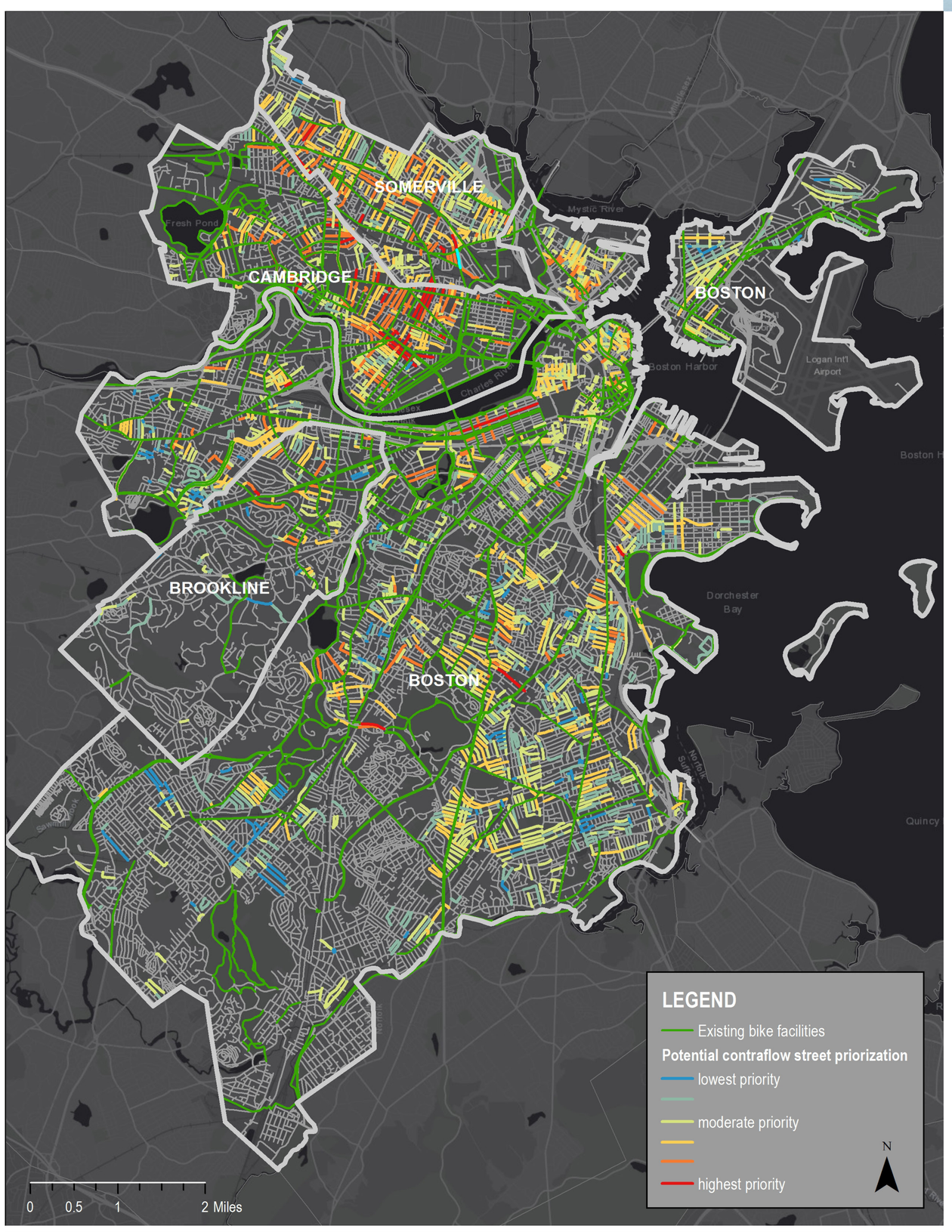
AGAINST THE GRAIN:

SUITABILITY AND PRIORITIZATION ANALYSIS FOR CONTRAFLOW BIKE TREATMENTS IN GREATER BOSTON

Photo: Payton Chung, Wikimedia Commons



Introduction

Photo: Rob Vandermark

Contraflow bike infrastructure allows, encourages, and formalizes two-way bicycling on one-way streets. Studied and debated for years in Germany, in 1997 national traffic laws were changed to allow contraflow under certain street conditions after research showed no negative safety effects[1]. Requiring unique design considerations on every street, contraflow treatments can range in complexity from purely signage (see left photo) to conventional painted lanes to buffered lanes (see topmost right photo) to two-way cycletracks (see top right photo). Safest on low volume, low speed streets, implementing bicycle contraflow can accomplish several transportation goals at once: reduce dangerous wrong-way riding; reduce motor vehicle speeds by narrowing travel lanes and increasing driver awareness of bicyclists; allow bicyclists to use safer, low-volume streets; decrease trip distance for bicyclists by reducing out-of-direction travel; decrease sidewalk riding; and influence motorist route choice without limiting bicyclists[2].

The Greater Boston area – in this project comprising Boston, Cambridge, Somerville, and Brookline – has myriad streets that would be suitable for contraflow bike travel. Yet even if an area-wide policy allowing contraflow were adopted, there are too many streets to study and redesign all at once. This project focuses on prioritizing potential contraflow streets based on factors identified in national transportation guides.

1 http://www.bikexprt.com/research/contraflow/gegengerichtet.htm
2 https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/contra-flow-bike-lanes/

Methods and Data Sources

- **2017 MassDOT Roads vector lines**. Key attributes: **Operation** (to select one-way vs. two-way streets); **Road Class** (to select low-volume roads); **Speed Limit** (to select low-speed roads); **Median Width** (to select roads without center medians); **Road Type** (to select roads that are not tunnels or ramps).
- **Bicycle Facility vector lines** (most recently available) from all four municipalities.
- **2005 MassGIS Land Use vector polygons.** Key attribute: **Land Use Code** (to select Commercial and Urban Educational/Institutional uses).
- **2010 Census Block Group vector polygons.** Key attribute: GeoID.
- **2017 American Community Survey table.** Key fields: **GeoID** (to join to census block groups); **Number of Bicycle Commuters** and **Population** per block group (to calculate percentage of bicycle commuters).
- **2014-2016 MassDOT Crash table.** Key fields: **Non-Motorized Vehicle Type** (to identify crashes involving bicyclists); **XY Coordinates** (to geocode to vector points).

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Suitability Factors

Following guidelines from the National Association of City Transportation Officials (NACTO) and Federal Highway Administration (FHWA), suitability for potential contraflow streets was determined by performing SQL queries within the MassDOT roads file. Streets had to:

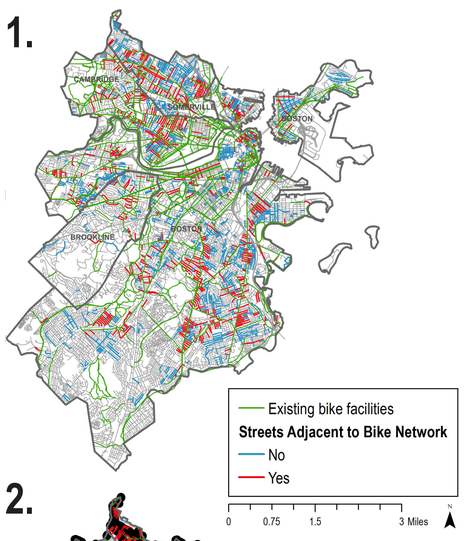
- be one-way operation
- be Class 5 or 6 (minor roads)
- have under 25mph speed limit
- not have a center median
- not be a tunnel or ramp

A 'potential contraflow streets' shapefile was created as a result.

Photo: J. Maus/Bike Portland

Prioritization Factors

1.



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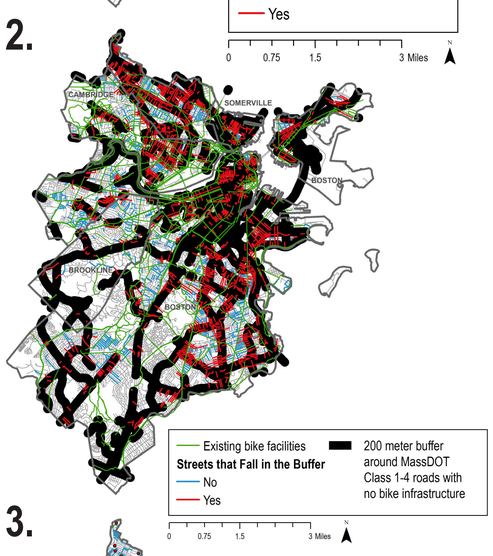

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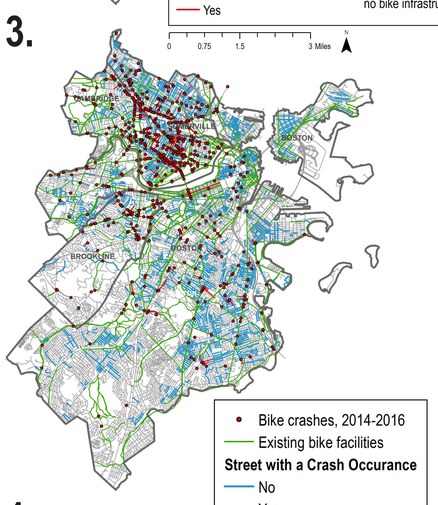

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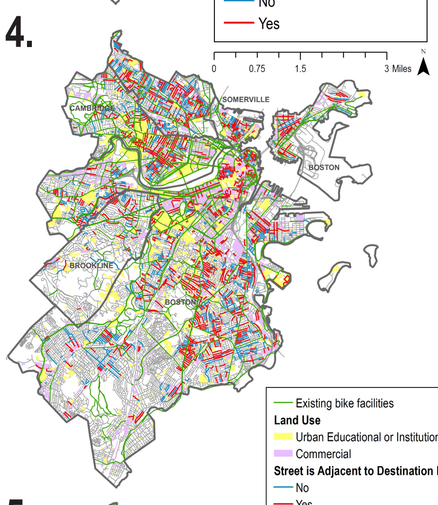

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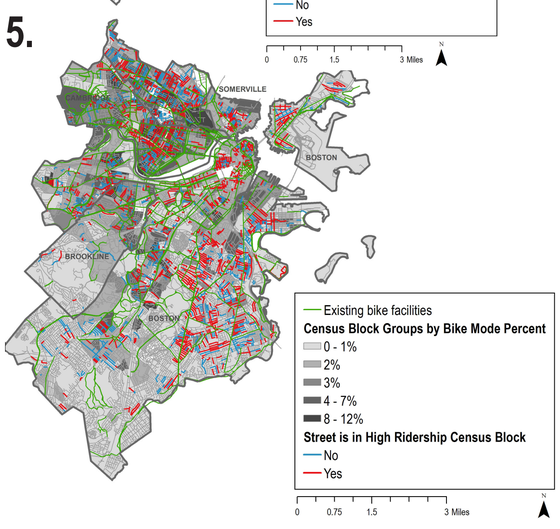

To determine which of the ample suitable roads should be prioritized for contraflow design, the following Boolean factors were determined and notated using 1s and 0s in new fields within the 'potential contraflow streets' shapefile:

1. Is the street adjacent to existing bicycle facilities?
Streets which fills gaps and connect existing parts of the bicycle network should be prioritized over streets which would stand alone. Using the **Union** tool, all municipal bike facilities layers were combined. Then, using **Select by Location** and **Intersect**, potential contraflow streets adjacent to the bike network were selected and given a 1.

2. Is the street within 200 meters of a dangerous road with no bike infrastructure?
Contraflow design that allows bicyclists to avoid high-volume, high-speed streets without bicycle infrastructure should be prioritized over streets in safer areas. First, **Select by Attribute** was used to find Classes 1-4 roads in the MassDOT shapefile. Then, **Intersect** was used to find streets with existing bike infrastructure. Finally, potential contraflow streets that fall inside the buffer were found using **Select by Location** and given a 1.

3. Has a crash occurred on the street?
Streets that have had crashes should be prioritized over streets that do not. All bicycle crashes were **geocoded using XY Coordinates**. Potential contraflow streets where a crash occurred were found using **Select by Location** and given a 1.

4. Is the street adjacent to high destination land uses?
Contraflow treatments are most important on streets with high ridership to prevent dangerous wrong-way and sidewalk riding. High-destination land uses were determined by using **Select by Attributes** in the MassGIS Land Use shapefile. Potential contraflow streets adjacent to these uses were found using Select by Location and given a 1.

5. Is the street in a census block with high bicycle ridership?
Census blocks were joined by attribute to tabular data from the 2017 American Community Survey. Potential contraflow streets adjacent to census blocks with higher than 2% ridership (the City of Boston average) were found using Select by Location and given a 1.

Final Map (top left)
The final prioritization map was created by adding a new 'Count' field to the 'potential contraflow streets' shapefile and adding the number of 1s from the previous five questions. Values range from 0-5.

Results: Highest Priority Streets Values = 5

STREET NAME	MUNICIPALITY
ARBORWAY	BOSTON
ASH STREET	CAMBRIDGE
BISHOP ALLEN DRIVE	CAMBRIDGE
CHAUNCY STREET	CAMBRIDGE
COLUMBUS AVENUE	SOMERVILLE
DAVIS STREET	CAMBRIDGE
DEVON STREET	BOSTON
ELM STREET	CAMBRIDGE
EMPIRE STREET	BOSTON
ESSEX STREET	CAMBRIDGE
FRANKLIN STREET	CAMBRIDGE
FRANKLIN STREET	CAMBRIDGE
GREEN STREET	CAMBRIDGE
HATHORN STREET	SOMERVILLE
HIGHLAND AVENUE	CAMBRIDGE
HOVEY AVENUE	CAMBRIDGE
IRVING STREET	SOMERVILLE
LOWELL STREET	SOMERVILLE
MARLBOROUGH STREET	BOSTON
MOORE STREET	CAMBRIDGE
NORFOLK STREET	CAMBRIDGE
NORFOLK STREET	SOMERVILLE
ORCHARD STREET	SOMERVILLE
PEARL STREET	CAMBRIDGE
PRENTISS STREET	CAMBRIDGE
SECOND STREET	CAMBRIDGE
SPARKS STREET	CAMBRIDGE
STATE STREET	CAMBRIDGE
SUMNER ROAD	CAMBRIDGE
TEMPLE STREET	CAMBRIDGE
TREMONT STREET	CAMBRIDGE
TREMONT STREET	SOMERVILLE
VINTON STREET	BOSTON
WENDELL STREET	CAMBRIDGE
WESTBOURNE TERRACE	BROOKLINE
WINDSOR STREET	CAMBRIDGE