Trail Use Counts, literature survey and Fall 2017 take aways.
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www.crossvermont.org

The motivation statement. Everyone says you should, but no one does. But you can!

The first question that advocates for bicycle/pedestrian/trail improvements often are presented is "how many people use the facility now, and how many will use it once the improvements are made?"

Trail organizations have traditionally struggled to provide reliable, objective answers to these questions. Resources are limited for small non profits, and many other needs typically take priority over carrying out formal use counts.

In this presentation, we will describe an example of a low cost way that high quality counts are being done through partnerships of numerous organizations using standard, easy to learn techniques that even the smallest organization can take advantage of.

We discuss carrying out a count combining manual sampling with an automatic counter, to capture both a large sample size and also finer details in a cost effective way. We will discuss the results of our first test run of this method, including lessons learned, how to responsibly calculate annual use based on sample counts, and ways in which the data gathered can be compared "apples to apples" with bike/ped counts done elsewhere in Vermont such as by VTrans and also nationwide by other organizations following the same method.

The NBPD succinct.

The basic approach is provided by the National Bicycle & Pedestrian Documentation Project (NBPD). This method is low cost, scalable, and possible for non-specialists to learn and implement. This nationwide effort provides a consistent model of data collection and ongoing data for use by planners, governments, and bicycle and pedestrian professionals. The basic assumptions of the methodology are that, in order to estimate existing and future bicycle and pedestrian demand and activity, agencies nationwide need to start conducting counts and surveys in a consistent manner similar to those being used by ITE and other groups for motor vehicle models. Full information at http://bikepeddocumentation.org/.

The National Bicycle & Pedestrian Documentation Project is co-sponsored by and Alta Planning and Design and the Institute of Transportation Engineers (ITE) Pedestrian and Bicycle Council. The project has been running since early 2000s. The information provided is kept current, but is also stable.

An informal but broad survey of other resources available online and locally in Vermont confirms for CVTA that the basic approach of the NBPD is fundamental, and is a method that can be compared "apples to apples" with other counts – such as those being done by VTrans on Shared Use Paths.

In practice NBPD project has two functions. First, they gather data from across the country, aggregate it, and use to help refine their method – as well to make it available for comparison and planning purposes for bike/ped managers – data from local counts can be submitted to the national pool via their website. Second – and more important for the topic at hand – they use this aggregated national data to produce and refine the provided the template for how to conduct new counts.

The most powerful specific tool NBPD project provides is the "extrapolation formula" that allows generalizing longer term use totals from smaller sample sizes – as little as two days of counting can provide a reasonably reliable annual figure, they say. A detailed step by step explanation of how to apply the extrapolation formula is provided by NBPD (and is attached to this document.)

Breaking it down, what makes it a "yes you can" thing.

<u>A small sample size is enough.</u>

The basic fact that makes the method possible to do with limited resources is the idea that a small sample size is enough to then calculate reliable longer term numbers, using the NBPD extrapolation formulas.

NBPD says that as little as four hours per day for just two days is the minimum required. The recommended sample size is larger, but not that much larger.

Number of days:

- Recommended number of days is six. For each location, the recommendation is will be to count two blocks of time, two hours long each, carried out on three weekdays and three weekend days, either all in one week (consecutive days Tues through Sun) OR do one weekday and one weekend day per week for three consecutive weeks.
- Maximum number of days: repeat the six day count in a different season of the same year.
- More than maximum. On the one hand, they say it's not needed. On the other hand, they say it can't hurt – the more the better. However, they recommend that beyond a certain point it would make sense to simply invest in a mechanical counter.

Number of hours per day, which hours:

- NBPD recommends two blocks of two hours each, centered on the peak times per day.
- Other sources confirm that two is good, and furthermore that more than three continuous hours is the maximum for manual counting, beyond three the accuracy decreases.
- Side note: VTrans actually does 6 hours shifts. However, they record the data every 15 minutes the same as all other methods, so the comparable hours can still be broken out if needed. Why is 6 OK for them? Can rationalize that the longer shifts are being done with the aid of mechanical counters, by professional staff who are experienced at the longer shifts.

To-do: experiment with when are the peak times of day.

- Based on Fall 2017 mechanical counts, the peak times in mid day were early afternoon not later morning, so in future may be worth doing manual counts Noon – 2 rather than 11 – 1. But definitely somewhere in that vicinity.
- And based on same mechanical counts, the later day peak hours were in the hours right around sun set in November, so between 3 and 6. It seems to make sense to pick two hours that tend a little earlier in late Fall and a little later in summer.

A simple paper form, pencil and clipboard is enough.

The second thing that makes the basic method cost effective, with low barrier to entry is the fact that the simple paper form for recording data is just as effective as any other more expensive.

Sources indicate that the paper form is not advisable beyond a certain level of use (200 per HOUR) as it becomes difficult for the person doing the counting to keep track of all the passer by. But even in this case, which is sometimes present on Vermont trails (some of the counts on the Stowe Rec Path, for example) the solution is still pretty low tech – for example, teams of counters, use of 'clickers' etc.

More expense counting tools are available for purchase, and are used by VTrans for example. The upshot for trail organizations is to be not distracted by those options, they aren't generally needed for our purposes.

And in general, don't be distracted by aspects of conventional transportation planning counts that are not relevant to trail counts. (We need to use only a subset of the conventions.)

There are four type of counts that are standard in transportation planning.

For trails, the one that matters is "Screenline" counts. Count users who pass by a certain point.

We are not doing "intersection turning movement counts" (which is what the VTrans system is set up to do almost exclusively, so when comparing trail counts to VTrans counts, we compare only a subset of the data in their forms); Occupancy counts (number of people in vehicles), or "On-off" counts (counting of public transit users).

Note: the definition of Screenline count is easiest way to determine best location for the count to take place. Count at a spot where the users can be expected to simply travel through one way or another, not at a place where there is a reason to pause or mill about (like a trailhead).

Some of the basic aspects of the manual counting method.

All sources agree on:

- record data in 15 minute increments
- record direction of travel
- record 'mode'

What modes are significant? Determine this for your trails, and then be consistent. Such as bike, ped, equestrian, etc. Also, counting dogs, describing groups (parents and children), noting if a person is passing by a second time during the count period (out and back). Never hurts to have an 'other' and a notes field.

Where to count – all agree it is an 'art not a science'. One basic rule is to count at a location where people are passing by, not a place where they are gathering or lingering (like a destination, intersection or trailhead). A second basic rule is once a site is picked, try to use it for subsequent counts in that area, to be consistent. But over all, source all agree selecting the locations is mostly just common sense, ask yourself where are the logical sections of trail and get a count for each.

The count should be accompanied by a narrative description of the site, the conditions that day, and so on.

There is not a specific formula that uses this information, but at the common sense or intuitive level of interpretation, it is important to have a feel for things.

The weather at the time of the count is captured on the form, and though not included in calculations, there is some advice to discard counts done on days when weather is very bad and use is abnormally low.

Other factors to describe, general area of trail, where or why people would be coming to the trail (such as there is a park nearby, etc.)

A full scale survey of users takes the most advantage of nuanced detail ability of manual counting.

Manual counts can be complemented by full scale surveys, where users are interviewed and asked questions about their trail use. The additional level of detail could be very interesting – especially about the person's use of the trail at other times (how often do they come, etc.). That said, the NBPD project method doesn't get into details of how to do a reliable or statistically correct survey, it's more just a questionnaire method, which is fine as far as it goes.

NBPD actually recommends that the person doing the survey be separate from the person doing the counting, a different person, and physically removed from them some distance. That said, in any manual count it can't hurt to take advantage of incidental conversation to ask passers by some basic questions.

Automatic or mechanical counters are great, too, and when available can complement the manual count method.

Mechanical counters are great – not necessarily better or preferable to use instead of manual counts, but they add value when done in addition to manual counts. You can buy a mechanical counter, they are somewhat expensive but not prohibitive. Borrowing or pooling use of counters among partners is also something people have done successfully.

NBPD specifically recommends combining manual and mechanical counters – the manual counts give more nuanced detail while the mechanical counter obviously gives a much greater volume of data. Together they can paint a more rounded or reliable picture.

Tips for combining manual and mechanical counts:

- manual counter should synchronize their time to the clock used by the mechanical counter, if possible
- manual counter should station themselves well clear of the mechanical counter, so that the mechanical counter is a "clean screenline" location, a place where people simple travel by without a reason to stop or mill about (such as to talk with the person doing the counting)

All mechanical counters are prone over counting if located at a spot where people mill, linger, etc – such as trail intersections, at information signs, and points of interest and so on.

For trails, the recommended standard is "passive infrared" counter.

- It is triggered by the heat of a person passing.

- Can determine the direction of travel.
- It is calibrated to avoid being triggered by animals, blowing leaves, etc.
- It has trouble counting groups of people who pass all at the same time.
- Accuracy – plan on an undercount (because of the trouble with groups factor.) Generally expect to be around 20% undercount (but could range from 1% to 50% under).
- Good for trails because portable, easy to set up on site, works in all weather, difficult to vandalize.
- Cost, $2000 to $3000
- Example brands: EcoCounter, TrafX.

Also common on trails are "active infrared" counters. In practice, similar in many ways to passive counters, but distinguished by:

- they work by projecting a beam across the trail and trigger a count when the beam is broken.
- they require hardware on both sides of the trail, and the target for the beam is shiny – so a little more difficult to set up and a little more attractive of vandalism.
- cannot determine direction of travel
- overall, slightly less accurate
- much cheaper, around $500

Last, for more developed areas there are all kinds of other options. Some of these can differentiate between bike and ped and so on, so it gets very fancy. But for the purposes of relatively primitive settings of trails, and need for relatively low cost solutions, none of these are worth spending much time on currently. Maybe in future technology will improve/get cheaper and then it would be worth looking at these options.

<u>Expected error. Within certain parameters of error, don't be alarmed or distracted.</u>

Basically, we are not counting for exact numbers. There is expected error no matter the method.

Mechanical counters are described in the literature as having up to 50% error rate. The 'passive infrared' EcoCounter which is an industry standard – basically the take away is assume that there is likely an error of between 1% and 25% to the count UNDER the true number, but there's no way to know for sure where you fall in the error range. (If you could predict the exact error rate you could simply correct for it.)

The manual counts are accurate for the period counted of course (assuming the total use is below the threshold of a person's ability to keep track; the threshold is around 200 per hour sources say). However, manual counts have an expected error by virtue of the fact that the extrapolation formulas are all just estimates, so can't be expected to be a specific number.

Using manual counts to check mechanical counts for matching period, and deriving a correction for specific error, is theoretically possible, but requires specialized knowledge which the NBPD project method doesn't get into. It's not as simple as just counting a sample, and comparing to the mechanical count for the same period and that's the correction value. Maybe a good project for students in a statistics class.

How to use the numbers you end up with, even with the expected error built in.

For day to day management and maintenance. The idea is that, even though cannot count exact use, can count use accurately enough to create categories of use – low, medium, high, and so on. Defining these categories and associating reasonable implications for management and planning for each category is big To Do. For better or for worse, this is the area that goes beyond the information collated and presented at NBPD. There are not standard formulas available, that I have found yet, that say "use level of X means management or planning need for Y." This will be interesting work.

For bigger picture planning and 'telling the story' of the trail. The most commonly cited use for the counts numbers in the sources is to reference in grant applications. Which is true as far as it goes, but misses the underlying point of the counts – to actually use in management and planning. But in any case, good counts enable telling the real story about a particular trail, whatever that may be. For example, if a trail is used by as many people as some other trail that is more known and prominent, then can say "you may be surprised to hear, but xyz is as popular as abc" thus implying xyz is as worthy of funding. Or conversely, can be up front about the fact that xyz has less use than some other facility, but then here is my explanation why that lesser use is still valuable or worth some money etc. Like it's fewer people but an underserved population, or a different purpose etc.

There is room for innovation and sharing of experience.

The NBPD project, and other sources, all pretty consistently assume that there is room for more innovation. Experimenting is encouraged, and sharing lessons learned. Let's go do it!

Cross Vemont Trail – use count and observations.

Cross Vt Trail Association; PO Box 116, Montpelier VT 05601 www.crossvermont.org

Name of person making notes:	
Date:	
Town:	
Location:	
Description IN:	
Description OUT:	

This sheet is for one site, one day, two different counting periods of two hours each. Big picutre: typically, a full set of counts will be: 1.) at the same location 2.) at the same two hour block of time each day (such as 11 AM to 1 PM or 5 PM to 7 PM) and 3.) be carried out on three weekdays and three weekend days, either all in one week (consecutive days Tues through Sun) OR do one weekday and one weekend day per week for three consecutive weeks. At the end of the count, all the data will be mulitplied by a standard formula in order to extrapolate generally reliable estimates for daily, weekly, monthly and annual use.)

If you are counting at a location where there also a mechanical counter, position yourself at least 100 feet from the mechanical counter, and in a way that does not cause people to linger or mill about in the vicinity of the mechanical counter.

Count each person passing by, in each category, each time they pass by. Wheelchairs, babystrollers, skateboards, etc are "other" and make a comment in the notes section describing other. Move to a new line every 15 minutes.

Observed Weather Legend: **S**=mostly sunny; **C**=cloudy; **L**=light precipitation and **H**=heavy precitpiation or bad weather.

thoughts, observations, sketches:

If you get a chance to chat with folks – such as, if they ask what you are doing . . .

Tell them a little bit about the work we do – advocating for and maintaining local trails. Getting real numbers about who is using the trail really helps with this work.

Bring with you some handouts, such as a CVTA brochure – these also direct them to where they can get more info.

And, very important, ask them to share their observations about the trail. How often do they use it? What uses do they see? What work do they want done on the trail?

15 min intervals	bike		ped + ski		equestrian		motorized		other		TOTAL PEOPLE	dogs		weather	notes
	in	out	in	out	in	out	in	out	in	out		in	out		
start time:															
end time:															
2 HR TOTAL															
start time:															
end time:															
2 HR TOTAL															

NATIONAL BICYCLE & PEDESTRIAN DOCUMENTATION PROJECT

Count Adjustment Factors

March 2009

While more year-long automatic count data is needed from different parts of the county, especially for pedestrians and on-street bicyclists, enough data now exists to allow us to adjust counts done almost any period on multi-use paths and pedestrian districts to an annual figure.

All percentages in the following tables represent the percentage of the total period (day, week, or month).

How to Use This Data

The factors in the following tables are designed to extrapolate daily, monthly, and annual users based on counts done during any period of a day, month, or year. The factors currently are designed to be used by (a) multi-use pathways (PATH) and (b) higher density pedestrian and entertainment areas (PED).

How Many Counts Can it Be Based On?

Given the variability of bicycle and pedestrian activity, we strongly encourage that all estimates be based on the average of at least two (2) and preferably three (3) counts during the same time period and week, especially for lower volume areas. For example, counts could be done from 2-4pm on consecutive weekdays (Tuesday – Thursday) during the same week, or, in consecutive weeks. Weekday counts should always be done Tuesday through Thursday, and never on a holiday. Weekend counts can be done on either day.

Bicyclists versus Pedestrians

The factors used in these formulas are for combined bicyclist and pedestrian volumes. Once you have calculated your total daily, monthly, or annual volume, you can simply multiple the total by the percent breakdown between bikes and pedestrians based on your original count information.

Start with the Hour Count

Once you have collected your count information and developed an average weekday and weekend count volume for bicyclists and/or pedestrians, pick any one (1) hour period from either of those days.

<u>Adjustment Factor</u>

Your next step is to multiply those counts by 1.05.

Sample #1

Average 1 hour weekday count: 236 bikes/peds x 1.05 = 248

Average 1 hour weekend day count: 540 bikes/peds x 1.05 = 567

This adjustment factor is done to reflect the bicyclists/pedestrians who use the facility between 11pm and 6am, or, about 5% of the average daily total. The count formulas are all based on total counts between 6am and 10pm, since many available counts only cover those periods. If you are certain your facility gets virtually no use between those hours, you can forgo this step.

Calculate Daily Weekday and Weekend Daily Total

Identify the weekday and weekend hour your counts are from in Table 1 below. Be sure to use the PATH column for all multi-use paths, and the PED column for all higher density pedestrian areas with some entertainment uses such as restaurants. Be sure to select the correct time of year (April-September, or, October-March) as well.

Sample #2: done in June on a multiuse path (weekday = 4-5pm, weekend day = 12-1pm):

Adjusted weekday hourly count = 248/.07 = 3,542 daily users

Adjusted weekend day hourly count = 567/.1= 5,670 daily users

Calculating Average Weekly Volumes

We need to adjust these figures based on the day of the week. See table 2 below. Find the day of the week your counts were done, and factor them by that percent. If you did multiple counts on different days of the week, then take the average of those factors.

Sample #3: counts were done on a Tuesday and a Saturday.

Adjusted weekday count = 3,542/.13 = 27,246 average weekly users

Adjusted weekend count = 5,670/.18 = 31,500

Add these two figures together, and divide by 2: 27,246+31,500=58,746/2 = 29,373 people

The average weekly volumes for that month are 29,373 people.

Convert to Monthly Volumes

To convert from average weekly volumes to an average monthly volume, multiply the average weekly volume by the average number of weeks in a month (4.33 weeks).

Sample #4: 29,373 x 4.33 = 127,282 people.

This is the average monthly volume for the month the counts were conducted.

Convert to Annual Totals

To convert from the average monthly volume for the month the counts were taken into an annual total, divide the average monthly figure by the factor from Table 3 for the month the counts were conducted. Use the general climate zones described. Some climate zone types are not included.

Sample #5: counts were done in June in a moderate climate zone.

Average monthly volumes = 127,282/.08 = 1,591,037 people.

Based on these sample figures, it is estimated that almost 1.6 million people use the pathway annually.

Average Monthly and Daily Figures

To identify the average monthly and daily figures, simply divide the annual figure by 12 (for month) or by 365 (for daily figures).

Monthly average = 1,591,037/12 = 132,586 people

Daily Average = 1,591,037/365 = 4,359 people

Table 1

Hourly Adjustment Factors

Multi-use paths and pedestrian entertainment areas by season

	April - September 6am - 9pm			
	---- PATH------		-----PED-----	
	wkdy	wkend	wkdy	wkend
0600	2%	1%	1%	1%
0700	4%	3%	2%	1%
0800	7%	6%	4%	3%
0900	9%	9%	5%	3%
1000	9%	9%	6%	5%
1100	9%	11%	7%	6%
1200	8%	10%	9%	7%
1300	7%	9%	9%	7%
1400	7%	8%	8%	9%
1500	7%	8%	8%	9%
1600	7%	7%	7%	9%
1700	7%	6%	7%	8%
1800	7%	5%	7%	8%
1900	5%	4%	7%	8%
2000	4%	3%	7%	8%
2100	2%	2%	6%	8%

	October - March 6am - 9pm			
	---- PATH------		-----PED-----	
	wkdy	wkend	wkdy	wkend
0600	2%	0%	1%	0%
0700	4%	2%	2%	1%
0800	6%	6%	3%	2%
0900	7%	10%	5%	4%
1000	9%	10%	6%	5%
1100	9%	11%	8%	8%
1200	9%	11%	9%	10%
1300	9%	10%	10%	13%
1400	9%	10%	9%	11%
1500	8%	10%	8%	8%
1600	8%	8%	7%	7%
1700	7%	5%	6%	6%
1800	6%	3%	7%	6%
1900	4%	2%	7%	6%
2000	2%	1%	6%	6%
2100	2%	1%	5%	5%

Table 2

Daily Adjustment Factors

Note: Holidays use weekend rates.

MON	14%
TUES	13%
WED	12%
THURS	12%
FRI	14%
SAT	18%
SUN	18%

Table 3

Monthly Adjustment Factors by Climate Area

	Climate Region		
Month	Long Winter Short summer	Moderate Climate	Very hot summer Mild winter
JAN	3%	7%	10%
FEB	3%	7%	12%
MAR	7%	8%	10%
APR	11%	8%	9%
MAY	11%	8%	8%
JUN	12%	8%	8%
JUL	13%	12%	7%
AUG	14%	16%	7%
SEP	11%	8%	6%
OCT	6%	6%	7%
NOV	6%	6%	8%
DEC	3%	6%	8%