Assessing Suburban Bicycle Infrastructure in Fairfax County, VA

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Outline

- Background
- Objective
- Why Fairfax County?
- Existing Research
- Data Sources and Methodology
- Timeline
- Significance and Limitations

Two-way cycle track: Streetsblog.org

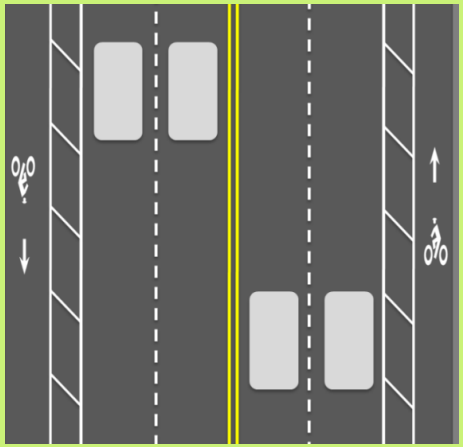
Background

What is bicycle infrastructure?

- On- or off-street lanes/paths
- Configured in a variety of ways
- Includes pavement markings on shared lanes with larger vehicles
- Generally does not include sidewalks
- Can include quiet/neighborhood streets

Shared lanes: Seattle DOT

Quiet street with wide shoulder: fabb-bikes.org

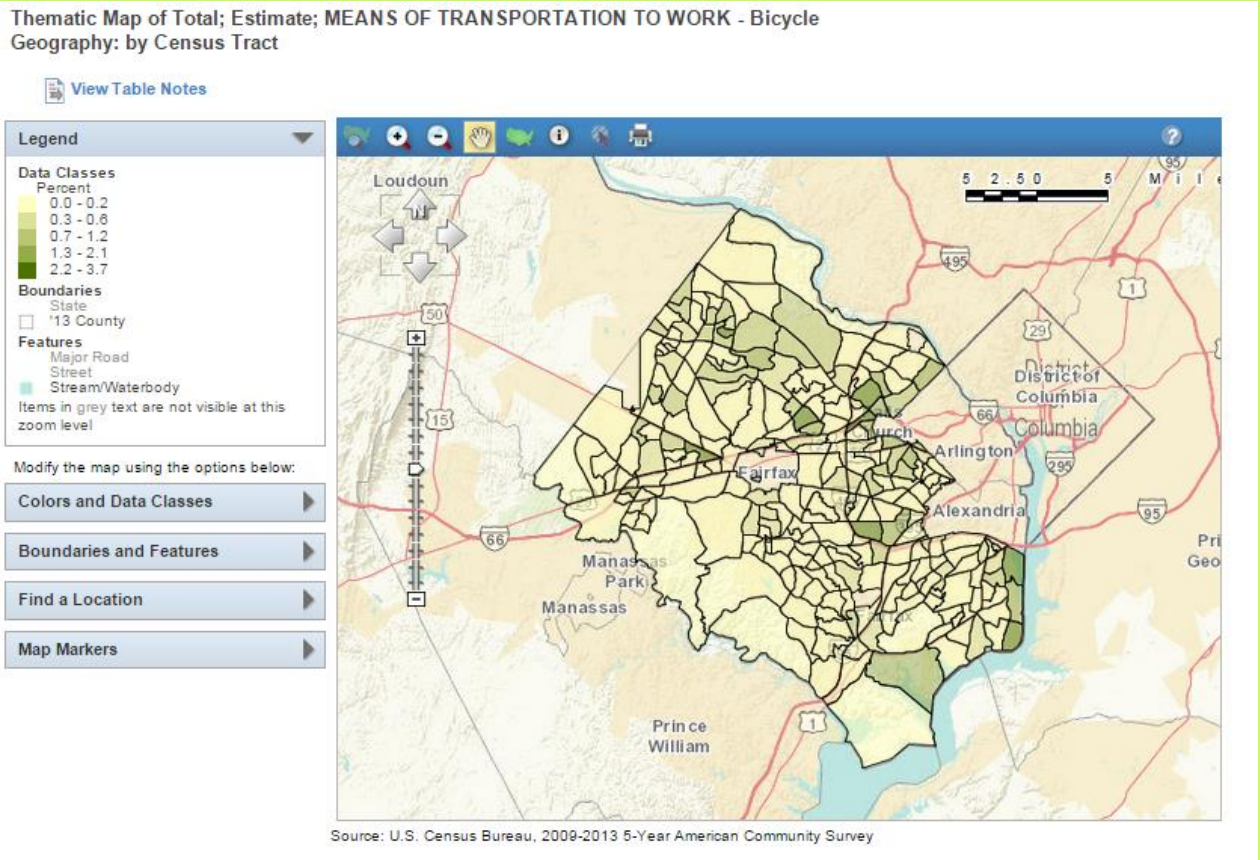


Buffered bike lanes: Toole Design Group

Background

Many current studies and summaries of bicycling within an area focus on:

- Large cities
- Bicycle commuters only
- American Community Survey (ACS) data



Background

This is problematic because:

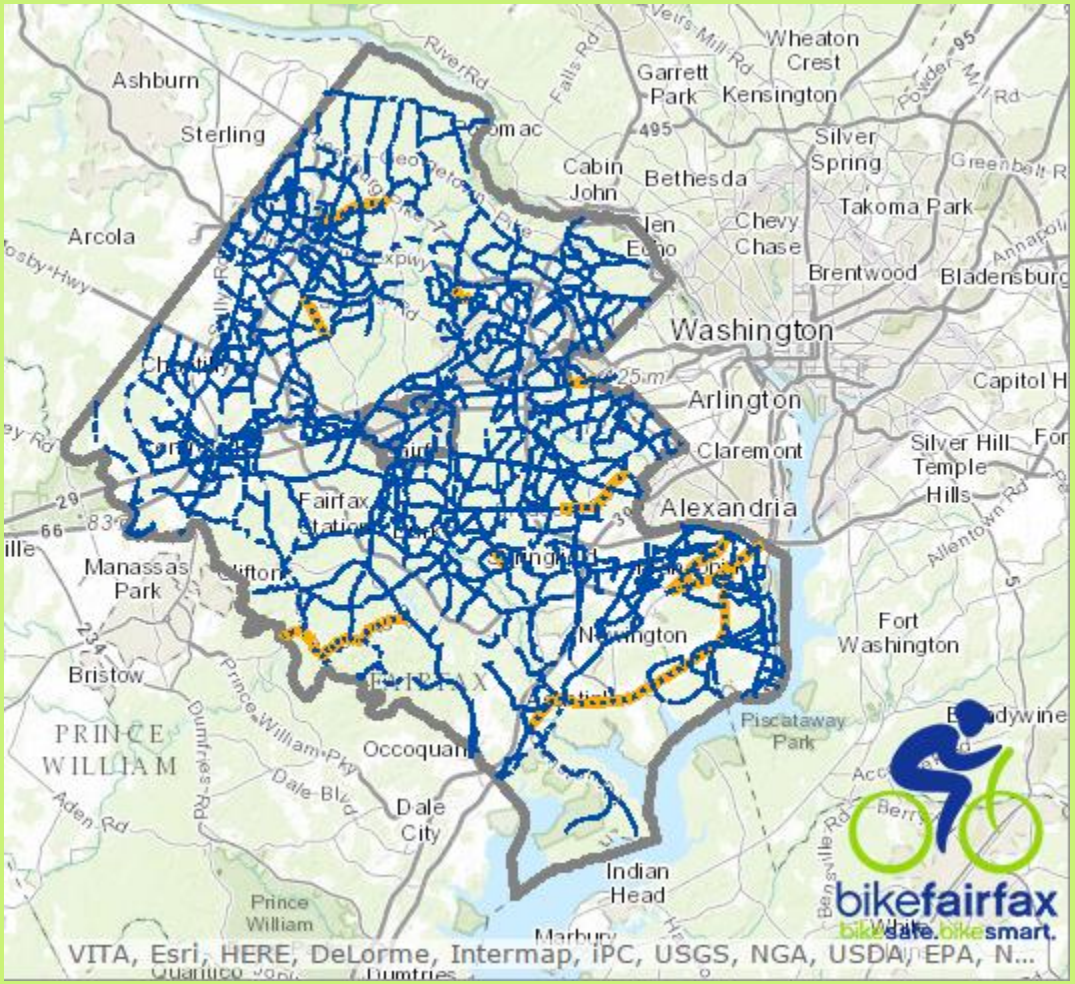
- Most of the country is not cities – hard to apply findings
- The ACS data asks for the most-used commuting mode within the last work week.
- ACS data has a margin of error that often exceeds 100% for bicycle commuting – but it usually still the best available
- Not all trips are commutes

Family in buffered bike lane: Peopleforbikes.org

Project Objective

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

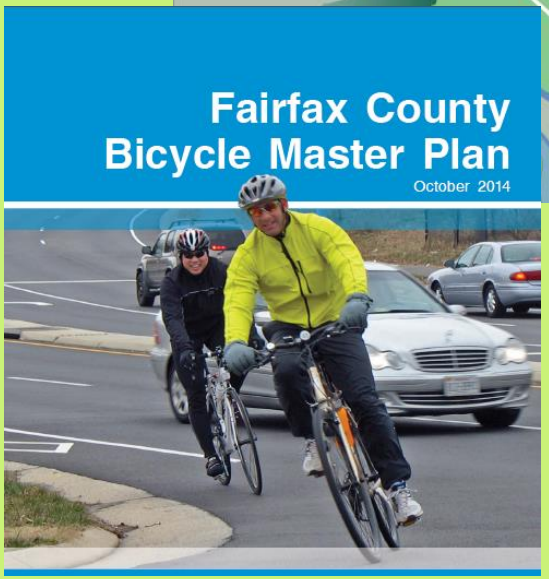
- Provide an assessment of current infrastructure status and effectiveness
- Identify deterrents to cycling
- Offer recommendations on focus areas for improvement



Bike routes in Fairfax: Fairfax County

Why Fairfax County?

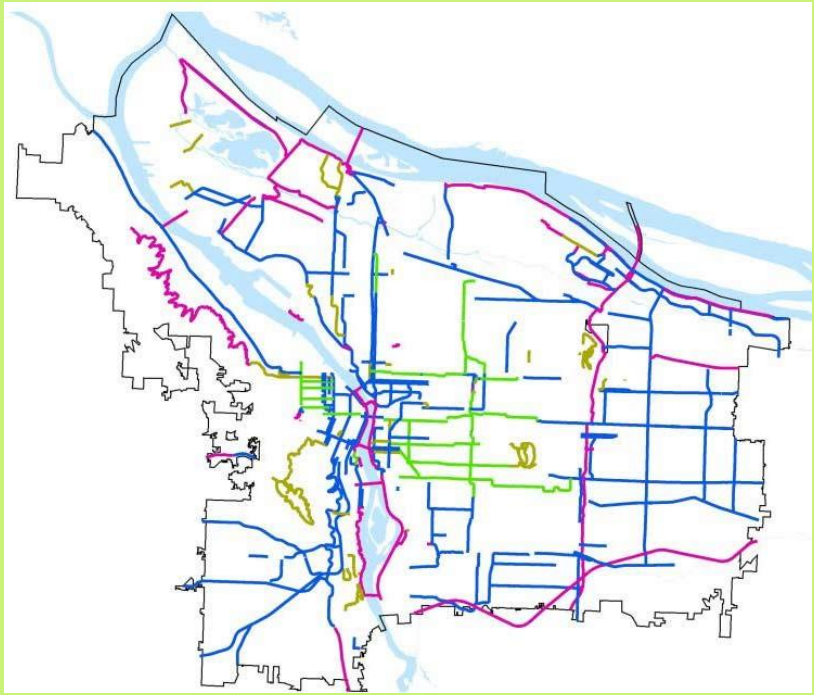
- Mostly-suburban county with large population (1.1 million)
- Proximity to Washington, D.C., one of the most traffic-congested areas in the nation
- Seeking decreased reliance on single-occupancy vehicles for transportation
- Has a network of bicycle-related infrastructure that it plans to expand



Images: Fairfax County

Existing Research

- Strong linear 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 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

Protected bike lane: WABA

Four types of cyclists: Reconnecting America

Existing Research

2011 study in the Vancouver area identified the top 10 motivators and top 10 deterrents to riding.

- Two of the motivators involved being separated from traffic
- Five (half) of the deterrents involved traffic risk or safety

Separated from traffic: EPA

Bicycling with traffic: Washington Post

Existing Research

Level of Traffic Stress classification system

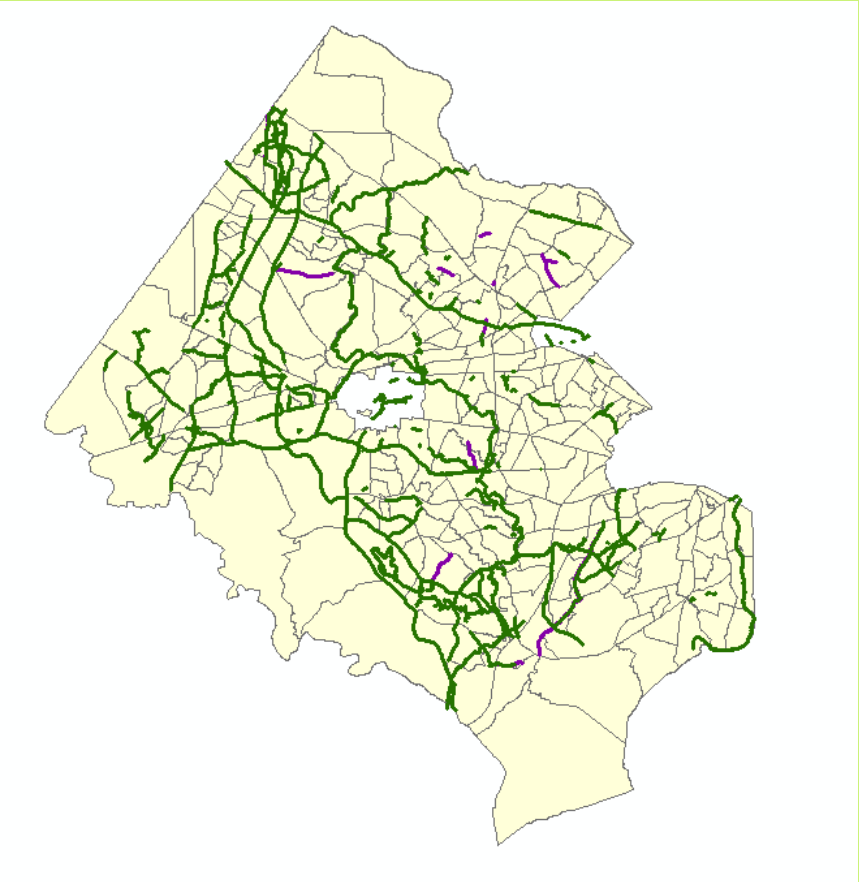
Primary Data Material

Fairfax County Bicycle Routes

- Have 2014 shapefiles from county planning office (verifying currency)
- Working with county transportation planning office to obtain updated files as well as information on near-future projects

Fairfax County Bicycle Master Plan

- Information on planned improvements over next 10-20 years; potential to evaluate using same criteria



Bicycle Routes in Fairfax County

Proposed 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

- Use Esri Network Analyst to build network model, assess connectivity measures, and pinpoint areas needing improvement

Proposed Metrics

Level of Traffic Stress

- Classify network according to LTS 1 or LTS 2 facilities – what will the "Interested but Concerned" group be willing to use?
- Assess connectivity of only the LTS 1/LTS 2 network – does this network connect? If not, does it connect with LTS 3 added?

Stress map showing LTS 1 (green) and 2(blue): Mekuria et al.

Methodological Details

Fairfax County data

- Includes information on low-volume (neighborhood) streets
  - Will be incorporated as part of bicycling network according to LTS criteria

Network analysis methods:

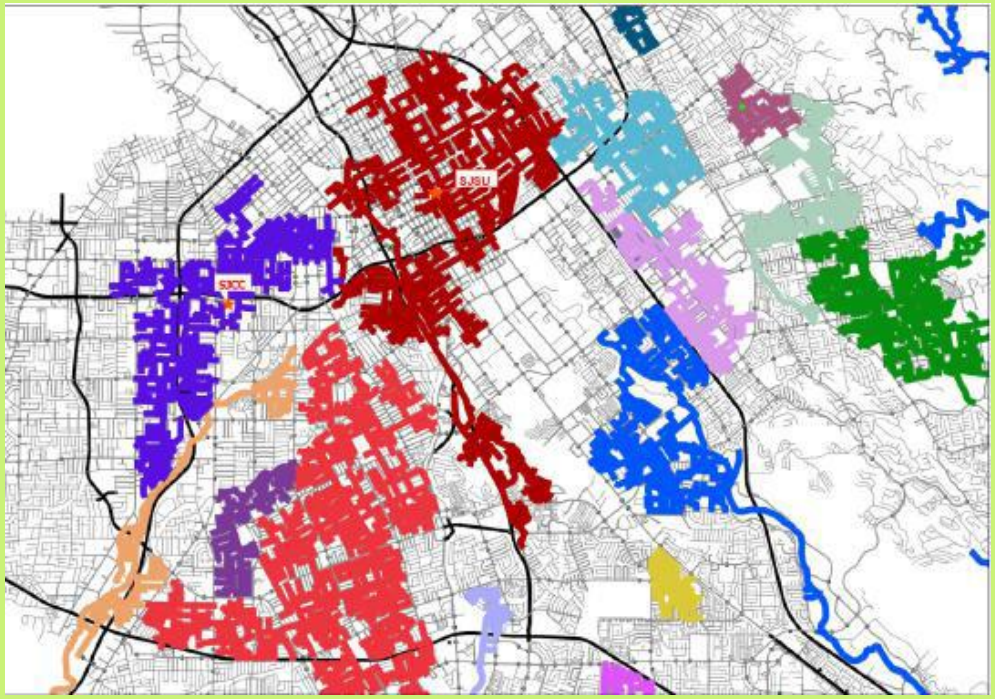
- **Service area solver** (more advanced buffer tool)
  - Evaluates accessibility, overall coverage, etc.

- **Route tool** (can modify for distance, time, etc. as highest priority)
  - Will use to determine/demonstrate difference between reasonable bicycling routes and street network

Connectivity Measures

Connectivity clusters/islands (Mekuria et al. 2012)

- Visually analyze network for clusters or islands
- Statistical analysis is possible, but would require additional tools and possibly more data



Connectivity clusters: Mekuria et al.

Connected node ratio (Dill 2004)

- Number of intersections divided by the number of intersections plus endpoints.
- Ideal ratio is 0.7 or higher, maximum value possible is 1.
- Addresses concerns of both density and connectivity determined important by more recent studies

Project Timeline

May–July 2015:
- Meet with Fairfax County Planning Staff
- Adapt project plan according to feedback from proposal presentation, discussions with County staff

Aug–Sept 2015:
- Build network(s) for analysis
- Conduct network analysis

Sept–Nov 2015:
- Analyze and synthesize findings for presentation

Dec 9–11, 2015:
- Present at Transportation Engineering and Safety Conference (State College, PA) – *awaiting confirmation*

Significance & Limitations

Significance:

- Only known study of a large suburban area
- Uses metrics more likely to be meaningful and accurate
- Applies recently developed methodologies that emphasize key determinants

Limitations:

- Single case study
- Relies heavily on single data source
- Hard to compare to other counties/suburbs at this point because those studies haven't been done

Primary References

- Advocacy Advance (2012) Bicycling Means Business: The Economic Benefits of Bicycle Infrastructure. Available at: http://www.bikeleague.org/sites/default/files/Bicycling_and_the_Economy-Econ_Impact_Studies_web.pdf

- Alliance for Biking and Walking (2014) *2014 Benchmarking Report*. Available at: http://www.bikewalkalliance.org/storage/documents/reports/2014BenchmarkingReport.pdf

- Andersen, M (2015). Here are the First-ever National Findings about "Interested but Concerned" Bikers. *People for Bikes*. Available at: http://www.peopleforbikes.org/blog/entry/here-are-the-first-ever-national-findings-about-interested-but-concerned-bi

- Bike League (n.d.) The New Majority: Pedaling Towards Equity. Available at: http://bikeleague.org/sites/default/files/equity_report.pdf

- Bike League (2014) Bike League Report: Analysis of Bicycle Commuting in American Cities. Available at: http://www.bikeleague.org/sites/default/files/ACS_report_2014_forweb_edit.pdf

- Buehler, R. (2012). Determinants of bicycle commuting in the Washington, DC region: The role of bicycle parking, cyclist showers, and free car parking at work. *Transportation research part D: transport and environment*, *17*(7), 525-531.

- Buehler, R. and Pucher, J. (2012) Cycling to Work in 90 Large American Cities: New Evidence on the Role of Bike Paths and Lanes. *Transportation* 39: 409-432. doi: 10.1007/s11116-011-9355-8

- Dill, J. (2004). Measuring network connectivity for bicycling and walking. In *83rd Annual Meeting of the Transportation Research Board, Washington, DC*.

Primary References (continued)

- 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

- Geller, R (2009). Four Types of Cyclists. *Portland Office of Transportation*. Available at: https://www.portlandoregon.gov/transportation/article/264746

- Handy, S. L., & Xing, Y. (2011). Factors correlated with bicycle commuting: A study in six small US cities. *International Journal of Sustainable Transportation*, *5*(2), 91-110.

- Mekuria, M., Furth, P. and Nizon, H. (2012) Low-Stress Bicycling and Network Connectivity. *Mineta Transportation Institute Report* 11-19.

- Parkin, J., Wardman, M., and Page, M. (2007) Models of Perceived Cycling Risk and Route Acceptability. *Accident Analysis and Prevention* 39(2): 364-371. doi: 10.1016/j.aap.2006.08.007

- Schlossberg, M. et al. (2013) Rethinking Streets: An Evidence-Based Guide to 25 Complete Street Transformations. Available at: http://pages.uoregon.edu/schlossb/ftp/RS/RethinkingStreets_All_V2_high_wCover.pdf

- Schoner, J. and Levinson, D. (2014) The Missing Link: Bicycle Infrastructure Networks and Ridership in 74 US Cities. *Transportation* 41: 1187-1204. doi: 10.1007/s11116-014-9538-1

- Winters, M., Davidson, G., Kao, D., & Teschke, K. (2011). Motivators and deterrents of bicycling: Comparing influences on decisions to ride. *Transportation*, 38(1), 153-168. doi:10.1007/s11116-010-9284-y

Questions?