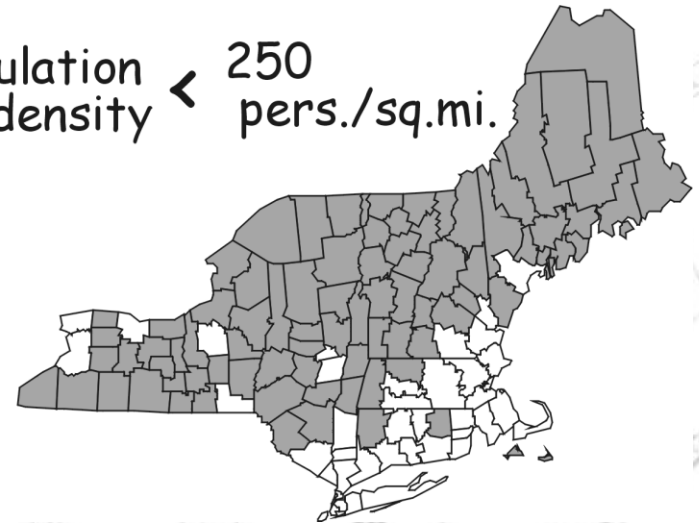
state <> New York



area $\geq$ 1000 sq. mi.



population density $<$ 250 pers./sq.mi.

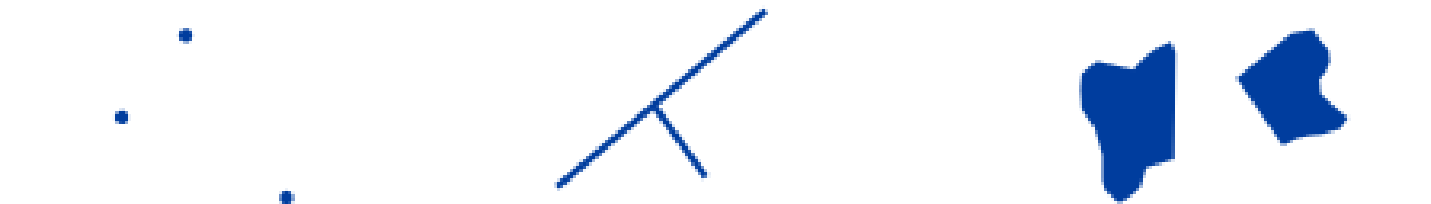


Selection and Classification

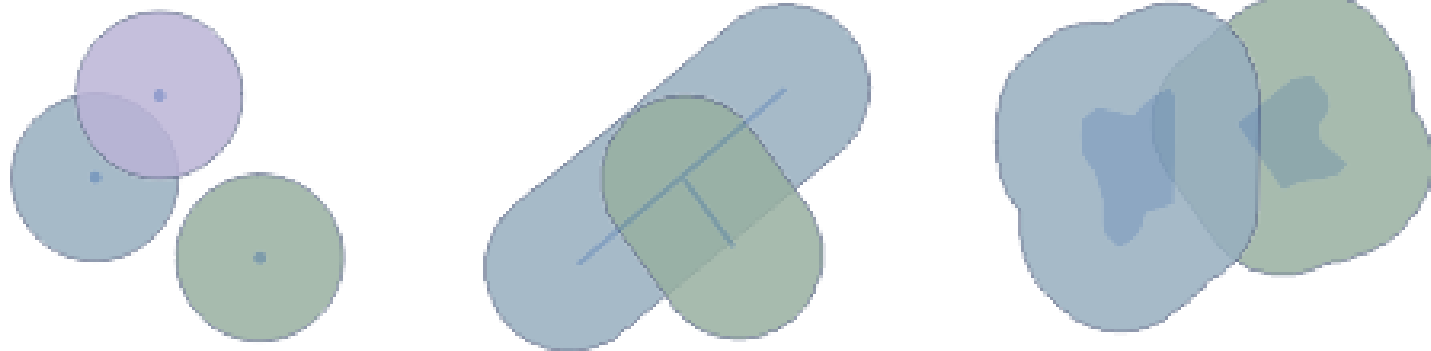


Proximity and Buffering

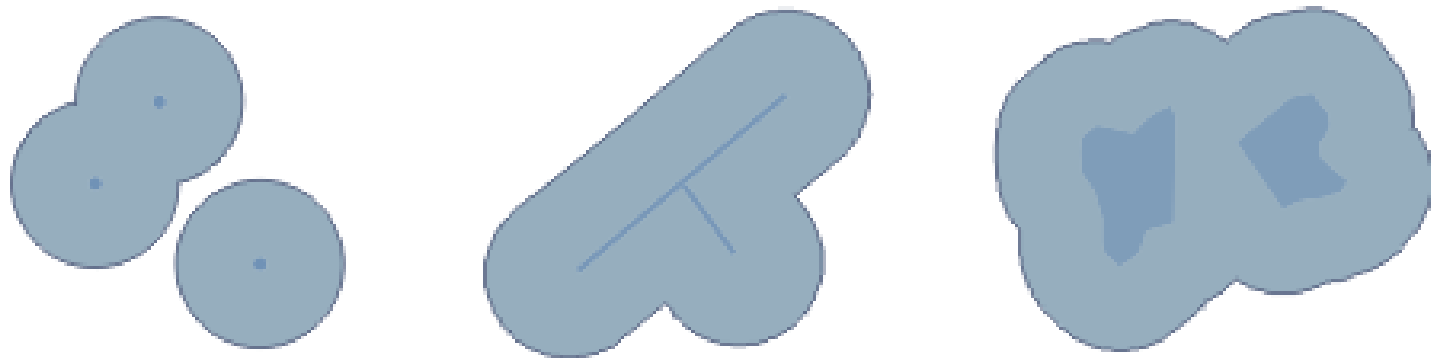
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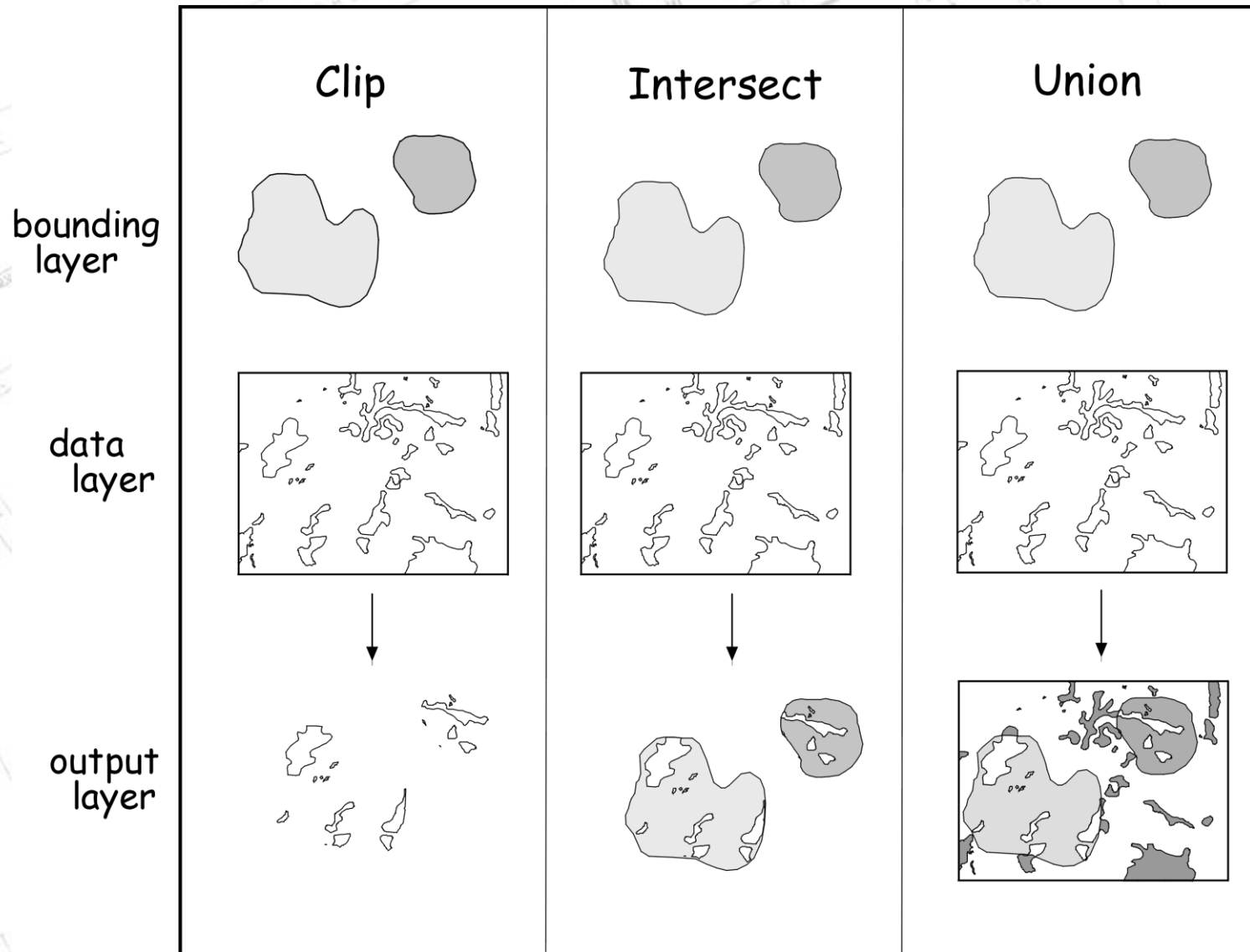
**OUTPUT
DISSOLVE TYPE:
NONE**



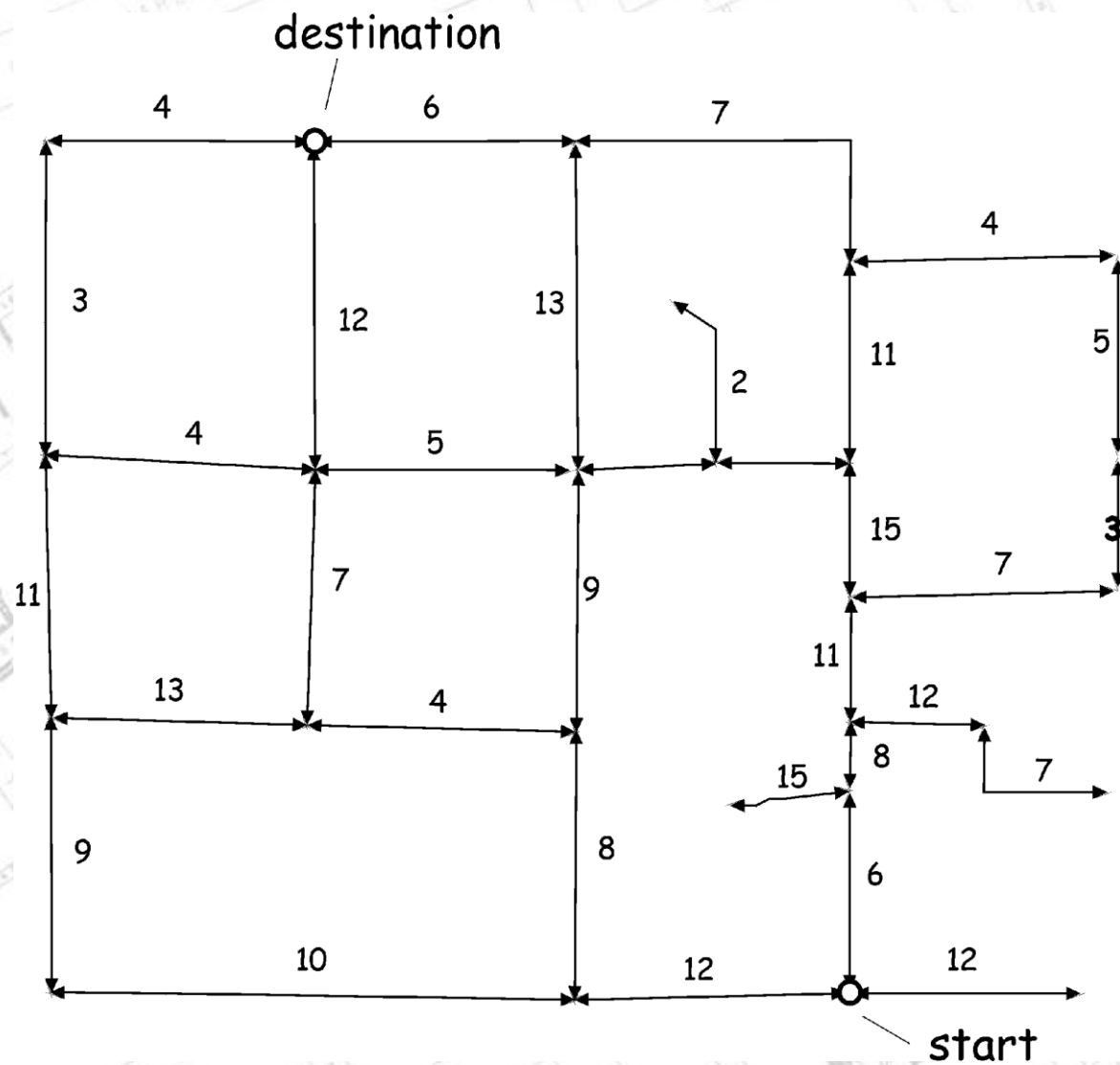
**OUTPUT
DISSOLVE TYPE:
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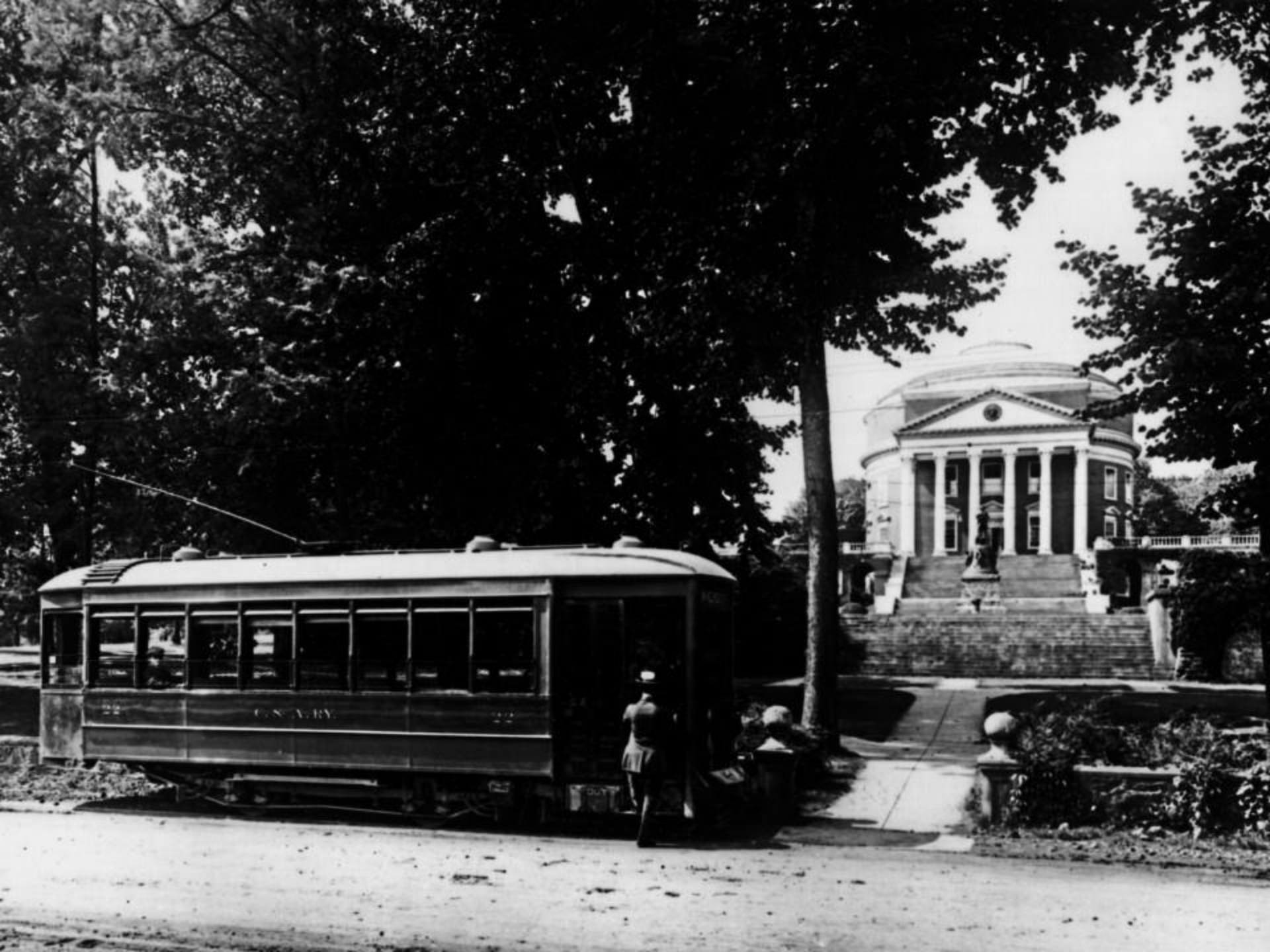


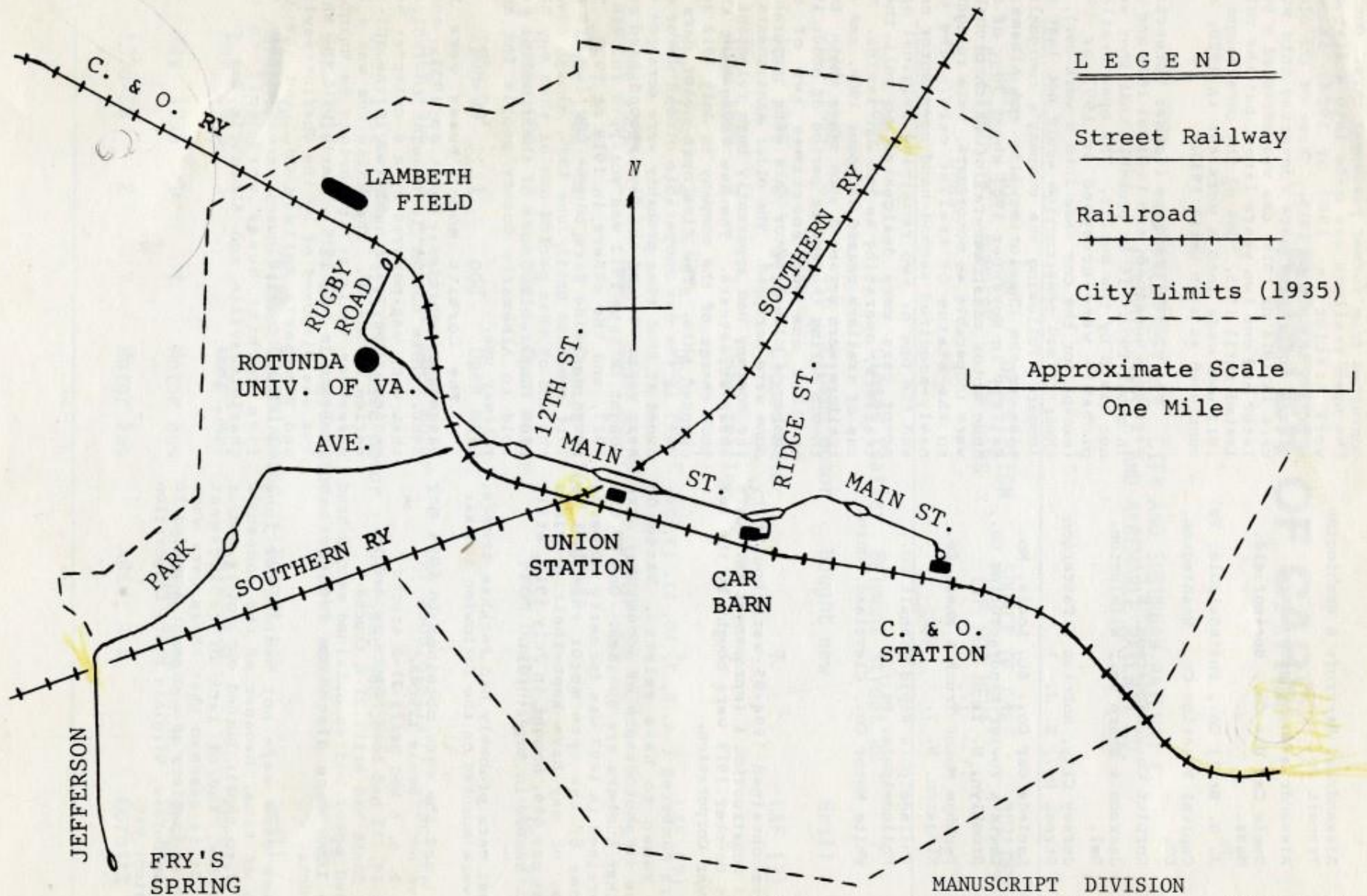
Clip, Intersect, Union



Network Analysis







STREET RAILWAYS - 1920

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ALDERMAN LIBRARY
UNIVERSITY OF VIRGINIA

GAJ-1981



1468 Barracks

29

1482 1481

LEGEND

Street Railway

Railroad

City Limits (1935)

Approximate Scale

One Mile

STREET RAILWAYS - 1920

MANUSCRIPT DIVISION
ALDERMAN LIBRARY
UNIVERSITY OF VIRGINIA

CAF-1381

64

53

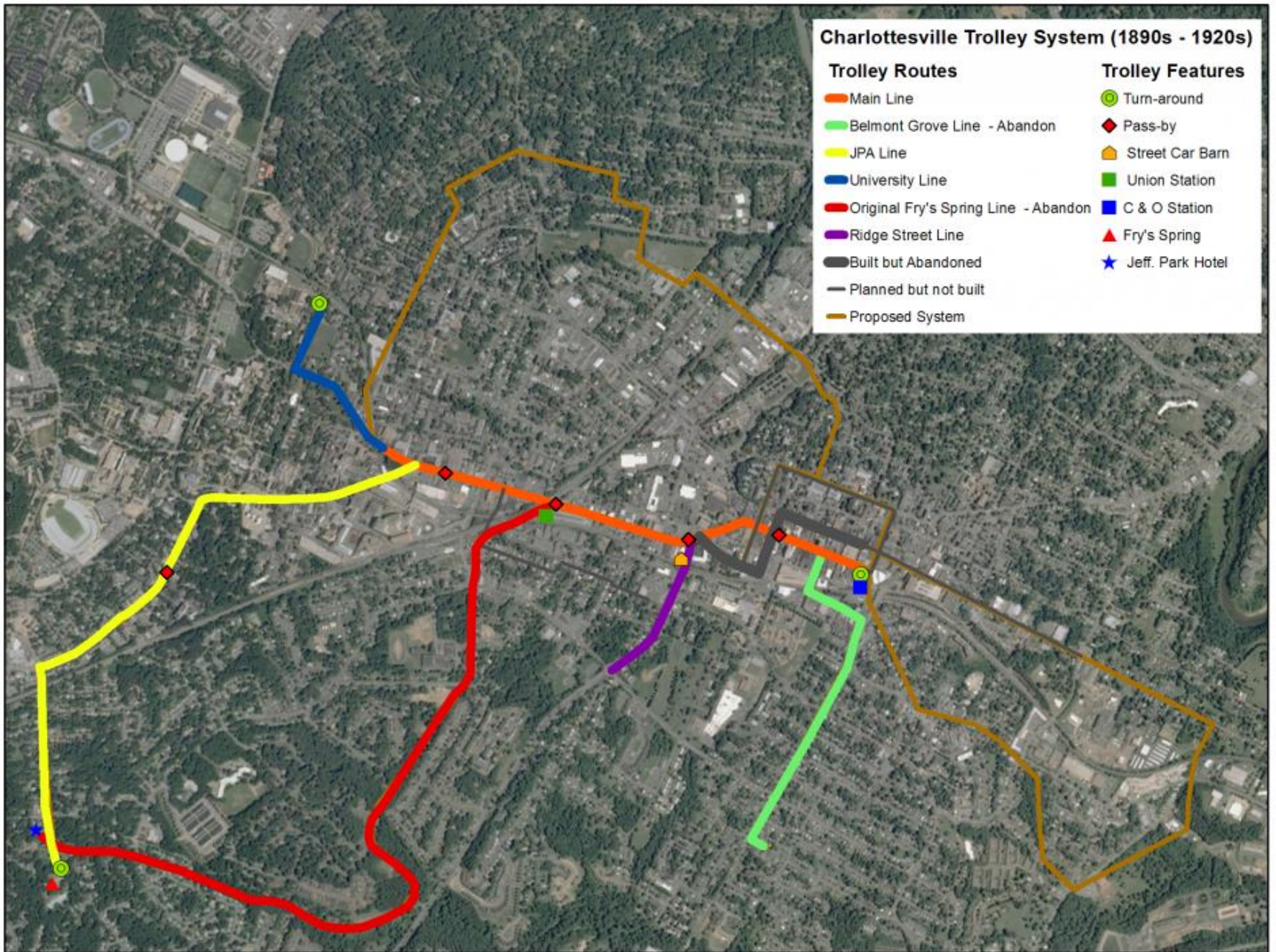
Charlottesville Trolley System (1890s - 1920s)

Trolley Routes

- Main Line
- Belmont Grove Line - Abandon
- JPA Line
- University Line
- Original Fry's Spring Line - Abandon
- Ridge Street Line
- Built but Abandoned
- Planned but not built
- Proposed System

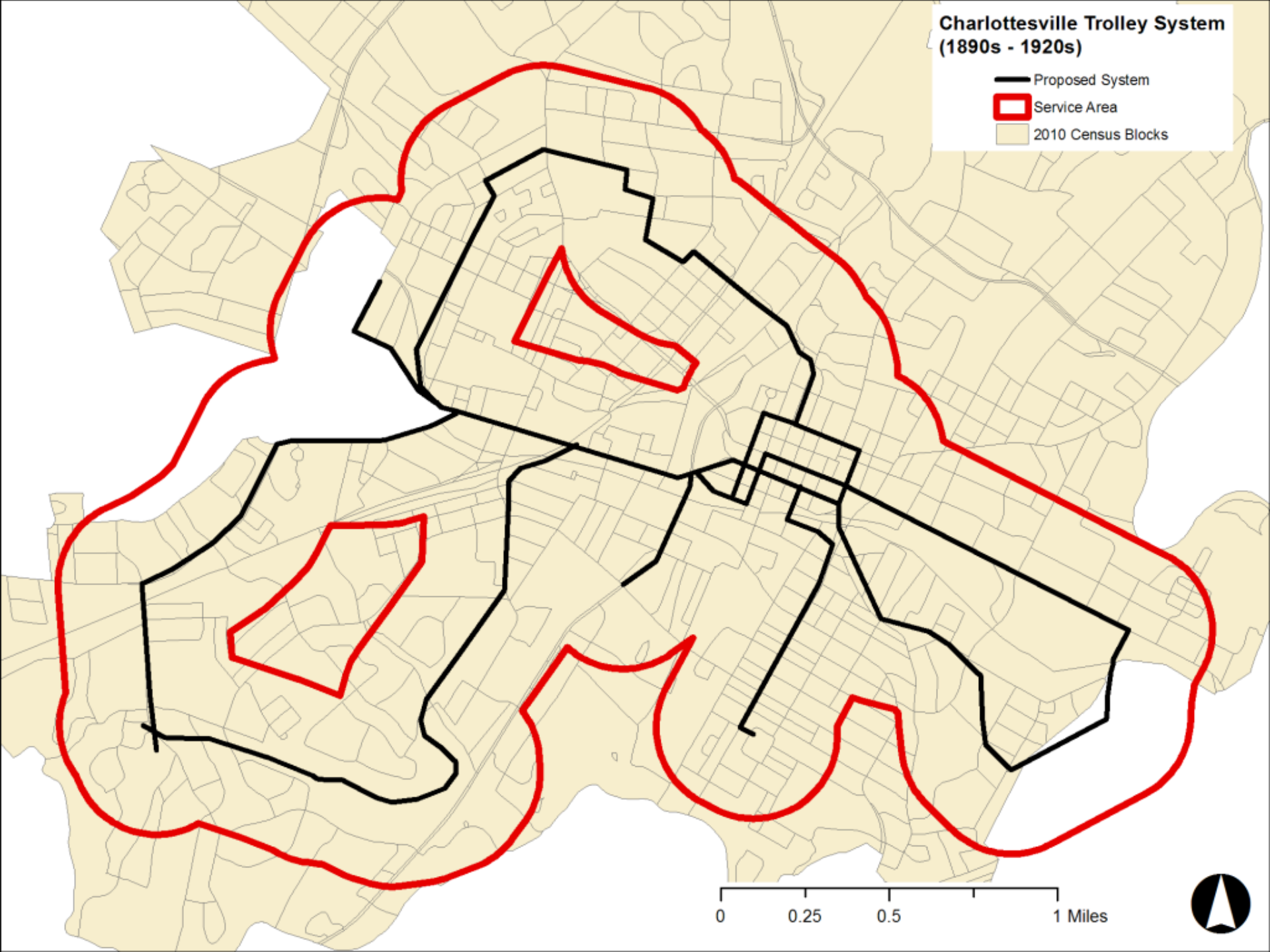
Trolley Features

- Turn-around
- Pass-by
- Street Car Barn
- Union Station
- C & O Station
- Fry's Spring
- Jeff. Park Hotel



**Charlottesville Trolley System
(1890s - 1920s)**

- Proposed System
- ▭ Service Area
- 2010 Census Blocks



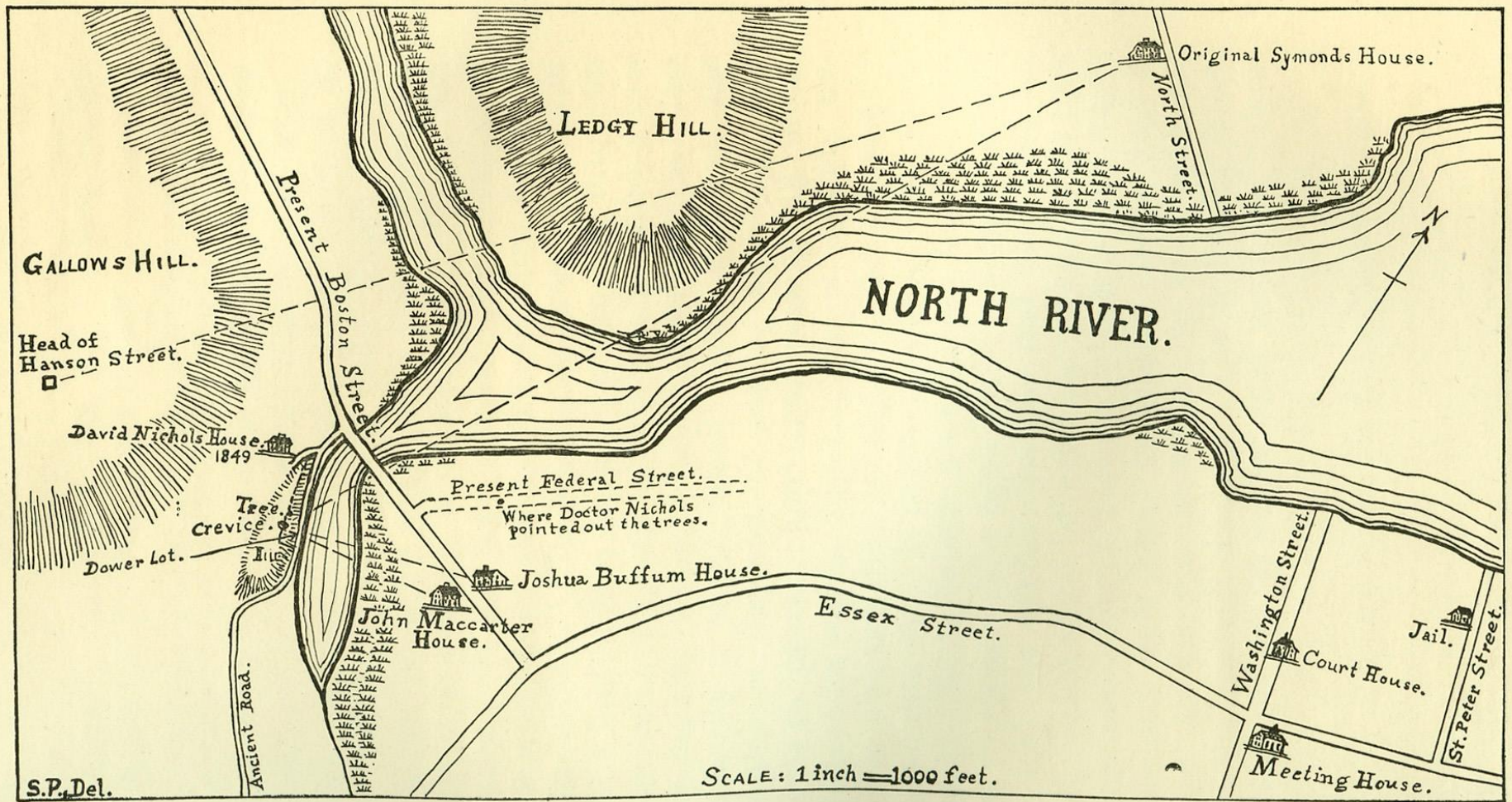
WITH UVA'S HELP, SALEM FINALLY DISCOVERS WHERE ITS 'WITCHES' WERE EXECUTED



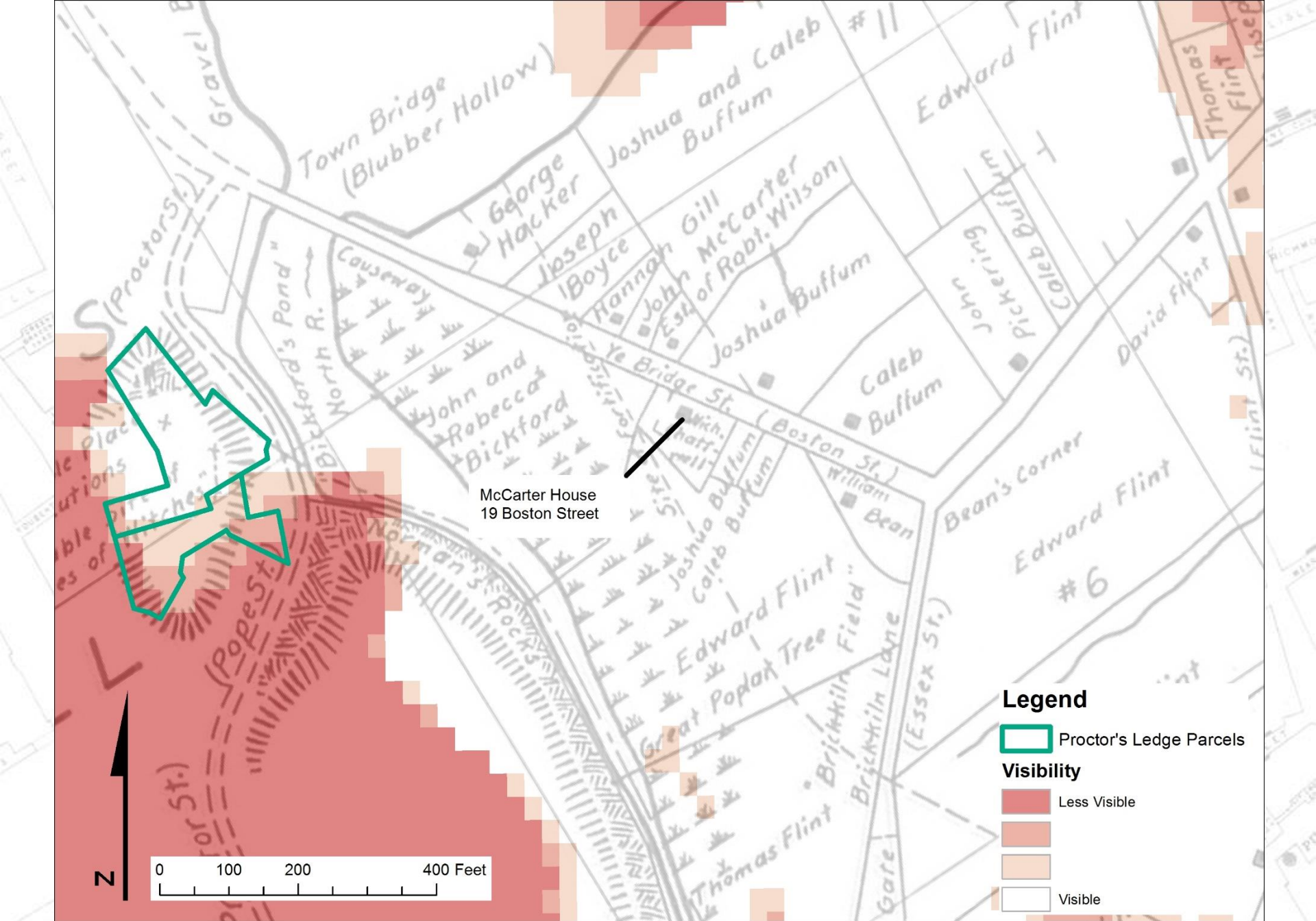
January 19, 2016 • Caroline Newman, news@virginia.edu



Chris Gist, left, and Benjamin Ray, right, used geographic information systems technology in UVA's



MAP SHOWING LOCATIONS





About Tutorial Walter Scheidel
Elijah Meeks

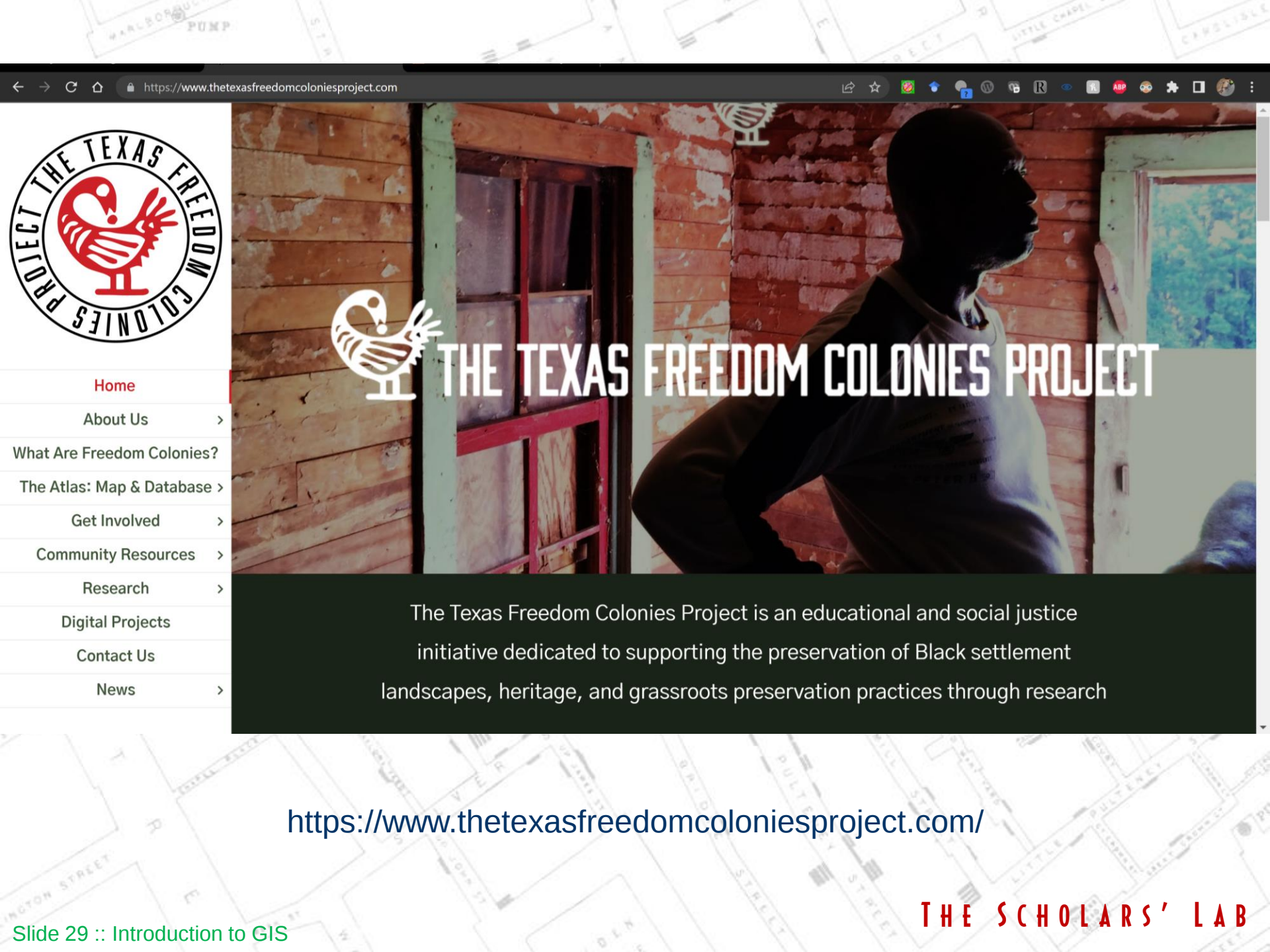
Start exploring the Roman World

If you see any bugs please let us know on [Twitter](#) or [via email at orbisproject@stanford.edu](mailto:email@orbisproject@stanford.edu).

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THE SCHOLARS' LAB





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Digital Projects

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THE TEXAS FREEDOM COLONIES PROJECT

The Texas Freedom Colonies Project is an educational and social justice initiative dedicated to supporting the preservation of Black settlement landscapes, heritage, and grassroots preservation practices through research

<https://www.thetexasfreedomcoloniesproject.com/>

ARCGIS ONLINE

1

DATA

Find authoritative data sources

APPS

Build mobile and field apps

2

3

MAPS

Design web maps and scenes

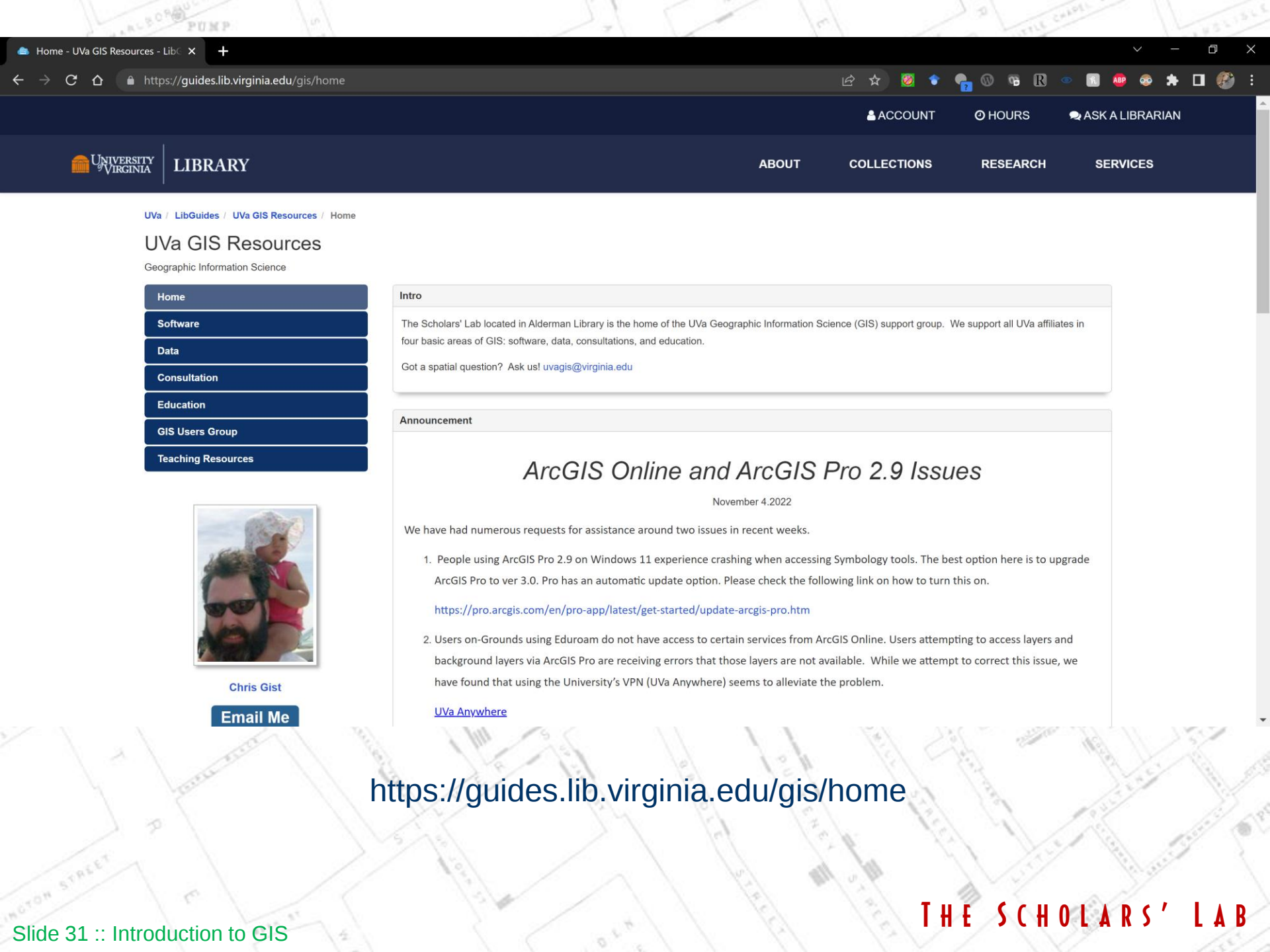
SHARE

Collaborate with your organization

4



<https://uvalibrary.maps.arcgis.com/home/index.html>



Home - UVa GIS Resources - Lib

+

https://guides.lib.virginia.edu/gis/home

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UVa GIS Resources

Geographic Information Science

Home

Software

Data

Consultation

Education

GIS Users Group

Teaching Resources



Chris Gist

Email Me

Intro

The Scholars' Lab located in Alderman Library is the home of the UVa Geographic Information Science (GIS) support group. We support all UVa affiliates in four basic areas of GIS: software, data, consultations, and education.

Got a spatial question? Ask us! uvagis@virginia.edu

Announcement

ArcGIS Online and ArcGIS Pro 2.9 Issues

November 4, 2022

We have had numerous requests for assistance around two issues in recent weeks.

1. People using ArcGIS Pro 2.9 on Windows 11 experience crashing when accessing Symbology tools. The best option here is to upgrade ArcGIS Pro to ver 3.0. Pro has an automatic update option. Please check the following link on how to turn this on.
<https://pro.arcgis.com/en/pro-app/latest/get-started/update-arcgis-pro.htm>
2. Users on-Grounds using Eduroam do not have access to certain services from ArcGIS Online. Users attempting to access layers and background layers via ArcGIS Pro are receiving errors that those layers are not available. While we attempt to correct this issue, we have found that using the University's VPN (UVa Anywhere) seems to alleviate the problem.
[UVa Anywhere](#)

https://guides.lib.virginia.edu/gis/home