

# ***SUSTAINABLE* TRAIL DESIGN, CONSTRUCTION, & MAINTENANCE**

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[outdoors.org](http://outdoors.org)

# What is Sustainability in Trail Work?

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- Trails are “Corridor’s of Sacrifice,” therefore they should be...
  - Designed to protect nature and conserve landscapes while engaging users
  - Constructed to minimize natural resource damage and human resource commitment
  - Maintained regularly and in a minimally impactful manner

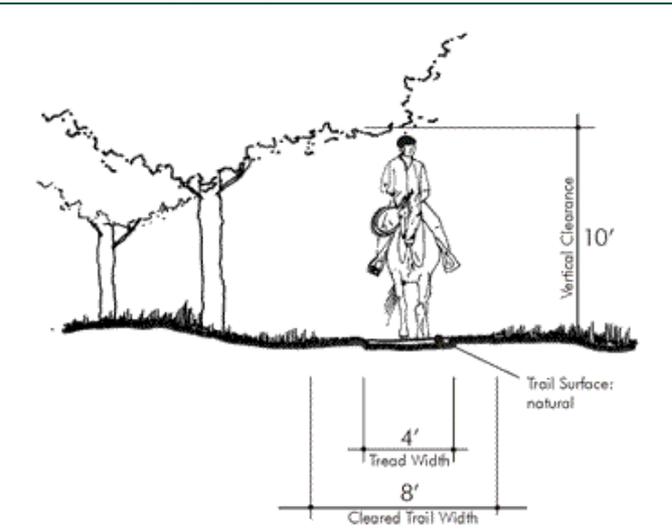
# Designing Sustainable Trails: Planning Stage

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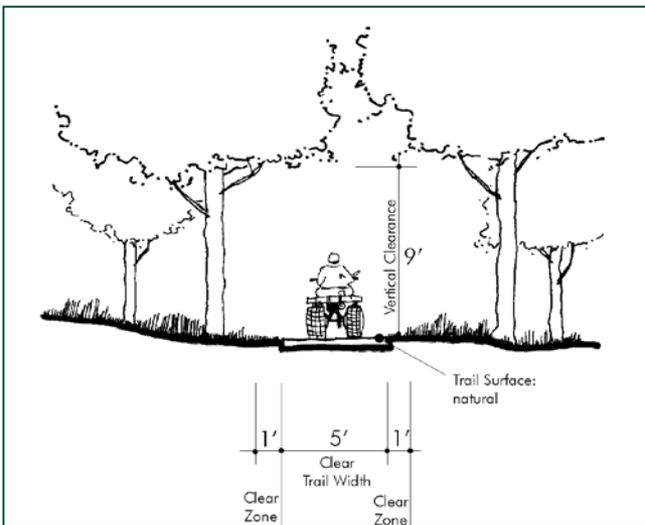
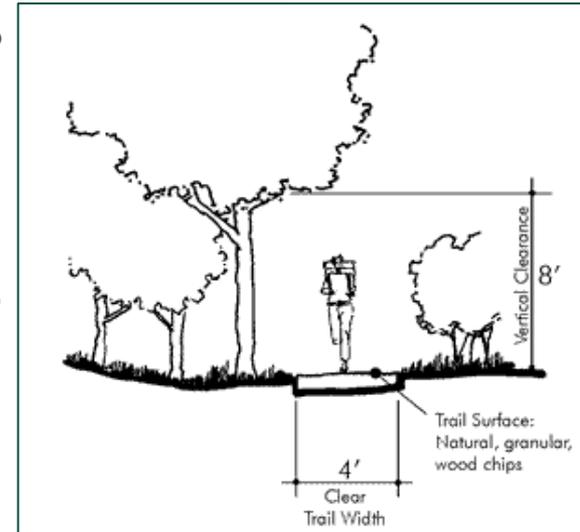
- Know before you go:
  - Intended users
  - Terrain
  - Sensitive natural areas
  - Major control points
  - The climate & landscape



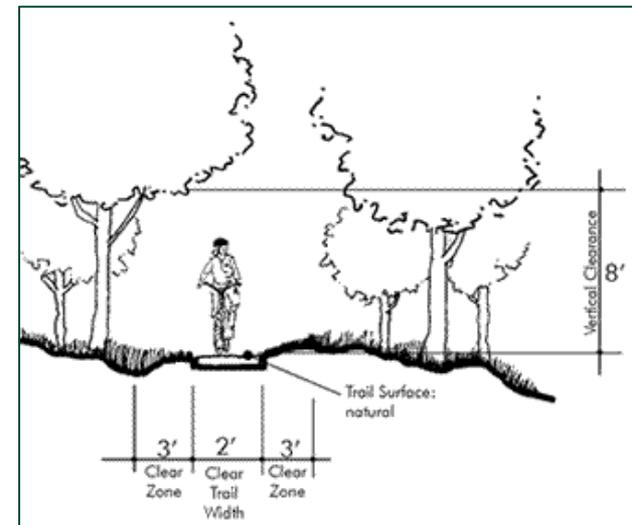
# Hikers, Bikers, or Horses?



- Who is your intended user?
  - Different users need different specific features installed and solutions to problems...
- ...Despite different specific features of different user type trails, many aspects of design, construction, and maintenance are universally applicable



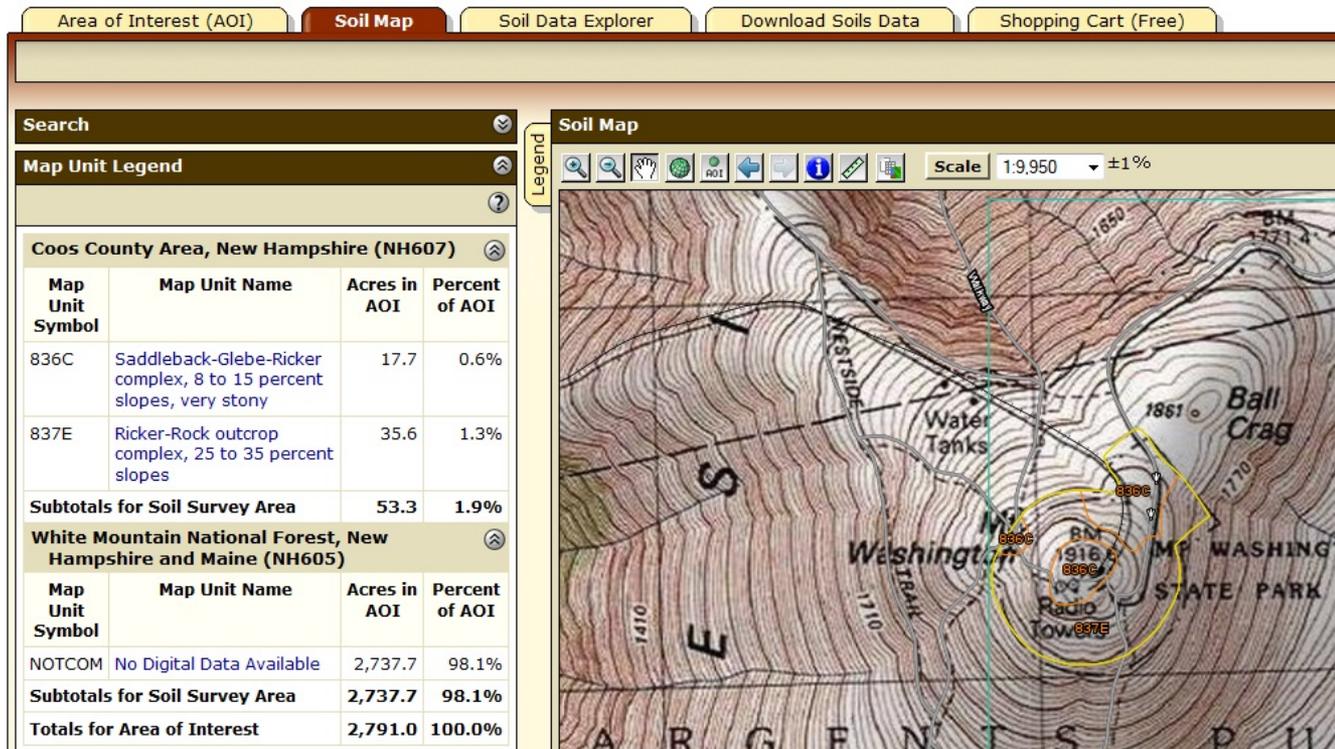
- All user types can have sustainable trails, if they are designed, constructed, and maintained sustainably





# ...Additional Planning Resources

- Soil & Vegetation Maps
  - Soil is the foundation of an ecosystem, therefore your trail
    - It will impact construction cost, durability of tread, and type of vegetation
    - Best soil to build a trail on is a mix of sand, silt, and clay
  - Vegetation is a good indicator of soil type and water in landscape



# ...Still More Planning Resources

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- Aerial photographs of landscape
  - Topographic maps may not show a rock outcrop with a beautiful view
  - They may not give a good understanding of how dense the vegetation is
  - Allows for a more nuanced understanding of the landscape (depressions, slides, etc.)
- Landowners and partners in trail management
  - Often most familiar with area



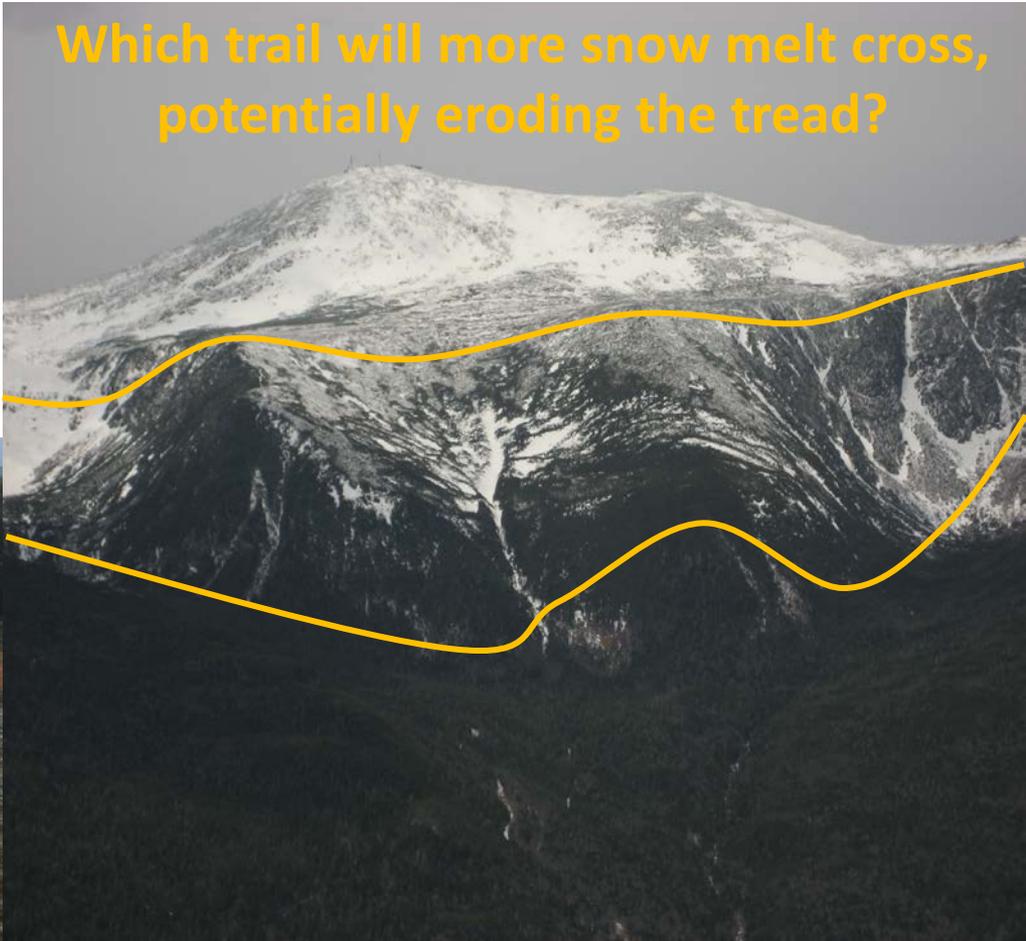
# Designing Sustainable Trails: Layout Stage

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- In the field, design your trail so it is:
  - High: both on the landscape and in each specific location
    - Military crest



Which tread will trap water more easily, the high or low tread?



Which trail will more snow melt cross, potentially eroding the tread?

# Make Sure Your Trail is Dry

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- Keep the trail free of erosive water
  - Grade reversals
    - Allow water to flow off trail in as natural course as possible
  - Sloped trail (no flat spots like bogs)



# Make Sure Your Trail is Hard

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- Hard: durable surfaces
  - Not wet, not muddy, not loose soil either



# Make Sure Your Trail is Visible

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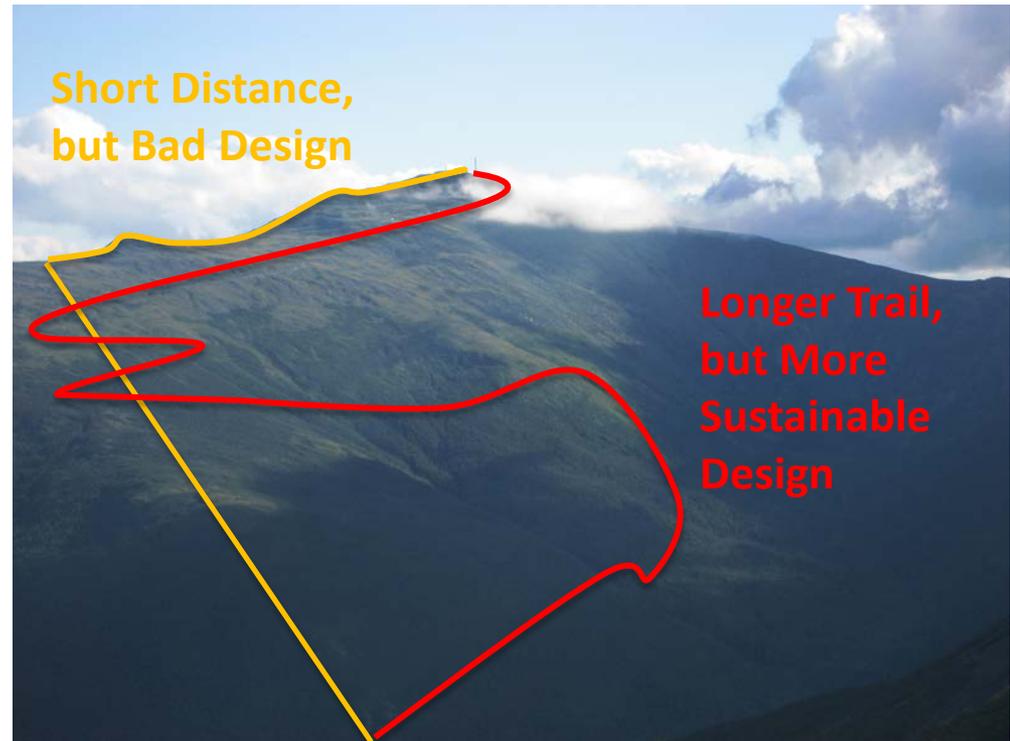
- Visible: tread is not braided, corridor is brushed appropriately
  - Create that corridor so hikers stay on trail and off the woods
    - This increases safety of hiker
    - Minimizes impact on surrounding natural area
- A trail that is high will be out of the water and dry, so that its' tread is hard and visible



# Key Layout Points to Remember

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- Don't go straight up a hill
  - Switchbacks (sharp turn & brief but drastic grade change – shorter trail length)
  - Climbing turns (gradual ascent that avoids sharp or drastic changes – medium trail length)
  - Topographic turns (wrap around hill sides and take a spiral like route to gain elevation – longer trail length)
- Well plotted trail will work with the land, not against it...
  - Water is encouraged to drain along natural course
  - Rocks and timber are not pulled from the surrounding area for structures
  - The point is for users to be in a natural area, avoiding signs of human development other than the trail



# Constructing Trails Sustainably

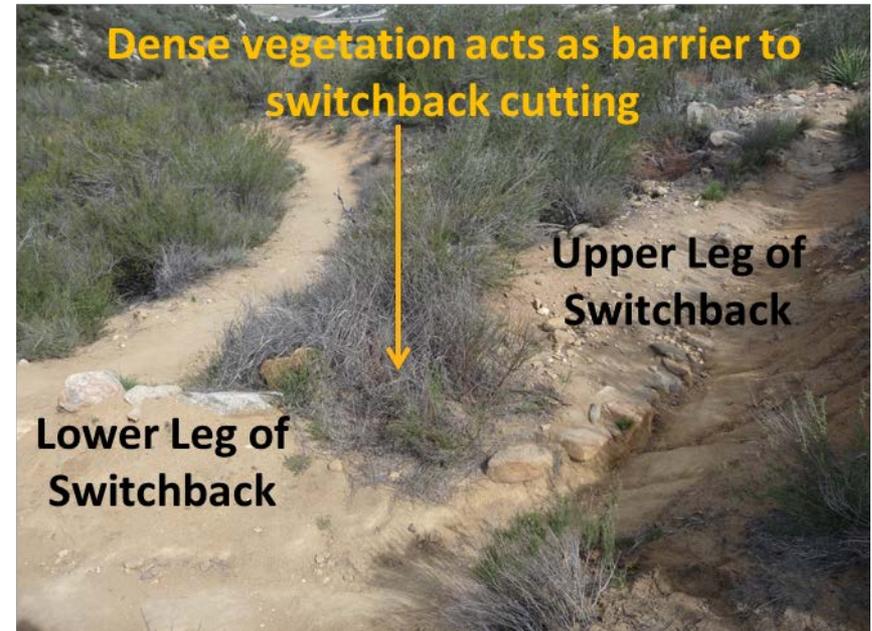
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- Goals:
  - Minimize immediate impact of construction to landscape
  - Minimize amount of human resources needed now and in the future

# From Major to Minor Control Points

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- Minor control points
  - Smaller features that can alter exact location of trail on landscape
  - Vegetation as guide
    - Leaving a tight corridor of vegetation can hem users in, preventing them from expanding their impact
  - Turning points in trail
    - Large trees, exposed bedrock, steep drops, drainages all are good points to turn the trail uphill
    - Trees can act as anchor of switchback keeping people from cutting corners



# Shaping the Trail: Corridor

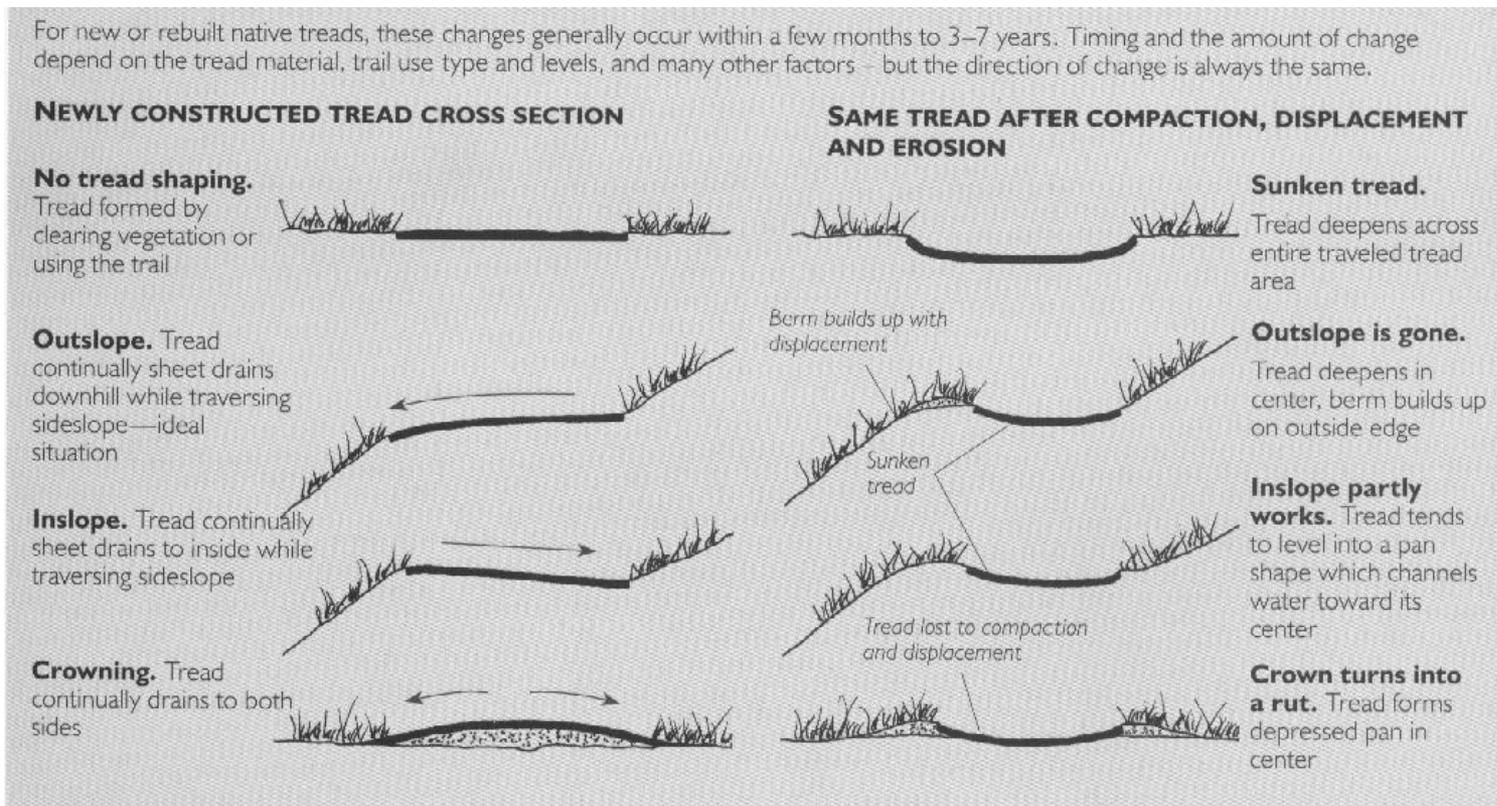
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- Exposing the corridor
  - Cut only what is needed
  - Vegetation can retain tread
  - Remove brush completely
  - Do you really need artificially created viewpoints?



# Shaping the Trail: Tread

- Keep everything gradual – no sharp turns or drops
  - Proper grade (8-10% grade)
  - Duffing
  - Grade reversals
  - Inslope & Outslope



# Remember the People Involved

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- Creators
  - Creating swath of death physically exhausting
  - Know capabilities of workers
- Users
  - Remove vegetation so their experience isn't negatively impacted
  - Layout of trail not likely to reveal every obstacle, so in construction, decisions must be made about how to get around an unexpected spring or buried rock – how would users want to take that approach
- Maintainers
  - If structure cannot be avoided, make a decision with sustainability in mind
    - Prevalence and/or fragility of local native resources
    - Simple first



# Maintaining Trails Sustainably

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- To sustain a trail in its original setting, perform maintenance:
  - Regularly
    - Don't let drains clog, brush grow in, tread creep away
  - According to Leave No Trace principles
    - Specifically for Outdoor Work Places



# Regular Maintenance Prevents Irregular Trail Problems

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- Perform Basic Maintenance every year, preferably multiple times a year
  - Will prevent major problems from developing
  - This is the simplest solution
- Goals of Basic Maintenance
  - Keep corridor open and visible
  - Keep tread high, dry, and hard
    - Feed the tread with soil!



# LNT: Plan Ahead & Prepare

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- Proper gear and supplies

- Know when and where you are going
  - Sensitive species
  - Is snow gone, are leaves down
  - Don't get lost!
  - Make sure that structure is being put in the right spot



# LNT: Travel & Camp on Durable Surfaces

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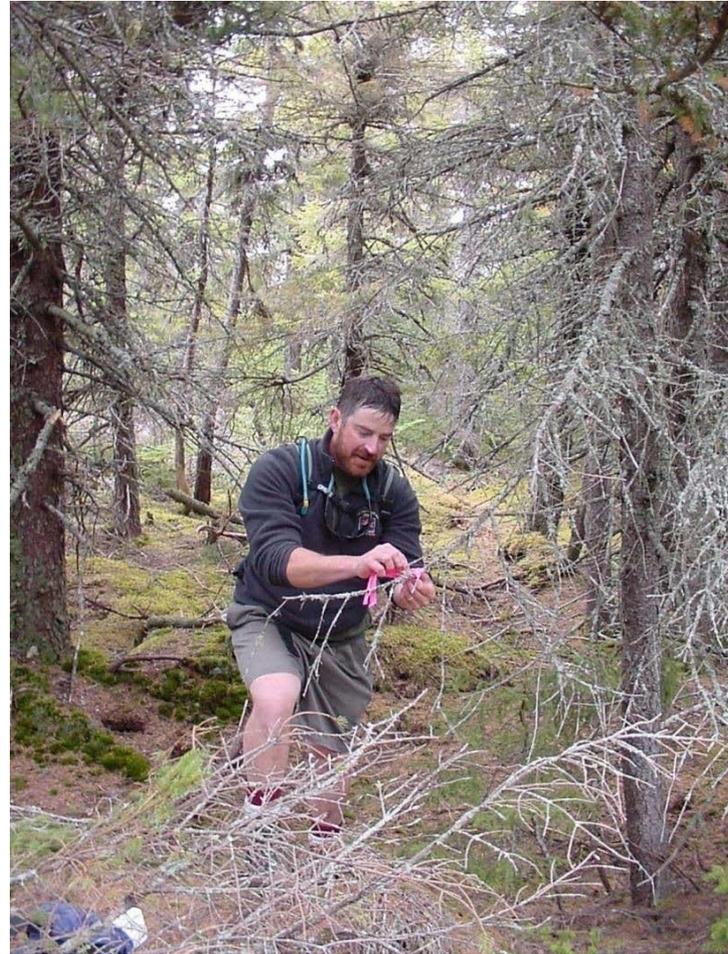
- Keep off trail resource gathering to a minimum and be thoughtful about how you are gathering those resources
  - Dispersed vs. concentrated quarry lanes
- A sustainable worksite is a clean worksite
  - Keep tools and packs consolidated to one area
- Trail crews are not backpacking groups
  - Stay in one camp and work area for extended periods of time
  - Good camps are found not made
  - Flag routes to water, bathroom, worksite
  - Don't pick the beautiful sandy bank of a river, pick a hardened area in the woods to spend multiple days



# LNT: Dispose of Waste Properly

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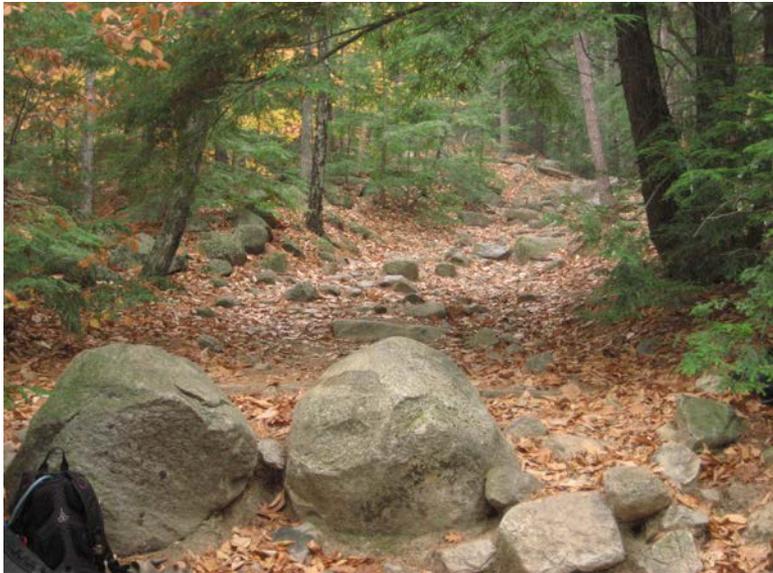
- Latrines vs. cat holes
- Proper food storage
- Remove all flagging



# LNT: Leave What You Find

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- Rehab is as important as work project itself
  - Encourages nature to heal
  - Reduces visual cue to users that trail is human made



# LNT: Minimize Campfire Impacts

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- Trail crews have the tools, time, and ability to breakdown unauthorized fire rings
- By being in one place for extended periods, impact to surrounding woods can be even greater from collection for firewood



# LNT: Respect Wildlife

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- Remember plan ahead and prepare: don't perform maintenance during sensitive breeding times
- Consider your native source material
  - A birds nest in the tree
  - A rock that shelters small mammals

# LNT: Be Considerate of Other Visitors

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- Keep crew size as small as possible
- Trail work is dangerous to workers, and users
  - Keep tools on uphill side of trail with dangerous end away from the trail
  - Don't leave massive holes in the trail for extended periods
  - Have a crew member be on the lookout for users



# So What is a Sustainable Trail?

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- If you work with the land...
- The land will not devastate your trail...
- So it will be an enjoyable resource for users...
- Who will want to keep that trail around for their own use...
- And help maintain the trail...
- And that is a sustainable trail.



# Additional Resources

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- Pacific Crest Trail Association Trail Skills College
  - Curriculum on Trail Design and Construction available online: <http://www.pcta.org/volunteer/trail-skills-college/trail-skills-college-course-curriculum/>
- USDA Soil Survey Website
  - Good for learning what types of soil are in your proposed trail area: <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
- Books on Trail Design, Construction, and Maintenance
  - *AMC's Complete Guide to Trail Building & Maintenance*
  - *Lightly on the Land*
  - *USDA Trail Construction and Maintenance Notebook*
- American Trails
  - Excellent source of countless trail articles: <http://www.americantrails.org/resources/index.html>
- Leave No Trace
  - Outdoor Workplace specific principles: <https://lnt.org/teach/leave-no-trace-outdoor-workplace>
- Training Opportunities
  - AMC Skill Sessions, Work Parties, and Volunteer Vacations: <http://www.outdoors.org/conservation/trails/volunteer/index.cfm>

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