Assessing Suburban Bicycle Infrastructure in Fairfax County, VA

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Outline

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

Two-way cycle track: 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

Family in buffered bike lane: 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
Fairfax County

- Mostly-suburban county with large population (1.1 million) and area of 407 mi²
- 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
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
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

Existing Research

Four types of bicyclists: 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
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

Source: WABA
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)

<table>
<thead>
<tr>
<th></th>
<th>Total miles</th>
<th>On–street</th>
<th>Off–street</th>
<th>Miles per mi²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle Facilities</td>
<td>205</td>
<td>32*</td>
<td>173</td>
<td>0.5</td>
</tr>
<tr>
<td>Roads (all)</td>
<td>5017</td>
<td>5017</td>
<td>N/A</td>
<td>12.3</td>
</tr>
<tr>
<td>Large–city average</td>
<td>251</td>
<td>166</td>
<td>85</td>
<td>1.6</td>
</tr>
</tbody>
</table>

1. Alliance for Biking and Walking, 2014

* – May not include all lanes added in 2015
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
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
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
Primary References


Primary References (continued)


• Fairfax County Department of Transportation (2015). *Biking to Metro and VRE Stations in Fairfax County*. Available at: http://wikimapping.com/wikimap/FairfaxCounty.html

• Fairfax County Department of Transportation (2014). Fairfax County *Bicycle Master Plan*. Available at: http://www.fairfaxcounty.gov/fcdot/pdf/bike/bicycle_master_plan_draft-final.pdf


Primary References (continued)


Questions?