Trail Maintenance 102

Advanced Trail Maintenance - Intro

Crew Management

Mechanical Advantage

- Simple Machines – Ramps and Levers
- Power of the Pulley
- Griphoist

Trail Design and Layout

- Who, What, Where
- What makes a trail sustainable?

Switchback vs Climbing Turns

New Trail Construction

Building With Rock

Crew Management

How do we get the most out of our crew, big or small?

- Crew leader knows the project and clearly outlines the days expectations
- Work as a unit
  - Small tasks for each person that result in a finished product when the last person touches the trail.
  - Good for tread maintenance and construction
- Leap Frog
  - One person or group tackles a project while everyone else moves on.
  - Good for log out and drain cleaning
- Crew leader conducts quality control throughout the day/project

Communication and Safety

- Span of Control - Who's making sure the right things are being done right?
- Radios or Relays?
- Circle of Danger – Spread out

Mechanical Advantage

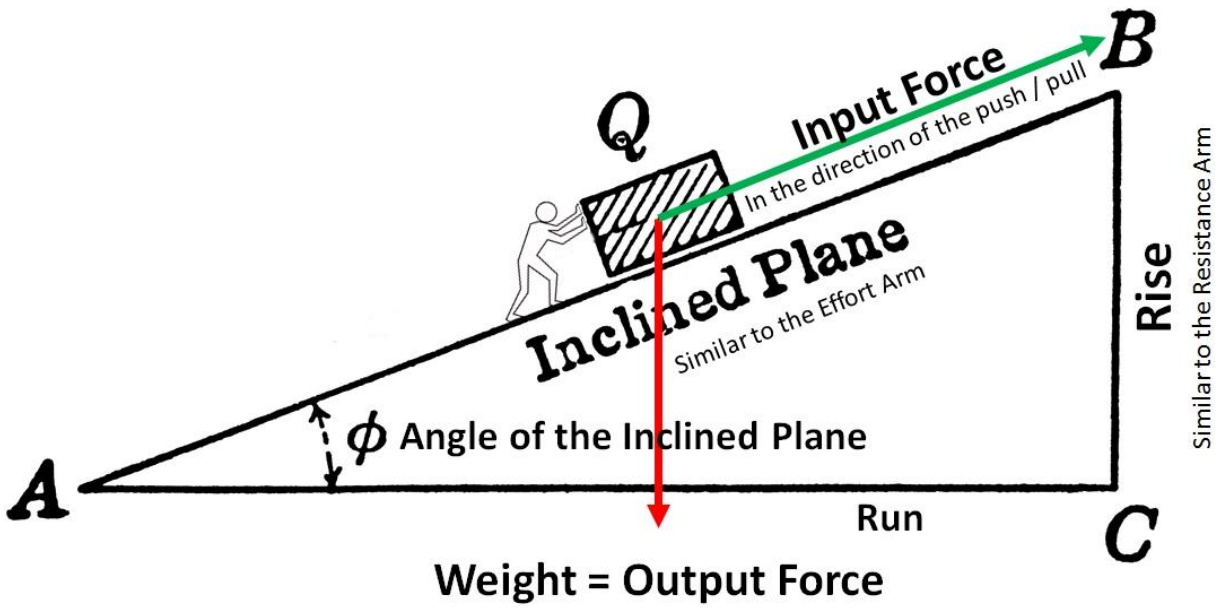
Work Smarter, Not Harder

Inclined Plane - Ramp

- Built or natural ramps can make work manageable

Leverage – remember fulcrums and levers?

- Rock Bar
- Long sticks or logs
- Pick Mattock, Pulaksi, or Hoe



Mechanical Advantage

Work Smarter, Not Harder

Pulleys

- The pulley has to be attached to the moving object to get a mechanical advantage
- 2:1 is simplest
- 4:1 is pretty easy and really provides a bunch of pulling power

Provides the ability to lift or drag heavy objects with minimal man power

1:1

Fig: 1

2:1

Fig: 4

3:1

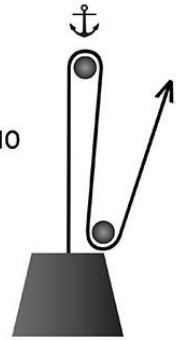


Fig: 10

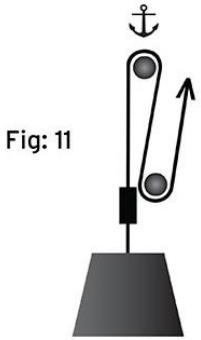
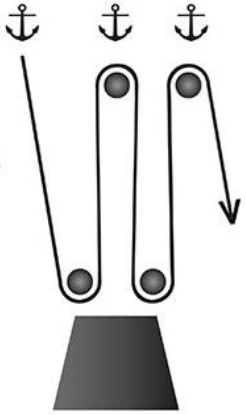


Fig: 11

4:1 & 5:1



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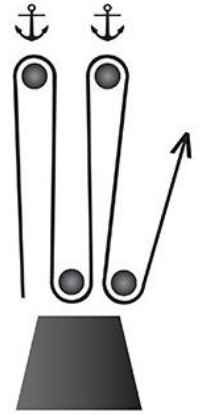


Fig: 15

Mechanical Advantage

Work Smarter, Not Harder

Come Along

- Fixed amount of cable – short pulls 6-12ft
- No controlled release
- Still provides mechanical advantage through leverage and pulleys
- Not ideal from a safety or versatility standpoint

Griphoist

- As long a pull as you have cable
- Can use to raise or lower heavy objects
- Primary power source to tension zip-lines and high-lines
- Combined with pulleys can move a tremendous amount of weight
- Come in various sizes/weights

Trail Design and Layout

Who, What, Where?

Who is your desired trail user?

- Beginner or advanced?
- Families or specialist?

What is intended trail use?

- Hiking, Biking, OHV, Equestrian?
- Mixed use vs. Single use

Where should or shouldn't the trail go?

- Control points – positive and negative control points
- Sustainable grades – the half rule
- Sensitive areas – biological or historical resources

Trail Design and Layout

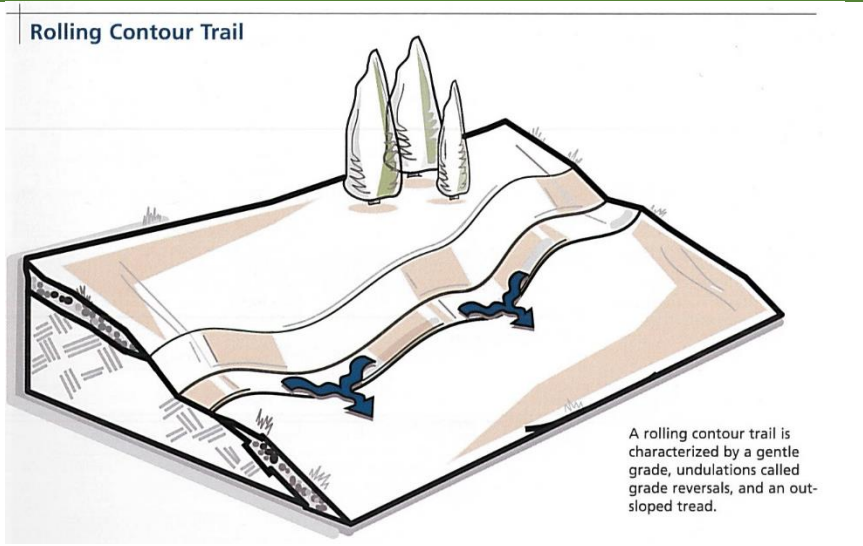
What makes a Sustainable Trail?

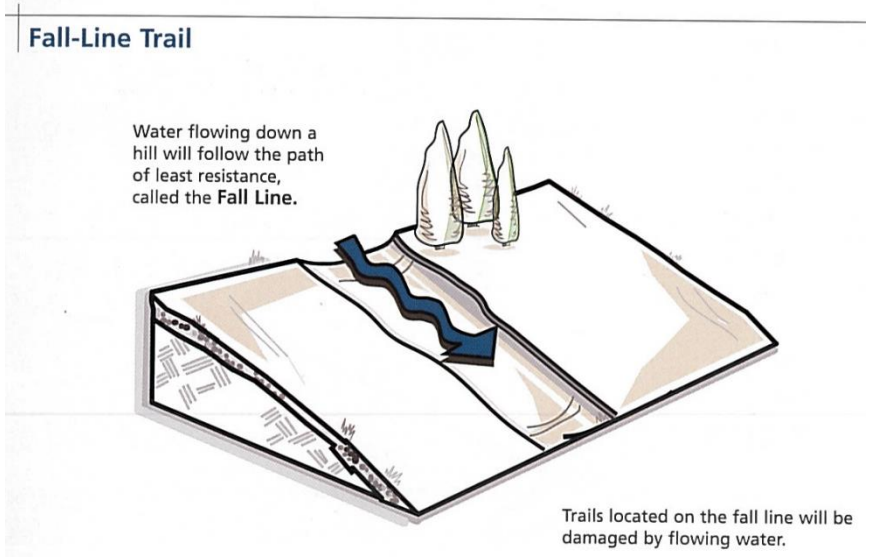
Rolling Contour Trails

- Gently traverse hills and sideslope
- Frequent grade reversals
- Outsloped tread

Avoid Fall-line Trails

- Goes directly downhill or down slope
- Often the shortest, most direct route
- Same route water wants to take





Trail Design and Layout

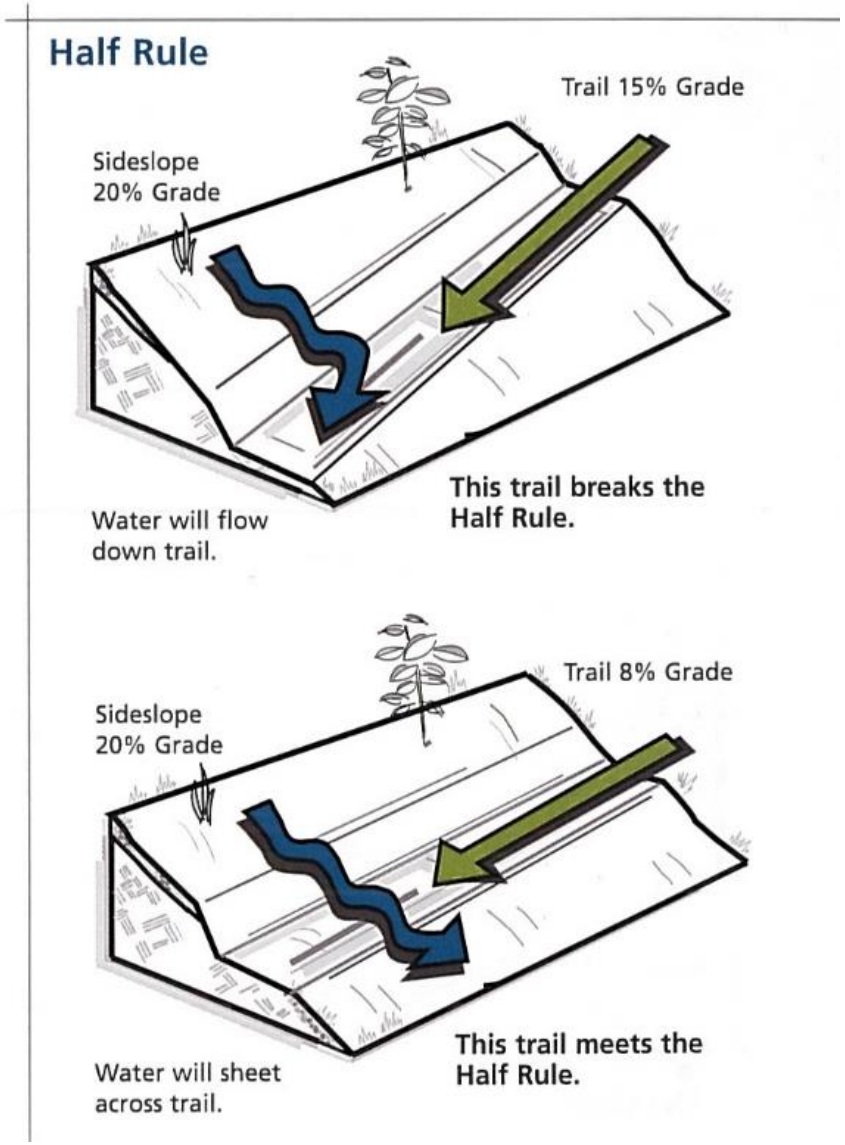
What makes a Sustainable Trail?

Half Rule

- Trail grade does not exceed
- A trail that is more than half the sideslope is considered fall-line

What is Grade?

- Measure of steepness
- Rise over Run
- If a trail rises 10ft over 100ft is 10% grade
- Measured with a Clinometer

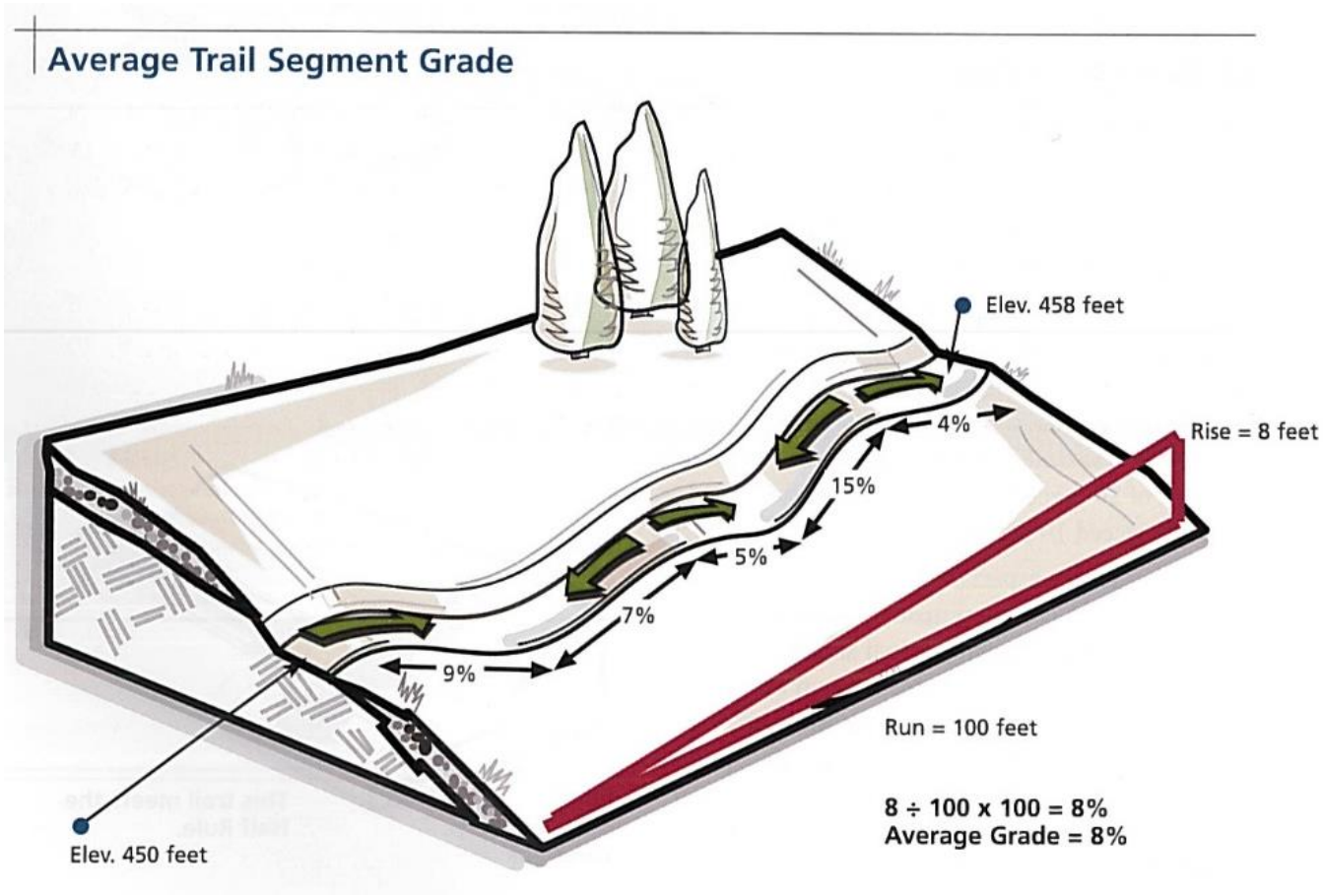


Trail Design and Layout

What makes a Sustainable Trail?

10% average grade

- Sometimes called overall grade
- Just a general rule of thumb
- Useful for planning
- Works in most soils
- Limits Erosion
- Allows for design flexibility
- Accommodates grade reversals
- Allows for future reroutes

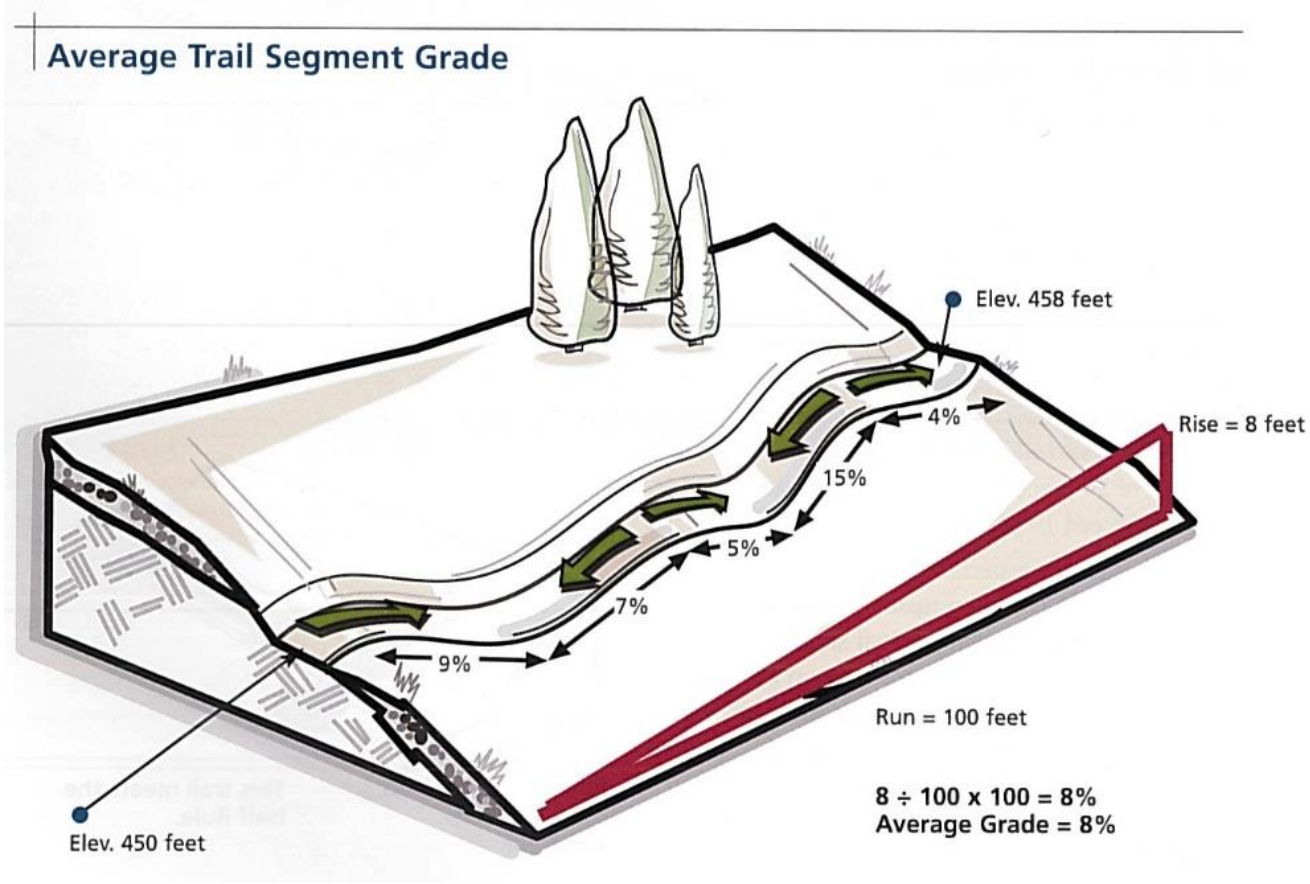


Trail Design and Layout

What makes a Sustainable Trail?

Maximum Sustainable Grade – It depends

- Typically 15-20%
- Still follows half rule
- Soil and rock make a difference
- Annual Rainfall
- Grade Reversals
- Trail use – Hiking vs OHV
- Amount of use
- Intended difficulty

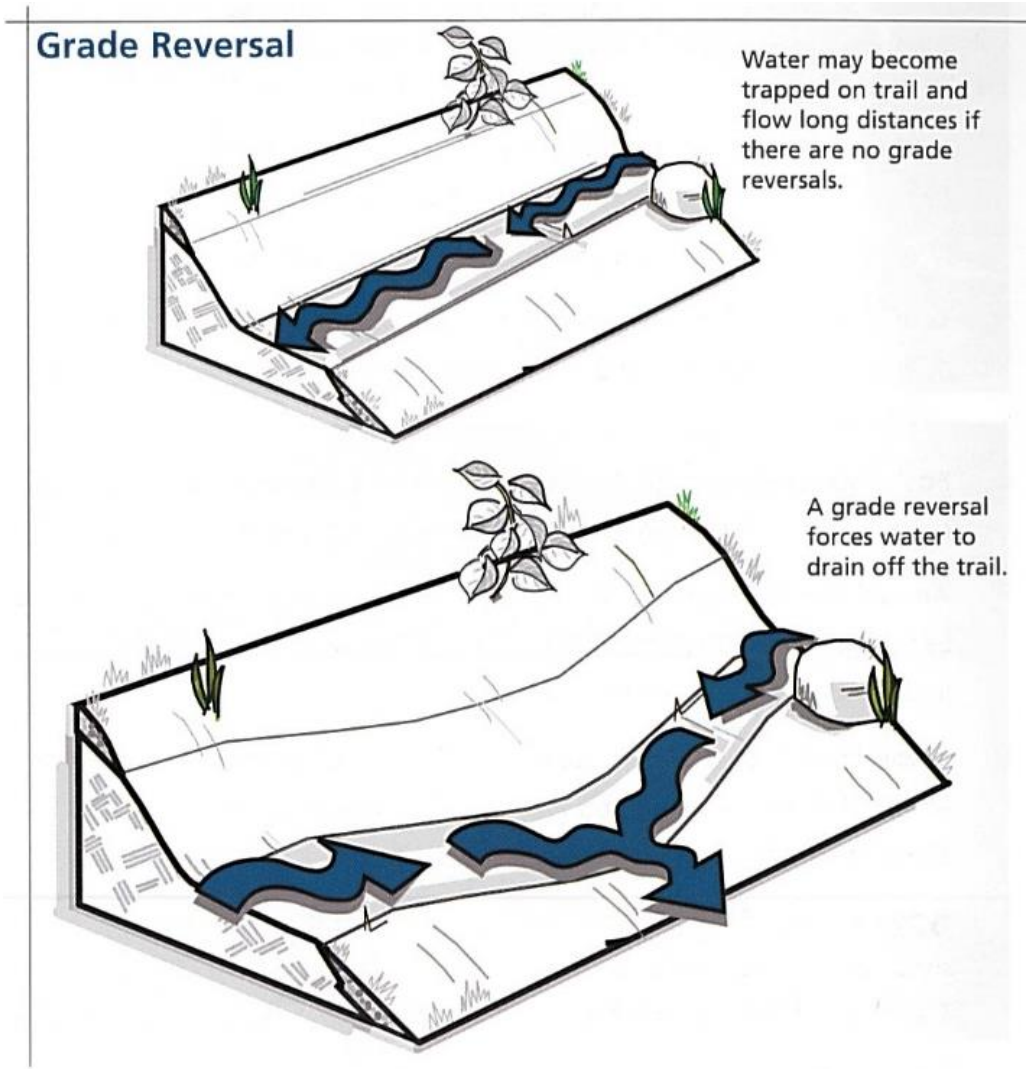


Trail Design and Layout

What makes a Sustainable Trail?

Grade Reversals

- A short change in grade from overall trail grade
- Forces water off the trail
- The more the better
- Dramatically reduces maintenance needs
- Should be included in the initial design
- Make trails more enjoyable

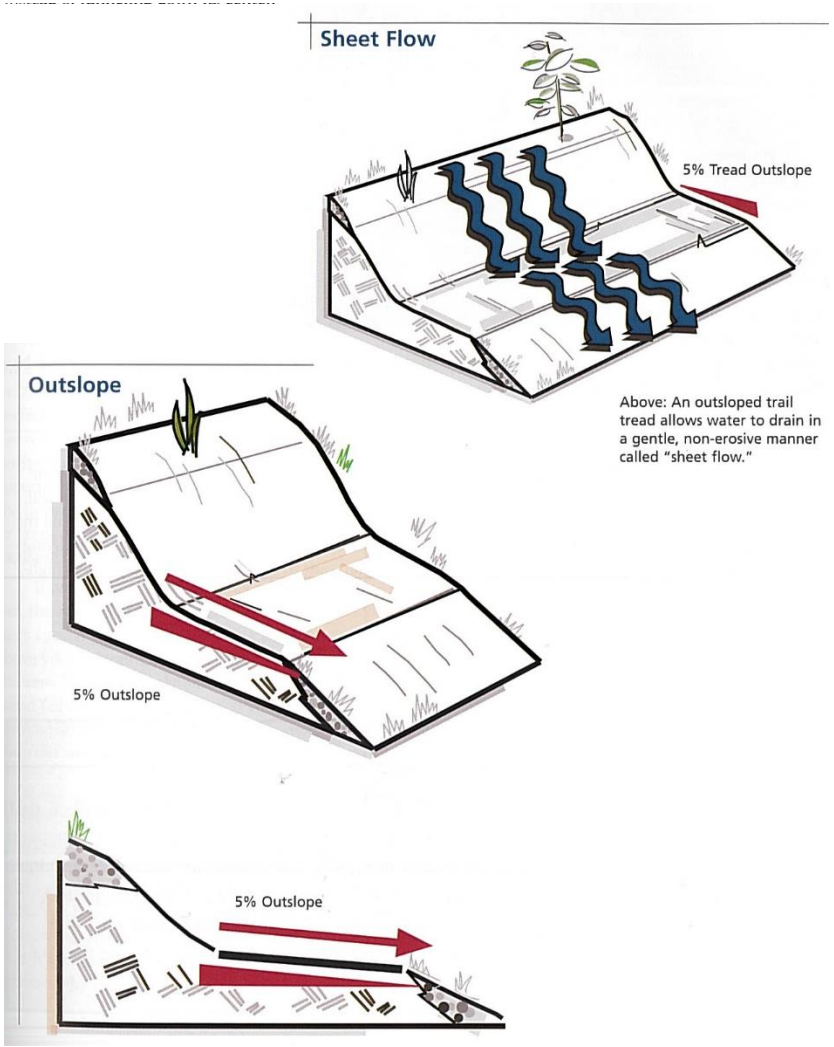


Trail Design and Layout

What makes a Sustainable Trail?

Outslope

- 3-5% oustlope
- 5% is enough to feel, but not uncomfortable
- Creates Sheet Flow
- Hard to maintain in loose or soft soils
- Dependent on grade reversals



Trail Design and Layout

Getting A Trail On the Ground

In the Office

- Gather maps
- Identify property boundaries
- Look at topo lines to determine potential route
- Identify control points on the map

In the Field

- Walk the ground
- Identify control points in the field
- Flag a corridor
- Walk and adjust, walk and adjust, walk and adjust
- Get it assessed and cleared
- Pin flag final trail location

Trail Construction

Who and How Much?

Who is going to the labor?

- In-house – Force Account
- Volunteers
- Youth Crews
- Professional Trail Builder - Contractor

How much will cost – It Depends

- Built by hand - $5 per foot or $26,000 per mile
- Built by Machine - $2.5 per foot or $13,000 per mile
- Don’t forget about…
- Bridges – $20-$50 per sq ft
- Trailhead - $20,000/restroom $15,000-$25,000/gravel parking lot
- Informational Kiosks - $2,000-$3,000
- Signs and Markers - $5-$100 each

Trail Construction

Lets swing some tools…

How hard can it be?

- It's usually harder than you think
- Building trail is not rocket science, but it can be done wrong
- If you did your design, layout, and flagging correctly it's easy for any crew to put in good trail

Having someone supervise is critical.

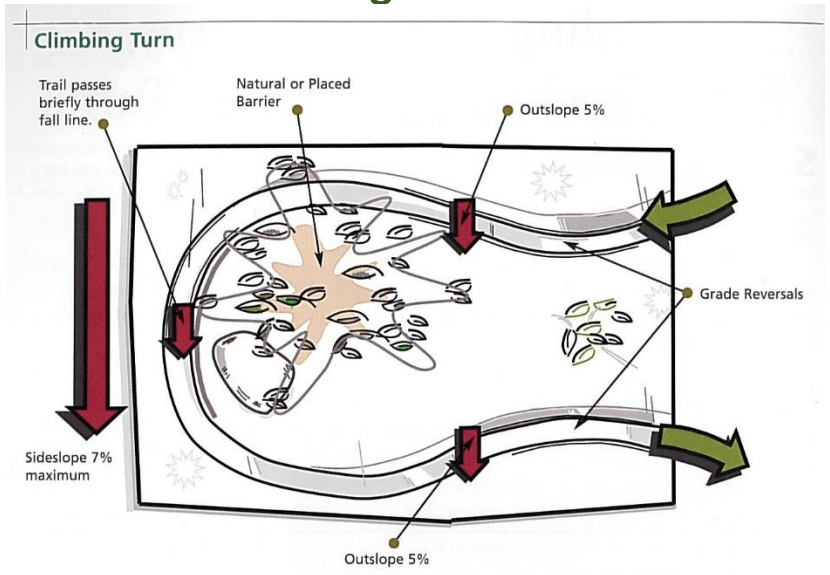
- Make sure the crew or contractor sticks to the plan
- Quality control to make sure trail meets specifications
- Someone to monitor safety
- Someone to gauge crew fatigue and morale

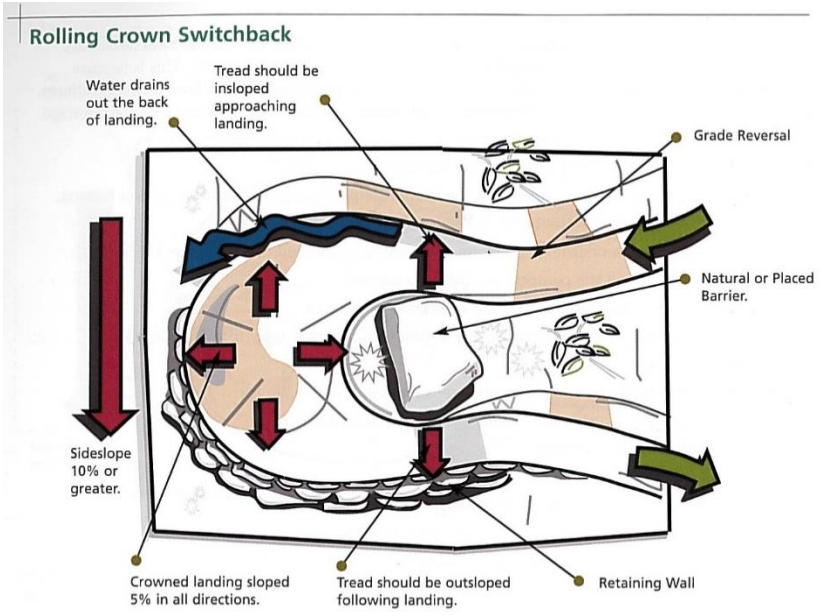
Watch out for the technical spots.

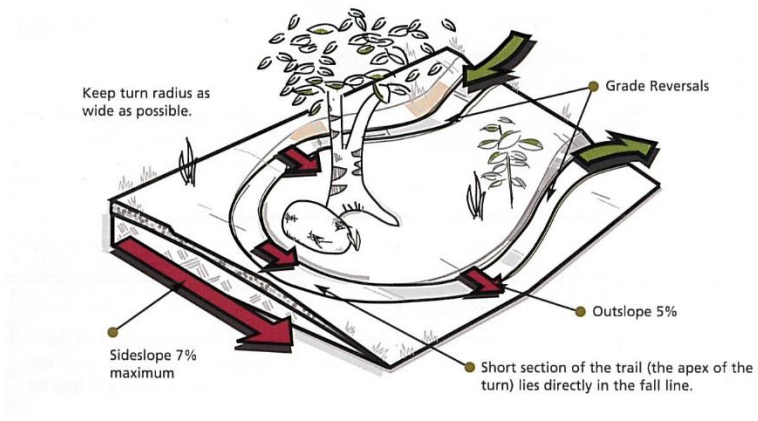
- Switchbacks and climbing turns
- Rock steps or retaining walls
- Stream crossing and stepping stones
- Bridges

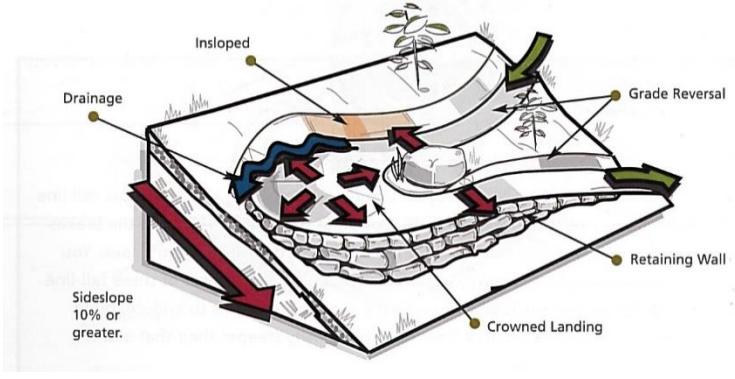
Trail Construction

Switchbacks and Climbing Turns









Trail Construction

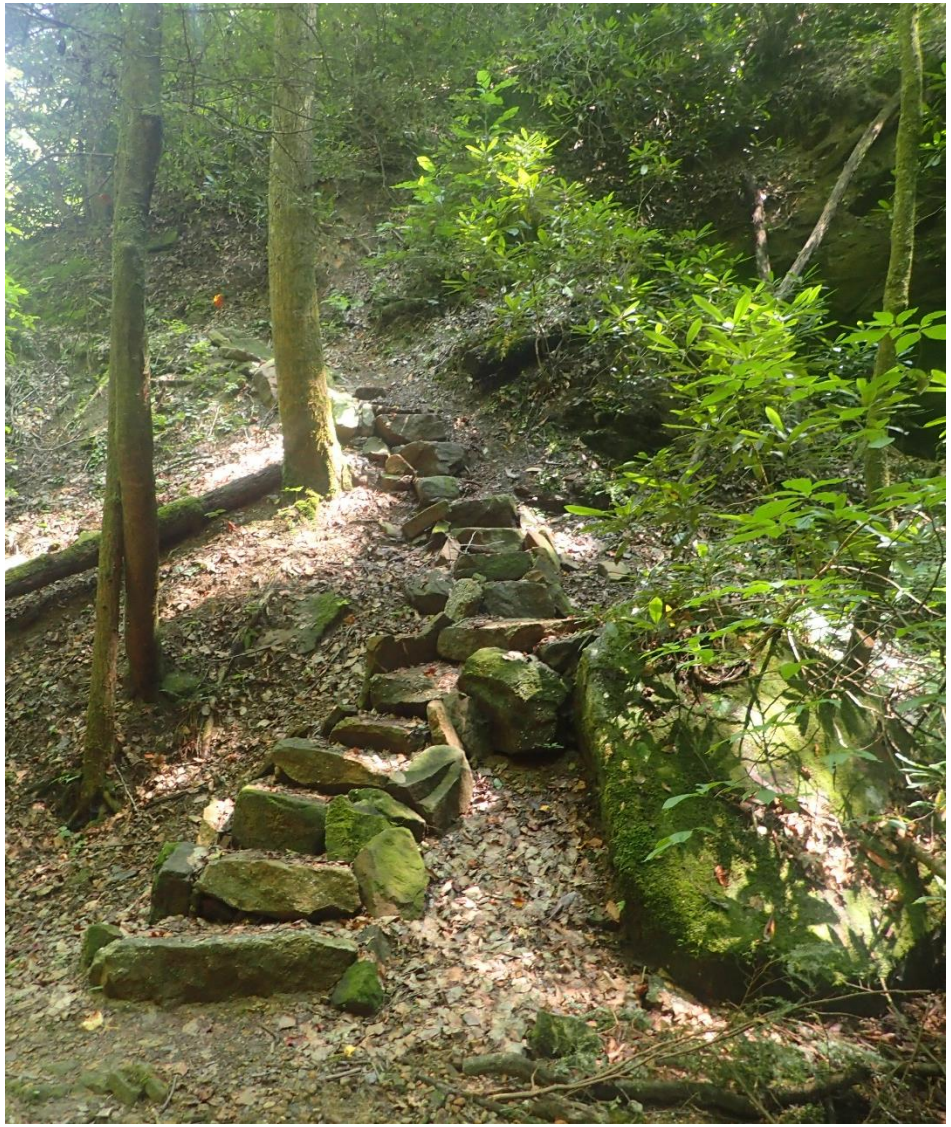
Working with Rock

Advantages of Rock

- Never rots
- When done correctly can last for 100s-1000s of years
- Extremely sustainable – use rarely erodes or damages rock
- Looks cool

Things to consider

- Safety
- Labor intensive
- Native or haul it in – that gets expensive
- Can be equipment intensive – that gets expensive too, but can be a great investment

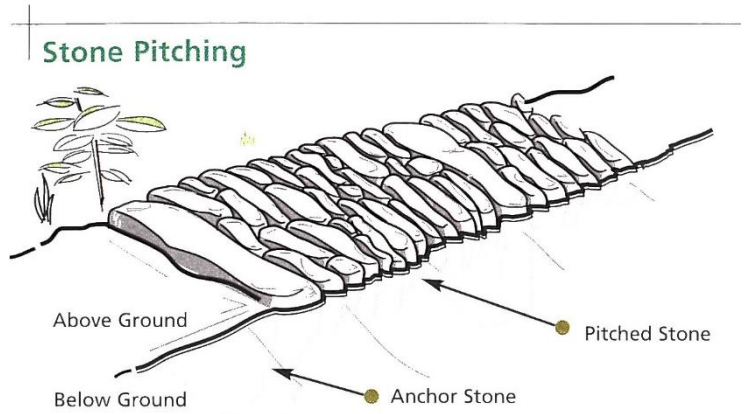


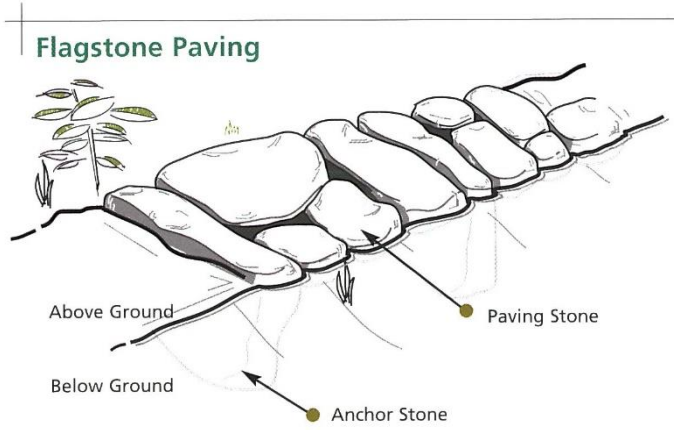
Trail Construction

Working with Rock

The Basics

- Bigger is better
- Start at an anchor
- Start at the bottom
- In-slope foundation
- Don’t forget the batter
- Break your joints
- Only wedge from the inside
- Fill as you go
- Large capstones





Questions and Discussion

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Trailism.com. Trail: building, science, art, journeys, and gear.