

Appalachian Trail Sustainability Research Study



**Jeff Marion, Recreation Ecologist
Virginia Tech Field Station
U. S. Geological Survey, Patuxent WLRC**

Appalachian National Scenic Trail

- 2,175 mile footpath from Maine to Georgia
- Crosses 14 states, 6 NPS units, and 8 National Forests,
- Managed by the NPS A.T. Park Office in partnership with the Appalachian Trail Conservancy and 31 maintaining clubs.



A.T. Trail & Recreation Site Research: 2015-19

Investigators: Jeff Marion & Jeremy Wimpey

- **Funded by NPS ATPO, administered by ATC**
- **Assessing the A.T. tread, informal trails, recreation sites, shelters, and campsites.**
- **Based on statistical sampling to provide comparative baseline data and support relational analyses to investigate sustainability.**
- **Fieldwork over 3 years, 2015-2017**

A.T. Trail & Recreation Site Research: 2015-19

A.T. presentations – preliminary findings:

- **Slope Ratio vs. Trail Slope Alignment Angle**
- **A.T. Trail Conditions and Sustainability**
- **GIS Applications to Trail Science**
- **Sustainable Tread Drainage**

Appalachian National Scenic Trail

Research Objectives

- 1. Provide quantitative, spatially related, baseline documentation of the Appalachian Trail tread and recreation sites to characterize the type, areal extent, and severity of visitation-related resource impacts to vegetation and soils,**
- 2. Statistically analyze data to evaluate trail design and alignment attributes and recreation site geophysical attributes to develop sustainability models, ratings, and guidance,**
- 3. Conduct analyses of tread and site data to identify and describe the relative influence of key use-related, environmental, and managerial factors that can be manipulated through design and management actions to minimize resource impacts,**

Appalachian National Scenic Trail

Research Objectives

- 4. Conduct spatial statistical analyses to evaluate how trail and site conditions and design attributes vary across latitude, elevation, eco regions, soil types, and management jurisdictions/styles,**
- 5. Formulate Best Management Practices describing actions (educational/interpretive, regulatory, and site/facility management) that avoid or minimize resource impacts,**
- 6. Apply sustainable trail and recreational facility construction and design principles through workshops with ATC field staff and volunteer trail maintainers, and**
- 7. Develop and communicate refined Leave No Trace practices.**

Appalachian National Scenic Trail

Research Design

Sampling was conducted using the EPA's Generalized Random Tessellation Stratified (GRTS) sample design (Stevens & Olsen, 2004).

The GRTS sampling algorithms achieve a spatial balance between the sampled A.T. trail segments.

63 5k segments - an 11% sample of the entire A.T.



Research Design

GRTS sampling was also applied within the 63 5k segments to determine the locations of 50 trail transects where tread measures are made. (N= 3150 transects). A GPS unit was used to navigate to each sample point.





Transect measurements

Assessed 13 inventory indicators and 21 impact indicators at each transect.

More will be added in GIS.



Transect measurements

Field data and transect photos were recorded using tablet computers.

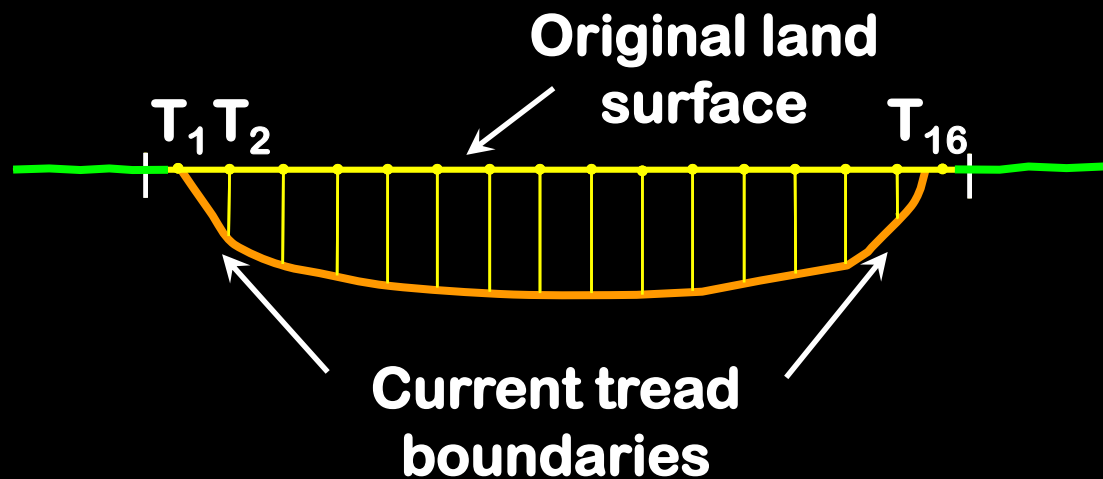
Fulcrum software used for forms and to upload / back-up to the internet.





Measuring Soil Loss on Trails

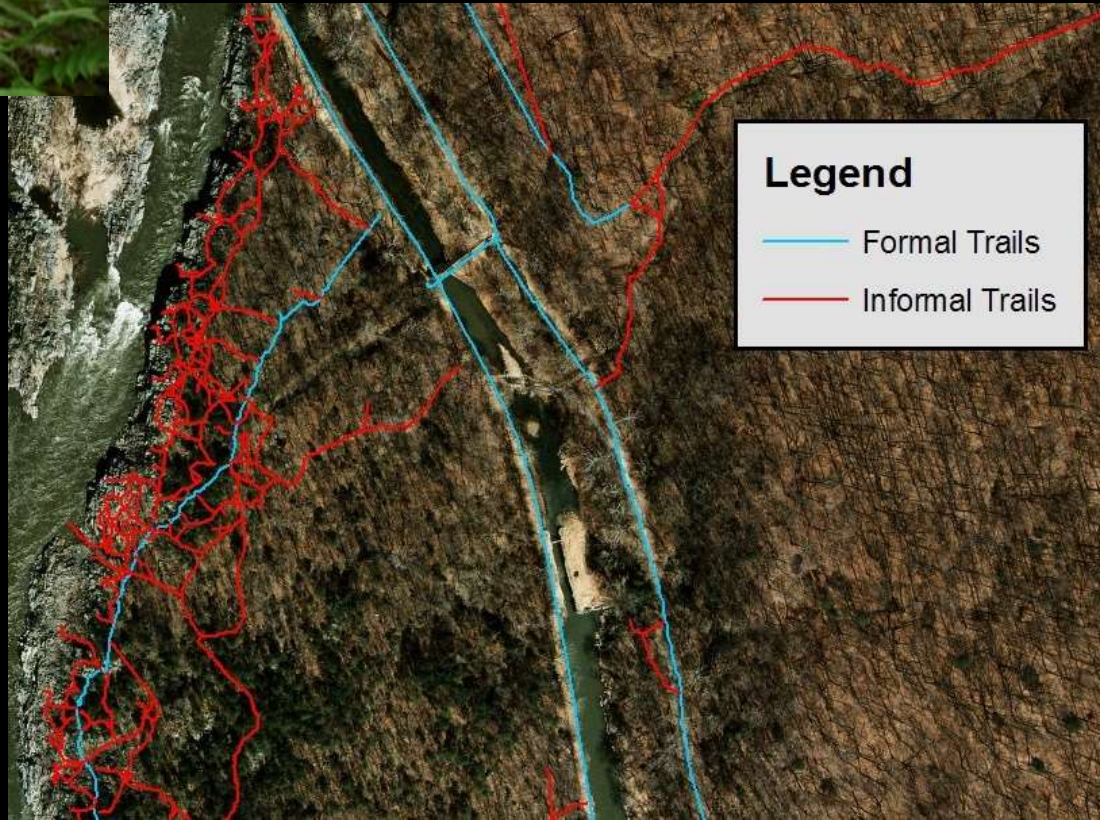
Cross-sectional area (CSA)





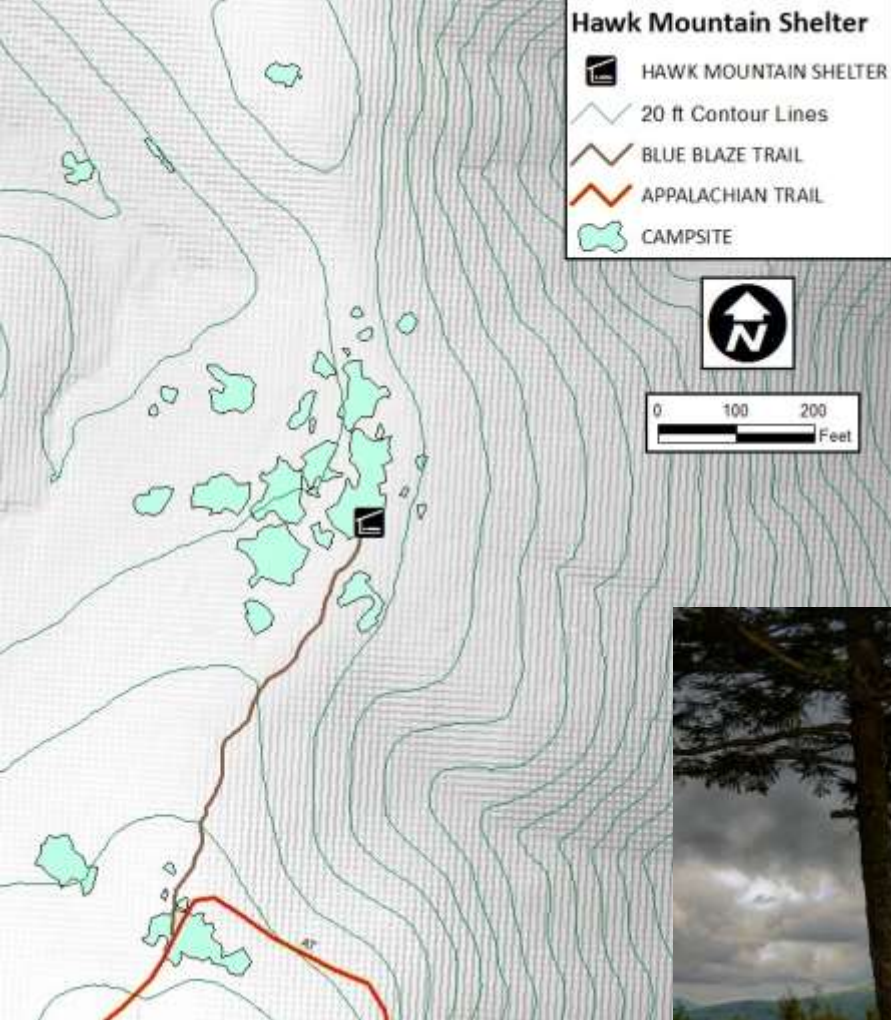
Informal Trails

A Trimble GPS unit was used to map and assess conditions on all informal (visitor-created) trails within a 150 m wide corridor.



Legend

- Formal Trails
- Informal Trails



Recreation Sites

Used a Trimble GPS unit to map and walk the boundaries of all day-use and overnight sites, including shelters.



Recreation Sites

Inventory Indicators:

Site expansion potential

Tree canopy cover

Rock substrate

Use type

Use level

Impact Indicators

Total site area

Condition class

Exposed soil

Vegetation ground cover on- and off-site

Tree damage

Root exposure

Tree stumps

Number of access trails



Recreation Ecology Studies

Relational Analyses:

- **Seek to ID and understand the relative contribution of factors that influence trail degradation.**
- **Improved knowledge allows us to:**
 - **a) manipulate factors having the greatest potential to minimize impacts.**
 - **b) increase our ability to professionally design, construct, and manage sustainable trails.**

Questions?

A.T. McAfee's Knob