ANALYZING BICYCLE ROUTES AND FORECASTING EFFECTIVE DEVELOPMENT FOR BURLINGTON, VT

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Goal:

To gauge the pathway selection behavior of bicyclists in Burlington, VT, surmise a pattern in their preferences, and ascertain where in Burlington improvement would yield the most utility.

building on the work of

http://is.gd/UZnKpG
Question Categories

1. Favorite Place
   *Regardless of purpose, where are cyclists’ favorite roads, paths or neighborhoods to ride in Burlington?*

2. Infrastructure
   *What aspects of transportation infrastructure repel or attract cyclists? What bicycle infrastructure do cyclists want?*

3. Perceived Safety
   *How safe do cyclists feel riding in Burlington? What situations on the road make them feel unsafe?*

4. Weather / Seasons
   *How do the seasons and weather impact cyclists’ propensity to ride their bicycles?*
Survey Distribution
Respondent Demographics

**Gender**
- % of respondents who identify as each gender
  - Female: 61%
  - Male: 39%
  - Other: 1%
  - Total: n = 114

**Age**
- % of respondents in each age group
  - 65+: 3%
  - 55-64: 10%
  - 45-54: 14%
  - 35-44: 12%
  - 25-34: 26%
  - 18-24: 35%
  - Total: n = 114

**Education**
- % highest degree or level of school completed
  - Doctoral Degree: 7%
  - Master’s Degree: 15%
  - Bachelor’s Degree: 47%
  - Associate’s Degree: 5%
  - 1 or more year of college credit: 18%
  - GED or alternative credential: 3%
  - Regular high school diploma: 4%
  - Total: n = 114

**Self-Classification**
- % of respondents who self-identify as each category of bicyclist
  - Beginner: 47.8%
  - Moderate: 48.7%
  - Expert: 3.5%
  - Total: n = 115
### Survey Results: Favorite Place

Where is your favorite place (road, path, neighborhood, etc.) to ride your bike in Burlington? Why?

#### Favorite place to cycle

<table>
<thead>
<tr>
<th>Place</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterfront bike path</td>
<td>54%</td>
</tr>
<tr>
<td>Spear St</td>
<td>9%</td>
</tr>
<tr>
<td>Old North End</td>
<td>8%</td>
</tr>
<tr>
<td>RT 127 bike path</td>
<td>7%</td>
</tr>
<tr>
<td>Intervale</td>
<td>6%</td>
</tr>
<tr>
<td>Riverside Ave</td>
<td>5%</td>
</tr>
<tr>
<td>Causeway</td>
<td>5%</td>
</tr>
<tr>
<td>Neighborhood</td>
<td>4%</td>
</tr>
<tr>
<td>North Winooski</td>
<td>4%</td>
</tr>
<tr>
<td>Pine St</td>
<td>3%</td>
</tr>
</tbody>
</table>

$n = 119$

One respondent embodied the respondents’ consensus, saying; “(The Burlington Waterfront) Bike Path is my favorite because of the scenery and the fact that it’s careless - but its [sic] also totally recreational so it’s obviously enjoyable for that reason too”.

6% mentioned a route they use for utility or commute

10% mentioned infrastructure as a feature that influenced their choice of favorite route

100% of individual roads mentioned have bike lanes
Survey Results: Desired Infrastructure

Respondents were given a list of seven types of infrastructure, and were asked to rate the options on a five-point scale, with 5 being the most important way to improve bicycle transportation in Burlington and 1 being the least important.
Survey Results: Features Bicyclists Avoid

“Which feature would you avoid the most (select one)?”

Avoidance
% of respondents who avoid ... the most

- Left-hand turns: 1%
- Busy intersections: 5%
- Poor pavement conditions: 14%
- Steep hills (uphill): 17%
- Dense car traffic: 29%
- Fast-moving car traffic: 35%

n = 119
Survey Results: Safety

Respondents were asked an open-ended question about what circumstances during a bike ride make them feel unsafe.

Respondents were asked to consider the question: “Do you feel safe bicycling in Burlington?” and answer on a scale from 1 to 5, with 1 meaning strongly disagree and 5 meaning strongly agree.
Survey Results: Weather and Seasons

### Weather Conditions

% of respondents who are willing to cycle each weather condition

- Rain with dry ground: 83%
- Uncomfortable heat: 80%
- Rain with wet pavement: 63%
- High winds: 61%
- Uncomfortable cold: 60%
- Snowfall with dry roads: 31%
- Icy roads: 14%
- Snowfall with snow on the ground: 14%

n = 119

### How the seasons impact bike ridership

% of respondents who report riding their bikes ... during the summer and winter

- **Summer**
  - a few times a year: 3.5%
  - a few times a month: 48.7%
  - a few times a week: 44.3%

- **Winter**
  - a few times a year: 9.6%
  - a few times a month: 29.8%
  - a few times a week: 32.7%
  - every day: 27.9%
Survey Results: Weather and Seasons

Respondents were asked in an open-ended question: “What improvements would you like to see in Burlington’s bicycle infrastructure?”

Desired Improvements

% of responses that mention a particular improvement

- Bike Lanes: 50%
- Pavement Improvement: 25%
- Connectivity: 17%
- Protected Bike Lanes: 11%
- More Prominent Signage: 7%
- Bicycle Education: 7%
- Bike Paths: 6%
- Bike Parking: 6%
- Shared Roads: 5%
- Car Speed Limit Enforcement: 5%
- Better Markings: 5%
- Change One-way roads to Two-way: 4%
- Bike Boxes: 4%
- Mediate Aggressive Driving: 2%

n = 119
Mapping: Bicycle Rider Counts

Respondents were asked to draw the route they ride most often, and to include directional arrows as well as boxes indicating origins and destinations.

The results were manually transcribed into ArcMap. VCGI’s Emergency Road data was edited to include a rider count category, and the finished data was analyzed and organized to create the deliverables shown here.
Rider Counts on Street Segments

Top 10

1. South Winooski (Pearl-Cherry)  49
2. South Winooski (Cherry - Buell)  45
3. South Winooski (Buell - Bank)  45
4. Pine Street (Main - King)  32
5. Pine Street (King - Maple)  28
6. Riverside Ave (North Willard - North Prospect)  27
7. South Winooski (Bank - College)  26
8. Riverside Avenue (North Prospect - Hillside Terrace)  26
9. Pine Street (Maple - Kilburn)  25
10. Pine Street (Kilburn - Pine Place)  25
## Conclusions and Recommendations

### Stated Preferences

<table>
<thead>
<tr>
<th>Category</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Favorite Places</td>
<td><em>Waterfront bike path and other off-road paths</em></td>
</tr>
<tr>
<td>Best New Infrastructure</td>
<td><em>Protected bike lanes</em></td>
</tr>
<tr>
<td>Features Cyclists Avoid</td>
<td><em>Fast and/or dense car traffic</em></td>
</tr>
<tr>
<td>Top Dangers</td>
<td><em>Motorists and traffic</em></td>
</tr>
<tr>
<td>Weather</td>
<td><em>Snow and ice</em></td>
</tr>
<tr>
<td>Wish list</td>
<td><em>Bike lanes, pavement improvement and connectivity</em></td>
</tr>
</tbody>
</table>

### Revealed Preferences

- *Convenience (shortest route)*
- *Resilience*
- *Left turns at minor intersections*
Conclusions and Recommendations

1. South Winooski Avenue
   - epicenter of Burlington’s bicycle network
   - sharrows are only existing infrastructure
   - need to increase bicycle visibility and safety in car-cluttered core

2. Improved Bike Lanes on Pine Street
   - primary entry corridor, alternative to Shelburne Rd
   - high car speeds with intermittent parallel parking
   - poor shoulder conditions

3. Protected Bike Lanes on North Avenue
   - similar negative features to Pine St and similar purpose
   - frequently mentioned as a dangerous place
   - continuous protected bike lane
   - no alternative route for New North End commuters
Conclusions and Recommendations

4. Pavement Upkeep
   - Waterfront Bike Path renovations only address recreational issues
     - 2nd most frequently recommended improvement
     - correlated to safety
     - bike lanes paced in shoulders

5. Bike Box at Pearl Street and North Winooski Avenue intersection
   - research review by Pucher and Dill found that bike boxes increase sense of safety
     - most crossed intersection in downtown Burlington
     - mediate danger of left hand turns
Further Research

1. Bicycle Rider Counts
   - CCRPC’s Bike & Pedestrian Count Data limited by request-based implementation
     - lack of accessible, consistent, coordinated holistic counts

2. Bicycle Routes
   - collection of individual bicycle routes could be used to determine pathway selection
     - VTrans State Highway On-Road Bicycle Facility Plan

3. Data and Research on Sidewalk Riding
   - sidewalk riding is pervasive in Burlington
     - detrimental to accurate data collection
     - possible indicator of insufficient bicycle infrastructure
Thank You

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