
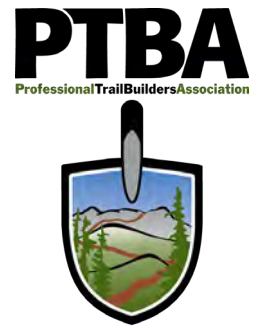


GIS Support and Analyses along the Pacific Crest Trail and Appalachian Trail



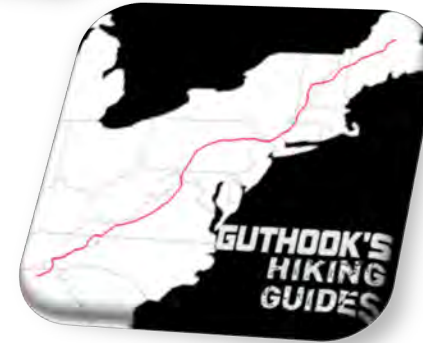
Ryan Branciforte of OuterSpatial and
Jeremy Wimpey of Applied Trails Research

Jeremy Wimpey



Applications of GIS & GPS Technology

- Estimate use levels
 - Numbers, \$, types, health
- Inform management of permits & quotas
- Locate and monitor trail system development
- LEO support
- Resource protection
- Experience enhancement
- Stewardship engagement

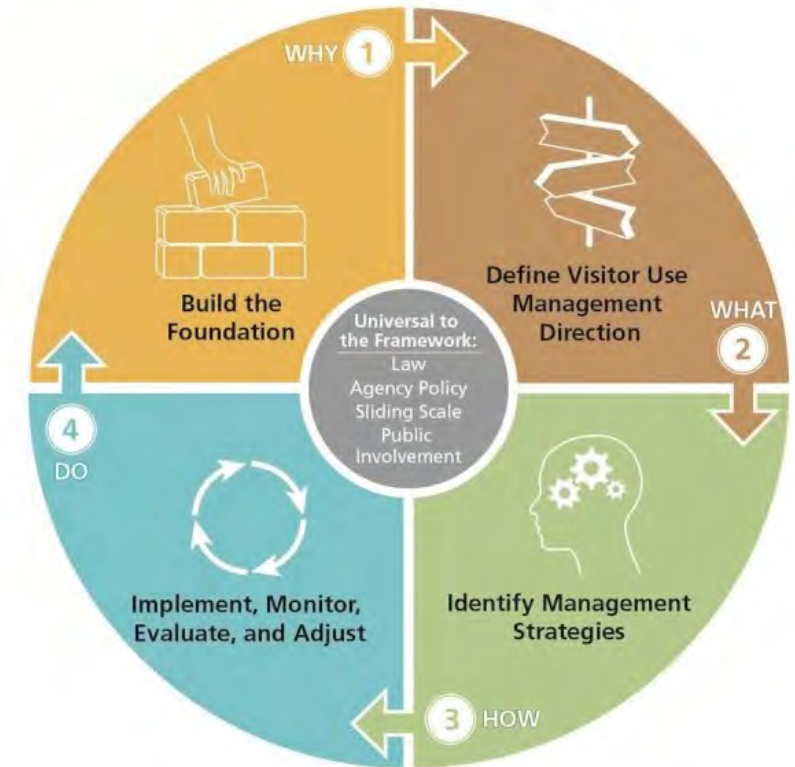


Leveraging Apps for Trail Sustainability



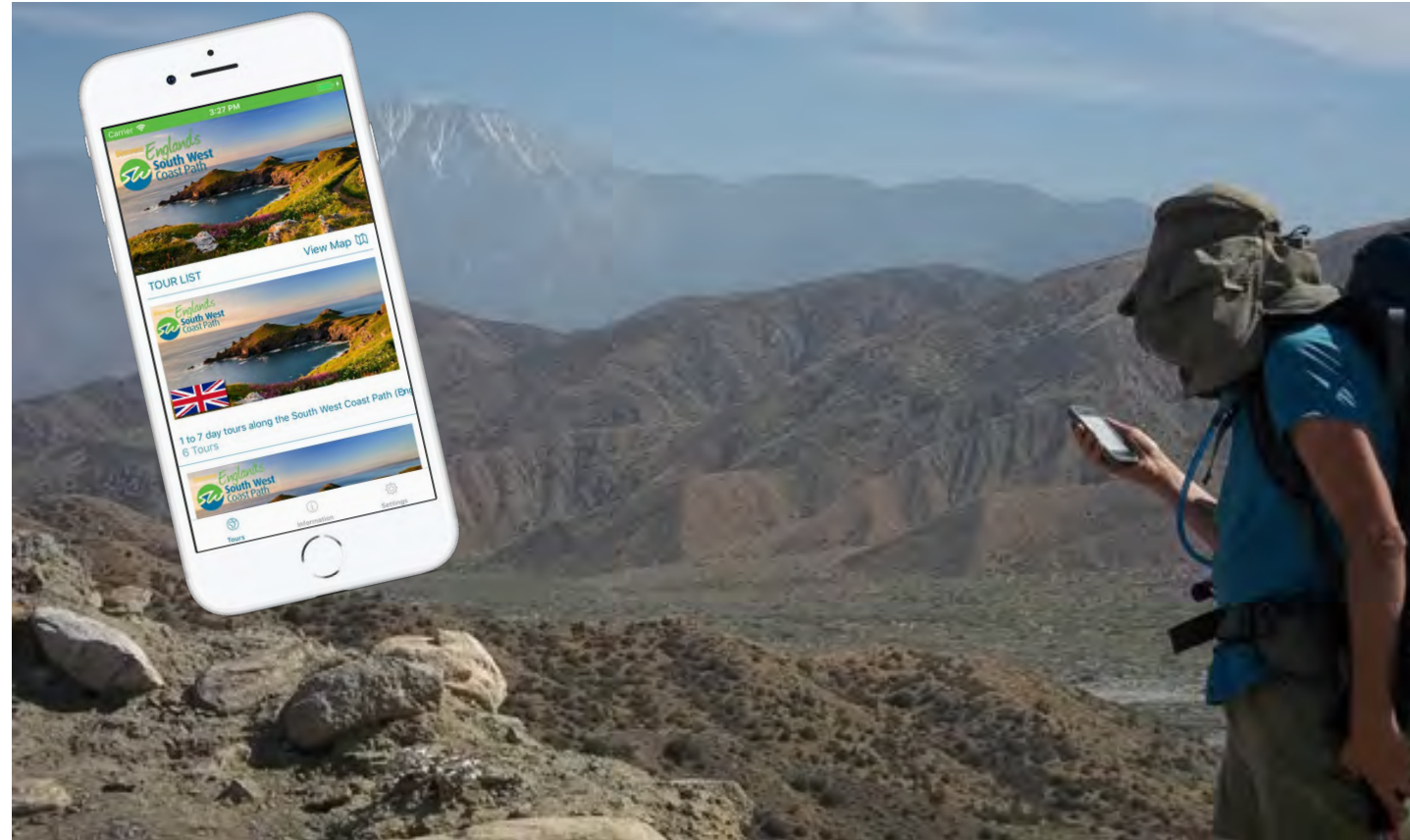
- Enhance communications
- Dynamic and engaging
- Volunteered GIS
- Public Participation GIS

Visitor Use Management Framework



Apps: Foundation of Data Sharing

- Modern communication platform
 - Push & Pull data
- Dynamic and timely
- Volunteered GIS
- Public Participation GIS



<https://atlasguides.com/getting-the-most-from-your-phones-battery/>

Leveraging Apps for Trail Sustainability

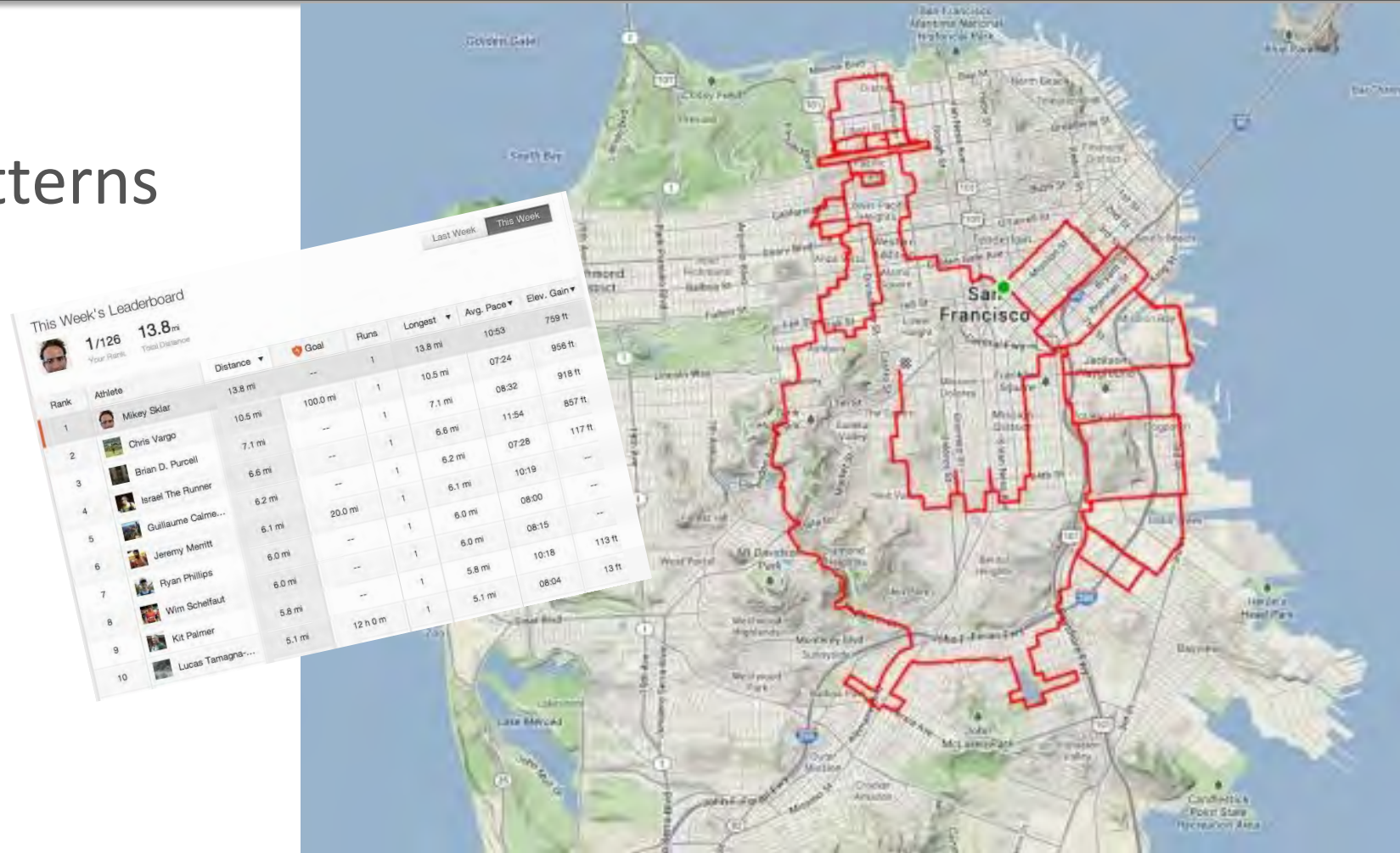


<https://itunes.apple.com/us/app/vidometer/>

- Capture information
 - Location
 - Speed
 - Behavior
- Share information
 - Guide visitors
 - Regulatory
 - Emergency

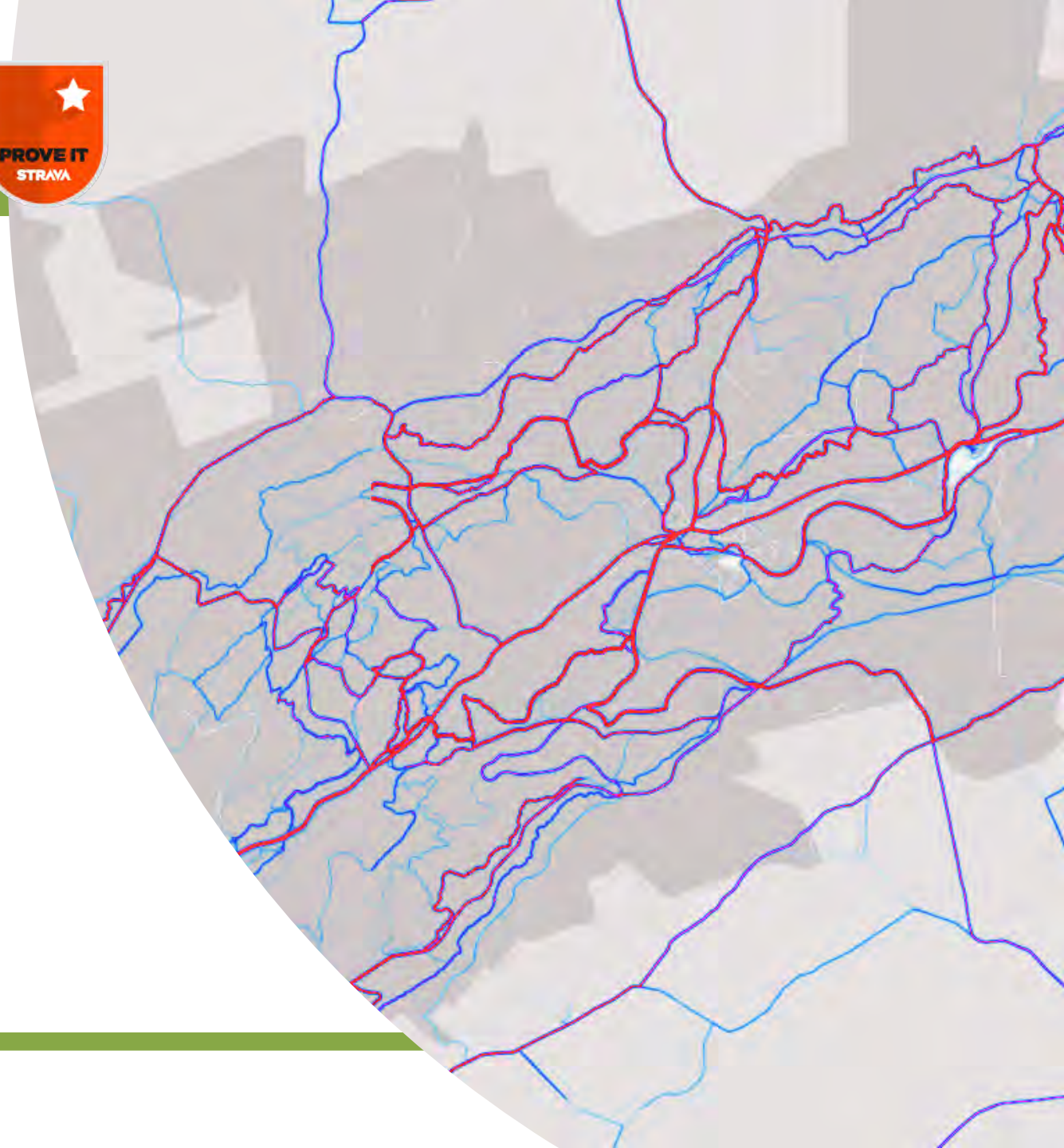
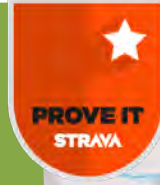
Tracking Use

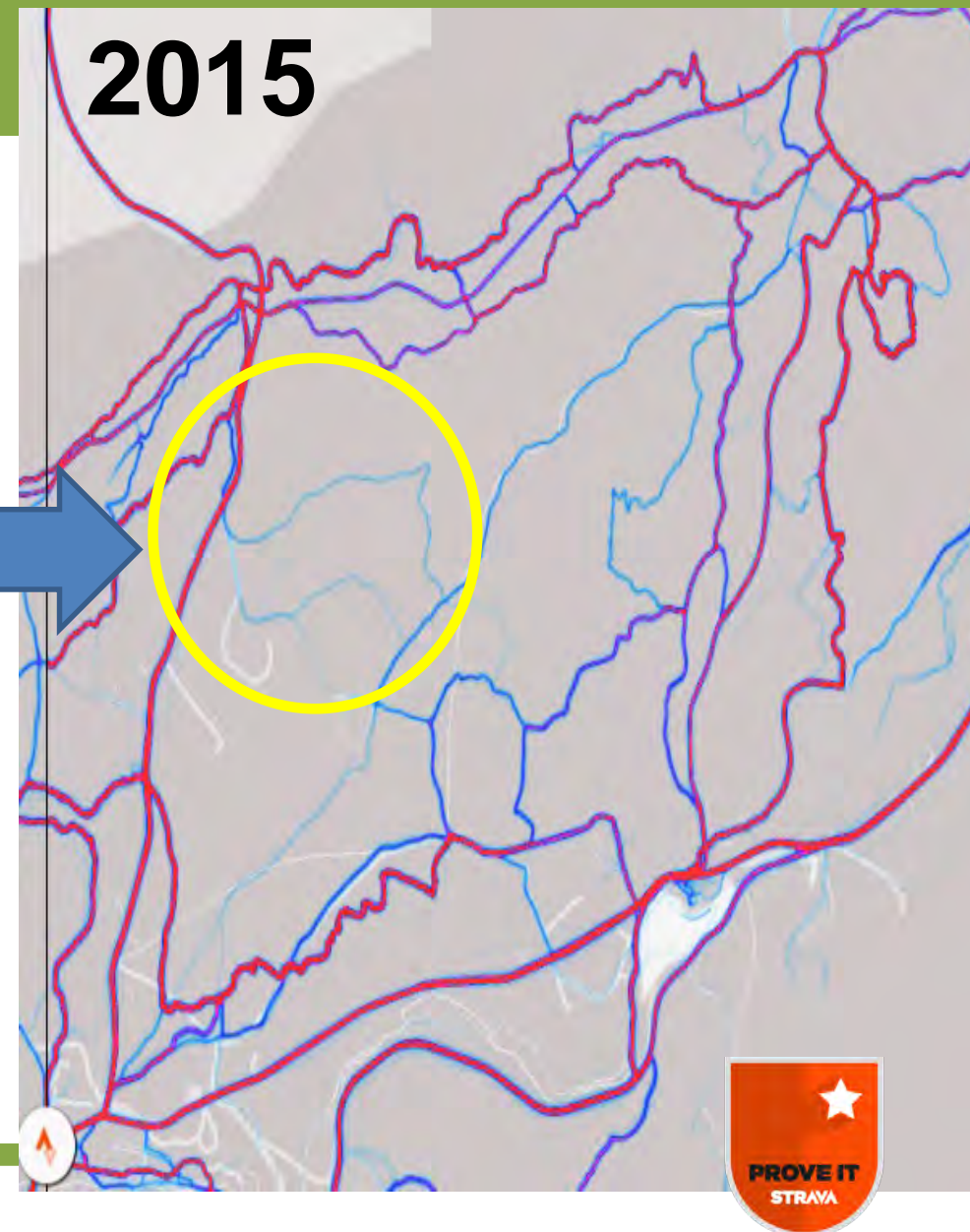
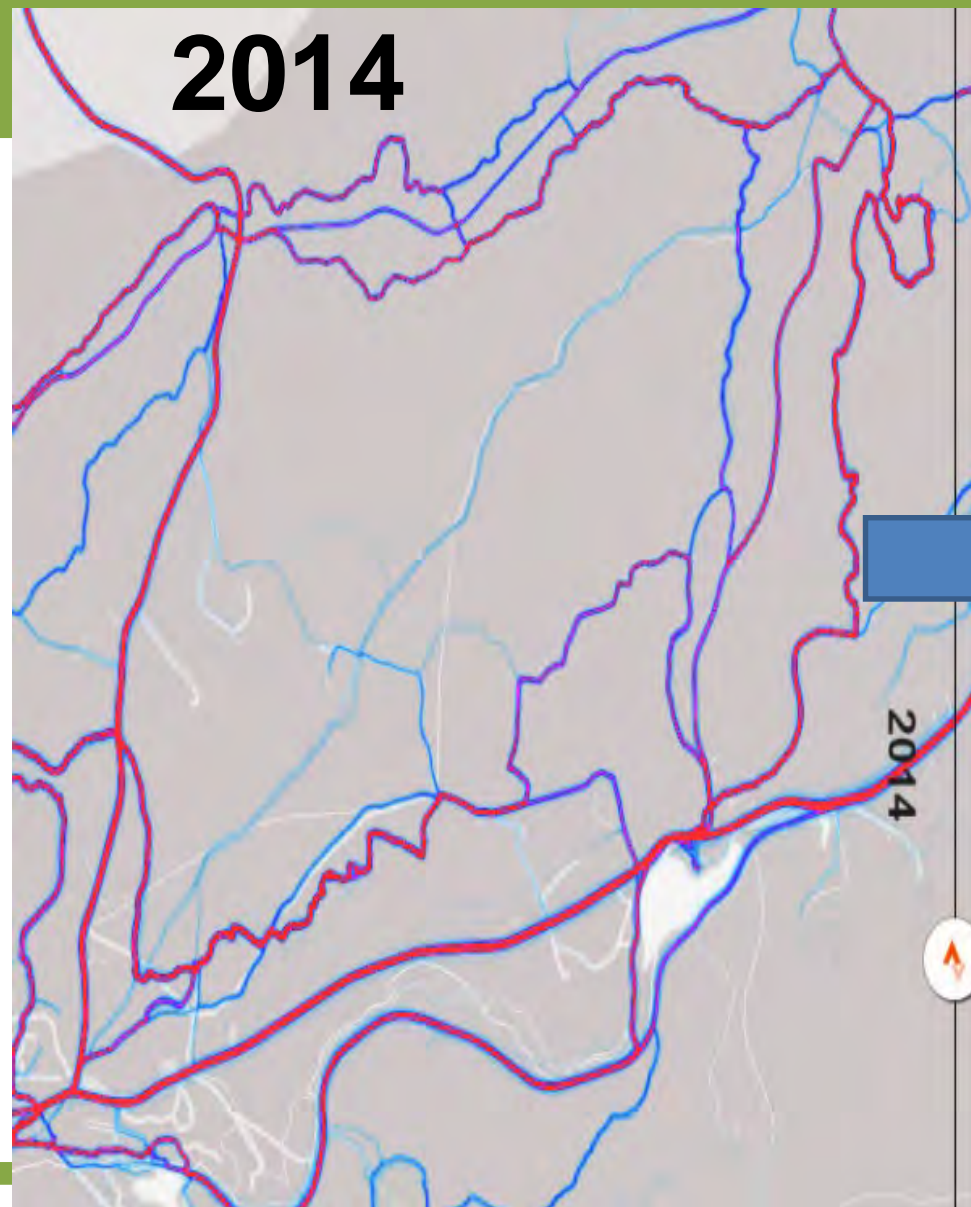
- Understand travel patterns
 - Time, speed
- Estimate use levels
 - Types & amounts
- Locate infrastructure



Michaux State Forest (PA) Appalachian Trail

- Dynamic and rapidly growing trail system
- “Rogue” trail network
- Official trail network





PCT Research – Permit System Interactions

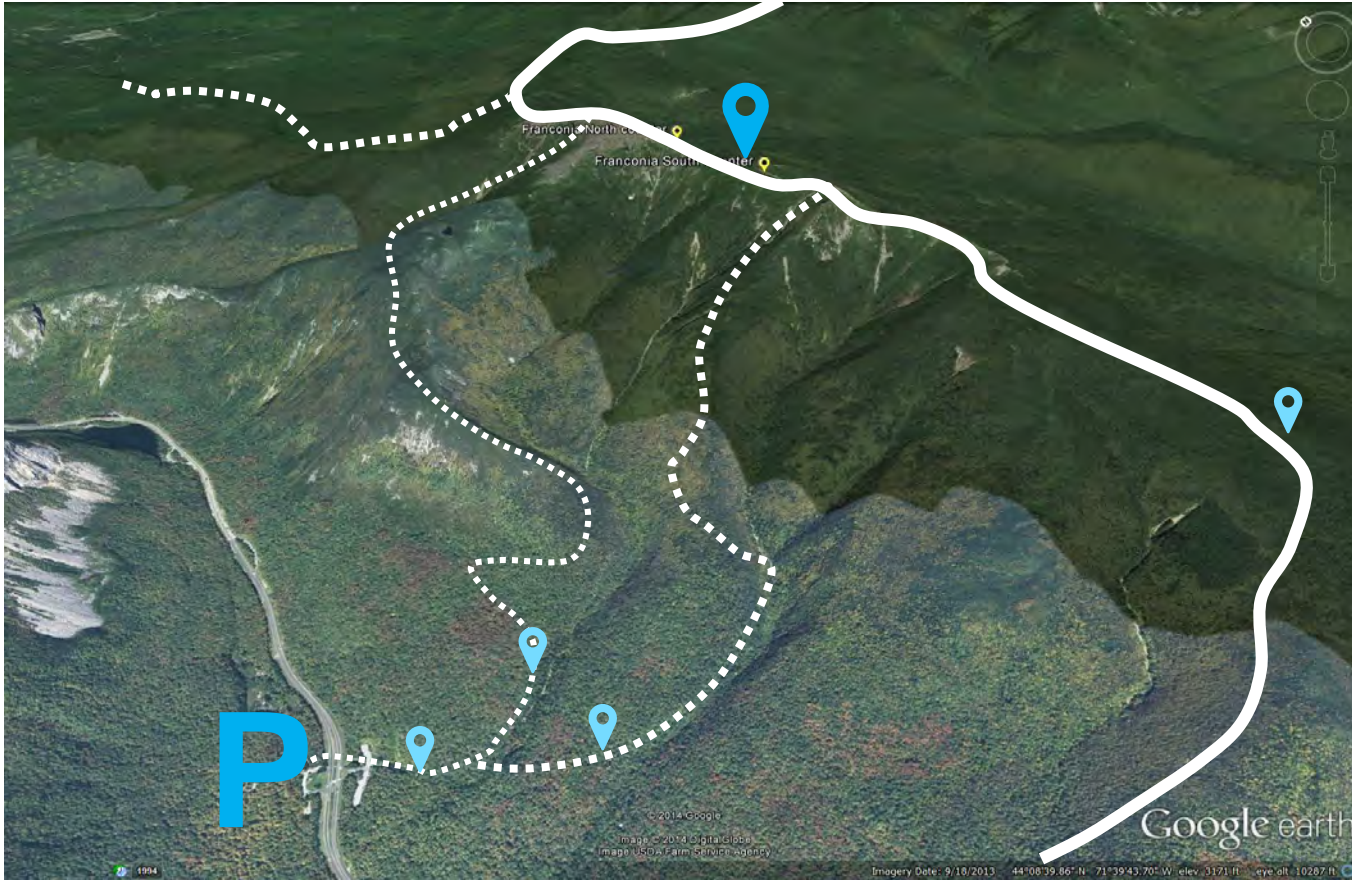


Permit Use & Attrition



Survey				% Abandon	% Abandoned	
		Response N	% Use Permit	Trail	for Snow or Fire	
2016	NoBo	March	31	100%	42%	17%
		April	212	99%	62%	13%
		May	125	100%	65%	16%
		June	35	100%	57%	0%
		July	44	100%	52%	10%
		August	16	94%	56%	0%
		September	2	100%	0%	0%
2017	NoBo	March	52	98%	27%	61%
		April	255	99%	42%	60%
		May	142	99%	39%	59%
		June	32	100%	22%	68%
		July	50	98%	48%	54%
		August	28	97%	32%	63%
		September	7	100%	43%	75%
2016	SoBo	June	14	100%	64%	40%
		July	31	100%	58%	23%
		August	10	100%	40%	33%
		September	4	100%	50%	0%
2017	SoBo	June	10	100%	50%	40%
		July	45	98%	60%	39%
		August	26	100%	42%	53%
		September	8	100%	25%	67%

Managing Visitor Use



- Crowding
- Capacity
- Safety
- Wilderness management
- Resource protection



Trail Impacts

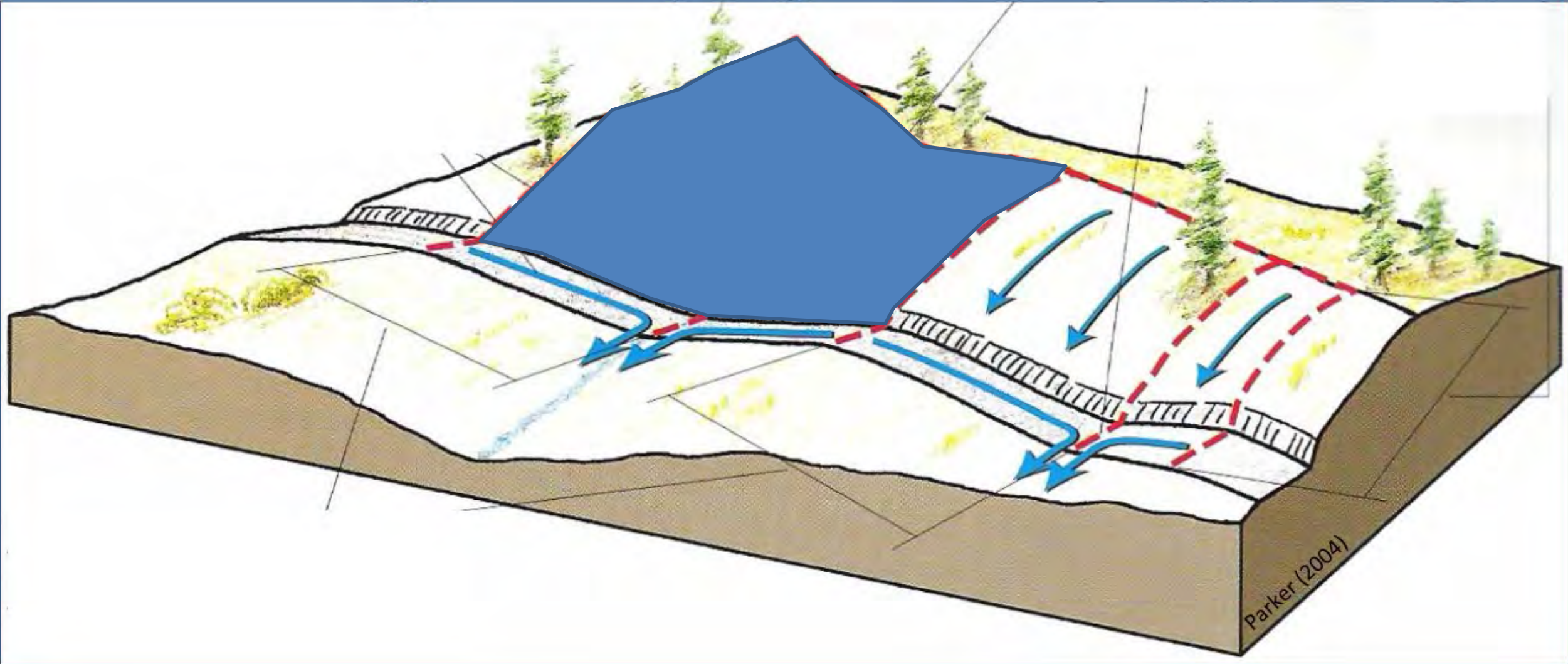
Widening

Soil Loss

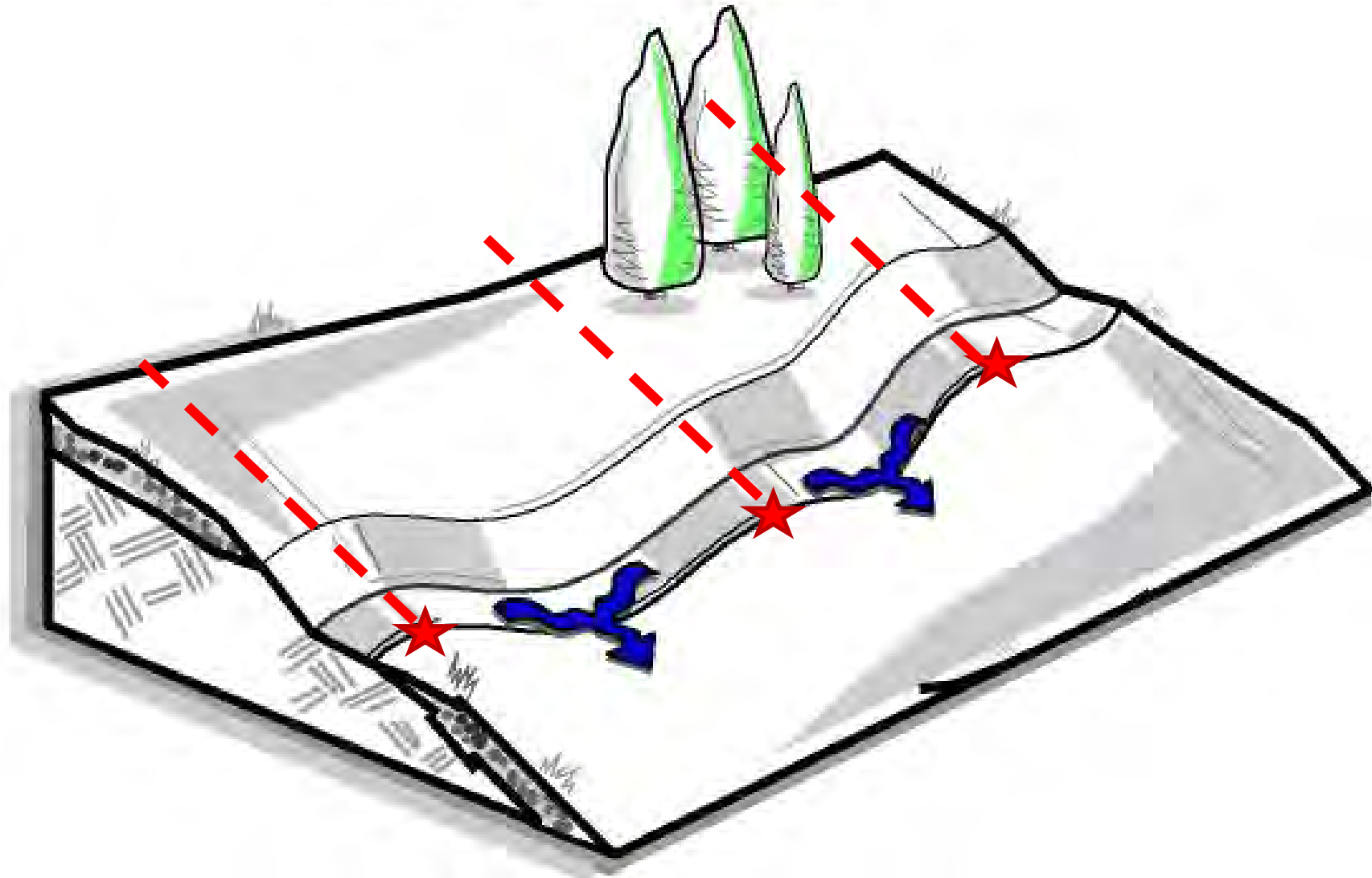
Muddiness



Upslope Landform Watershed



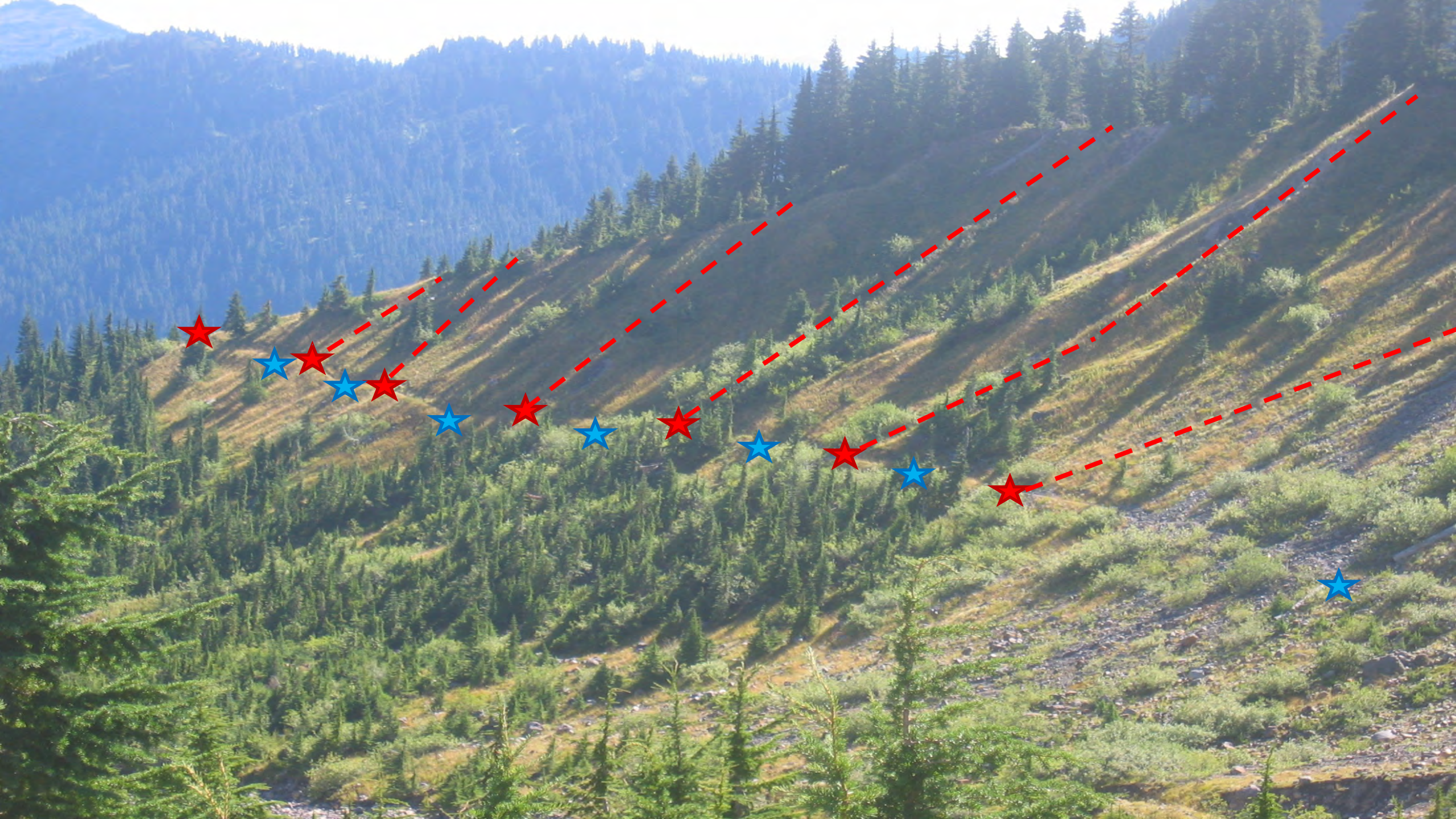
Rolling Contour Trail









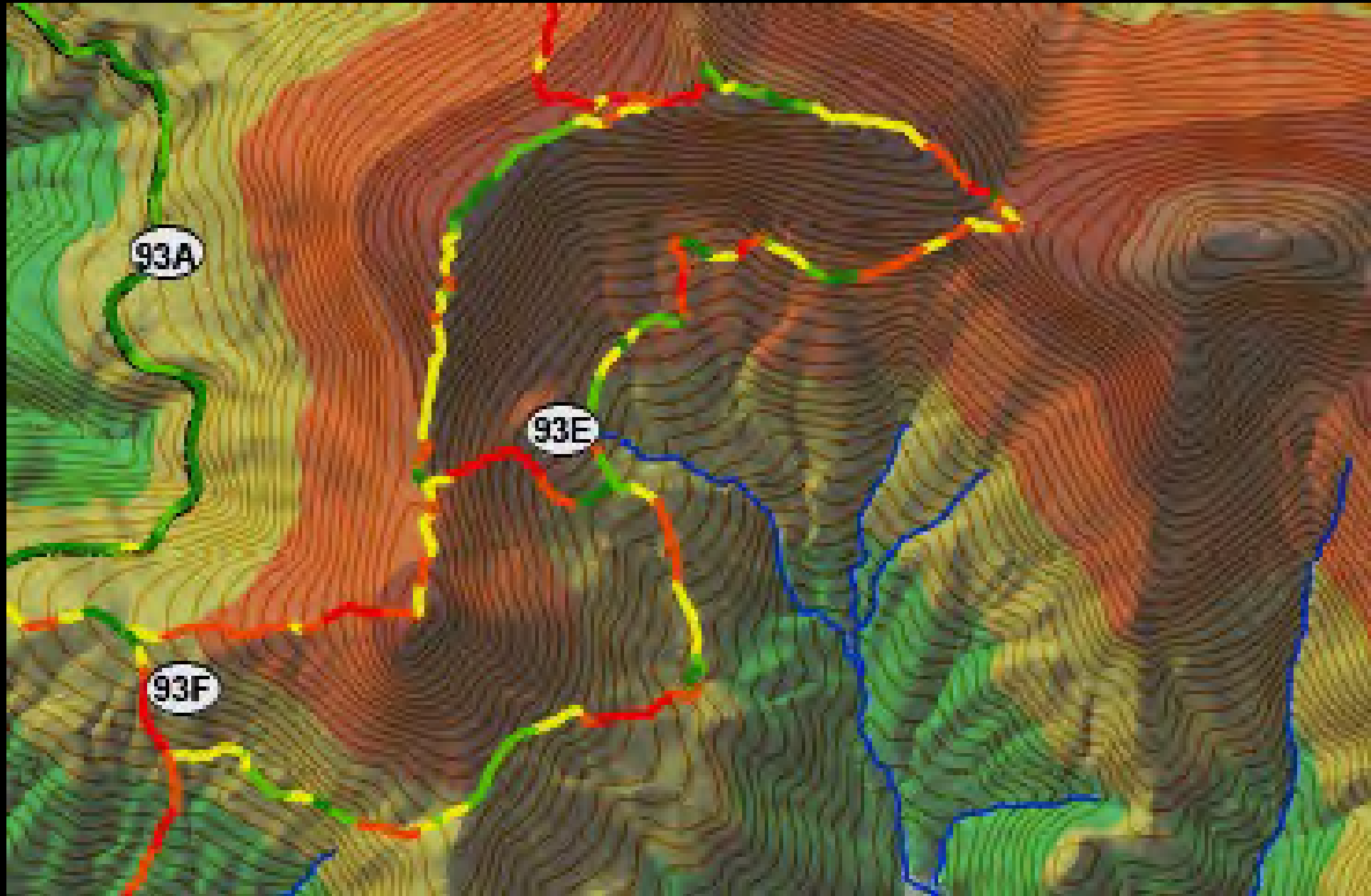


Trail sustainability ratings for the AT based on trail grade and slope alignment angle.

INDICATORS (n=2957)		TRAIL SLOPE ALIGNMENT ANGLE				
		0-22°	23-45°	46-68°	69-90°	Totals
TRAIL GRADE	0-2%	4.8%	2.5%	3.9%	8.1%	19.3%
	3-10%	10.5%	5.7%	10.0%	13.0%	39.2%
	11-20%	9.5%	4.8%	9.1%	6.9%	30.1%
	>20%	5.0%	2.5%	2.9%	1.0%	11.4%
Totals		29.8%	15.5%	25.8%	28.9%	100.0%

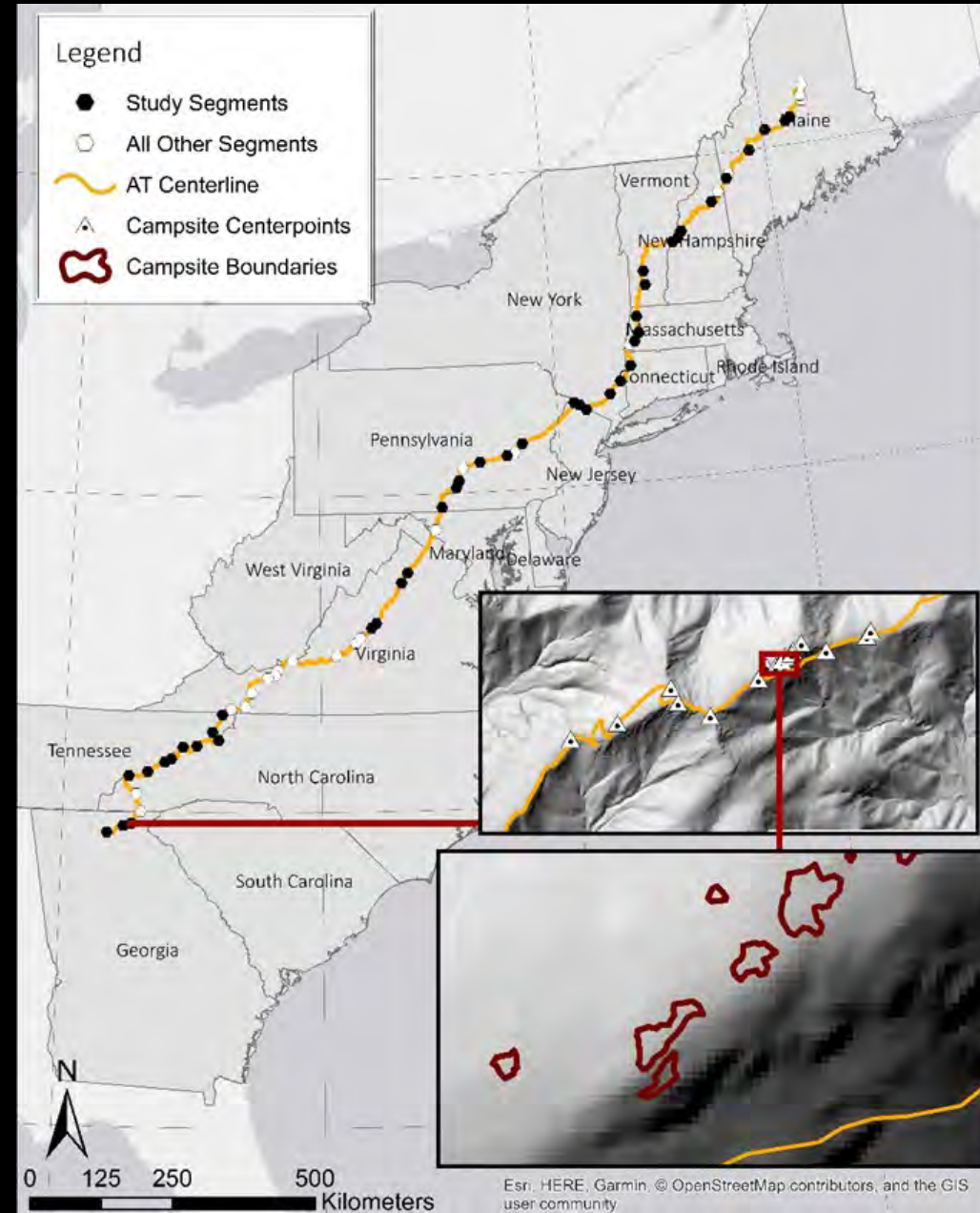
TRAIL SUSTAINABILITY RATINGS			
Good	Neutral	Poor	Very Poor

Trail Sustainability Ratings



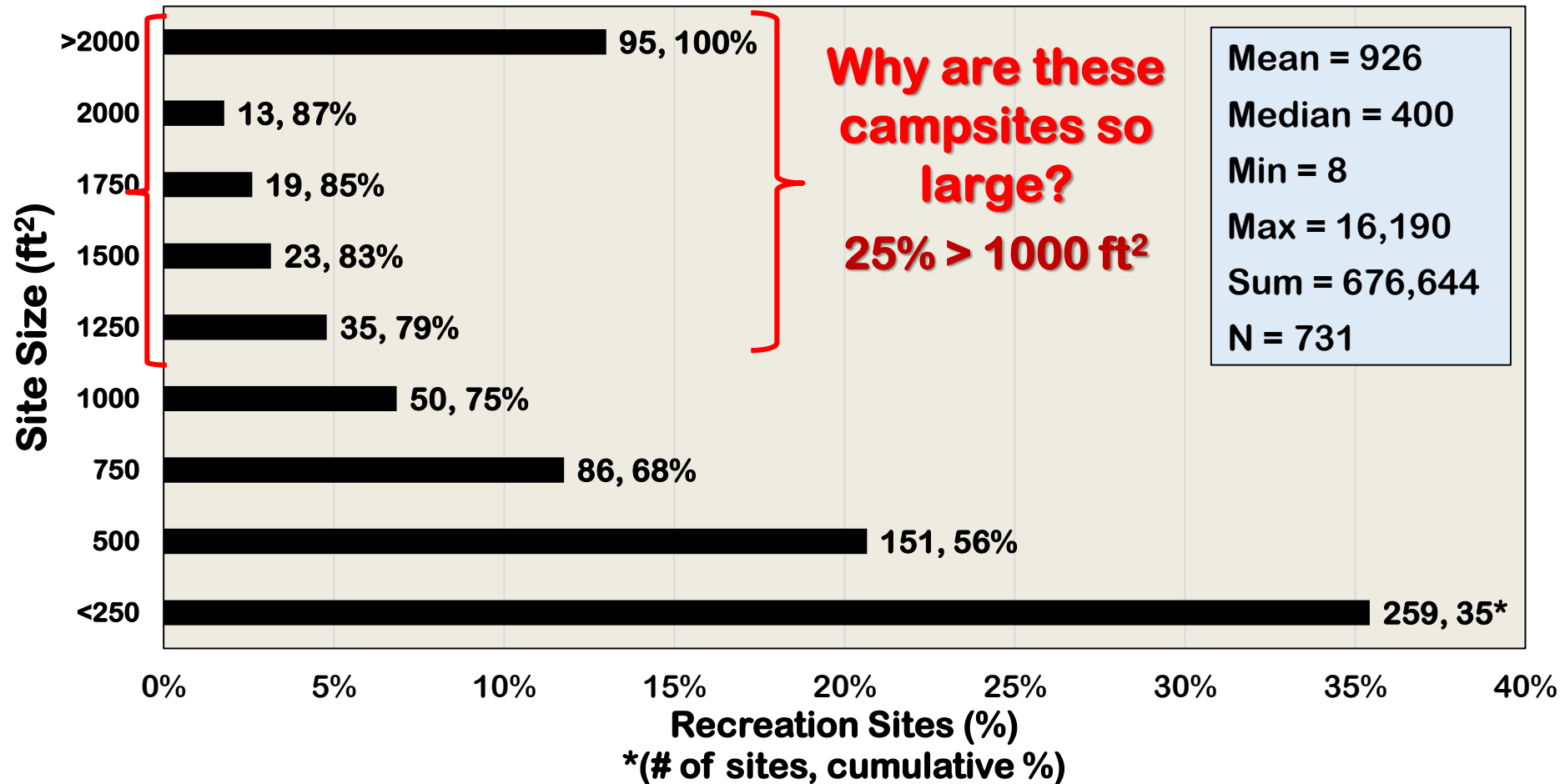
Research Methods – Recreation Sites

- Within each of the 63 5k segments field staff located and assessed all day-use and overnight recreation sites.
- Used a Trimble GPS unit to map and walk the boundaries of all recreation sites, from which site sizes were calculated.



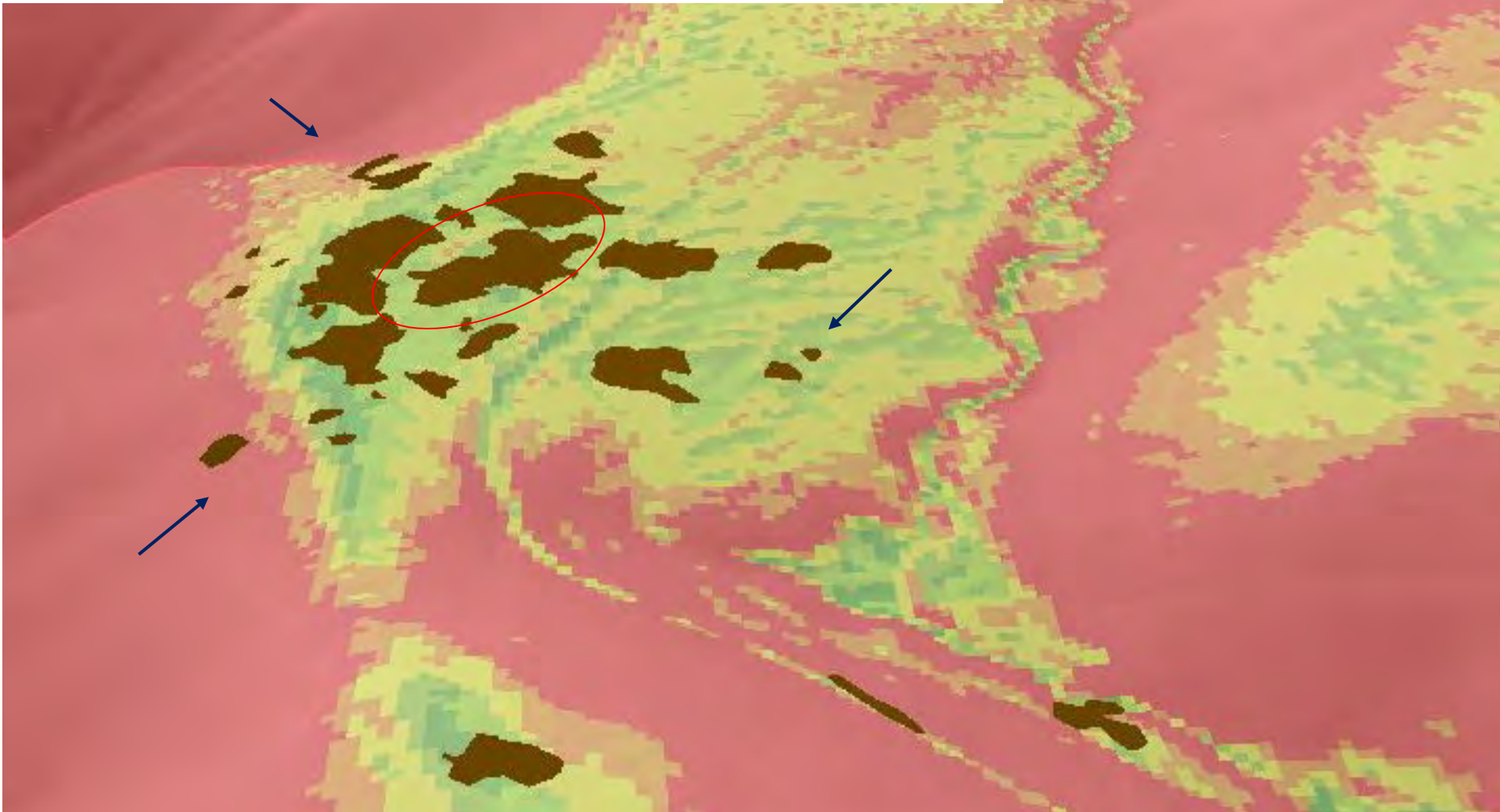
Limit Campsite Size to Limit Camping Impacts

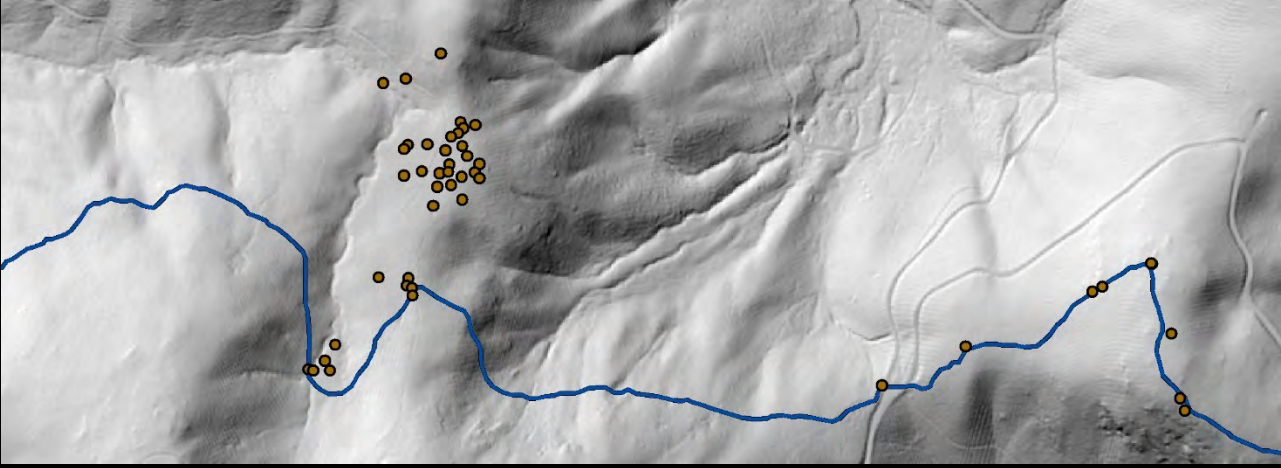
Appalachian Trail, Overnight Sites, 9% sample



$$\text{Aggregate Impact} = \sum_{i=1}^N \text{campsite size}_i$$

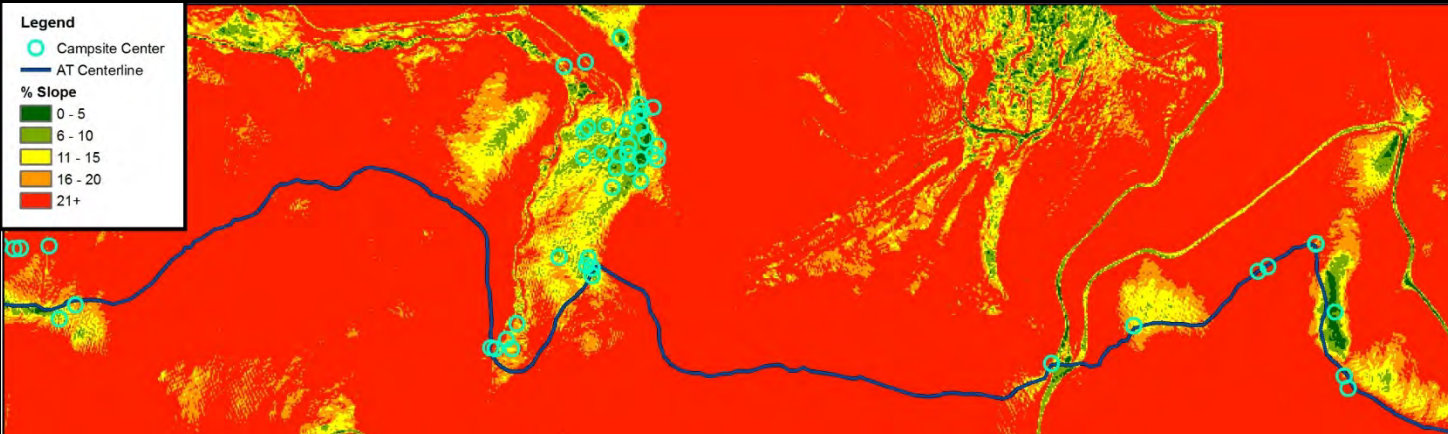
** An increase in site size AND/OR the number of sites increase aggregate impact



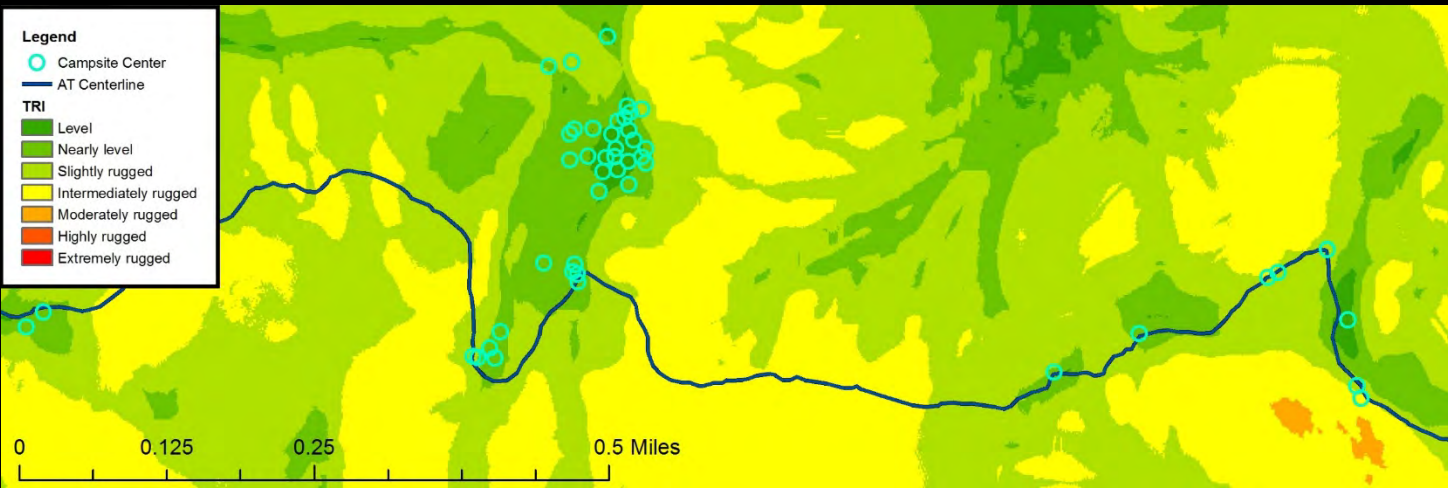


Hawk Mountain

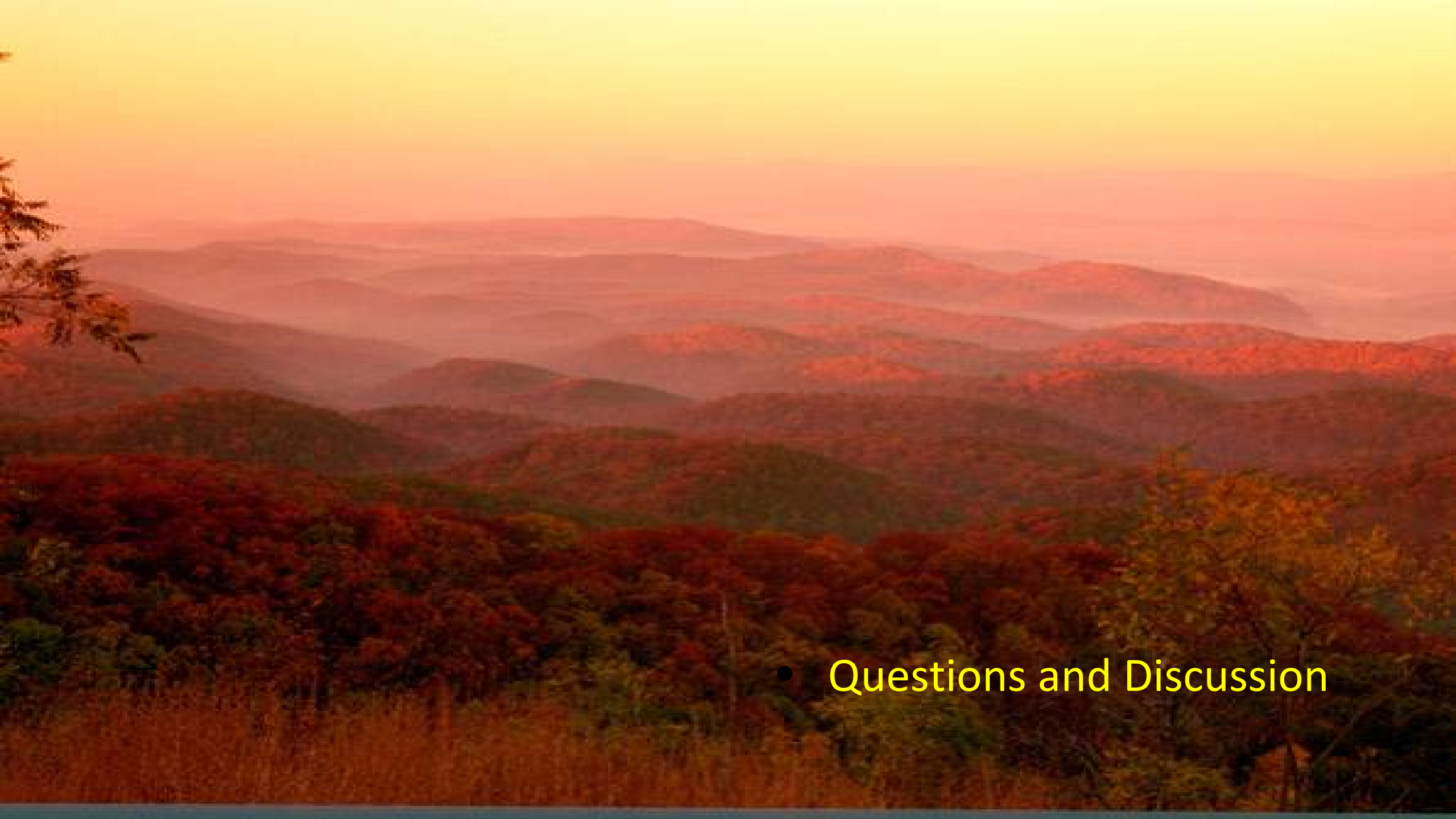
Hillshade Map
(from LiDAR data)



Slope Map



Terrain Ruggedness Map



- Questions and Discussion