Everything You Wanted to Know About Bicyclist and Pedestrian Count Data

Module 2: SUMMARIZE

Online Training Presented by:

TxDOT Bicycle and Pedestrian Program & Texas A&M Transportation Institute (TTI)
WELCOME to Module #2: Summarizing and Visualizing Pedestrian and Bicyclist Count Data

- Moderator: Shawn Turner, TTI
- TxDOT Program: Bonnie Sherman, TxDOT

- MODULE 2, SUMMARIZING AND VISUALIZING THE DATA
  - Introduction & Overview
  - Texas Bike and Pedestrian Count Exchange
  - Visualization tools in Count Exchange
  - Uploading count data to Count Exchange
  - Reviewing count data
  - Seasonal adjustment

Shawn Turner  
Bonnie Sherman  
Phil Lasley
Everything You Wanted To Know About Bicyclist And Pedestrian Count Data

COLLECT

1

SUMMARIZE

2

USE

3

July 23
Recording

TODAY

August 4
Registration
Best Practices for Virtual Meetings

- Please stay muted unless you are speaking

- Remove all other distractions (work email, instant messenger, etc.)

- Actively participate in training
  - Take notes on slide handouts
  - Use Q&A panel for questions or comments (not chat)
  - Respond to polls

- Webcam not necessary
  - Turn off outgoing video to conserve WiFi bandwidth
Webex Event Features

- View Polling (when enabled)
- View Q&A
- Adjust Audio Settings
- More Options
- Ask Question Here
- Answer Poll Here
- Feedback Options
- Raise Hand
Introduction Poll

- Please respond to poll at this time

- Any questions before we get started?
  - Feel free to test question box now
TxDOT Bicycle and Pedestrian Count Program

Bonnie Sherman, TxDOT
Statewide efforts addressing bicycle & pedestrian transportation

Texas Transportation Plan 2050
Bikeway Design Effort
Project Development Enhancements
Road to Zero
Economic Impact of Bicycling in Texas
ADA Transition Plan Update
Pedestrian/Bicycle Facility Inventory
Bicycle Tourism Trails Study
Better decision-making requires good data

Safety
- Exposure for crash rates
- Behavior (contra-flow riding)

Planning
- Demand estimation
- Travel patterns

Design
- Facility type and design
- Barriers
- High activity areas

Performance Measurement
- Before and after studies
- Long-term trends from areawide improvements
- Mode shift

Understand problems
Anticipate future needs
Identify solutions
Track trends

We need to know about bicycle and pedestrian usage on our roadways.
Working to resolve the data gap for bicyclists and pedestrians...

- Texas Bicycle and Pedestrian Count Exchange
- Crowdsourced bicycle data (StravaMetro)
- Counter equipment loan program
- Upcoming procurement of bike/ped counts
- Data collection and analysis guidance
- Virtual training in Summer 2020
Thank you!

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Questions?
Why Am I Doing Bicyclist and Pedestrian Counts?

Shawn Turner, TTI
Why are you collecting bicyclist and pedestrian counts?

- “...that’s what our program plan lists...”
- “...that’s what my boss said to do...”
- “...that’s what others are doing...”
- Unless your job is ONLY data collection...
- ...THOSE ARE NOT VERY GOOD REASONS.
Everything You Wanted To Know About Bicyclist And Pedestrian Count Data

COLLECT

SUMMARIZE

How will you use count data??

The uses (Module 3) inform many decisions made in these first 2 modules
How will you (and others) use count data?

- Most likely will have multiple uses
- Will be used for more things than what you planned

- Count Exchange designed for flexibility
  - Summary and detail
  - Weekday vs. weekend
  - Other visuals

- Most common uses:
  1. Trend monitoring
  2. Before/after study or funding justification
  3. Identifying/prioritizing/selecting projects
  4. Safety analysis
Summarizing, Reporting, Visualizing Your Data

Phil Lasley, TTI
Thinking About How Counts Are Used

- How counts are used directly impacts how we Summarize and Display them.

- Counts are ultimately used for:
  - Planning
  - Policy
  - Research
  - Design

- Universal Common Assumption:
  Counts are High Quality and Widely Available for Use.
The issue with collected data

- Collected data often go unused.
  - No organization of the data.
  - **No validation or quality control.**
    - No aggregation or analysis into usable statistics.
      - *Difficulty learning how to do this.*
  - No general reporting mechanism.
  - No means to easily collect and share data with others.

- All these hurt the effort to make meaningful changes.

**Question: How has your organization struggled to use data?**
The Texas Bicycle & Pedestrian Count Exchange (BP|CX)

- Collaborative tool maintained by TxDOT with data contributed by multiple local partners.
- Provides a publicly-viewable platform that consolidates and standardizes biking and walking count data.
- Tracks active transportation growth in Texas to justify greater infrastructure investment.
- Integrates with other TxDOT planning maps and tools (future).
- Build a robust dataset to support research and analysis, such as exposure estimates, crowd-sourced data validation, and performance measures.
Public Visualization

There are 86 permanent count and 245 short duration count locations in Texas.

BP|CX Data Manager

Quality Control Your Data

Help: Below is a list of counters that need Quality Control assessment. Click QC on a Station to begin the process.

<table>
<thead>
<tr>
<th>Station ID</th>
<th>Station Name</th>
<th>City Area</th>
<th>Days of Data</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU0001</td>
<td>Exposition Blvd at O. Henry Track</td>
<td>Austin</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AU0002</td>
<td>Wmberville Rd at Biggy Creek bridge</td>
<td>Austin</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AU0003</td>
<td>Rio Grande St. W 22nd St in West Campus</td>
<td>Austin</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AU0004</td>
<td>Walnut Creek Trail N of Jain Ln</td>
<td>Austin</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AU0005</td>
<td>Shoal Creek Trail 5 of W 3rd St</td>
<td>Austin</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AU0006</td>
<td>Lance Armstrong Bikeway at Waller Creek</td>
<td>Austin</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AU0007</td>
<td>Ann and Roy Butler Trail at E Bouldin Creek</td>
<td>Austin</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>AU0008</td>
<td>Ann and Roy Butler Trail at MoPac/Crenshaw Bridge</td>
<td>Austin</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
BP|CX Registration

- All BP|CX data owners (agencies) must be registered.
  - Provides data security.
  - Limits access to authorized users.

- To register: [https://txbpcx.org](https://txbpcx.org) → “Register”
  - Read the Terms and Conditions
  - Fill out form.
BP | CX Registration

- Two User Types
  - Authorized Agency User
  - Agency Administrator

- *Agency users can be within your agency or outside of your agency (e.g., consultants)

- *Administrators can view/edit all users for their agency in the “Authorized Users” link in the navigation pane.
Live Demo of the BP | CX
BP|CX Architecture and Navigation

**New or Existing Count Location Setup**

- **Collect Data**
- **Upload Station Location**
- **Upload Count Data**

**New Count Location Setup**

- **Upload Station Location**
- **Collect Data**
- **Upload Count Data**

**New or Existing Eco-Counter Setup in Eco-Visio**

- **Install Eco Counter**
- **Import New Station Location (Eco-Visio)**
- **Import/Update Count Data (Eco-Visio)**

**Start: No Data Collected**

**End: Data Ready for Quality Review**
Our New Count Station!

- **Hill of Life Trail Head** *(30.274889, -97.825271)*
  - Eco-Counter (but not set up in Visio).
  - Can detect bicycles and pedestrians by direction.
Quality Review Concepts
Types of Quality Control

- Metadata Review
  - Naming and matching
  - Location
  - Direction
  - Other information

- Count Data Review
  - Nulls
  - Extreme values
  - Abnormal but valid values

- Count Data Validation*
Metadata Review

- Data Mislabeling

29.778044, -95.621102
### Metadata Review

- **Data Mislabling**

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<th>direction</th>
<th>label</th>
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</thead>
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<td>bike + ped</td>
<td>both</td>
<td>Santa Fe at Beacon</td>
</tr>
<tr>
<td>1</td>
<td>ped</td>
<td>in</td>
<td>Pedestrians OUT</td>
</tr>
<tr>
<td>2</td>
<td>ped</td>
<td>out</td>
<td>Pedestrians IN</td>
</tr>
<tr>
<td>3</td>
<td>bike</td>
<td>in</td>
<td>Cyclists OUT</td>
</tr>
<tr>
<td>4</td>
<td>bike</td>
<td>out</td>
<td>Cyclists IN</td>
</tr>
</tbody>
</table>

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<td>both</td>
<td>WRT Fisher</td>
</tr>
<tr>
<td>1</td>
<td>ped</td>
<td>in</td>
<td>Pedestrians Counter Clockwise</td>
</tr>
<tr>
<td>2</td>
<td>ped</td>
<td>out</td>
<td>Pedestrians Clockwise</td>
</tr>
<tr>
<td>3</td>
<td>bike</td>
<td>in</td>
<td>Pedestrians Counter Clockwise</td>
</tr>
<tr>
<td>4</td>
<td>bike</td>
<td>out</td>
<td>Pedestrians Clockwise</td>
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<tbody>
<tr>
<td>0</td>
<td>bike + ped</td>
<td>both</td>
<td>Santa Fe at Glasgow</td>
</tr>
<tr>
<td>0</td>
<td>n/a</td>
<td>both</td>
<td>Santa Fe at Glasgow Bike Only</td>
</tr>
<tr>
<td>1</td>
<td>bike</td>
<td>n/a</td>
<td>Santa Fe at Glasgow Bike Only Cyclists</td>
</tr>
<tr>
<td>2</td>
<td>car</td>
<td>n/a</td>
<td>Santa Fe at Glasgow Bike Only Cars</td>
</tr>
</tbody>
</table>
Validity Flags

- **Valid**: Count appears to be normal.

- **Invalid**: Count appears to be in error and not representative of reality.

- **Abnormal but Valid (ABV)**: Count appears to be in error but is actually a valid count.

*It is up to the reporting agency to determine if an error actually occurred.*
Invalid Flag Types

- **Data Gaps**
  - Any null values in the data.

- **Consecutive Zeros**
  - Too many zero values in a row.
  - FHWA recommends 7 periods; we recommend 15 hours of zeros.

- **Consecutive Non-Zeros**
  - Too many of the same value in a row.
  - Usually 3; counts above 15.

- **Maximum Count Exceeded**
  - Too high of a number for a single day or period
  - Usually 5,000/day and 1,500/period.
  - FHWA: 4000/hour.
Invalid Flag Types (cont.)

- **Interquartile Range Violation**
  - Outliers based on the 25\textsuperscript{th}/75\textsuperscript{th} percentiles over a +/- 2 month rolling average of counts.

- **Adjacent Interval**
  - Counts jump from 0 to 50 or higher (or the reverse).
  - *+/-100% difference (depending on count average).*

- **Inverted AM/PM**
  - Counts at 3:00 AM are > 3:00 PM

- **Invalid for Multiple Inconsistencies (General Error)**
  - Used for mass counter failures or multiple errors.

- **Minimum Daily Total**
  - Counts for a day are less than 100
Count Data
Good Data

**Strong Seasonal Pattern**

**Weak Seasonal Pattern**
Good Data

Strong Weekly Pattern

Weak Weekly Pattern
What did I just look at?

- Strong weekend pattern
- Consistent nightly use
Good Data
Good Data

Strong Recurring Event Pattern

Daily Subtotal & Individual Period

Count

Jun 1, 15  Aug 1, 15  Oct 1, 15  Dec 1, 15  Feb 1, 16  Apr 1, 16  Jun 1, 16  Aug 1, 16  Oct 1, 16  Dec 1, 16  Feb 1, 17  Apr 1, 17  Jun 1, 17  Aug 1, 17  Oct 1, 17  Dec 1, 17

Daily Subtotal & Individual Period

Count

Feb 1, 16  Apr 1, 16  Jun 1, 16  Aug 1, 16  Oct 1, 16  Dec 1, 16  Feb 1, 17  Apr 1, 17  Jun 1, 17  Aug 1, 17  Oct 1, 17
Bad Data

The day the counter was picked up.

Zero values for the rest of the day.
Bad Data

Counter was likely in an office being worked on.

Legitimate count.
Bad Data

Consecutive Zeros
Bad Data

Graphs showing the count over time.
Counter began combining all modes while zeroing bike counts.
Bad Data

No apparent reason for spike/erratic pattern

Stable pattern

Questionable?
Counter began reporting daily totals at midnight instead of 15 minute counts.
Bad Data

Possible legitimate count?

Count Location:
Local DOT Office
(Not a real count location)
Abnormal But Normal (ABV) Data

- What is Abnormal but Valid?
  - Events
  - Unusual Occurrences
  - *Counts outside the norm for the trail, but cannot be ruled an error.*

- How to spot ABV data?
Abnormal Data

Foot Races, Coded ABV
Abnormal one-way spike with ridiculously high count.

MS 150 Bike Race
Abnormal Data

Abnormal two-way spike usually on a weekend morning around 6:30 a.m. to 10:00 a.m.

This is usually characterized by a concentration of counts within a 15-minute interval followed by high counts spread out.
Abnormal Data

Abnormal long recurring period in one or all directions

SXSW
Abnormal Data

Abnormal spikes: Both directions close to equal, but at different times.

Movie in the Park
Abnormal Data

Hurricane Harvey, Houston
Abnormal Data

Wrong-Way Riders

**Southbound**

**Northbound**
Be on the lookout for...

- Rainy or Snowy Days
- Wrong-Way Riders
- Unequal Directional Splits
- Count Spikes Overnight
- Count Spikes Before/After Counter Error

Try to connect the Behavior with the Count.
Quiz Time!
Quiz, Counter 1

Daily Subtotal

Count

Median

Filter Counts by Date: (Use the slider or click on the date to choose a custom range.)

June 1, 2018

Raw Counts

Count

0

1

2

3

August 5, 2020
Quiz, Counter 2

Daily Subtotal

Filter Counts by Date: (Use the slider to choose a custom range.)

April 2, 2020  May 31

Raw Counts

Count

0  50  100  150

April 8  April 18  April 28  May 8  May 18  May 28
Quiz, Counter 3

Daily Subtotal

Filter Counts by Date: (Use the slider or click on the date to choose a custom range.)

Raw Counts
Quiz, Counter 4

**Daily Subtotal**

Filter Counts by Date: (Use the slider or click on the date to choose a custom range.)

May 1, 2019

**Raw Counts**
Quiz, Counter 5

Daily Subtotal

Filter Counts by Date: (Use the slider or click on the date to choose a custom range.)

Raw Counts
Quiz, Counter 7

Daily Subtotal

Filter Counts by Date: (Use the slider or click on the date to choose a custom range.)

November 1, 2018 — February 22, 2019

Raw Counts
Quiz, Counter 8

Daily Subtotal

Filter Counts by Date: (Use the slider or click on the date to choose a custom range.)

November 2, 2018

Raw Counts
BP|CX Quality Review Process Flow

Start: No Data Collected

1. Collect Data
2. Upload Station Location
3. Import Count Data

4. Upload Station Location
5. Collect Data

6. Quality Control Review
7. Factoring
8. Certify

End: Data Released

Validation Log
The QC Process in a Nutshell

- **Review the Metadata.**
  - Correct errors before reviewing counts.

- **Review the Counts.**
  - Visually inspect the broad pattern.
    - What’s the context?
    - Do the new data match previous counts?
    - Do they seem reasonable?
    - What is happening at this location?
  - Identify potential problem areas.

- **Visually Inspect Problem Areas.**

- **Flag Suspect Counts.**

- **Log Flagged Data for Potential Reasons.**

- **Certify the Review.**
Live Demo of the BP | CX
For More Info or Questions

- Phil Lasley
  - P-Lasley@tti.tamu.edu
  - 512-407-1113

For 3 hours of AICP CM Credit:
[Link included after webinar.]
Future improvements in the works

- In the works this year:
  - Apply and annotate factors to your data.
  - View AADNMT counts in the public view.
  - Create custom reports (we need your input!)
  - Improve system performance to speed load times.

- In the future:
  - Use AI to automate most of the QC process.
  - Improve data management tools.
  - Implement user-suggested improvements.
Why should you upload your data to the BP|CX?

- Access to data quality review tools.
- Access to data summary and visualization tools.
- Access to seasonal adjustment factors and tools (in future).
- Ability to coordinate with other local agencies for count locations.
- Ability to download datasets from peer cities to establish benchmarks.
- Ability to easily share your data with decision-makers, colleagues, and the public.
- Demonstrate increased bicycling and walking in your community to support active transportation investments.
- If desired, contributing to a statewide submission of bicycle and pedestrian count data to FHWA’s Travel Monitoring System (TMAS).