

HRTPO Trail Usage Forecasting Tools

Presented by Robert B. Case, PhD, PE
To VaULT
On April 28, 2026



Source: Virginia.org

Purpose

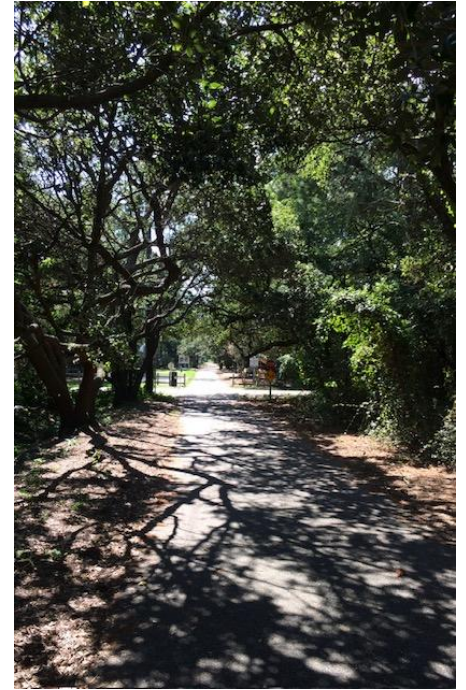
When **picking a high-usage location** for a trail,
or when **preparing a grant application** for a proposed trail,
it is valuable to **estimate the number of users**.



Source: EPA.gov

Need

- In the US, bike/ped facility volumes are forecasted via:
 1. **Comparison** to similar facilities
 2. **Sketch planning**
 - e.g. **SMART SCALE** bases AT project volumes on traffic volume of parallel roadways
 3. **Regional** travel demand models (those with bike/ped modes)
 4. **Direct demand** models (i.e. regression formulas)
 - Example input variables: population, employment, traffic speeds
- Due to the *lack* of rigorousness of comparison studies and sketch planning, the *difficulty* of adding bike/ped modes to regional travel demand models, and the *lack* of direct demand models for Virginia, HRTPO staff developed two **direct demand models for Virginia trails**.



Source: HRTPO staff

Bike trails in VA used for model development

“19 Family Bike Rides in Virginia” (virginia.org [Virginia is for Lovers])

1. VB Boardwalk (*10x volume of any other trail, omitted as outlier*)
2. Blue Ridge Railway Trail
3. Tobacco Heritage Trail (La Crosse to Broadnax segment)
4. Riverwalk Trail (Danville)
5. Dismal Swamp Canal Trail
6. Riverwalk Trail / Blackwater Crk Trail (Lynchburg)
7. Virginia Capital Trail
8. Burke Lake Trail (Fairfax Station)
9. York River State Park (Backbone Trail)
10. Riverway Trail (Radford)



Source: Bruce Wessel, Google Maps

Bike trails in VA used for model development

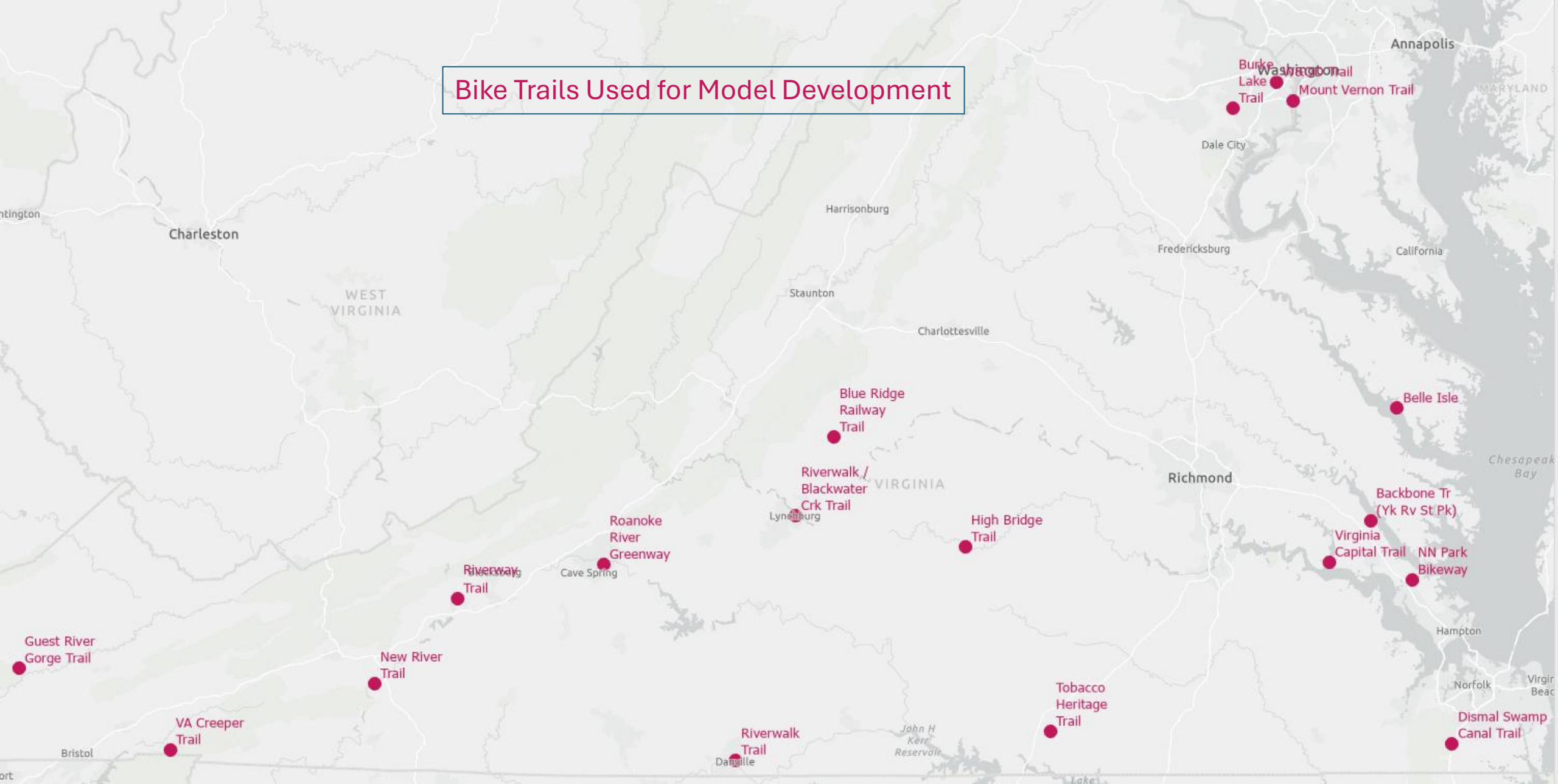
“19 Family Bike Rides in Virginia”- continued

- 11. Belle Isle St Park (Mud Creek, Watch House, Neck Fields Trails)
- 12. Newport News Park Bikeway
- 13. New River Trail (Pulaski, Galax)
- 14. Virginia Creeper Trail (near Abingdon)
- 15. W&OD Trail
- 16. High Bridge Trail (near Farmville)
- 17. Mount Vernon Trail
- 18. Guest River Gorge Trail (near Coeburn)
- 19. Roanoke River Greenway (Roanoke)

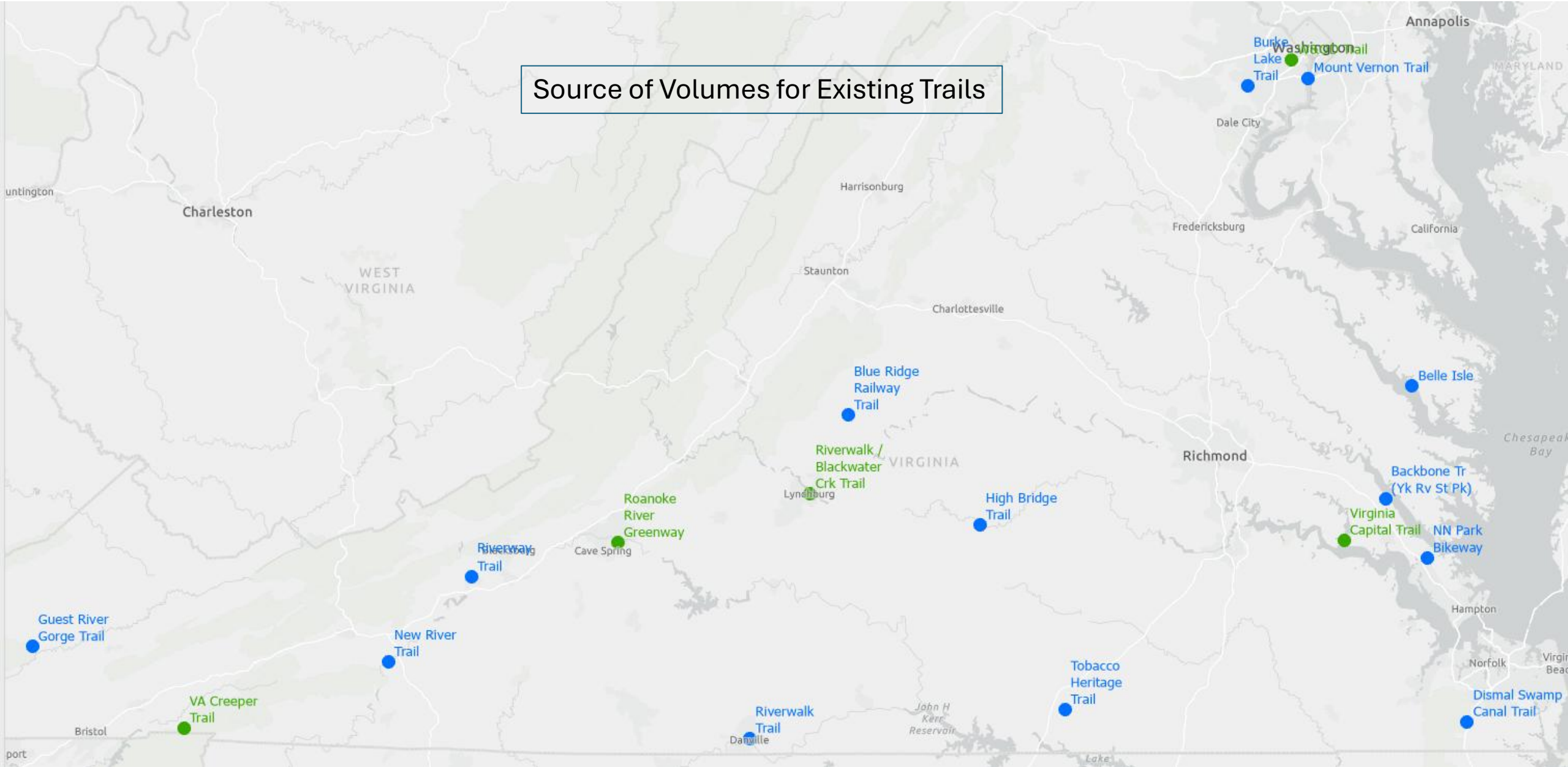


Source: HRTPO staff

Bike Trails Used for Model Development

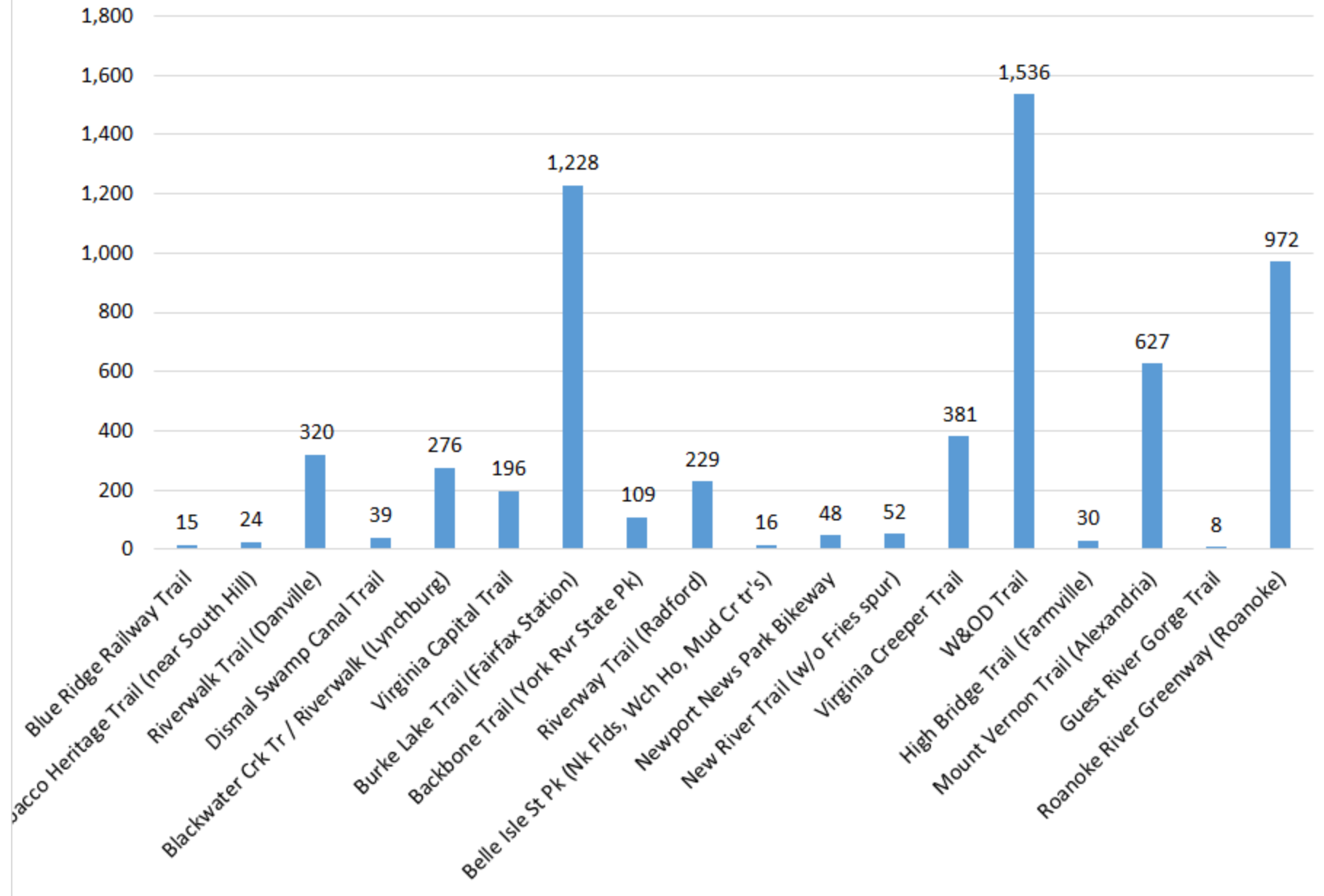


Source of Volumes for Existing Trails



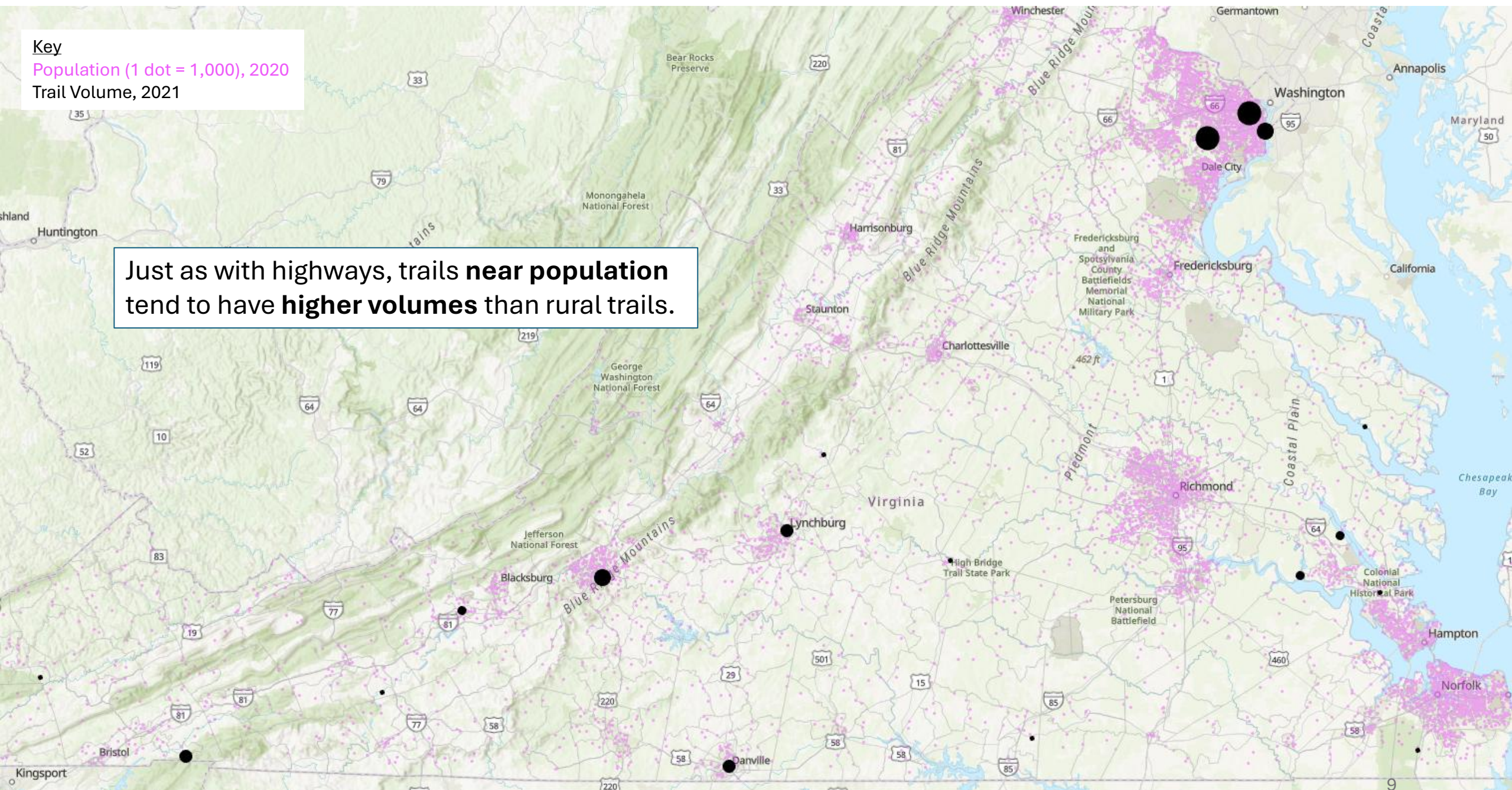
Source: HRTPO staff

Total Bike and Ped Volume per day (2021)



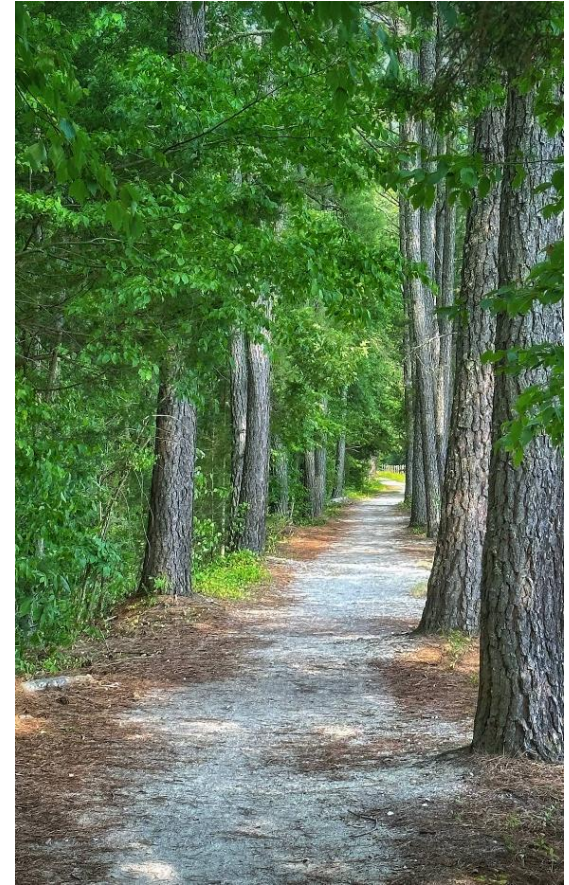
Population (1 dot = 1,000), 2020

Just as with highways, trails **near population** tend to have **higher volumes** than rural trails.



Development of Tool #1

Using the **population effect** to estimate trail usage.

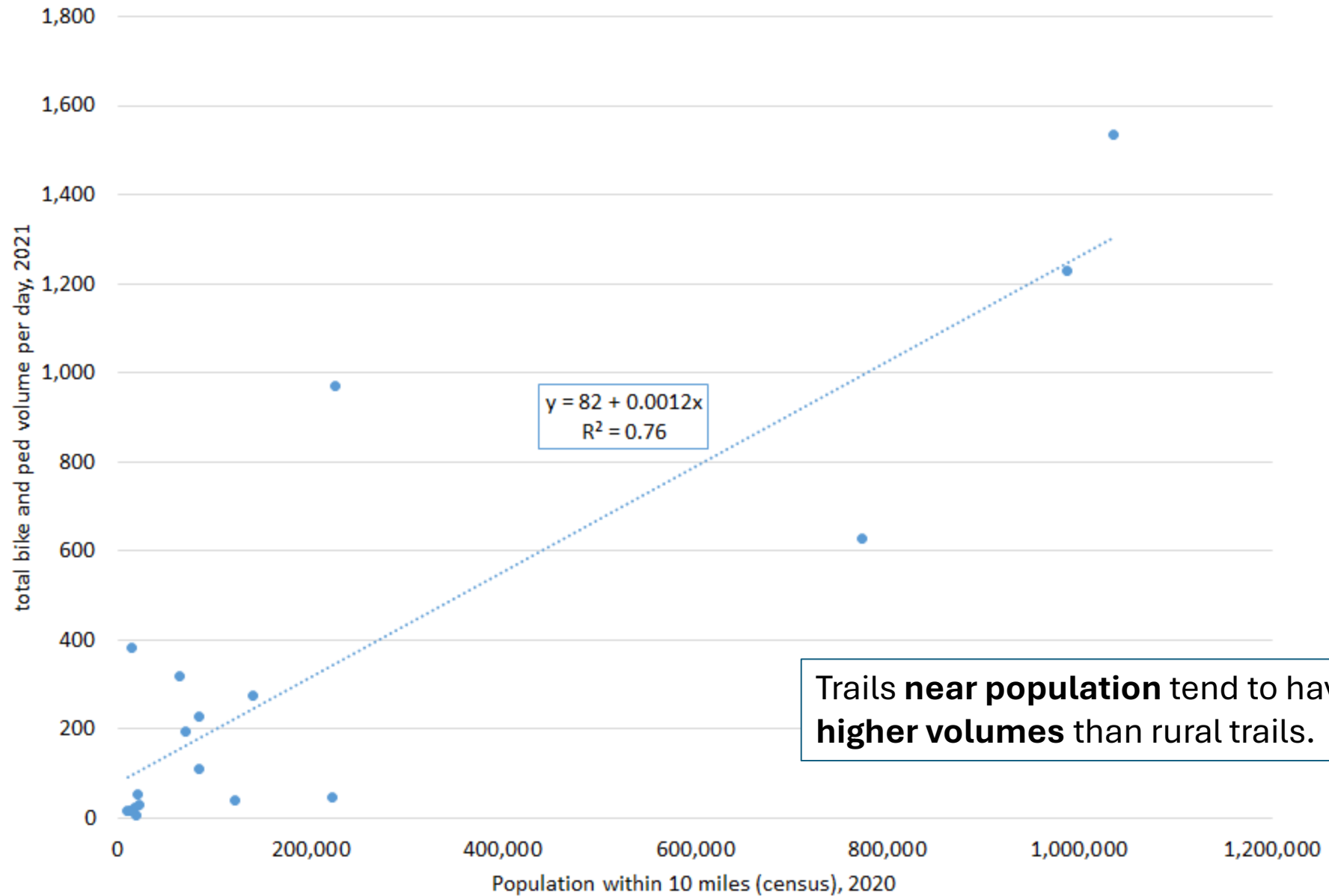


Source: Google Maps

Trail Mid-Point

Source: HRTPO staff

Trail Volume vs Nearby Population



Development of Tool #2

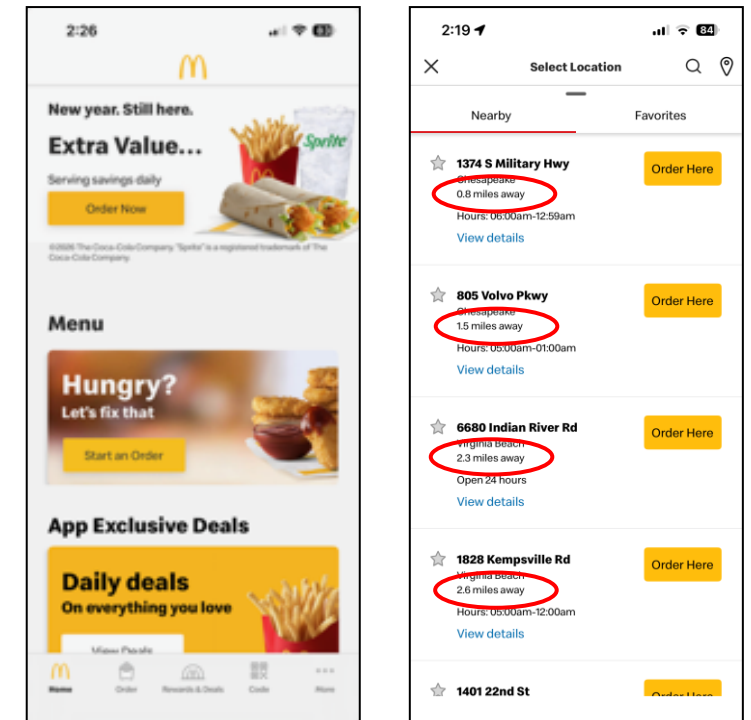
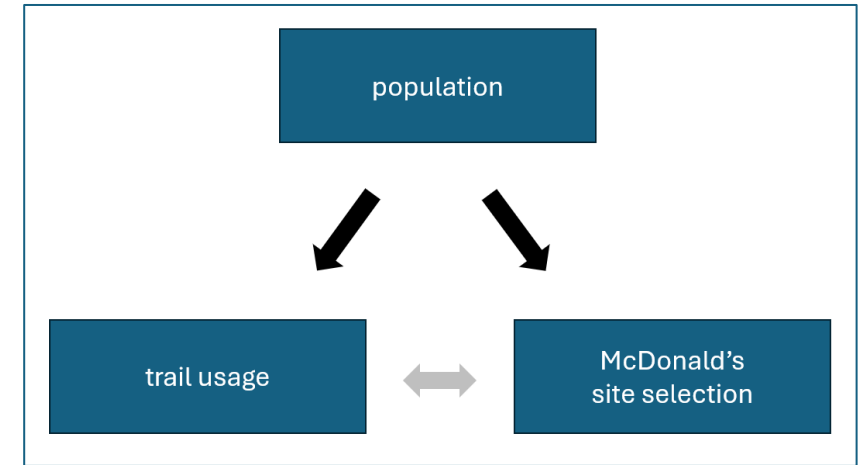


Source: Google Maps

Given **limited access to GIS** for measuring population near a proposed trail, staff developed a **smartphone-based** tool.

Smartphone-based Tool

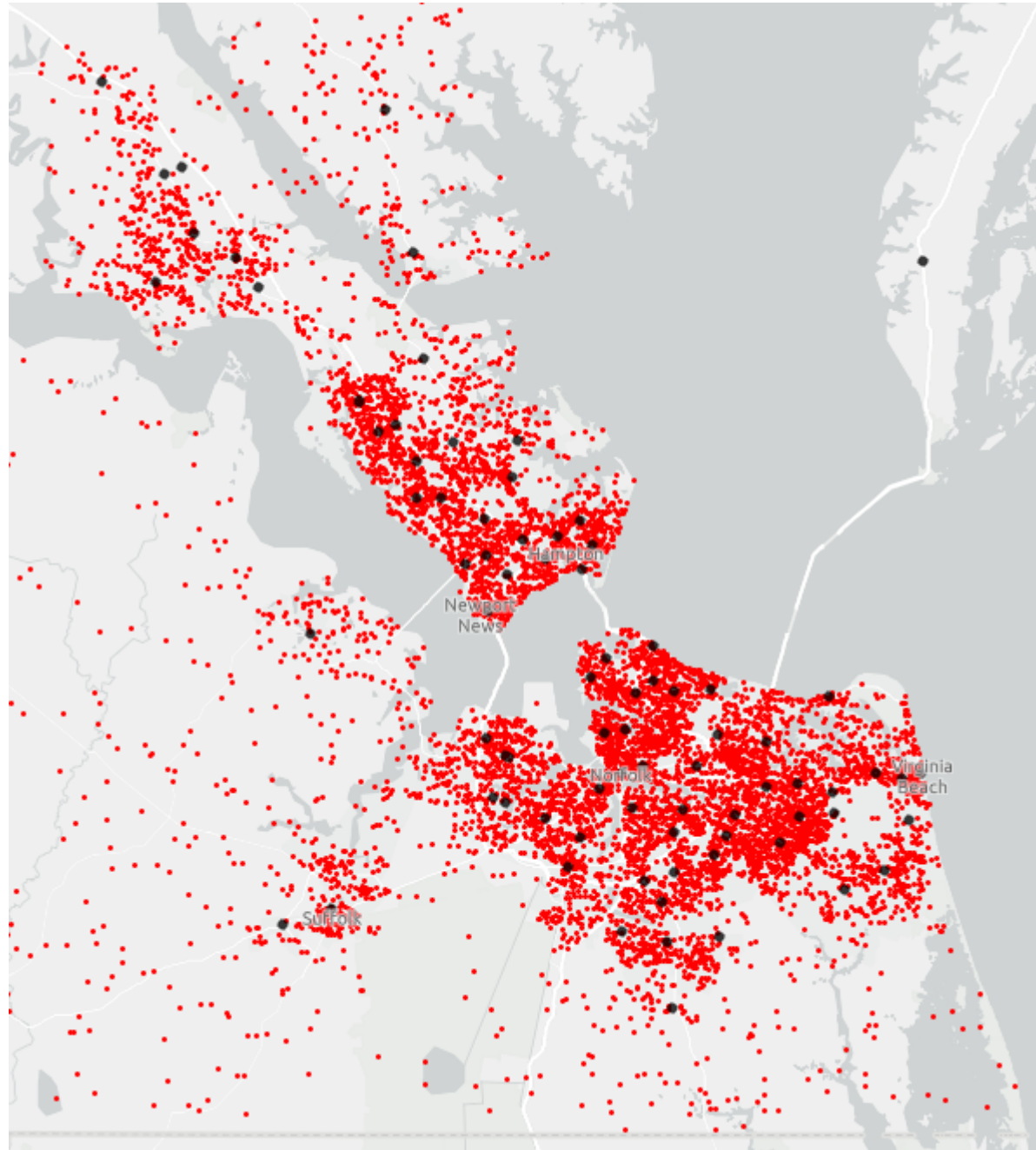
- Staff theorized that the **# of retail stores** in an area reflects the **# of people** in that area, as shown at right.
- Staff tested smartphone apps of largest retailers in the US:
 - **Restaurants:** Subway, McDonald's, Starbucks, Dunkin
 - **General retail:** Dollar General, 7-Eleven, Walmart
- Based on the ability to enter a **lat/long** for a trail, and how well its stores explained trail usage, staff chose to use the **McDonald's app**.
- Staff determined lat/long for trails by dropping a pin in **Google Maps**.



Not surprisingly,
McDonald's stores
have been sited
where people live.

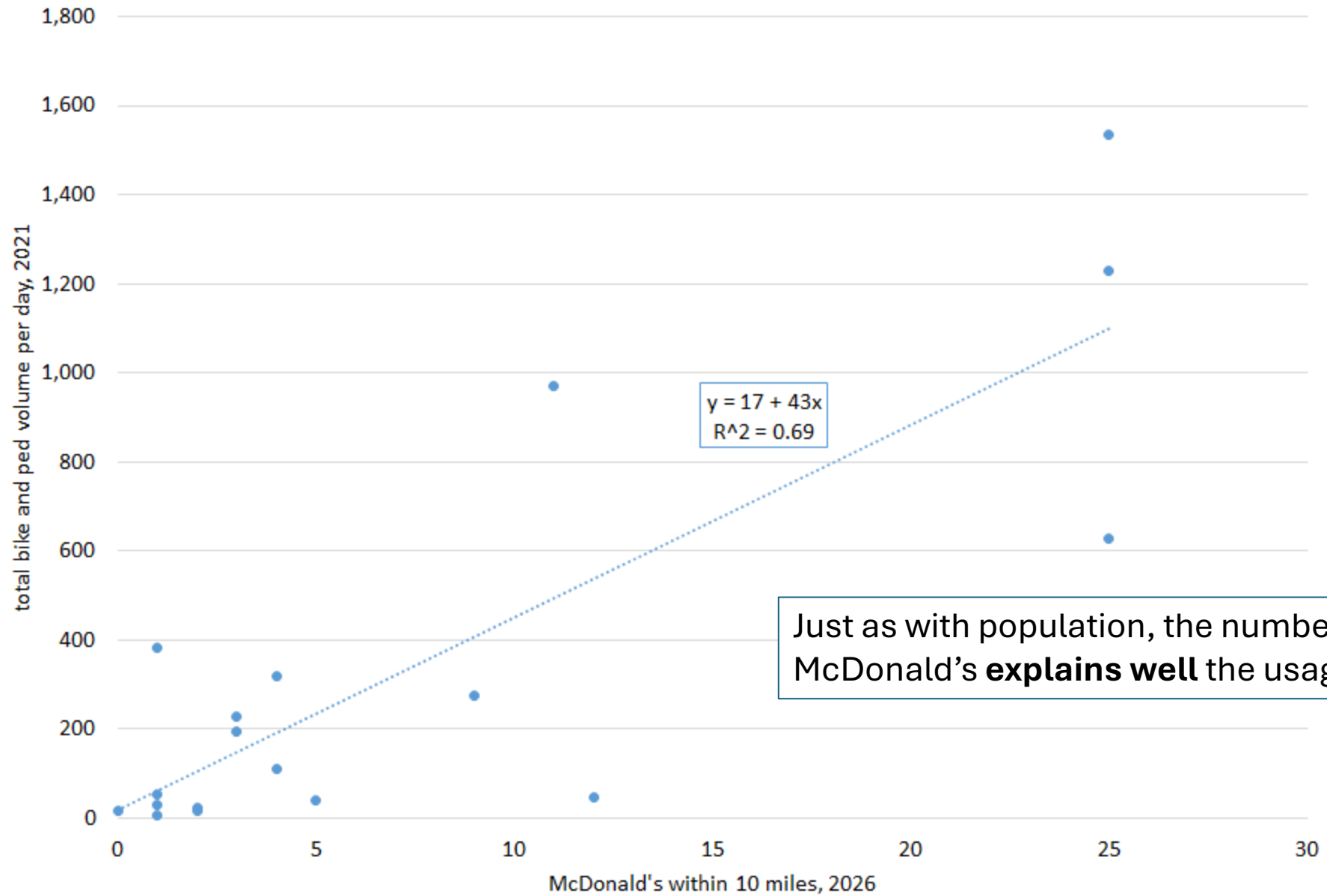
Legend

- McDonald's
- Population
 - Year 2020
 - 1 dot = 200



Source: HRTPO staff

Trail Volume vs Nearby Population



Just as with population, the number of nearby McDonald's **explains well** the usage of trails.

Using TPO Tools

#1 **Daily Bike + Ped Volume** = $82 + 0.0012 \times (\text{persons within 10mi})$

#2 **Daily Bike + Ped Volume** = $17 + 43 \times (\text{McDonald's within 10mi})$

- Due to the set of volumes from which these models were developed, these models are **designed to be used for** (and only for) trails like the 18 subject “Virginia is for Lovers” trails:
 - in Virginia
 - off-road
 - named
- Due to being based on regression models, the output of these tools are **estimates**.



Source: viriniacapitaltrail.org

Questions?

Rob Case 757-420-8300, rcase@hrtpo.org



Source: HRTPO staff