

Mapping for Implementation and Advocacy

Urban





Agenda

I. Introduction

Welcome, warm-up, and background

2. Challenges and Solutions

Derek Strout, RTC – Examples from across the country

3. Case Study - Philadelphia Greater Metropolitan Area

Emily Goldstein, Delaware Valley Regional Planning Commission

4. Trail Maintenance Toolkit

Pennsylvania Environmental Council

5. Action Planning

Mapping your expertise, Around the World





Geographic Information Systems as a platform

to gather, organize, analyze, understand, and communicate

Hardware Servers, computers, phones

Software Desktop GIS, SaaS, mobile apps

Data Shapefiles, spreadsheets, survey reports, imagery

Methods Data collection workflows, map creation processes

People GIS professionals, volunteers, public



Geographic Information Systems as a system of systems

to gather, organize, analyze, understand, and communicate



Record

geodatabases shapefiles spreadsheets



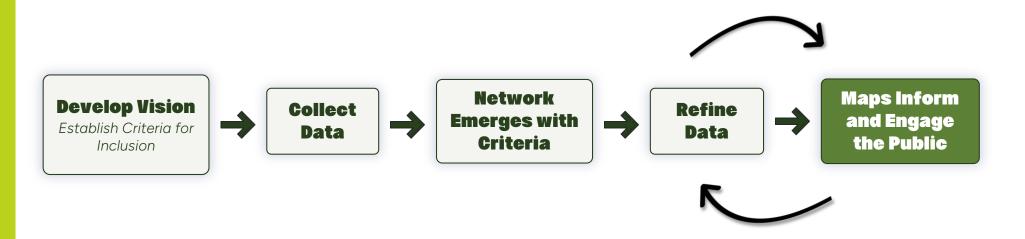
Insight

exploratory analysis geoprocessing tools reports & dashboards



Engagement

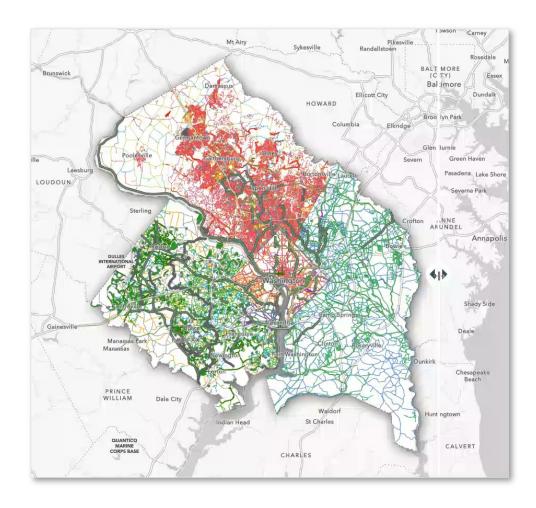
static & interactive maps geo-enabled surveys ArcGIS StoryMaps











"...a map is worth a million words."



Develop Vision

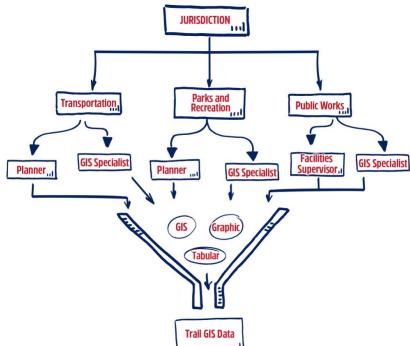
Establish Criteria for Inclusion

- Accessible to all
- Healthy and safe
- Equitably distributed
- Reliable for transportation
 - Open space access
 - World-class





Collect Data



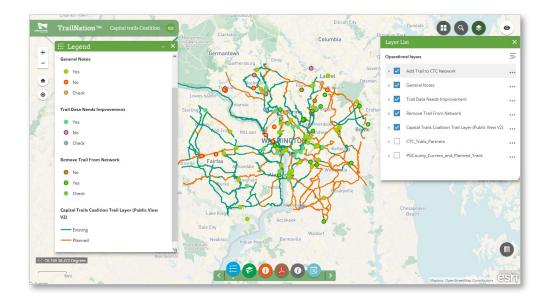




Network Emerges with Criteria

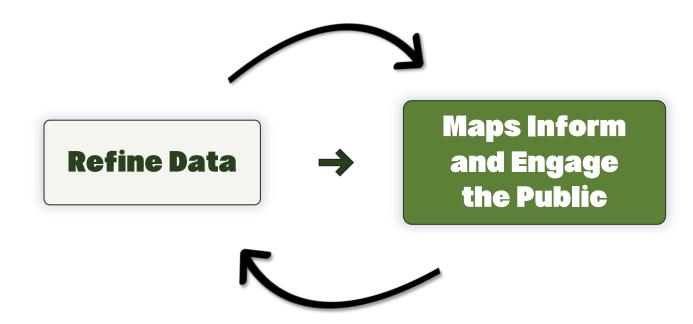


Refine Data

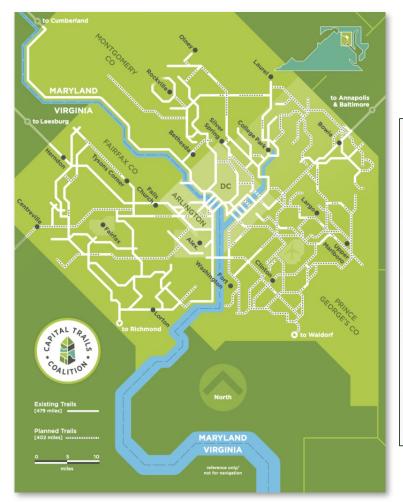












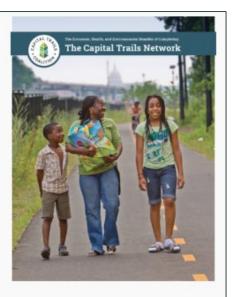


You know what's cool?

- 881 miles of trails.
- ✓ 19,580 metric tons of CO2 emissions prevented every year.

We did the math.

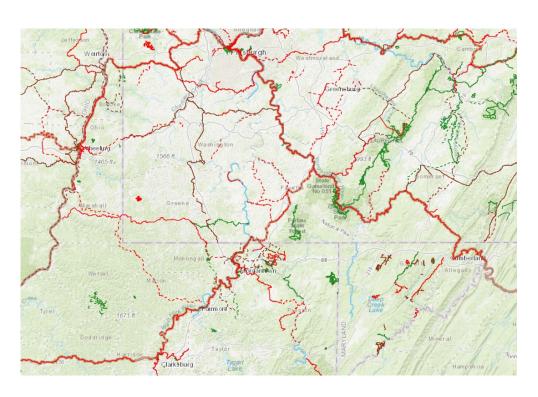
Turns out: trails are AWESOME.

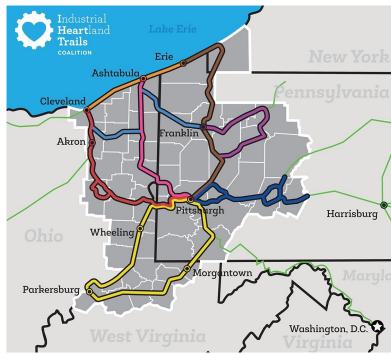


READ THE REPORT

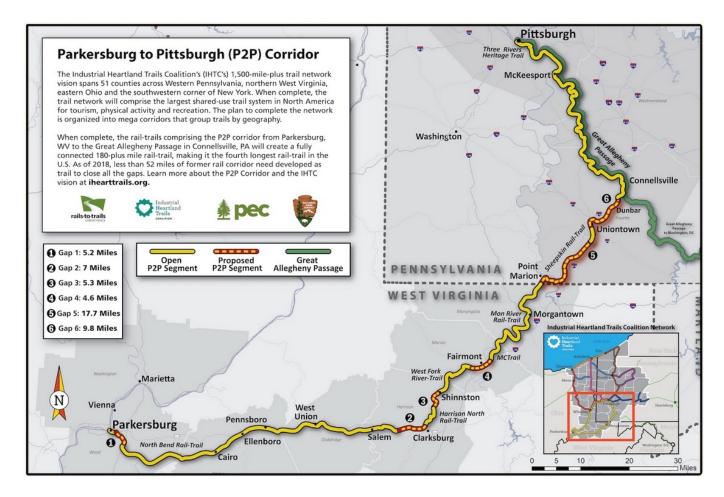


Industrial Heartland Trails Coalition













City of Fairmont Rail Trail Project



Cost Breakdown

A-1 - West Fork River Trail Extension Part 1

Design: \$86,665 Construction: \$712,441

A-2 - On-Street Sharrows

Design: \$2,433

Construction: \$30,418

B - West Fork River Trail Extension Part 2

Design: \$30,510

Construction: \$305,095

C - Beltline Rail Trail

Design: \$70,854 Construction: \$776,020

D - Monongahela River Pedestrian Bridge

Design: \$600,000

Construction: \$5,400,000

E - East Side Rail Trail

Design: \$230,000 Construction: \$2,207,000

onstruction: \$2,207,000

Total Design: \$1,020,462 Total Construction: \$9,430,974



City of Fairmont Rail Trail Project

Budget Source Breakdown



Trail Master Plan:

General Fund

On-Street Sharrows and Signs:

 Capital Improvement Project Funding

Video Promotion:

RTC Grant

West Fork River Acquisition:

- RTC Grant
- Fairmont EPA Assessment Grant
- WV Land Stewardship Corp EPA Assessment Grant
- TIF Project

East Side Acquisition:

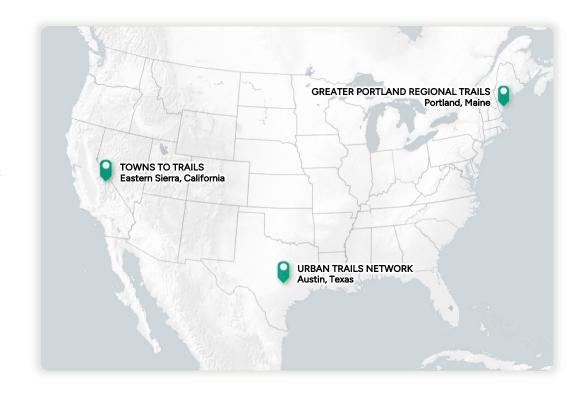
- Sharon Steel Trust Funding
- TIF Project
- Local conservation groups

Design and Construction:

- TIF Project
- TAP Funding
- EPA Cleanup Grant
- Land Water Conservation Fund



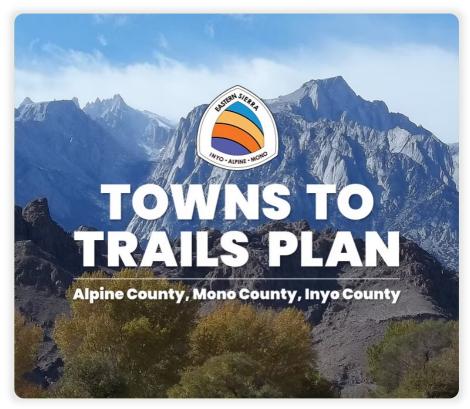
- DEVELOP A GEOSPATIAL DATASET
- ANALYZE THE EMERGING NETWORK
- PROJECT PRIORITIZATION
- ADVOCACY AND STORYTELLING





Eastern Sierra, CA

- Feasibility and data-gathering study December 2022-April 2025
- Goal of connecting Eastern Sierra communities to each other and to existing public lands and trails
- Project managed by the Eastern Sierra
 Council of Governments conducted by
 Mammoth Lakes Trails and Public Access
 Foundation and Toole Design + Planning

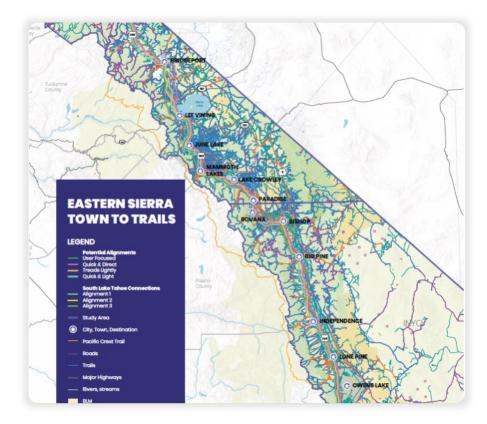




Eastern Sierra, CA

DEVELOPING A GEOSPATIAL TRAIL DATASET TO SUPPORT THE VISION

- Conceptual alignment ~ 200 miles
- Network inventory process aggregated and standardized data
 - Three counties & 12 municipalities
 - Federal land managers (NFS & BLM)
 - Los Angeles Department of Water and Power





Eastern Sierra, CA

VISUALIZE AND ANALYZE THE EMERGING TRAIL NETWORK

- Project team focused on emerging route county by county
- Network Gap Analysis
 to find routes that you could travel
 50 miles uninterrupted to identify
 potential network and gaps





Eastern Sierra, CA

PROJECT PRIORITIZATION AND GAP-FILLING

- Least Cost Path Analysis relevant geospatial datasets >
- Public feedback opportunities included geo-enabled surveys and web maps
- Stakeholder working sessions with tribes, land managers and local agencies centered around exploration through interactive maps

	LOW COST	HIGH COST
DESTINATIONS & AMENITIES	Route is within one mile of a recreation site	Route is not within five miles of a recreation site
EXISTING ROAD & TRAIL NETWORK	Tier I and Tier 2 trails/roads	
SAGE GROUSE HABITAT	Areas outside of Sage Grouse Priority Areas for Conservation (PAC)	Areas within Sage Grouse Priority Areas for Conservation (PAC)
USFS WILDERNESS AREAS	Areas outside of USFS Wilderness Areas	
SLOPE	0% - 5% Slope	12+% Slope
ELEVATION (SUMMER EDITION)	Areas above 5,000 FT.	
PROXIMITY TO HIGHWAY	Areas more than 1/4 mile from US or State Highways	Areas less than 1/4 mile from US or State Highways



Eastern Sierra, CA

ADVOCACY AND STORYTELLING

- Detailed, multi-scale alignment maps at the center of all stakeholder engagement events
- Feasibility report published as an ArcGIS StoryMap with static and interactive maps
- Towns to Trails was selected as one of eight regional projects recommended by the Sustainable Recreation & Tourism Initiative for implementation





Portland, ME

- MPO: Portland Area Comprehensive Transportation System (PACTS)
 - 18 cities and towns in southern Maine, serving a population of ~ 300,000
- PACTS Regional Trail Plan kicked off in Oct 2024
- Builds upon several other active transportation studies and plans with a goal of expanding transportation choices from Connect 2045

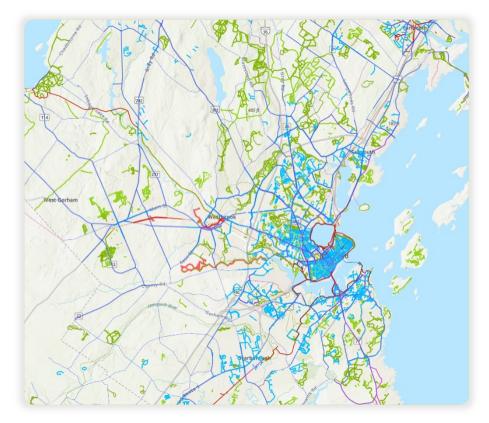




Portland, ME

DEVELOPING A GEOSPATIAL TRAIL DATASET TO SUPPORT THE VISION

- Greater Portland Council of Governments (GPCOG) maintains an Open Data Hub which includes a comprehensive active transportation dataset of bicycle and pedestrian paths
- Existing and planned routes are routinely collected and updated from member municipalities and local partners like Portland Trails





Portland, ME

VISUALIZE AND ANALYZE THE EMERGING TRAIL NETWORK

- Builds upon decades of established trail network planning and development
- Emerging network assessed against demographic, economic, and environmental datasets for highest impact
- Informed and refined by multiple rounds of public engagement





Portland, ME

PROJECT PRIORITIZATION AND GAP-FILLING

- Interactive trail network map viewer provided all project partners a common operating picture to identify existing gaps
- Two rounds of public surveys included static and interactive maps for comment, including opportunity to comment on initial highest scoring priority gaps
- PACTS Executive Board endorsed the plan's priority project list in August 2025





Portland, ME

ADVOCACY AND STORYTELLING

- 50+ AT gaps spanning 100 miles across
 15 of the 18 PACTS communities
- ArcGIS StoryMap of the Regional Trail Plan allows the public to explore interactive maps and access additional project info
- PACTS Policy Board voted to adopt the Regional Trail Plan on October 23, 2025!

The Regional Trail Plan

A plan to connect communities via trails and paths throughout the PACTS Region.

PACTS April 18, 2024





Austin, TX

- One of family of plans serving 990,000 residents
- Each plan relies on and leverages power of GIS
- Urban Trails Plan a key component of the city's ambitious goal of 50-50 mode-share by 2039, where 50% of all trips to be made by walking, biking, transit, and carpool and 50% by driving alone











Austin, TX

DEVELOPING A GEOSPATIAL TRAIL DATASET TO SUPPORT THE VISION

- Datasets used in the 2023 Urban Trails Plan have been developed over decades
- Austin's multi-use trail network defined and developed by many city departments and contractors
- Field work conducted by city staff and consultants to assess corridor feasibility, identify alternative routes, and collect location information and photographs

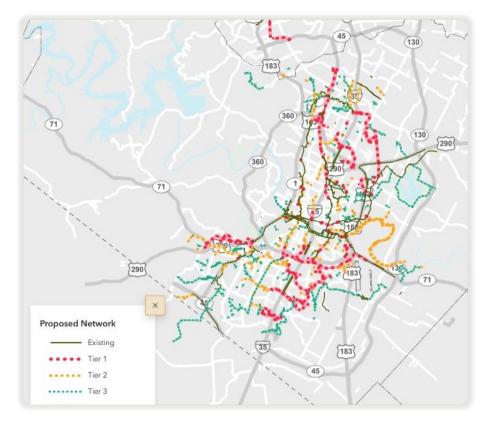




Austin, TX

VISUALIZE AND ANALYZE THE EMERGING TRAIL NETWORK

- Trail alignments updated with city programs like Safe Routes to School and Vision Zero
- In coordination with partners including nonprofits and private developers
- Segment inclusion influenced by deep community engagement, assisted by feedback collected through static and interactive maps

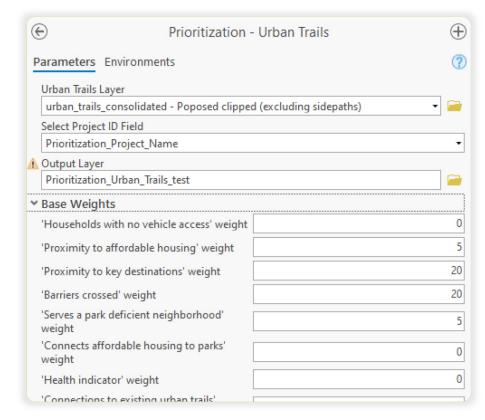




Austin, TX

PROJECT PRIORITIZATION AND GAP-FILLING

- City staff use a suite of GIS tools developed by Toole Design for initial prioritization scoring
- Hundreds of proposed urban trail segments are assessed against dozens of weighted geographic datasets to provide a score for each segment
- 2023 Urban Trails Plan identified:
 - 68 miles of existing trails
 - **221 miles** of Tier 1, 2, 3 trails

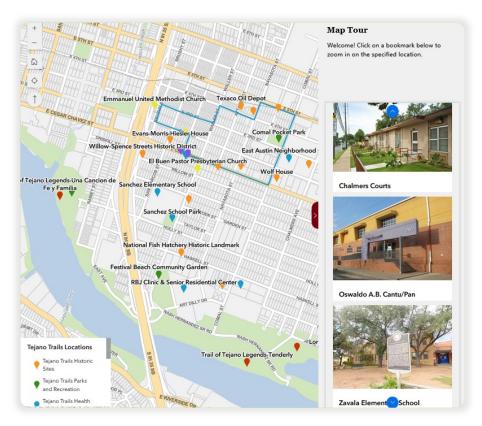




Austin, TX

ADVOCACY AND STORYTELLING

- The Urban Trails Program provides public interactive map of current trail segment development status
- Maps of proposed network highlight work being done to develop a system that matches needs and concerns of residents
- Austin Parks & Recreation Department ArcGIS StoryMap highlights the Austin Tejano Trails during Hispanic Heritage Month





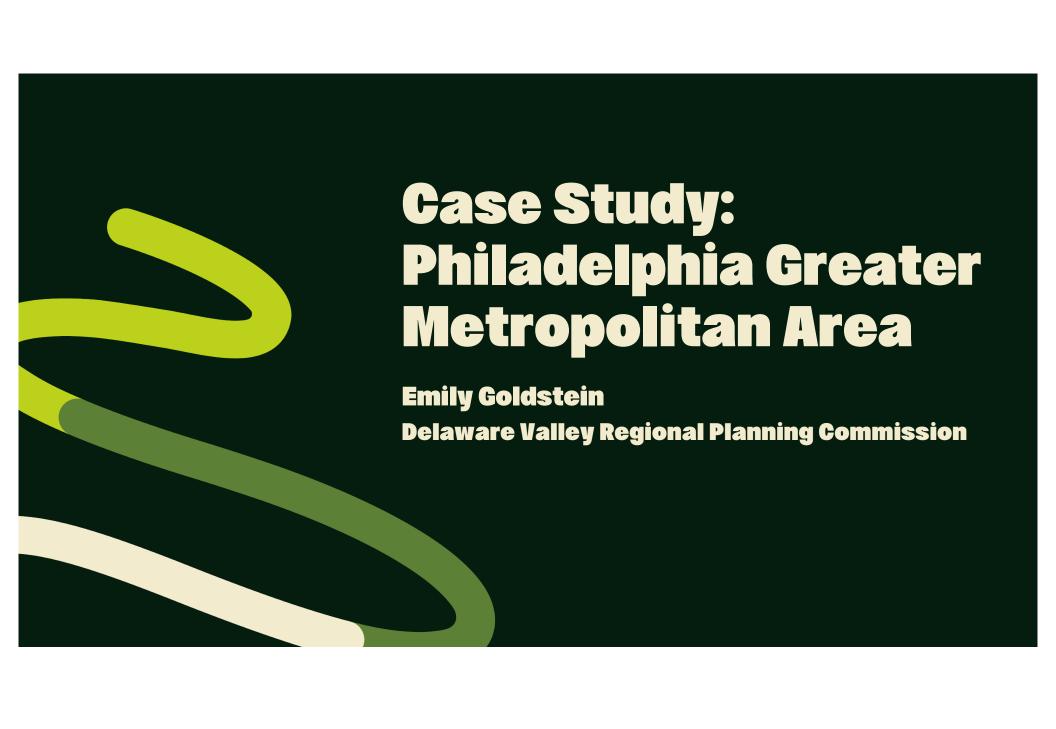






Image Credit: Getty Images

TrailNation Summit

Mapping & Advocacy Masterclass: Urban Cohort – Philadelphia Greater Metropolitan Area

Emily Goldstein, DVRPC | egoldstein@dvrpc.org

Greater Philadelphia





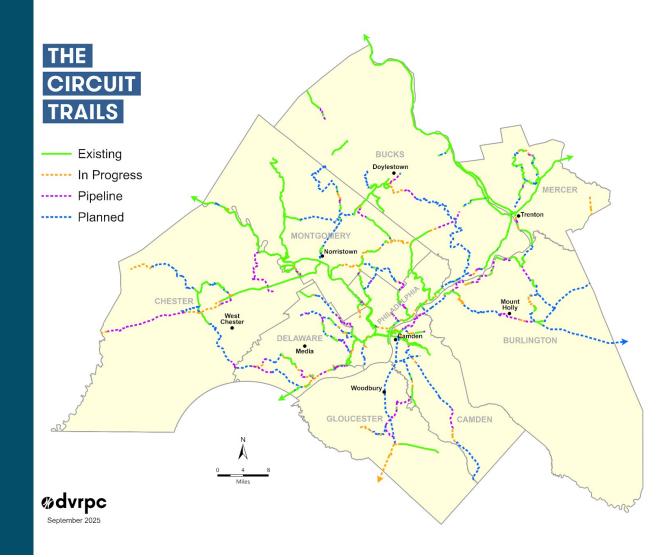


DVRPC Greater Philadelphia Region

- Two States
- **Nine Counties**
- One Large City
- **Three Smaller Cities**
- 350 Municipalities
- Thousands of Neighborhoods

DVRPC & The Circuit







Community Needs & Trails



Image by: Bicycle Coalition of Greater Philadelphia

Governance and Local Leadership



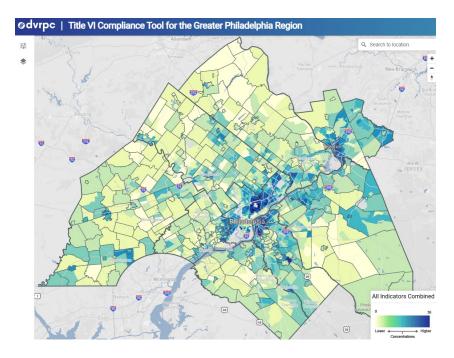


Navigating Federal Uncertainty



Image by: Miles Owen | DVRPC

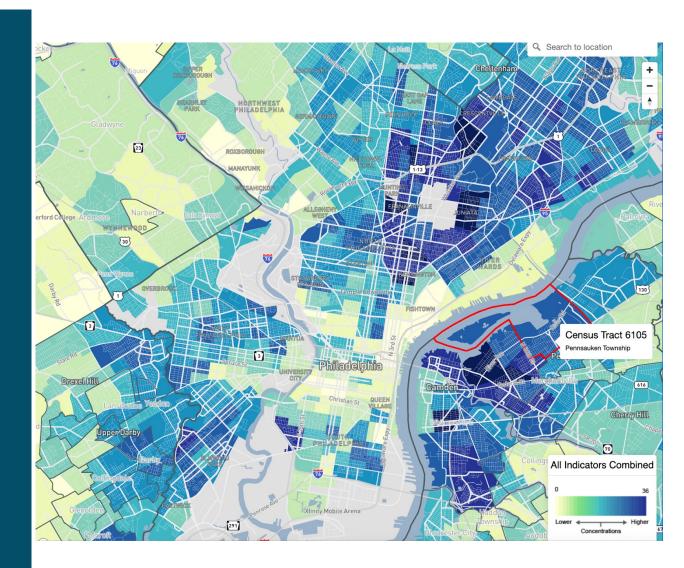
Primary Mapping Tools





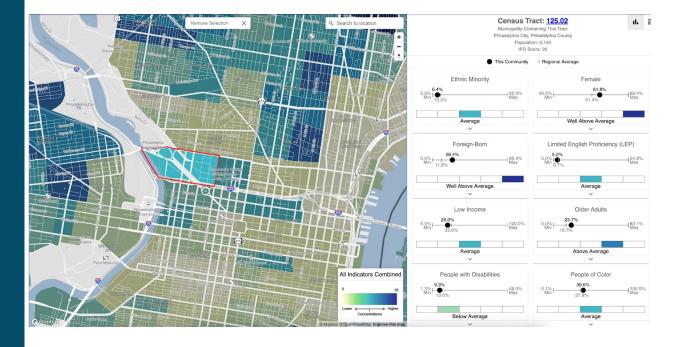
Title VI Web Map





Title VI Web Map





LINK Tool





Level of Traffic Stress (LTS)

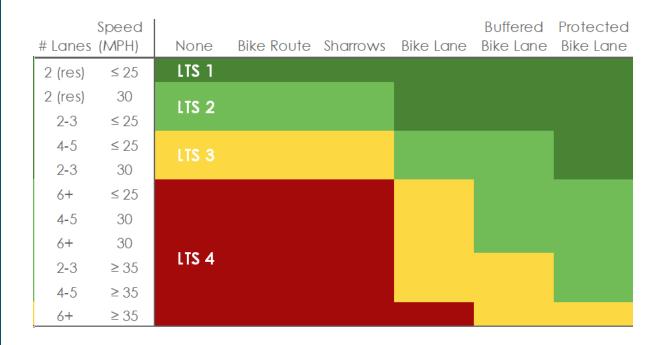


LTS	Comfortable Enough For (Cyclist Type)	Characteristics
1	Most People	Lowest stress Comfortable for most ages and abilities
2	Interested, but Concerned	Suitable for most adults Presenting little traffic stress
3	Enthused and Confident	Moderate traffic stress Comfortable for those already biking in American cities
4	Strong and Fearless	High traffic stress Multilane, fast moving traffic

Mekuria, M., Furth, P. and Nixon, H. "Low-stress bicycling and network connectivity", *Mineta Transportation Institute*, No. Report 11-19, 2012. Geller, R. "Four Types of Cyclists," Portland Bureau of Transportation, Portland, OR, 2006. www.portlandoregon.gov/transportation/article/264746. Accessed Aug, 11, 2016.

Assigning LTS





Lowry, M., Furth, P., and Hadden-Loh, T. Low-Stress Neighborhood Blkeability Assessment to Prioritize Bicycle Infrastructure. Presented at the 95th Annual Meeting of The Transportation Research Board, Washington D.C., 2016.

New Approach to Connectivity

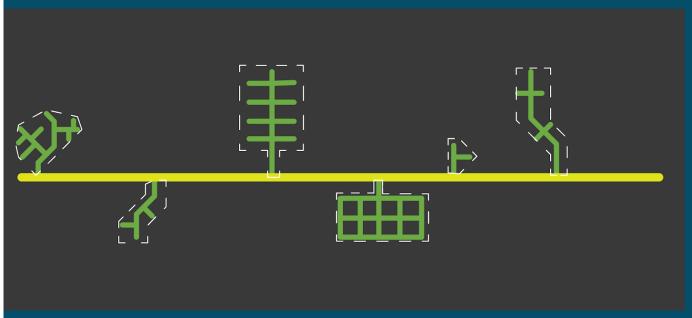




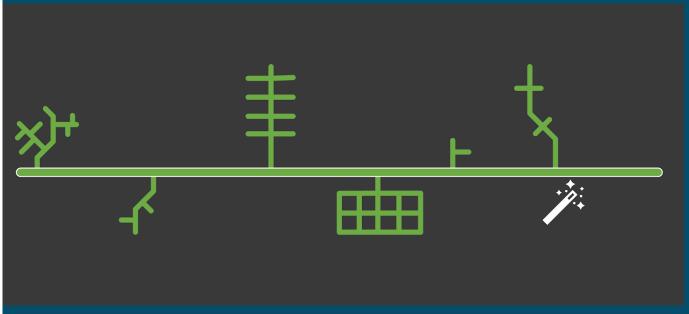
- •Focus on local segments
- •Provides information relevant for funding and grants
- •Allows LTS 4 roads to be analyzed
- •Also works for sidewalks!



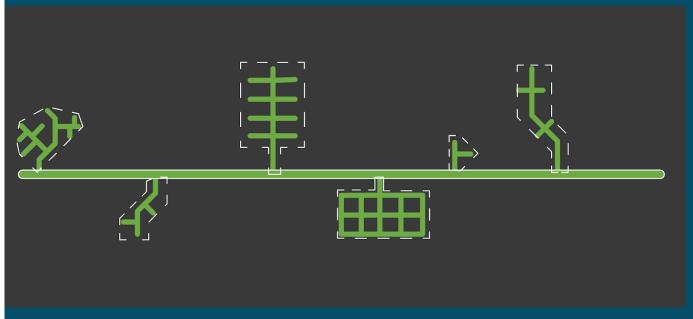




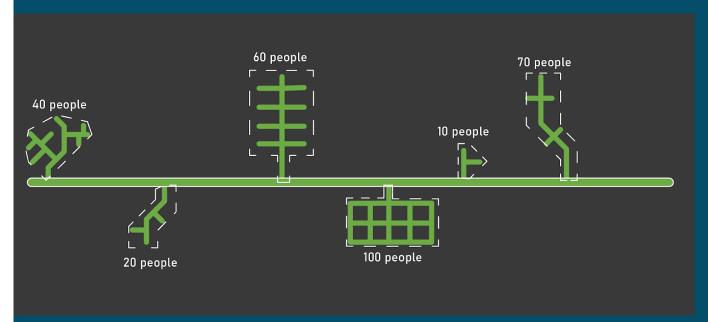




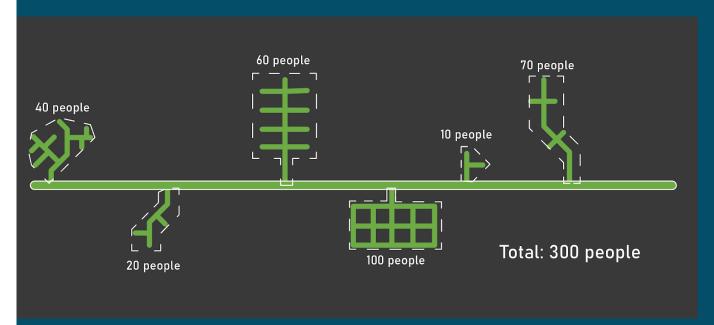




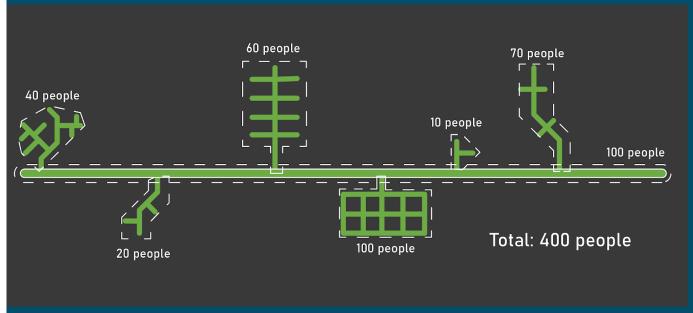




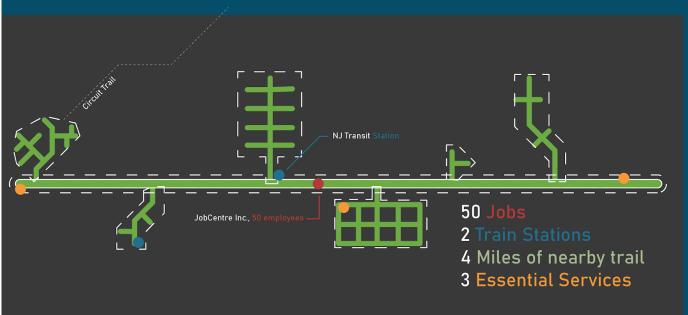




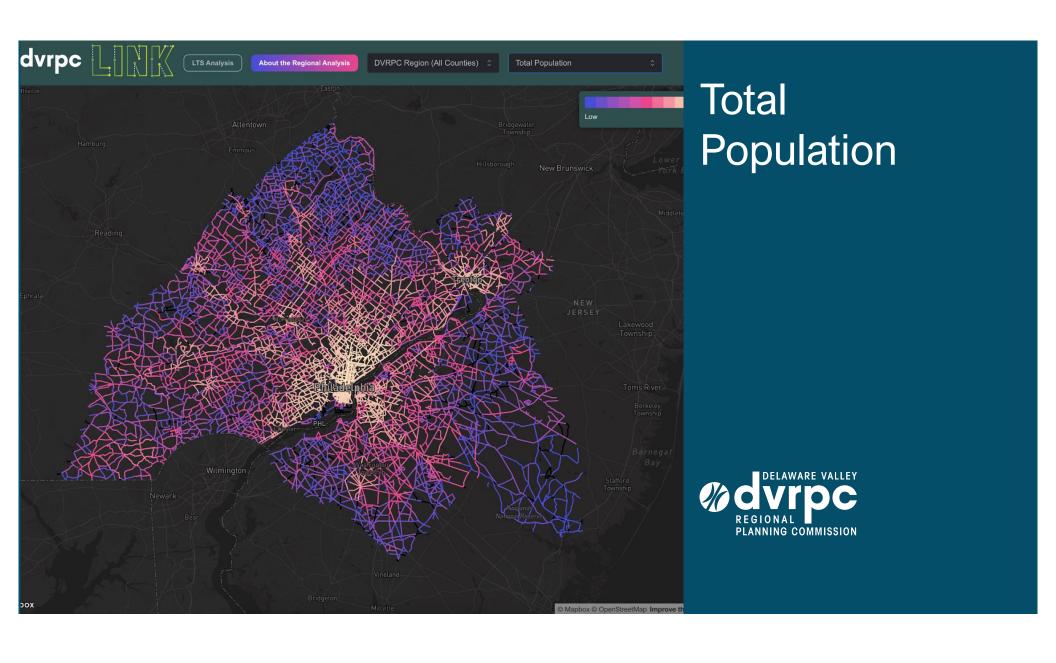


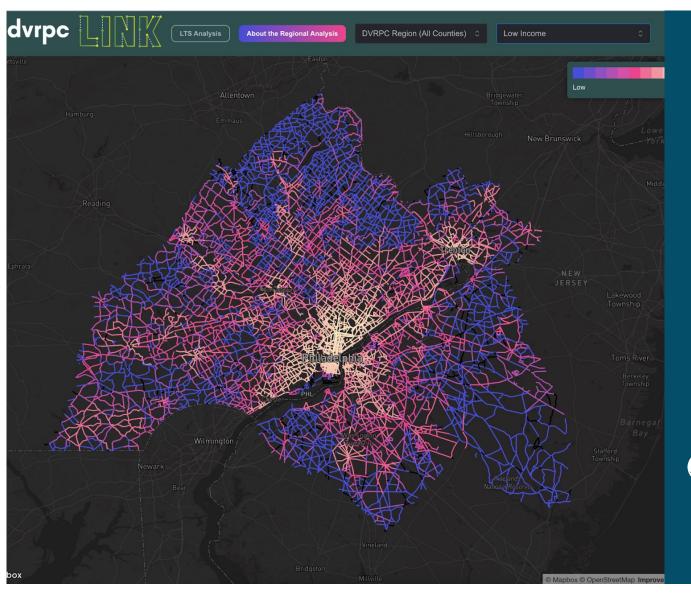






PLANNING COMMISSION



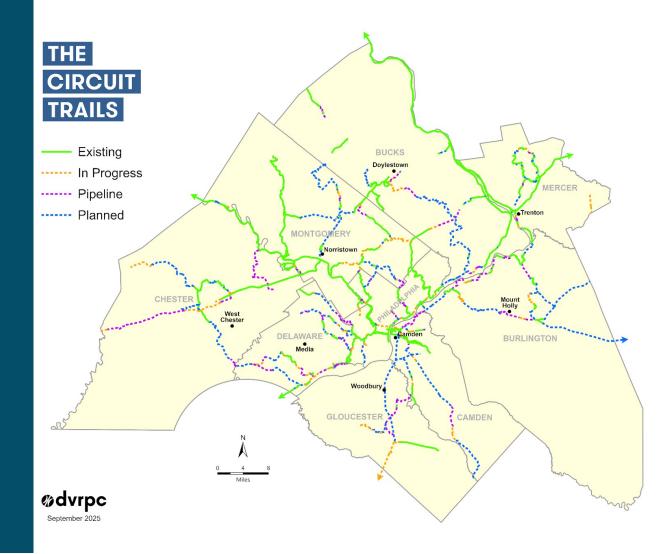


Low Income



A Stronger Network









Thank You.

www.dvrpc.org

DVRPC fully complies with Title VI of the Civil Rights Act of 1964 and related nondiscrimination mandates in all activities.

For more information about DVRPC's Title VI Program or to obtain a Title VI Complaint Form, visit www.dvrpc.org/GetInvolved/TitleVI, or contact DVRPC's ADA and Title VI Compliance Officer Shoshana Akins by calling 215-592-1800 or via email at public_affairs@dvrpc.org.



Cracks in the Foundation: Prioritizing Trail Maintenance



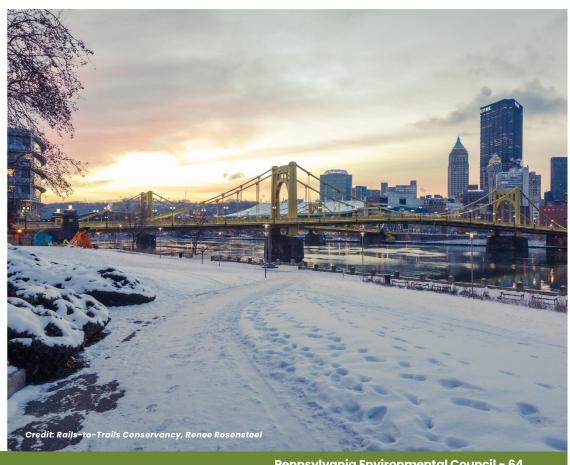


Common Operational & Maintenance Issues



The PEC Approach

- PEC has developed a full portfolio of trail sustainability work:
 - The Trail Maintenance Assessment **Guide & Trail Maintenance Field** Guide
 - The Trail Maintenance Toolkit (TMT) Field Maps phone app & webmap
 - TRAILS (Training Regional Advocates, Investing in Long-term Sustainability) being piloted in Southwest PA 2025-2026



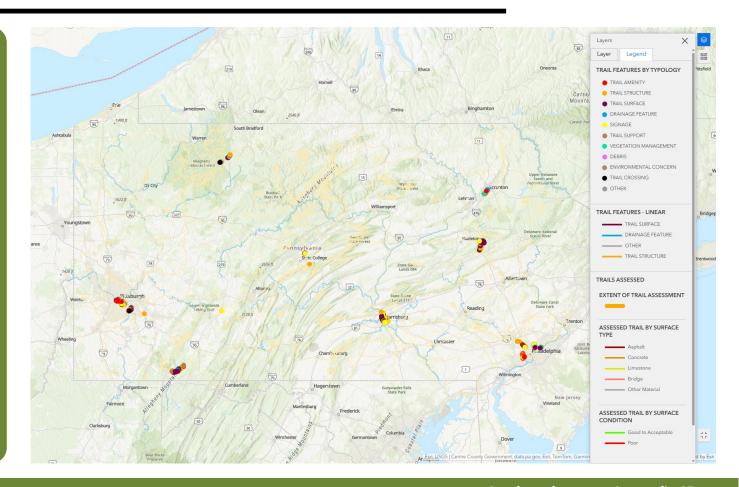
Trail Assessments Completed to Date

We have completed more than 15 assessments of 250+ miles of trail in PA:

- Southeast, NEPA Trails, Central PA, Southwest PA
- PA Wilds
- Statewide, Long-Distance Trails

Three primary issues affecting trail sustainability:

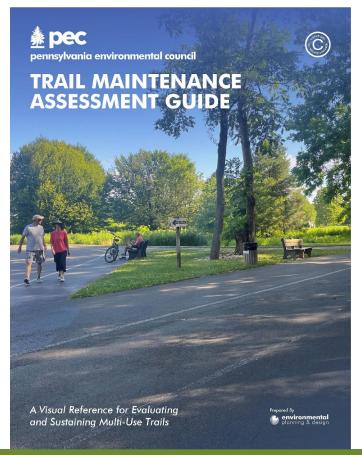
- Water
- Increased user volumes
- Life cycle of materials



PEC's Trail Maintenance Assessment Guide

- First-of-its-kind compendium:
 - The "state of our trails"
 - Common operational & sustainability issues
 - A proactive approach to maintenance

 - Defining a rating & prioritization system
 The importance of trail assessments, & tools to conduct them
- PEC's Trail Maintenance Field Guide:
 - Slimmed down, pocket-sized version of the *Assessment* Guide
 - For use in the field alongside the Trail Maintenance Toolkit



Importance of Trail Assessments

- "Regular trail assessments are like a report card for your trail: they tell you what's working, and what's not"
- Benefits of conducting regular trail assessments:
 - Reducing wear & tear on your trail & its amenities
 - Preventing damage
 - Minimizing or eliminating the need for unexpected detours or closures
 - Avoiding loss of economic benefits
 - Tempering negative public perceptions or publicity
 - Discovering minor flaws / issues before they become major





Ranking & Prioritizing Trail Maintenance Needs

"Picture Book"

- Basic tenets of trail sustainability and maintenance guidelines
- **Real world examples** to help diagnose and rate common issues in the field, plus tips on how to address / prevent them
 - Dovetails with the Trail Maintenance **Toolkit**
- Diagrams outlining underlying causes

TRAIL MAINTENANCE ASSESSMENT GUIDE

III EXISTING CONDITIONS RATING SCALE: EXAMPLES FOR CONTEXT

LIKE NEW

Freshly groomed trail, with neatly defined edges, a consistent width, and an evenly compacted, level surface, all while still effectively directing runoff to the sides of the trail.



Groomed trail surface with consistent width and little to no grassy incursions. Some debris collecting along the lesser-used middle and edge areas of the trail.



Trail surface in ridable but not optimal condition in early spring, with much of the fines surface eroded or washed away and pitted areas beginning to form.



Ponding on trail surface beginning to result in rutting and depressions, though the trail surface has yet to deteriorate to the point of large puddles and potholes. Nearly all crushed stone has been washed away.



ISSUE NEEDS FURTHER EVALUATION

Downspout from the neighboring building has been allowed to discharge directly on the trail, resulting in ponding on the trail surface where it meets the boardwalk. The problem will continue to worsen until addressed.



3.3.1 Trail Surfaces: Crushed Gravel

COMMON PROBLEMS



compaction. This could be exasperated by heavy use during wet conditions, leaving impact scars which subsequently dry. This surface can be uncomfortable or even tricky for some





PART 3: TRAIL SUSTAINABILITY GUIDE

If grass or other vegetation is allowed to grow in the median, impact along the edges causing additional problems like



Tree roots create tripping hazards and cause trail surface damage. Roots can also be exposed by erosion of the crushed gravet over time.



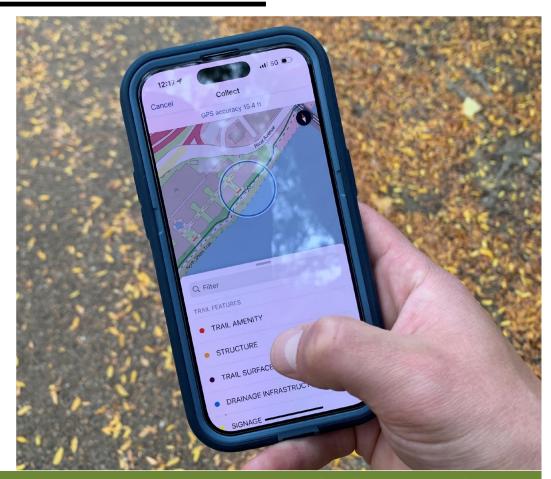


An example of poor drainage with standing water pooling on the trail surface resulting in muddy conditions. A natural clay subgrade may be hindering water filtration, and insufficient cross-slope is allowing water to collect in dips and voids. This section will require regrading to restore proper drainage off the trail corridor and into the adjacent swale

The Trail Maintenance Toolkit (TMT)

Phone app and webmap

- Phone app: collect, rank, and geolocate information in the field using a smartphone and the Field Maps app from ESRI
- Webmap: review, analyze, and catalog information collected in the field, export lists and create reports



The Trail Maintenance Toolkit (TMT)







The Trail Maintenance Toolkit (TMT)

Phone App

- Accurately drop points and lines on or offline using GPS
- Take photos and attach files to points in the field
- Dropdowns for different categories and subcategories of issues based on the Trail Maintenance Assessment Guide



The Collect tool allows users to place trail features on the Trail Webmap. Tap the appropriate item for the type of trail feature you would like to record on the map. This will reveal a set of trail feature subtypes

Once the trail feature type is selected, record the geographic coordinates to the Trail Webmap by selecting the "Add Point" button. Once the operation has been completed, a symbol and a dataset is added to the Trail Webmap. If a point was accidentally recorded or you wish to adjust the location, select the recently added point on the Trail Webmap and then hit "Edit" or "Delete" to modify or remove the recorded point.

Action: Tap "Add Point" button.

When adding a point to your Trail Webmap, you can also attach a photograph, plan, sketch, or other type of digital file. Note the property of the property othat if a photograph is added to the recorded point, that particular image will not be incorporated into your mobile device's photo album or camera roll. Rather, the image is integrated into the Trail Webmap and stored within the GIS database itself. These images can be separated, exported, and added back into your camera roll through a separate action.

Action: Take a photo and select "Use Photo" or "Retake" as appropriate.

Select the trail feature subtype. "Bike rack" has been chosen for this example.

Action: Tap "Trail Amenity Subtype."

Then, select the appropriate condition rating. Part 3 of this Guide provides a series of visual examples of '1' through '5' ratings for various trail features.

Action: Tap "Condition."

When appropriate, you can record any observed source of a problem or issue related to a recorded trail feature. The selections are pre-programmed to simplify data entry. If you do not feel any of the selections are applicable for this particular recorded point, then select

Action: Tap "Observed Source of Problem."

This view depicts the "Note" box where you can type in unique information about the recorded point. Up to 256 characters can be entered into the box. You can also use the Note box to add information or context beyond the general maintenance conditions you have selected. For instance, if you recorded the condition of the bike rack as '4' (Poor) because of vandalism, you could further elaborate in the Note box about the specific part that needs to be repaired or replaced, or to otherwise indicate a priority level beyond the general condition rating.

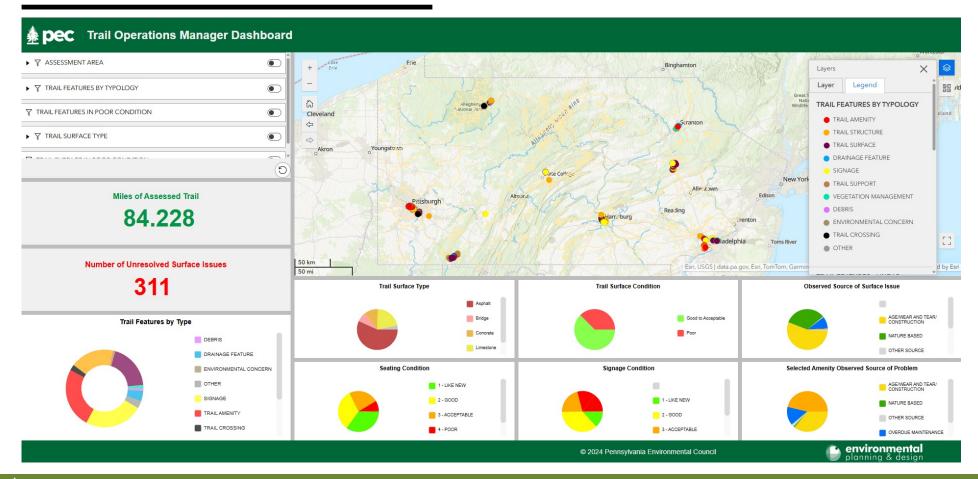
Action: Type in the note, comment, or message



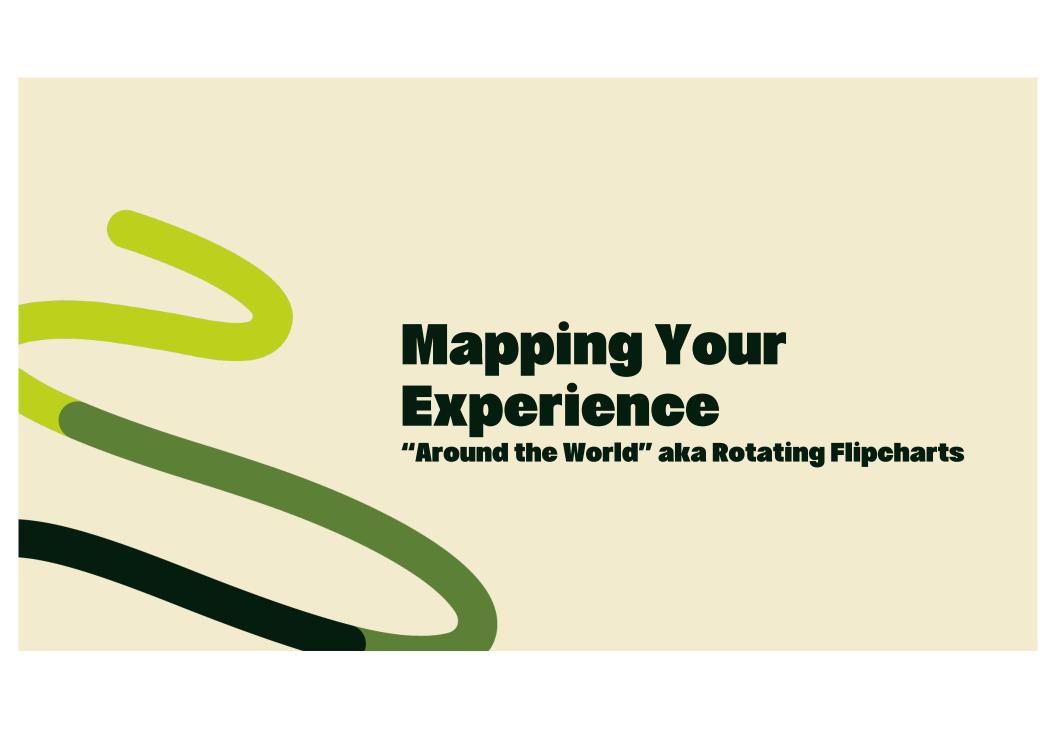
BB-10



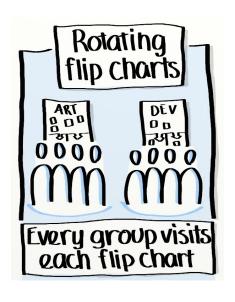
The TMT Dashboard







Action Planning: Mapping Your Experience



Small group breakout

Rotate to different charts

We will reconvene at the end!



1

3

4

GEOSPATIAL DATASET TO SUPPORT VISION

We now have access to so much data! What data are you collecting and consulting to support your trail network?

What gaps exist in current data, how can community partners or field work help fill them?

PROJECT PRIORITIZATION AND GAP FILLING

Which geospatial criteria are being used to prioritize trail projects in your network?

How are you approaching equitable development in any project prioritization efforts?

ANALYZING & VISUALIZING THE TRAIL NETWORK

What data are you using to help make the case for the trail(s) in your area?

Imagine showing a mayor or funder a single map. What would you want them to understand right away?

ADVOCACY AND STORYTELLING

What personal or community stories could be paired with maps?

How might the same trail network be presented differently on a map depending on the audience?



Reach Out!

Kelly Packkellyp@railstotrails.org

Derek Strout derek@railstotrails.org





