Performance measures for urban trails: Minneapolis, MN

S Hankey, G Lindsey
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Performance Measures for Urban Trails

• Motivation
  – How does traffic vary on our trail network?

• Approach
  – Adapt procedures for traffic monitoring outlined in Federal Highway Administration Traffic Monitoring Guide (2013)
FHWA Traffic Monitoring Guide

- **Objective:** two key performance measures
  - Average annual daily traffic (AADT)
  - Vehicle miles traveled (VMT)

- **Approach**
  - Establish network of permanent and short-duration monitoring sites
  - Use adjustment factors from reference sites to extrapolate short-duration counts

- **Challenges in Nonmotorized Monitoring**
  - Traffic variability, technology, resources
Objective/Approach: Estimate AADT and TMT for Minneapolis trail network

Protocol for motor vehicles

1. 48-hour short-duration counts
2. Month-of-year, day-of-week scaling factors
3. Factor groups

How to adjust for non-motorized traffic?
Reference locations

Weekday

Weekend
Reference locations

Monthly Average Daily Traffic (MADT)

MADT/AADT (normalized traffic)
Designing a count campaign

No. of segments = 82
Sum = ~80 miles
Mean = 0.98 miles
Min = 0.17 miles
Max = 1.8 miles
Count equipment: mixed-mode

\[ y = 0.0002x^2 + 1.0655x - 1.2937 \]

\[ R^2 = 0.9958 \]

Hennepin Ave, n=84
W River Pkwy, n=41
Cedar Ave, n=5
1:1 Hypothetical
Scaling factors

Approach 1: “Traditional”

Approach 2: “New”
Designing a short-duration count campaign based on long-term reference site data

- Compute traditional (day-of-week, month-of-year) and new day-of-year factors for five of six reference sites.
- Randomly select 50 different 1 day, 3 day, 5 day, 7 day, 14 day, 30 day counts from sixth site
- Use both factoring approaches to estimate AADT and TMT for sixth site
- Compare extrapolation error from two factoring approaches
Short-duration counts: Duration

Conclusion: 1-week counts
Short-duration counts: Time of year

Conclusion: April-Sep
Traffic estimates:
Map of point estimates of AADT

<table>
<thead>
<tr>
<th>Segment</th>
<th>AADT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>954</td>
</tr>
<tr>
<td>Median</td>
<td>750</td>
</tr>
<tr>
<td>Max</td>
<td>3,728</td>
</tr>
<tr>
<td>P90</td>
<td>2,321</td>
</tr>
<tr>
<td>P75</td>
<td>1,264</td>
</tr>
<tr>
<td>P25</td>
<td>142</td>
</tr>
<tr>
<td>P10</td>
<td>81</td>
</tr>
<tr>
<td>Min</td>
<td>39</td>
</tr>
</tbody>
</table>
Traffic estimates:
AADT by trail segment

Estimate: ~28 million
Trail Miles Traveled (TMT)
Top/Bottom 5 count locations

<table>
<thead>
<tr>
<th>Top five</th>
<th>Location</th>
<th>AADT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>AADT</td>
<td></td>
</tr>
<tr>
<td>Lake Calhoun (north side)</td>
<td>3,728</td>
<td></td>
</tr>
<tr>
<td>Stone Arch Bridge</td>
<td>3,613</td>
<td></td>
</tr>
<tr>
<td>Lake Calhoun (east side)</td>
<td>3,480</td>
<td></td>
</tr>
<tr>
<td>Lake Harriet (east side)</td>
<td>3,451</td>
<td></td>
</tr>
<tr>
<td>Lake Harriet (west side)</td>
<td>3,282</td>
<td></td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Bottom five</th>
<th>Location</th>
<th>AADT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>AADT</td>
<td></td>
</tr>
<tr>
<td>Diagonal Trail (Stinson to Broadway)</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>University Ave Trail</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>3rd Ave Trail NE</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Van White Parkway</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>N 49th Ave Tr (Humboldt to I94)</td>
<td>57</td>
<td></td>
</tr>
</tbody>
</table>
Short-duration monitoring identified three different traffic patterns (factor groups). Need new reference monitoring sites.

Utilitarian (weekday)

Mixed Recreational – Utilitarian (all current reference locations)

Recreational
Conclusions

1. Possible to estimate AADT and TMT for trail network.
2. Day-of-year scaling factors reduce estimation error (10-15%).
3. Traffic volumes on trails are significant and follow seasonal, daily, and hourly patterns.

Next steps/limitations

1. Need to re-site of reference network (factor groups).
2. Day-of-year factors can only be applied retroactively.
3. Need to re-assess segment breaks.
4. Design monitoring systems that separate bikes/peds.
5. How best to integrate to planning (i.e., track progress, distribute maintenance funds, etc.)?