An Introduction to Monitoring and Modeling Bicycle and Pedestrian Traffic: Learning from Minnesota

TRAIL IMPACT SERIES

Designing a monitoring program for bicycle and pedestrian traffic can be informative for communities, planners, and stakeholders interested in bicycle and pedestrian traffic on streets, trails, and sidewalks. In addition to providing information about overall use, user information can inform allocations of funding and resources, help to prioritize maintenance, scheduling and activities, measure changes in carbon emissions associated with active travel, and, as illustrated by the COVID 19 pandemic, assess changes in travel and recreational behavior associated with disruptions in society. This infosheet provides an overview of bicycle and pedestrian monitoring programs, modeling traffic approaches and methods, considerations, and resources.

PERMANENT CONTINUIOUS MONITORING

1. Review existing continuous count program
2. Develop inventory of available continuous count locations and equipment
3. Determine the traffic patterns to be monitored
4. Establish seasonal pattern groups
5. Determine number of continuous count locations
6. Select specific count locations
7. Compute adjustment factors

SHORT DURATION MONITORING

1. Select count locations
2. Select type of count (segment vs intersection)
3. Determine duration of counts
4. Determine method of counting (automated vs. manual)
5. Determine number of counts
6. Evaluate counts (QA/QC)
7. Apply factors (occlusion, time of day, day of week, monthly, seasonal)

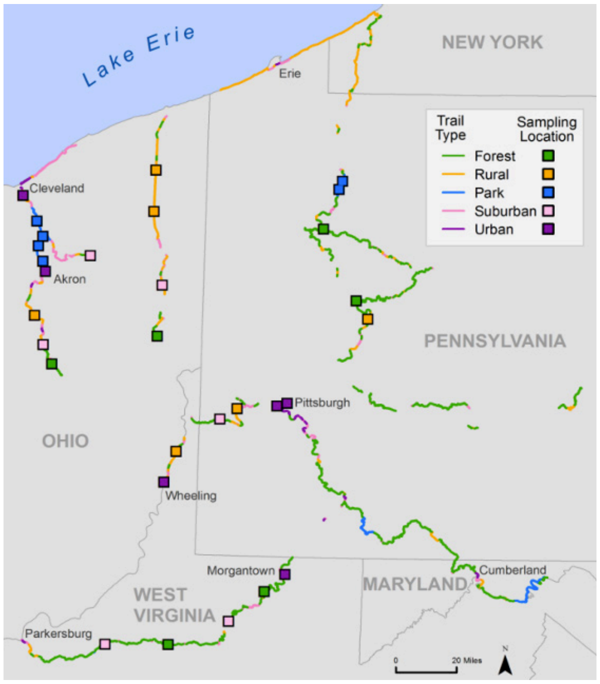
While these methods have been applied for many years in vehicle count programs, non-motorized counting programs have unique challenges. First, traffic varies from day to day because there are different times of the day in which individuals walk, run, or ride a bicycle each day. Technology needs to adapt to these. Second, recreation or trail managers typically focus on visit or visitors, not traffic or trail miles traveled, which can make implementation challenging.

A number of resources exist to get started and address these challenges. The FHWA Traffic Monitoring Guide (TMG) provides guidance for two key performance measures in non-motorized counting programs: Average Annual Daily Traffic (AADT) (including Average Annual Daily Bicyclists - AADB and Average Annual Daily Pedestrians - AADP), and Vehicle Miles Traveled (VMT) or Bicycle Miles Traveled (BMT). The Guide also outlines basic monitoring guidelines for both permanent continuous and short duration monitoring. The recommended approach for bicycle and pedestrian counting is to establish a network of permanent and short-duration monitoring sites, and apply adjustment factors from reference sites to extrapolate short-duration counts.

Starting a count program also involves choosing appropriate technology for the specific situation, and decisions will depend on the type of count (either pedestrian, bicycle, or both) and resources available. Examples of these technologies include pneumatic tubes, inductive loops, microwave technology, and passive infrared counters. Each type of technology creates different types and levels of errors caused by things like occlusion or bicyclists passing the tube at the same time, that may require manual counts or adjustment factors. It is important to understand and acknowledge errors given their implications for how the data can be used in decision making.

Case Study: *Industrial Heartland Trail Coalition*

The Industrial Heartland Trail Coalition is a 100-member regional economic development coalition that includes nearly 1,000 miles of existing trail and plans to expand its network to 1,400 miles across four states (Ohio, Pennsylvania, West Virginia, and New York) and 48 counties. Research was conducted to estimate performance indicators for the 972 mile trail network in the four-state region, illustrate application of FHWA Traffic Monitoring Guide methods to regional trails, help design long-term monitoring plans, and describe implications for practice. The approach included stratified randomized selection of thirty monitoring sites, data collection using passive infrared monitors, data quality management (visual inspection of data, identifying and flagging outliers, assessing zero counts, and imputing missing values), modeling of daily traffic, estimating performance indications (such as Average Annual Daily Trail Traffic (AADTT) and Trail Miles Travelled (TMT), and determining permanent and short duration sites. The study found that FHWA principles are applicable to regional trail monitoring, quality assurance and quality control procedures are essential for valid estimates, and that daily traffic can be modelled using weather, day-of-week, and season variables.



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This infosheet is part of a series based on webinar presentations for the Northeast Regional Center for Rural Development small grant project *Best Practices in Bike/Pedestrian Trail Data and Monitoring*. More information can be found at https://cttrailcensus.uconn.edu/nercrd/

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Resources

[National Bike and Pedestrian Documentation Project]

[FHWA Traffic Monitoring Guide]

[NCHRP 770 Estimating Bicycling and Walking for Planning and Project Development: A Guidebook]

[NCHRP 7-19 Methods and Technologies for Pedestrian and Bicycle Volume Data Collection]

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