

# Assessing Suburban Bicycle Infrastructure in Fairfax County, VA

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# Outline

- Background
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- Existing Research
- Methodology
- Conclusions
- Significance and Limitations



Two-way cycle track: [Streetsblog.org](http://Streetsblog.org)

# Background

## What is bicycle infrastructure?

- On- or off-street lanes/paths
- Configured in a variety of ways
- Generally does not include sidewalks
- Can include quiet/neighborhood streets



Quiet street with wide shoulder:  
[fabb-bikes.org](http://fabb-bikes.org)

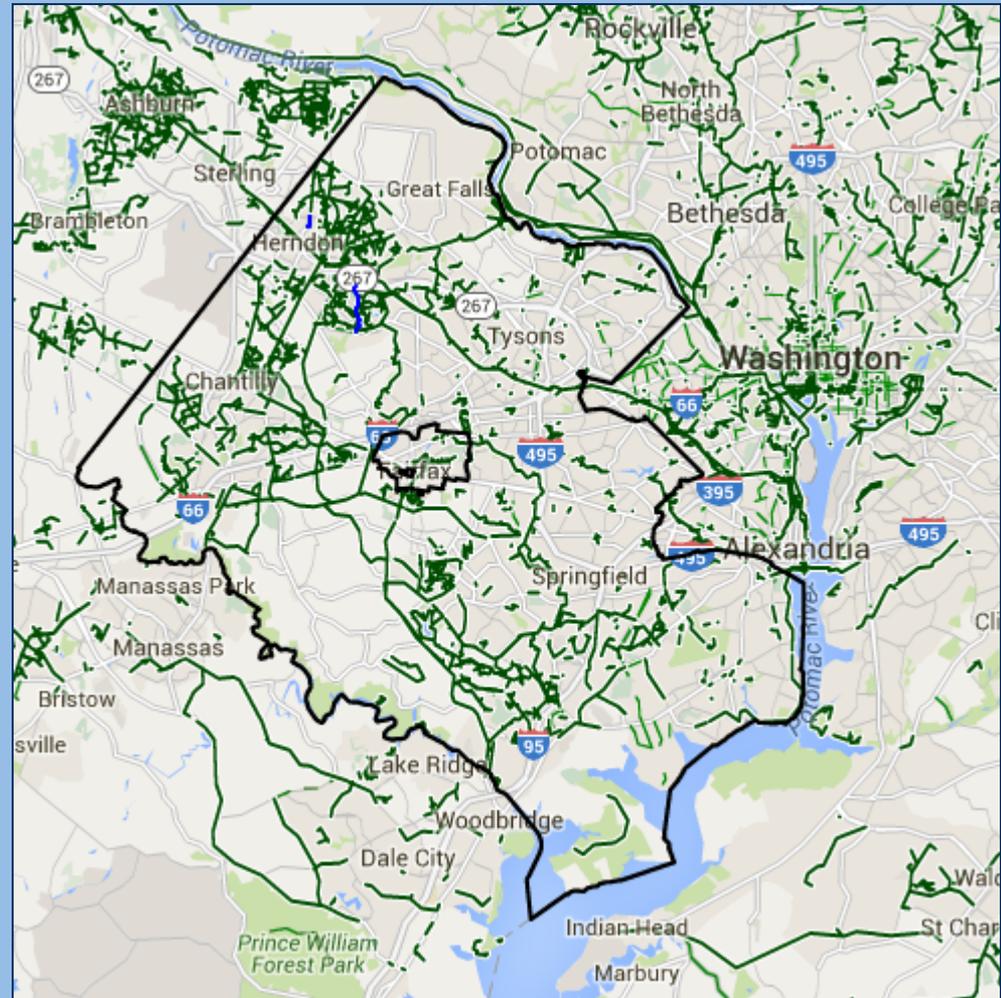


Family in buffered bike lane: [Peopleforbikes.org](http://Peopleforbikes.org)

# Project Objective

Develop methodology for assessing suburban bicycle infrastructure, using Fairfax County, VA as a case study.

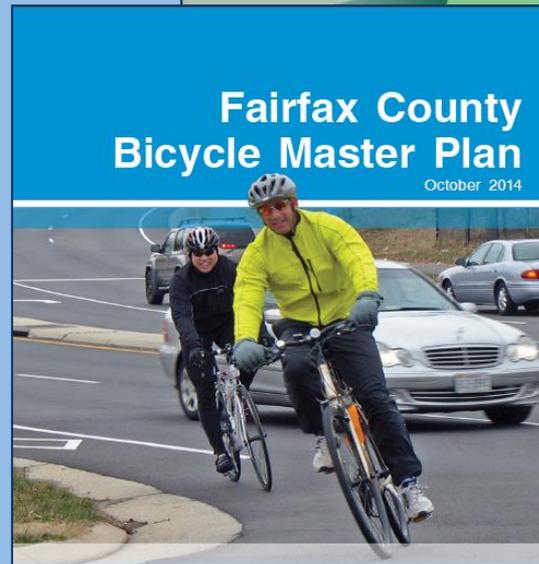
- Provide an assessment of current infrastructure ease of use
- Identify deterrents to cycling
- Offer recommendations on focus areas for improvement



Bike lanes and trails in Fairfax: Fairfax County

# Fairfax County

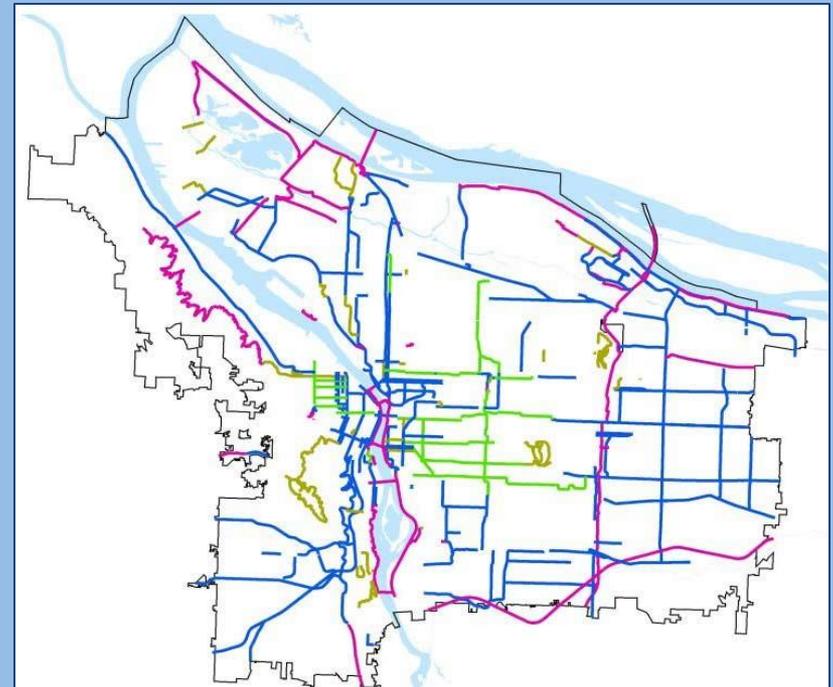
- Mostly-suburban county with large population (1.1 million) and area of 407 mi<sup>2</sup>
- Close to Washington, D.C., one of the most traffic-congested areas in the nation
- Seeking decreased reliance on single-occupancy vehicles for transportation
- Has bicycle-related infrastructure that it is actively expanding in cooperation with VDOT



Images: Fairfax County

# Existing Research

- Strong correlation between the amount of bicycle-related infrastructure present in a city and the number of bicycle commuters
- Difference between types of bicycle facilities
- Bicyclists will travel farther for a less stressful journey
- Number of lane-miles is less important than:
  - Level of network connectivity
  - Overall network density



Portland's Bicycle Network: Alta Planning

# Existing Research

Schoner and Levinson (2012) note that discontinuities in the bicycle network may have three potential consequences:

1. Forcing the cyclist into mixed traffic
2. Requiring lengthy detours to avoid mixed traffic
3. Discouraging cycling altogether



Bicycling with traffic: Washington Post



Four types of cyclists: Reconnecting America

# Existing Research

## What is a bicycling network?

Can be defined as an inventory of bicycling facilities, or as the links that cyclists are permitted or encouraged to use. BUT:

- Not all bike lanes feel safe
- Not all areas without bicycle markings feel unsafe

Proposed definition (Mineta Transportation Institute):

- Network of infrastructure, with or without bicycle-specific markings, which bicyclists feel comfortable using



Protected bike lane: WABA

# Level of Traffic Stress (LTS)



# Level of Traffic Stress



- Physically separated from traffic or low volume, mixed-flow traffic at 25 mph or less
- Bike lanes 6 ft. wide (or more)
- Intersections easy to approach and cross
- Comfortable for children with good bicycle skills and awareness

# Level of Traffic Stress

- Mixed traffic on two-lane roads up to 30 mph
- Bike lanes 5.5 ft. wide or less, next to 30 mph auto traffic
- Un-signalized crossings of up to 5 lanes at 30 mph
- Comfortable for most adults (“interested but concerned”)



# Level of Traffic Stress



- Bicycle lanes next to 35 mph auto traffic, or mixed-flow traffic up to 30 mph on roads with double yellow line
- Comfortable for most current adult U.S. riders
- Many bicycle facilities in the United States are LTS 3

# Level of Traffic Stress

- No dedicated bicycle facilities
- Traffic speeds 40 mph or more, or 4+ lanes at 30 mph
- Comfortable for “strong and fearless” riders (vehicular cyclists)
- *Also includes all roads unsuitable for bicyclists (e.g. interstate highways)*



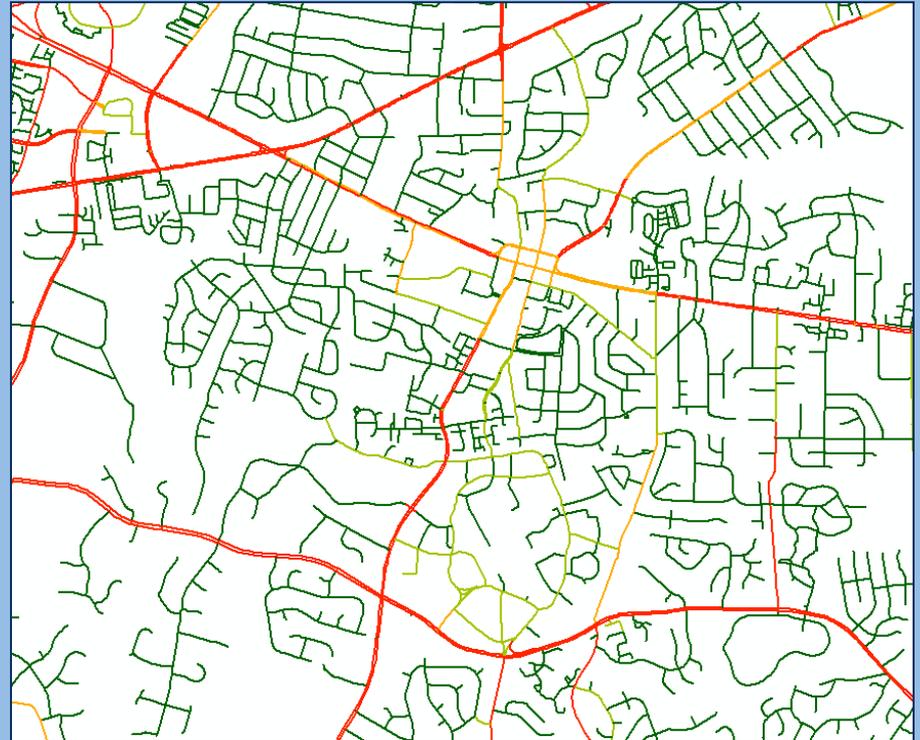
# Metrics

Ratio of bicycle facility miles to county square miles as a base comparison to cities

- Frequently noted in previous studies and can serve as a point of comparison, even if it is not ultimately the best measure

Connectivity of the overall network

- Assign Level of Traffic Stress (LTS) values to roads and trails in Fairfax County
- Use ESRI Network Analyst to build network model, assess connectivity measures, and pinpoint areas of low connectivity



Stress map showing LTS 1-4 (green-red)

# Methodology

## Assigned LTS values to all roads in Fairfax County

- Auto-assignment for roads with speed limits of  $\leq 25$  or  $\geq 40$
- Manual assignment for roads with speeds between 30–35
- Manual review of all roads

## Compiled bike lanes

- 2014 Fairfax County bike lane layer
- 2015 FCDOT wikimapping project

## Compiled trail networks using Fairfax County data

- Removed trails that operated solely within a single neighborhood (no connectivity gains)
- Modified remaining trails to connect to road centerline layers at crossings (combination of manual and ArcGIS operations)

**Used Network Analyst to assess networks of trails and roads at different LTS levels**

# Key Findings

## Bicycle Facility Statistics for Fairfax County (407 square miles)

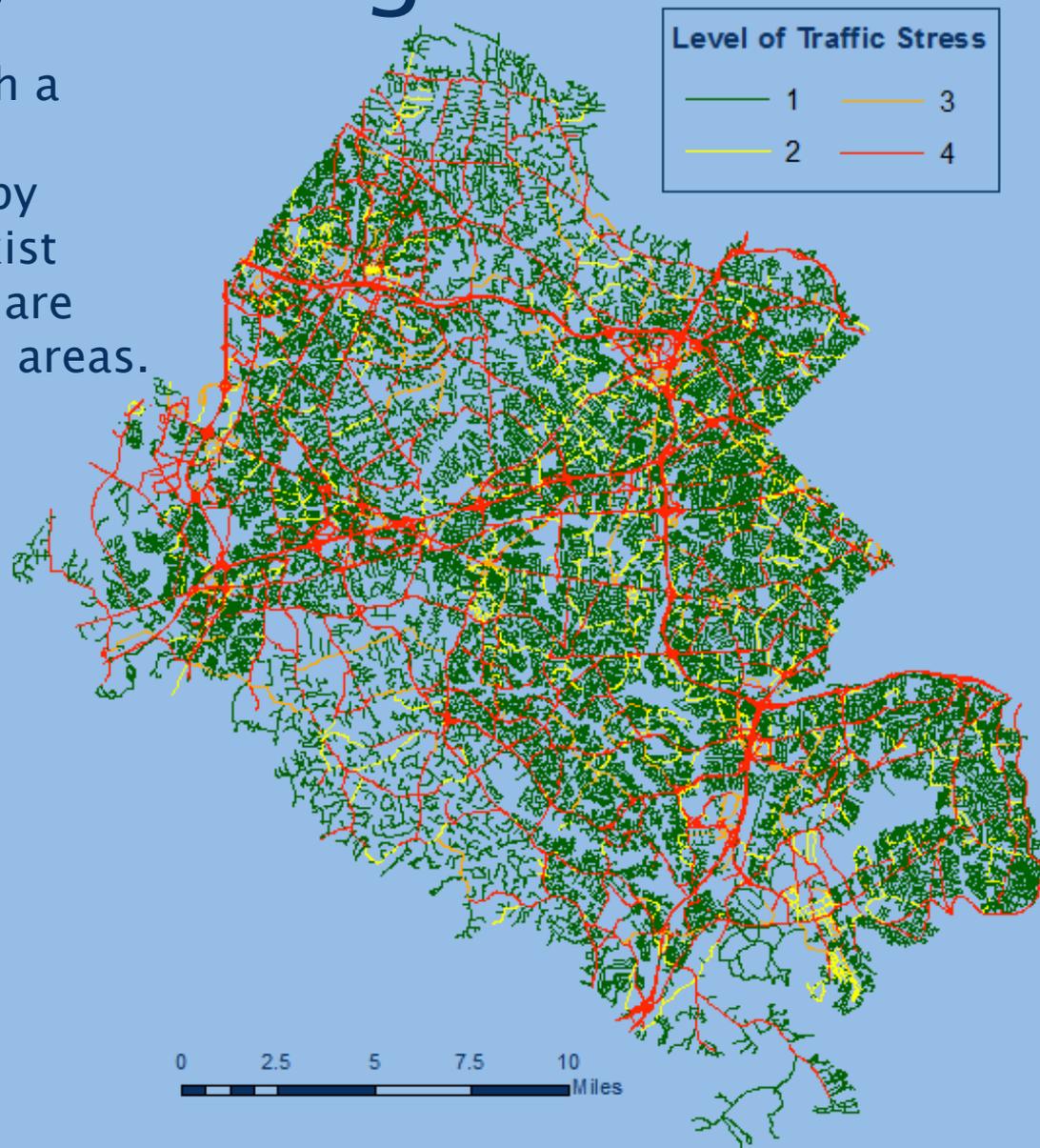
	Total miles	On-street	Off-street	Miles per mi <sup>2</sup>
Bicycle Facilities	205	32*	173	0.5
Roads (all)	5017	5017	N/A	12.3
Large-city average (bicycle facilities) <sup>1</sup>	251	166	85	1.6

\* - May not include all lanes added in 2015  
1 - Alliance for Biking and Walking, 2014

# Key Findings

68% of roads are LTS 1, but with a road-only network, they are disconnected; all are boxed in by major roads. Some networks exist within more urban centers, but are disconnected from surrounding areas.

- 74% of roads and trails are levels 1 or 2
- 25% of road sections are either dead ends or cul-de-sacs

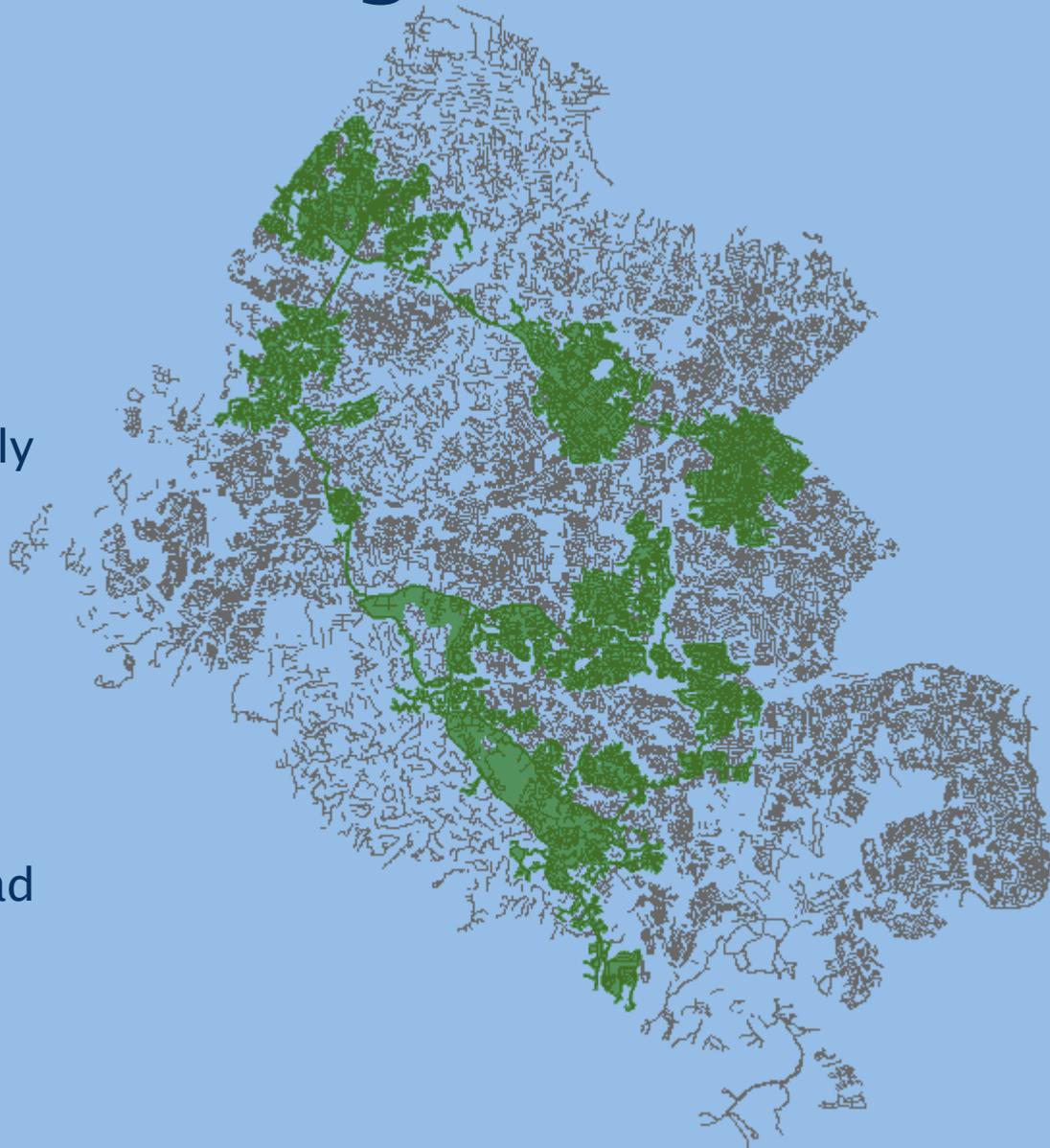


# Key Findings

With the addition of trails, one large connected network is created.

*However:*

- Most of the county is still disconnected and in relatively small sections
- Much of the network is dependent on a single trail/link
- Many neighborhoods are disconnected by a single road crossing or short section of major road



Largest LTS 1-2 network

# Key Findings

Second-largest network  
(Southeast Fairfax County)  
pictured at right.

Characteristics include:

- Indirect routes for most trips
- Heavy reliance on single connections (Mount Vernon Trail in many cases)
- Network extent is approximately 6 miles North-South

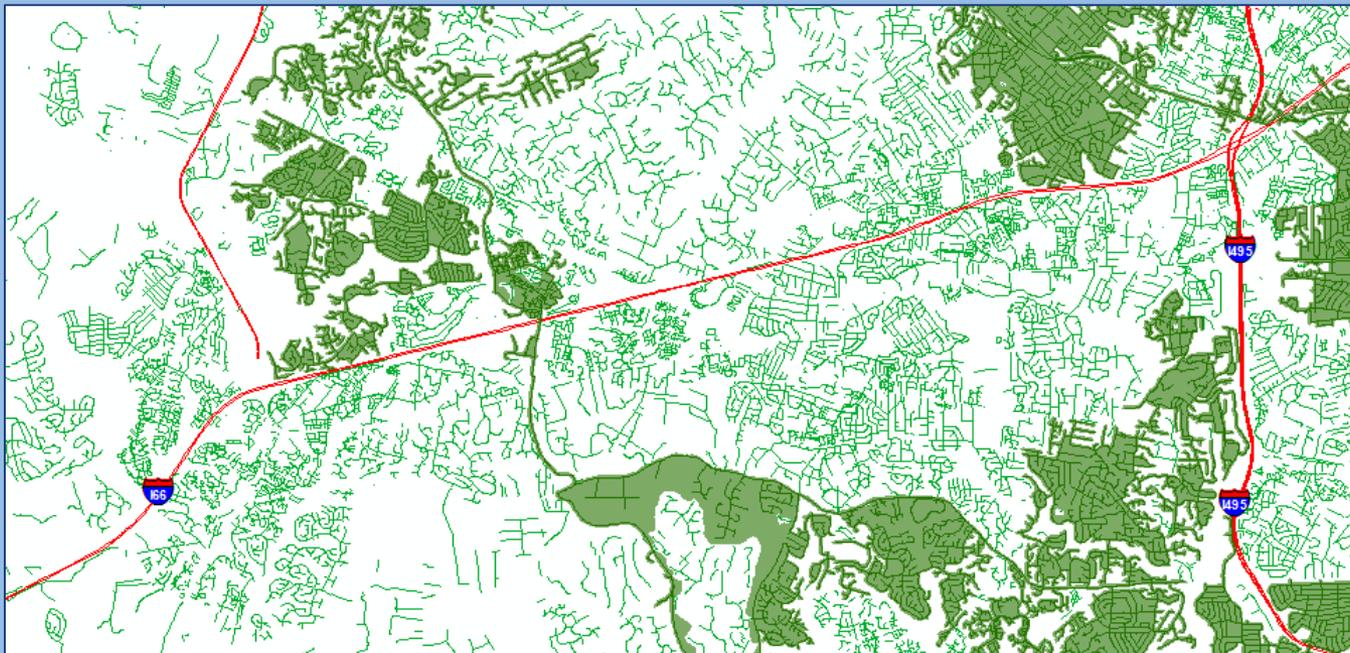


Second-largest LTS 1-2 network

# Key Findings

Deterrent: minimal connections across interstates and other large highways

- 16-mile stretch of I-66 below has 4 crossings suitable for bicyclists, but *only 1 ties into a major network*



# Key Findings

## Bike lanes:

- Generally improve LTS by one level (e.g. LTS 3 to LTS 2)
- In some locations, *bike lane presence does not change LTS*



Dranesville Road near Herndon High School (40 mph, LTS 4): Google Earth

# Significance & Limitations

## Significance:

- Demonstrates connectivity issues that cannot easily be seen via other methods
- Only known comprehensive study of bicycle infrastructure in a large suburban area
- Applies recently developed methodologies that emphasize key determinants of a successful bicycling network

## Limitations:

- Single case study
- Human error potential
- Hard to compare to other counties/suburbs at this point because those studies have not been done

# Data Sources

## Virginia Geographic Information Network (VGIN)

- Virginia Most Recent Imagery (Lambert)
- Virginia Administrative Boundaries
- Roadway Centerlines

## Fairfax County

- BikeFairfax/FCDOT Wikimapping project (bike lane locations)
- Bicycle Routes
- County Trails
- Non-County Trails

## Google Earth

- Street view

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Questions?