

# 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 Tesselation Stratified (GRTS) sample design (Stevens & Olsen, 2004).**

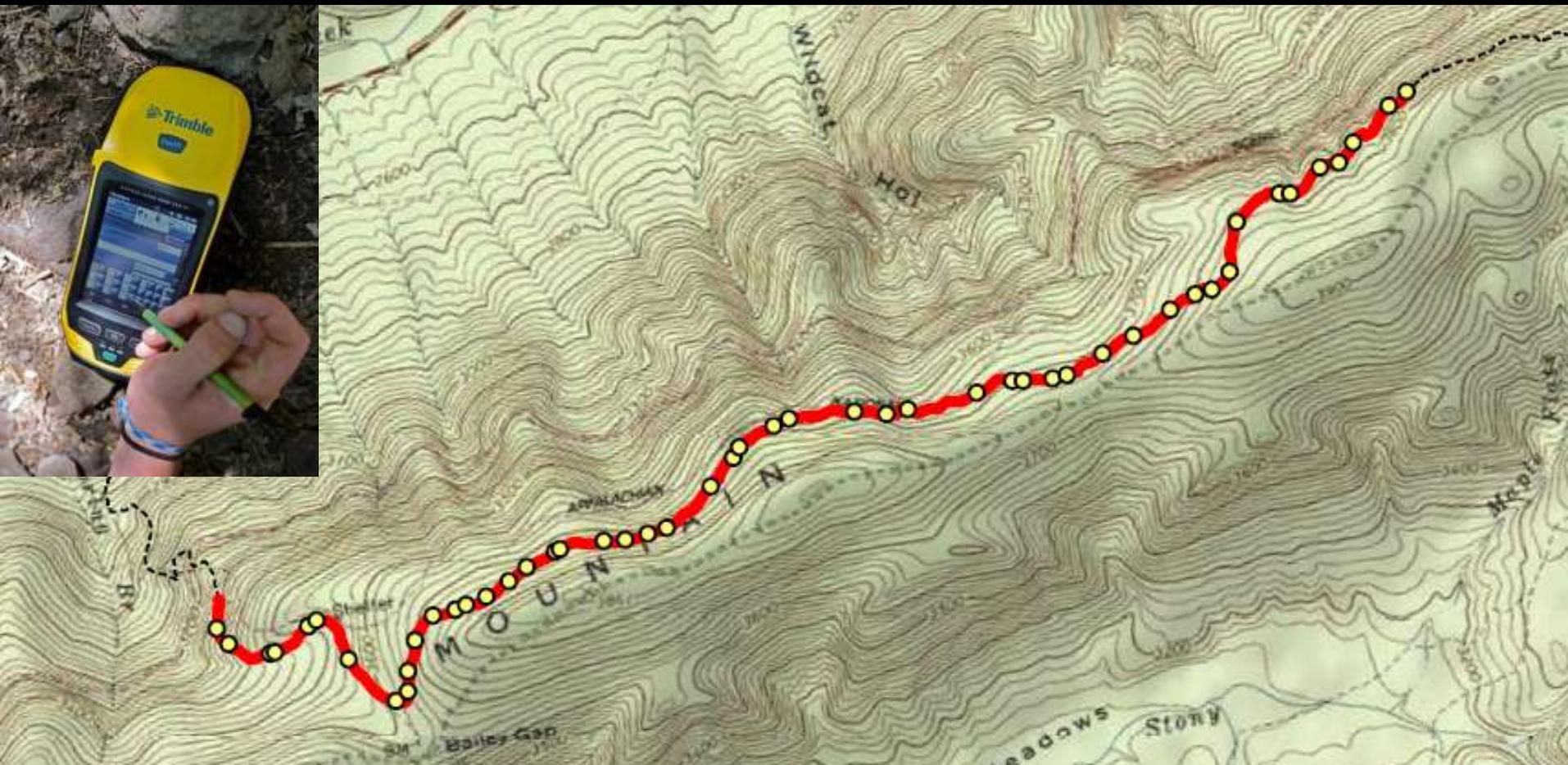
**The GRTS sampling algorithms achieve a spatial balance between the sampled A.T. trail segments.**

**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.

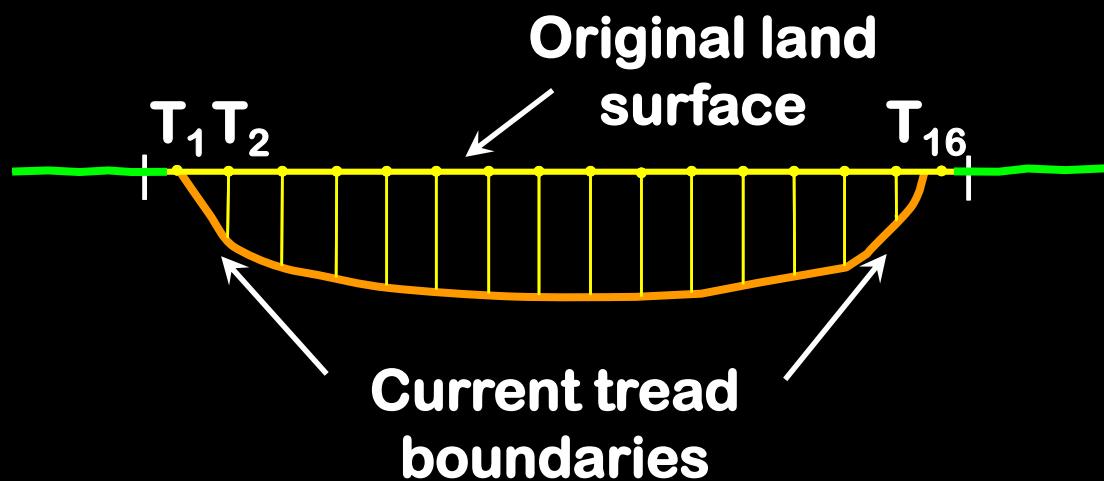
Fulcrum software used for forms and to upload / back-up to the internet.





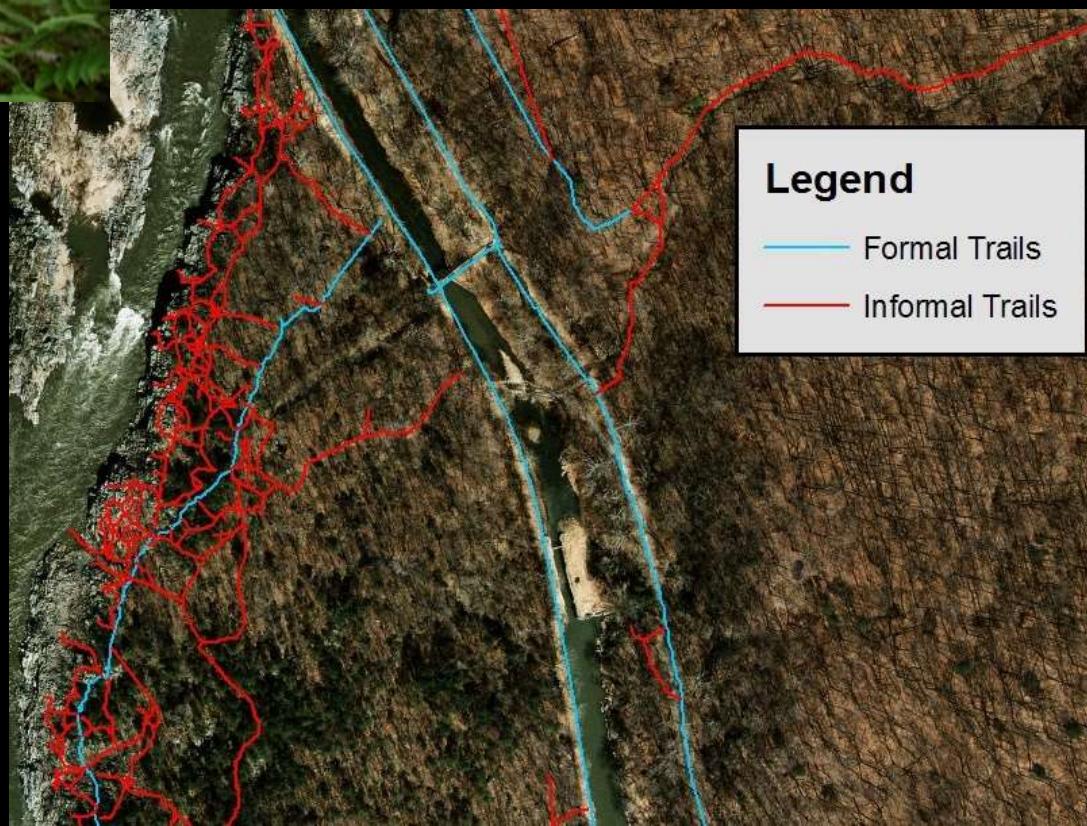
## Measuring Soil Loss on Trails

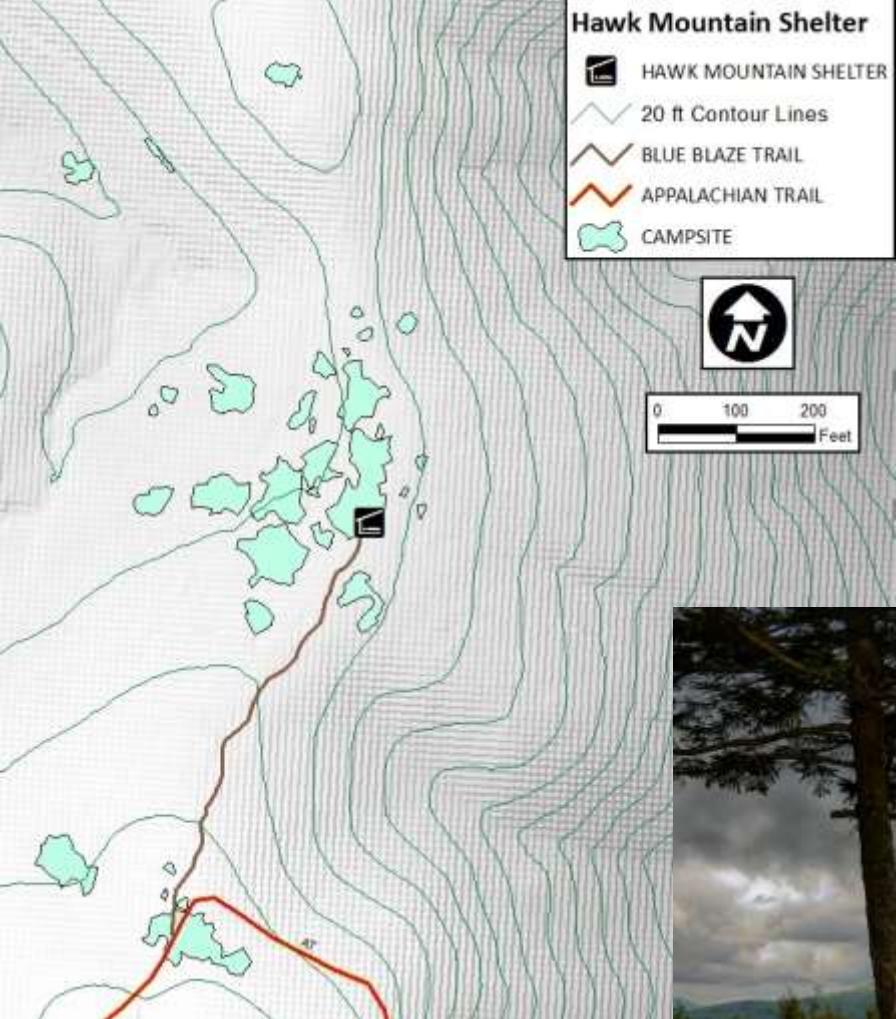
Cross-sectional area (CSA)



## 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.





## 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.

A photograph of a rugged, rocky mountain landscape at night. In the foreground, a large, light-colored rock formation with deep grooves and ledges dominates the scene. A small, glowing green tent is pitched on one of the higher ledges on the right side. The sky above is a deep purple, transitioning into a bright orange and yellow glow near the horizon, suggesting either a sunset or a sunrise. In the far distance, the lights of a town or city are visible along a valley floor. The overall atmosphere is serene and adventurous.

# Questions?

A.T. McAfee's Knob