# SUSTAINABLE TRAILS

# **ALLEGRA**





















Vipuvoimaa EU:lta 2014–2020

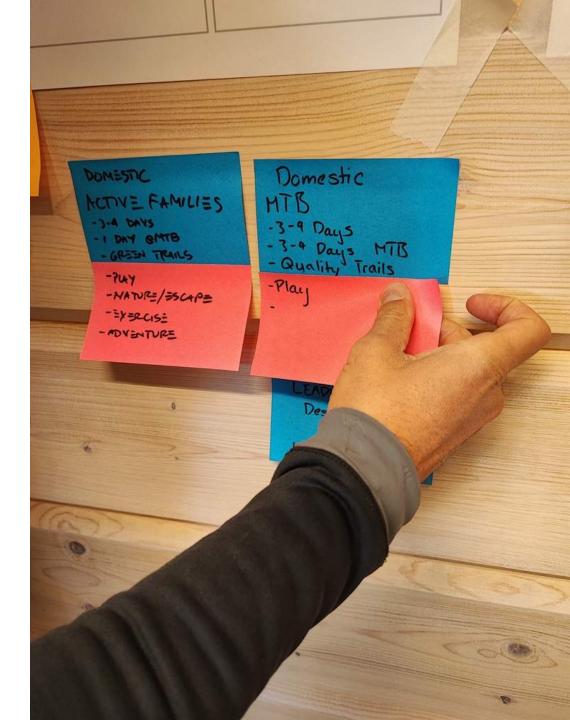


Euroopan unioni Euroopan aluekehitysrahasto



Select graphics and photos courtesy of the International Mountain Bicycling Association, the Bureau of Land Management, and the Bicycle Product Suppliers Association.







#### Today's Schedule

09:00 - 12:00 = Indoor presentation 12:00 - 13:00 = Lunch 13:00 - 16:00 = Get eBikes, field visit

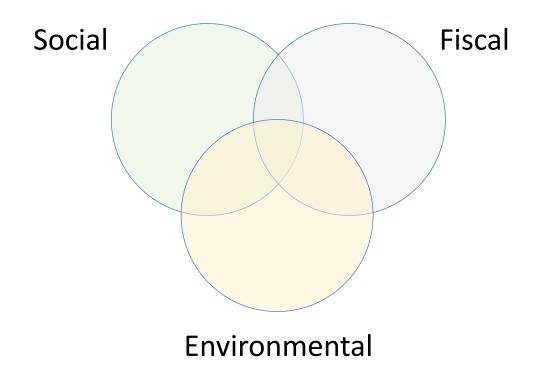


Today's Schedule

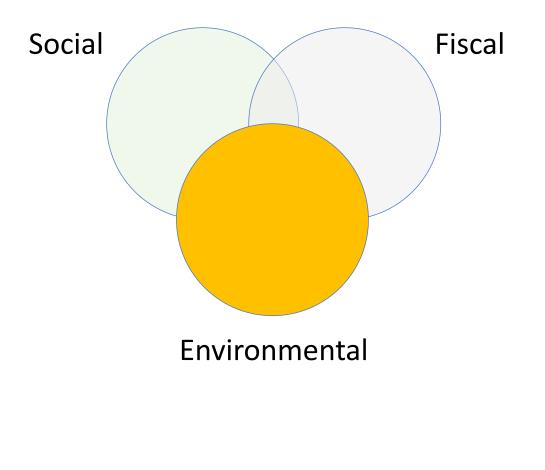
- 09:00 12:00 = Indoor presentation
- Trail sustainability
- User experiences
- Trail design
- Trail construction and maintenance

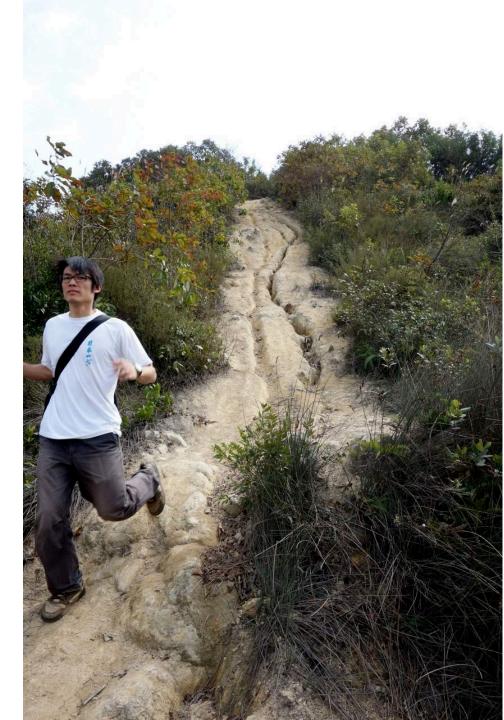


#### SUSTAINABLE TRAILS



#### ENVIRONMENTALLY SUSTAINABLE TRAILS

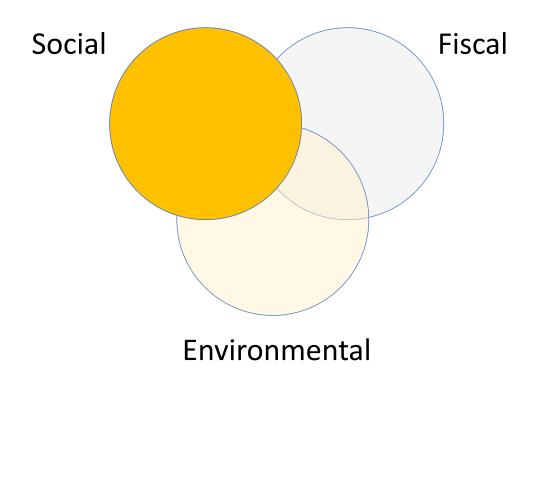




#### ENVIRONMENTALLY SUSTAINABLE TRAILS



#### SOCIALLY SUSTAINABLE TRAILS

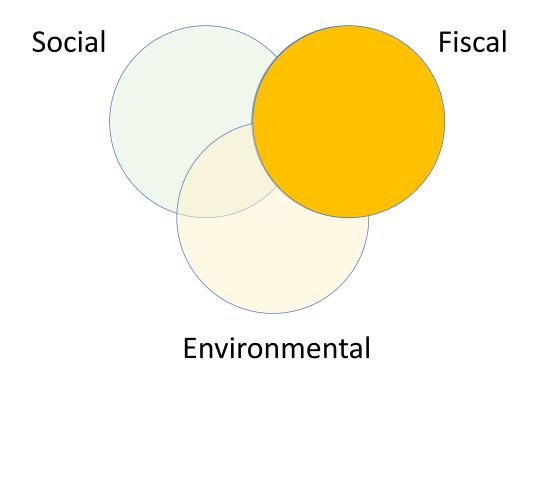




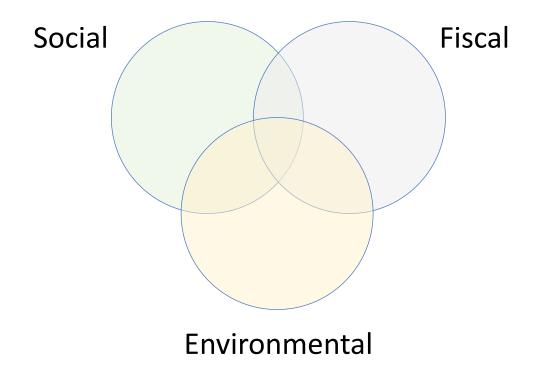
#### SOCIALLY SUSTAINABLE TRAILS

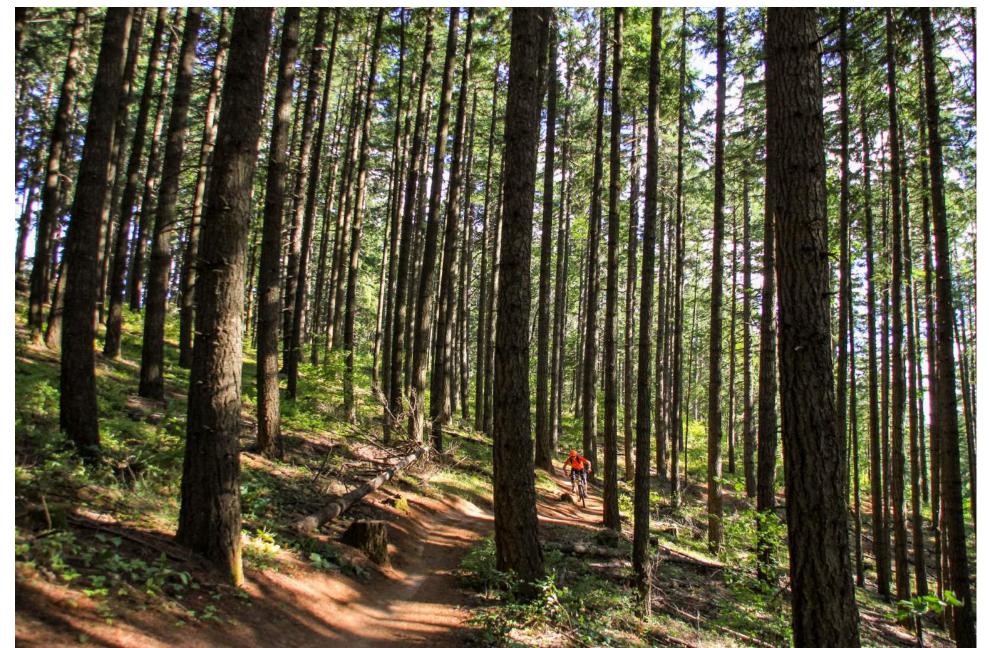


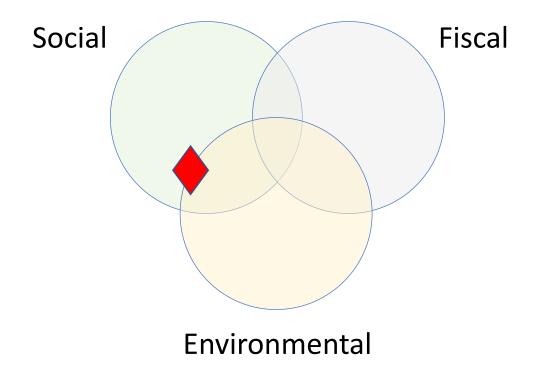
#### FISCALLY SUSTAINABLE TRAILS

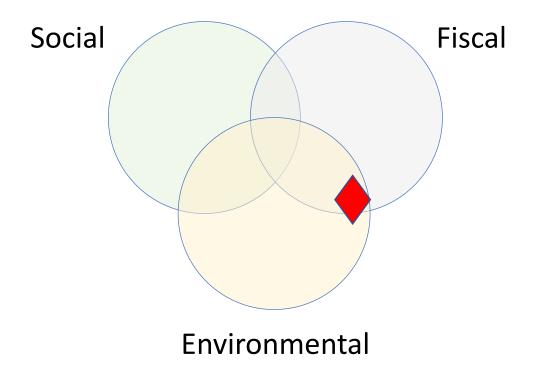


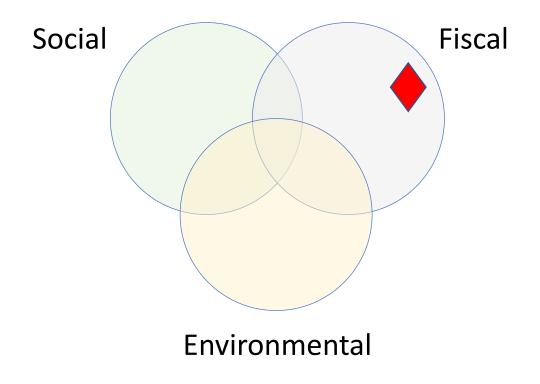


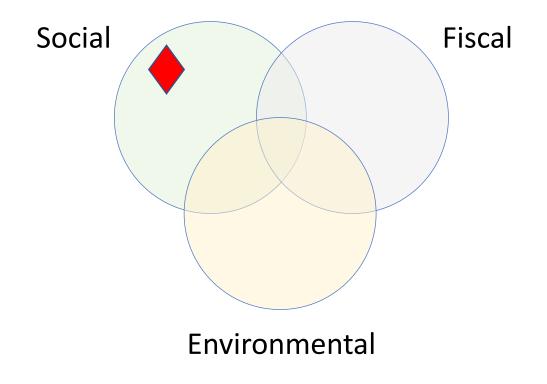


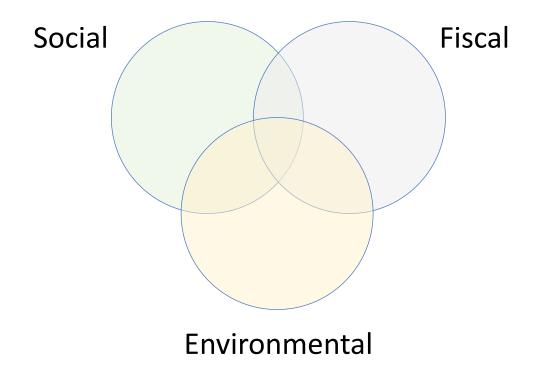




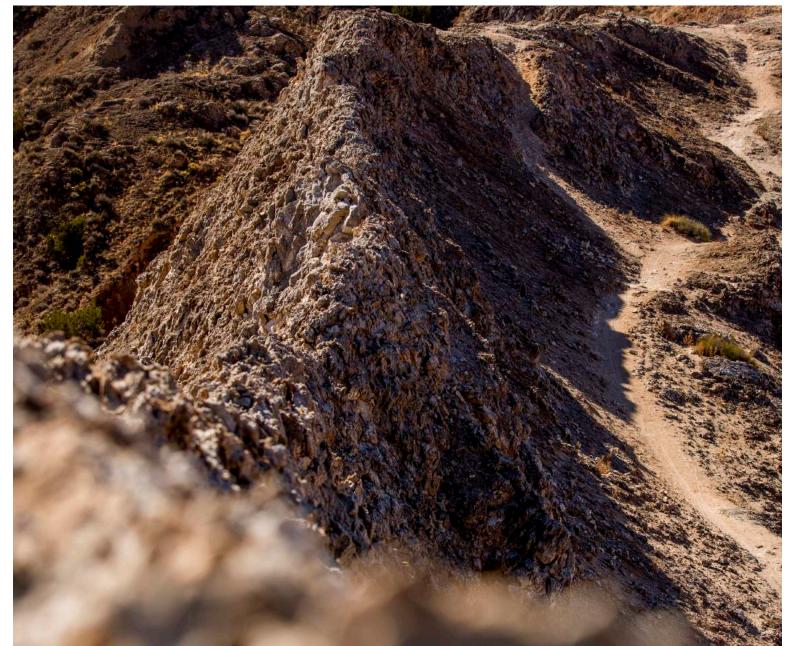








#### WHAT MAKES A SUSTAINABLE TRAIL?



#### SOCIAL SUSTAINABILITY



#### SOCIAL SUSTAINABILITY

People seek experiences on the trail.





# EXERCISE

- Benefits of physical fitness
- Away from cars
- More stimulating to be in nature



## EXERCISE

- Typically going to get more exercise under human power
- Can be a barrier to accessing nature



# NATURE

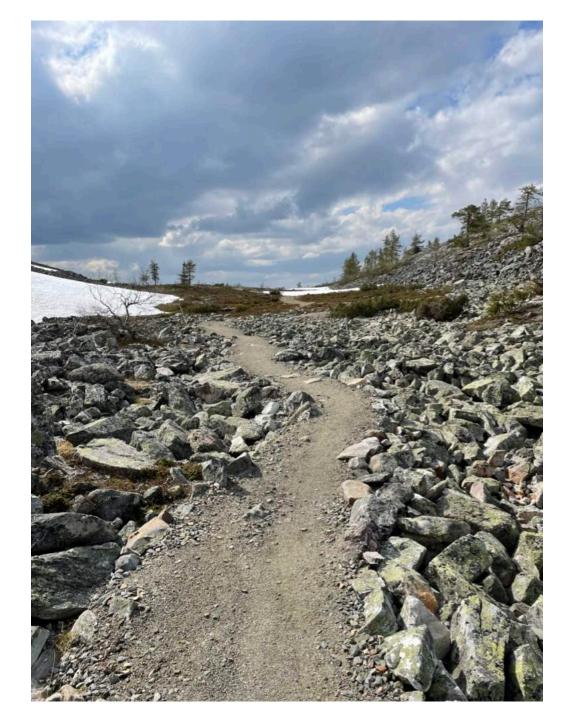
- Getting away from buildings, roads, cars
- Relieves stress



# NATURE

• Singletrack!





## ADVENTURE

- New, different, exciting
- Exploring, discovering
- Just a little stressful





# CHALLENGE

- Technical, not physical (that's exercise)
- Feeling of accomplishment





# CHALLENGE

Many forms



# CHALLENGE

Relative



#### CHALLENGE

#### • Skill rating

Trail Grade	Suitable for	Trail & surface types	Gradients & technical trail features (TTF's)	Suggested fitness level
Forest Road and similar	A wide range of cyclists. Most bikes and hybrids. Ability to use maps helpful. Routes may or may not be way marked.	Relatively flat and wide. The trail surface may be loose, uneven or muddy at times. These roads may be used by vehicles and other users, including Horse riders and dog walkers.	Gradients can be very variable and may include short steep sections. Occasional potholes may be present.	A good standard of fitness can help.
Green Easy	Beginner/novice cyclists. Basic Bike Skills required. Most bikes and hybrids. Some green routes can take trailers.	Relatively flat and wide. The trail surface may be loose, uneven or muddy at times. May include short flowing singletrack style sections.	Climbs and descents are mostly shallow. No challenging features	Suitable for most people in good health.
Blue Moderate	Intermediate cyclist/mountain bikers with basic off road riding skills. Mountain bikes or hybrids.	As "Green" plus specially constructed single track. Trail surface may include small obstacles of roots and rock.	Most gradients are moderate but may include short steep sections. Includes small TTF's	A good standard of fitness can help.
Red Difficult	Proficient mountain bikers with good off road riding skills. Suitable for better quality off-road mountain bikes	Steeper and tougher, mostly singletrack with technical sections. Expect very variable surface types.	A wide range of climbs and descents of a challenging nature will be present. Expect boardwalks, berms, large rocks, medium steps, drop-offs, cambers, iwater crossings	Higher level of fitness and stamina.
Black Severe	Expert mountain bike users, used to physically demanding routes. Quality off-road mountain bikes	As "Red" but with an expectation of greater challenge and continuous difficulty. Can include any useable trail and may include exposed open hill sections.	Expect large, committing and unavoidable TTF's. Sections will be challenging and variable. May also have "downhill" style sections.	Suitable for very active people used to prolonged effort.
Bike Parks Extreme	Riders aspiring to an elite level of technical ability, incorporates everything from Full on downhill riding to big- air jumps.	Severe constructed trails and / or natural features. All sections will be challenging. Includes extreme levels of exposure and or risk. Jumping ability obligatory	Will include a range of small medium and large TTF's, including downhill trails, freeride sections and mandatory jumps.	A good standard of fitness, but technical skills more important.

		ing Syster			
					++
	EASIEST WHITE CIRCLE	EASY GREEN CIRCLE	MORE DIFFICULT BLUE SQUARE	VERY DIFFICULT BLACK DIAMOND	EXTREMELY DIFFICUL DBL. BLACK DIAMONI
RAIL WIDTH	72" (1,800 mm) or more	36" (900 mm) or more	24" (600 mm) or more	12* (300 mm) or more	6" (150 mm) or more
IREAD SURFACE	Hardened or surfaced	Firm and stable	Mostly stable with some variability	Widely variable	Widely variable and unpredictable
AVERAGE TRAIL GRADE	Less than 5%	5% or less	10% or less	15% or less	20% or more
MAXIMUM TRAIL GRADE	Max 10%	Max 15%	Max 15% or greater	Max 15% or greater	Max 15% or greater
NATURAL OBSTACLES AND TECHNICAL TRAIL FEATURES (TTF)	None	Unavoidable obstacles 2" (50 mm) tall or less Avoidable obstacles may be present Unavoidable bridges 36" (900 mm) or wider	Unavoidable obstacles 8" (200 mm) tall or less Avoidable obstacles may be present Unavoidable bridges 24" (600 mm) or wider TTF's 24" (600 mm) high or less, width of deck is greater than 1/2 the height	Unavoidable obstacles 15" (380 mm) tall or less Avoidable obstacles may be present May include loose rocks Unavoidable bridges 24" (600 mm) or wider TTF's 48" (1,200 mm) high or less, width of deck is less than 1/2 the height Short sections may exceed criteria	Unavoidable obstacles 15" (380 mm) tall or less Avoidable obstacles may be present May include loose rocks Unavoidable bridges 24" (600 mm) or narrower TTF's 48" (1,200 mm) high or greater, width of deck is unpredictable Many sections may exceed criteria

#### PLAY

- Child-like pursuit of joy
- Enjoying the journey, not just seeking a destination



## PLAY

• Doesn't mix well with other users



#### EXERCISE

# What do you think is the primary experience for each of the following activities?

- Play
   Nature
- Exercise

- Challenge
- Adventure

#### Photo #1



#### Photo #2



### Photo #3



#### Photo #4



• Should compliment experiences



• Nature and development 😕



• *Play* and steep terrain 😕



• Challenge and flat terrain 😕



• Challenge and steep terrain 😊





• *Play* and flat terrain 😊



• *Play* or *Challenge* and development 😊



#### EXERCISE

# What do you think are good experiences for the following landscapes? Why?

#### EXERCISE

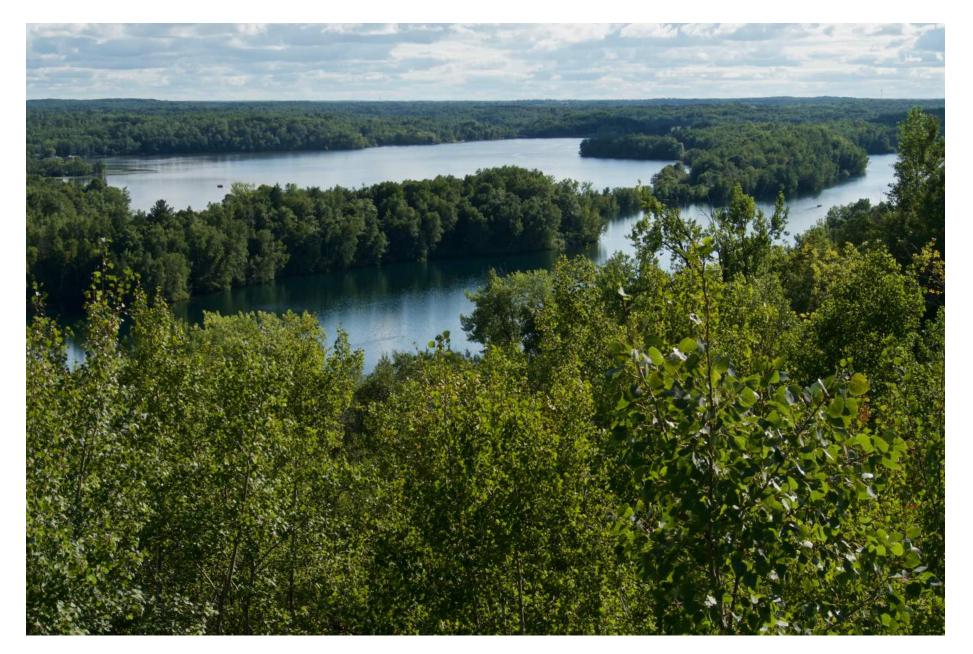
# What do you think are good experiences for the following landscapes? Why?











#### ENVIRONMENTAL SUSTAINABILITY



### ENVIRONMENTAL SUSTAINABILITY

#### EROSION

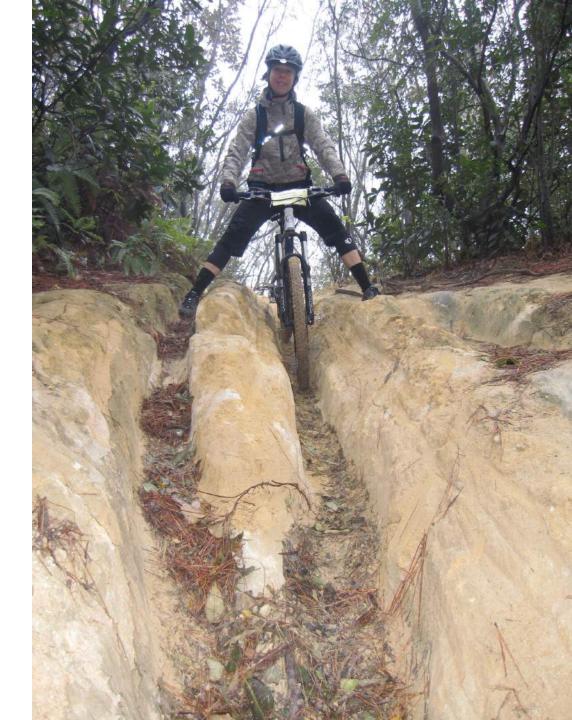
• Process by which wind, water, and users move soil



### ENVIRONMENTAL SUSTAINABILITY

# EROSION

• Process by which wind, water, and users move soil



• First step against erosion



• Rolling contour alignment



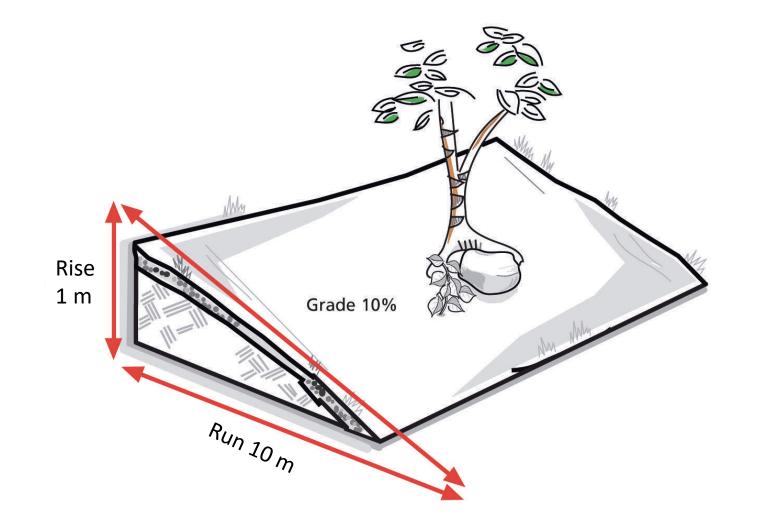
• Rolling contour alignment 🤓



• Fall-line alignment 🥪



• Contour versus fall-line alignment



Inclinometer ("clino")

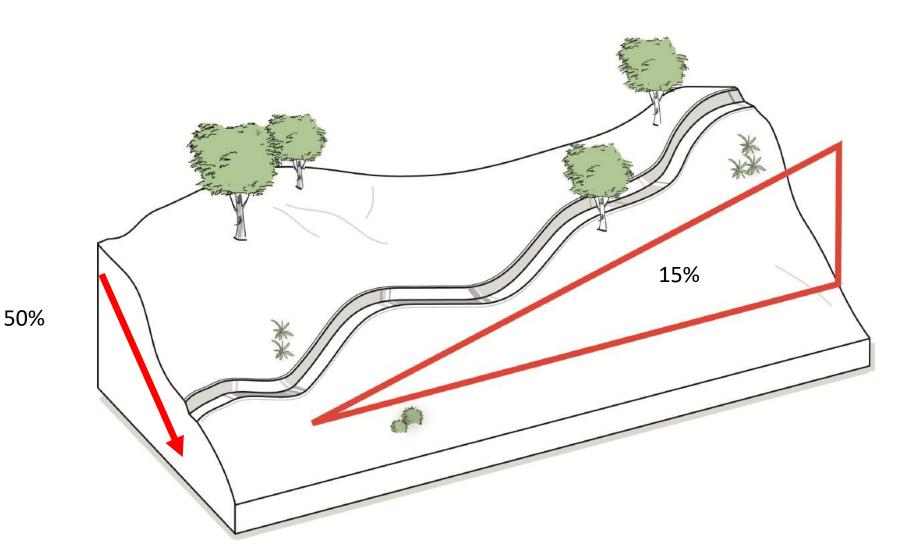


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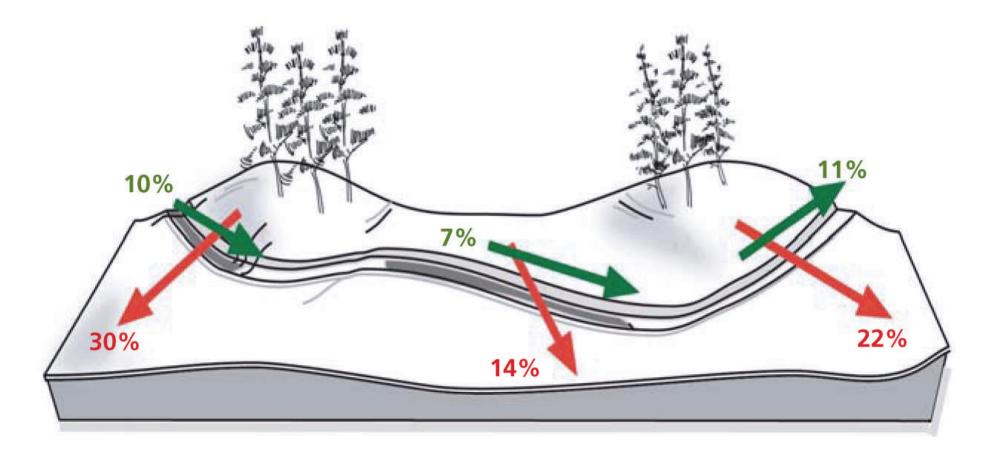


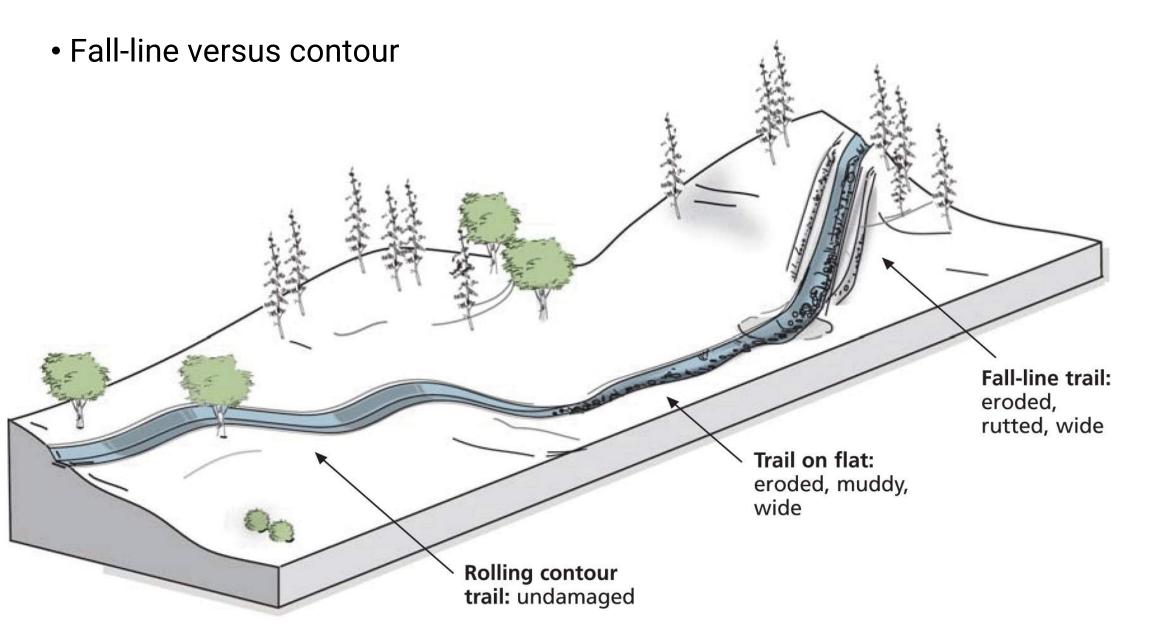
• The "Half Rule"



50% / 2 = 25% 15% < 25% = 😊

• The "Half Rule"





### • Fall-line versus contour





#### Fall-line versus contour

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	Journal of Environmental Management	Environmental Managranent
ELSEVIER	journal homepage: www.elsevier.com/locate/jenvman	- 16 M

Assessing the influence of sustainable trail design and maintenance on (E) CrossMark soil loss

Jeffrey L. Marion<sup>a,\*</sup>, Jeremy Wimpey<sup>b</sup>

<sup>a</sup> U.S. Geological Survey, Virginia Tech, 310 W. Campus Dr., 304f Cheatham, Blacksburg, VA 24061, USA b Jeremy Wimpey, Applied Trails Research, State College, PA 16803, USA

#### ARTICLE INFO

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Keywords: Recreation impact Trail impact Trail erosion Sustainable trail design Trail maintenance

#### ABSTRACT

Natural-surfaced trail systems are an important infrastructure component providing a means for accessing remote protected natural area destinations. The condition and usability of trails is a critical concern of land managers charged with providing recreational access while preserving natural conditions, and to visitors seeking high quality recreational opportunities and experiences. While an adequate number of trail management publications provide prescriptive guidance for designing, constructing, and maintaining natural-surfaced trails, surprisingly little research has been directed at providing a scientific basis for this guidance. Results from a review of the literature and three scientific studies are presented to model and clarify the influence of factors that substantially influence trail soil loss and that can be manipulated by trail professionals to sustain high traffic while minimizing soil loss over time. Key factors include trail grade, slope alignment angle, tread drainage features, and the amount of rock in tread substrates. A new Trail Sustainability Rating is developed and offered as a tool for evaluating or improving the sustainability of existing or new trails.

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• Maximum sustainable grade

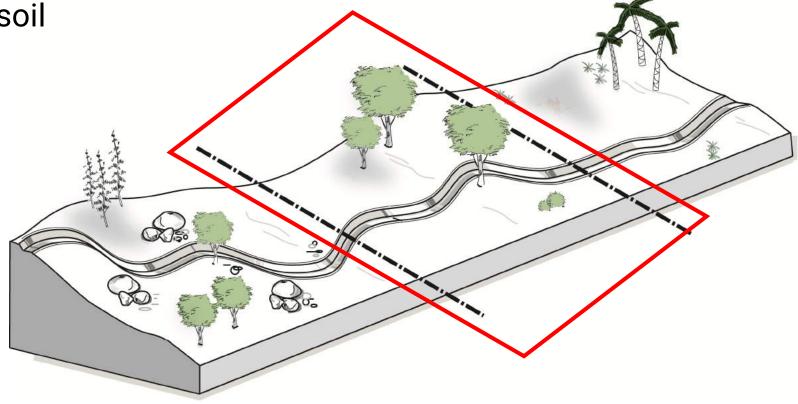


- Maximum sustainable grade
- Clay-based soil with rock

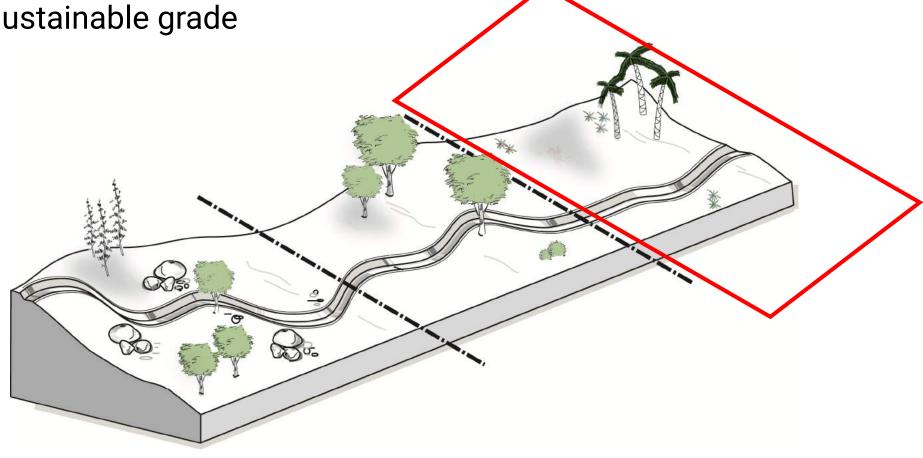
- Maximum sustainable grade
- Clay-based soil



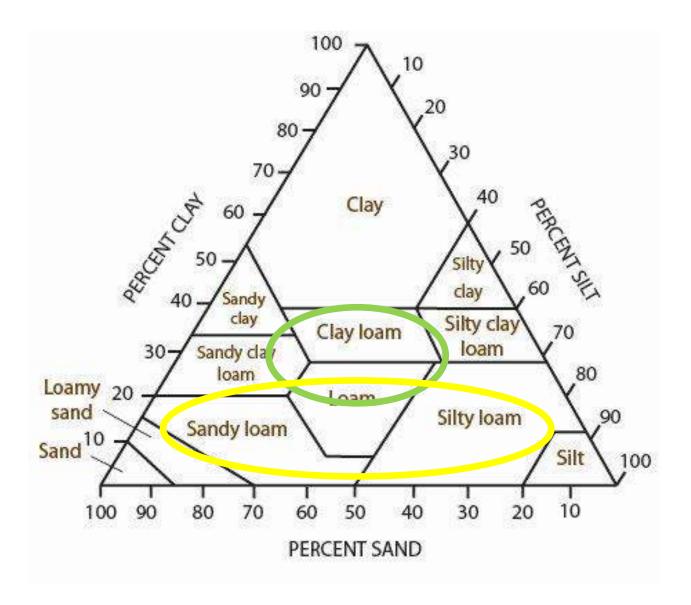
- Maximum sustainable grade
- Silty-sandy soil



- Maximum sustainable grade
- Sandy soils



Ideal soil type for trails
Local soils



• Field soil test



- Terrain grade of 50%
- Soils are a mix of sand and silt
- What is the ideal maximum grade of the trail?



• The Half Rule: 50% terrain grade / 2 = 25%

- The Half Rule: 50% terrain grade / 2 = 25%
- Maximum Sustainable Grade: silty/sandy soils = 10%

- The Half Rule: 50% terrain grade / 2 = 25%
- Maximum Sustainable Grade: silty/sandy soils = 10%
- Answer = 10% to minimize water and user-based erosion

- Terrain grade of 20%
- Soils are a mix of clay, sand, and silt
- What is the ideal maximum grade of the trail?



• The Half Rule: 20% terrain grade / 2 = 10%

- The Half Rule: 20% terrain grade / 2 = 10%
- Maximum Sustainable Grade: clay/silty/sandy soils = 20%

- The Half Rule: 20% terrain grade / 2 = 10%
- Maximum Sustainable Grade: clay/silty/sandy soils = 20%
- Answer = 10% to minimize water and user-based erosion

## SUSTAINABLE ALIGNMENTS – TRICK QUESTION

- Terrain grade of 16%
- Soils are a mix of rock, sand, and silt
- What is the maximum grade of the trail?



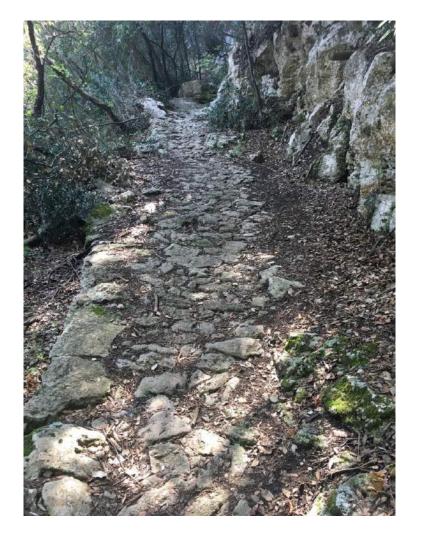
• The Half Rule: 16% terrain grade / 2 = 8%

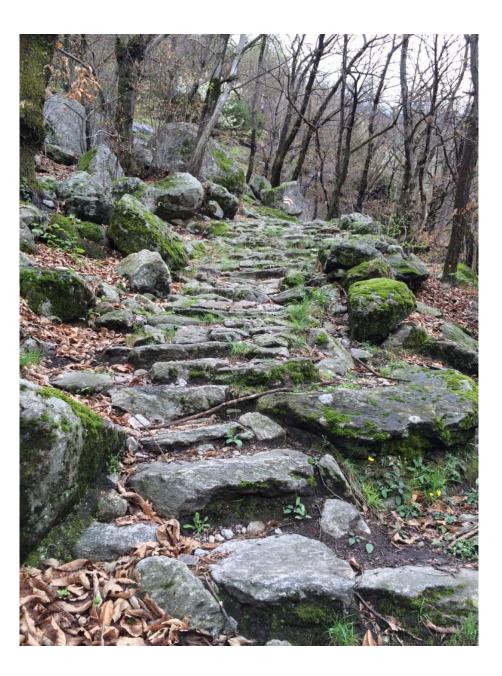
- The Half Rule: 16% terrain grade / 2 = 8%
- Maximum Sustainable Grade: rock = UNLIMITED

- The Half Rule: 16% terrain grade / 2 = 8%
- Maximum Sustainable Grade: rock = UNLIMITED
- Answer = as steep as the users can hike/bike!

## **BREAKING THE RULES - STEEP**

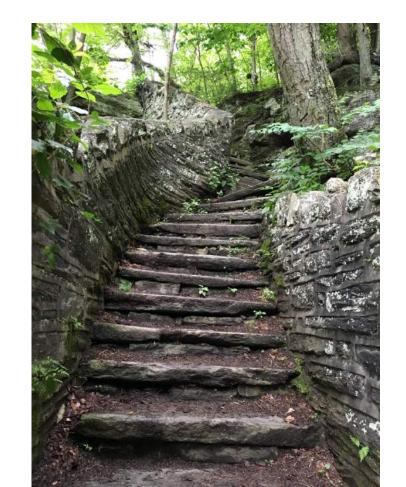
Rock armoring





# BREAKING THE RULES - STEEP

• Durable but expensive





## BREAKING THE RULES - STEEP

• Blocks





## BREAKING THE RULES - STEEP

• Import



# BREAKING THE RULES - STEEP

• Must have binder material

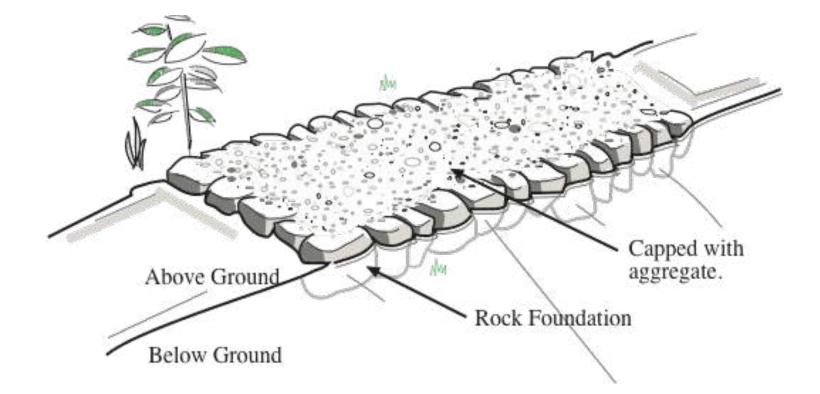


## BREAKING THE RULES - FLAT



# **BREAKING THE RULES - FLAT**

• Raised tread (import)





SUSTAINABLE ALIGNMENTS BREAKING THE RULES - FLAT

• Raised tread (import)



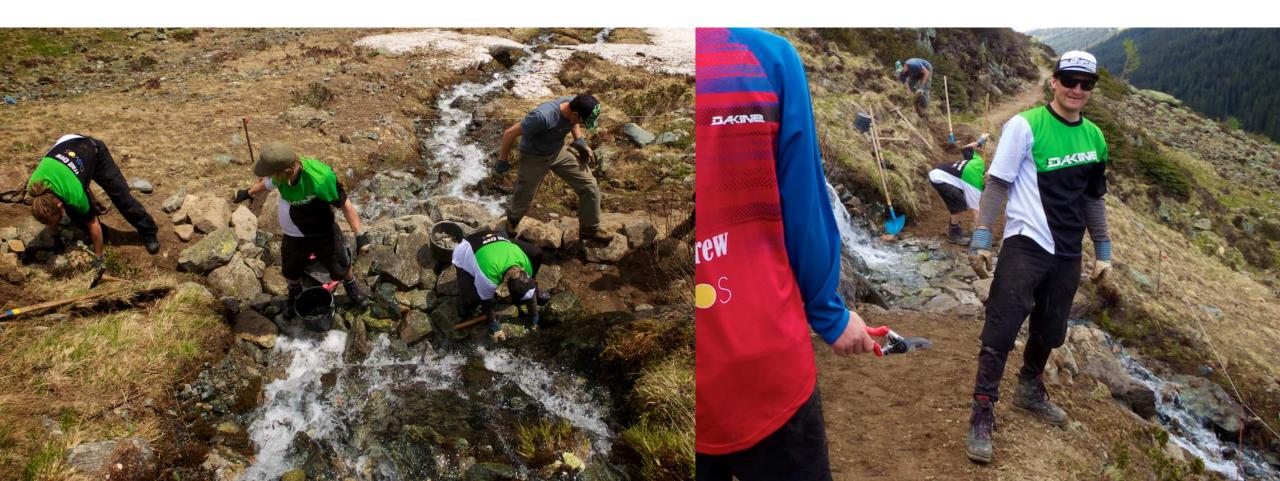
# BREAKING THE RULES - FLAT

• Armoring



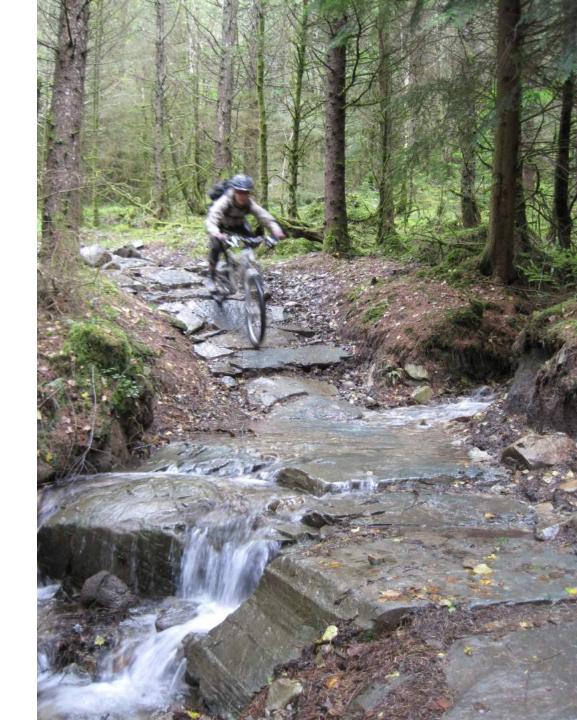
## **BREAKING THE RULES - FLAT**

• Armoring



## BREAKING THE RULES - FLAT

• Armoring



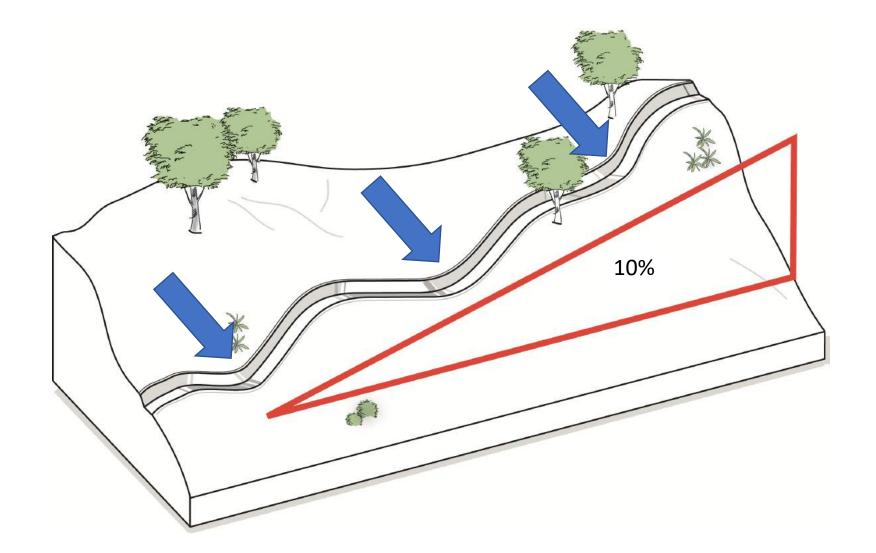
**BREAKING THE RULES - DISCUSSION** 

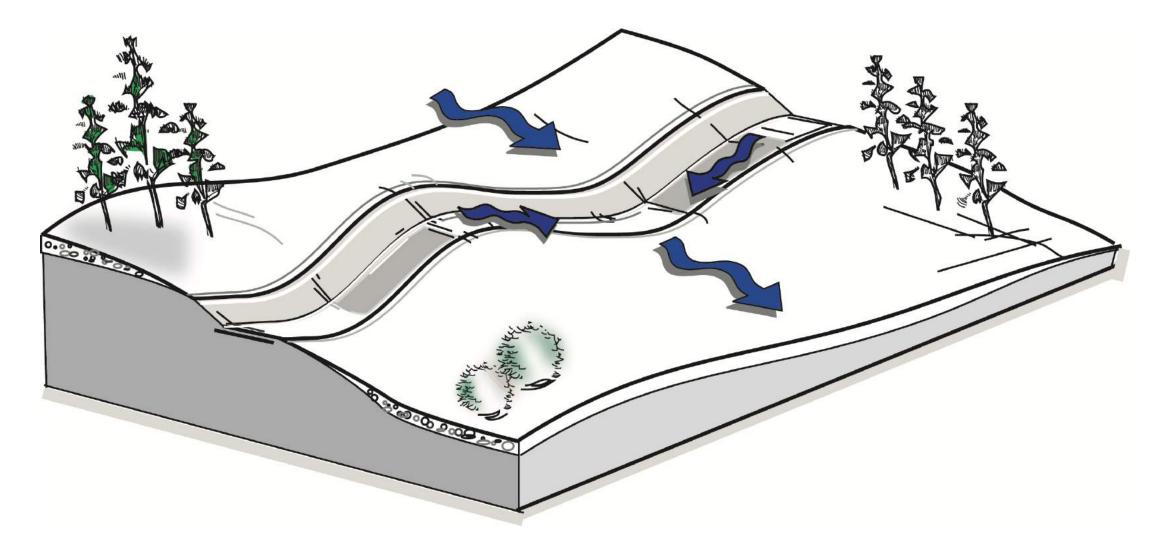


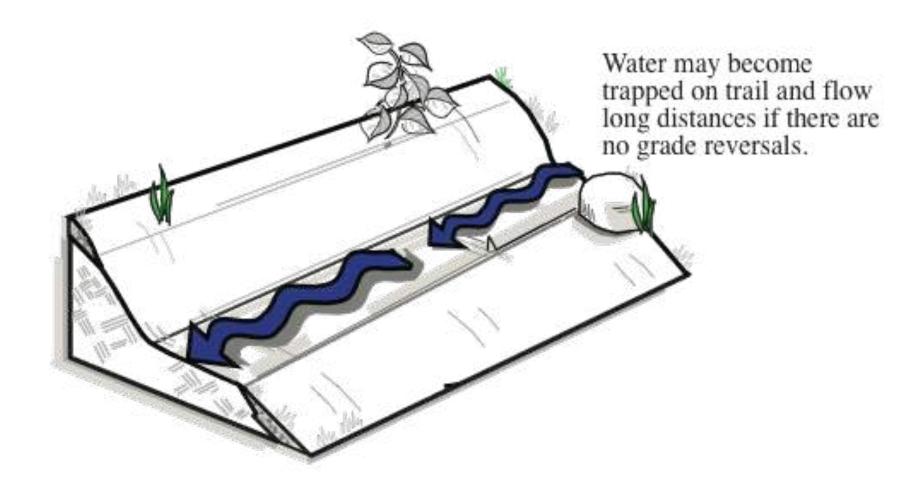












- Every couple meters
- Water can't flow down the trail

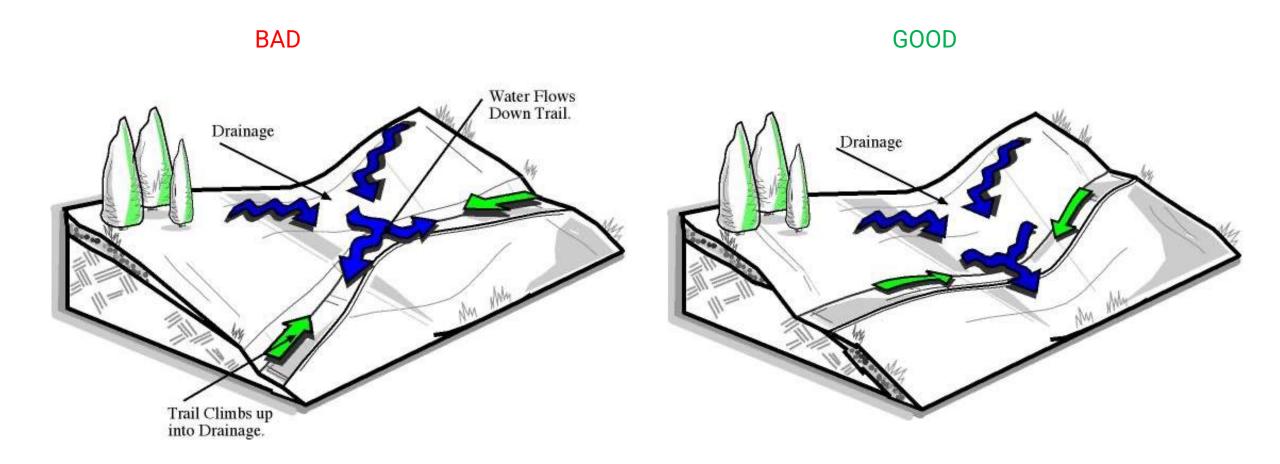


## GRADE REVERSALS

• Feels more natural



• Drainage crossings



# SUSTAINABLE ALIGNMENTS

# FIELD DESIGN

- Apply rules
- Use clino and flags







#### QUESTIONS? COMMENTS?

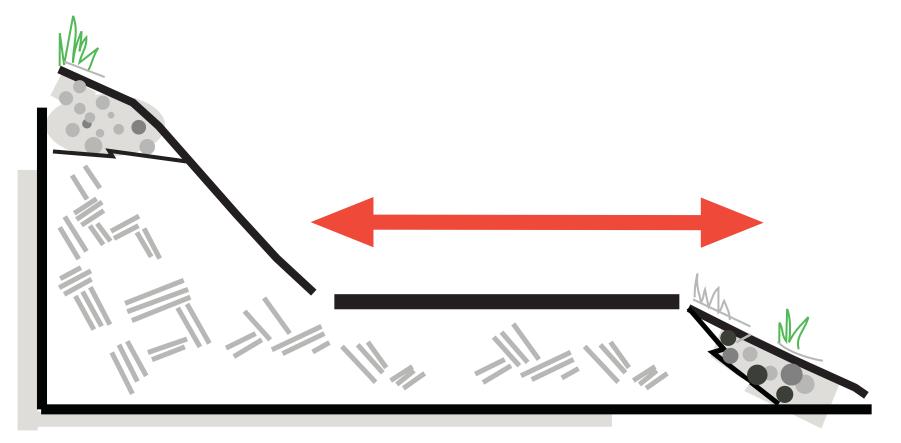


- Different but shared techniques
- Emphasis on maintenance
- Reroutes are maintenance but look like construction



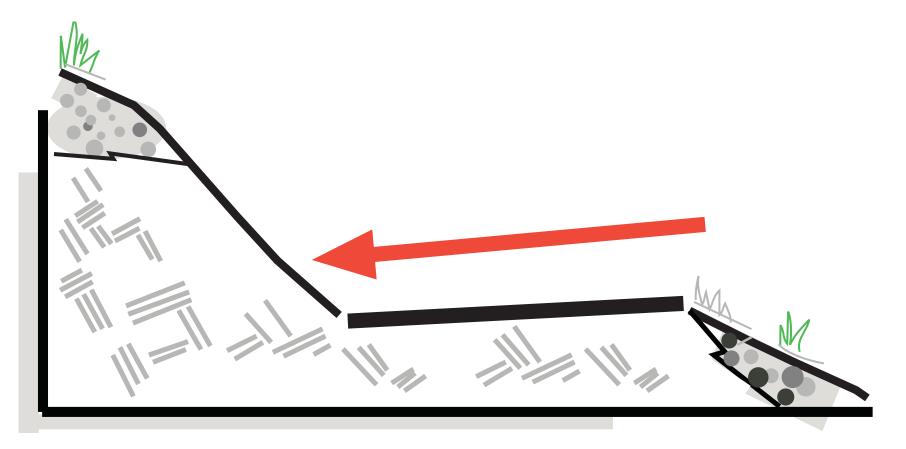
TREAD SHAPE

• Flat



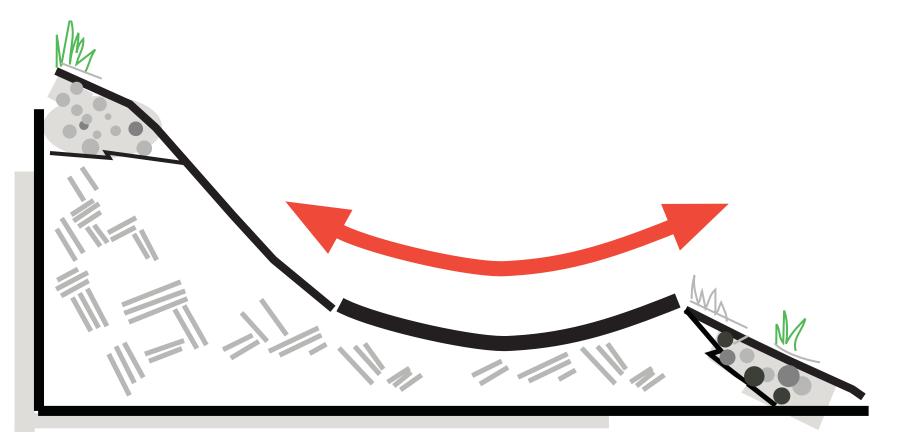
TREAD SHAPE

• Insloped



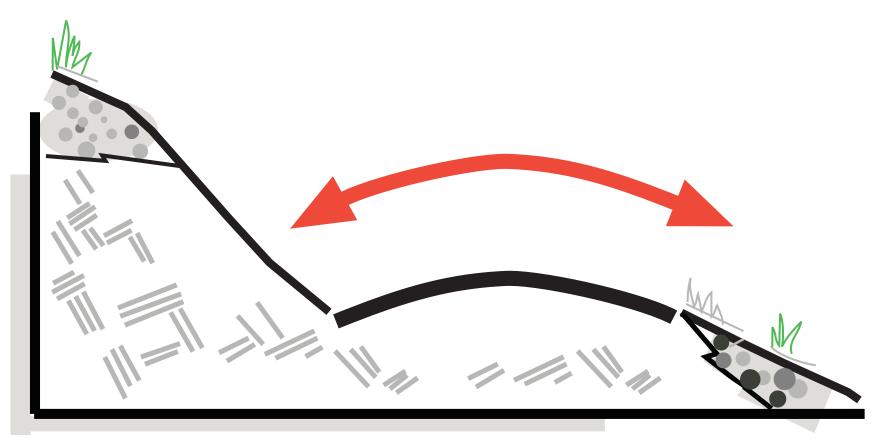
TREAD SHAPE

• Cupped



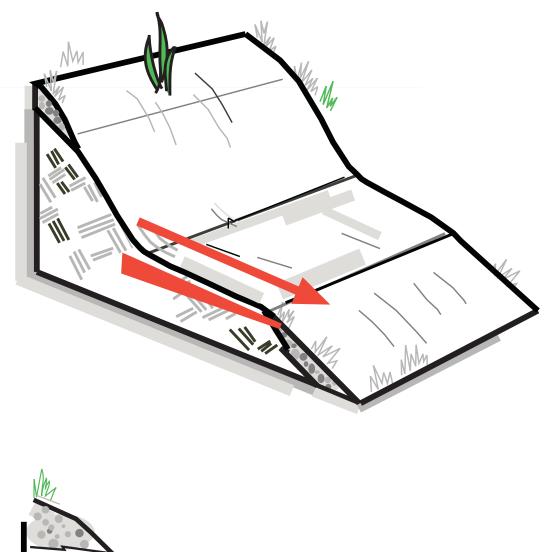
TREAD SHAPE

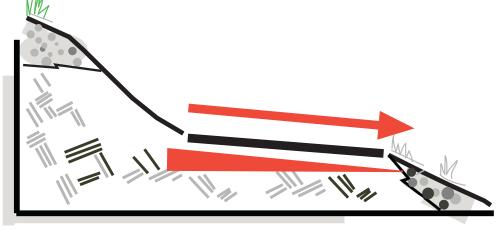
• Crowned



TREAD SHAPE

• Outsloped





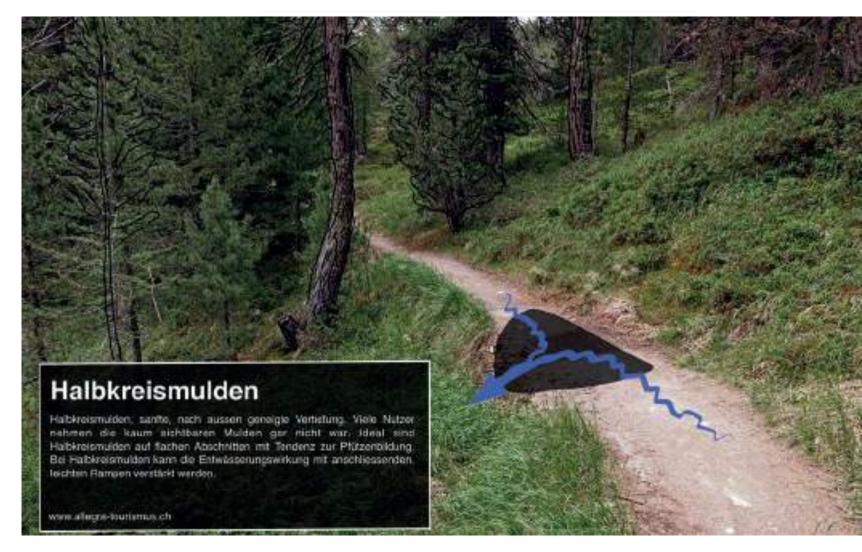
# TREAD SHAPE

• Outsloped = sheet flow



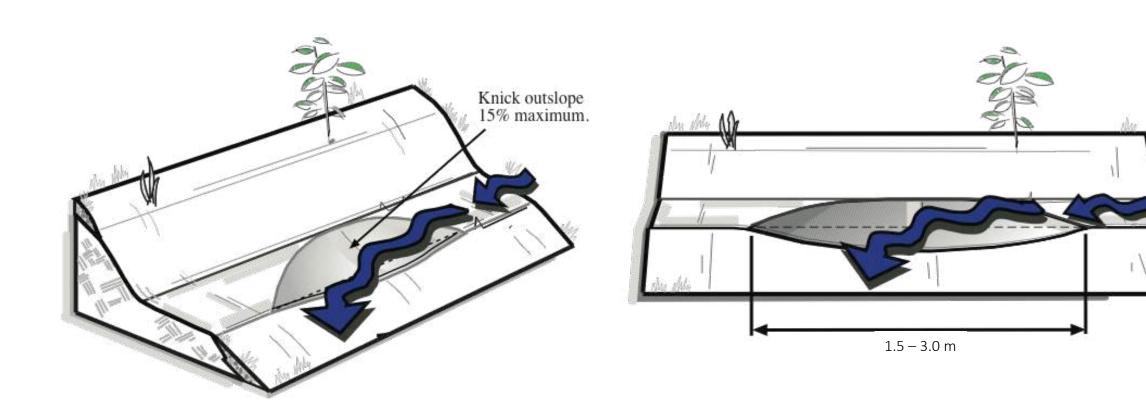
# "KNICK"

- Drain trails
- Mimic grade reversal



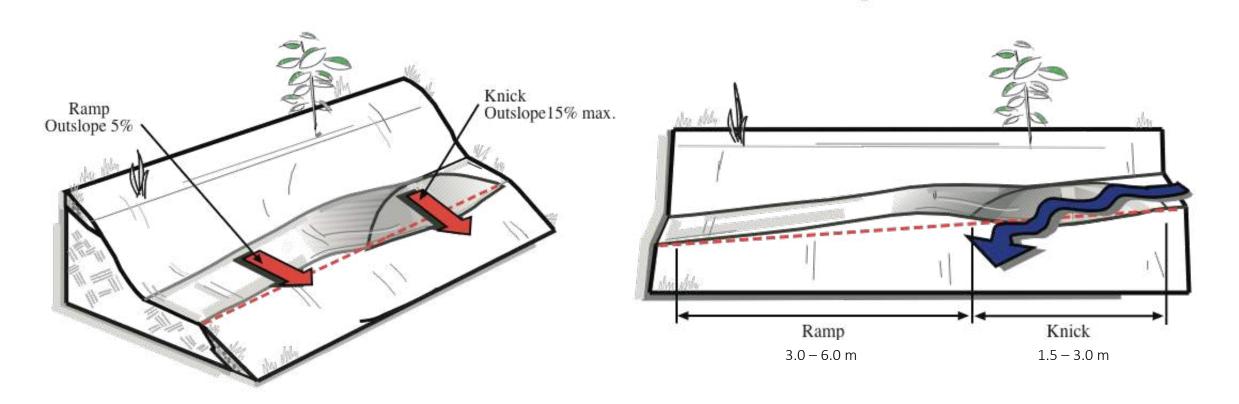
# "KNICK"

• Drain trails



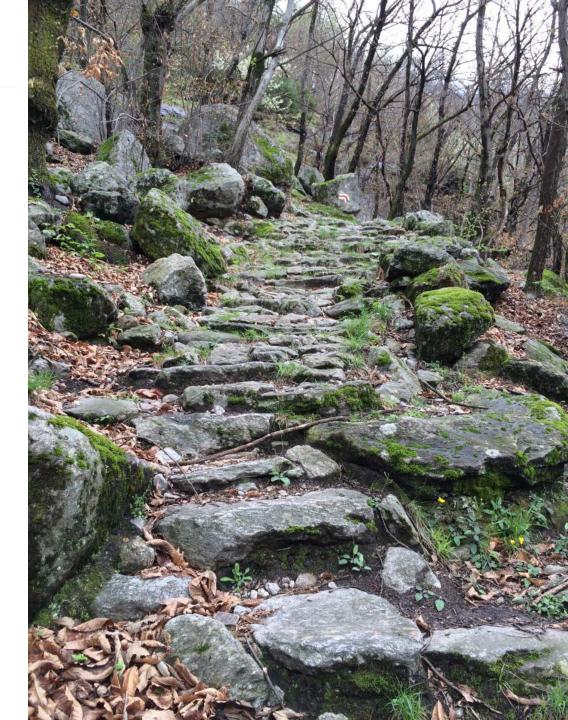
# "ROLLING GRADE DIP"

• Drain steeper trails

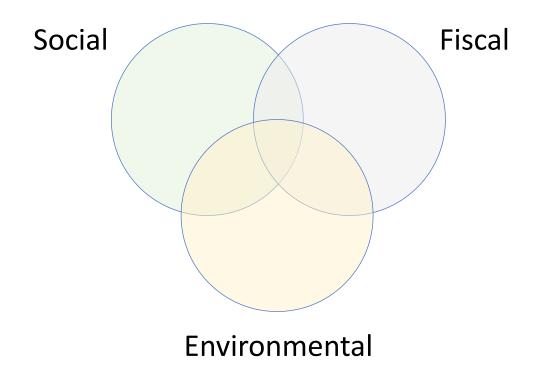


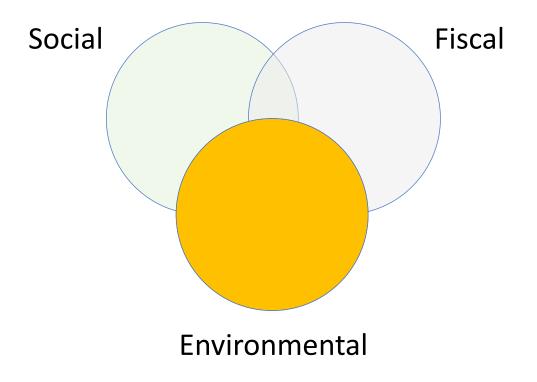
# ADVANCED TECHNIQUES

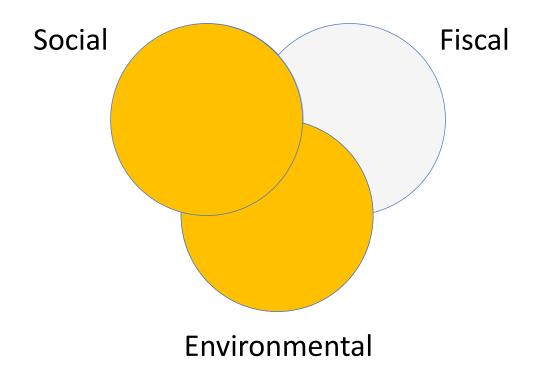
- Raised tread
- Import material
- Armoring
- Reroutes

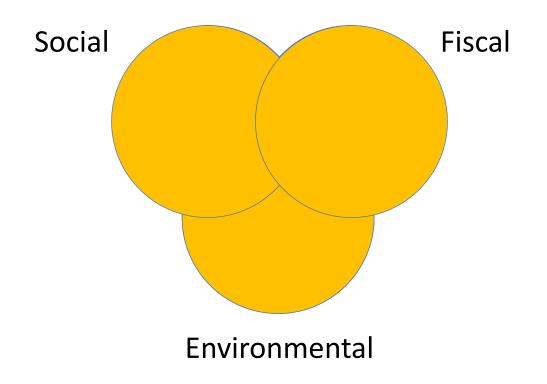












#### QUESTIONS? COMMENTS?





# PROBLEMS

• Speed differential



# PROBLEMS

• Hiking abreast



# SOLUTIONS - PHYSICAL

• Singletrack



# SOLUTIONS - PHYSICAL

• Pinch points/chokes



# SOLUTIONS - PHYSICAL

• Texture



SOLUTIONS - PHYSICAL

• Texture



# SOLUTIONS - PHYSICAL

• Texture



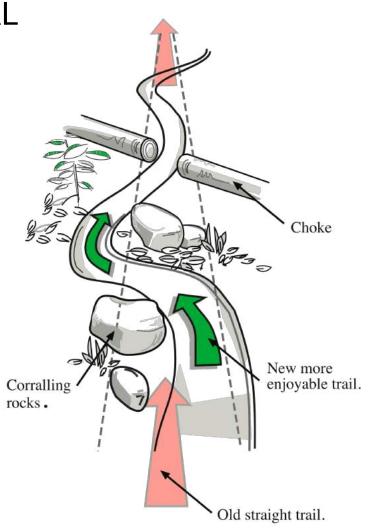
# SOLUTIONS - PHYSICAL



# SOLUTIONS - PHYSICAL



# SOLUTIONS - PHYSICAL





# SOLUTIONS - PHYSICAL



# SOLUTIONS - PHYSICAL



# SOLUTIONS - PHYSICAL

• Sightlines



SOLUTIONS - PHYSICAL

• Sightlines



# SOLUTIONS - PHYSICAL

• Separation with the trail corridor



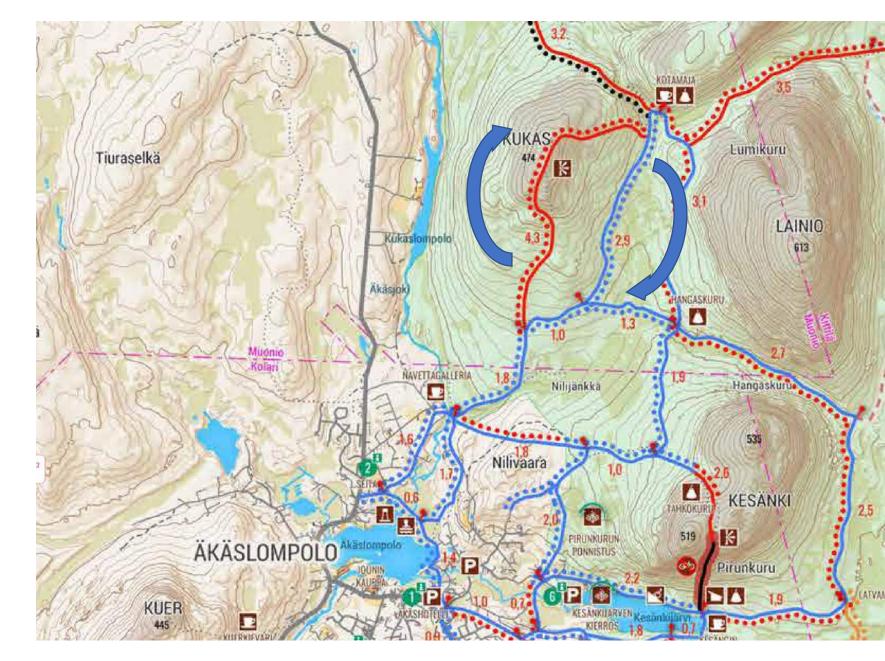
# SOLUTIONS - PHYSICAL

• Directionality



SOLUTIONS - PHYSICAL

• Directionality



# SOLUTIONS - PHYSICAL

• Single-use



SOLUTIONS – PROGRAMMATIC

• Education @ Trails

Trail Ma	考 Valley Foot Path	😑 Ted's Traverse
And an	And the second of the second o	Umit, it's preat for muchos verificatios, es hose new to nding genal para quienes cue, ne tuyel che
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SOLUTIONS – PROGRAMMATIC

• Education @ Trails



# SOLUTIONS - PROGRAMMATIC

• Education @ websites

### Retkeilyn ABC - retkeilijän vinkit

Oletpa aloitteleva retkeilijä tai kokenut eränkävijä, saat näiltä sivuilta monenlaisia vinkkejä retkeilyyn. Kun retkeilytaidot karttuvat, retkeilystä tulee turvallisempaa ja retkistä nauttii enemmän.







#### RETKIETIKETTI

Kunnioita luontoa.
 Suosi merkittyjä reittejä.
 Leiriydy vain sallituille paikoille.
 Tee tulet vain sallituille paikoille.
 Älä roskaa.

## ENSIMMÄINEN YÖN YLI RETKI

harrastus luonnossa.

Aloita haaveilulla, suunnittele hyvin ja toteuta, kun olet valmis.

ENSIMMÄINEN VAELLUS









onnistuu Ylläksellä.

MAJOITUS AKTIVITEETIT HIIHTOKESKUS PALVELUT TAPAHTUMAT INFO

retkeilyä, melontaa, kalastusta, moottorikelkkailua, porot, huskyt ja koiravaljakot... mitä tahansa haluatkin harrastaa, se

LASTEN KA Screenshot ELLE

M Tilaa uutiskirje

Laskettelu

i Matka

enshot ELLE

VENEILYETIKETTI

KOIRAN KANSSA RETKELLE



# SOLUTIONS – PROGRAMMATIC

Education @ brochures/maps

### Suositellut reitit

Varkaankurun polku 3km

PAL

### **Retkeily** Hiking Äkäslompolo

RKEANKUR 1

# Recommended Trails

Ylläsjärven kyläkierros 3km

of for whole french intro

The

CAFE RASILA

P 🛓 🕨

Koko perheen reitti esittelee Ylläsiärven kylää

#### Retkeily Hiking Ylläsjärui

Kesänkijärven kierros 6 km Helppo koko perheen reitti laskeutuu vehreän kurun Enimmäkseen tasainen koko nerheen reitti kaunissa issa. Kodalle astivaativa esteetön tunturiiarvimaise Visit the lush green garge with whole family on a easy reitti. Mostly flat trail for whole family in beautiful lake fell landscape. Anst part to Day Trip Hut is demading accessible trail. 518 13

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#### Maastopyöräily Mountain Biking 50

Vinkit maastapyöräilyyn: - Ylläksellä rinteisiin kesälläkini Ylläs Bike Parkissa noustaan hissillä ja lasketaan maastopyörällä. Eritasoisia reittejä erittäin helposti alkaen. Tule kokeilemaanl Inaatooyo ata, Ernadosa reskip erintain reportu aisaet, nde nooetennaan Vuokraamo ja opetusta – www.jlaa.f/bkepark Ylläsätyven Pump Traek sopii pyörälytaitojen harjoitteluun. Aina auki, vapaa pääsy Maastopyöräilyt olmilikkarata on Karilan Navettagallerian pihassa (Åläslompoloj. Vapaa pääsy

Kukastunturin polkaisu 21 km Kaulavaaran kiritys 16 km Pytraile tunturin huipulle ihailemaan maisemia

Hienoimmat reitit vauhdikkaas

ne

#### Matkailuinfo auttaa kaikissa kysymyksissä

Tourist information helps with all question

info@yllas.fi +358 40 550 2424

Seuraa ja tägää

### **Reittimerkit** Trail Signs

Suositeltu kävelyreitti Recommended walking trail

Suositeltu maastopyöräilyreitti Suositeltu maastopyöräilyreitti Recommended mountain biking trail

Pyöräity on sallittu virallisilla merkityillä kesäreiteillä, mutta ne volvat olla vaativla. Pyöräity merkittyjen reittien ukopuolela on kielletty.

Ż Cycling is permitted on official marked summer trails, but these may be demanding Cycling outside of the marked trails is prohibited.

Keskisenlaen kierros 11 km Totovaaran tunturireitti 13km Moninuolinen reitti tunturissa Vebrea Tuomilauru Framainen & akenustunturi avotunturia ja rakkainen Kellostapulinkuru. Voried truit in Yllöstunturi Fell: Lush Tuomikuru Gorge hiking abave the treeline and rocky Kellostapylinky



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### Melonta Paddli

Jo ennestaan kaunis maisema nayttaytyy viela hienompana heijastuessaan irkkaasta järvenpinnasta.

Kesä-heinäkuussa yöttömän yön retkelle voi lähteä vaikka puoliltaöin. Nuku rauhassa aamulla ja ota päiväunetkin. Revontulet loimottavat taivaalla pimeään aikaan elokuun lopulta aikaen. Suuntaa aukealle paikalle ja

Vuoleraamo 200 m rannasta: Tunturiflow - sup-laudat, kajakit, packraftit Rental 200 m from the lake: Tunturiflow - sup-boards, kauaks, packrafts

Kesänkilärvi Lake Soutuveneiden vuokraus: Sport Corner Yilas Rowing boat rental: Sport Carner Yild

#### Vinkkil Kyyti Yllästunturin huipulle Tipl Reach the Yllästunturi peak

käy kevyesti gondolilla Huipulta aukeaa laaja erämainen tunturimaisema. Poikkea kahvilassa ja kulje lyhyt Ylläksen historiapolku (vaativa esteetön reitt). Matka alas käy jalan tai ondolilla. Gondoli avoinna joka päivä kio 10-17

From the highest top you see usit wilderness to all directions. Visit cafe and take a short Yila's History Trail (demanding accessible trail). Hike down or return with the gandala. Gandala is open every day 10am to 5pm 18.6.-2.10.2022

#### Hätätilanteessa

Hoidettu talvipolku kävelyyn Luontopolku: reitillä opastustauluja Maintained winter trail for walking Merkitty lumikenkäilyreitti Marked snowshoeing trail Hoidettu talvipolku pyöräilyyn Maintained winter trail for cycling

Reitin kokonaispituus Total trail length (km) Etäisyys määränpäähän Distance to destination (km)

Kaikki reitit, kuvat ja Sää, sääkamerat, lisätiedot

revontuliennuste www.yllas.fi/reitit www.yllas.fi/saa

All traits, pictures and more uww.yllas.fi/traits Weather forecast, weather camers and Northern Lights www.yllas.fi/weather

Aukioloajat

www.yllas.fi/aukioloajat

Retkietiketti Kunnioita luonto Kunsiona luontoa Suosi merkittyjä reittejä Leityky vain sallituilla paikoille Tee tulet vain sallituille paikoille Älä roskaa

Outdoor Etiquette Respect nature Use marked trails only Camp only where it's allowed ight your campfire only where it is allowed Do not littler

Opening hours yllas.fi/today

Follow and tag

@visitvllas

# een aloon

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Ylläs-Levi maastopyöräily 50 km Monipuolinen kisareitti tunturien valilla. Varied MTB competition route between

Vilasian

käännä katse taivaalle.

Melontaumkit

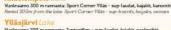
Gorg

vesilta noolo Lak

Dadding Tips In June-July it is bright 24/7 as the Midnight Sun shines all the time. No harry in the morning, nor the in evening! Start your trips at midnight

Beautiful fell landscape becomes even better when seen double - reflected from a still lake.

In late August night spart of the august and so will the Northern Lights dances in the sky again. Head to open place and look to the sky. In September colors of the Autumn makes landscape utuid yellow-orange-red. Try padding in these colors!





Ips for Mountain Biking: Enjoy the Yillis slopes in the summer, tool In Bike Park lift takes you up and you

ride down with a mountain bike. Routes in all difficulties starting from very easy.

Ylläsjärvi Pump Track is great for practice. Always open, free entry Easy mountain killing skill obstaales can be found in Karlan Nauettagalleris (in Akadompole). Free entry

Nelcome to trul Rentals and auides available -> www.ullas.fi/bikepark

gondolilla. Gon 19.6.-2.10.2022

Nature trail: information boards located along the trail

Hoidettu hiihtolatu

Maintained ski trail

Merkitty kesäreitti Marked summer trail

# SOLUTIONS – PROGRAMMATIC

• Education @ rental shops



# SOLUTIONS – PROGRAMMATIC

• Bells



# SOLUTIONS - PROGRAMMATIC

• Fair Trail by Allegra (www.fairtrail.ch)



# QUESTIONS? COMMENTS?



# **REMAINING SCHEDULE**

12:00 – 13:00 = Lunch 13:00 – 16:00 = Get eBikes, field visit



# **KITTOS!**

