

Maintenance

Planning

- Objectives: Style, Audience, Skill Level, Connections
- Bike-Specific vs. Bike-Friendly Multi-Use
- Resources, Funding, Volunteers
- Permission, Permitting, contracts

Design

- Maps, Grades, Half-rule, Specs, Flow
- Scouting, Natural Terrain, Natural Forces, Control Points, Flagging, Sightlines
- Documentation

Construction

- Trail Corridor, Dirt, Full Bench, Outslope, Half Bench, SBs, Grade Reversals
- Dealing with Running Water (seeps & streams)
- Crossing Flat/Wet Areas
- Tools & Work Safety

Maintenance

- Brushing & clearing
- Drainage problems: ruts, erosion, puddles, mud-holes, widening
- Steep / Fall-Line Trails: ruts, erosion, steps, water bars, check dams
- Trail Creep
- Dealing with Clay
- Re-routes



Bike-Friendly Techniques



PNW Techniques



Tools, Special Considerations

Brushing Trail Corridor



#1 Issue in the PNW: Poor Drainage



How do we deal with
Flat/Wet Trail Sections?

(Same as new construction)

Fixing Drainage Problems: Flat/Wet Sections



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- 1) Re-route**
- 2) Rock Armoring or Rollers**
- 3) Turnpike / Causeway**
- 4) Boardwalk**

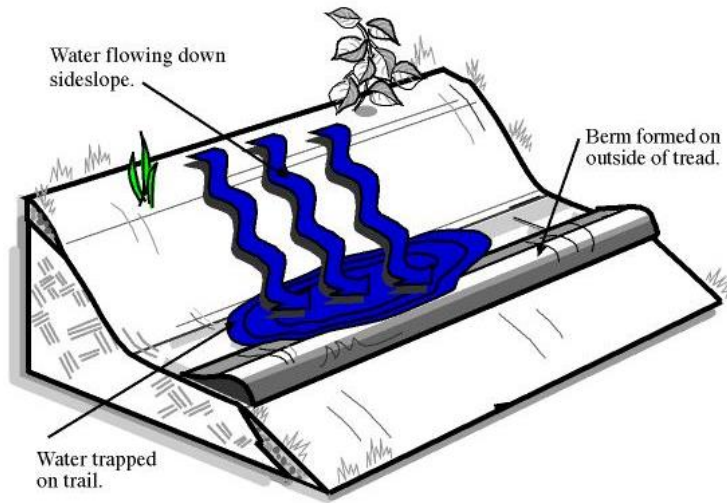
Drainage Problems: Puddles



What causes Isolated Puddles and how do we deal with it?

Drainage Problems: Puddles

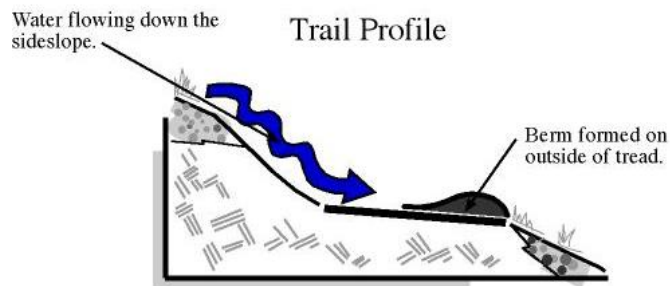
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Probable cause: outslope has failed

Quickest Solution: re-establish the outslope

Better Solution: small grade dip



Courtesy of IMBA

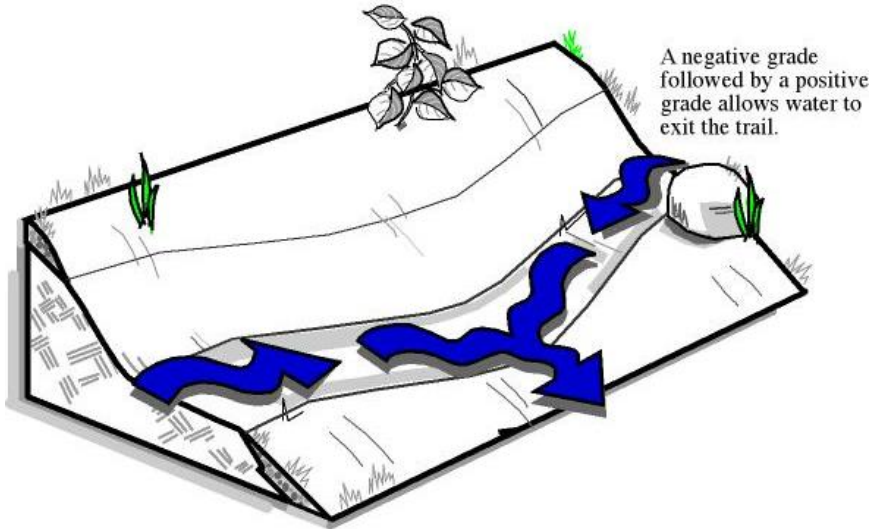
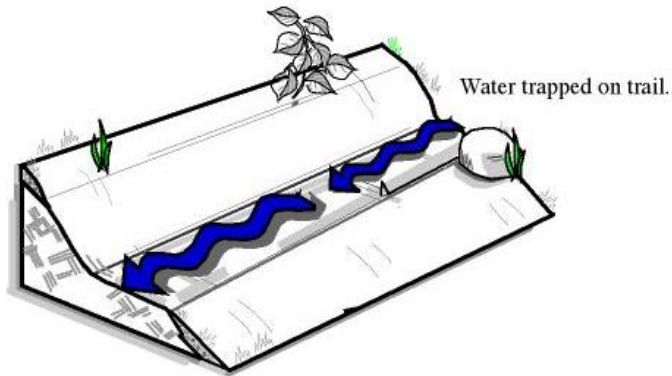


Drainage Problems: Ruts



**What causes ruts and how
do we deal with it?**

Drainage Problems: Ruts



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Probable cause: Outslope degrades and causes water to run down the trail

Best Solution:
Grade Reversals

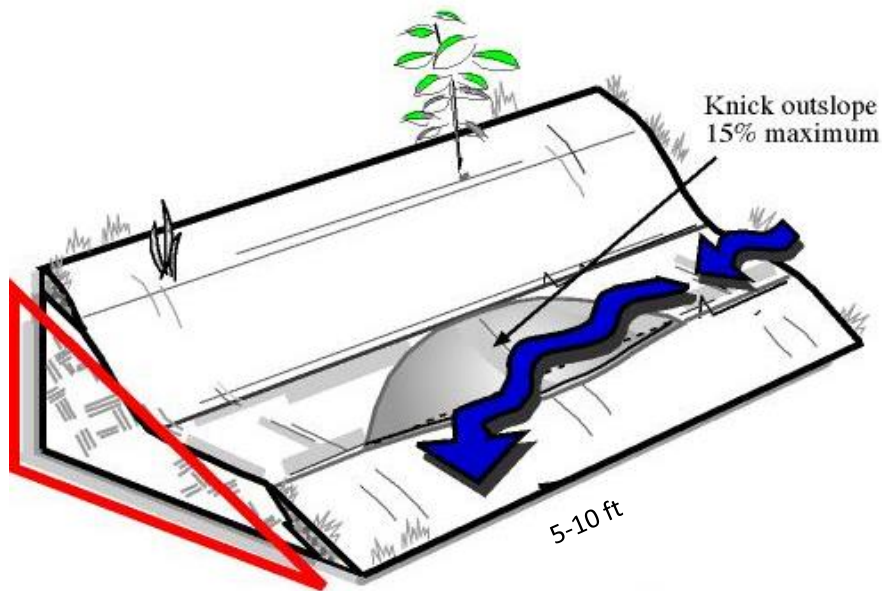


Alternative solutions?

Courtesy of IMBA

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Knick

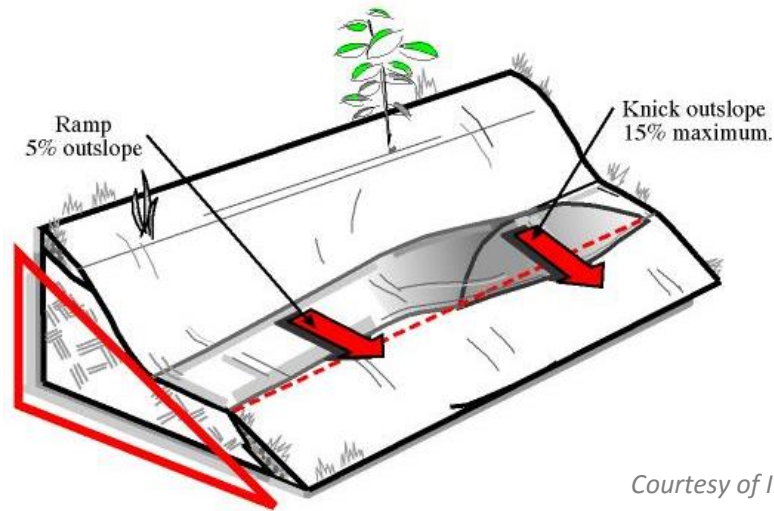


Courtesy of IMBA

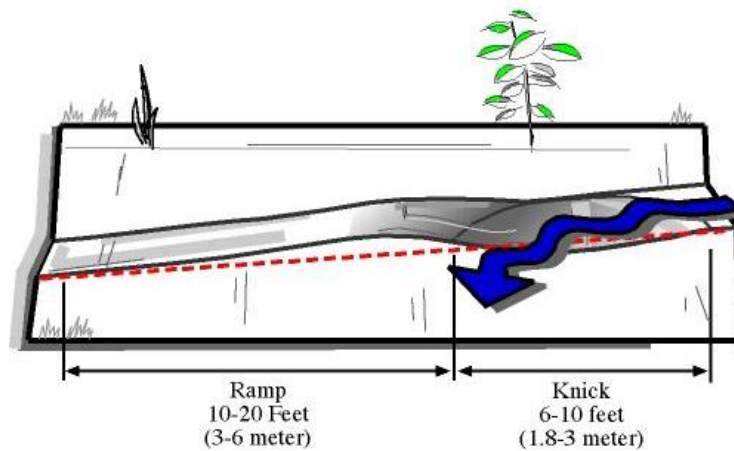
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Rolling Grade Dip

Knick with a short grade reversal



Courtesy of IMBA





How do we Deal with Wet Clay



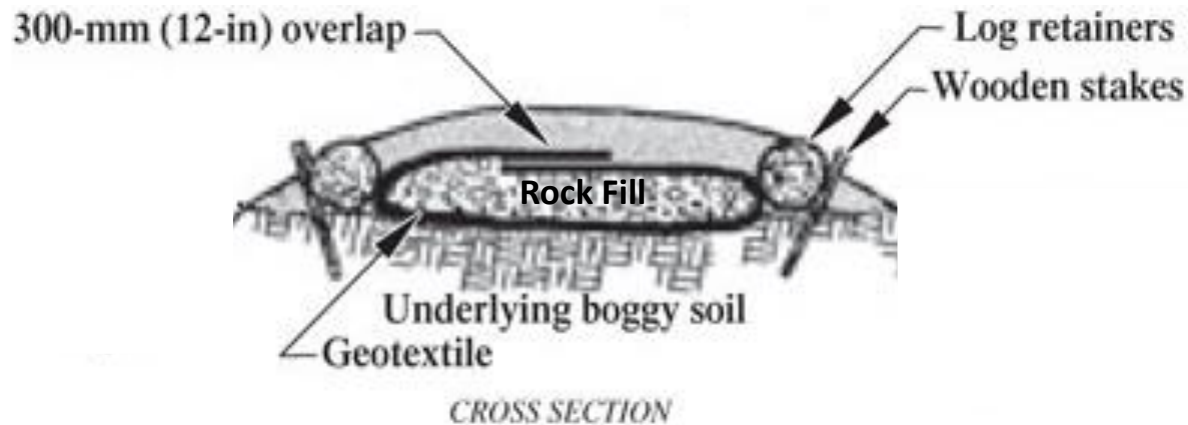
When all the right techniques just aren't enough!

Dealing with Wet Clay

Try wet area construction techniques (rock armoring, rollers, turnpike, causeway), but...



May need to **encapsulate drainage rock in landscaping fabric**



#2 Issue: Steep or Fall-Line Trail Sections



What problems result from steep or fall-line trails?

Steep or Fall-Line Trail Sections



Ruts from water running down the trail.

Steep trails also result in **Erosion** from slipping, spinning out or skidding.



How do we fix it?

Steep Trail Sections

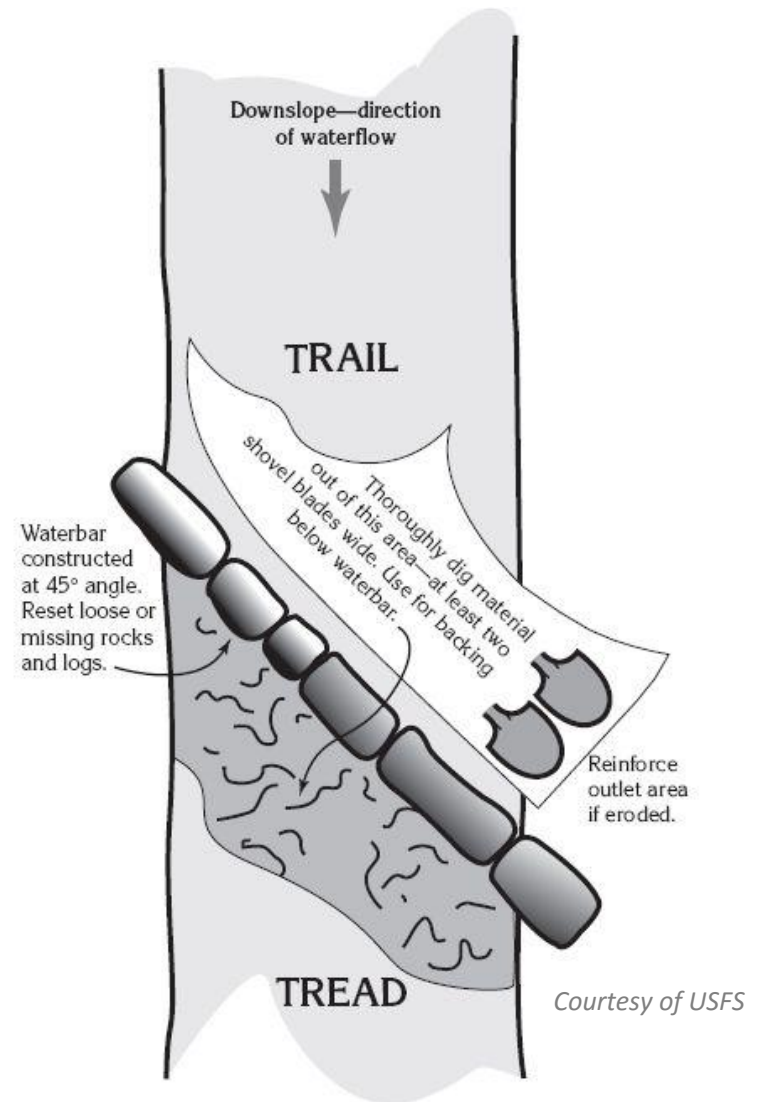
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- Grade reversals, nicks, dips
- Re-route
- Rock Armoring

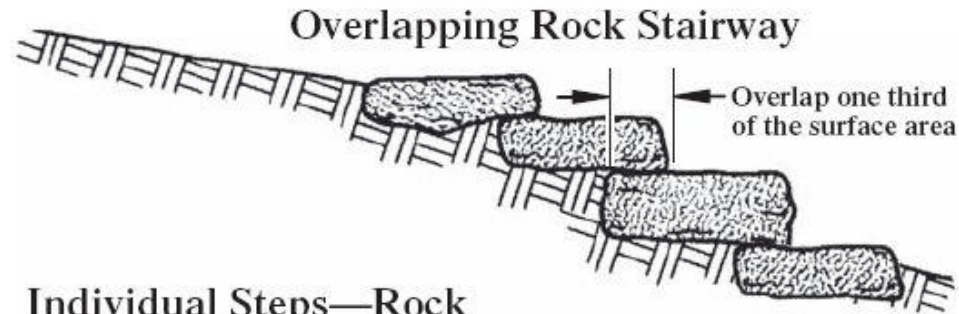


Water Bar – Traditional & Least Preferred Solution

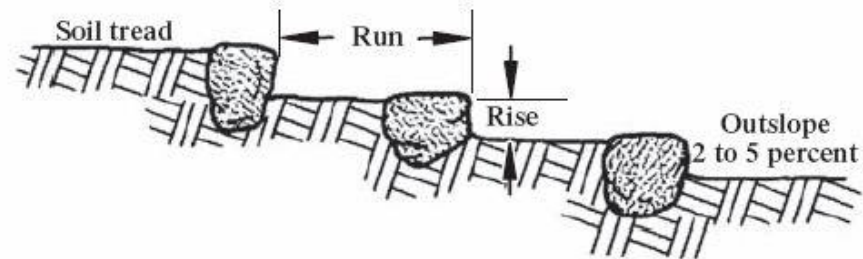
- Sediment clogs and Requires Maintenance
- Not bike-friendly



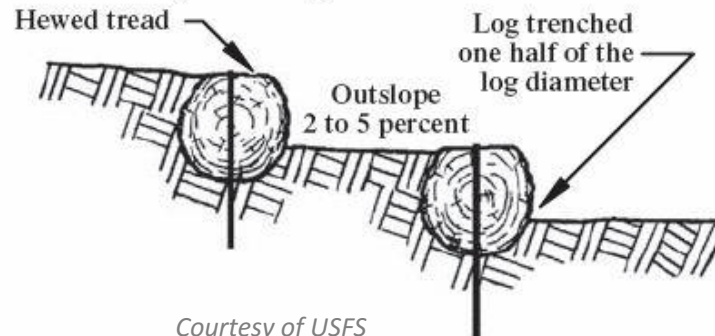
Steps – Another Traditional Solution



Individual Steps—Rock



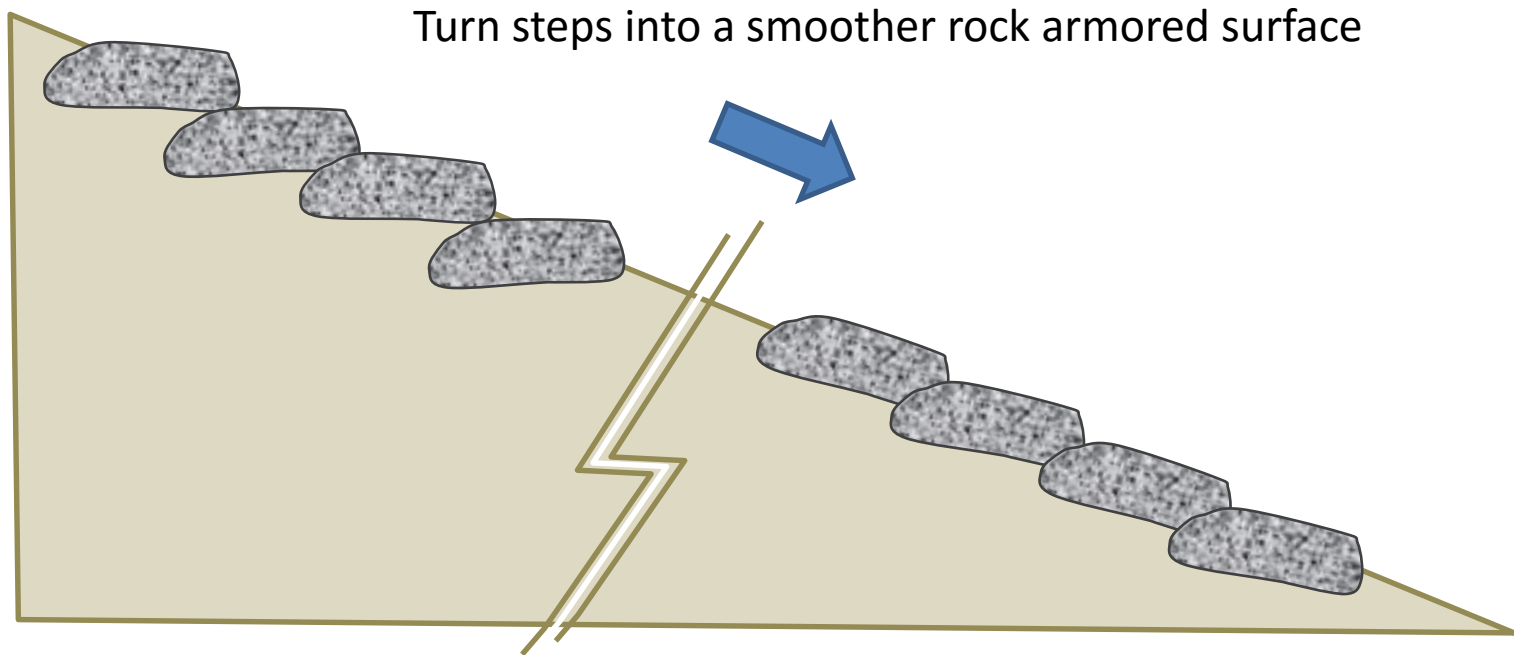
Individual Steps—Logs



Avoid! Last resort!

Courtesy of USFS

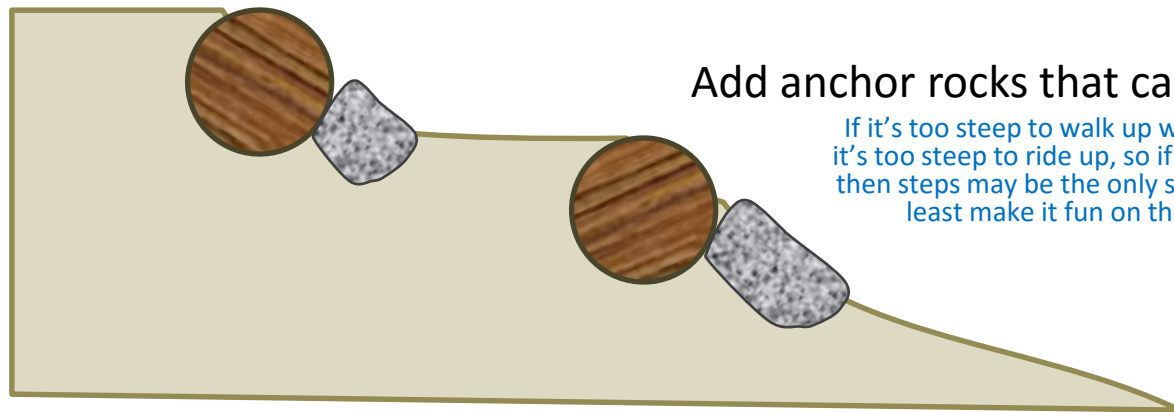
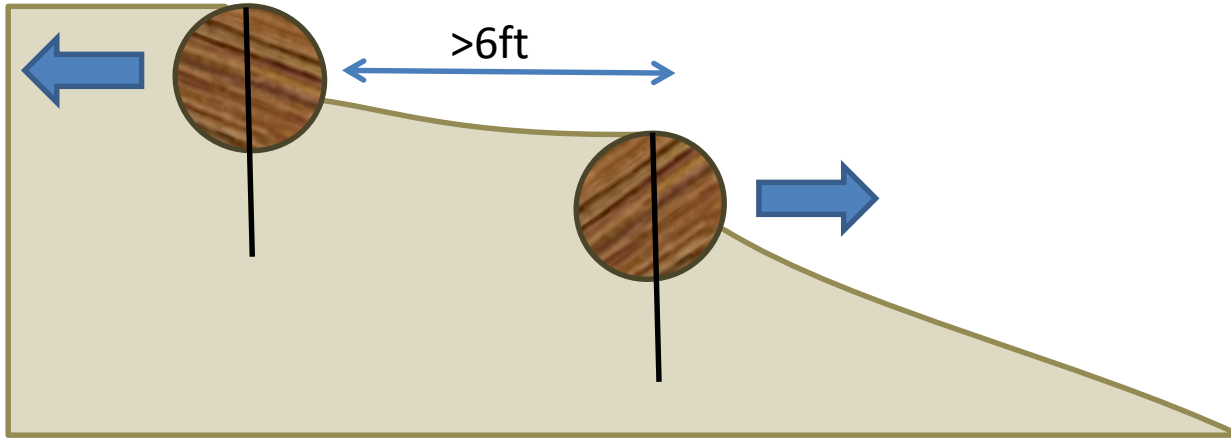
Armor Steep Trail Instead of Steps



Or have both... a narrow smooth line for bikes
and a step line for hikers

If Steps Can't Be Avoided

Move steps apart to accommodate wheelbase

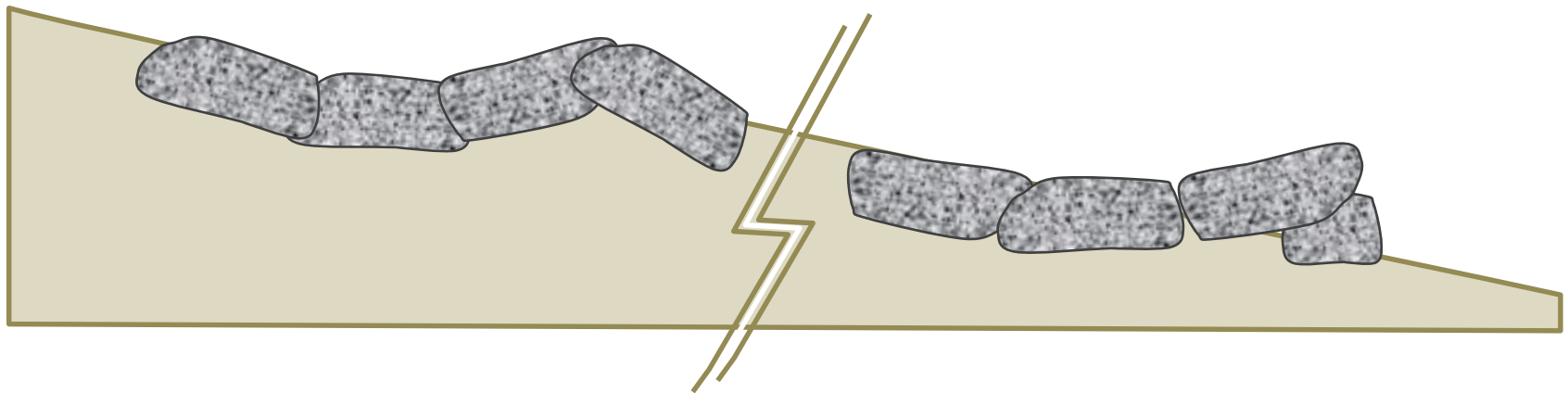


Add anchor rocks that can be rolled

If it's too steep to walk up without steps, then it's too steep to ride up, so if you can't re-route, then steps may be the only solution. You can at least make it fun on the downhill 😊

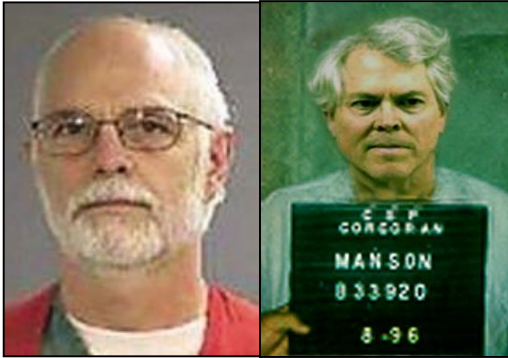
Check Dams

If a steep or fall line trail can't be Re-routed or Fully armored,
Slow water flow and resulting erosion using check-dams.

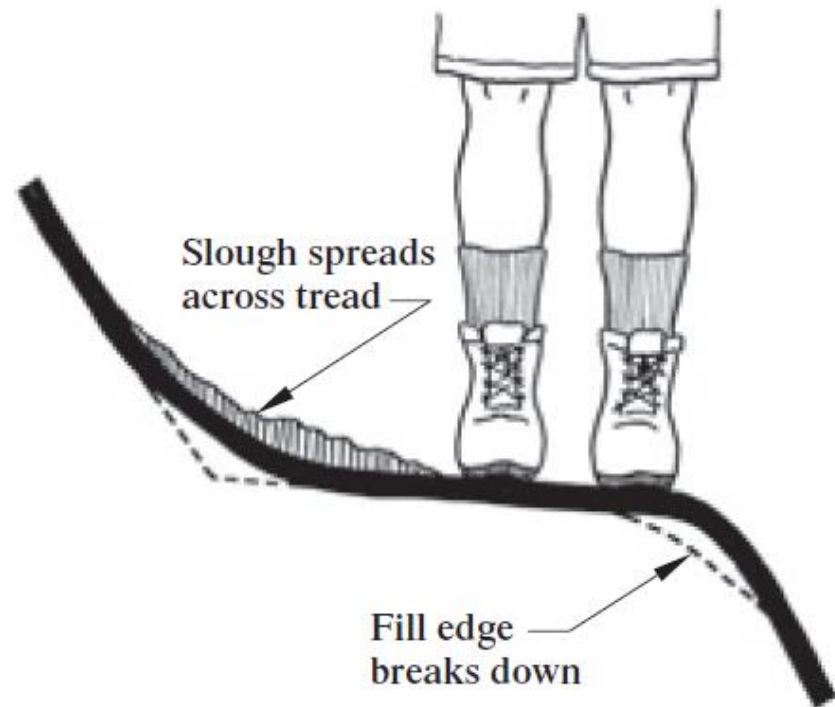


Another Common Problem: Trail Creep

Not talking about these guys:



Talking about this:



Courtesy of USFS

Causes:

- Steep backslope
- Off camber roots/rocks
- Poor flow

Solutions:

- Re-shape, armor or vegetate backslope
- Armor outer edge
- Choke point or re-route higher up

Drainage Problems: Outsloped Turns



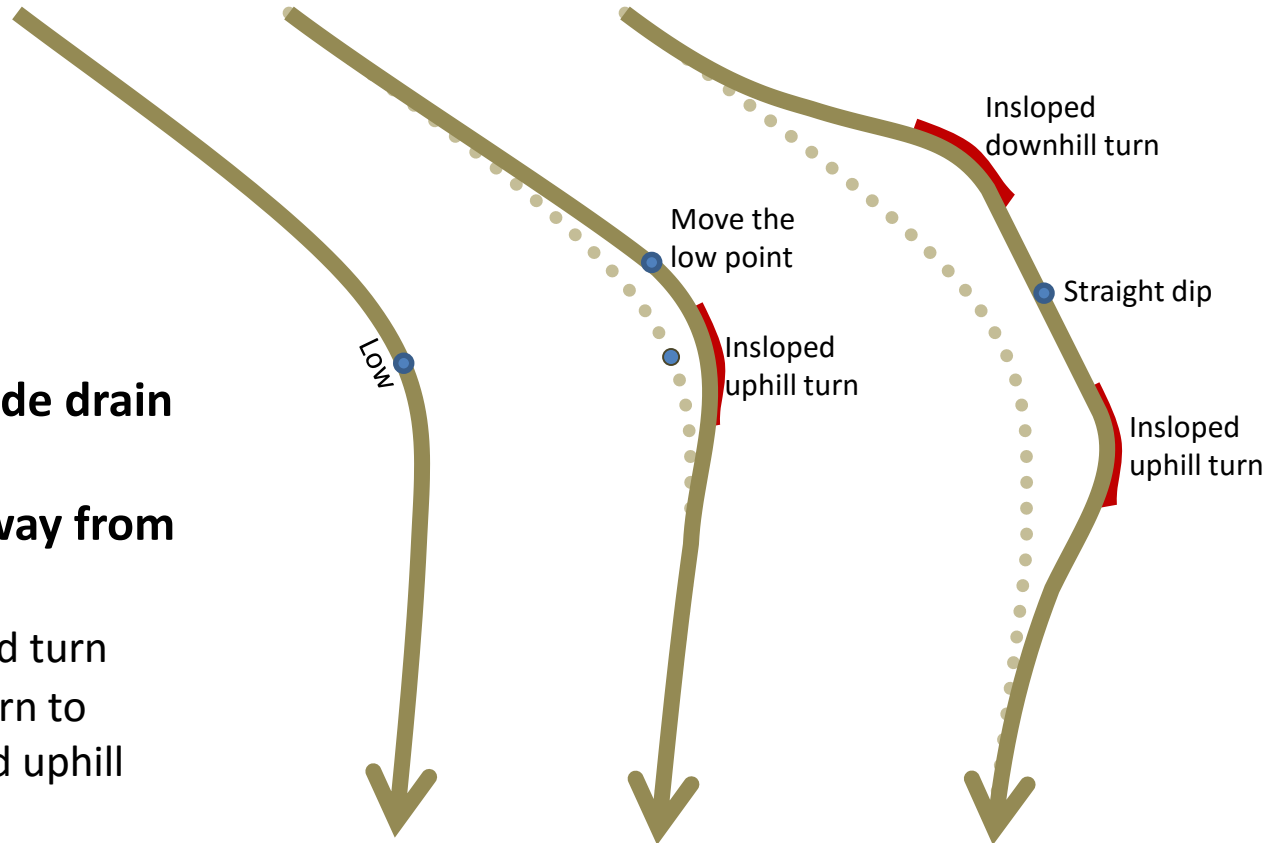
How do we deal with berms cause by high traffic and higher speeds?



Drainage Problems: Outsloped Turns

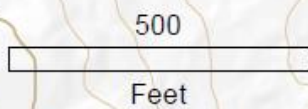
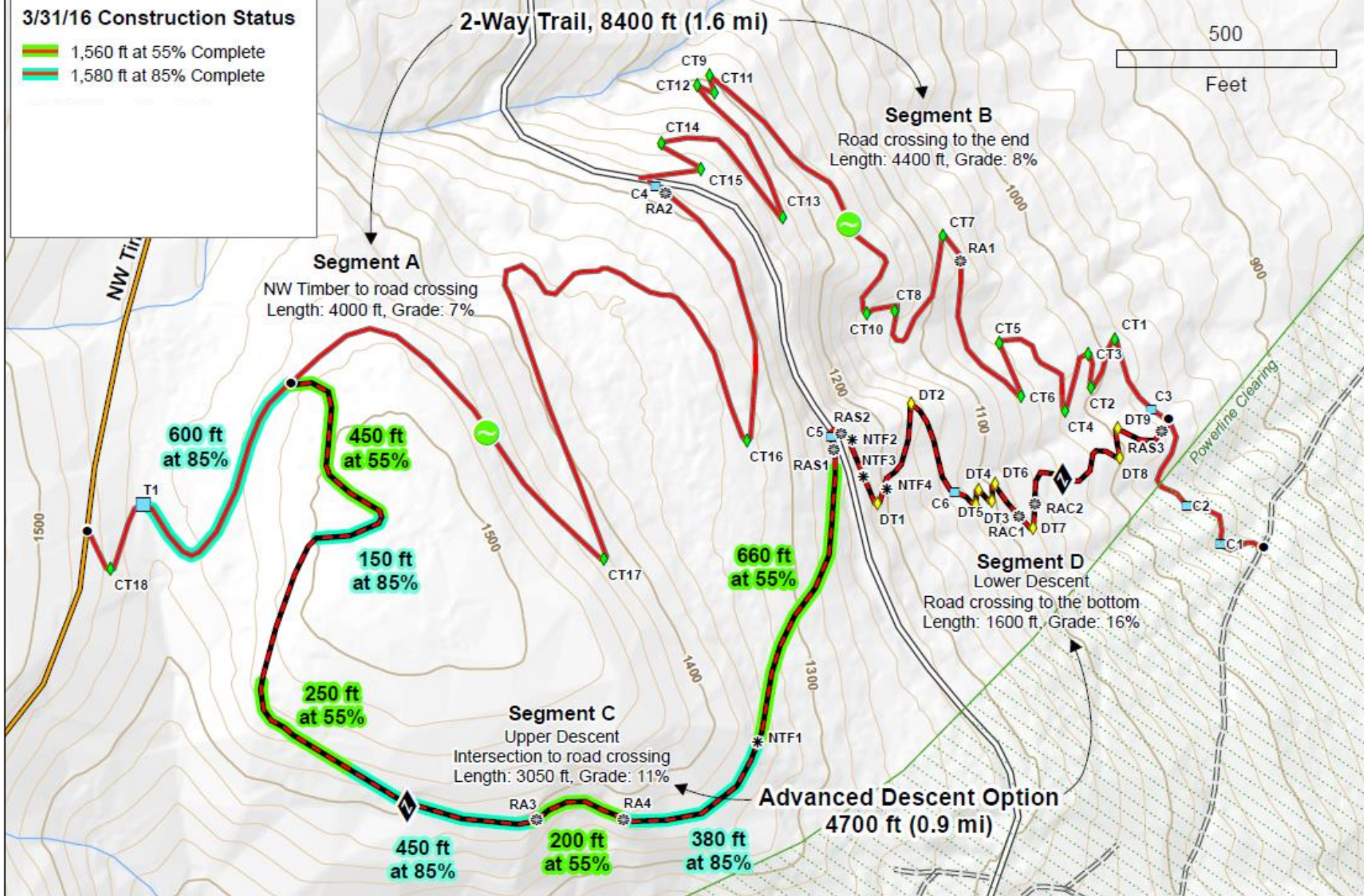
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- **Armoring**
- **Insloped turn with inside drain**
(if well-draining soil)
- **Move the low point away from the turn apex**
 - Grade dip to insloped turn
 - Insloped downhill turn to grade dip to insloped uphill turn
- **Re-route**



3/31/16 Construction Status

- █ 1,560 ft at 55% Complete
- █ 1,580 ft at 85% Complete



Tiger Mountain State Forest

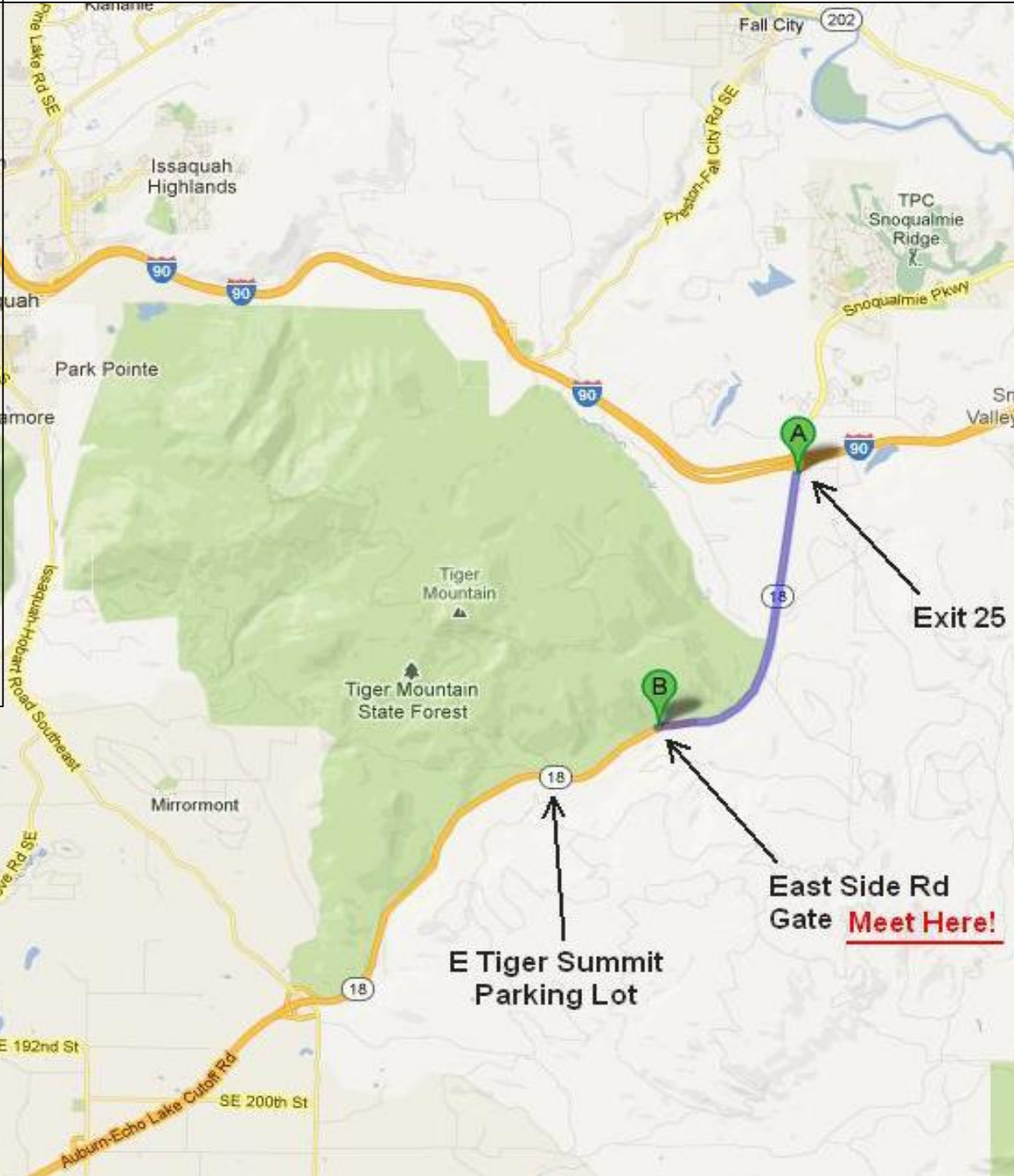
East Tiger Mt Phase 3 Status Map

2.5 Mile Loop East of NW Timber

- █ New 2-Way Trail (hike/bike)
- █ Advanced Descent Option
- █ Existing Trails
- █ Forest Roads
- █ Streams Layer

- ◆ DT: Descending Turn
- ◆ CT: Climbing Turn
- ❄ RA: Rock Armoring
- * NTF: Rock Feature
- Turnpike / Culvert





Thanks to the USFS and IMBA!

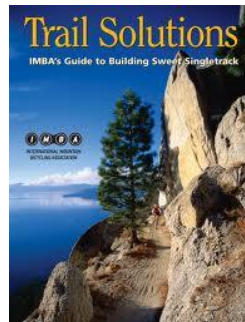
Many diagrams and concepts provided by:



USDA / USFS “Trail Construction and Maintenance Notebook”



INTERNATIONAL MOUNTAIN BICYCLING ASSOCIATION



International Mountain Biking Association’s “Trail Solutions Handbook”

Wrap-Up Q&A