MAG Bicycles Count Project

Bicycle Count Data Summary

Sherry Ryan, PhD
5-20-2014
Agenda

- Schedule Overview
- Automated Count Data Cleaning Process
- Extrapolating Manual Counts to Daily Counts
- Developing and Applying Sidewalk Cycling Factors
- Data Summary and Identification of Trends
# Project Schedule

| Task 1: Refine Scope of Work | Completed |
| Task 2: Conduct Technology Review | Completed |
| Task 3: Develop a Data Collection Methodology and Plan | Completed |
| Task 4: Bike Count | Completed |
| Task 5: Analysis of the Data | Completed |
| Task 6: Final Report and Implementation Plan | |

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</tr>
</thead>
<tbody>
<tr>
<td>M1</td>
<td>M2</td>
<td>M3</td>
<td>M4</td>
<td>M5</td>
<td>M6</td>
<td>M7</td>
<td>M8</td>
<td>M9</td>
<td>M10</td>
<td>M11</td>
<td>M12</td>
<td>M13</td>
<td>M14</td>
<td>M15</td>
<td>M16</td>
<td>M17</td>
</tr>
</tbody>
</table>

- Completed
- Star
Study Sites

Bicycle Count Stations
- Automated Station
  (Segment Counts)
- Manual Station
  (Intersection Counts)

# Site Identification Number

Bicycle Facility Classification
- Bike Lane
- Bike Path
- Bike Route
- Paved Shoulder
Temporary Pneumatic Tubes

Counted over eight 2-weeks periods in Oct and Nov 2013
Data Cleaning Process

- Identify anomalies in automated count data
- Anomalies result from one of the following:
  1. Install & Uninstall Day – Incomplete data, contains data from two sites.
  2. Count Tube Pulled Up – Counter begins counting vehicles or stops counting
Data Cleaning Process

In response to the previous two issues the following data cleaning actions were taken:

1. *Exclude first and last days of each count period (install and uninstall).*

2. *Exclude days with irregular count volumes. Estimate daily volume to replace excluded values.*

3. *Exclude all data from seven sites with irregular and difficult to interpret data (Count Site IDs: 6, 9, 17, 23, 60, 70, and 103)*

4. *Exclude data for a single direction of travel for Count Site IDS 62 and 69*
Data Cleaning Process

1. Install & Uninstall Day – Incomplete data, can contain data from two sites.
2. Count Tube Pulled Up – Causing counter to begin counting vehicles or stop counting completely
Process for estimating volumes for excluded days

- Median weekday and median weekend volumes were calculated for individual sites using valid count days.

- Median volume (weekend or weekday) used to replace excluded volumes (weekend or weekday).
### Data Cleaning Process

- Example of estimating volumes of excluded days:

<table>
<thead>
<tr>
<th>Date</th>
<th>ID 73N IN (westbound)</th>
<th>ID 73N OUT (eastbound)</th>
<th>ID 73S IN (eastbound)</th>
<th>ID 73S OUT (westbound)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue, Oct 1, 2013</td>
<td>24</td>
<td>12</td>
<td>256</td>
<td>149</td>
</tr>
<tr>
<td>Wed, Oct 2, 2013</td>
<td>80</td>
<td>58</td>
<td>58</td>
<td>39</td>
</tr>
<tr>
<td>Thu, Oct 3, 2013</td>
<td>69</td>
<td>46</td>
<td>46</td>
<td>30</td>
</tr>
<tr>
<td>Fri, Oct 4, 2013</td>
<td>93</td>
<td>54</td>
<td>54</td>
<td>50</td>
</tr>
<tr>
<td>Sat, Oct 5, 2013</td>
<td>77</td>
<td>60</td>
<td>60</td>
<td>34</td>
</tr>
<tr>
<td>Sun, Oct 6, 2013</td>
<td>53</td>
<td>48</td>
<td>48</td>
<td>26</td>
</tr>
<tr>
<td>Mon, Oct 7, 2013</td>
<td>57</td>
<td>40</td>
<td>40</td>
<td>55</td>
</tr>
<tr>
<td>Tue, Oct 8, 2013</td>
<td>17</td>
<td>13</td>
<td>51</td>
<td>48</td>
</tr>
<tr>
<td>Wed, Oct 9, 2013</td>
<td>0</td>
<td>0</td>
<td>45</td>
<td>50</td>
</tr>
<tr>
<td>Thu, Oct 10, 2013</td>
<td>17</td>
<td>21</td>
<td>46</td>
<td>46</td>
</tr>
<tr>
<td>Fri, Oct 11, 2013</td>
<td>64</td>
<td>71</td>
<td>70</td>
<td>55</td>
</tr>
<tr>
<td>Sat, Oct 12, 2013</td>
<td>60</td>
<td>52</td>
<td>48</td>
<td>39</td>
</tr>
<tr>
<td><strong>Median Bicycle Count Value</strong></td>
<td><strong>66.5</strong></td>
<td><strong>53</strong></td>
<td><strong>49.5</strong></td>
<td><strong>39</strong></td>
</tr>
</tbody>
</table>
3. Seven count sites were identified as completely irregular or unreliable data: Count Site IDs 6, 9, 17, 23, 60, 70, 103

Example: Count Site ID 17
Excluded Automated Count Sites
Extrapolate Manual Counts into Estimated Daily Volumes

- Continuous 14-day, 24-hour automated counts conducted at 44 sites

- Manual Peak Period counts conducted at 84 additional sites
  - 56 weekday evening peak period (4:00PM – 6:00PM)
  - 28 weekend peak period (Saturday from 10:00AM – 12:00PM)

*Need to extrapolate manual counts into estimated daily volumes*
Extrapolate Manual Counts into Estimated Daily Volumes

- Process used to extrapolate volumes:

  1. Calculate percentage of cyclists recorded during *weekday and weekend peak periods* from *automated count sites*.

  2. Use automated count site peak period percentages to grow the manual volumes.
1. Calculate percentage of cyclists recorded during weekday and weekend peak periods from automated count sites.

<table>
<thead>
<tr>
<th>Summary Statistic</th>
<th>Weekday Peak Period (4PM-6PM) Percentage of Total Daily Bicycle Travel</th>
<th>Weekend Peak Period (10AM – 12noon) Percentage of Total Daily Bicycle Travel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>16.8%</td>
<td>17.8%</td>
</tr>
<tr>
<td>Median</td>
<td>16.5%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Minimum Value</td>
<td>9.6%</td>
<td>8.3%</td>
</tr>
<tr>
<td>Maximum Value</td>
<td>28.6%</td>
<td>33.3%</td>
</tr>
</tbody>
</table>
Peak period percentages were compared to results from San Diego County.

<table>
<thead>
<tr>
<th></th>
<th>22 Sites in San Diego County</th>
<th>44 Sites in Maricopa County</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekday Mean</td>
<td>16.5%</td>
<td>16.8%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Weekday Median</td>
<td>16.2%</td>
<td>16.5%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Weekend Mean</td>
<td>21.2%</td>
<td>17.8%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Weekend Median</td>
<td>21.2%</td>
<td>16.1%</td>
<td>5.1%</td>
</tr>
</tbody>
</table>
2. Use automated count site peak period percentages to **grow the manual volumes**.

**Equation 1:**

\[
\frac{\text{Weekday Manual Count Volume}}{x} = \frac{16.8}{100}
\]

**Equation 2:**

\[
\frac{\text{Weekend Manual Count Volume}}{x} = \frac{17.8}{100}
\]
The need for sidewalk factors:

- Casual observation indicates a **large number of cyclists** in the MAG region **ride along the sidewalk** rather than travel lanes or bike lanes.
- Count tubes are installed to record cyclists on travel lanes or bike lanes, not sidewalks.

Response:

- Collect sidewalk cycling counts during the manual counts to support development of a “sidewalk cycling factor.”
Manual count sites were categorized based on the following roadway characteristics:

1. Number of travel lanes;
2. Presence of bike lane; and
3. Presence of right-turn-only lane.
### Sidewalk Factors – 12 Roadway Types

<table>
<thead>
<tr>
<th>Roadway Type ID Number</th>
<th>With Bike Lane</th>
<th>With Right Turn Only Lane</th>
<th>Number of Manual Count Stations</th>
<th>Sidewalk Bike Trips</th>
<th>Total Bike Trips</th>
<th>Sidewalk Cycling Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2-Lane Roadway Sidewalk Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>No</td>
<td>No</td>
<td>52</td>
<td>123</td>
<td>388</td>
<td>31.7%</td>
</tr>
<tr>
<td>2</td>
<td>No</td>
<td>Yes</td>
<td>11</td>
<td>11</td>
<td>20</td>
<td>55.0%</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Yes</td>
<td>No</td>
<td>53</td>
<td>199</td>
<td>669</td>
<td><strong>29.7%</strong></td>
</tr>
<tr>
<td>4</td>
<td>Yes</td>
<td>Yes</td>
<td>12</td>
<td>89</td>
<td>248</td>
<td>35.9%</td>
</tr>
<tr>
<td><strong>4-Lane Roadway Sidewalk Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>No</td>
<td>No</td>
<td>89</td>
<td>460</td>
<td>514</td>
<td>89.5%</td>
</tr>
<tr>
<td>6</td>
<td>No</td>
<td>Yes</td>
<td>36</td>
<td>254</td>
<td>287</td>
<td>88.5%</td>
</tr>
<tr>
<td>7</td>
<td>Yes</td>
<td>No</td>
<td>59</td>
<td>247</td>
<td>437</td>
<td>56.5%</td>
</tr>
<tr>
<td>8</td>
<td>Yes</td>
<td>Yes</td>
<td>35</td>
<td>297</td>
<td>415</td>
<td><strong>71.6%</strong></td>
</tr>
<tr>
<td><strong>6-Lane Roadway Sidewalk Factors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>No</td>
<td>No</td>
<td>71</td>
<td>662</td>
<td>738</td>
<td>89.7%</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td>No</td>
<td>Yes</td>
<td>41</td>
<td>361</td>
<td>384</td>
<td><strong>94.0%</strong></td>
</tr>
<tr>
<td>11</td>
<td>Yes</td>
<td>No</td>
<td>41</td>
<td>128</td>
<td>272</td>
<td>47.1%</td>
</tr>
<tr>
<td>12</td>
<td>Yes</td>
<td>Yes</td>
<td>25</td>
<td>32</td>
<td>97</td>
<td>33.0%</td>
</tr>
</tbody>
</table>
Applying sidewalk factors to automated count sites

- Assign each automated count site a roadway category based on presence of bike lane and presence of right-turn-only lane.

- The more conservative factors from the 2-lane roadways were then assigned and applied to the automated count volumes.
Data Summary

Average Daily Weekday Bicycle Volume
Data Summary

Average Daily Weekend Bicycle Volume
Data Summary

Chart 4-1: Average Daily Bicycle Volumes for Weekdays & Weekends by Automated Count Sites along Bike Paths
Data Summary

Chart 4-2: Average Daily Bicycle Volumes for Weekdays & Weekends by Automated Count Sites along Bike Lanes

Average Daily Volume

Automated Count Site ID

ID1, ID10, ID18, ID35, ID39, ID40, ID41, ID42, ID43, ID46, ID54, ID63, ID65, ID66, ID67, ID98, ID104

Average Daily Weekday Volume

Average Daily Weekend Volume
Chart 4-3: Average Daily Bicycle Volumes for Weekdays & Weekends by Automated Count Sites without Bicycle Facility

- **ID16**: Average Daily Volume
- **ID24**: Average Daily Volume
- **ID55**: Average Daily Volume
- **ID59**: Average Daily Volume
- **ID61**: Average Daily Volume
- **ID73**: Average Daily Volume
- **ID74**: Average Daily Volume

**Legend**:
- **Green**: Average Daily Weekday Volume
- **Light Green**: Average Daily Weekend Volume
Data Summary

Chart 4-4: Average Daily Bicycle Volumes for Weekdays & Weekends by Facility Type
Data Summary

Chart 4-5: Average Hourly Weekday Bicycle Volumes by Facility Type

- Bike Path
- Bike Lane
- No Facility
Chart 4-6: Average Hourly Weekend Bicycle Volumes by Facility Type
Data Summary

Chart 4-7: Average Daily Bicycle Volumes by Day of Week and Facility Type
# Data Summary

## Table 4-7: Comparing Maricopa County Average Daily Bicycle Volumes to Other US Regions

<table>
<thead>
<tr>
<th></th>
<th>Maricopa County</th>
<th>Minneapolis</th>
<th>Portland</th>
<th>San Diego</th>
<th>San Francisco</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population of Region or City</strong></td>
<td>3,817,117</td>
<td>382,578</td>
<td>583,776</td>
<td>3,095,313</td>
<td>805,235</td>
</tr>
<tr>
<td><strong>Land Area of Region or City</strong> (sq. miles)</td>
<td>9,200.14</td>
<td>53.97</td>
<td>133.43</td>
<td>4,206.63</td>
<td>48.87</td>
</tr>
<tr>
<td><strong>Population Density</strong> (persons/acre)</td>
<td>0.65</td>
<td>11.07</td>
<td>6.83</td>
<td>1.15</td>
<td>25.74</td>
</tr>
</tbody>
</table>

**Three Sites with the Highest Average Daily Bicycle Volumes**
- 2,244 (Mill Ave & 10th St)
- 7,370 (Washington Ave SE Bridge)
- 4,330 (15th Ave, north of University)
- 488 (107th Ave & Thomas Rd)

**Three Sites with the Lowest Average Daily Bicycle Volumes**
- 6 (Cotton Lane & MC 85)
- 6 (SR-85 & Martin Ave)
- 12 (7th St & Carefree Highway)

**Sites with the Highest Volumes**
- Mill Ave & 10th St
- Washington Ave SE Bridge
- 15th Ave, north of University
- 107th Ave & Thomas Rd

**Sites with the Lowest Volumes**
- Cotton Lane & MC 85
- SR-85 & Martin Ave
- 7th St & Carefree Highway
Next Steps

- Prepare Final Bicycle Count Report in mid-June 2014.
- Present Findings at Conference or in Publications
- Thank You -

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MAG Bicycles Count Project