Trails: A Sustainable Transportation Solution

Shawn McLaughlin, AICP, CPRP
Union County Planning Director

Michelle Oswald, Ph.D., LEED AP
Assistant Professor at Bucknell University

APA PA Annual Conference
Harrisburg, PA
Overview

- I. Sustainable Transportation
- II. Background on Rail Trails
  - Definition
  - History
  - Benefits
- III. Buffalo Valley Rail Trail
  - Planning
  - Development
  - Future Goals
- IV. Travel Demand Analysis
  - Rail Trail Impact Assessment Method (RTIAM)
  - Travel Demand Results
Part I

What is Sustainable Transportation?
How would you define the term sustainability?

“Sustainability is development that meets the needs (and aspirations) of the present generation without compromising the ability of future generations to meet their own needs.”

(World Commission on Environment and Development, United Nations, 1987)

How can this be applied to transportation?
How does sustainability relate to transportation?

Transportation has been defined as an... **UNSUSTAINABLE ACTIVITY**
A sustainable transport system:

- Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations
- Is affordable, operates fairly and efficiently, offers a choice of transport mode and supports a competitive economy, as well as balanced regional development
- Limits emissions and waste within the planet’s ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation of noise.

(European Council of Ministers of Transport 2004)
Triple Bottom Line of Sustainability

- Three Pillars of Sustainability
- Three E’s of Sustainability
Applying the Triple Bottom Line to Transportation and Urban Planning
Motivation for Sustainability

- Recent national emphasis on sustainability and “going green”

WHY?
Consumer Demand

U.S. Vehicle Miles Traveled
What we thought would happen vs what is happening

Vehicle Miles Traveled - Moving 12-Month Total

Baxandall (2012)
Sustainable Transportation Options

Mode Shift

Corridor Efficiency

TOD

Rail Freight

Fuel Efficiency

Transit
One sustainable solution...
Part II
Background on Rail Trails
Railroad History

Rail Track Mileage & Number of Class I Rail Carriers, 1830-2008

Source: Hofstra University
Rail Trail Movement

Midwestern Region
1983 US Congress amended Section 8(d) of the National Trails System Act to preserve rail corridors through “rail banking” and allow for “interim” trail use.

Future abandonments need to go through federal review and state and local government notification.

Legal abandonment now more than ceasing rail service and removing infrastructure.

Rail Trail Benefits

- Health & Wellness
- Adaptive Reuse
- Preserves Rail Corridor
- Transportation/Connectivity
Rail Trail Benefits

* Economic Revitalization
* Community Identity
* Livability
* Social Interaction
Part III
Buffalo Valley Rail Trail Case Study
BVRT History
BVRT Major Phases

Plan → Acquire → Design

Design → Monitor → Construct

Expand!
Planning Phase

- Idea by Main Street organization in 2001
- Feasibility Study initiated in 2003
  - Review constraints
  - Evaluate options
  - Obtain public input
  - Recommended option
2008 sales agreement between Lewisburg Area Recreation Authority and West Shore Railroad Corp.

- Federally railbanked by US Surface Transportation Board (STB) in 2008
- Property Transaction Closed
- Infrastructure removed
Design (Opposition) Phase

Farmers blast group

Priest Moore Sr. speaks about his concerns at the Lewisburg Area Recreation Authority meeting concerning its rails-to-trails project.

Organization doddling issue, landowners complain
Construction Phase

* Awarded $3.2 million PCTI Funding

* 2 miles Superpave; 7 miles TSA

* Construction completed in 8 ½ months

**Trail Surface Aggregate (TSA)**

**Background:**
Trail Surface Aggregate (TSA) is designed for use as a wearing surface for trails. It is different from traditional materials used to surface trails such as “number 10’s.” TSA is designed to have a uniform mixture of a range of rock sizes from 3/8-inch all the way down to fine material. This uniform mix allows the compaction to achieve a higher in-place aggregate density than commonly used aggregates to resist wear and erosion. The mix was designed by the PSU Center for Dirt and Gravel Road Studies, and is based on a “downsizing” of the successful and popular Driveway Surface Aggregate (DSA) developed for use on roads.

**Specification:**
All TSA material is to be derived from natural stone formations. Stone is defined as rock that has been crushed, rock is defined as consolidated mineral matter. Both are restricted to that which has been mined or quarried from existing geologic bedrock formations.

All components of the aggregate mix, including fines, passing the #200 sieve, are to be derived by crushing parent rock material that meets TSA purchasing specifications for abrasion resistance, pH, and freedom from contaminants. No clay or silt soil may be added or retained after processing operations. Determine the amount of particles less than #200 sieve size using the washing procedures specified in PTM No. 100.

**TSA GRADATION:**

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>TSA Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2</td>
<td>100%</td>
</tr>
<tr>
<td>3/8</td>
<td>90-100</td>
</tr>
<tr>
<td>#4</td>
<td>50-65</td>
</tr>
<tr>
<td>#8</td>
<td>35-60</td>
</tr>
<tr>
<td>#16</td>
<td>25-50</td>
</tr>
<tr>
<td>#200</td>
<td>12-18</td>
</tr>
</tbody>
</table>

**TSA RECIPE:**
Combine existing aggregates and water in the ratio:
- 4 parts unwashed AASHTO #10 (or B3 sand)
- 4 parts AASHTO #8
- 1 part minus #200 fines (collector fines)
Maintenance & Monitoring Phase

- Maintenance cost $1,800 per mile
- Dog issues
- Illegal parking
- Vegetation Management
- Monitoring of use and conditions
Expansion Phase
– The Last Mile?

- Definitely most difficult
- Will cost 90% of Phase I (9 miles) or $2.6 million
- Technical design and funding challenges

Opposition Phase II
– The Sequel
Expansion Phase – Challenges?

US 15 Crossing

St. John Street in Trail ROW

Susquehanna River Bridge
Key Lessons Learned

- Attorney specializing in railroad law very helpful
- It’s a marathon not a sprint
- Funding always a challenge
- Opposition Guaranteed
- Build it and they will come!
Background on Trail Studies

- Rails to Trails Conservancy- Trail User Survey Workbook
- Great Alleghany Trail Alliance
- Perkiomen Trail User Survey and Economic Impact Analysis
- Virginia Creeper Trail
RTIAM- Rail Trail Impact Assessment Methodology

1. Define Rail Trail Corridor Study Area
2. Data Collection
   - Automatic Counts (2a)
   - Manual Counts (2b)
   - Survey/interviews (2c)
3. Data Analysis
   - Trail Demand (3a)
   - Economic Impact (3b)
   - Sensitivity Analysis (3c)
4. Summarizing Results
   - Audience (4a)
   - Frequency of Monitoring (4b)
   - Key Points and Findings (4c)
Study Area
Data Collection Process

1. Automatic Counts
   * 4 locations using TRAFx infrared counters

2. Manual Counts
   * Adjustment factor for automatic counts

3. Surveys/Interviews
   * 2 trailheads
1-Automatic Counts

1.0, 4.0, 6.0 and 8.5 mile markers
1-Automatic Counts
## Site Management

Below is a list of all your counter sites. Click the [Manage] links below to modify.

<table>
<thead>
<tr>
<th>Site name</th>
<th>Lat.</th>
<th>Long.</th>
<th>Adjust factor</th>
<th>Filter</th>
<th>Photo</th>
<th>Exclusions</th>
<th>Image 2</th>
<th>Data sets</th>
<th>Start</th>
<th>End</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail Trail 2012-April MM 1</td>
<td>...</td>
<td>...</td>
<td>1.75599</td>
<td>Y</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2012-05-01</td>
<td>2012-06-01</td>
<td>[Delete]</td>
</tr>
<tr>
<td>Rail Trail 2012-April MM 4</td>
<td>...</td>
<td>...</td>
<td>1.89903</td>
<td>Y</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2012-04-03</td>
<td>2012-04-23</td>
<td>[Delete]</td>
</tr>
<tr>
<td>Rail Trail 2012-April MM 6</td>
<td>...</td>
<td>...</td>
<td>1.89903</td>
<td>Y</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2012-04-03</td>
<td>2012-04-23</td>
<td>[Delete]</td>
</tr>
<tr>
<td>Rail Trail 2012-April MM 8.5</td>
<td>...</td>
<td>...</td>
<td>2.04207</td>
<td>Y</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2012-04-03</td>
<td>2012-04-23</td>
<td>[Delete]</td>
</tr>
<tr>
<td>Rail Trail 2012-June MM 1.0</td>
<td>...</td>
<td>...</td>
<td>1.75599</td>
<td>Y</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2012-06-01</td>
<td>2012-07-11</td>
<td>[Delete]</td>
</tr>
<tr>
<td>Rail Trail 2012-June MM 4.0</td>
<td>...</td>
<td>...</td>
<td>1.89903</td>
<td>Y</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2012-06-01</td>
<td>2012-07-11</td>
<td>[Delete]</td>
</tr>
<tr>
<td>Rail Trail 2012-June MM 6.0</td>
<td>...</td>
<td>...</td>
<td>1.89903</td>
<td>Y</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2012-06-01</td>
<td>2012-07-11</td>
<td>[Delete]</td>
</tr>
<tr>
<td>Rail Trail 2012-June MM 8.5</td>
<td>...</td>
<td>...</td>
<td>2.04207</td>
<td>Y</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>2012-05-01</td>
<td>2012-07-11</td>
<td>[Delete]</td>
</tr>
</tbody>
</table>

### Trafx Datanet Software Program
2-Manual Counts

* Purpose:
  * Directional split
  * Modal split
  * Error adjustment
  * Two-way trip adjustment
2-Manual Counts

<table>
<thead>
<tr>
<th>Manual Counts</th>
<th>Gender</th>
<th>Activity</th>
<th>Approx. Age</th>
<th>Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weather:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number on counter at start:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start Time:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number on counter at end:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End Time:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total count at end:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>M</td>
<td>F</td>
<td>Walk</td>
<td>Jog/Run</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>F</td>
<td>Walk</td>
<td>Jog/Run</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>F</td>
<td>Walk</td>
<td>Jog/Run</td>
</tr>
<tr>
<td>4</td>
<td>M</td>
<td>F</td>
<td>Walk</td>
<td>Jog/Run</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>F</td>
<td>Walk</td>
<td>Jog/Run</td>
</tr>
</tbody>
</table>
Mode Distribution

* Based on manual counts
3-Surveys
3-Survey Results

10.59 average # of trips per month
Average age: 48.8 years old
Average duration: 86.85 minutes

17. During your most recent use of the trail, or past use, did you make any stops to establishments near the trail?
- No: 45%
- Yes: 55%
  - Community pool/park: 4%
  - Farmers Market: 5%
  - Purple Cow: 12%
  - Amy’s Tasty Freeze: 11%
  - Health Food Store: 4%
  - Mifflinburg Sheetz: 8%
  - Mifflinburg Weis: 7%
  - Vargo: 5%
  - Other: 24%

14. How did you find out about the trail?
- Internet: 2%
- Friend/family: 23%
- Advertisement: 2%
- Road signs: 1%
- Newspaper: 21%
- Tourist/visitor information: 2%
- Saw it: 7%
- Local (don’t remember): 37%
- Other: 5%

15. Has the use and/or existence of the trail influenced your spending on any recreational goods in the Susquehanna Valley Area?
- No: 58%
- Yes:
  - Clothing: 7%
  - Footwear: 1%
  - Bike purchase/rental: 24%
  - Bike accessories: 11%
  - Car accessories (bike rack, etc.): 3%
Travel Demand Analysis

* DataNet Software - download from infrared counters
* Calculate Adjustment factor - from manual count
* Apply 2-way trip factor
* Analyze results
* Explore seasonal adjustment

<table>
<thead>
<tr>
<th>Rail Trail 2012-April MM 1</th>
<th>Manage</th>
<th>...</th>
<th>...</th>
<th>1.75599</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail Trail 2012-April MM 4</td>
<td>Manage</td>
<td>...</td>
<td>...</td>
<td>1.89903</td>
</tr>
<tr>
<td>Rail Trail 2012-April MM 6</td>
<td>Manage</td>
<td>...</td>
<td>...</td>
<td>1.89903</td>
</tr>
<tr>
<td>Rail Trail 2012-April MM 8.5</td>
<td>Manage</td>
<td>...</td>
<td>...</td>
<td>2.04207</td>
</tr>
</tbody>
</table>
Yearly Data from TRAFx counters:

- Study 1: April 2012 – 432 Preliminary Study (Spring 2012)
- Study 2: June and July 2012 - 2012 Summer Study (Summer 2012)
- Study 3: September 2012 through January 2013

Remaining yearly data calculated using adjustment factors

- National Bike and Pedestrian Documentation Project
- Alta Planning and Design, 2012
Peak hour travel
Day of the Week

Day of the Week Averages

Number of Round Trips

Mon | Tue | Wed | Thu | Fri | Sat | Sun

MM 1.0 (Mifflinburg) | MM 4.0 (Vicksburg) | MM 6.0 (near Purple Cow) | MM 8.5 (Lewisburg)
Account for Months without data:

- February
- March
- August
- May

Assumed Long winter and short summer

<table>
<thead>
<tr>
<th></th>
<th>Seasonal Adjustment Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan</td>
<td>3%</td>
</tr>
<tr>
<td>Feb</td>
<td>3%</td>
</tr>
<tr>
<td>Mar</td>
<td>7%</td>
</tr>
<tr>
<td>Apr</td>
<td>11%</td>
</tr>
<tr>
<td>May</td>
<td>11%</td>
</tr>
<tr>
<td>Jun</td>
<td>12%</td>
</tr>
<tr>
<td>Jul</td>
<td>13%</td>
</tr>
<tr>
<td>Aug</td>
<td>14%</td>
</tr>
<tr>
<td>Sept</td>
<td>11%</td>
</tr>
<tr>
<td>Oct</td>
<td>6%</td>
</tr>
<tr>
<td>Nov</td>
<td>6%</td>
</tr>
<tr>
<td>Dec</td>
<td>3%</td>
</tr>
</tbody>
</table>
## 2012 Summer Study

### June & July Data

<table>
<thead>
<tr>
<th>Site</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM 1.0</td>
<td>1877</td>
<td>1877</td>
<td>4380</td>
<td>6883</td>
<td>6883</td>
<td>7508</td>
<td>8134</td>
<td>8760</td>
<td>6883</td>
<td>3754</td>
<td>3754</td>
<td>1877</td>
</tr>
<tr>
<td>MM 4.0</td>
<td>1096</td>
<td>1096</td>
<td>2558</td>
<td>4020</td>
<td>4020</td>
<td>4385</td>
<td>4751</td>
<td>5116</td>
<td>4020</td>
<td>2193</td>
<td>2193</td>
<td>1096</td>
</tr>
<tr>
<td>MM 6.0</td>
<td>1621</td>
<td>1621</td>
<td>3782</td>
<td>5944</td>
<td>5944</td>
<td>6484</td>
<td>7024</td>
<td>7565</td>
<td>5944</td>
<td>3242</td>
<td>3242</td>
<td>1621</td>
</tr>
<tr>
<td>MM 8.5</td>
<td>1731</td>
<td>1731</td>
<td>4039</td>
<td>6347</td>
<td>6347</td>
<td>6924</td>
<td>7501</td>
<td>8078</td>
<td>6347</td>
<td>3462</td>
<td>3462</td>
<td>1731</td>
</tr>
<tr>
<td>Season Factor</td>
<td>3%</td>
<td>3%</td>
<td>7%</td>
<td>11%</td>
<td>11%</td>
<td>12%</td>
<td>13%</td>
<td>14%</td>
<td>11%</td>
<td>6%</td>
<td>6%</td>
<td>3%</td>
</tr>
</tbody>
</table>

## 2013 Spring Study

### Full Year Data

<table>
<thead>
<tr>
<th>Site</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM 1.0</td>
<td>548</td>
<td>1394</td>
<td>3252</td>
<td>5111</td>
<td>5111</td>
<td>7508</td>
<td>6671</td>
<td>6504</td>
<td>3938</td>
<td>3005</td>
<td>2140</td>
<td>1279</td>
</tr>
<tr>
<td>MM 4.0</td>
<td>785</td>
<td>953</td>
<td>2224</td>
<td>2613</td>
<td>3495</td>
<td>4385</td>
<td>3317</td>
<td>4448</td>
<td>4054</td>
<td>2856</td>
<td>1736</td>
<td>904</td>
</tr>
<tr>
<td>MM 6.0</td>
<td>300</td>
<td>1252</td>
<td>2922</td>
<td>3935</td>
<td>4591</td>
<td>6484</td>
<td>5999</td>
<td>5844</td>
<td>4568</td>
<td>3195</td>
<td>1859</td>
<td>793</td>
</tr>
<tr>
<td>MM 8.5</td>
<td>889</td>
<td>1663</td>
<td>3881</td>
<td>6131</td>
<td>6098</td>
<td>6924</td>
<td>4430</td>
<td>7762</td>
<td>6641</td>
<td>5259</td>
<td>3603</td>
<td>2159</td>
</tr>
<tr>
<td>Season Factor</td>
<td>3%</td>
<td>3%</td>
<td>7%</td>
<td>11%</td>
<td>11%</td>
<td>12%</td>
<td>13%</td>
<td>14%</td>
<td>11%</td>
<td>6%</td>
<td>6%</td>
<td>3%</td>
</tr>
</tbody>
</table>
Monthly Trail Usage

Number of Users

Month

Year Long Study
Summer Study
Travel by Mile Marker

Mile Marker Usage

- MM 1.0
- MM 4.0
- MM 6.0
- MM 8.5

Number of Users

- Summer Study
- Year Long Study

Mile Marker Usage Chart

<table>
<thead>
<tr>
<th>Mile Marker</th>
<th>Summer Study</th>
<th>Year Long Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM 1.0</td>
<td>60000</td>
<td>45000</td>
</tr>
<tr>
<td>MM 4.0</td>
<td>30000</td>
<td>30000</td>
</tr>
<tr>
<td>MM 6.0</td>
<td>50000</td>
<td>40000</td>
</tr>
<tr>
<td>MM 8.5</td>
<td>60000</td>
<td>50000</td>
</tr>
</tbody>
</table>
Summer versus yearly study

Study Data Comparison

- January: 150% difference
- February: 20% difference
- March: 15% difference
- April: 30% difference
- May: 25% difference
- June: 10% difference
- July: 40% difference
- August: 20% difference
- September: 15% difference
- October: 5% difference
- November: 35% difference
- December: 20% difference
Highlighted

* BVRT approximately 85,000-100,000 trips annually (9.2 miles)
  * Based on the following assumptions:
    * Each traveler passes either the 1.0 and 8.5 mile marker
    * Using the 2.4 counter hits per trip (1.0 and 8.5 surveys)
    * NBPD seasonal adjustment values for months without data
    * Based on Spring 2012 to Spring 2013
Comparison to other studies

* BVRT approximately 85,000-100,000 trips annually (9.2 miles) compared to…..

* Virginia Creeper Rail Trail (34 miles) located in Southwestern Virginia, has just over 130,000 visitors annually

* Heritage Trail (26 miles) in Eastern Iowa attracts 134,000 users annually
GIS Applications and Web Map

• **Interactive Base Map**


TRAFx, Ltd. TRAFx Infrared Counters and DataNet Software.
Contact Information

Michelle Oswald, Ph.D., LEED AP
Assistant Professor at Bucknell University
Department of Civil & Environmental Engineering
michelle.oswald@bucknell.edu

Shawn McLaughlin, AICP, CPRP
Planning Director
Union County Planning Commission
smclaughlin@unionco.org
QUESTIONS?

FULL REPORT Available at: www.bvrt.org