Pedestrian and Bicycle Counting Programs

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March 18, 2015

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Today's presenters

Tony Hull, Nonmotorized Transportation Consultant

Zlatko Krstulic, P. Eng., Senior Project Manager, City of Ottawa

Tracy Hadden Loh, Ph.D., Director of Research, Rails-to-Trails Conservancy

Luis F. Miranda-Moreno, Ph.D., Associate Professor, McGill University

Krista Nordback, Ph.D., P.E., Postdoctoral Research Associate, TREC, Portland State University

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Today's presenters

Tony Hull is a Nonmotorized Transportation Consultant with over 15 years of experience in the planning, design and evaluation of active transportation projects. Tony's work includes extensive experience overseeing the development and implementation of pedestrian and bicycle count programs in the states of Delaware, Minnesota and Ohio. Most recently Tony served as a key researcher and co-author of the NCHRP 797 Guidebook on Pedestrian and Bicycle Volume Data Collection. He is a graduate of the Ohio State University, serves on the TRB Committee on Pedestrians and is a long time member of APBP. He is currently an independent consultant residing in Minneapolis, Minnesota where it is never too cold for a nice walk or bicycle ride.

Today's presenters

As part of the Strategic Transportation Planning unit at the City of Ottawa, **Zlatko Krstulic**, P. Eng., has been involved in the design and implementation of cycling infrastructure across the city. He was responsible for development of network concepts and policies within the 2013 Ottawa Cycling plan, and is currently engaged in the implementation phase. Zlatko is active in provincial technical standards and policy initiatives, including OTM Book18 (Cycling Facilities), as well as participating on the Ministers' Cycling Strategy Working Group. He is interested in policy issues related to the promotion of Active Transportation, as well as cycling trends analysis.

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Today's presenters

Tracy Hadden Loh, Ph.D., knows firsthand the challenges faced by people who use wheels or feet as their primary mode of transportation. On her very first day of work at Rails-to-Trails Conservancy, she was struck by a minivan while cycling home. Fortunately, she made a complete recovery. But her experience pressed home the importance of encouraging development that safely accounts for bicyclists and pedestrians. She is a founder of All Walks DC, her local pedestrian advocacy group. Tracy holds a doctorate in city and regional planning from the University of North Carolina at Chapel Hill. She is the director of research at RTC where she leads development of the Trail Modeling and Assessment Platform (T-MAP).

Today's presenters

Professor **Luis F. Miranda-Moreno**'s specialty is in transportation engineering with a focus on road safety, traffic monitoring and demand modeling, and sustainable transport strategies. His research interests include the development of crash-risk analysis methods, the integration of emergency technologies for traffic monitoring, the impact of climate on transportation systems, the analysis of short and long-term changes in travel demand, the impact of transport on the environment, the evaluation of energy efficiency measures and non-motorized transportation.

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Today's presenters

Krista Nordback, Ph.D., P.E. is a research associate at the Transportation Research and Education Center (TREC) at Portland State University, focusing on bicycle and pedestrian traffic and cyclist safety. She earned her doctorate in civil engineering from the University of Colorado Denver, master's from University of Minnesota, and bachelor's from Massachusetts Institute of Technology. Her doctoral dissertation developed a new method for estimating bicycle traffic and provides the first safety performance functions for bicyclists at signalized intersections in the U.S. She has researched non-motorized traffic counting technologies and programs for Colorado, Washington, and Oregon DOTs.

APBP Webinar March 18, 2015

Tony Hull

OVERVIEW: BICYCLE & PEDESTRIAN COUNTING STATE OF PRACTICE

NCHRP 7-19 *Methods and Technologies for Collecting Pedestrian and Bicycle Volume Data*

Project and Guidebook Overview

Research Team

- Kittelson & Associates, Inc.
- University of Wisconsin—Milwaukee
- UC Berkeley, SafeTREC
- Toole Design Group
- McGill University
- Quality Counts, LLC

Learning Objectives

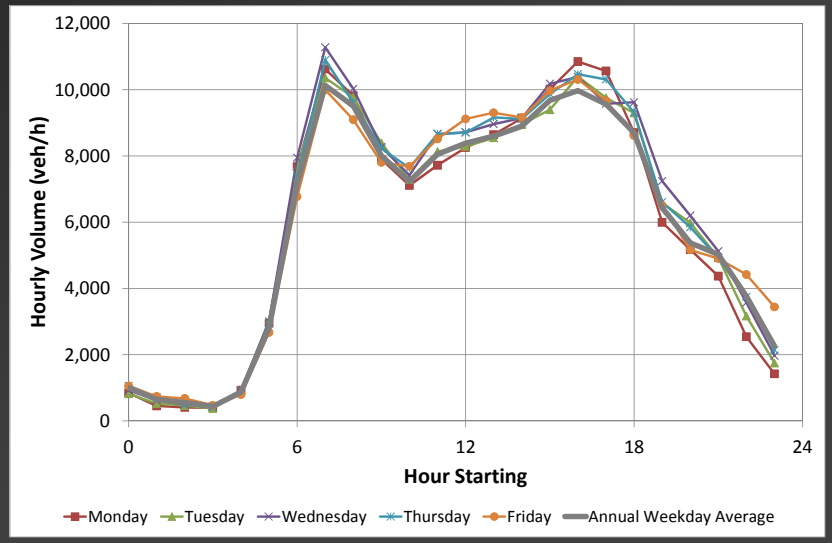
- How to use NCHRP Report 797 as a resource for supporting a non-motorized count program
- Applications for non-motorized count data
- Relative strengths and weaknesses of 14 non-motorized counting methods and technologies
- How to correct and adjust non-motorized count data
- How to develop local correction factors for your own counting equipment and count sites

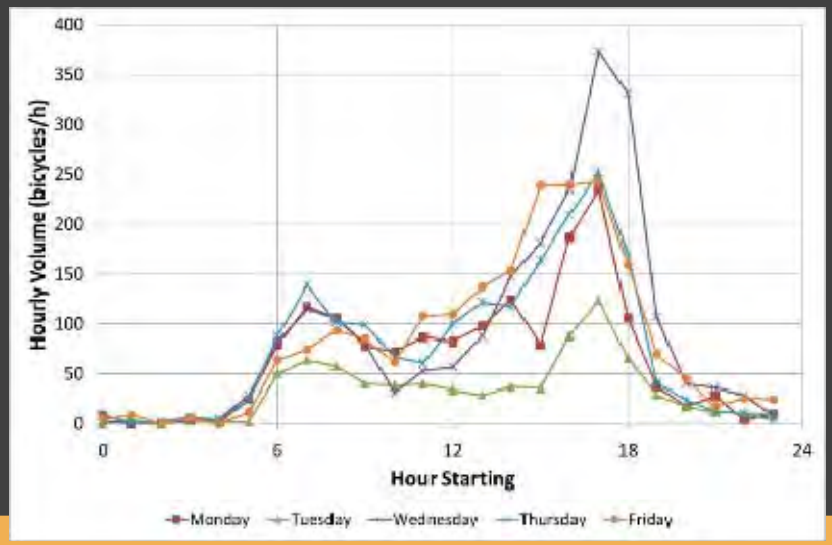
NCHRP 7-19 Project Purpose

- Address lack of pedestrian and bicycle volume data
- Assess data collection technologies and methods
- Develop guidance for practitioners

Key Differences: Motorized & Non-motorized Counting

- Pedestrian and bicycle volumes are more variable than motorized vehicle volumes
  - Relatively low ped/bike volumes relative to auto volumes
  - Weather effects





Auto (top) and bike (bottom) volumes on freeway and nearby shared path in Minneapolis
Sources: MnDOT, NCHRP 07-19 counting

Key Differences: Motorized & Non-motorized Counting

- Motor vehicles tend to be easier to detect than pedestrians and bikes
  - Cars: large, separated metal objects in lanes
  - Peds & bikes:
    - Smaller objects
    - May travel in groups
    - May travel outside designated spaces
    - Peds and bikes may use same facility

Source: NCHRP 07-19 data collection videos

Motor Vehicle Data Collection

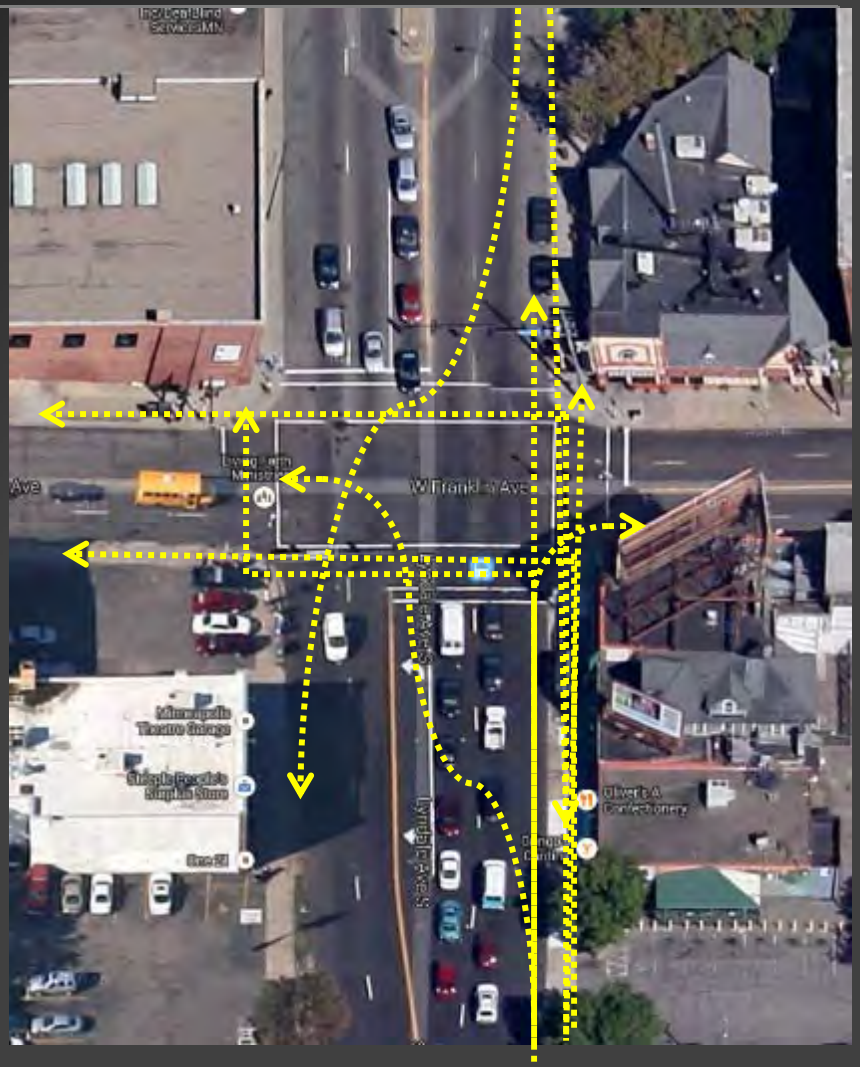
Constrained; somewhat predictable

Source: Tony Hull

Bicycle Data Collection

Constrained environments easy to monitor

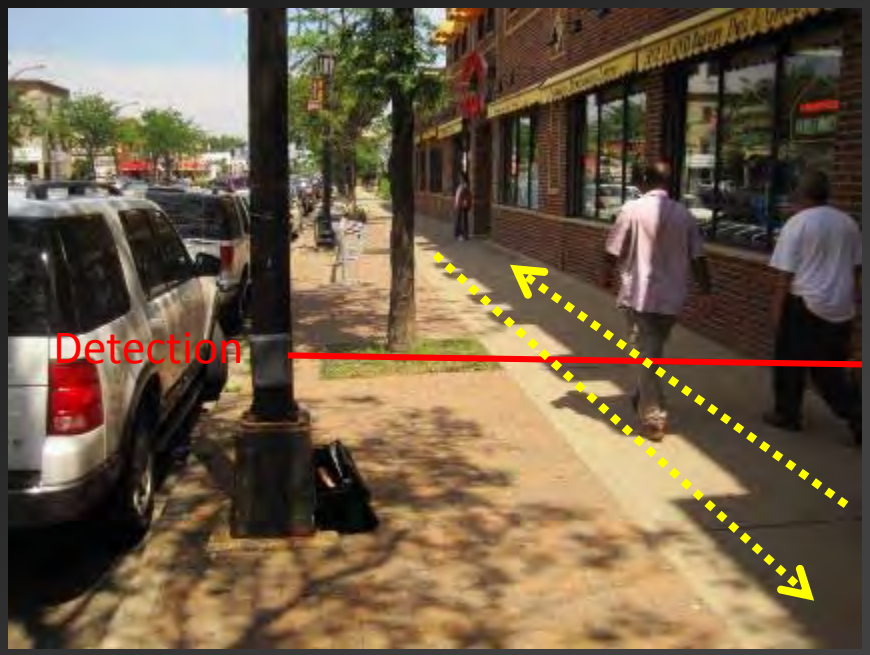
Complex environments harder to define



Source: Tony Hull

Pedestrian Data Collection

Constrained environments easy to monitor



People tend to make their own path

Source: Tony Hull

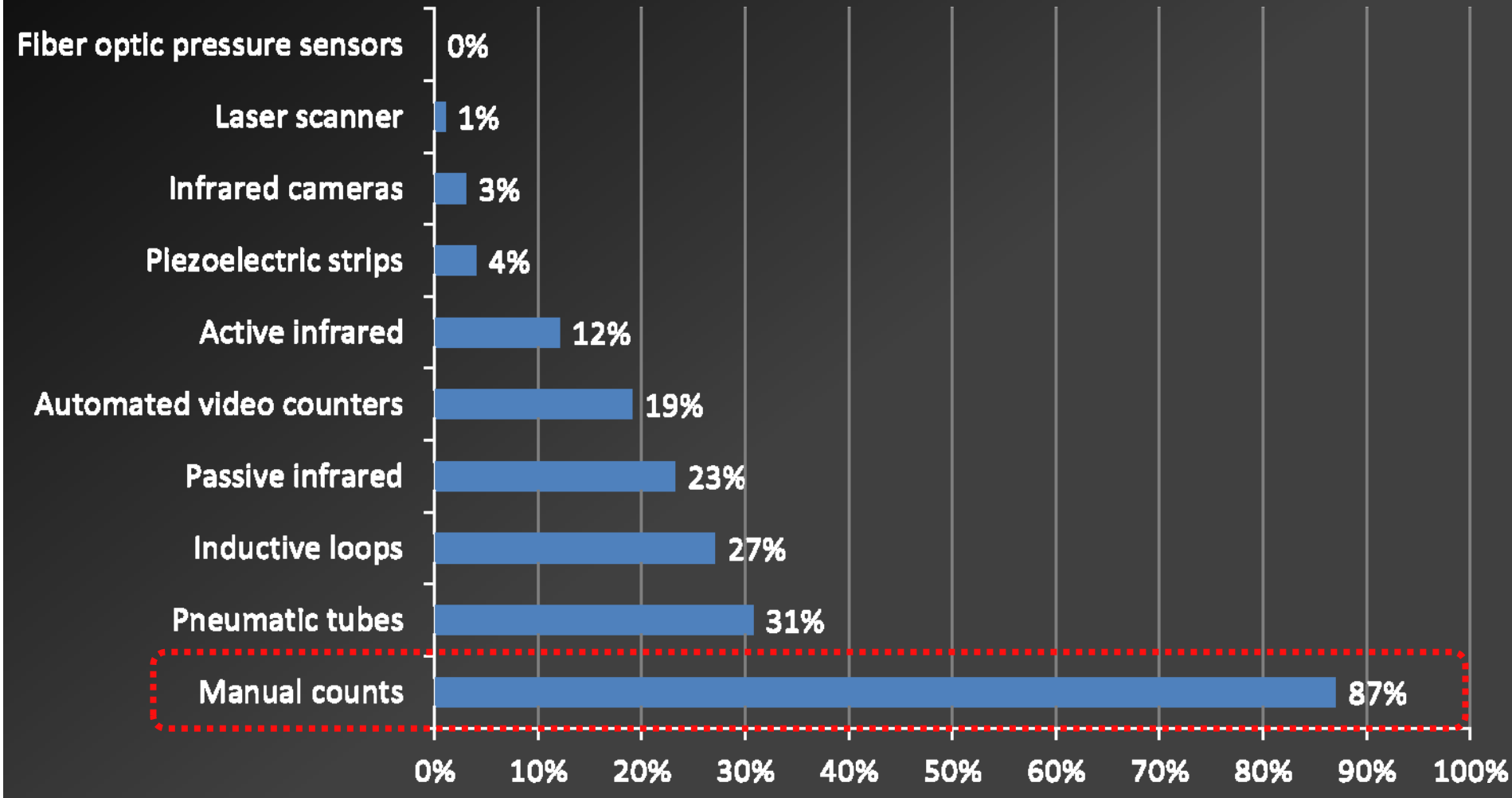
NCHRP 7-19 Research Approach

- Conduct literature review
- Develop work plan
- Survey and outreach
- Field test counting technologies and methods
- Produce guidance document for practitioners

NCHRP 7-19 Key Survey Findings

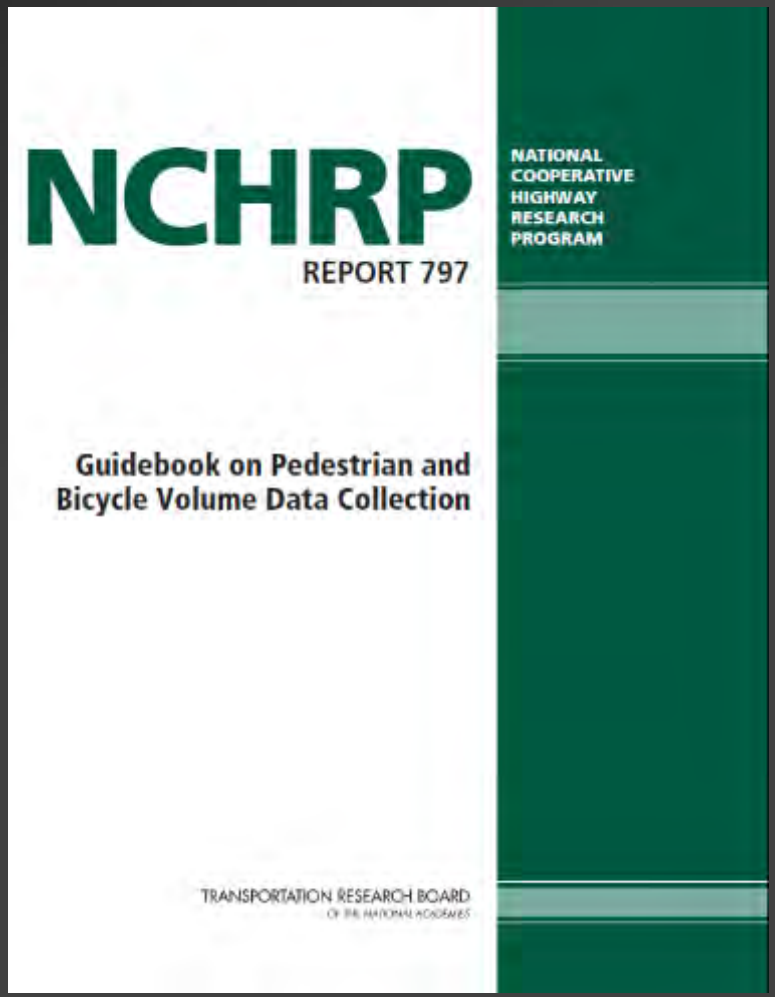
- There is no standard approach for initiating a count program
- Practitioners are looking for more guidance
  - Choosing devices
  - Selecting locations
  - Count intervals and duration
  - Temporal/seasonal adjustments

Reported Methods of Counting



Products

- NCHRP Report 797
  - Guidance for practitioners
- NCHRP Web-only Document 205
  - Documentation of the research effort



Final Report (NCHRP WoD 205) Contents

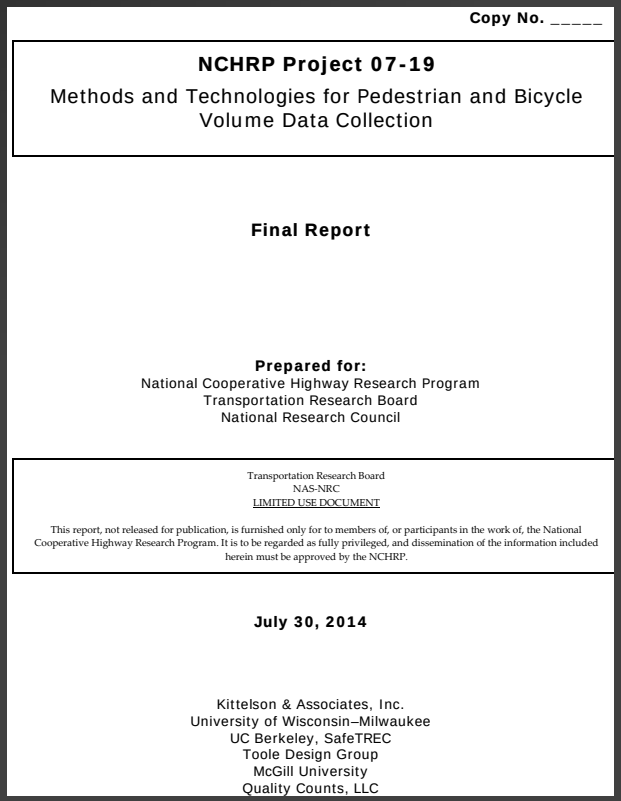
1. Project Background
2. State of the Practice
   - Literature review, survey results
3. Research Approach
   - Counting technology, test site selection
4. Findings & Applications
   - Detailed testing results
5. Conclusions & Suggested Research

Appendices

Practitioner survey form

Practitioner survey results

Non-motorized count programs described in the literature



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NCHRP Project 07-19

Methods and Technologies for Pedestrian and Bicycle Volume Data Collection

Final Report

Prepared for:
National Cooperative Highway Research Program
Transportation Research Board
National Research Council

Transportation Research Board
NAS-NRC
LIMITED USE DOCUMENT

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July 30, 2014

Kittelson & Associates, Inc.
University of Wisconsin–Milwaukee
UC Berkeley, SafeTREC
Toole Design Group
McGill University
Quality Counts, LLC

Guidebook (NCHRP Report 797) Topics

- Count applications & case studies
- Overview of Planning and implementing a count program
- Correction factors for raw count data
- Expanding short-term count data to estimate longer-duration volumes
- Typical applications, strengths/limitations, relative cost, installation needs, and accuracy of count technologies

Guidebook (NCHRP Report 797) Contents

Quick Start Guide

1. Introduction
2. Non-Motorized Count Data Applications
3. Data Collection Planning and Implementation
4. Adjusting Count Data
5. Sensor Technology Toolbox

Appendices

- *Case Studies*
- *Manual Pedestrian and Bicyclist Counts: Example Data Collector Instructions*
- *Count Protocol Used for NCHRP Project 07-19*
- *Day-of-Year Factoring Approach*

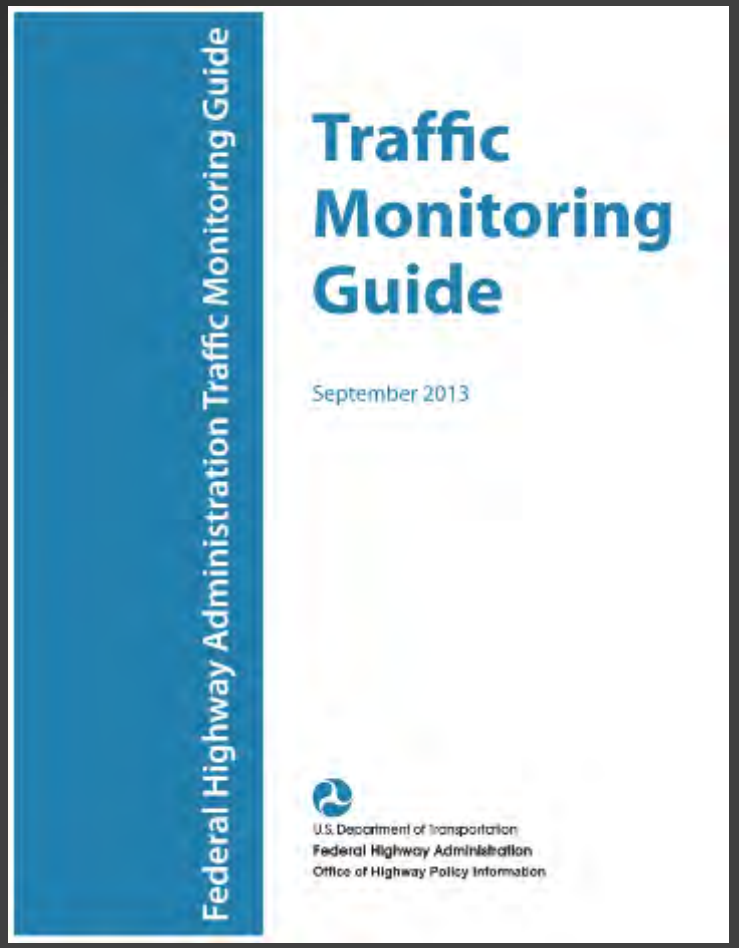
Related Topics Not Covered

- Product-specific (by name) results
- Sampling and forecasting methods
  - Bluetooth and WiFi detection
  - GPS data collection
  - Radio frequency ID (RFID) tags
  - Bike sharing data
  - Pedestrian signal actuation buttons
  - Surveys
  - Presence detection
  - Trip generation

Sources: SFCTA CycleTracks app (top), Paul Ryus (bottom)

Related Work

- FHWA Traffic Monitoring Guide (TMG)
  - 2013 edition includes chapter on non-motorized traffic
  - Guidance on data reporting formats
  - NCHRP research complements FHWA guide



Thank you!

Tony Hull
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Photo by Tony Hull

Ottawa's Cycling Trends Analysis Program



City of Ottawa
•Zlatko Krstulic, P. Eng.

McGill
•Dr. Luis F. Miranda-Moreno
•David Beitel

APBP Webinar; March 18 2015

Agenda

- Ottawa Overview
  - *our bike counter network*
- Tracking Cycling Data
  - *for performance reporting*
- Changing Perceptions, Developing new insights
  - *to shift attitudes and support strategic goals*
- Next Steps

About the City of Ottawa

- Federal, NCC, Municipal
- Population: 912,000 (2010) → 1,136,000 (2031)
- Area: 2,796 km2 (urban, suburban, rural)
- Formal Greenbelt

Cycling Plan Context

- Ottawa is a growing City; new sub-divisions outside the green-belt, intensification inside the Greenbelt.
- Major investments in cycling ($28M for 2011-2014).
- New cycling-supportive policies approved.
- Aggressive cycling modal share targets set for 2031.

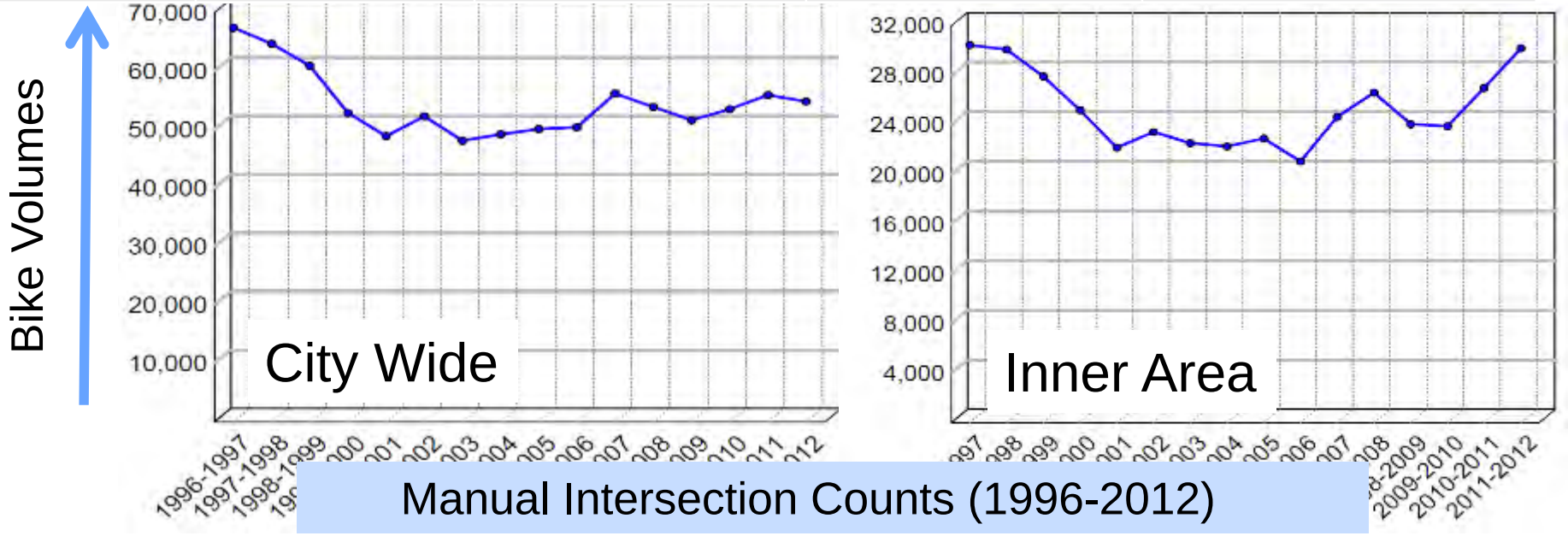
The Tide Turns

Figures from 2011 O/D survey

- Recent, significant increases in cycling activity.
- Cycling is gaining modal share inside the Greenbelt.
- Outside the Greenbelt, cycling trips are not growing as fast as vehicular travel.

Available Data on Cycling Rates

	Origin/ Destination Survey	StatsCan Household Survey	Intersection Counts	Bike Counters
Frequency	2011, 2005, 2000, 1995	2011, 2006, 2001, 1996	Biannually / annually (scan-lines)	Full-time cycling season, some winter counters
Methodology	Telephone sampling	Mail-in	Student manual counts, 8hr	Automated Counts
Coverage	City-wide	City-wide	City-wide	18 sites (inside Greenbelt)



Manual Intersection Counts (1996-2012)

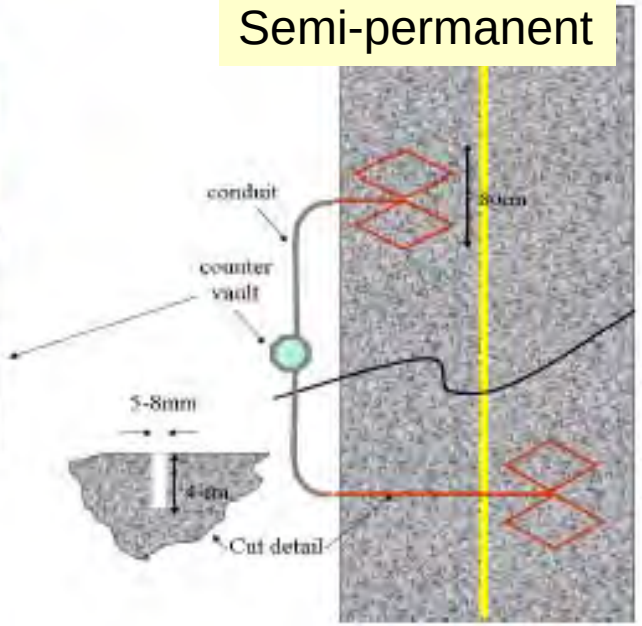
Expanding Bike Counter Network

Annual Counts	2009	2010	2011	2012	2014	2016
Counter Sites (Active)	1	2	6	8	15	18
Bike Passes Counted (Millions)	0.2	0.6	1.3	2	3	4

Automated Bicycle Counters

- A means of *continuously* tracking every bicycle trip, all year, at a limited number of sites.
- Count locations can exceed active counters, and counters moved to sites as needed.
- Proven Accuracy (over 95%), repeatability is even higher.
- Portable Counters can generate complementary high-resolution data over periods of a few weeks.

Permanent or Semi-permanent



Automated Bicycle Counter Deployments

All- Season counters

On-road bike lanes

Pathways or Bike Tracks

Planned

Existing

Hemlock 2013

Sussex Plan: 2015

Alexandra Bridge Start: June/'09

Laurier SBL Start: Jul/'11

E. Canal Pathway Start: Feb/'10

Portage Bridge 2013

W. Canal Pathway Start: 2012

Ottawa River Pathway Start: Mar/'10

Trillium Pathway 2013

Somerset 2011

A joint project by local cycling advocacy group, (Citizens for Safe Cycling), the National Capital Commission, the City of Ottawa and with funding support from TELUS

Why we have a Bike Counting Program

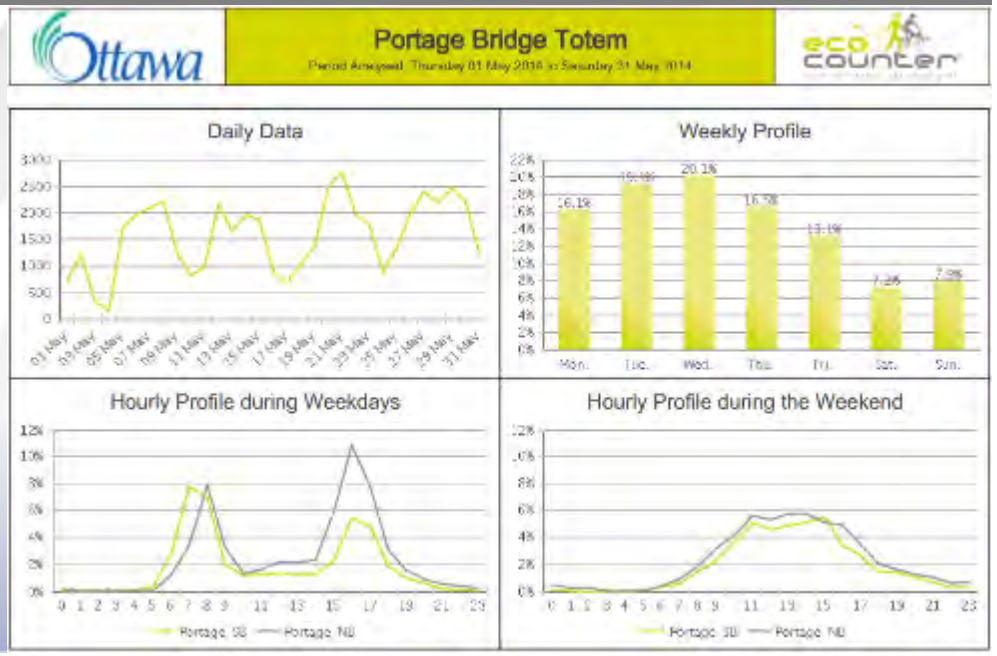
Data Collection/Analysis:

- Measure year/year changes in cycling rates
- Track performance of individual cycling projects
- Improve accuracy of related measures

Strategic:

- Shift public/stakeholder perceptions
- Develop new insights
- Build credibility for ambitious modal-shift targets

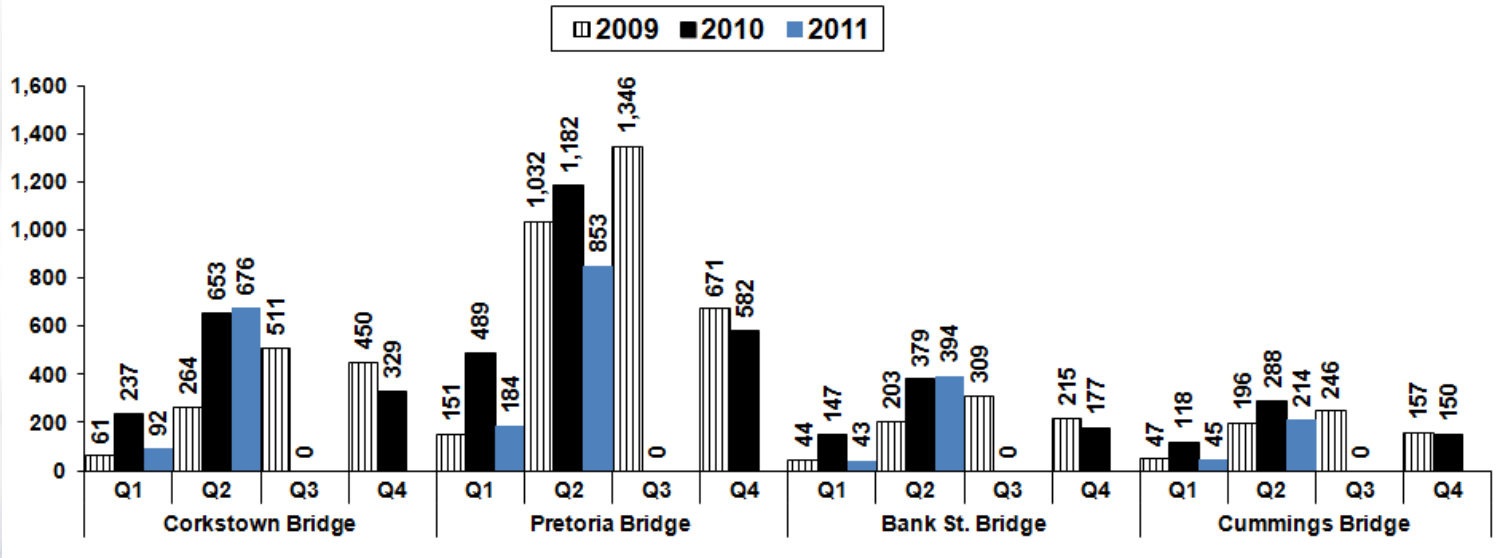
2 Tracking cycling data



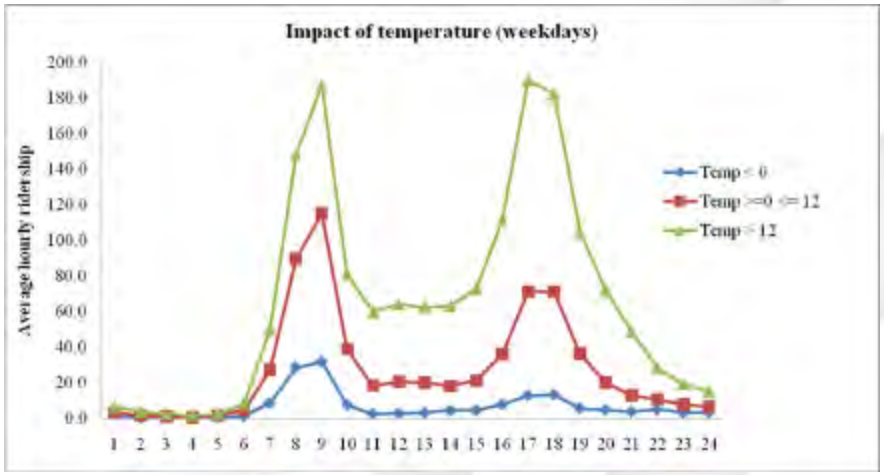
Developing year/year Trend Data

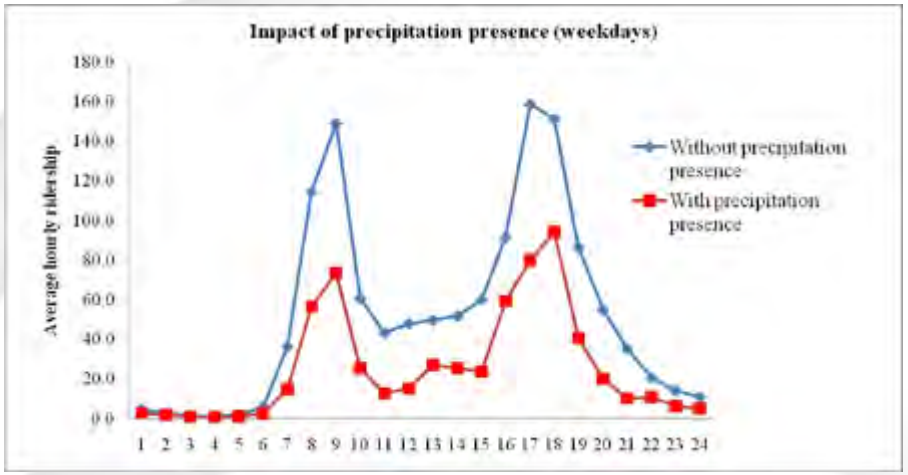
- City Council; Are cycling investments working?
  - Cycling added to quarterly performance measures
  - Cycling added as Strategic Measure, a part of Council priorities

- Staff need to find a way to track changes in cycling travel behaviours, *not weather.*



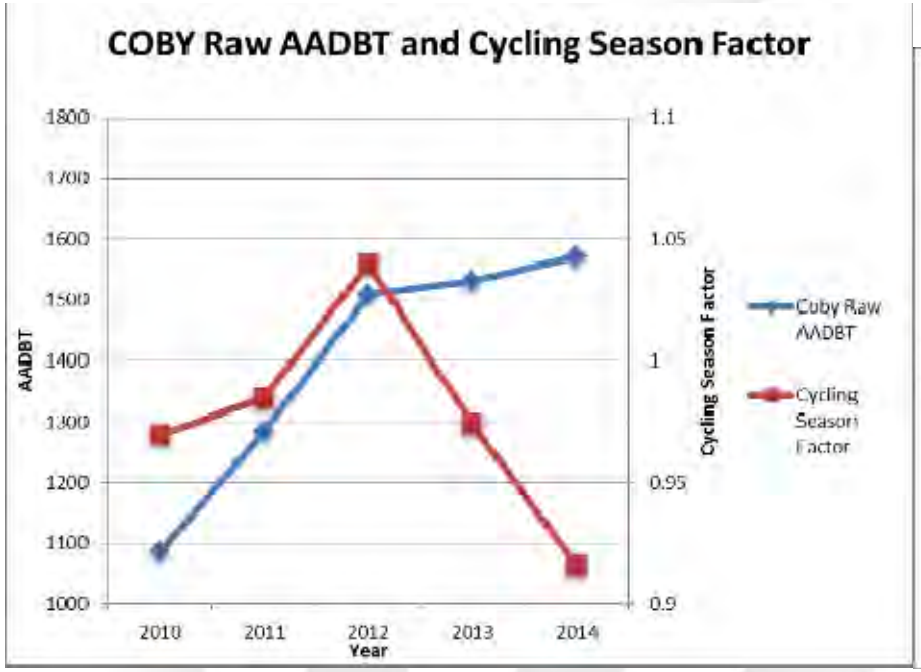
Modeling Weather Impacts

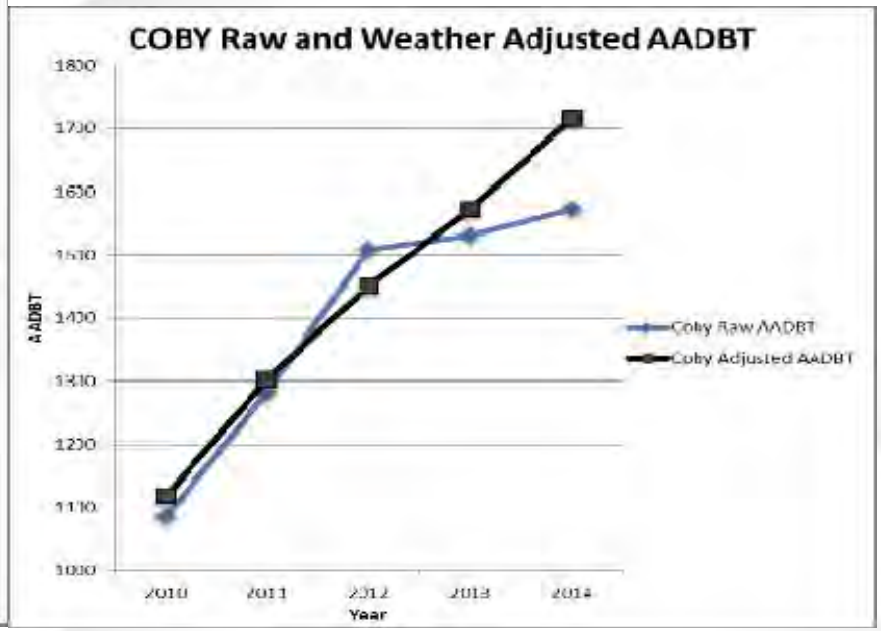




- The response to weather by Ottawa cyclists can be modeled
- Strong correlation between daily weather and cycling activity across all counters
- Changes in weather ‘hardiness’ of Ottawa cyclists can be tracked as an independent cycling trend component

Correcting for Weather Impacts





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Tracking Individual Projects

- Laurier Segregated Bike Lane Pilot.
- Major Pedestrian Cycling bridges/tunnels
- New “Complete Streets” -- bike tracks on Churchill and Main Streets.
- Pre-analysis of existing conditions -- balancing bike/pedestrian needs in critical areas.

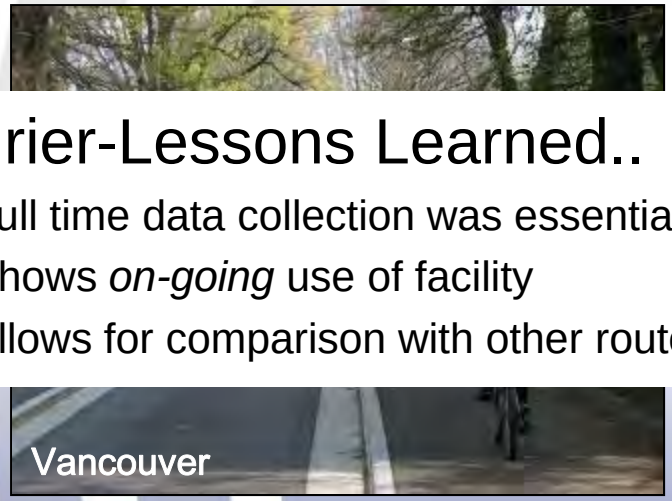
Monitoring and Evaluation

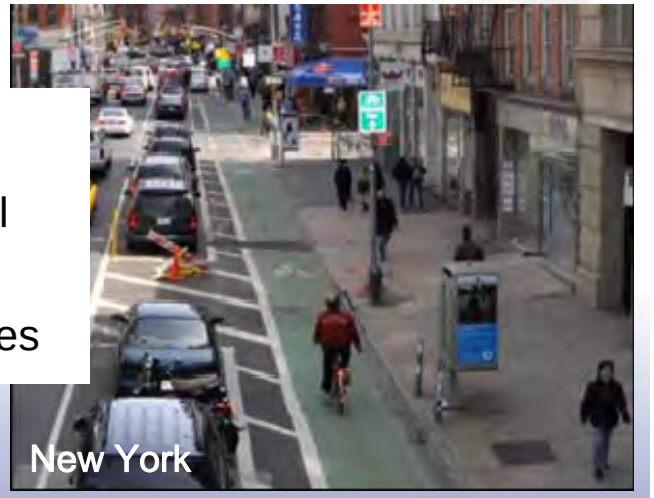
On-Going Performance Monitoring

- Regular communication with stakeholders
- On-going monitoring using existing intersection traffic cameras
- Automated bicycle counters with Quarterly Performance Reports to Council

Pilot Evaluation

- *Traffic Impact Assessment Report* - To determine transportation impacts (travel times, intersection LOS, parking, traffic safety, accident reports, etc.)
- *Surveys* - To determine stakeholder impacts (street-level retail businesses, office towers, hotels, property management companies, taxi companies, school bus companies, street vendors, courier services, etc.)

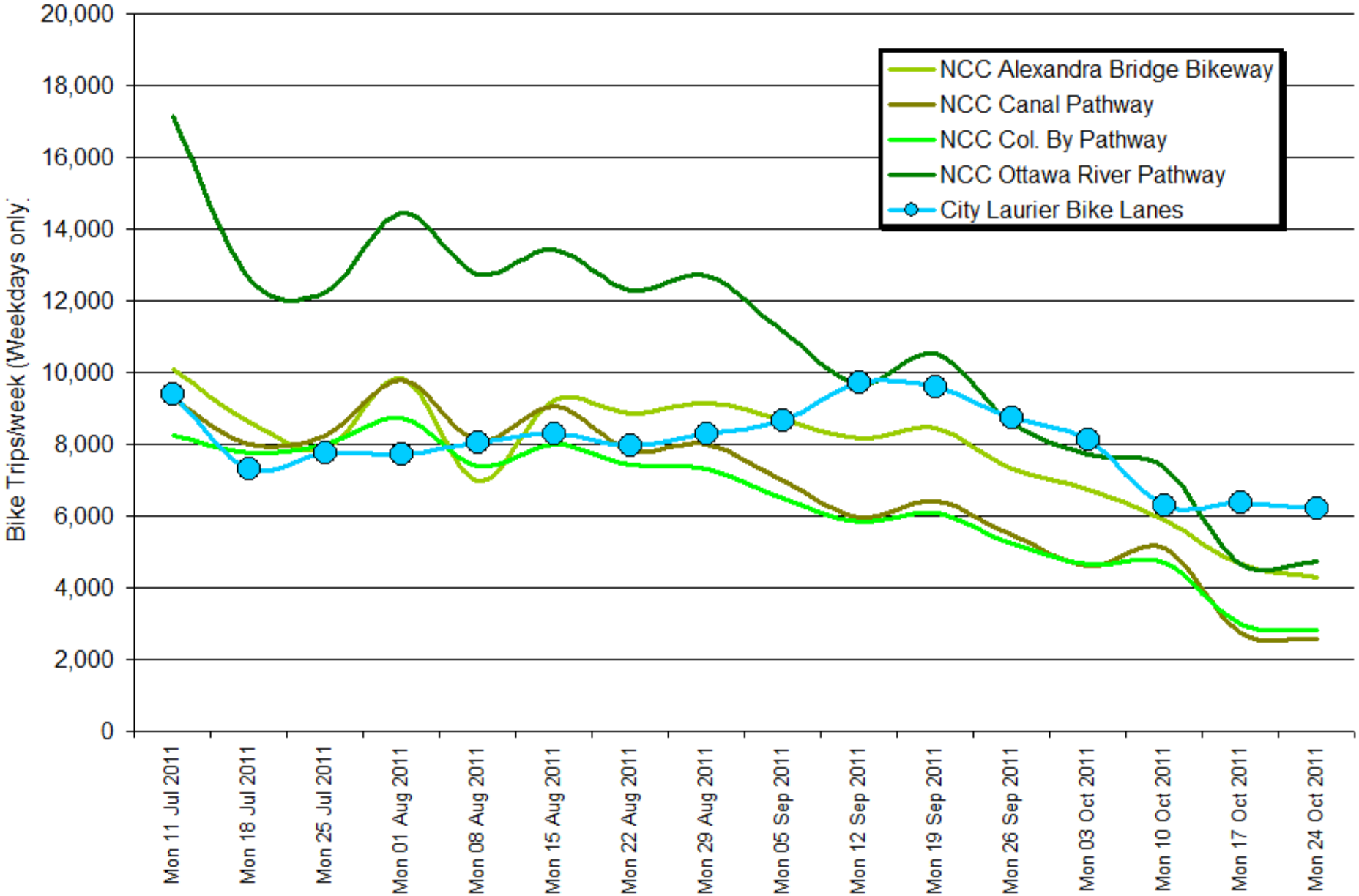




Laurier-Lessons Learned..

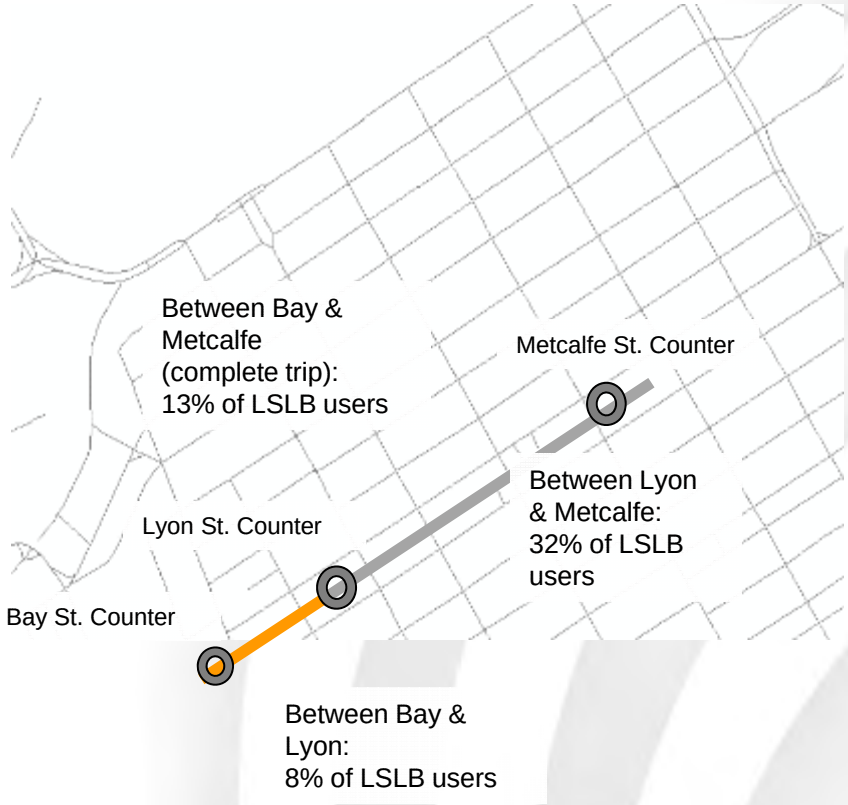
- ❑ Full time data collection was essential
- ❑ Shows *on-going* use of facility
- ❑ Allows for comparison with other routes

Supporting Performance/Impacts analysis
Example: Laurier Segregated Bike Lane counts

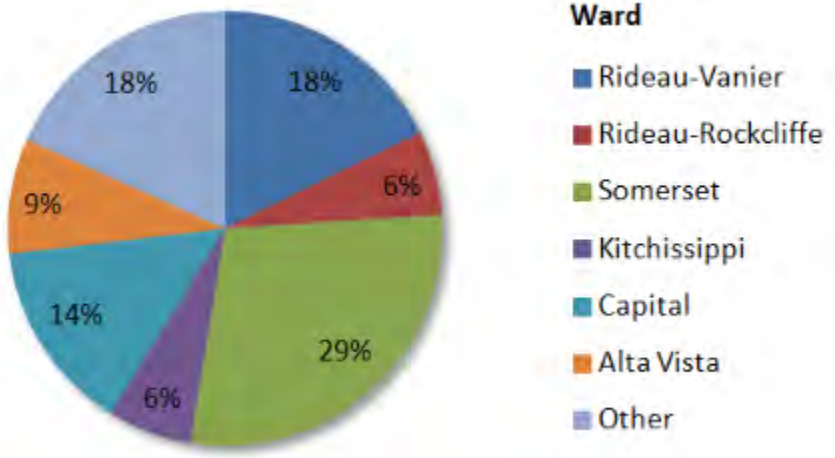


MetroQuest Cycling Survey

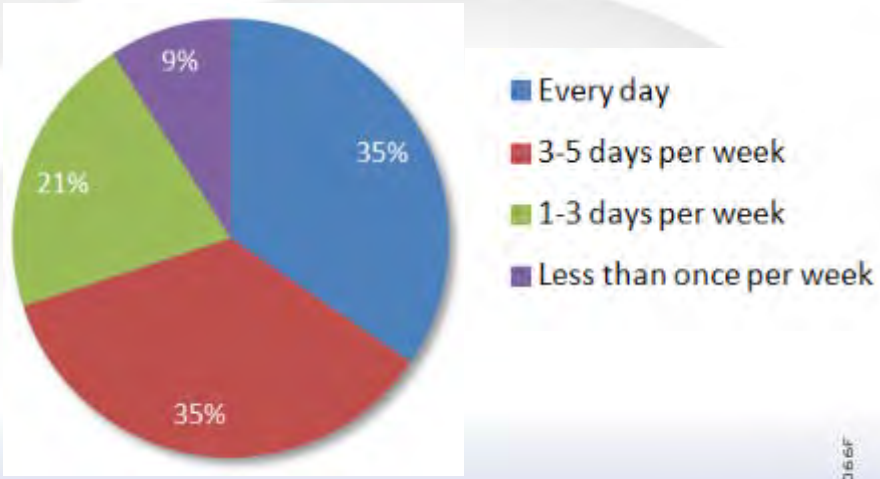
Laurier Bike Lanes



Laurier Bike Count Distribution (three Count Sites)



Laurier Bike Lane Users, by Ward of Origin



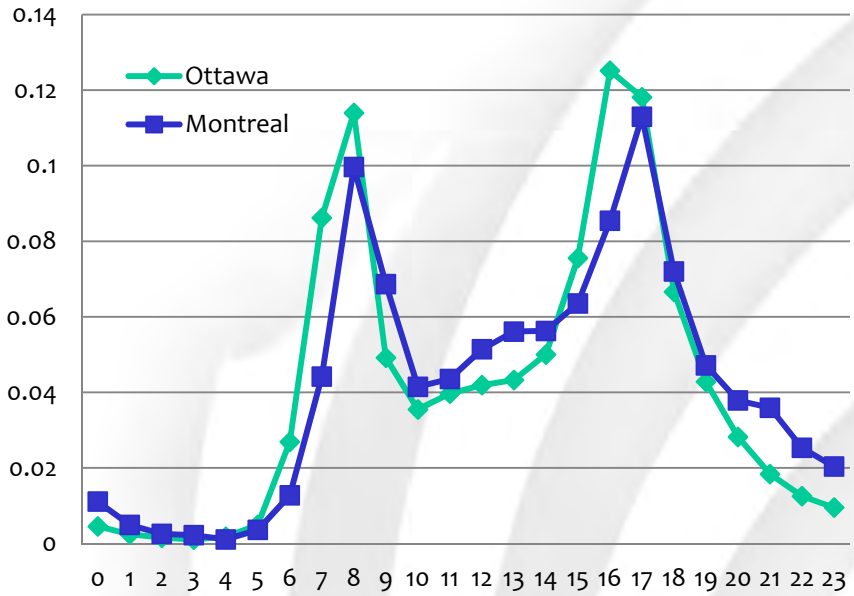
Laurier Bike Lane Users, By frequency of usage

Improve Accuracy of Transportation Measures

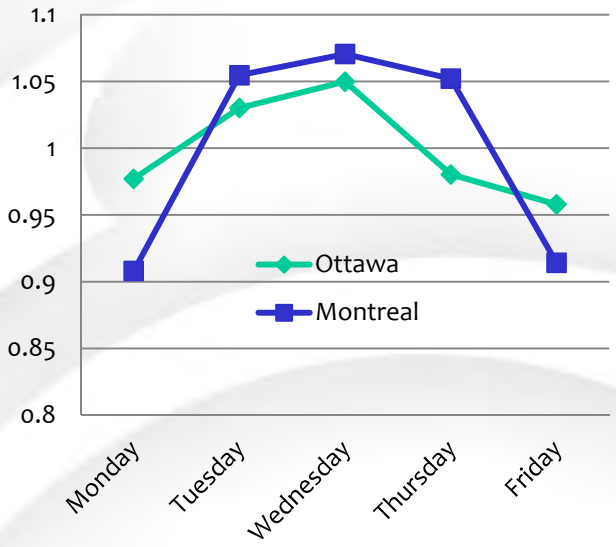
- Multi-modal monthly expansion factors
- Cycling expansion factors (peak,8hr,12hr,day)
- Correcting single day manual Bike Counts
- Seasonal expansion for Origin/Destination surveys
- Weather correction for Origin/Destination survey
- Transit parked-bike count normalization (for weather, day of season)

Expansion Factors for Cycling

Weekday Hourly Expansion Factors



Daily Expansion Factors



Origin/Destination Survey:

- Unsolicited telephone survey.
  - Question: Where/how/when did each person in your household travel yesterday?
- Covers all modes, including multi-modal trips.
- Results represent a typical fall work-day with schools in session.

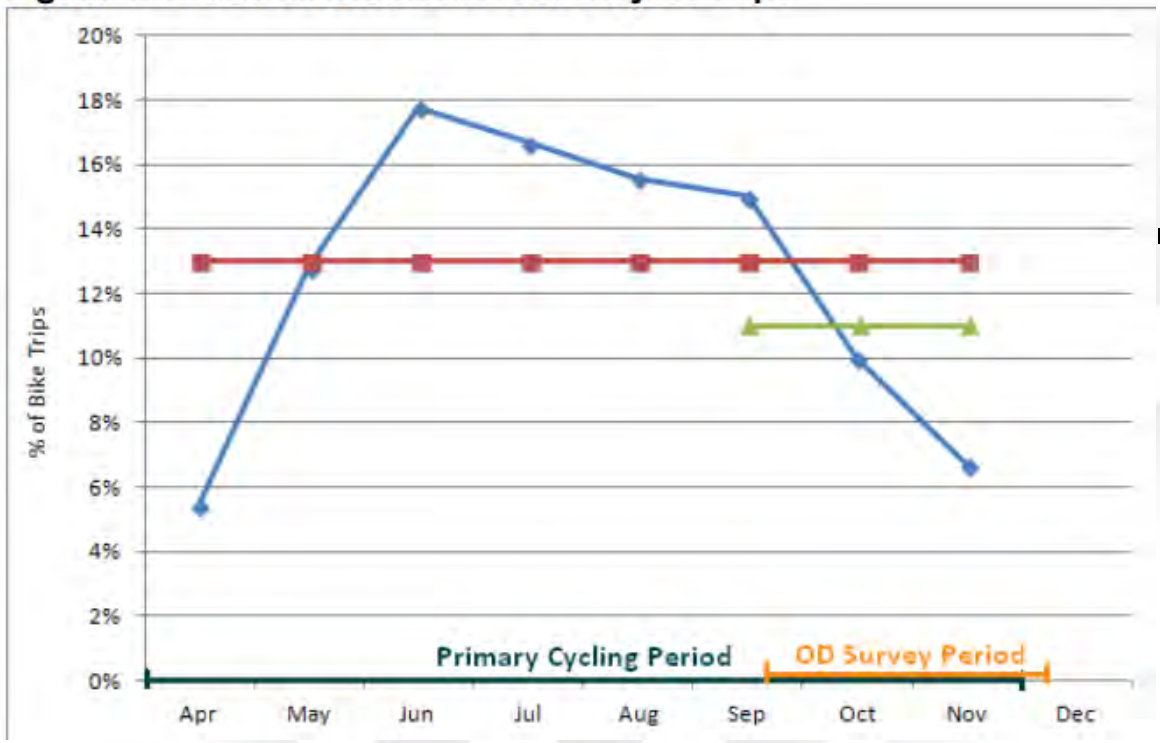
"...Current 'gold standard' for measuring Transportation Modal Shares..."

Ottawa

Survey occurs at onset of winter...

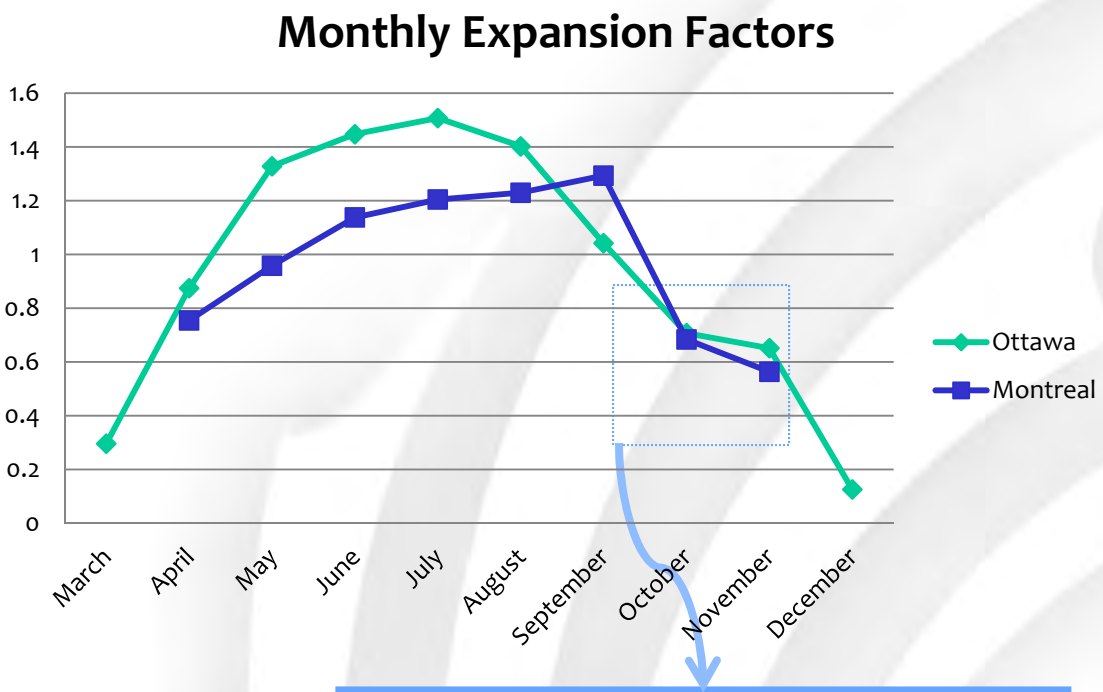
Bicycle Profile
2011 Origin-Destination Survey

Figure 1: Seasonal Distribution of Bicycle Trips



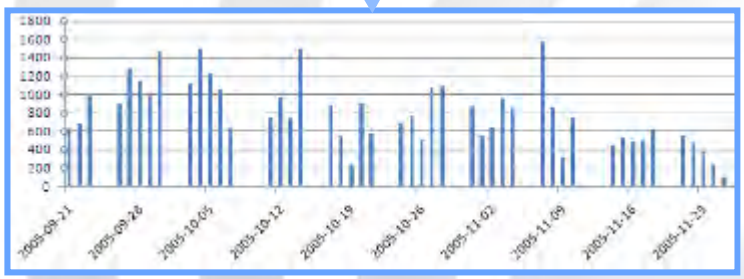
- Fall survey conditions under-estimate cycling rates over April-October period
- Survey very sensitive to fall weather, early storms

Normalizing O/D survey periods



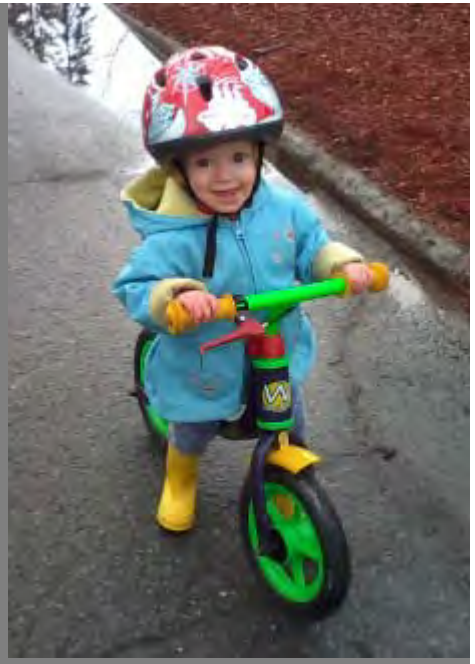
Month	Factors
1	0.037
2	0.037
3	0.575
4	1.908
5	2.147
6	1.69
7	1.673
8	1.562
9	1.127
10	0.769
11	0.397
12	0.077

2005 OD Survey	
16.3%	
42.9%	**0.676**
40.8%	



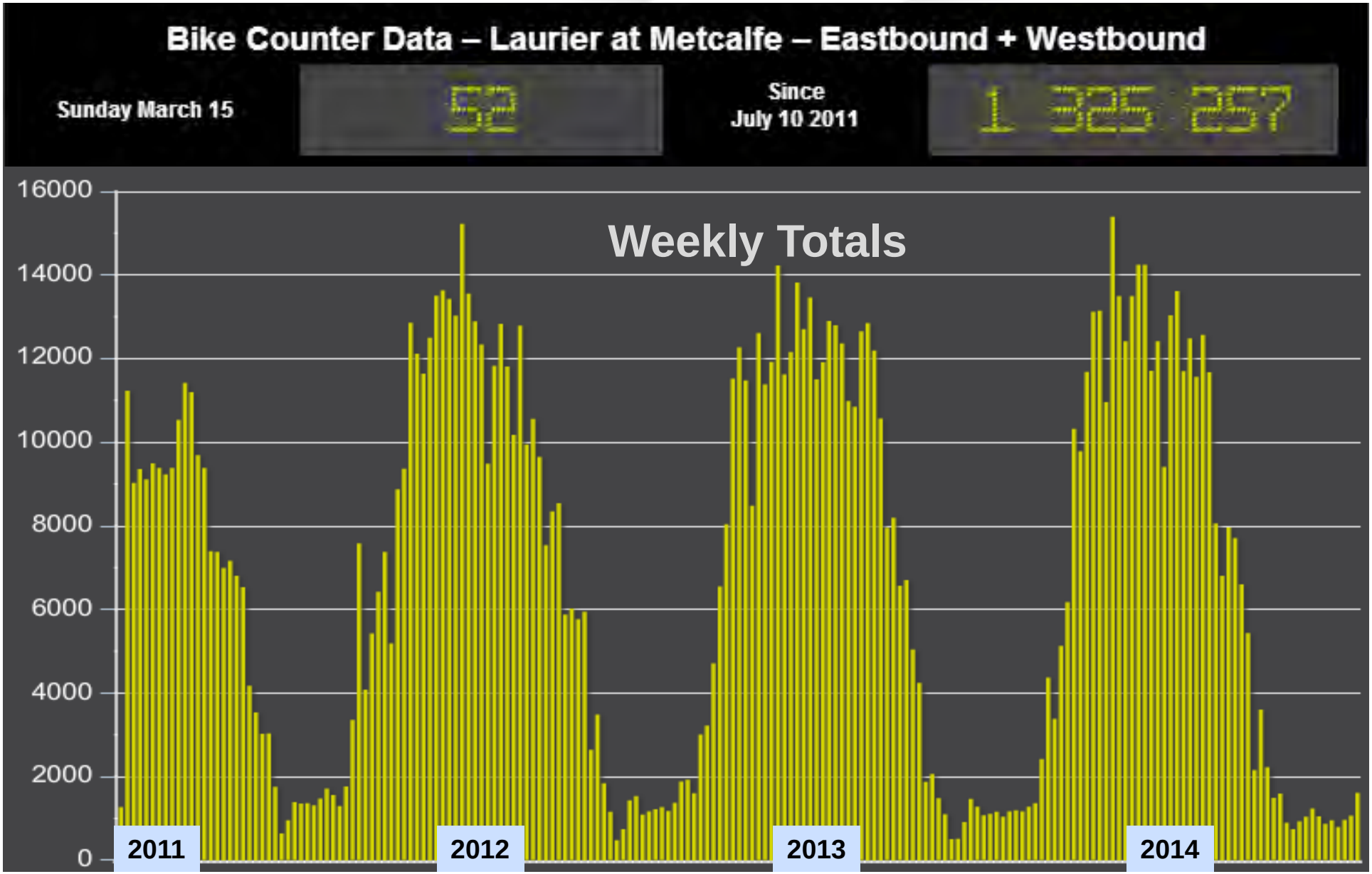
Expansion factor for 2005 O/D survey period estimated at 0.676

3



Changing Perceptions, Developing new insights

Facts, Public Facts, and Generally Held Views….

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May / Mai 2012
Laurier Bike Lanes are a waste of money, I'm here every day- probably only about 200 bikes/day'
Actual: over 2,000 bikes/day

Active Transportation Links Rival Road Capacity

Corktown Bridge Counts

- Daily Average (October) 6,500 trips.
- Busiest day recorded: 9,230 (June 19, 2014)
- New design guidelines requires bike / pedestrian counters on all new AT bridges.

Mining Data for Insights

- Capture regional successes for cycling modal shift, in the context of an expanding urban boundary
- Develop quantitative health benefits (Epidemiology morbidity cost model)
- Normalized Cycling Safety Index (crashes per trip vs. absolutes)
- With path-tracking data; who uses particular facilities- and total users/facility (not just total trips)
- Identify ratios of commuting vs. other travel by bike. by route

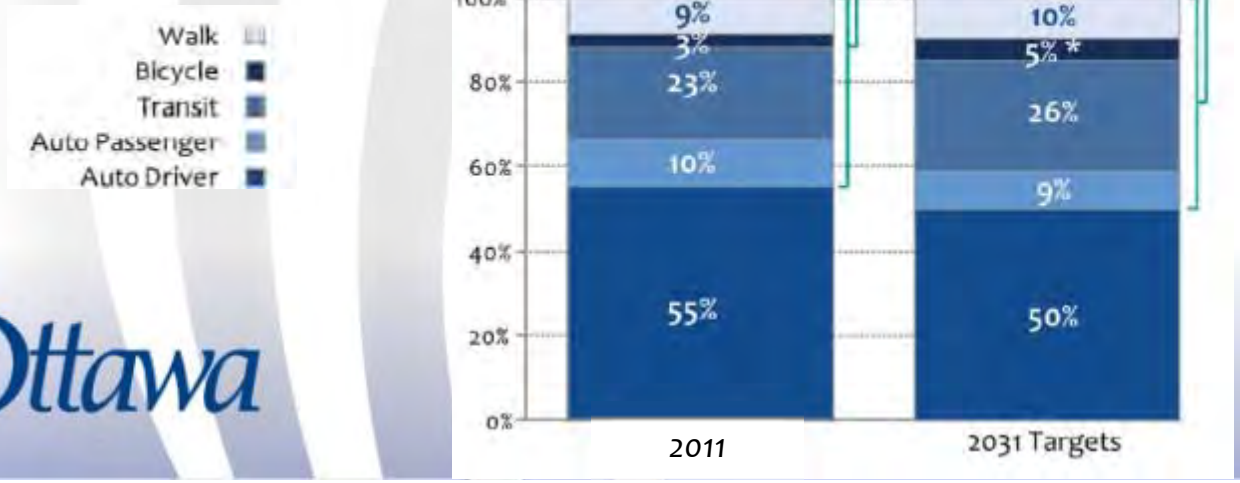
Targets: Increased Cycling Modal Share

Cycling Targets by Geographic Area

Area	2011	2031
Inner Area	8%	12%
Inner Suburbs	3%	6%
Orléans	2%	3%
Riverside South/Leitrim	1%	3%
South Nepean	2%	4%
Kanata / Stittsville	1%	4%
City-Wide	**2.5%**	**5%**

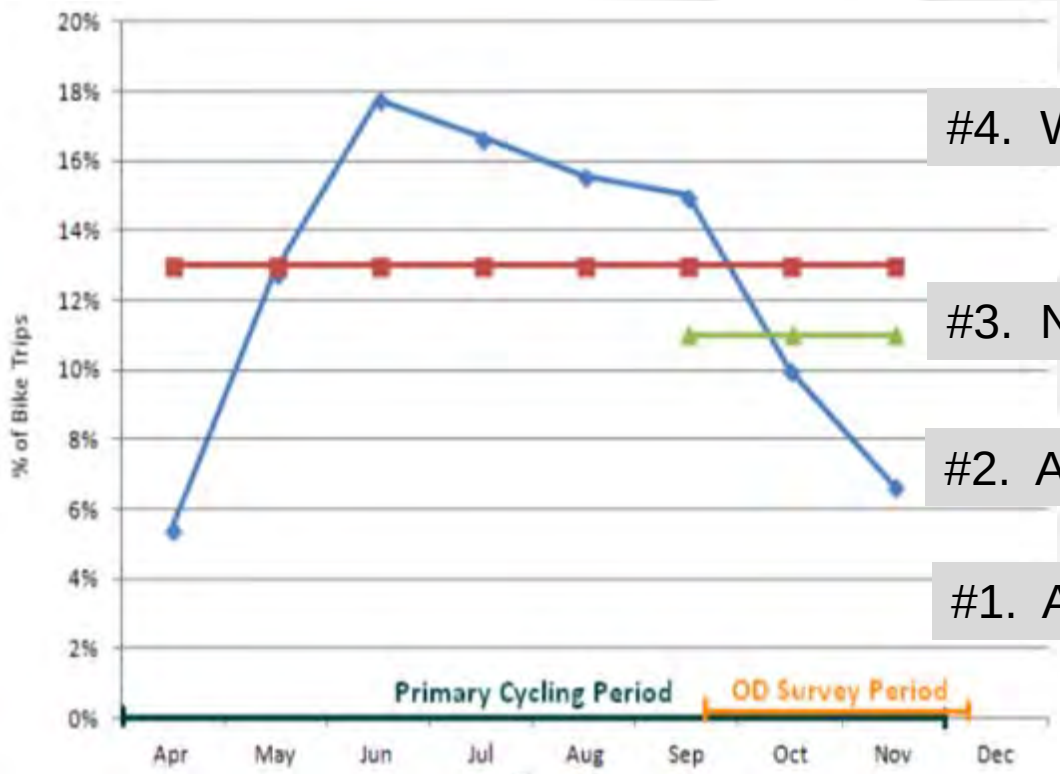
8% Inside Greenbelt

5% City-Wide



Annual Trips/year

16 million bike trips, and 100 million transit trips estimated for the City in 2011.



#4. Weekend vs. workday cycling ratio (BC)

#3. Number of workdays / season

#2. Av. bike season workday trips (BC)

#1. Av. fall workday bike trips (O/D)

Requires both Bike Counter (BC) and O/D Survey datasets

4 Next Steps

Next Steps

- Grow the counter network to improve sampling and increase geographic coverage.
- Refine analysis methodology for weather and temporal adjustments (day of week, week of year).
- Compare analysis methodology and conclusions with other cities with (dense) automated bike counter data-sets.
- Leverage multiple data sources into a more comprehensive view of cycling trends.

Questions?

Zlatko Krstulic, P. Eng.
Sr. Project Manager,
City of Ottawa

Luis F. Miranda-Moreno, PhD
Associate Professor,
McGill

We are Traffic:
Creating Robust Bicycle and Pedestrian Count Programs

Krista Nordback, Ph.D., P.E.

Research Associate

Transportation Research and Education Center (TREC)

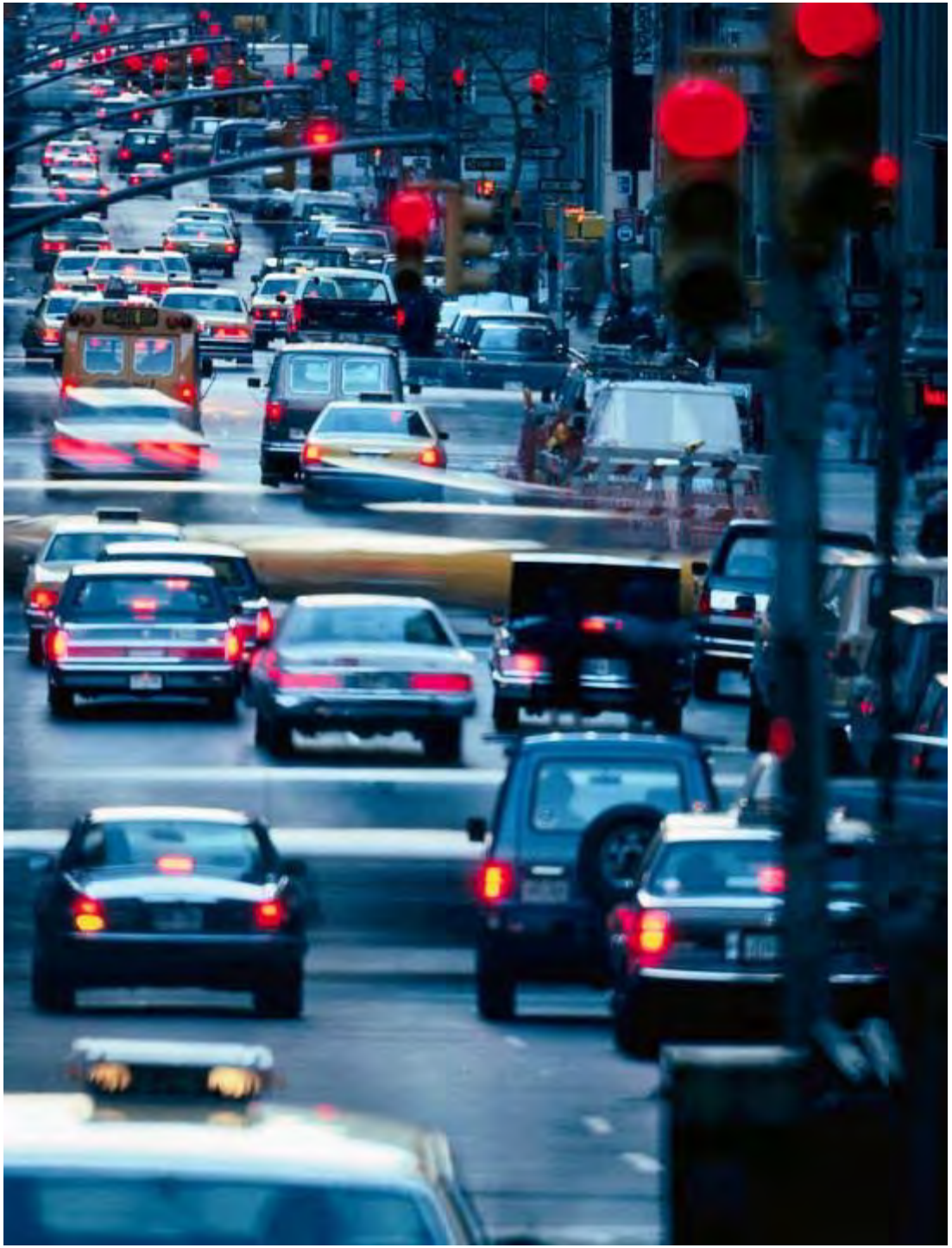
Portland State UNIVERSITY

TREC
Transportation Insight for Vibrant Communities

Overview

- Motor Vehicle Traffic Monitoring Programs
- Non-Motorized Count Programs:
  - Permanent (Continuous) Count Program
  - Short Duration Count Program
  - Annual Average Daily Bicyclists and Pedestrians
- Conclusions and Recommendations

TRAFFIC MONITORING PROGRAMS



Traffic Monitoring

- Required by FHWA (MAP21):
  - **all urban and rural principal arterial roadways**
  - all intermodal connector roadways
  - the strategic defense highway network

- Historically used to allocate federal funds to state DOTs.
- Municipalities
  - Planning
  - Signal timing

Traffic Monitoring

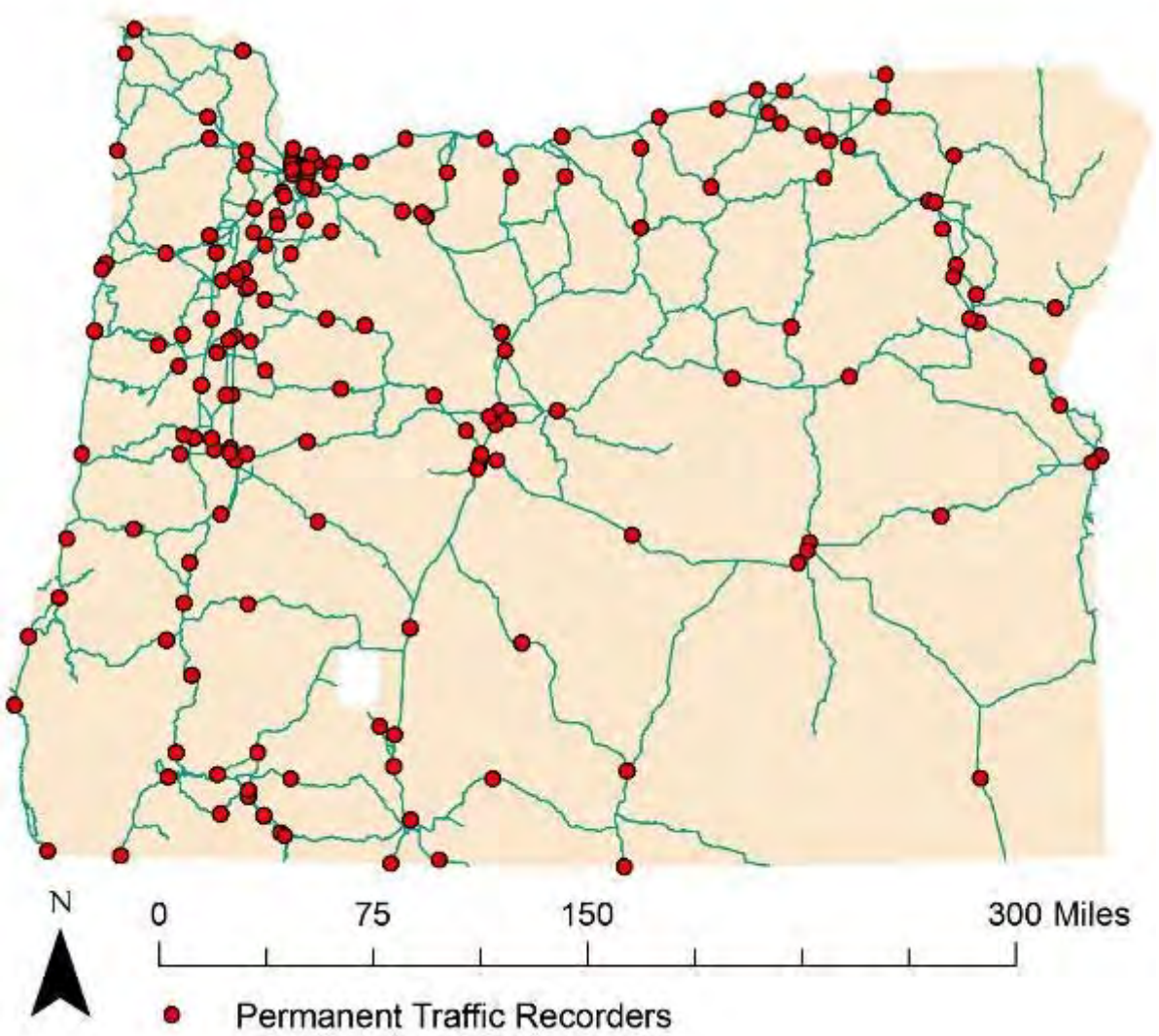
Permanent Counters

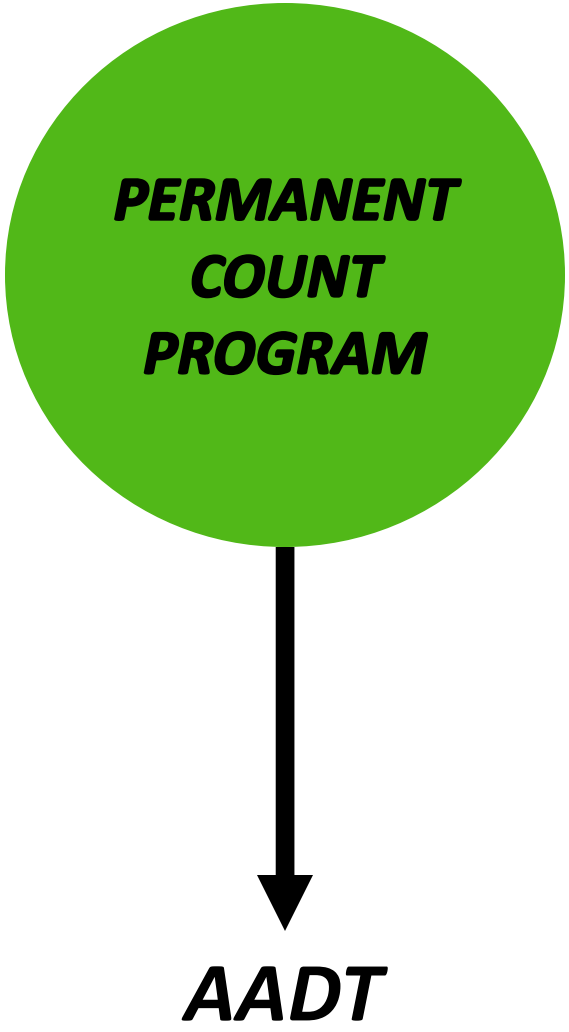
Commonly inductive loops

Metro Count Accessed 6/13/13 http://mtehelp.tech-metrocount.com/article.aspx?key=mc5805

Oregon's Permanent Counters

About 180




PERMANENT
COUNT
PROGRAM
AADT

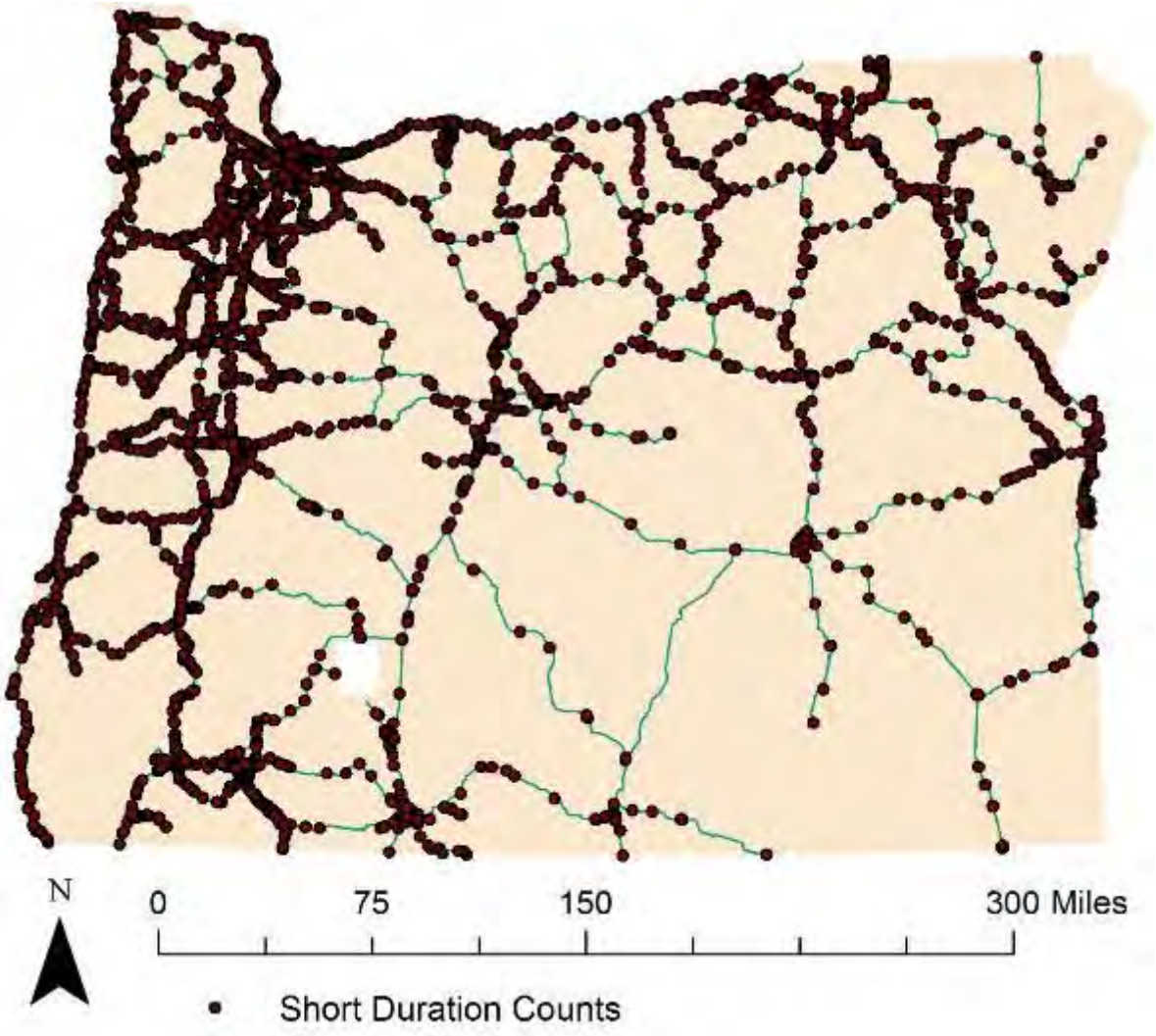
State Traffic Monitoring

Short Duration Counters

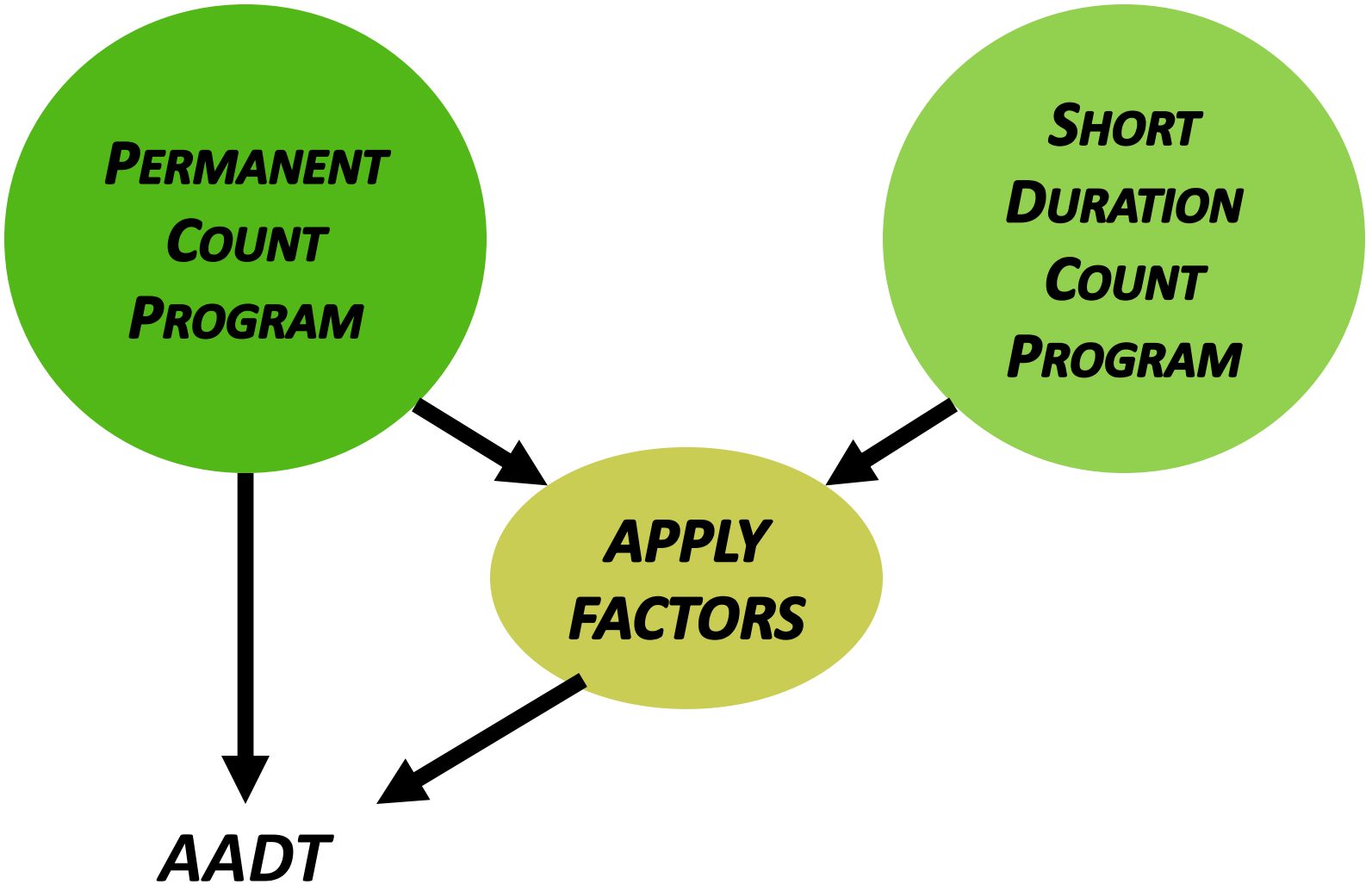
Commonly pneumatic tubes

Oregon's Short Duration Counts

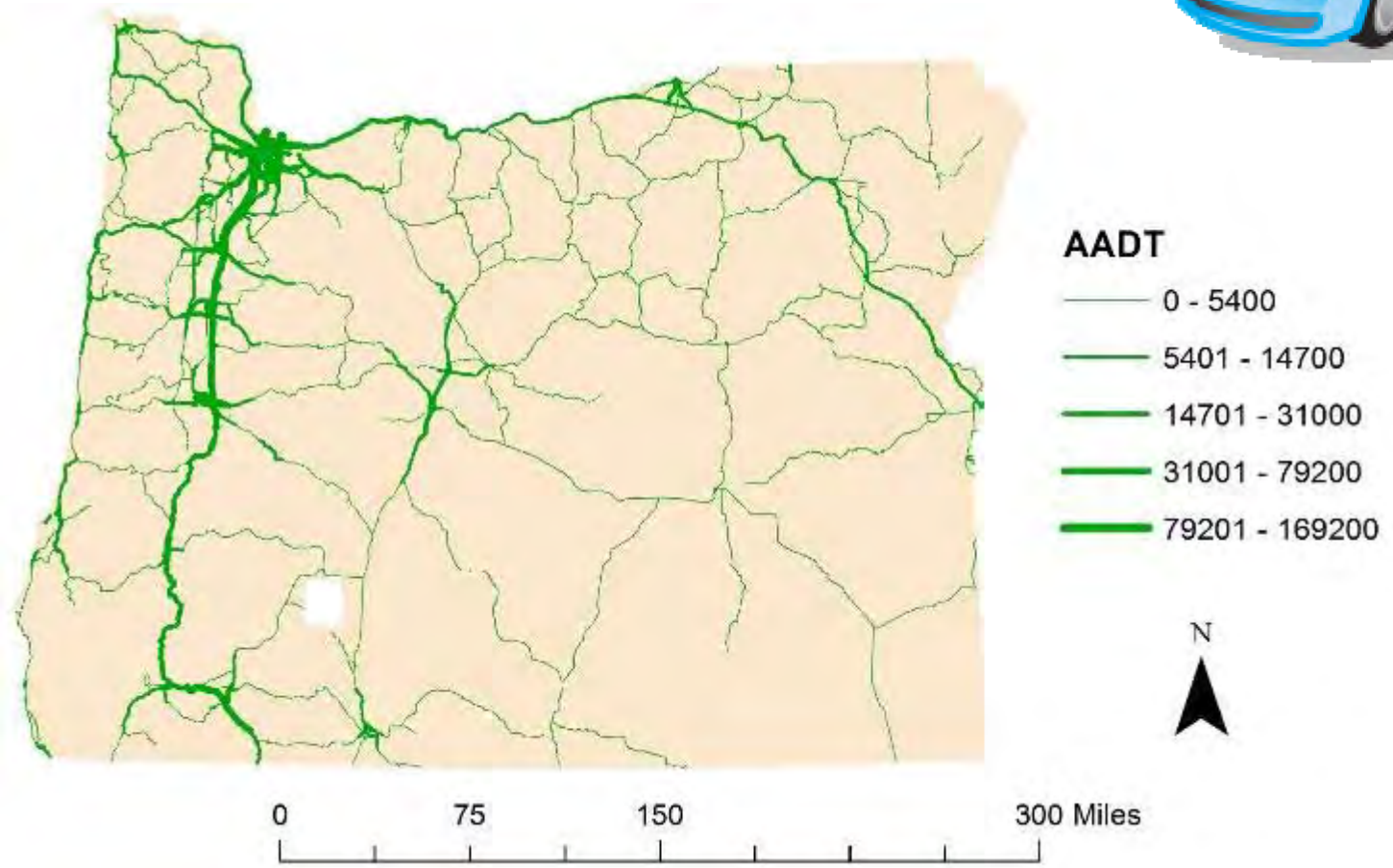
About 7000



ODOT ftp://ftp.odot.state.or.us/tdb/trandata/GIS_data/ Accessed 9/23/14


PERMANENT COUNT PROGRAM
SHORT DURATION COUNT PROGRAM
APPLY FACTORS
AADT

AADT



Sum (AADT X Segment Length) over network to compute Vehicle Miles Traveled (VMT)

Can we apply these methods to biking and walking?

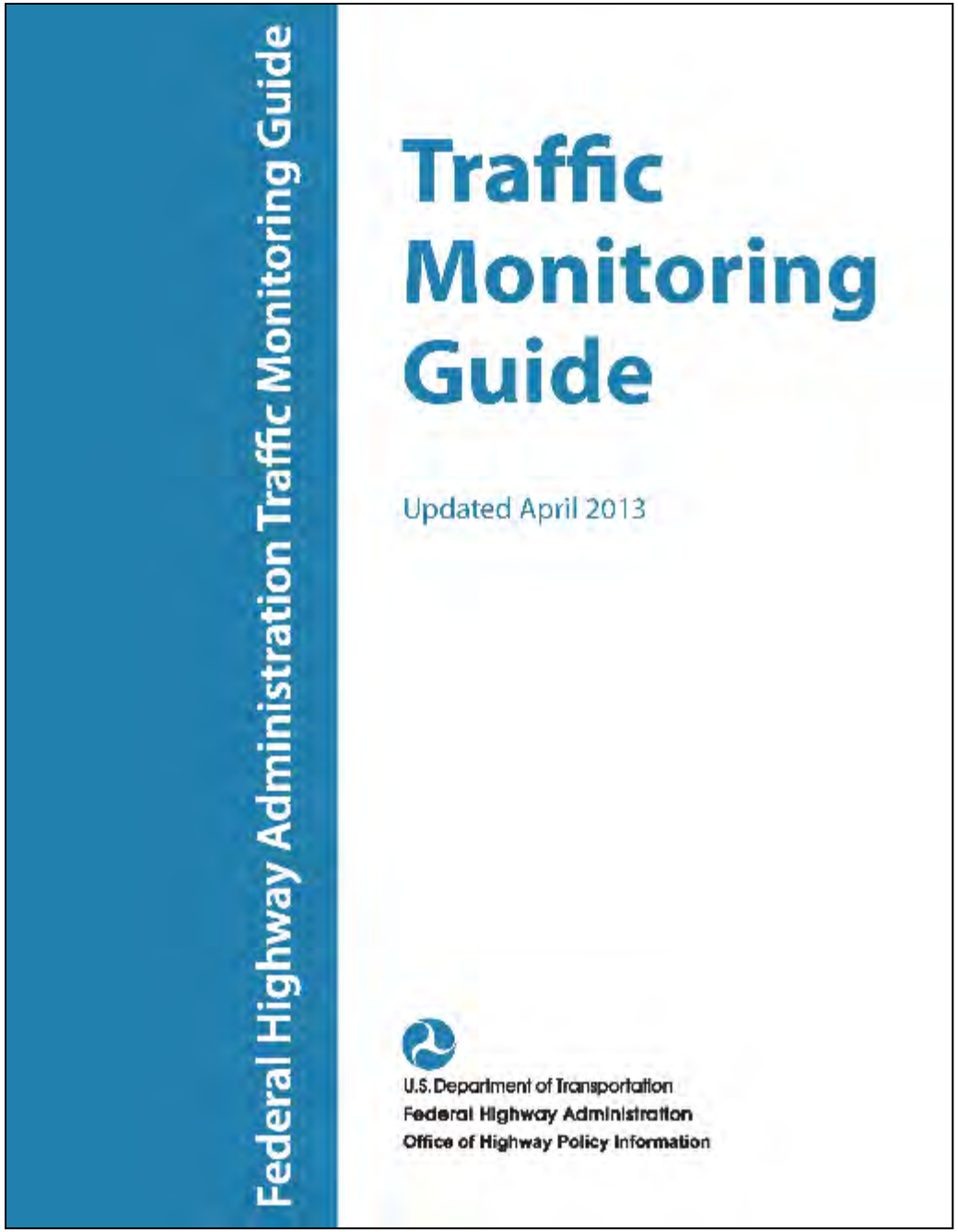
AADB:
Annual Average Daily Bicyclists

AADT for bicyclists!

NON-MOTORIZED COUNT PROGRAMS

Traffic Monitoring Guide 2013:

Chapter 4 for Non-motorized Traffic

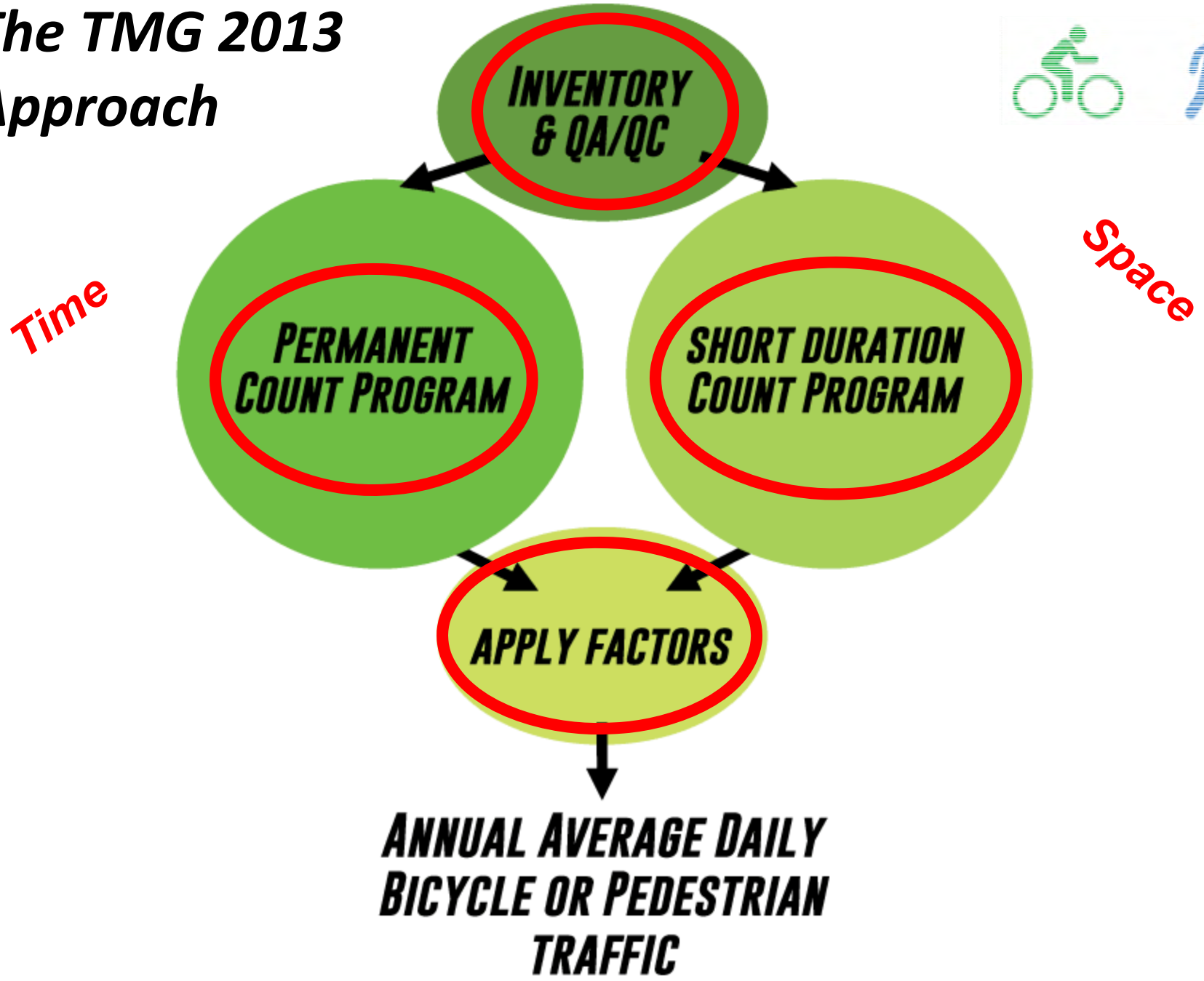


http://www.fhwa.dot.gov/policyinformation/tmguide/

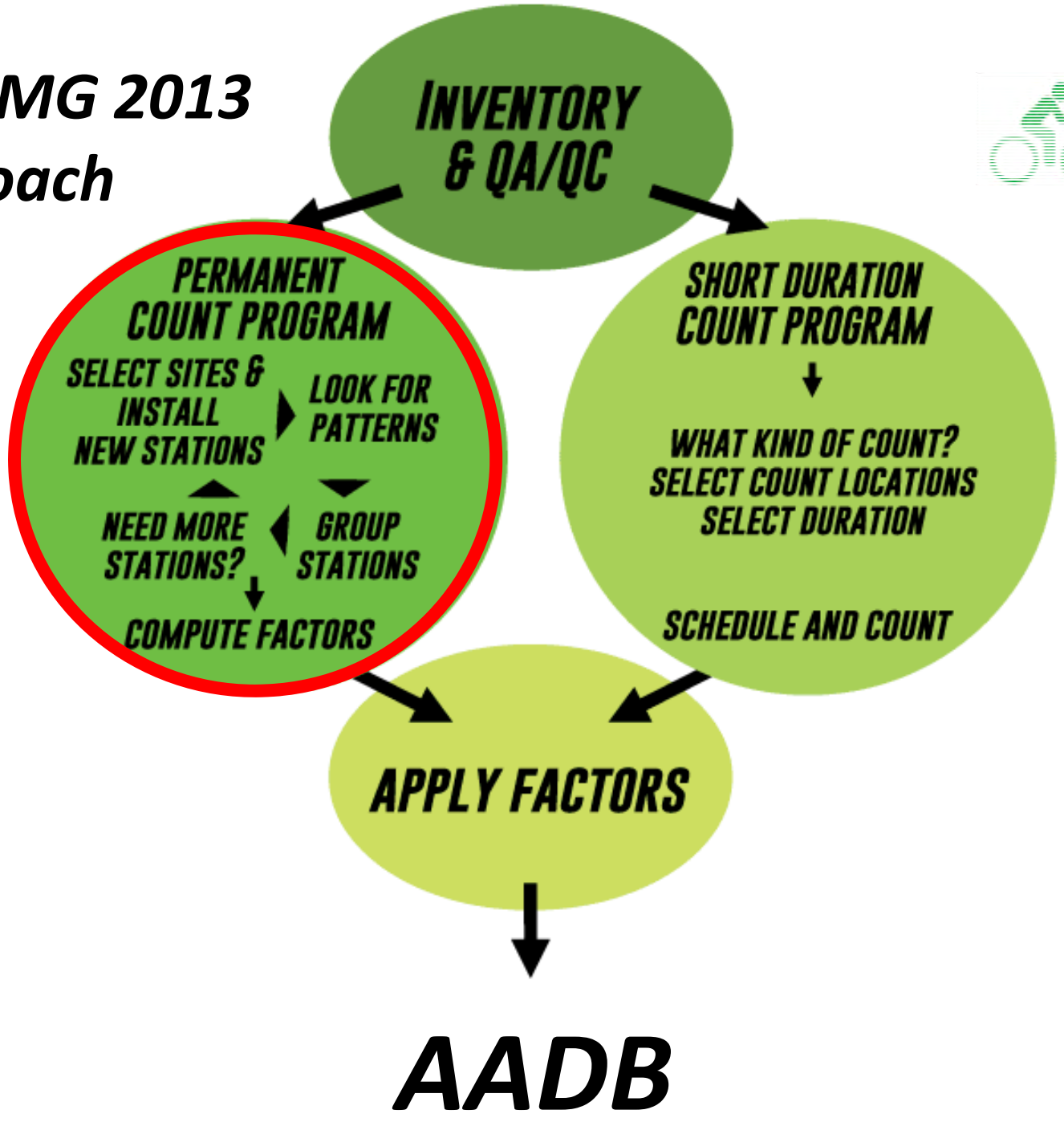
Online Guide

www.pdx.edu/ibpi/count

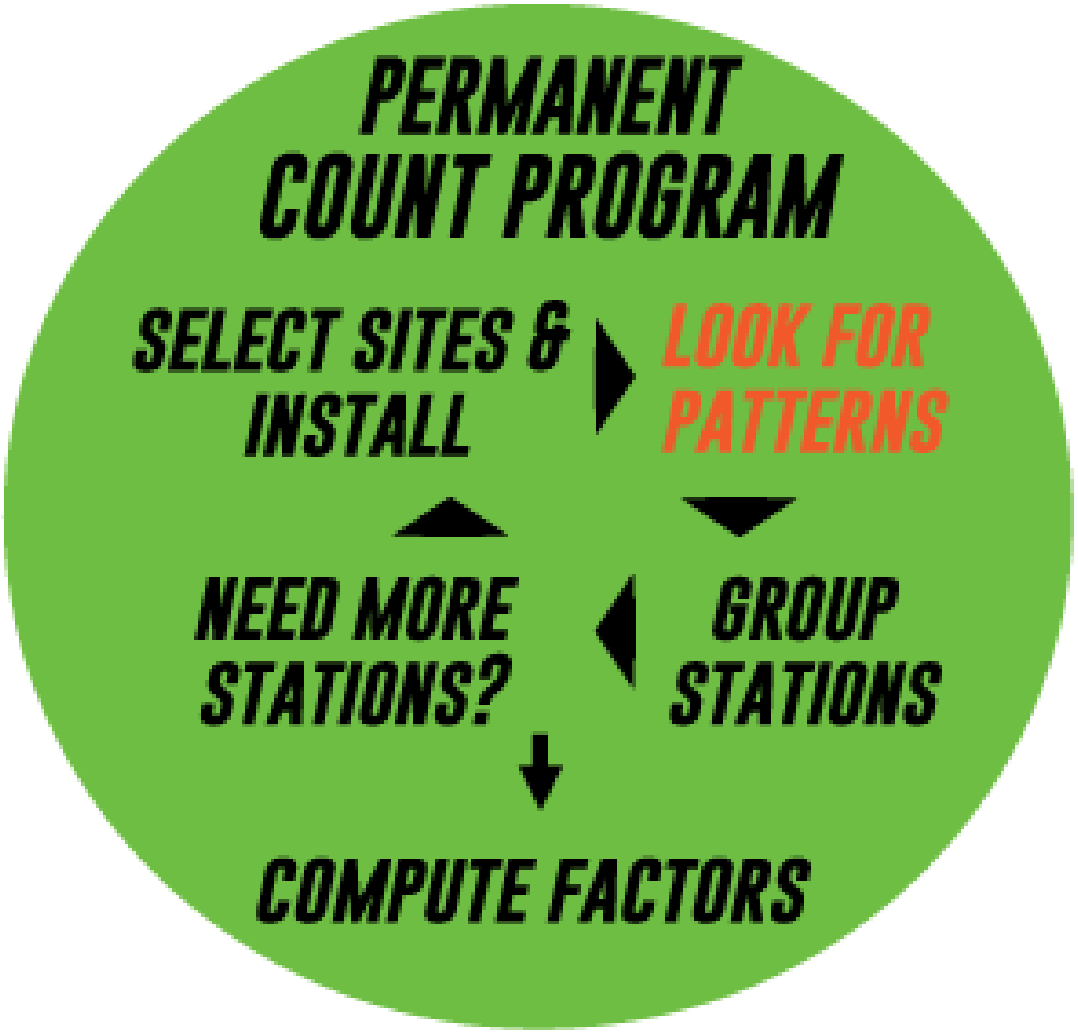
The TMG 2013 Approach



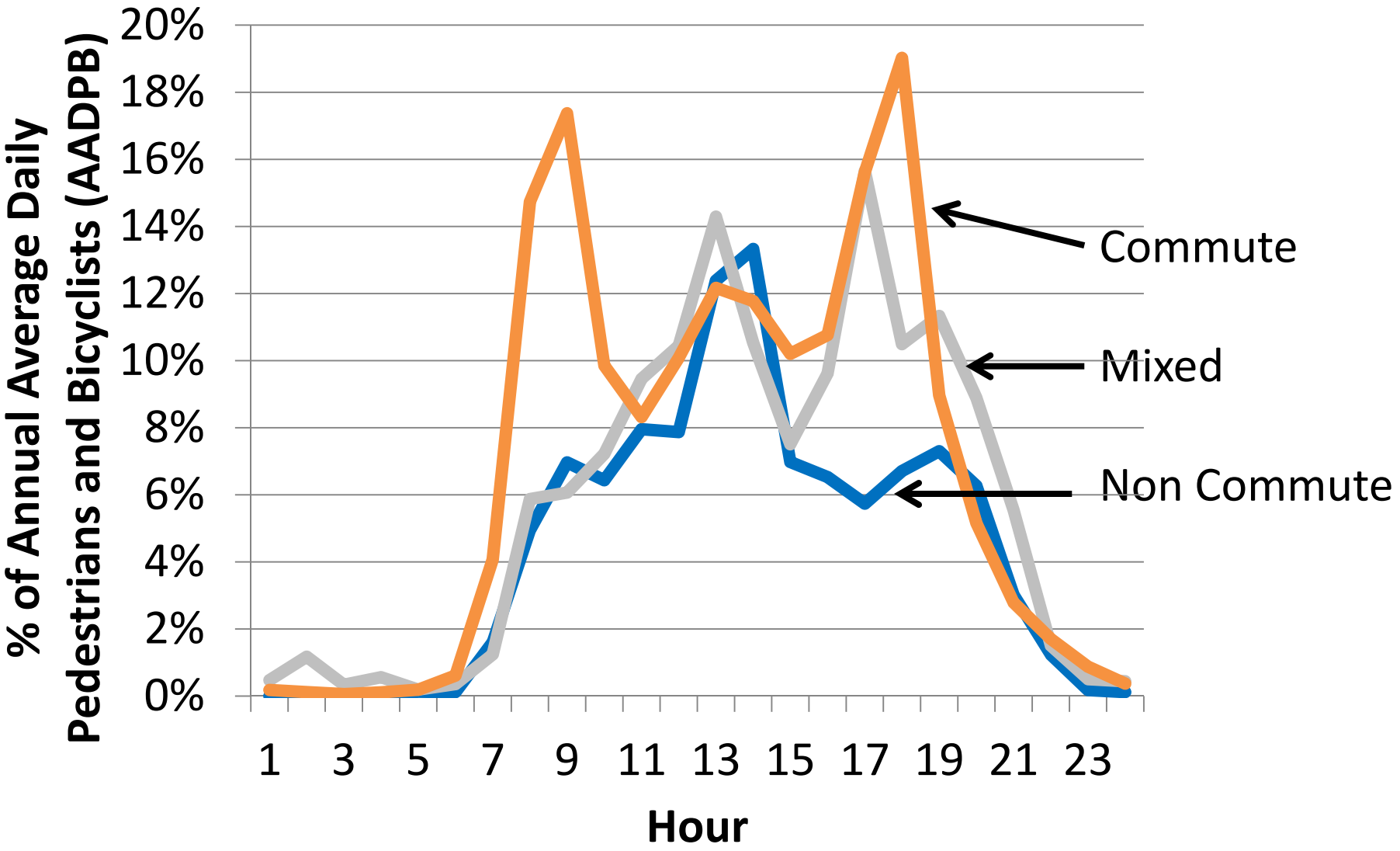
The TMG 2013 Approach



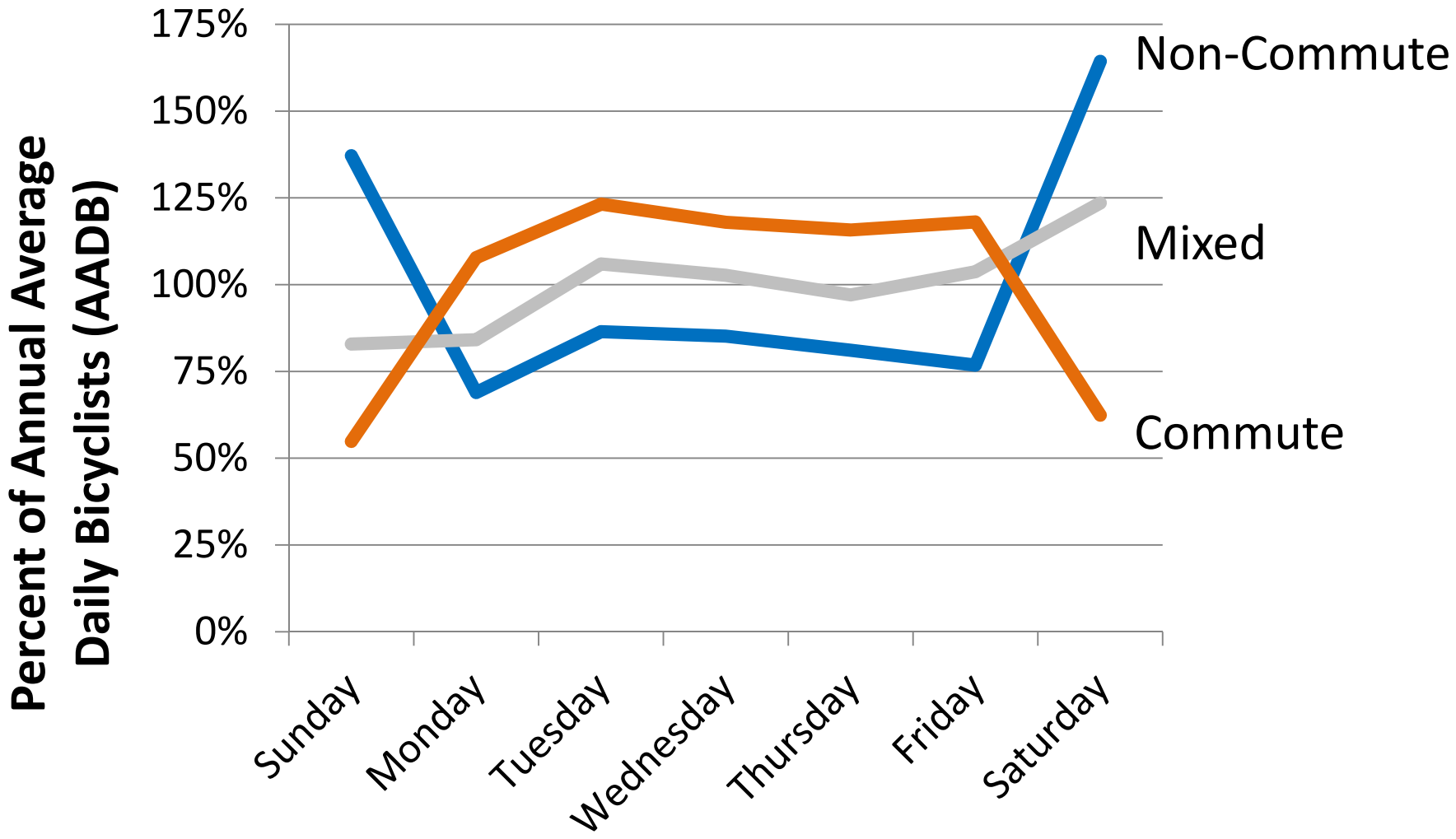
Permanent Count Program



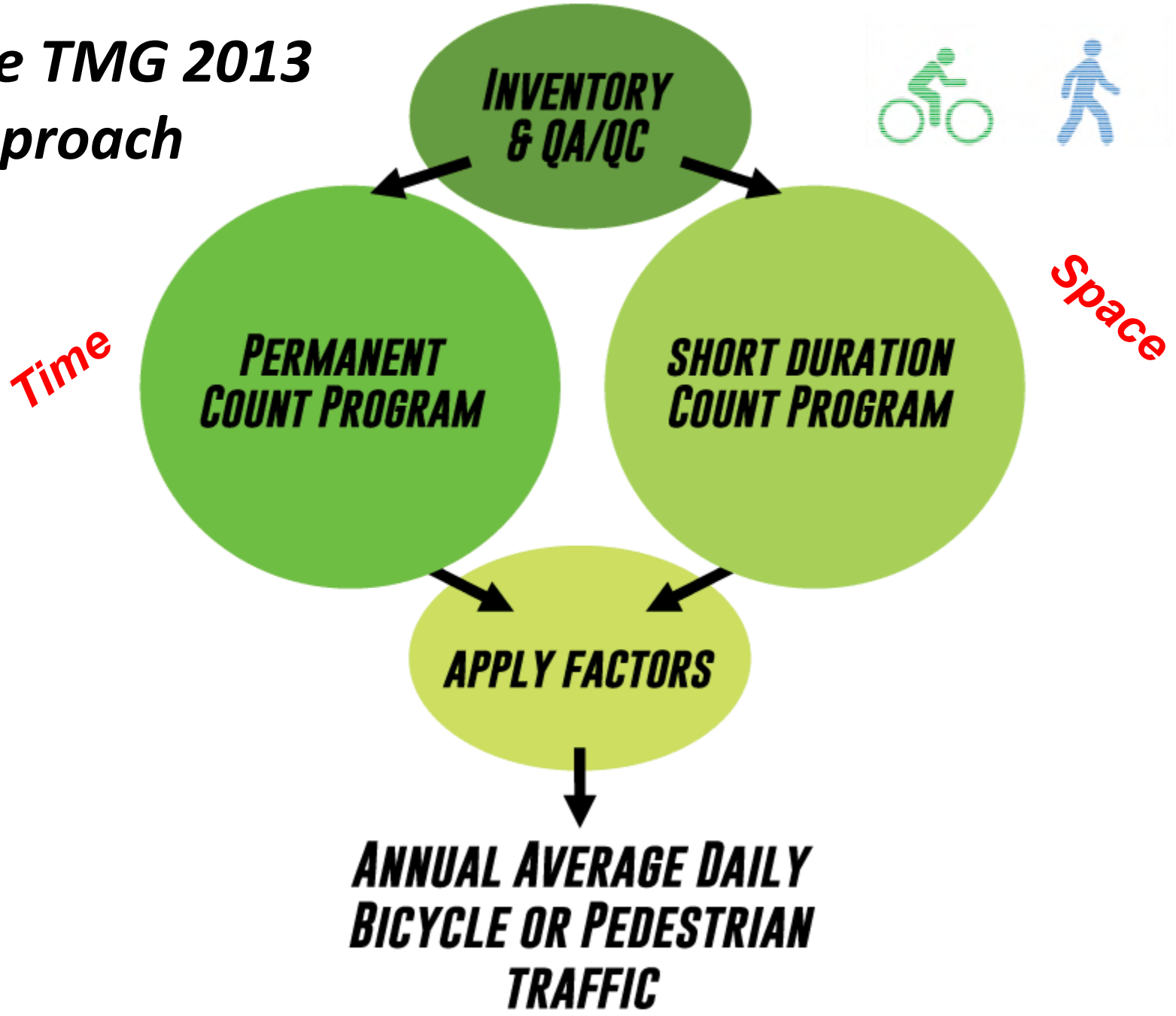
Group by Traffic Patterns



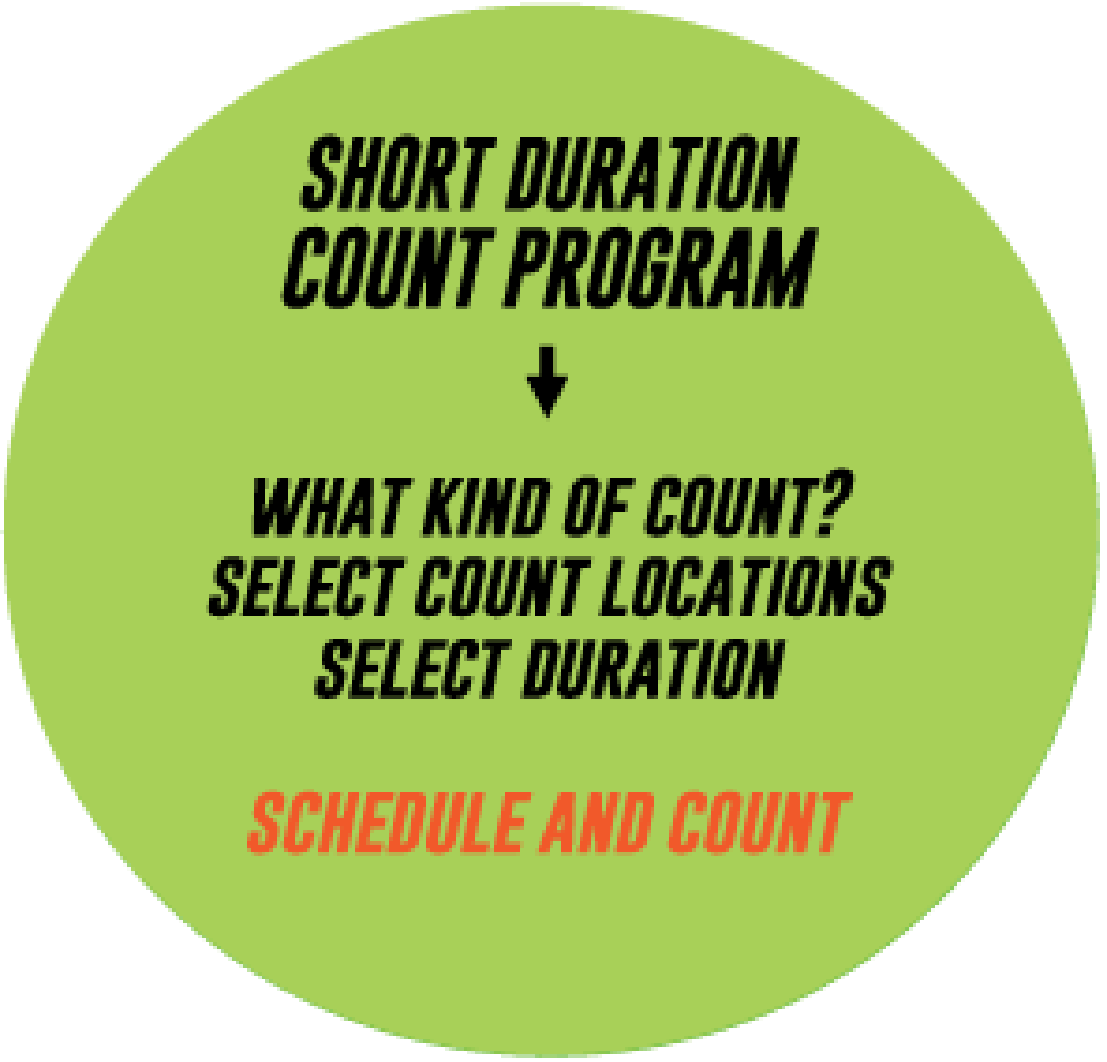
Group by Traffic Patterns



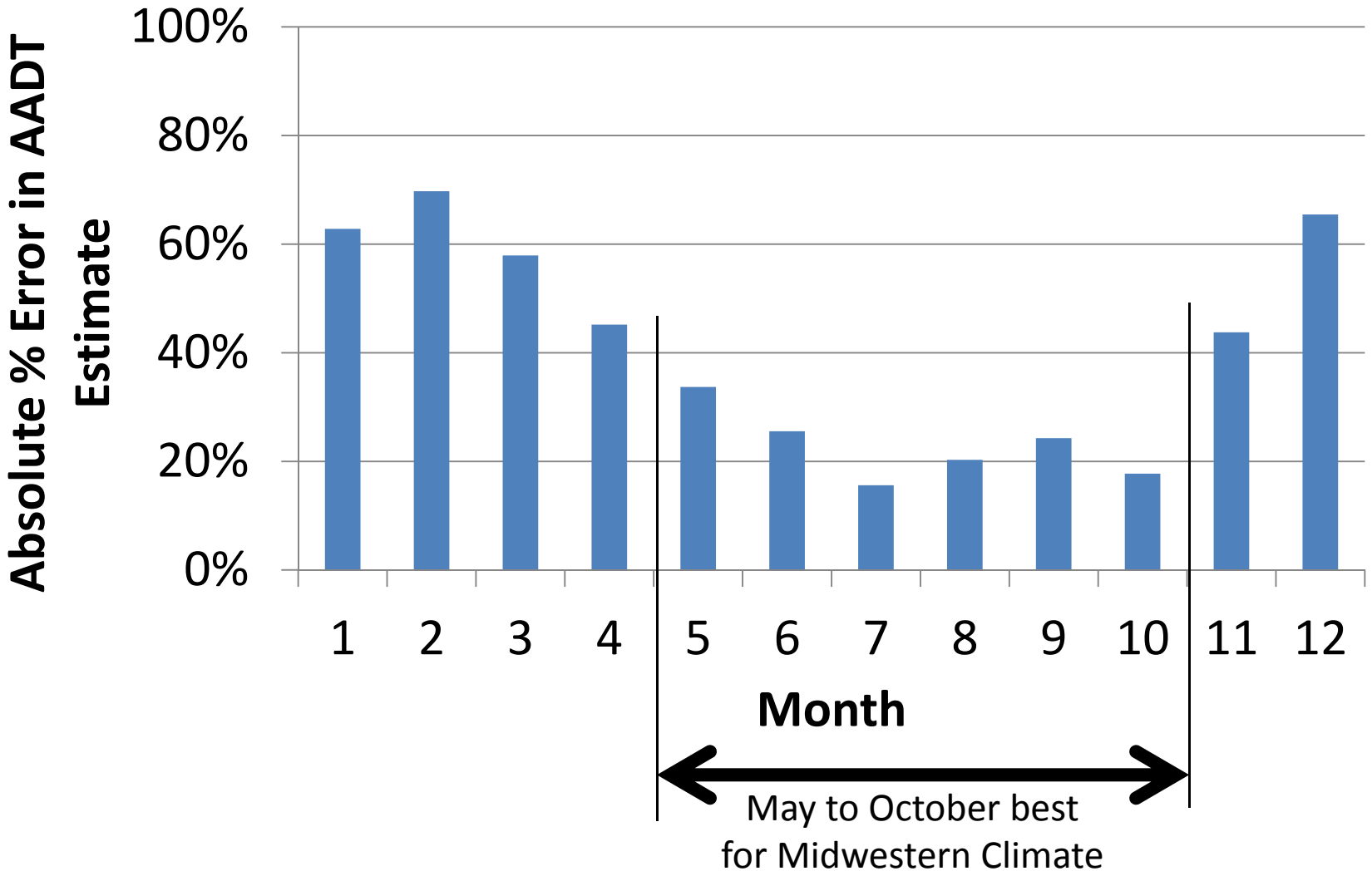
The TMG 2013 Approach



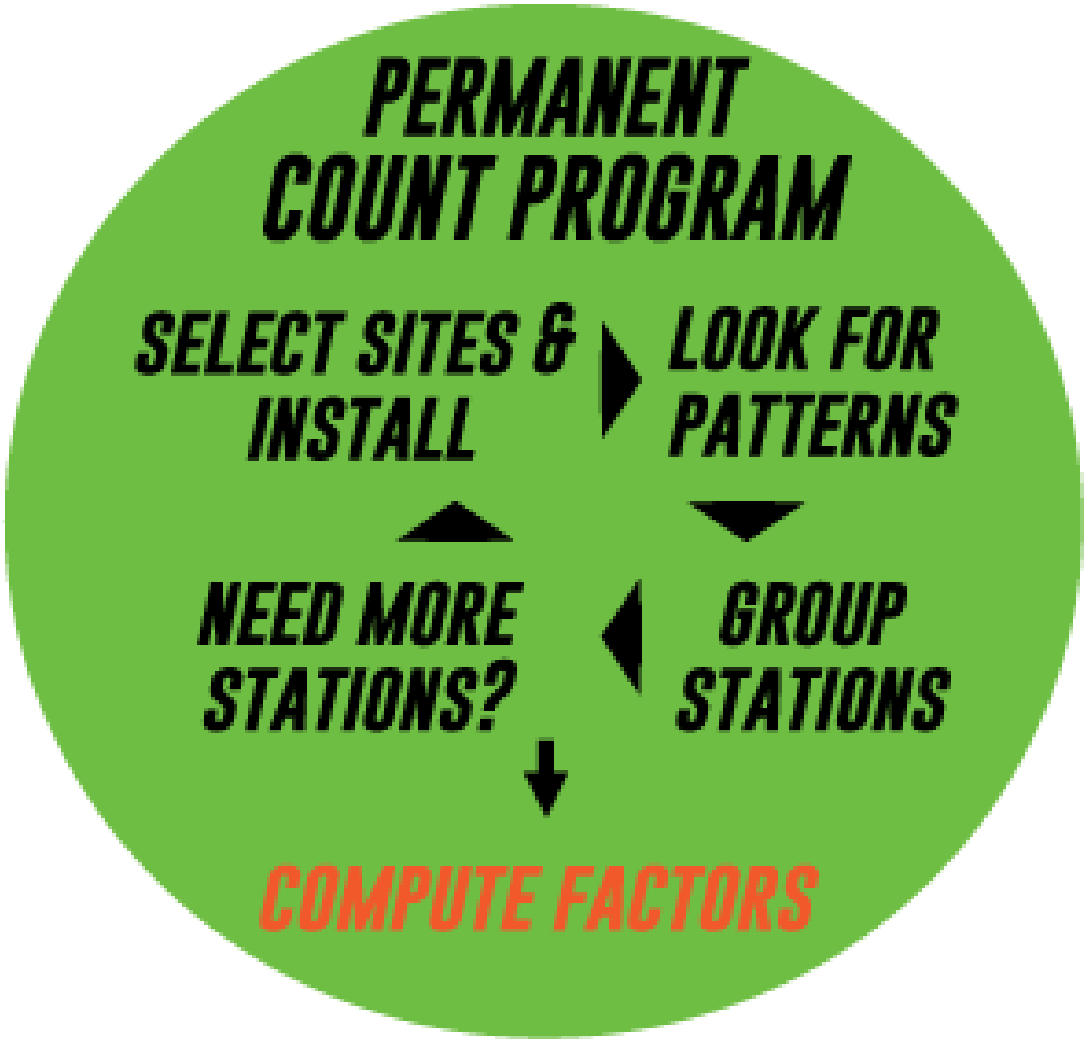
Short Duration Count Program



Schedule Counts



Permanent Count Program



Factoring Method

Adapted from Traffic Monitoring Guide

$$AADB = C_{known} * D * M$$

C_{known} = known manual count for 24 hours

D = Daily Factor

M = Monthly Factor

Monthly Factor

$$M = \frac{AADB}{MADB} = \frac{\text{June}\ 500}{1{,}000} = 0.5$$

Daily counts in June are twice AADB.

where

MADB = Ave daily bike count in that month

Colorado Monthly Factors

Groups:	Mountain Non-Commute	Urban Planes Non-Commute	Commute
January		3.9	1.5
February		3.2	2.0
March		1.3	1.2
April	2.2	1.1	1.1
May	1.0	0.8	0.9
June	0.5	0.8	0.7
July	0.4	0.8	0.8
August	0.5	0.7	0.7
September	0.7	0.8	0.8
October	1.7	1.0	1.0
November		1.5	1.4
December		2.5	2.3

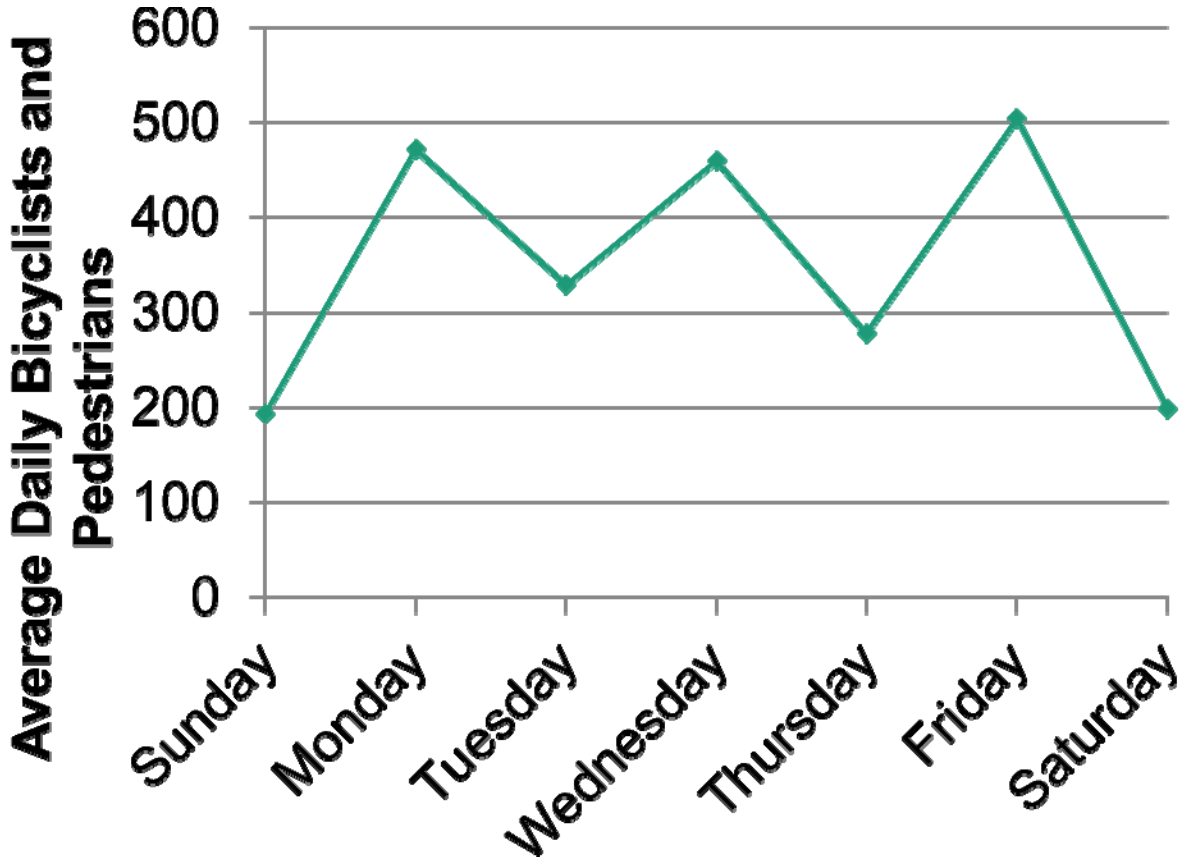
http://www.coloradodot.info/programs/research/pdfs/2013/bikecounts.pdf/view#!

Example
8th & Vallejo Bridge in Denver

Bicyclists and pedestrians were counted for 19 days in May using a portable infrared counter.

Average Daily Count 342

Look for Patterns



Low weekends

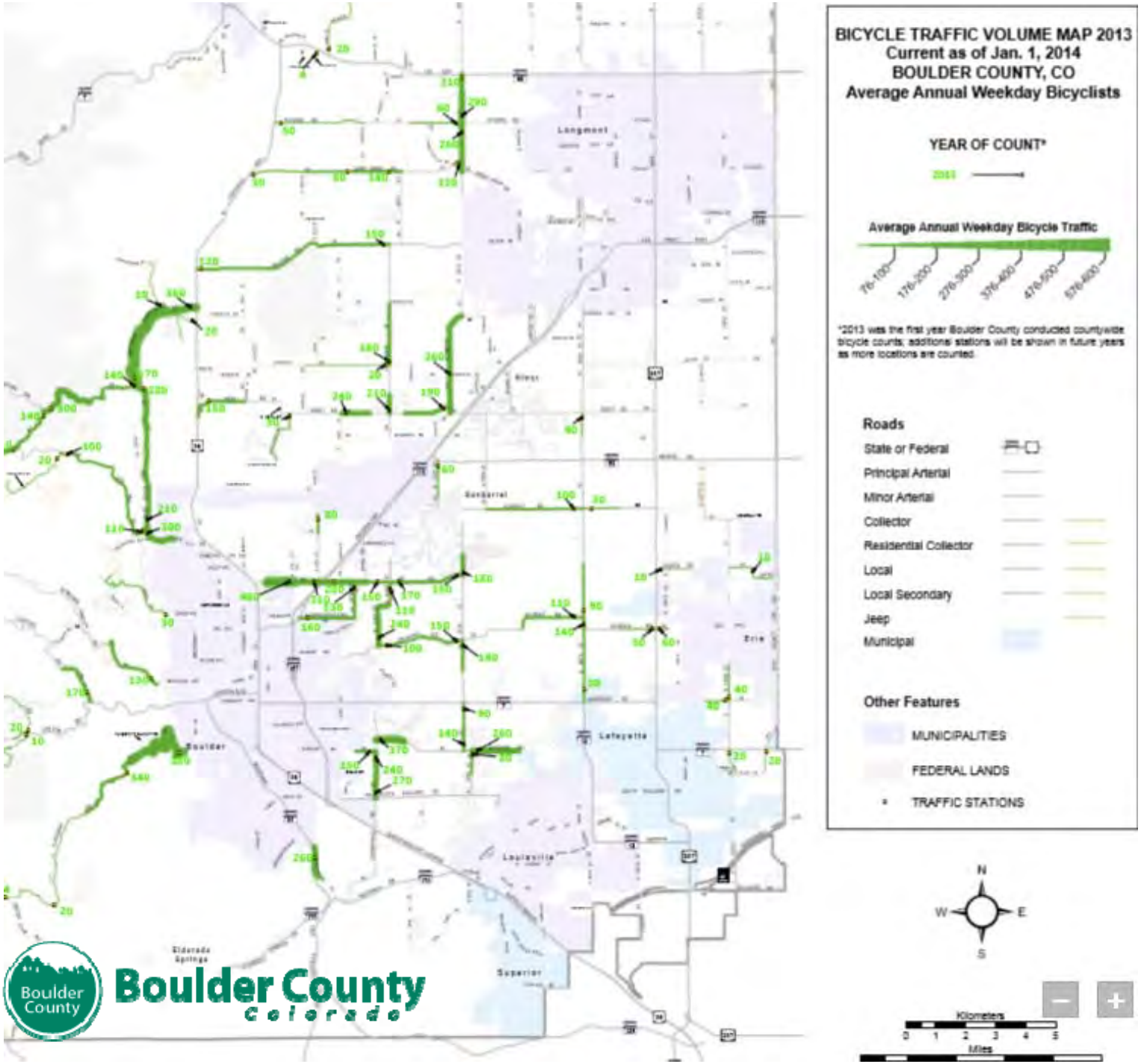
Urban setting

Colorado Monthly Factors

Groups:	Mountain Non-Commute	Urban Planes Non-Commute	Commute
January		3.9	1.5
February		3.2	2.0
March		1.3	1.2
April	2.2	1.1	1.1
May	1.0	0.8	0.9
June	0.5	0.8	0.7
July	0.4	0.8	0.8
August	0.5	0.7	0.7
September	0.7	0.8	0.8
October	1.7	1.0	1.0
November		1.5	1.4
December		2.5	2.3

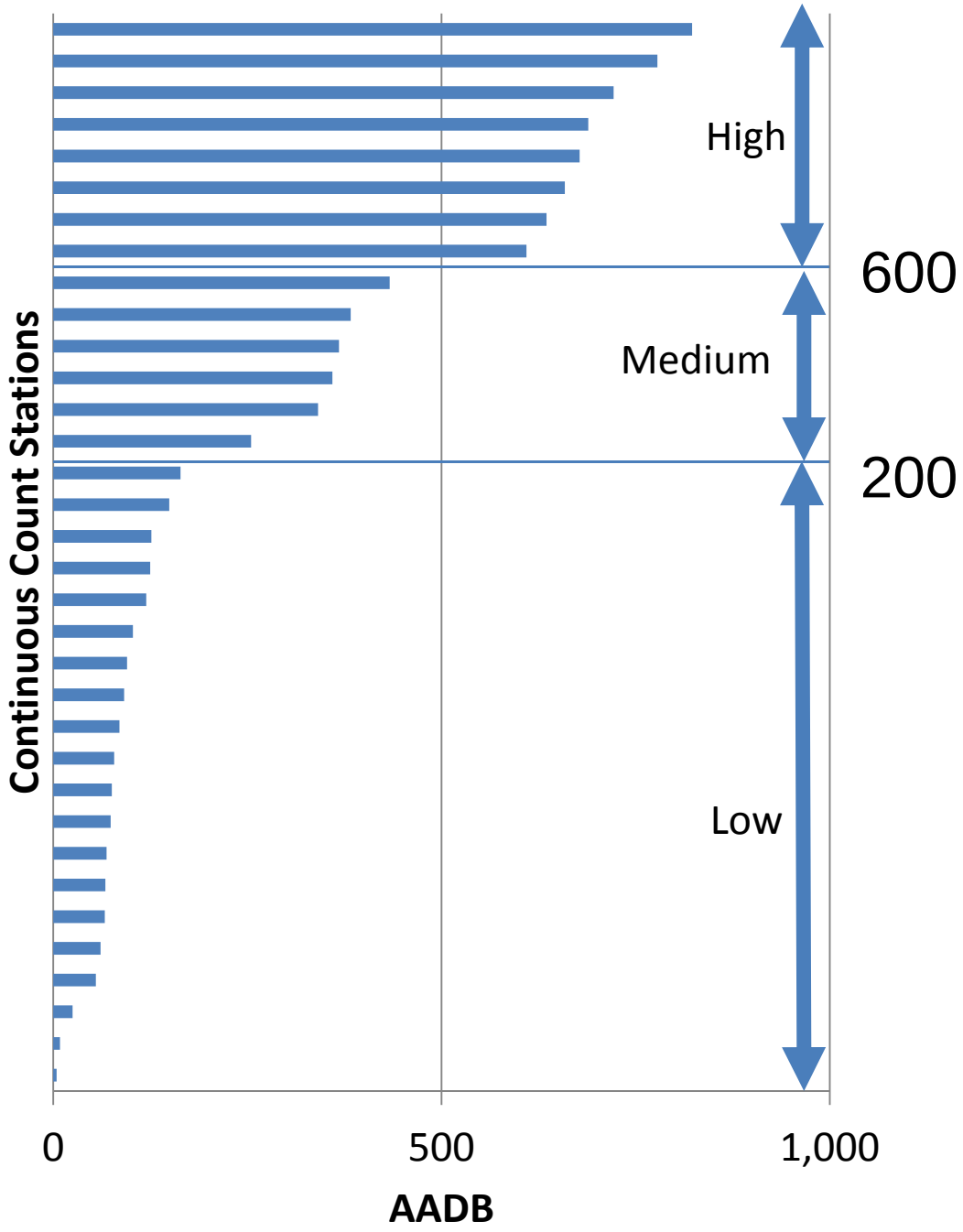
Date	Daily Count		Daily Factor		Monthly Factor		AADT estimate
Thursday, May 12, 2011	140		1.0		0.9		126
Friday, May 13, 2011	646		1.0		0.9		598
Saturday, May 14, 2011	140		1.3		0.9		164
Sunday, May 15, 2011	93		1.4		0.9		123
Monday, May 16, 2011	565		0.9		0.9		496
Tuesday, May 17, 2011	395		0.9		0.9		315
Wednesday, May 18, 2011	264		0.9		0.9		214
Thursday, May 19, 2011	211		1.0		0.9		190
Friday, May 20, 2011	330	✖	1.0	✖	0.9	=	306
Saturday, May 21, 2011	267		1.3		0.9		313
Sunday, May 22, 2011	244		1.4		0.9		322
Monday, May 23, 2011	523		0.9		0.9		459
Tuesday, May 24, 2011	263		0.9		0.9		210
Wednesday, May 25, 2011	655		0.9		0.9		532
Thursday, May 26, 2011	482		1.0		0.9		433
Friday, May 27, 2011	536		1.0		0.9		496
Saturday, May 28, 2011	190		1.3		0.9		223
Sunday, May 29, 2011	243		1.4		0.9		321
Monday, May 30, 2011	327		0.9		0.9		287
					Average AADT		322

AADB

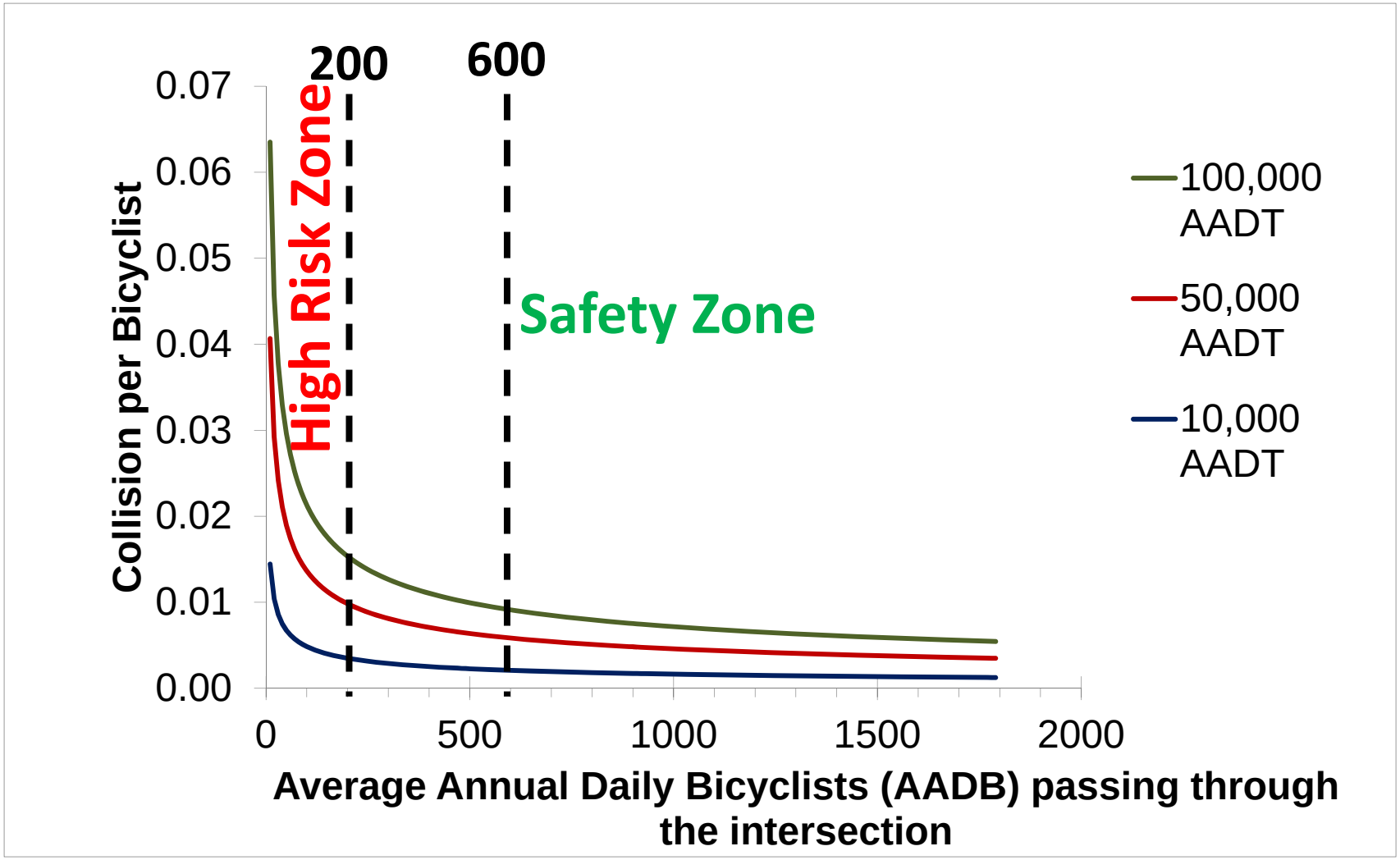

BICYCLE TRAFFIC VOLUME MAP 2013
Current as of Jan. 1, 2014
BOULDER COUNTY, CO
Average Annual Weekday Bicyclists
YEAR OF COUNT*
Average Annual Weekday Bicycle Traffic
76-100
176-200
276-300
376-400
476-500
576-600
*2013 was the first year Boulder County conducted countywide bicycle counts; additional stations will be shown in future years as more locations are counted.
Roads
State or Federal
Principal Arterial
Minor Arterial
Collector
Residential Collector
Local
Local Secondary
Jeep
Municipal
Other Features
MUNICIPALITIES
FEDERAL LANDS
TRAFFIC STATIONS
Boulder County
Colorado
N
W
E
S
Kilometers
0 1 2 3 4 5
Miles

Annual Average Daily Bicyclists (AADB)

Volume Categories



Individual Bicyclist Risk

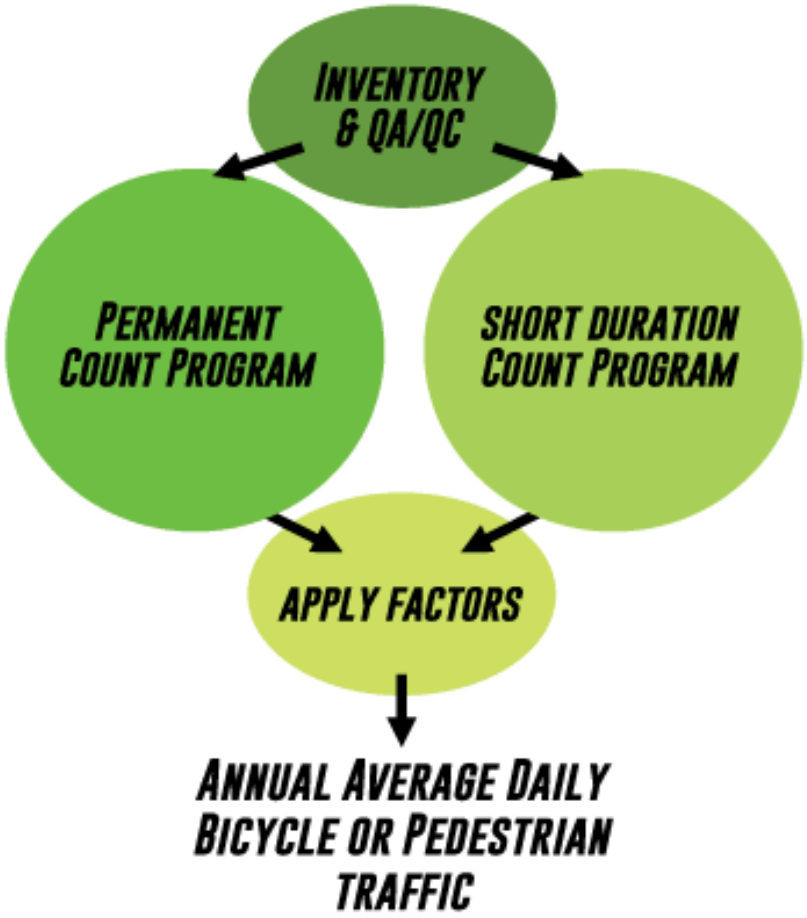


Nordback, K., Marshall, W. E., & Janson, B. N. (2014). Bicyclist safety performance functions for a U.S. city. *Accident Analysis & Prevention, 65*, 114-122. doi: http://dx.doi.org/10.1016/j.aap.2013.12.016

CONCLUSIONS & RECOMMENDATIONS

Summary

- Traffic Monitoring Guide Approach:
  - Permanent Count Program
  - Short Duration Count Program
  - Compute AADT for Bikes and Pedestrians



http://www.pdx.edu/ibpi/count

Online Guide

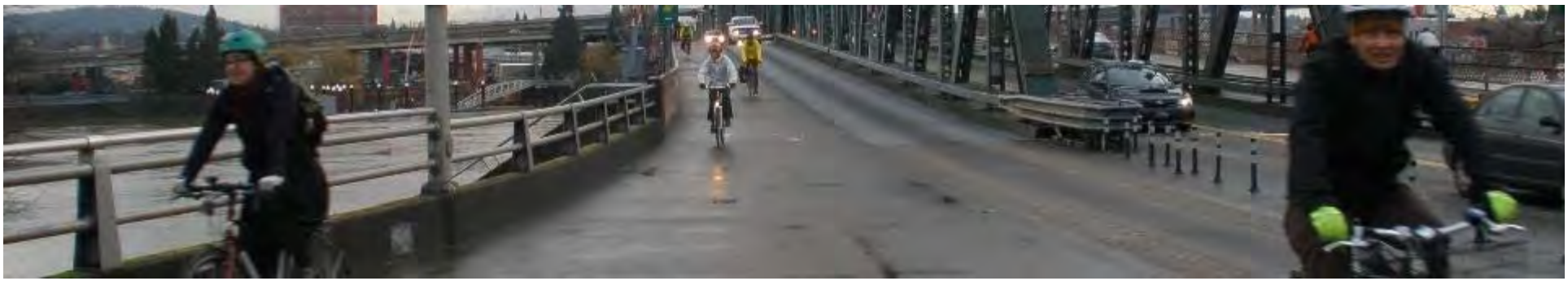
www.pdx.edu/ibpi/count

Recommendations

- Both permanent and short duration count programs are needed.
- Validate automated counters.
- Prefer 1 week short count *(Tues-Thurs, if strong commute pattern)*
- Short duration counts in high volume months
  - Summer – Aug, Sept
- Integrate bike/ped counts into traffic data for preservation and access

On-going Work

- Colorado, Vermont, Minnesota, Oregon, North Carolina, Washington State DOT's are developing programs.
- TRB Bike/Ped Data Subcommittee
  https://sites.google.com/site/bikepeddata/home
- FHWA to include bike/ped counts in Travel Monitoring Analysis System (TMAS)
- Public Google Discussion Group: walk-bike-count
- TREC's Bike/Ped Portal – A home for count data
- **Guide to Bicycle & Pedestrian Count Program Website**
  http://www.pdx.edu/ibpi/count



Questions?

TREC
Transportation Insight for Vibrant Communities

Krista Nordback

Nordback@pdx.edu

503-725-2897

Guide to Bicycle & Pedestrian Count Programs
http://www.pdx.edu/ibpi/count

Portland State UNIVERSITY

AADB Computation

Two methods

- If full 365 days available, sum and divide by 365.
- If at least a week per month are available, use AASHTO method:

$$AADB = \frac{1}{7}\sum_{i=1}^{7}\left[\frac{1}{12}\sum_{j=1}^{12}\left(\frac{1}{n}\sum_{k=1}^{n} DT_{ijk}\right)\right]$$

where

DT= daily traffic for day *k*, of day of the week *i*, and month *j*

i = day of the week

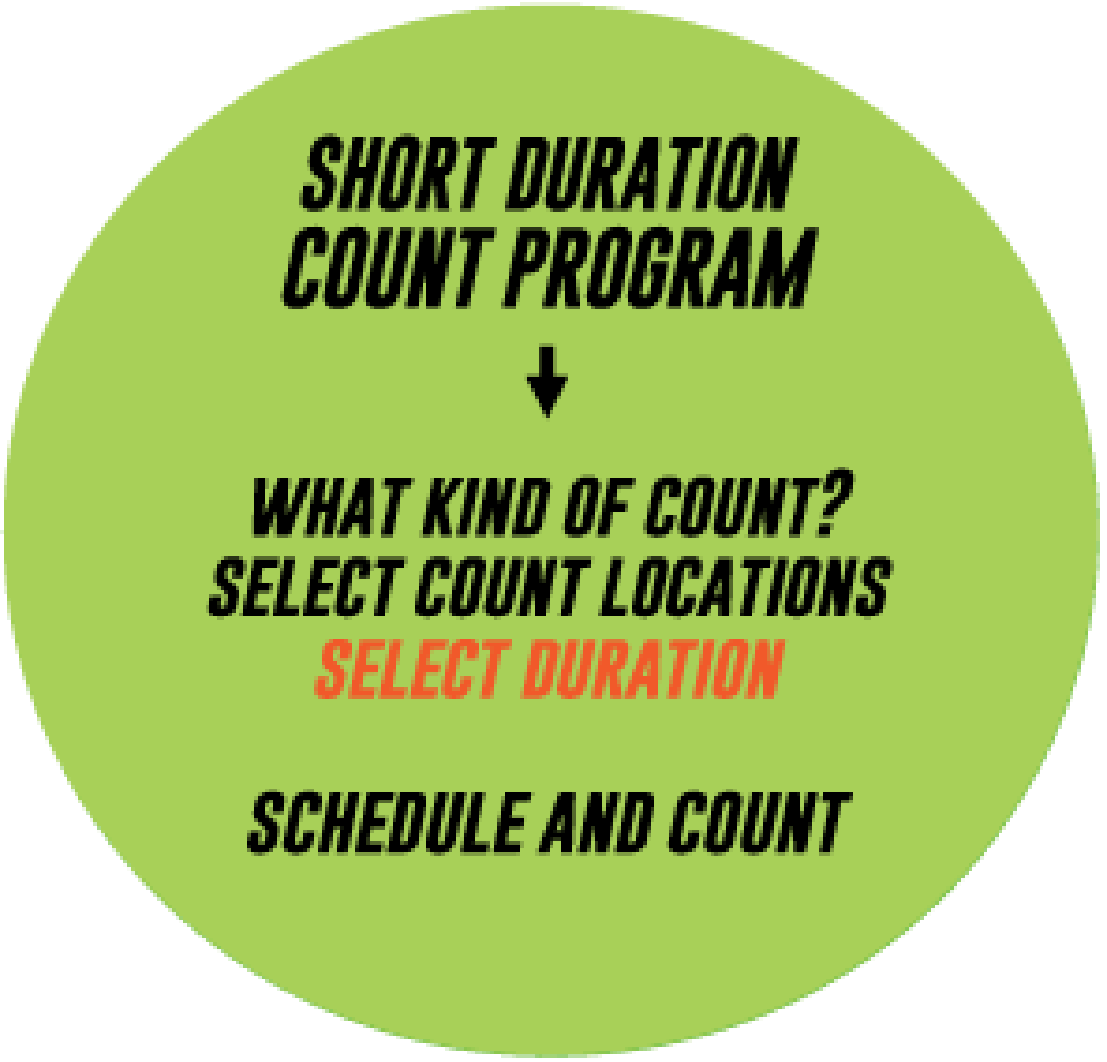
j = month of the year

k = index to identify the occurrence of a day of week *i* in month *j*

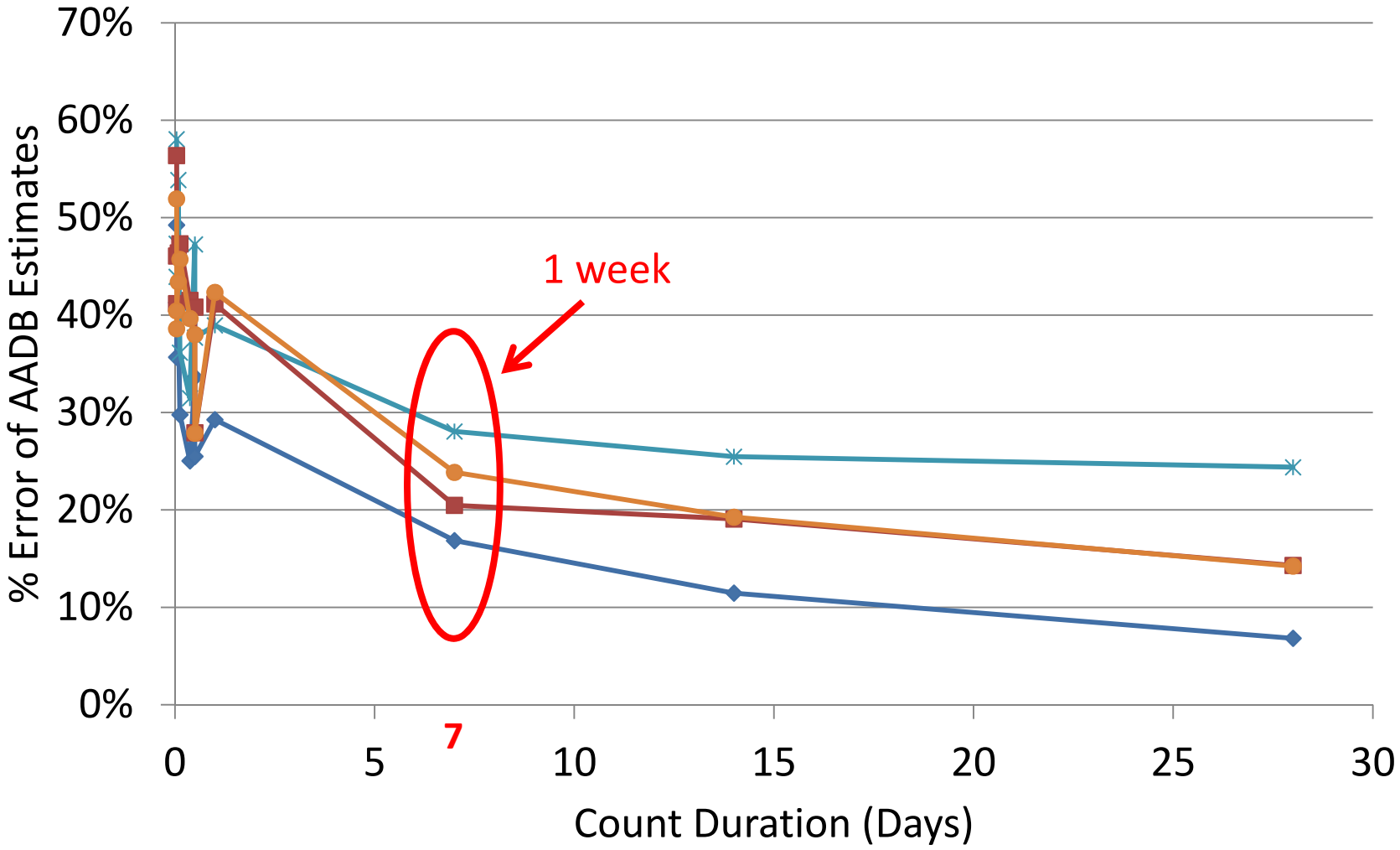
n = the number of occurrences of day *i* of the week during month *j*

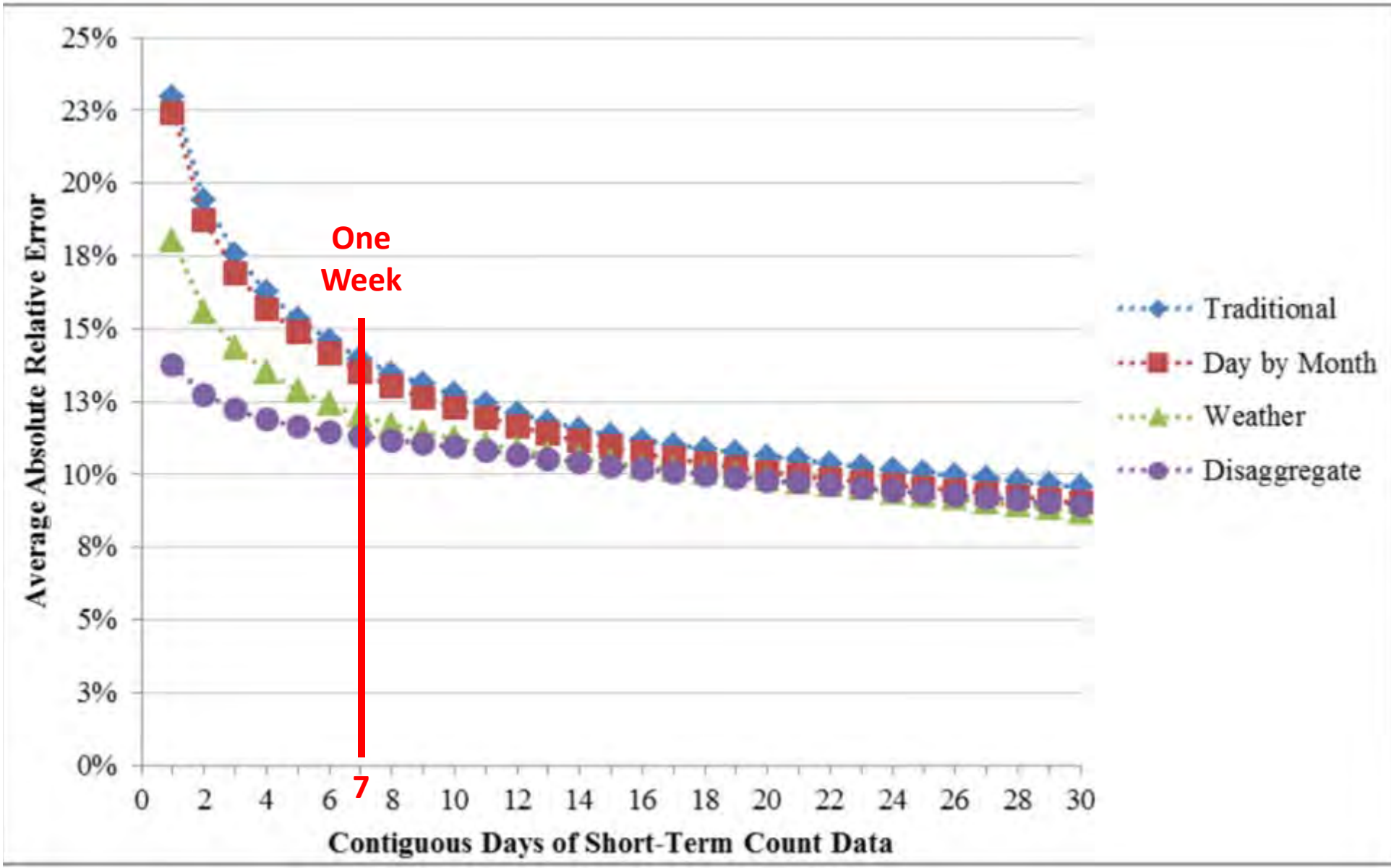
AASHTO. (1992). Guidelines for Traffic Data Programs (pp. 114). Washington, D.C.: Joint Task Force on Traffic Monitoring Standards of the AASHTO Highway Subcommittee on Traffic Engineering.

Short Duration Count Program

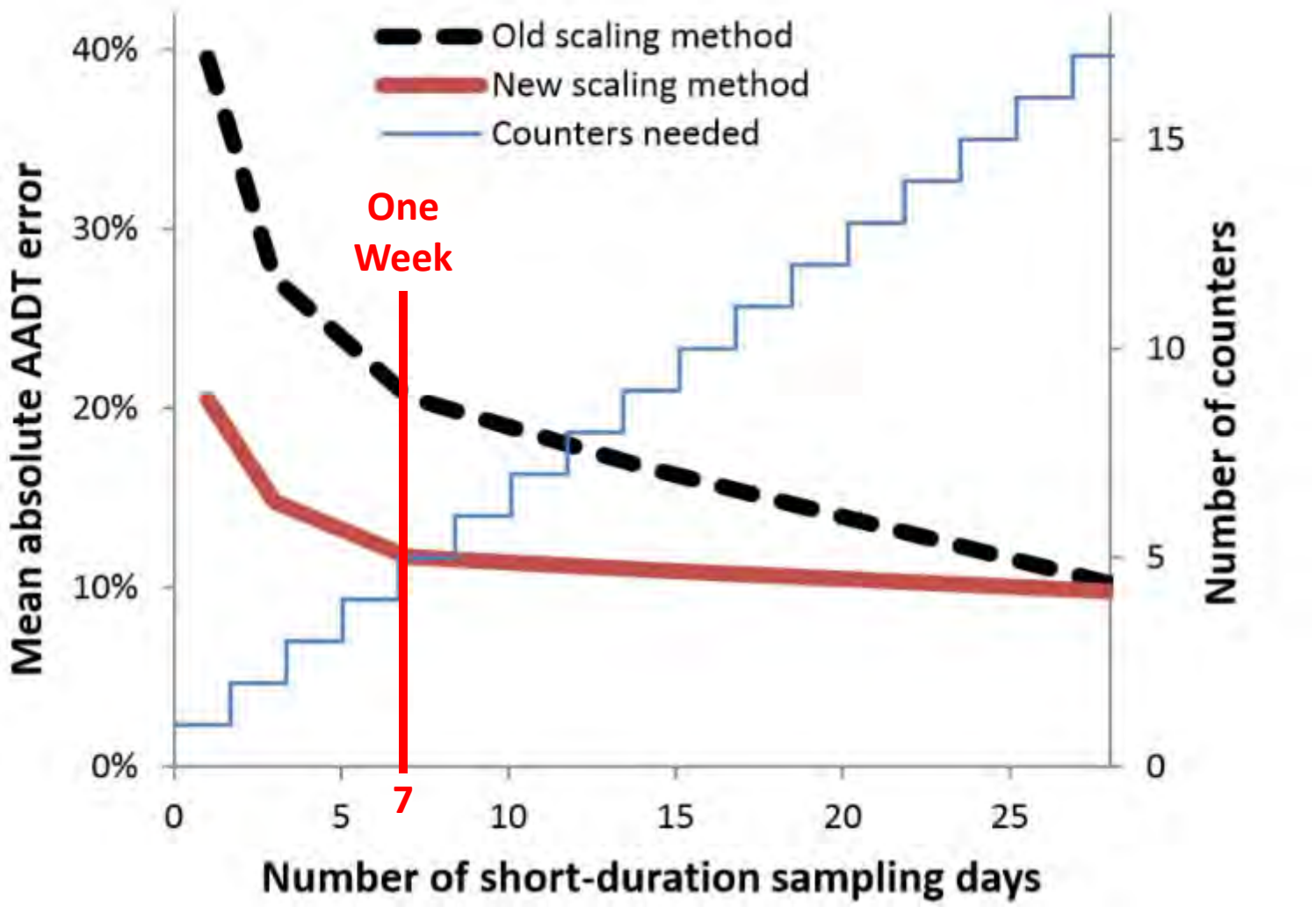


Count Duration





Nosal, T., L. Miranda-Moreno, et al. (2014). Incorporating weather: a comparative analysis of Average Annual Daily Bicyclist estimation methods. 93rd Annual Meeting of the Transportation Research Board. Washington, D.C., National Academies.

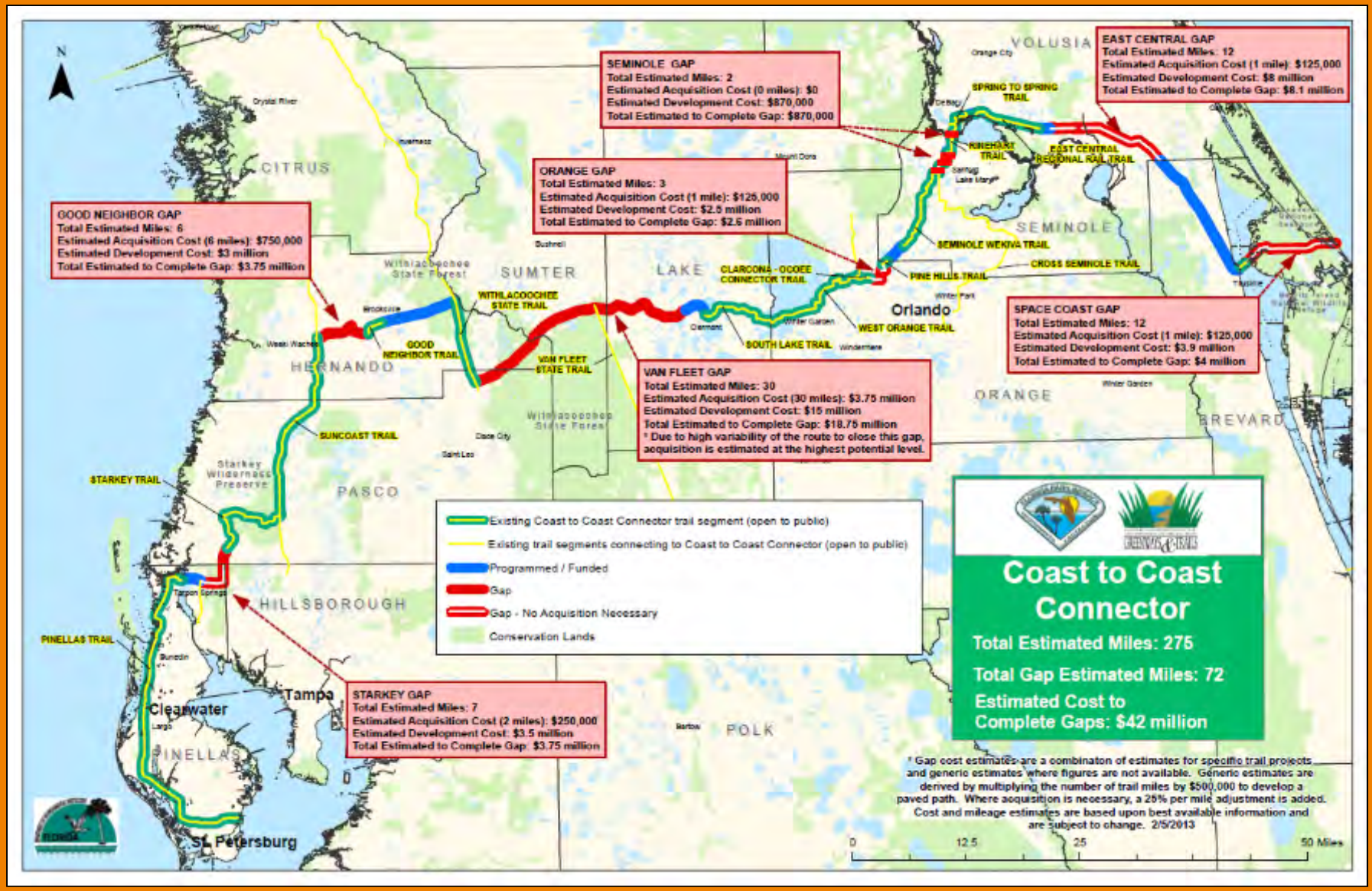


Hankey, S., G. Lindsey, et al. (2014). Day-of-Year Scaling Factors and Design Considerations for Non-motorized Traffic Monitoring Programs. 93rd Annual Meeting of the Transportation Research Board. Washington, D.C., National Academies.

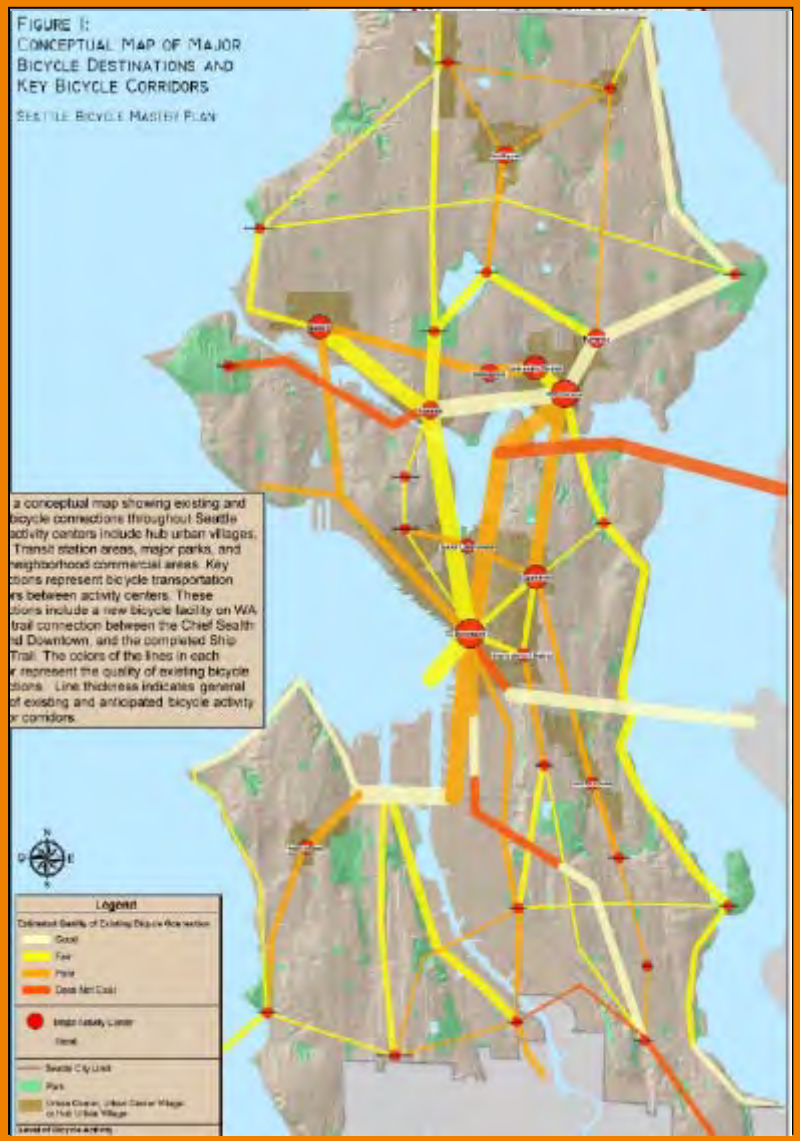
The Trail Modeling and Assessment Platform (T-MAP)

rails-to-trails conservancy

Motivation – Why Systems?



Motivation – Why Systems?

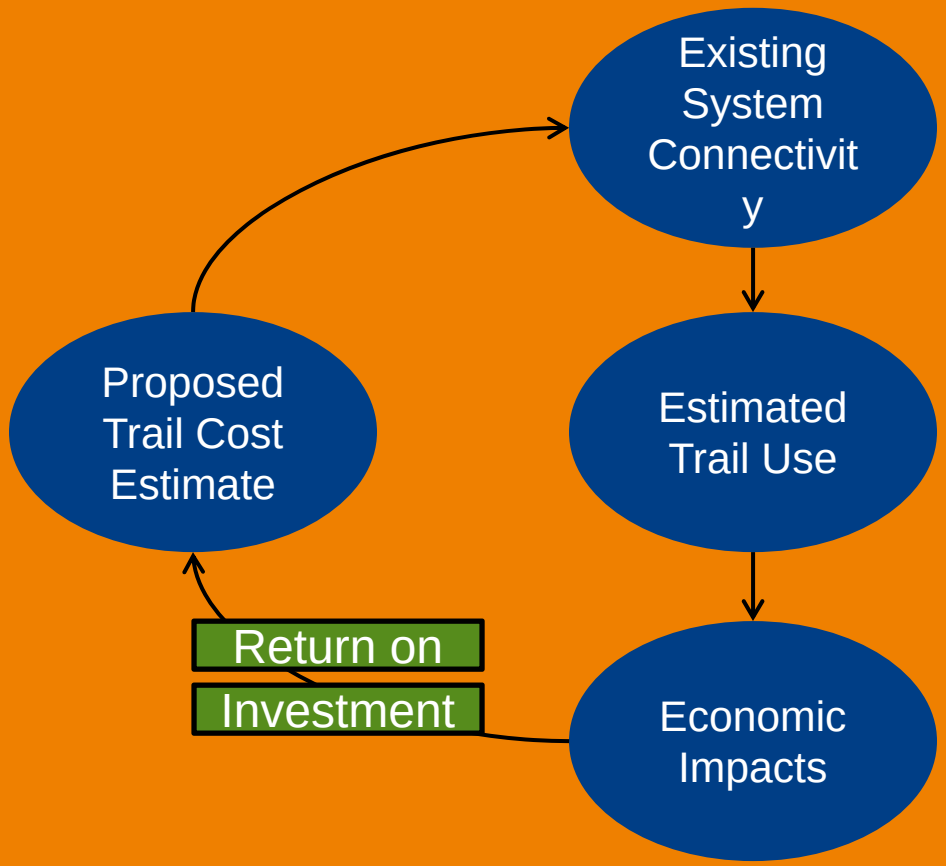


Motivation – Why Model?

Motivation – Why Assess?

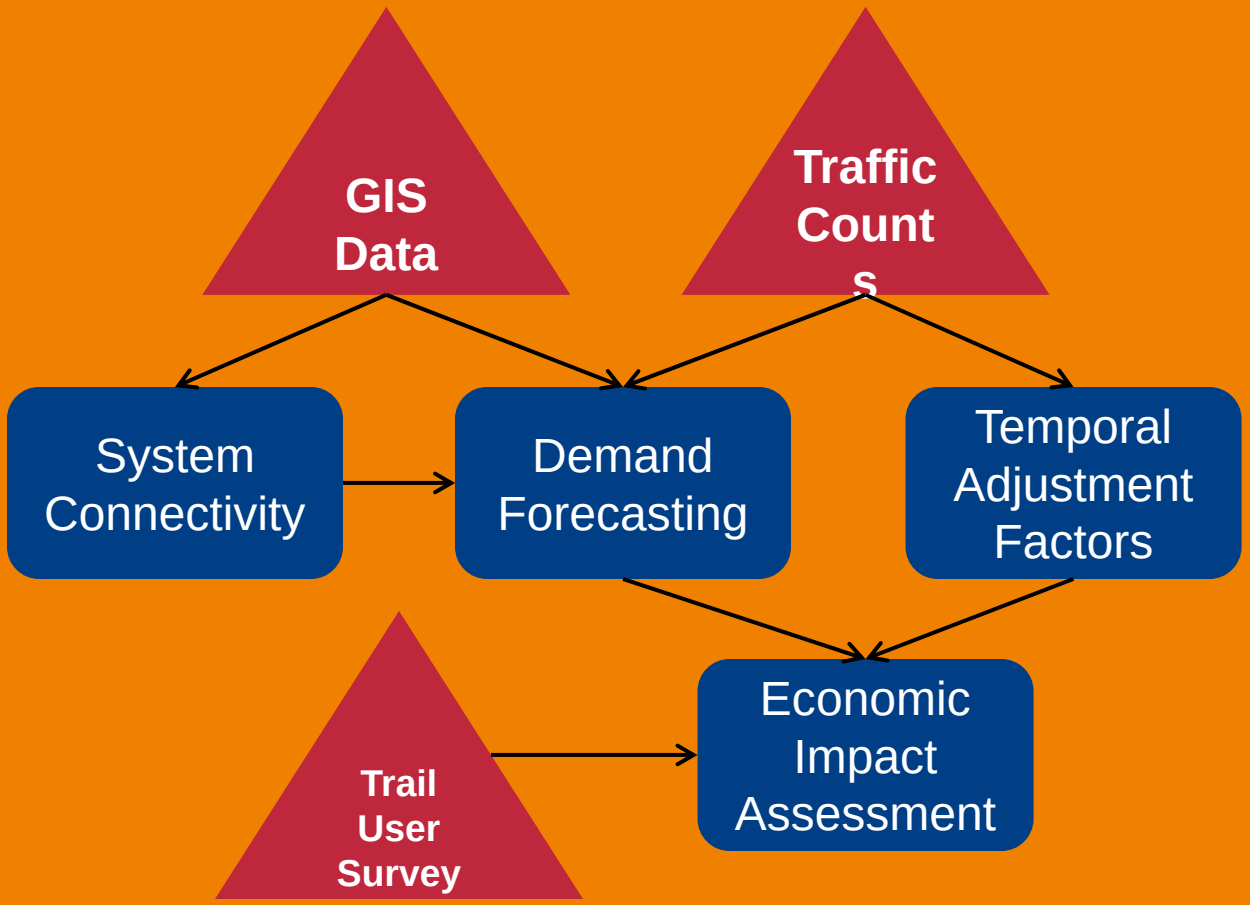
U.S. Department of Transportation
Federal Highway Administration

Logic Model



rails·to·trails conservancy

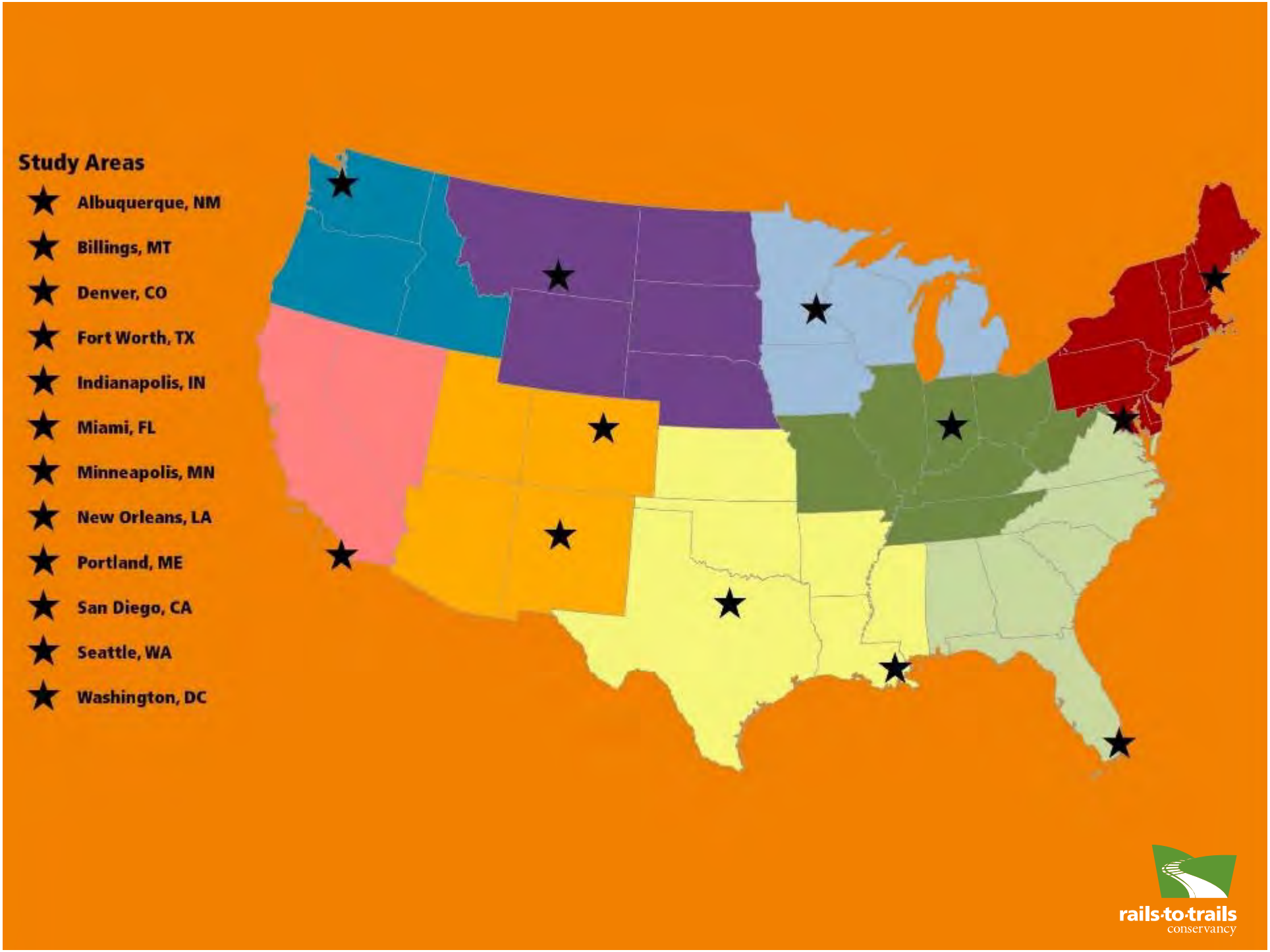
Inputs and Outputs



rails-to-trails conservancy

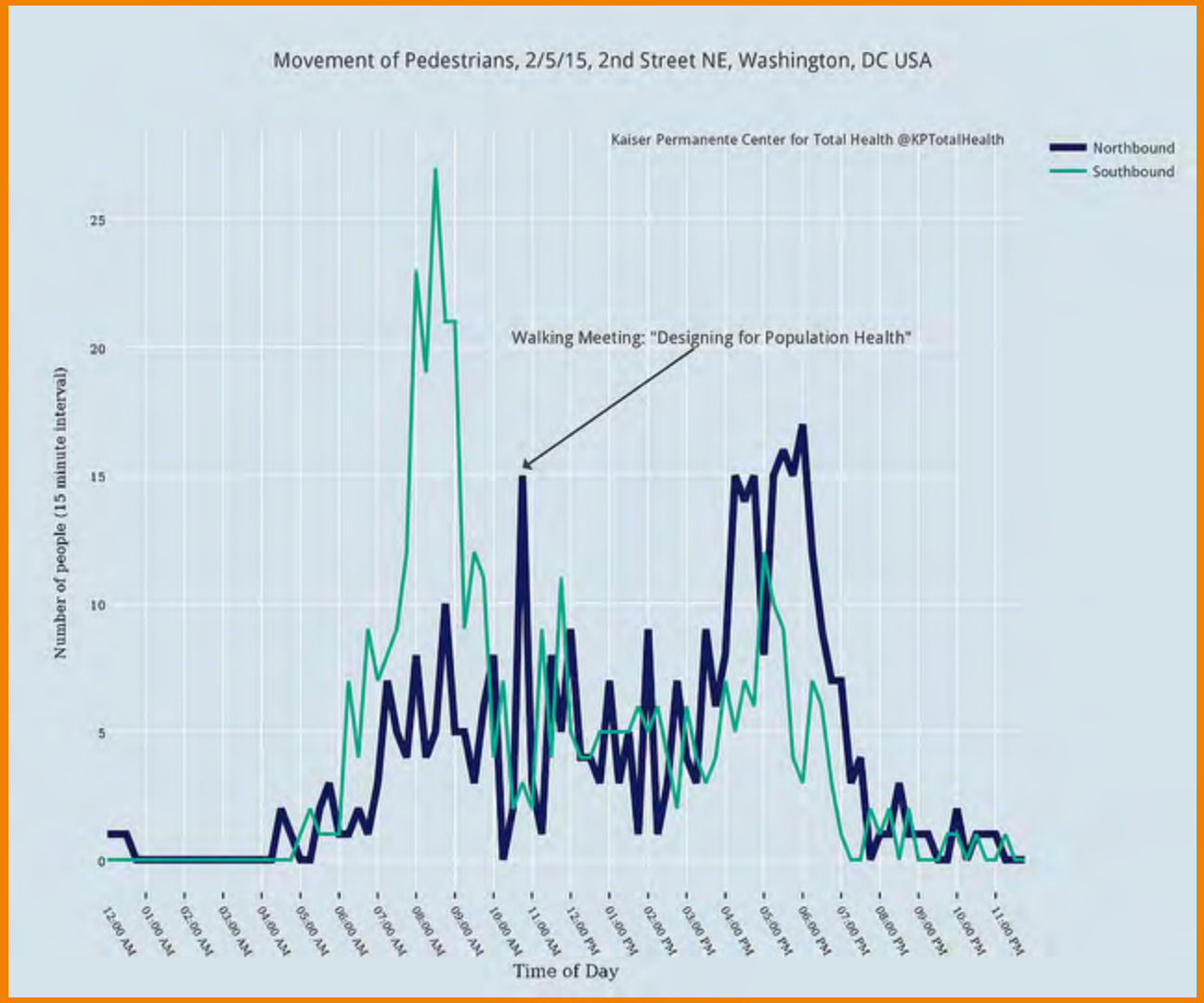
Timeline

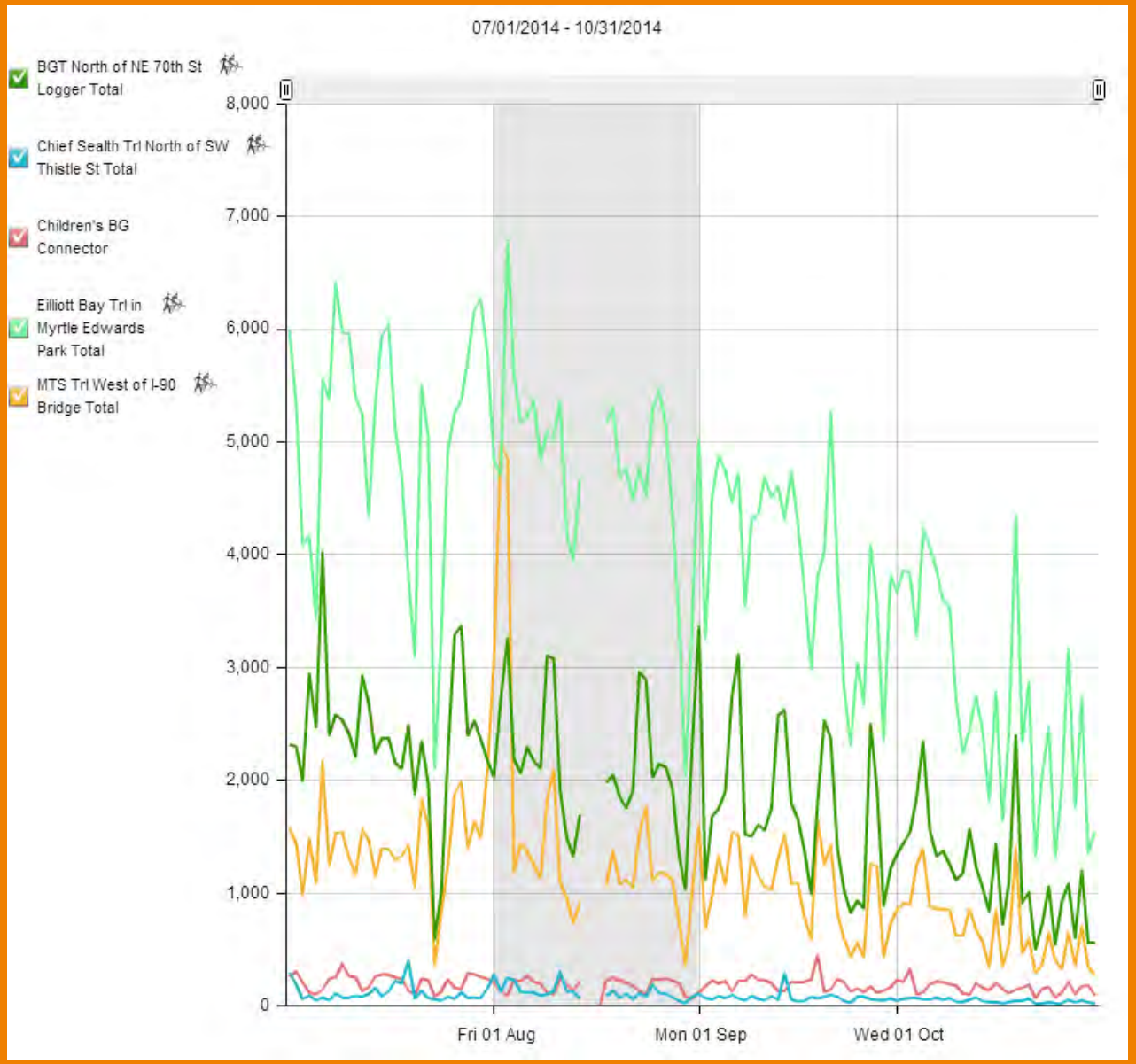
- June 2014 – June 2015: Traffic monitoring
- Spring 2015: Manual count app release
- Summer 2015: Trail user survey
- Fall 2015: Factoring calculator on railstotrails.org
- Winter 2015: Traffic forecasting tool
- Spring 2016: Economic impact assessment calculator on railstotrails.org


Study Areas
Albuquerque, NM
Billings, MT
Denver, CO
Fort Worth, TX
Indianapolis, IN
Miami, FL
Minneapolis, MN
New Orleans, LA
Portland, ME
San Diego, CA
Seattle, WA
Washington, DC
rails-to-trails
conservancy

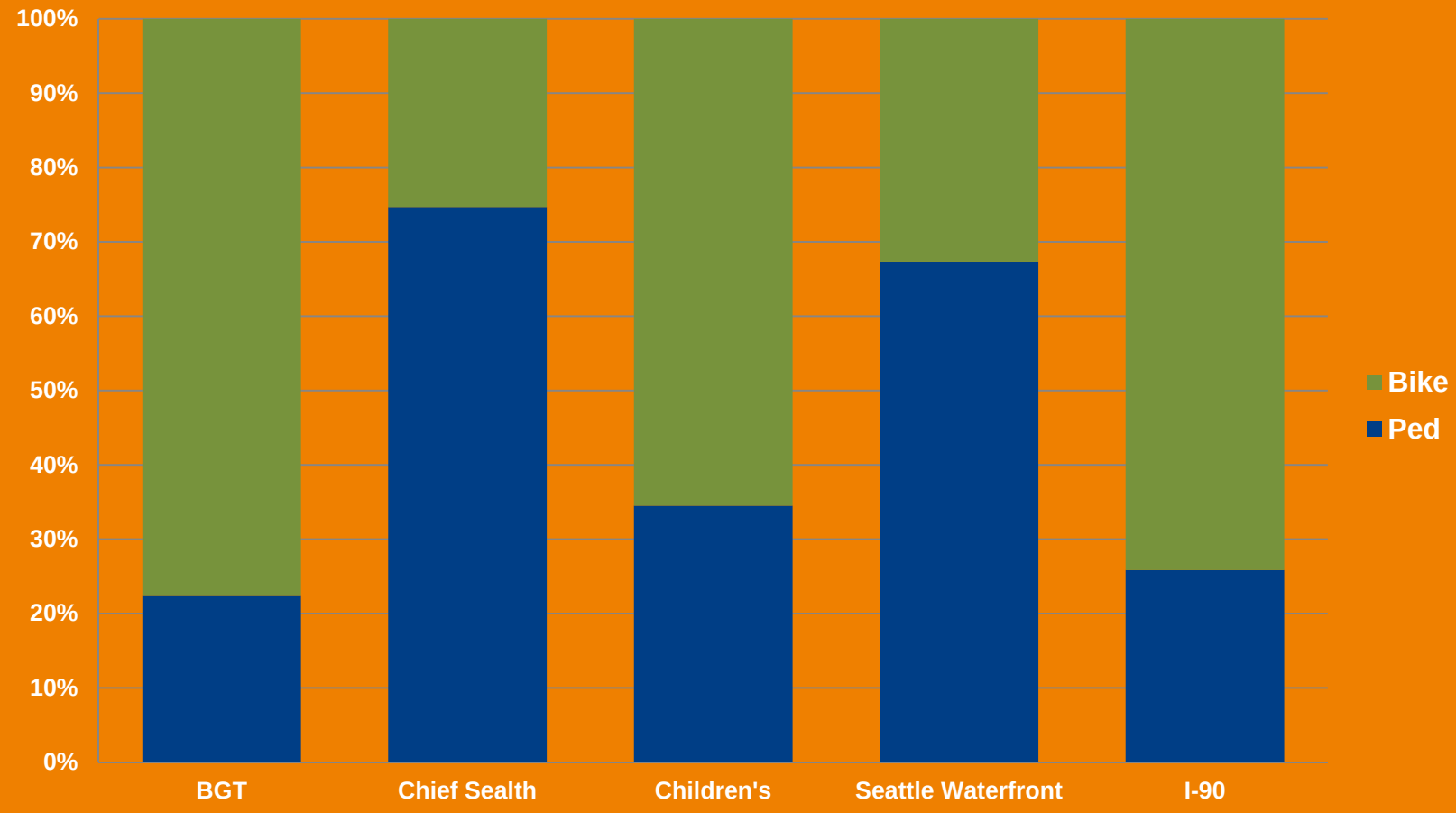
Traffic Counts

- Separate monitoring of bicyclists and pedestrians
- 42 permanent, continuous locations
- Mobile application for short-term manual counts


Movement of Pedestrians, 2/5/15, 2nd Street NE, Washington, DC USA
Kaiser Permanente Center for Total Health @KPTotalHealth
Northbound
Southbound
Walking Meeting: "Designing for Population Health"
Number of people (15 minute interval)
0
5
10
15
20
25
12:00 AM
01:00 AM
02:00 AM
03:00 AM
04:00 AM
05:00 AM
06:00 AM
07:00 AM
08:00 AM
09:00 AM
10:00 AM
11:00 AM
12:00 PM
01:00 PM
02:00 PM
03:00 PM
04:00 PM
05:00 PM
06:00 PM
07:00 PM
08:00 PM
09:00 PM
10:00 PM
11:00 PM
Time of Day


07/01/2014 - 10/31/2014
BGT North of NE 70th St Logger Total
Chief Sealth Trl North of SW Thistle St Total
Children's BG Connector
Eilliott Bay Trl in Myrtle Edwards Park Total
MTS Trl West of I-90 Bridge Total
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
Fri 01 Aug
Mon 01 Sep
Wed 01 Oct

Dominant Trail User Mode



Trail Use Estimates

Demand Forecasting

Temporal Adjustment Factors

Trail managers don’t know how many people use their trail. In 2014 RTC surveyed 205 trail managers across the US. One of the most surprising outcomes of that research was the revelation that less than a quarter of the respondents did any kind of trail user estimate and more than half of those indicated it was a guess.

Trail Use Estimates

Demand Forecasting

Temporal Adjustment Factors

Funders need a way to value and prioritize trail investments.

Valuing Trail Use

- Need survey data
  - Tourism: ask about consumer spending
  - Health: ask about trip & traveler characteristics
- Combine survey data with traffic monitoring to estimate population/community/facility level impact, makes level of effort needed to get representative survey data much more reasonable
- Many studies take data collection shortcuts and are based on big assumptions. Ouch!

Upcoming US National Trail User Survey – Summer 2015

- Intercept, takeaway, and online
- Focusing on physical activity and travel-related questions