



# Bicyclist and Pedestrian Count Data in Texas

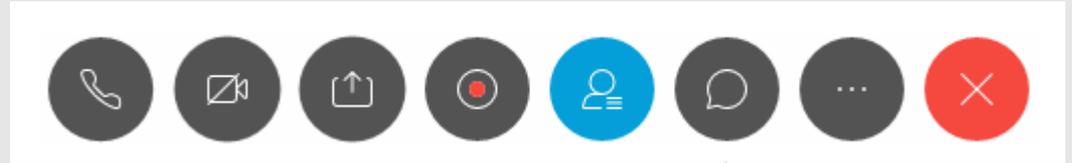
Online Webinar Presented by:

TxDOT Bicycle and Pedestrian Program &  
Texas A&M Transportation Institute (TTI)





- All phones are muted
- Use Webex chat box to ask questions
- Webinar is being recorded
- Slides will be emailed to all registrants after webinar





1. Overview of TxDOT Bicycle and Pedestrian Program and Efforts
  - Bonnie Sherman, TxDOT
2. “Why Should I Count Bicyclists and Pedestrians?”
  - Michael Martin, TTI
3. Collecting Bicyclist and Pedestrian Count Data
  - Shawn Turner, TTI
4. Summarizing, Reporting, Visualizing Your Data
  - Phil Lasley, TTI
5. Questions and Discussion





1. Pharr District (Brownsville), March 6
  
2. San Antonio, March 25
  - Held in conjunction with Texas Trails and Active Transportation Conference
  - <https://www.eventbrite.com/e/making-bicycle-and-pedestrians-count-in-texas-how-to-count-registration-85824610721>
  
3. Dallas-Ft. Worth, April 2
  
4. Houston, May 1

More information will be forthcoming in these areas

Contact [s-turner@tti.tamu.edu](mailto:s-turner@tti.tamu.edu) for more details

# Overview of TxDOT Bicycle and Pedestrian Program

Bonnie Sherman, TxDOT



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Gap in bicycle and pedestrian datasets

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Data integration in TxDOT activities

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Tools and resources



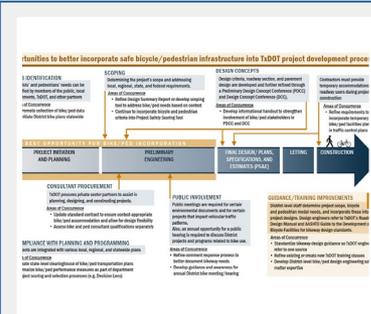


Texas Transportation Plan 2050

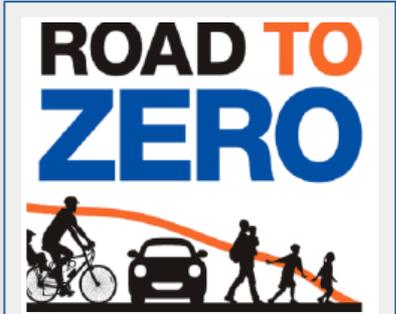


[www.pedbikeimages.org](http://www.pedbikeimages.org) /foote Design Group

Bikeway Design Effort



Project Development Enhancements



Road to Zero



Economic Impact of Bicycling in Texas



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ADA Transition Plan Update



Pedestrian/Bicycle Facility Inventory



Bicycle Tourism Trails Study

# TxDOT/BAC collaboratively identified project development enhancements



## NEEDS IDENTIFICATION

Bicyclists' and pedestrians' needs can be identified by members of the public, local governments, TxDOT, and other partners

### Areas of Concurrence

- Promote collection of bike/ped data
- Initiate District bike plans statewide

## SCOPING

Determining the project's scope and addressing local, regional, state, and federal requirements.

### Areas of Concurrence

- Refine Design Summary Report or develop scoping tool to address bike/ped needs based on context
- Continue to incorporate bicycle and pedestrian criteria into Project Safety Scoring Tool

## DESIGN CONCEPTS

Design criteria, roadway section, and pavement design are developed and further refined through a Preliminary Design Concept Conference (PDCC) and Design Concept Conference (DCC).

### Areas of Concurrence

- Develop informational handout to strengthen involvement of bike/ped stakeholders in PDCC and DCC

## TRAFFIC CONTROL PLANS

Contractors must provide temporary accommodations for roadway users during project construction.

### Areas of Concurrence

- Refine requirements to better incorporate temporary bike/ped facilities (detours) in traffic control plans

## BEST OPPORTUNITY FOR BIKE/PED INCORPORATION

PROJECT INITIATION AND PLANNING

PRELIMINARY ENGINEERING

FINAL DESIGN/ PLANS, SPECIFICATIONS, AND ESTIMATES (PS&E)

LETTING

CONSTRUCTION



## CONSULTANT PROCUREMENT

TxDOT procures private sector partners to assist in planning, designing, and constructing projects.

### Areas of Concurrence

- Update standard contract to ensure context-appropriate bike/ped accommodation and allow for design flexibility
- Assess bike and ped consultant qualifications separately

## COMPLIANCE WITH PLANNING AND PROGRAMMING

Projects are integrated with various local, regional, and statewide plans

### Areas of Concurrence

- Create state-level clearinghouse of bike/ped transportation plans
- Formalize bike/ped performance measures as part of department project scoring and selection processes (e.g. Decision Lens)

## PUBLIC INVOLVEMENT

Public meetings are required for certain environmental documents and for certain projects that impact vehicular traffic patterns.

Also, an annual opportunity for a public hearing is required to discuss District projects and programs related to bike use.

### Areas of Concurrence

- Refine comment response process to better document bike/ped needs
- Develop guidance and awareness for annual District bike meeting/hearing

## GUIDANCE/TRAINING IMPROVEMENTS

District-level staff determine project scope, bicycle and pedestrian modal needs, and incorporate these into project designs. Design engineers refer to TxDOT's Roadway Design Manual and AASHTO Guide to the Development of Bicycle Facilities for bikeway design standards.

### Areas of Concurrence

- Standardize bikeway design guidance so TxDOT engineers refer to one source
- Refine existing or create new TxDOT training classes
- Develop District-level bike/ped design engineering subject matter expertise



# Better data is needed to better accommodate bicyclists & pedestrians



- 1 Standardize bikeway design guidance so TxDOT engineers refer to one source
- 2 Initiate District bicycle plans statewide
- 3 Continue to incorporate bicycle criteria into Project Safety Scoring Tool
- 4 Develop District-level bike/ped design engineering subject matter expertise
- 5 Promote collection of bike/ped data
- 6 Refine DSR or develop scoping tool to address b/p needs based on context
- 7 Refine req'ts to better incorporate temporary b/p facilities (detours) in traffic control plans
- 8 Refine existing or create new TxDOT training classes
- 9 Refine comment response process to better document bikeway needs
- 10 Update standard contract to ensure consistent bike/ped accommodation and allow for design flexibility
- 11 Develop informational handouts to strengthen b/p involvement at PDCC & DCC
- 12 Create a state-level clearinghouse of bike/ped transportation plans
- 13 Assess bike and ped consultant qualifications separately
- 14 Formalize bike/ped performance measures as part of department project scoring and selection processes (e.g. Decision Lens)
- 15 Develop guidance and awareness for annual District bike meeting/hearing



## 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

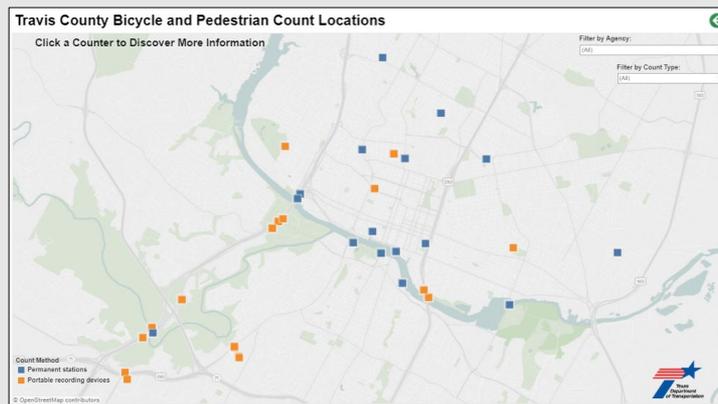
- Before and after studies
- Long-term trends from areawide improvements
- Mode shift



**We need to know about bicycle and pedestrian usage on our roadways.**



- Texas Bicycle and Pedestrian Count Exchange
  - Planned data integration with TPP in STARS III
- Crowdsourced bicycle data (StravaMetro)
- Counter equipment loan program
- Data collection and analysis guidance
- Upcoming training in spring 2020



**Thank you!**



**Bonnie Sherman, AICP**

TxDOT – Public Transportation Division

Bicycle/Pedestrian Program Manager

[Bonnie.Sherman@txdot.gov](mailto:Bonnie.Sherman@txdot.gov)

(512) 486-5972



**Questions?**

# Why Should You Collect Bicyclist and Pedestrian Counts?

Michael Martin, TTI





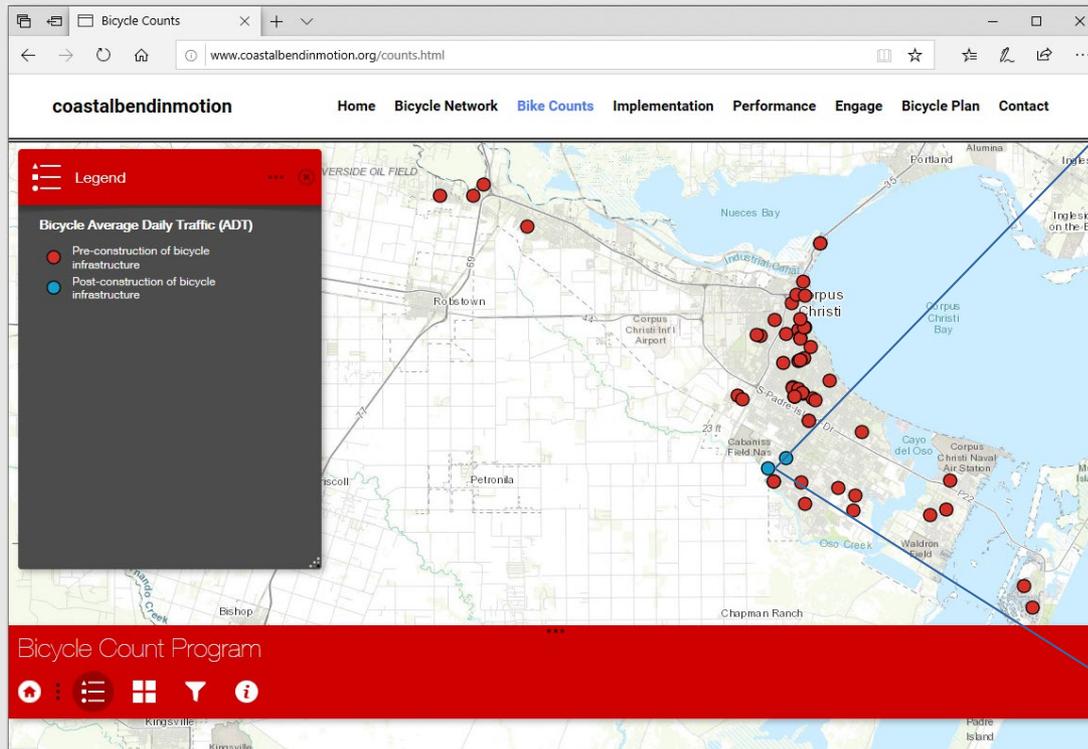
## Possible uses for count data:

- Measuring Facility Usage
- Monitoring Travel Patterns
  - Developing Extrapolation Factors (expand short-duration counts)
  - Evaluating User Behavior Patterns
- Evaluating Before-and-After Volumes
- Project Prioritization
- Visitor Usage
- Site Evaluation
- Multimodal Model Development
- Public Health Surveillance
- Safety Analysis
  - Quantifying Exposure
  - Identifying Before-and-After Safety Effects
  - Countermeasure evaluation
  - Safety Performance Measures
  - Network Screening, Areawide & Facility Specific



## Corpus Christi MPO

- Pre- and post-construction bike counts for projects around the area.
- Data collection separates anecdotal information from the facts.



**Schanen Ditch Trail: Yorktown Blvd to Cedar Pass Dr**

MPO ID	020-16
Anchor	Ditch trail sign
Final Infrastructure:	<u>Off-Road Multi-use Trail</u>
Transitional Infrastructure:	
Sidepath	
Sidewalks Captured:	Not Present
Lanes Captured:	WB/EB
Full ADT Report:	Coming Soon
Pre-construction ADT	Not Available
Deployed	Not Available
Analysis	Not Available
Picked Up	Not Available
<u>Post-construction ADT</u>	<u>13</u>
Deployed	12/08/2016
<u>Analysis</u>	<u>6 full days, 2 partial days</u>
Picked Up	12/15/2016

**Post-construction**

Latitude: 27.684178, Longitude: -97.421539



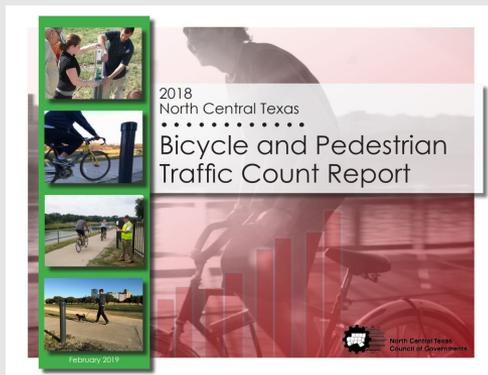
Edited by corpuschristimpo on 8/12/19 at 10:10 AM

<http://www.coastalbendinmotion.org/counts.html>

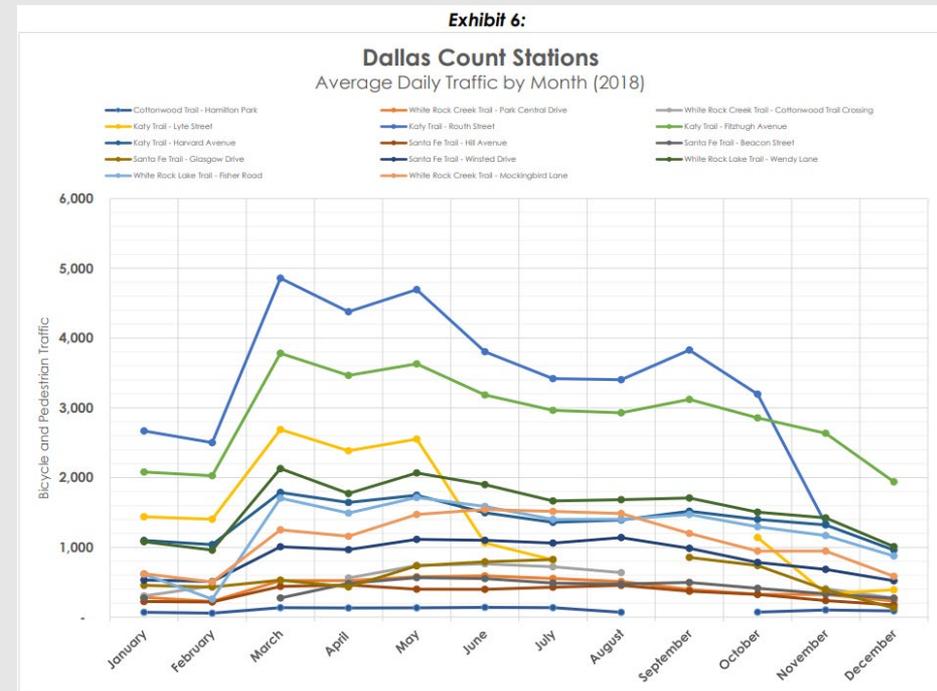


## North Central Texas Council of Governments (NCTCOG)

- Annual benchmarking count report
- Data about actual non-motorized travel volumes helps:
  - Inform the public and decision makers about actual usage and travel patterns
  - Evaluate the impacts of specific projects (before and after) with mobile counts
  - Analyze trends



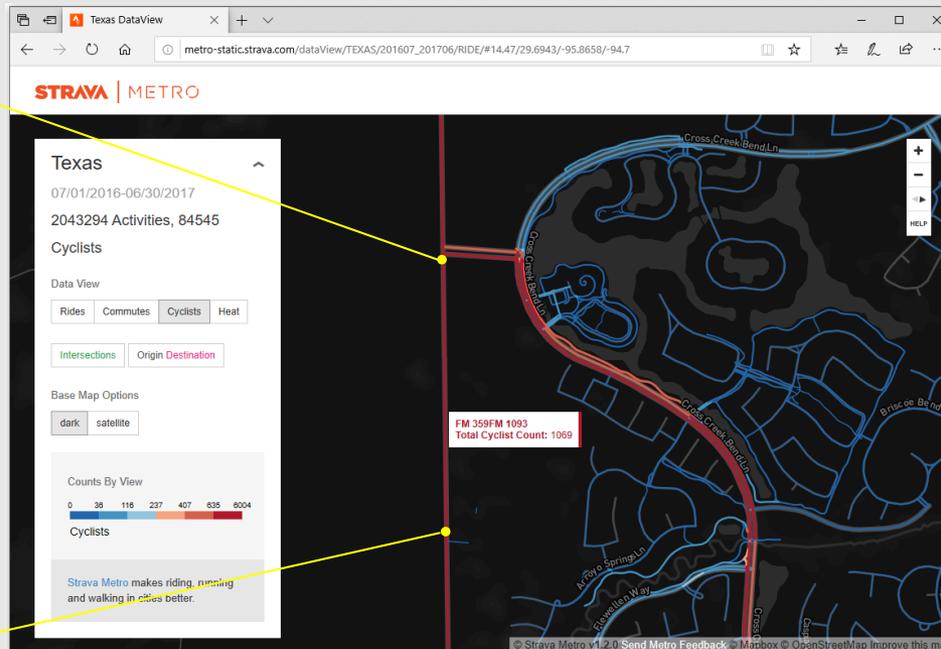
[https://www.nctcog.org/nctcg/media/Transportation/DocsMaps/Plan/Bike/NCTCOGBikePedTrafficReport\\_2018.pdf](https://www.nctcog.org/nctcg/media/Transportation/DocsMaps/Plan/Bike/NCTCOGBikePedTrafficReport_2018.pdf)



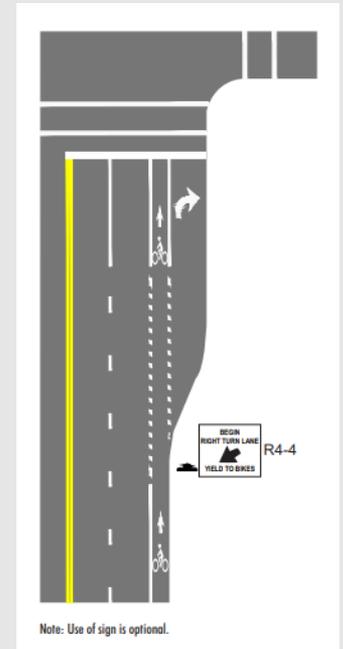


## TxDOT Houston District

- New right-turn lane for property development
- Strava Metro Data shows 1,069 cyclists during 2016-2017
- Integrated bike lane treatment



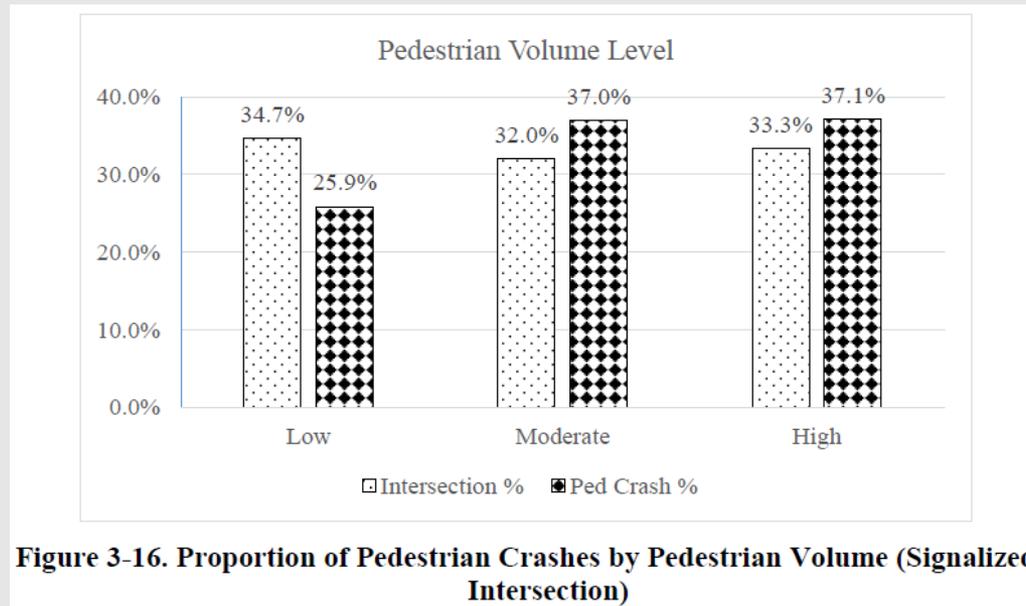
[http://metro-static.strava.com/dataView/TEXAS/201607\\_201706/RIIDE/#7.72/31.155/-96.972](http://metro-static.strava.com/dataView/TEXAS/201607_201706/RIIDE/#7.72/31.155/-96.972)





## TxDOT

- Risk factor evaluation of signalized intersections
- The proportion of pedestrian crashes as a function of pedestrian volume level
- As pedestrian volume increases, more pedestrian crashes occur at intersections.



Source: Systemic Approach to Pedestrian Safety Improvement, TxDOT Project 58-7XXIA001, 2017



## Houston-Galveston Area Council (HGAC)

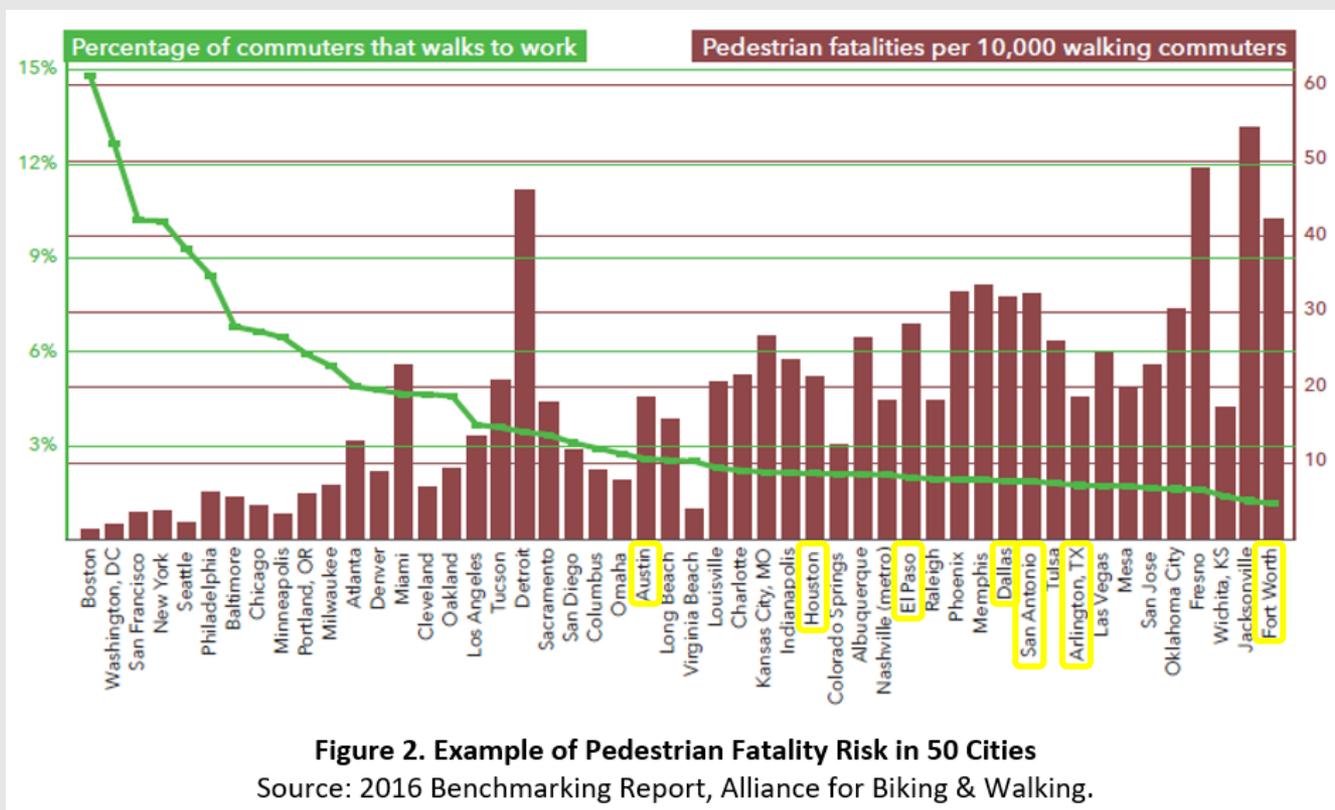
- TxDOT Houston District response to HGAC TIP call for projects
- Selection based on the benefit-cost ratio (safety and reduction of SOV)
- Estimate of non-motorized users per project required

	A	B	C	D	I	J	M	N	U
1		<b>Step 10A: Calculate Priority Score</b>							
3									
4									
5	ID	GAP LOCATION	Stakeholder Input SCORE	Stakeholder Input WEIGHTED SCORE	Safety SCORE	Safety WEIGHTED SCORE	Demand SCORE	Demand WEIGHTED SCORE	Prioritization Score
7	1	CENTRAL AVE	6.3	62.5	0.0	0.0	8.1	32.5	95.0
8	2	WASHINGTON/JEFFERSON CORRIDOR	4.2	41.7	7.1	57.1	8.4	33.6	132.4
9	3	3RD ST	9.6	95.8	4.3	34.3	3.8	15.0	145.2
10	4	12TH ST	0.8	8.3	1.4	11.4	2.5	10.0	29.8
11	5	15TH AVE	0.4	4.2	4.3	34.3	3.6	14.6	53.0
12	6	ENCANTO BLVD	6.3	62.5	4.3	34.3	7.7	30.9	127.7
13	7	OSBORN RD	8.8	87.5	2.9	22.9	5.2	20.6	131.0
14	8	OAK ST	3.8	37.5	2.9	22.9	4.0	16.0	76.4
15	9	20TH ST	2.1	20.8	0.0	0.0	3.1	12.6	33.4
16	10	3RD/5TH	1.3	12.5	10.0	80.0	3.1	12.5	105.0
17	11	DEER VALLEY DR	3.3	33.3	0.0	0.0	5.4	21.5	54.8
18	12	UNION HILLS DR	5.0	50.0	7.1	57.1	9.9	39.8	146.9
19	13	19TH AVE	5.8	58.3	7.1	57.1	3.5	14.0	129.5
20	14	32ND ST	8.8	87.5	10.0	80.0	6.8	27.3	194.8
21	15	40TH ST	3.3	33.3	5.7	45.7	3.1	12.6	91.6

Source: NCHRP Report 803, Pedestrian and Bicycle Transportation Along Existing Roads—ActiveTrans Priority Tool Guidebook, 2015.



- Alliance for Biking and Walking
  - Compare areas or facilities to find over represented locations



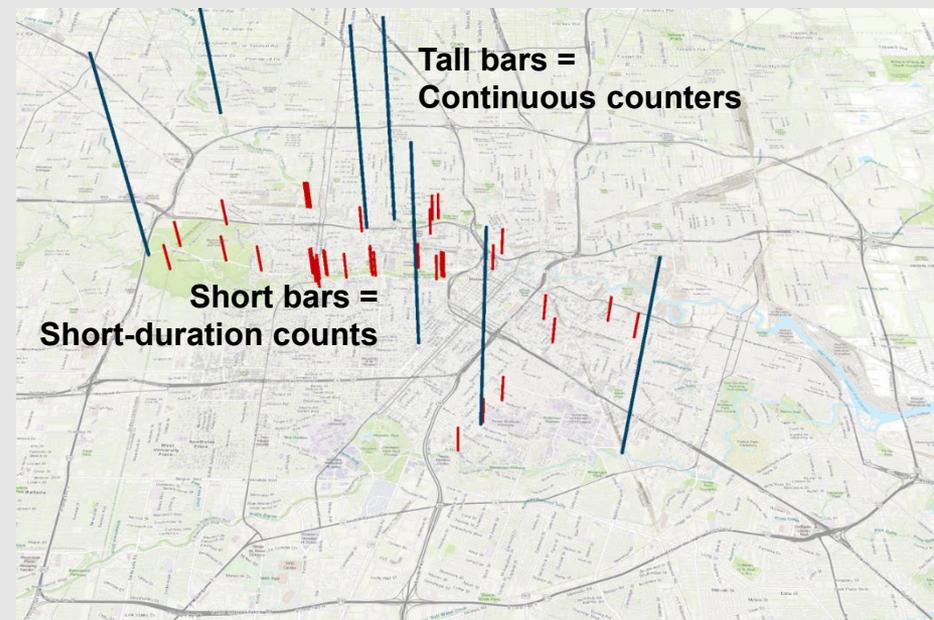
# Collecting Bicyclist and Pedestrian Count Data

Shawn Turner, TTI





- Can't count everywhere all the time, so we must sample
  1. Continuous counts at permanent locations
    - Collect 365 days of data at representative locations
    - TEMPORAL COVERAGE
  2. Short-duration counts with portable equipment
    - Collect 7-14 days of data at many more locations
    - SPATIAL COVERAGE
  3. NEW: Crowdsourced / Big Data
  
- Data uses affect approach
  - Citywide activity
  - Before-and-after at selected sites





- Continuous counts at representative locations in 3 pattern groups:
  1. Commuting to work/school routes
  2. Recreational/utilitarian routes
  3. Hybrid/mix of commuting and recreation
- FHWA TMG recommends 3-5 permanent locations in each group
- Phased approach
  - Not all 9-15 permanent locations at once
- Use short-duration counts
  - Test/confirm ideal permanent site
- Plan for long-term maintenance
  - E.g., batteries, cleaning, modem fees



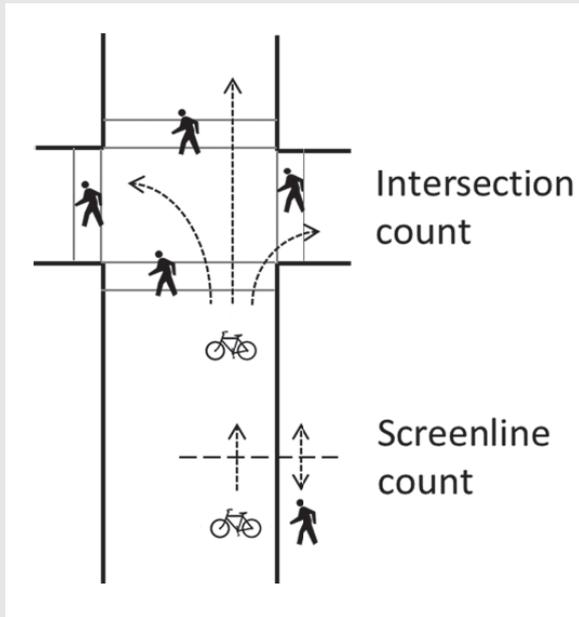


- Available resources usually determine how long and how many sites
- What is short-duration?
  - Automated equipment: min. 7 days, preferred 14 days
  - Manual counts: minimum 4 hours, preferred 12 hours
- How many sites?
  - Depends mostly on data uses
  - 30 locations per traffic pattern group, but often less
- Coordinate among multiple agencies, pool resources
  - Parks & recreation
  - Utility/waterway districts
  - Commercial/business districts
  - Ped/bike counts as part of motor vehicle special counts





- First decision – intersection vs. screenline counts
- Intersection more complicated, different collection equipment
- Based on planned data uses



Source: NCHRP Report 797

- Intersection counts
  - Safety and conflicts
  - Detail of turning movements
- Screenline counts
  - Overall activity levels
  - Big picture corridor movement



- Typically focused on certain types of locations, not random
  - Planned improvements
  - Moderate to high activity levels (also growth potential)
  - Area and land use types
    - Commercial
    - Residential
    - Mixed use
    - Recreational
  - Bicyclist/pedestrian facility types
- Typically “more art than science”



- Not just the highest-volume locations (unless that is your goal)
- Interplay between sites and technology – one affects the other
- Counter positioning (especially automatic counters):
  - READ THE MANUAL!
  - Where flow always moving – no pacing or waiting areas
  - Where flow likely to be single file – prevent occlusion
  - Bicyclists on sidewalks or against traffic

# Bicyclist and Pedestrian Counting Technology



## 1. What Are You Counting?



	Technology	Bicyclists Only	Pedestrians Only	Pedestrians & Bicyclist Combined	Pedestrians & Bicyclist Separately	Cost
<b>2. How Long?</b> ↑ Permanent ↓ Temporary/ Short Term	Inductance Loops <sup>1</sup>	●			◐	\$\$
	Magnetometer <sup>2</sup>	○				\$-\$\$
	Pressure Sensor <sup>2</sup>	○	○	○	◐	\$\$
	Radar Sensor	○	○	○		\$-\$\$
	Seismic Sensor	○	○	○		\$\$
	Video Imaging: Automated	○	○	○	◐	\$-\$\$
	Infrared Sensor (Active or Passive)	○ <sup>3</sup>	●	●	◐	\$-\$\$
	Pneumatic Tubes	●			◐	\$-\$\$
	Video Imaging: Manual	○	○	○	●	\$-\$\$\$
	Manual Observers	●	●	●	●	\$\$-\$\$\$

○ Indicates what is technologically possible.

● Indicates a common practice.

◐ Indicates a common practice, but must be combined with another technology to classify pedestrians and bicyclists separately.

\$, \$\$, \$\$\$: Indicates relative cost per data point.

<sup>1</sup> Typically requires a unique loop configuration separate from motor vehicle loops, especially in a traffic lane shared by bicyclists and motor vehicles.

<sup>2</sup> Permanent installation is typical for asphalt or concrete pavements; temporary installation is possible for unpaved, natural surface trails.

<sup>3</sup> Requires specific mounting configuration to avoid counting cars in main traffic lanes or counting pedestrians on the sidewalk.

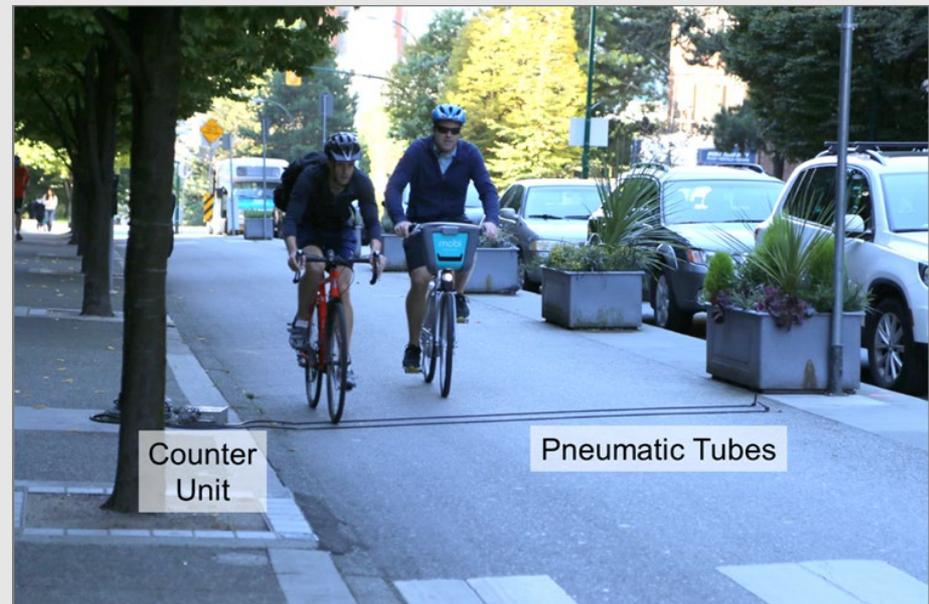
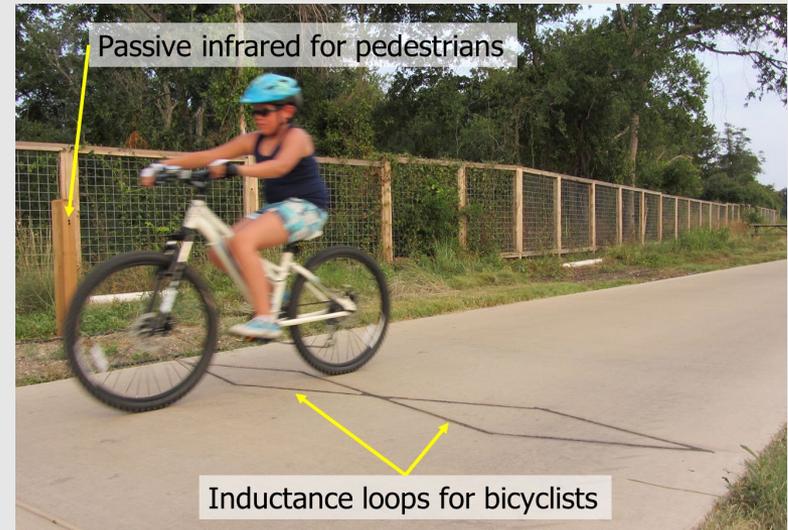


- Infrared
  - Most common automated tech
  - Several vendors
  - Passive vs. active infrared
  - Occlusion (blocking) a problem, overcome with overhead mount
- Video
  - Also common, several vendors
  - Manual vs. automatic reduction
  - Capture pedestrian behavior and demographics
- Manual (human observer)
  - Clipboard or tablet computer
  - Simple and low-tech
  - Limited to short time intervals





- Inductance loops
  - Most common (permanent)
  - Specific loop shapes
  - Requires pavement cuts
- Pneumatic tubes
  - Most common (portable)
  - Specific tube size
  - Hazard issues
- Video
  - Common (esp. intersections)
  - Capture behavior
- Manual
  - Use in complex situations
  - Limited to short time intervals





## Intersection signal system analytics



## Other video system analytics

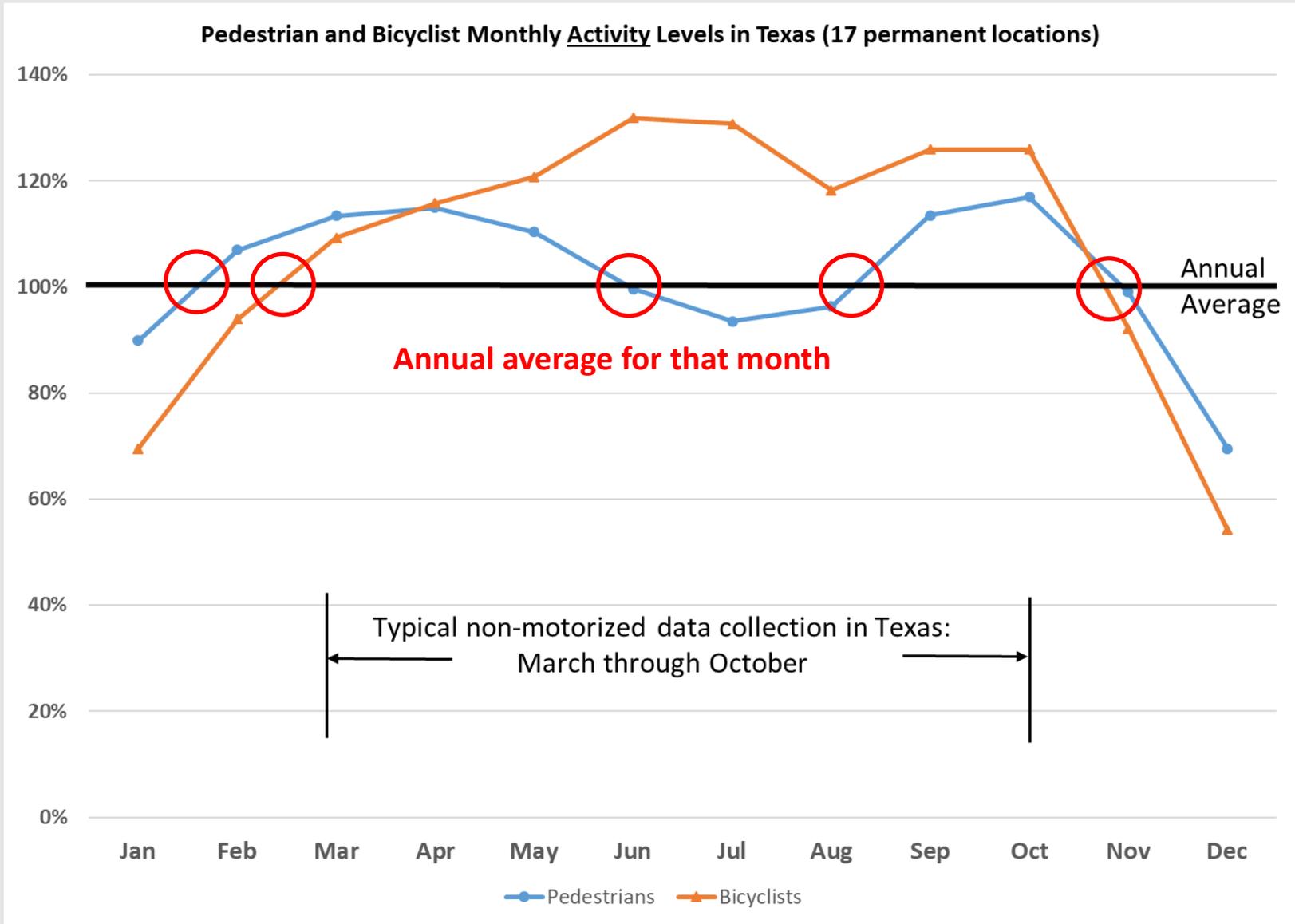




- Portable equipment for loan:
  - 10 infrared counters
  - 8 pneumatic tube counters (bikes)
- Available for:
  - TxDOT districts
  - Local agencies
  - Others as available

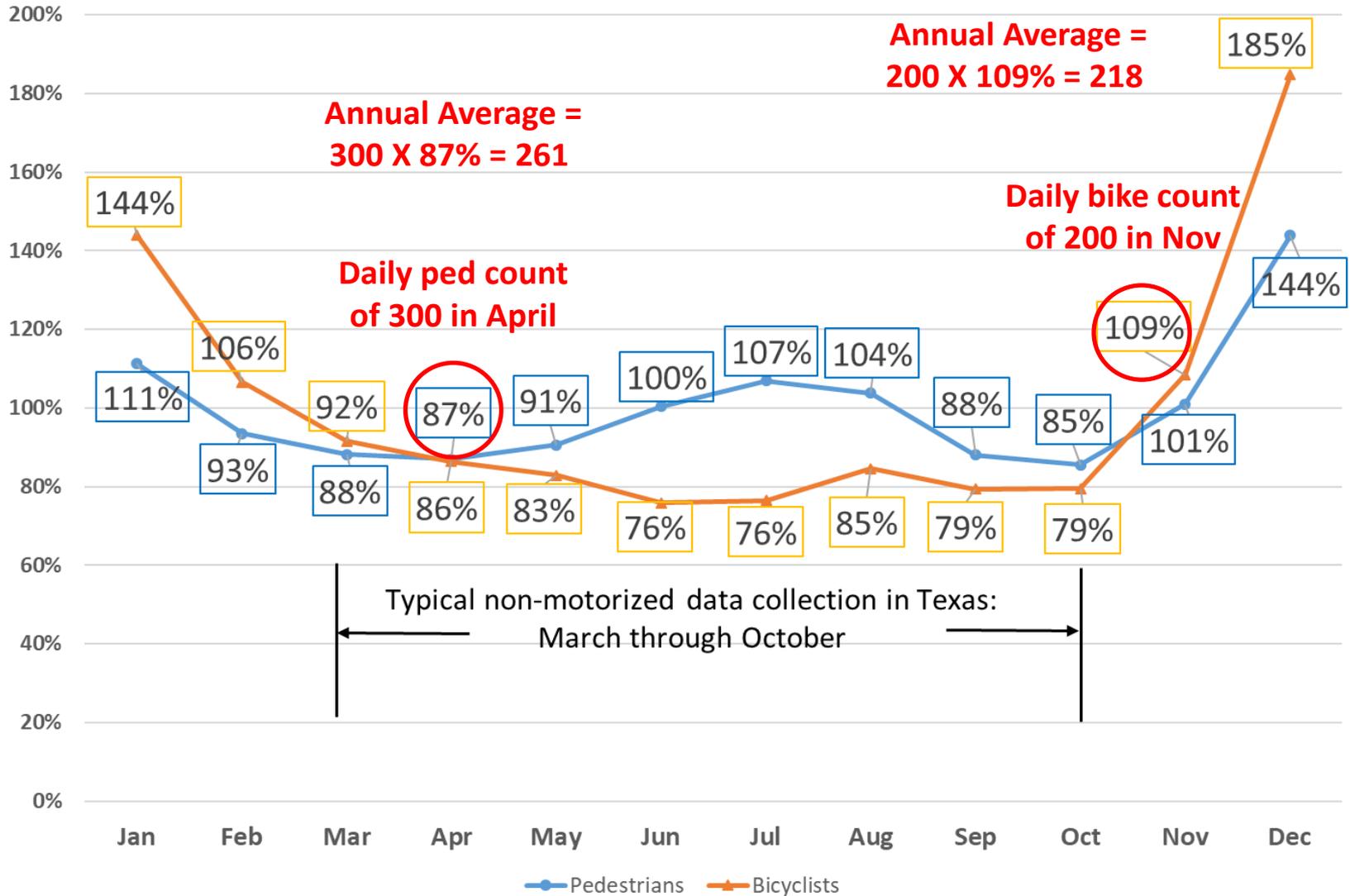


# Seasonal variation and adjustment





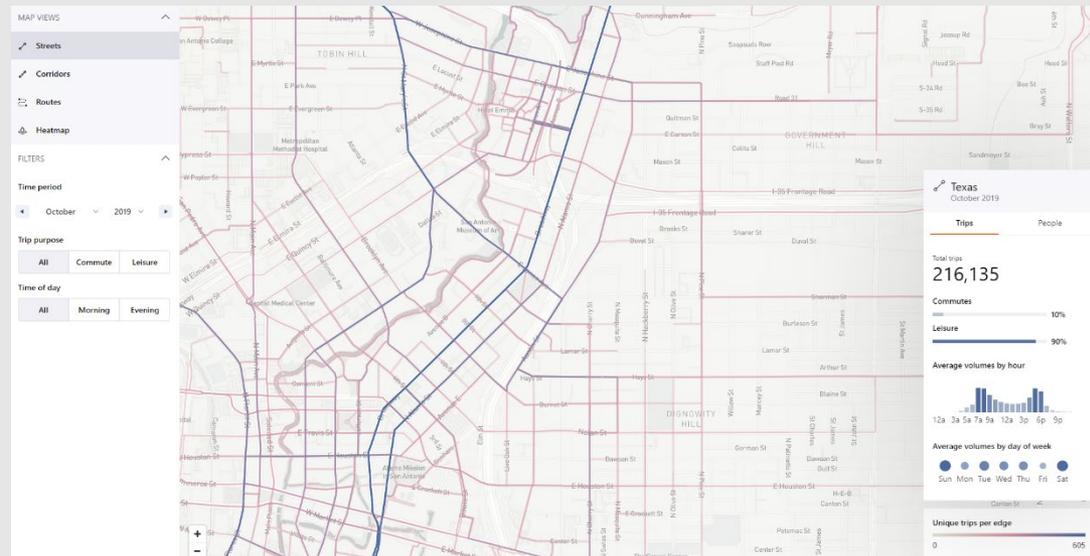
Pedestrian and Bicyclist Month-of-Year Count Adjustment Factors in Texas





- Crowdsourced = location of a person walking or biking
- Strava Metro – user-prompted data collection (active)
- StreetLight Data and others – background data collection (passive)

- TxDOT licensed 4 years of statewide Strava Metro
  - 2016-2019
- Local entities have free access through sublicense
- New online analytic interface!





- Different Strava sample rates on different types of routes
  - Non-recreational routes: <1% of all bicyclists
  - Highly recreational routes: 50%+ of all bicyclists
  
- Estimate total bicyclists based on readily-available and most influential prediction variables:
  - Open Street map (OSM) functional road class
  - High-income households
  - 30% mean absolute error,  $R^2=70\%$

*Functional Classification (CLAZZ in Strava Metro's network data from Open Street Map)*

Highway, primary (15)	$AADB_t = 63 \times (\exp(AADB\ Strava_t))^{0.038} (\exp(\text{Household} > 200K_t))^{0.002}$
Highway, secondary (21)	$AADB_t = 13 \times (\exp(AADB\ Strava_t))^{0.038} (\exp(\text{Household} > 200K_t))^{0.002}$
Highway, tertiary (31)	$AADB_t = 22 \times (\exp(AADB\ Strava_t))^{0.038} (\exp(\text{Household} > 200K_t))^{0.002}$
Highway, residential (32)	$AADB_t = 17 \times (\exp(AADB\ Strava_t))^{0.038} (\exp(\text{Household} > 200K_t))^{0.002}$
Highway, path (72)	$AADB_t = 72 \times (\exp(AADB\ Strava_t))^{0.038} (\exp(\text{Household} > 200K_t))^{0.002}$
Cycleway (81)	$AADB_t = 62 \times (\exp(AADB\ Strava_t))^{0.038} (\exp(\text{Household} > 200K_t))^{0.002}$
Footway (91)	$AADB_t = 28 \times (\exp(AADB\ Strava_t))^{0.038} (\exp(\text{Household} > 200K_t))^{0.002}$



Guide for Seasonal Adjustment  
and Crowdsourced Data Scaling

**Report 6927-P6**



- TxDOT 6927 Reports, 2018-2019
  - Final Project Report: <https://tti.tamu.edu/documents/0-6927-R1.pdf>
  - Guide for Seasonal Adjustment and Crowdsourced Data: <https://tti.tamu.edu/documents/0-6927-P6.pdf>
  
- PBIC Infobrief, 2018
  - [http://www.pedbikeinfo.org/cms/downloads/PBIC\\_Infobrief\\_Counting.pdf](http://www.pedbikeinfo.org/cms/downloads/PBIC_Infobrief_Counting.pdf)
  
- FHWA Traffic Monitoring Guide, 2016
  - <https://www.fhwa.dot.gov/policyinformation/tmguide/>
  
- NCHRP Report 797, 2014
  - <http://www.trb.org/Main/Blurbs/171973.aspx>

# Summarizing, Reporting, Visualizing Your Data

Phil Lasley, TTI





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

*All these weaken the effort to make meaningful decisions with the 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).
- Builds a robust dataset to support research and analysis, such as exposure estimates, crowd-sourced data validation, and performance measures.

# Live Demo of the BP | CX





- 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.
  - On-board and train local contributors to QA/QC data.
- In the future:
  - Use AI to automate most of the QC process.
  - Improve data management tools.
  - Implement user-suggested improvements.



- 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 .
- Ability to embed interface on local webpages.
- 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).



- Bonnie Sherman
  - [Bonnie.Sherman@txdot.gov](mailto:Bonnie.Sherman@txdot.gov)
  - (512) 486-5972
- Michael Martin
  - [M-Martin@tti.tamu.edu](mailto:M-Martin@tti.tamu.edu)
  - (979) 317-2469
- Shawn Turner
  - [S-Turner@tti.tamu.edu](mailto:S-Turner@tti.tamu.edu)
  - (979) 317-2481
- Phil Lasley
  - [P-Lasley@tti.tamu.edu](mailto:P-Lasley@tti.tamu.edu)
  - (512) 407-1113

