Low-Stress Connectivity Assessment to Prioritize Bicycle Infrastructure

Liz Thorstensen

VP of Trail Development

rails-to-trails conservancy

Ana Valenzuela

GIS Analyst

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T-MAP
Trail Modeling and Assessment Platform

<u>T-MAP Tools</u>

1. Analyze trail connectivity
2. Collect bike and pedestrian counts
3. Estimate/Forecast Demand
4. Assess Impacts (health, environment, economy, etc.)

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Project Goal

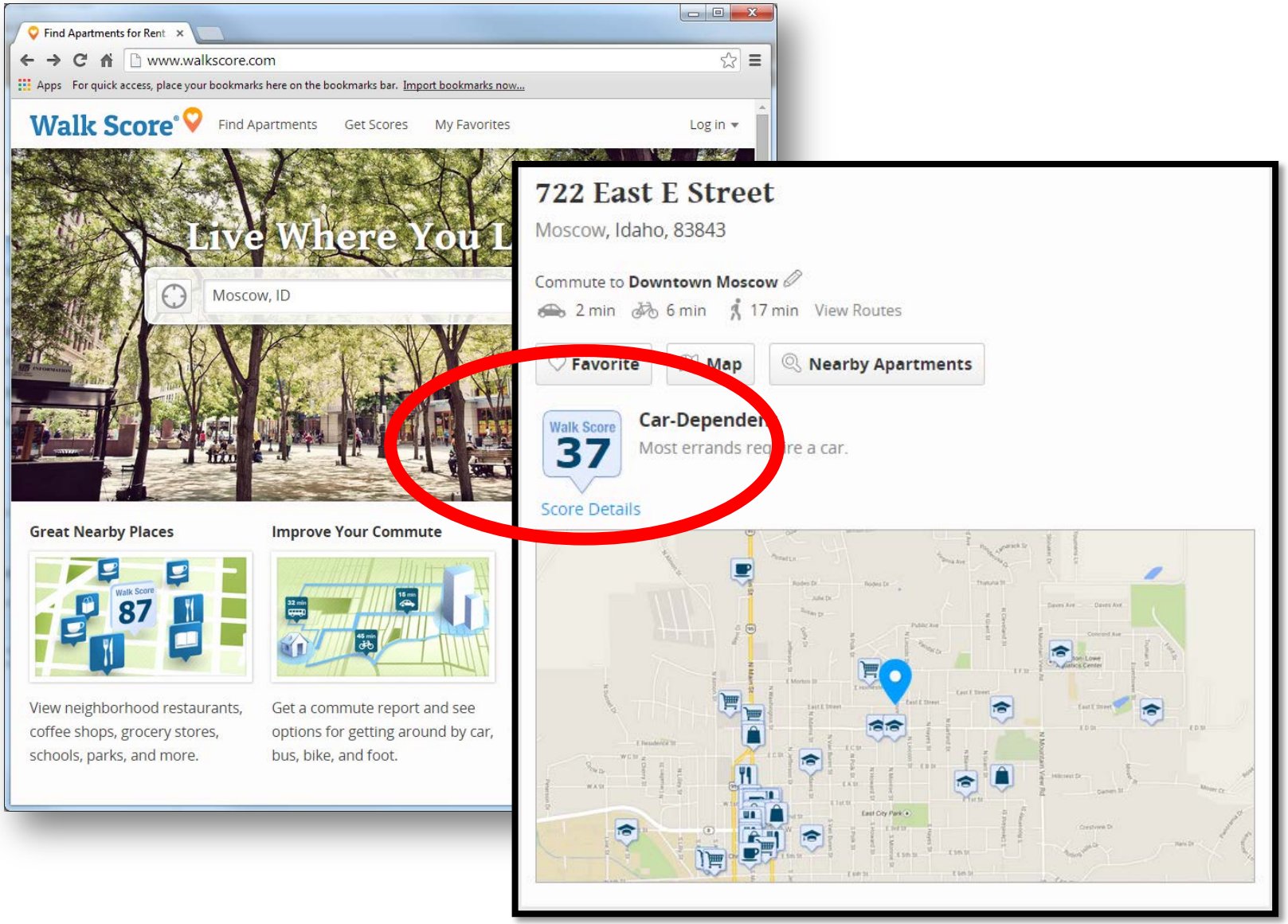
Create a GIS tool to help prioritize trail projects based on network connectivity

-Objective, transparent, meaningful, and generalizable.

-Focused on bicycle connectivity.

-Focused on urban utilitarian travel.

Walk Score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Great Nearby Places
Improve Your Commute
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87
View neighborhood restaurants, coffee shops, grocery stores, schools, parks, and more.
Get a commute report and see options for getting around by car, bus, bike, and foot.
722 East E Street
Moscow, Idaho, 83843
Commute to Downtown Moscow
2 min
6 min
17 min
View Routes
Favorite
Map
Nearby Apartments
Walk Score
37
Car-Dependen
Most errands re re a car.
Score Details

Walk Score® Find Apartments Get Scores My Favorites

Type an address, neighborhood or city Go

2121 Ward Court Northwest

Dupont Circle, Washington D.C., 20037

Commute to **Downtown Washington D.C.**

2 min 13 min 4 min 12 min View Routes

Favorite Map Nearby Apartments

Looking for a home for sale in Washington D.C.?

Walk Score 97

Walker's Paradise

Daily errands do not require a car.

Transit Score 93

Rider's Paradise

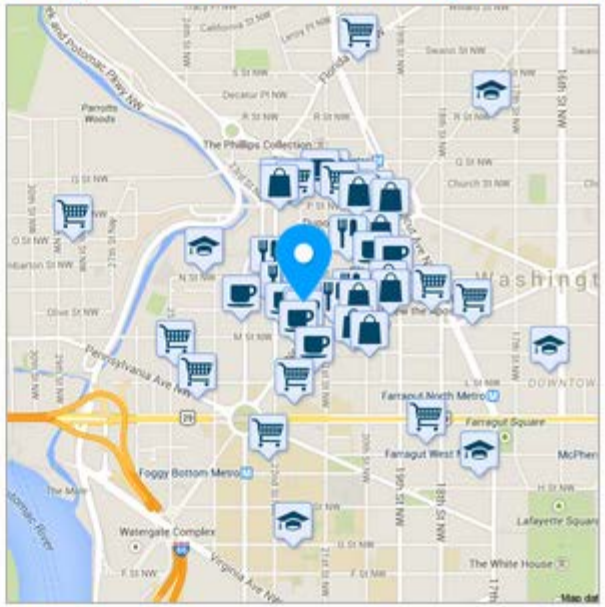
World-class public transportation.

Bike Score 83

Very Bikeable

Flat as a pancake, excellent bike lanes.

Score Details



Prioritization Criteria

1. Equity
2. Community Support
3. Connectivity
4. Visibility of Bicycling
5. Innovation

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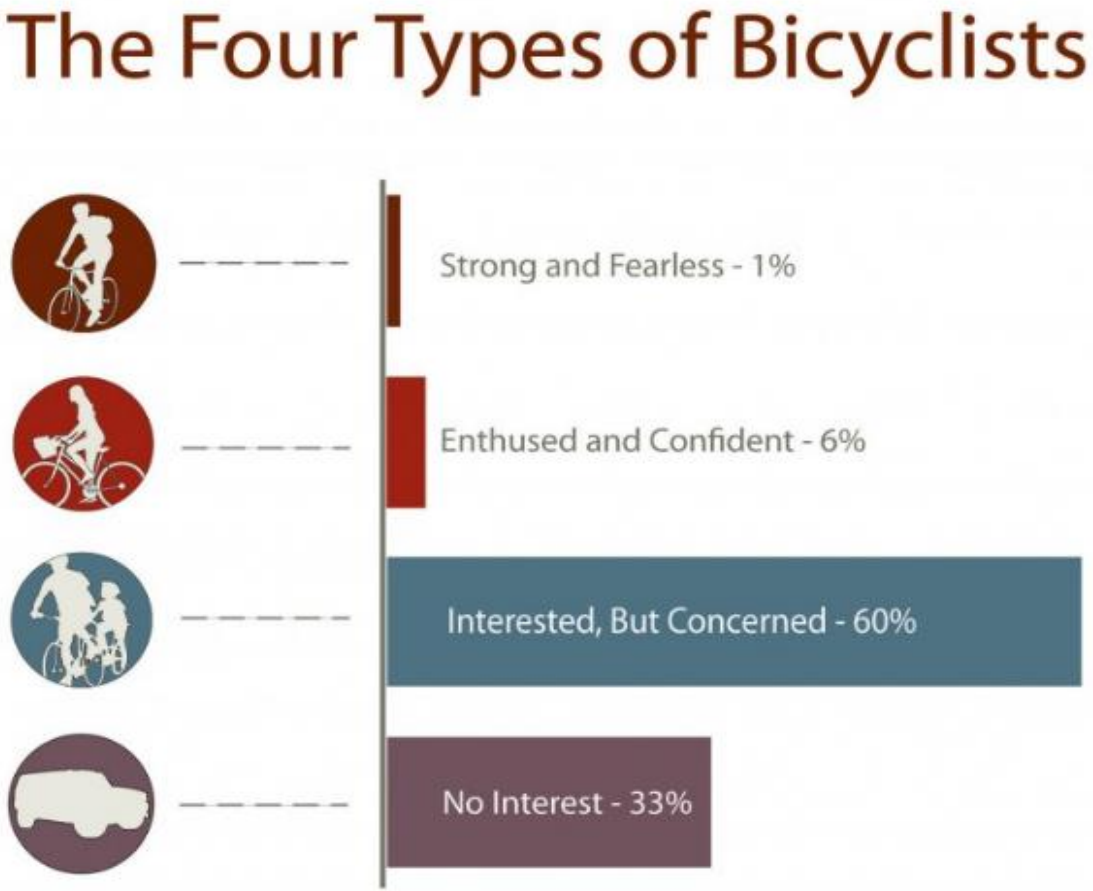
Connectivity, access and barrier reduction

- Does the project address a significant barrier?
- Does the project close a gap in the bikeway network?
- Will the treatment make the facility usable by the 'interested but concerned'?
- Does the project facilitate access to key destinations?

Perception of Stress



Source: Geller, R. (2006), "Four Types of Cyclists"

High Stress

Number of Lanes

Speed Limit

Low Stress

Stress Reducing

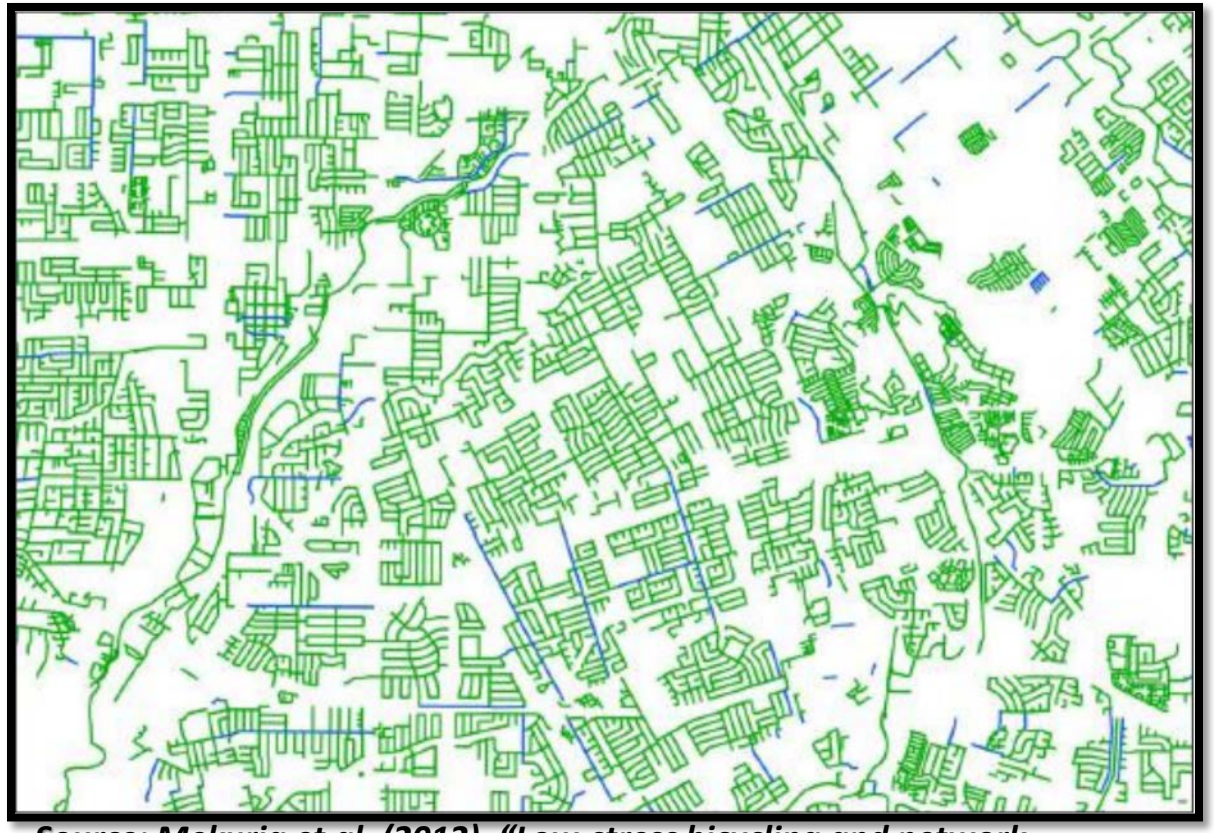
Protected Bike Lane

Buffered Bike Lane

Bike Lane

Sharrow

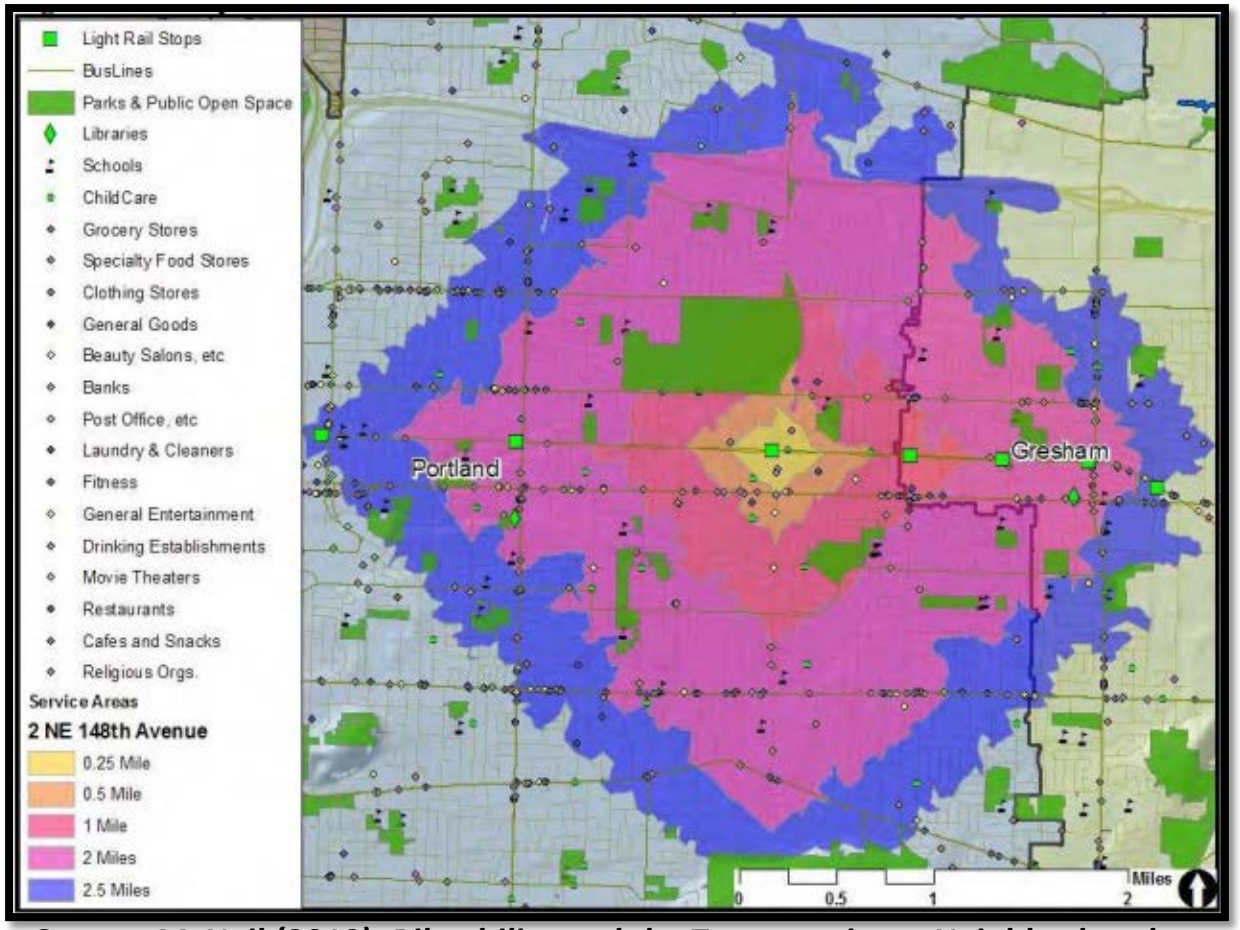
Islands of Low-Stress Connectivity



Source: *Mekuria et al. (2012), "Low-stress bicycling and network connectivity"*

Connectivity = Accessibility

McNeil (2010)
20-Minute Neighborhood



Source: ***McNeil (2010), Bikeability and the Twenty-minute Neighborhood: How Infrastructure and Destinations Influence Bicycle Accessibility***

Method

Step 1. Identify Improvement Projects and Define Scenarios

Step 2. Prepare Origin and Destination Data

Step 3. Run the GIS tool for each Scenario

Step 4. Score Projects based on Connectivity

EXAMPLE: Seattle, Washington Connectivity and Project Prioritization

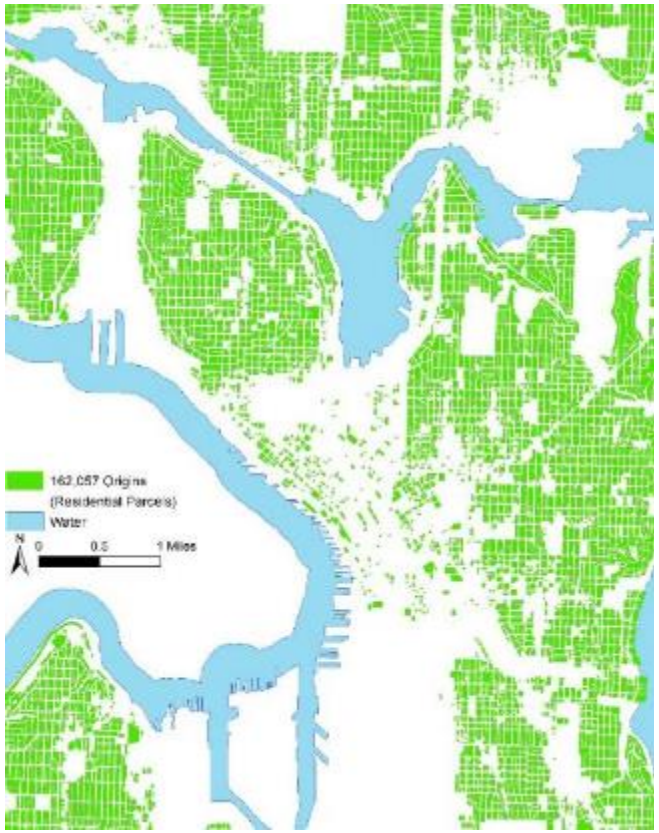
Item	Existing Conditions	Full build out of BMP
Sharrows (miles)	30	7
Bike Lane (miles)	68	33
Buffered Bike Lane (miles)	3	14
Protected Bike Lane (miles)	1	102
Neighborhood Greenway (miles)	4	234
Multi use Trail (miles)	2	30
Number of Projects	-	771 projects

Which projects will most effectively improve low-stress connectivity?

Existing Conditions

Bicycle Master Plan

Inputs: Origins and Destinations



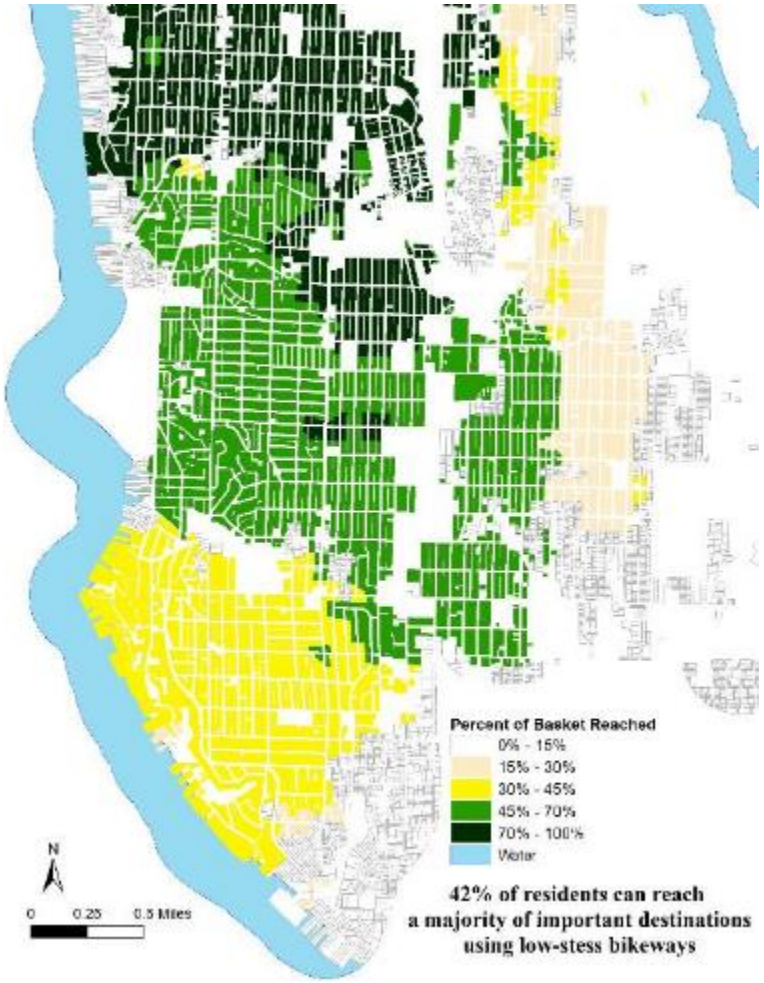
Origins = Residential Parcels

Destinations = Businesses

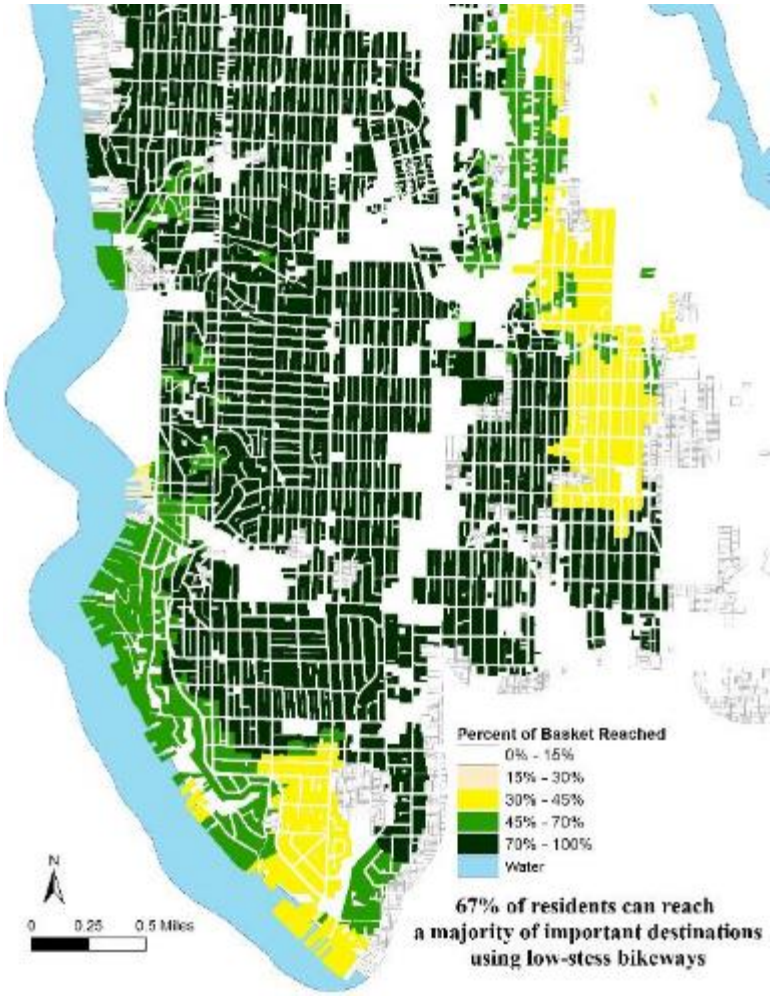
Analysis: Connecting origins to destinations based on cycling stress levels

Roadway		Stress Marginal Rate of Substitution	Stress Reduction			
Number of Lanes	Speed Limit		Sharrows 10%	Bike Lane 50%	Buffered Bike Lane 65%	Protected Bike Lane 75%
2 lanes (residential)	Up to 25 mph	10%	9%	5%	4%	3%
2 lanes (residential)	30 mph	15%	14%	8%	5%	4%
2-3 lanes	Up to 25 mph	20%	18%	10%	7%	5%
4-5 lanes	Up to 25 mph	35%	32%	18%	12%	9%
2-3 lanes	30 mph	40%	36%	20%	14%	10%
6+ lanes	Up to 25 mph	67%	60%	34%	23%	17%
4-5 lanes	30 mph	70%	63%	35%	25%	18%
6+ lanes	30 mph	80%	72%	40%	28%	20%
2-3 lanes	35+ mph	100%	90%	50%	35%	25%
4-5 lanes	35+ mph	120%	108%	60%	42%	30%
6+ lanes	35+ mph	140%	126%	70%	49%	35%

Output: Accessibility to Destinations

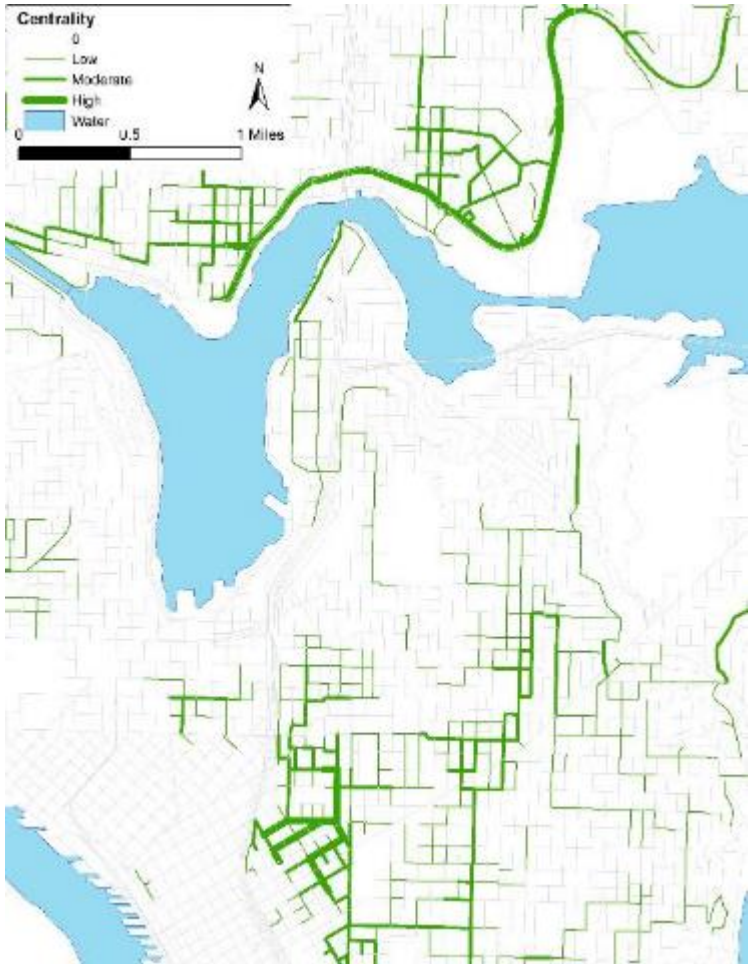


Existing Conditions

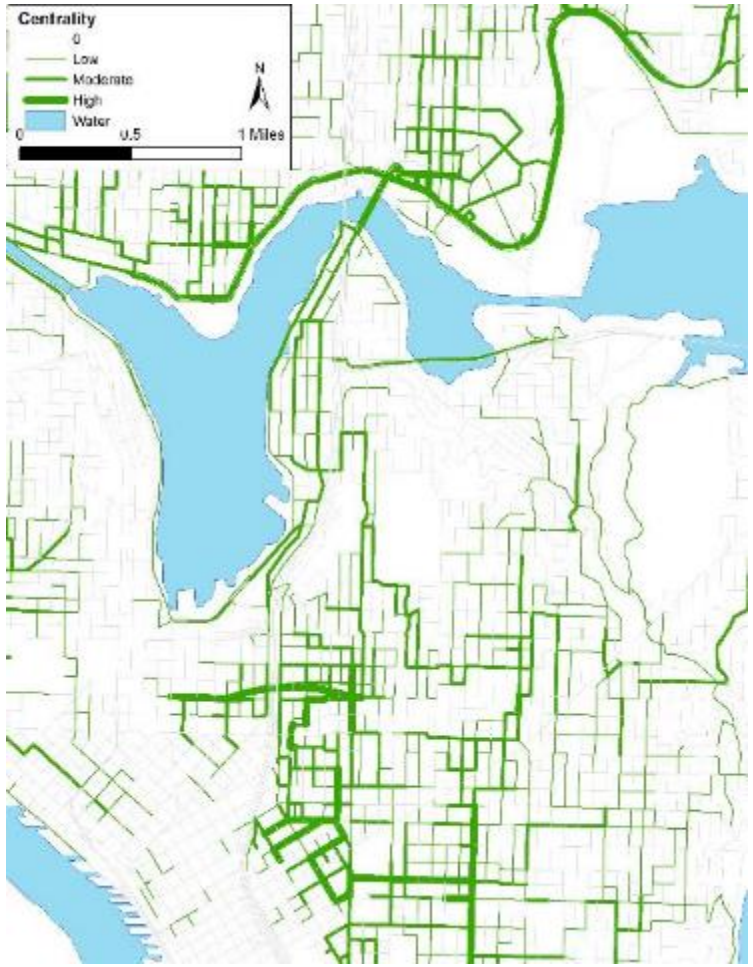


Bicycle Master Plan

Output: Network Flow



Existing Conditions



Bicycle Master Plan

Output: Project Rankings

Rank	Project	Current Facility	Bicycle Accommodation	Miles	Score
1	508	-	Multi use Trail	0.58	786
2	368	-	Multi use Trail	0.40	103
3	626	Principal Arterial	Protected Bike Lane	0.35	89
4	627	Minor Arterial	Bike Lane	0.08	62
5	385	Minor Arterial	Protected Bike Lane	0.57	47
6	636	Collector	Protected Bike Lane	0.46	43
7	423	Local Street	Neighborhood Greenway	1.21	42
8	625	Collector	Neighborhood Greenway	0.41	41
9	121	Minor Arterial	Protected Bike Lane	0.51	33
10	306	-	Multi use Trail	1.01	32
11	391	-	Multi use Trail	1.36	31
12	392	-	Multi use Trail	0.13	29
13	137	Principal Arterial	Protected Bike Lane	0.49	28
14	466	Principal Arterial	Protected Bike Lane	0.63	27
15	685	Principal Arterial	Protected Bike Lane	0.47	25

Conclusion

- What the tool offers:
  - Objective, transparent, meaningful, and generalizable analysis.
  - Focused on bicycle connectivity and on urban utilitarian travel.
  - Measures percent of accessibility from origins to destinations in community, providing areas of focus for possible expansion if no bicycle master plan exists.
  - Prioritization of trail projects based on low-stress network connectivity.

- Questions/Discussion

Ana Valenzuela
ana@railstotrails.org