Common Trail Maintenance Tasks using Hand Tools
Short Course

Hazards, First Aid, and Safety

Hazards:

- Weather
- Dehydration
- Hypothermia
- Frost Bite
- Heat Exhaustion/Stroke
- Insect Bites – bees/hornets/wasps/ticks
- Snake bites
- Plants - Poison Ivy, Stinking Nettle, Thorns
- Trip Hazards – roots, rocks, holes
- Sharp limbs
- Sharp tools
- Wildlife
- Other Hikers, Hunters

First Aid:

- Loggers First Aid Kit (groups)
- Weekend First Aid Kit
- Extras:
    - Splint
    - Quick clot
    - EpiPens
    - Sting Eze
    - Benadryl
    - Tick Removal Tool
    - Poison Ivy Skin Cleanser for post-trip cleanup

Safety:

- There is safety in groups, work with a companion or in a trail crew when possible.
- Do not work too close to others in your group
- If hiking alone, let someone know where you are going and when you return.
- Use a Satellite Communicator – InReach, Zoleo, Spot, etc., this is a suggestion, not a requirement
- Personal Gear:
    - Appropriate clothing *(orange hat, shirt, jacket, or vest during hunting season)*
    - Insecticide (treat outer clothing with Permethrin before your trip)
    - Sunscreen
    - Flashlight
    - Gloves
    - Hat or Helmet
    - Chaps
    - Eye Protection
    - Snacks
    - Water, water, water *(3 quarts or liters per trip)*

Volunteers should feel safe and supported
Provide adequate resources and encourage learning and development

Trail Corridor - The space the trail travels through that needs to be maintained. This includes the tread, the backslope, the outslope and the width of the cleared vegetation.

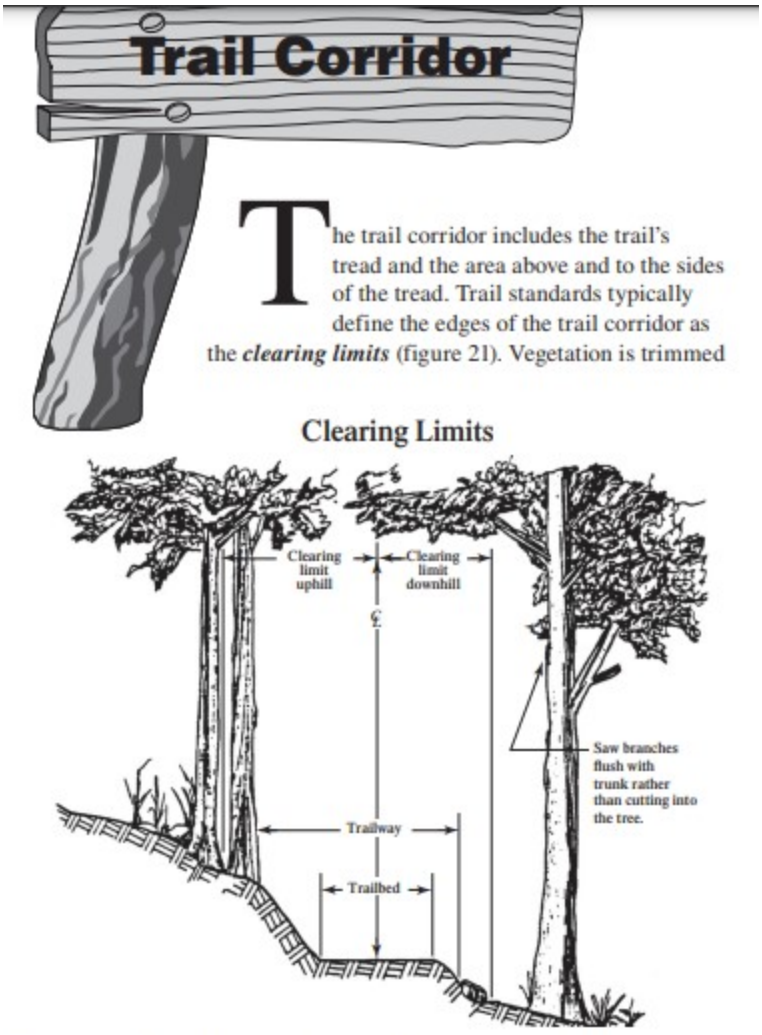
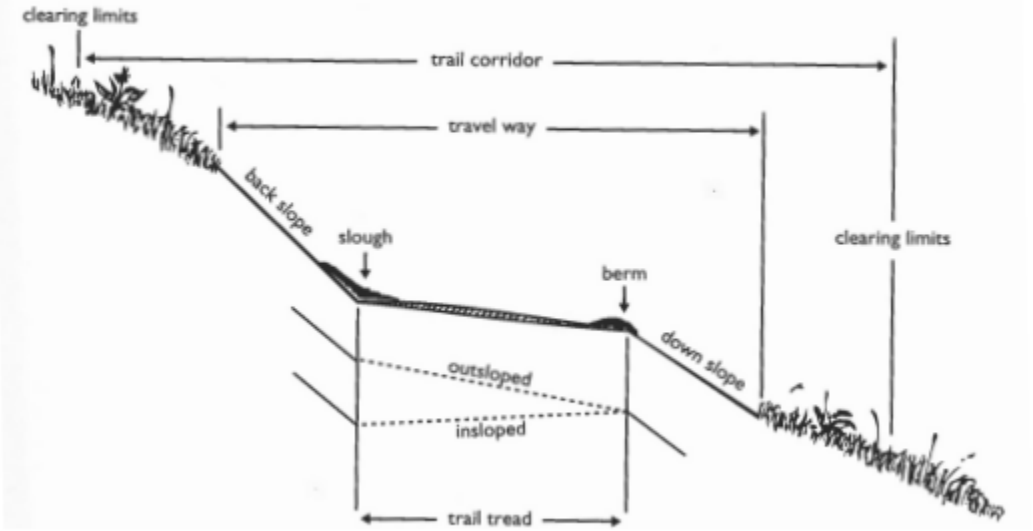


Figure 21—Terms describing the trail corridor clearing limits. You need to understand these terms to clear a trail to specifications.

Trail cleared 6 feet wide and 8 feet high, 3 to 4 feet trail tread

<u>Treadway</u> - The trail treadway, or trail tread, is the surface upon which the hiker makes direct contact with the ground

Figure 1. Trail Structure Terms (IMAGE COURTESY OF THE SCA)



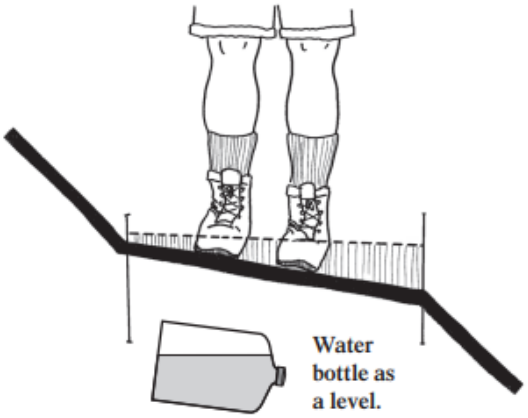
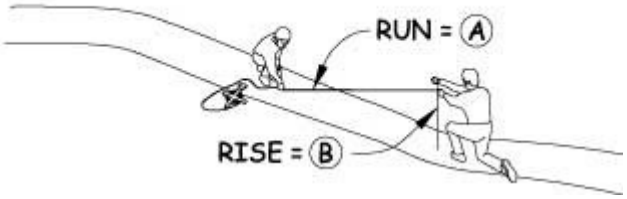


Figure 29—If your ankles start to roll, the tread has too much outslope.

Trails are generally outsloped by about 5% or about 2.4 inches over a 4-foot treadway so that water can gently run off the trail to help prevent erosion

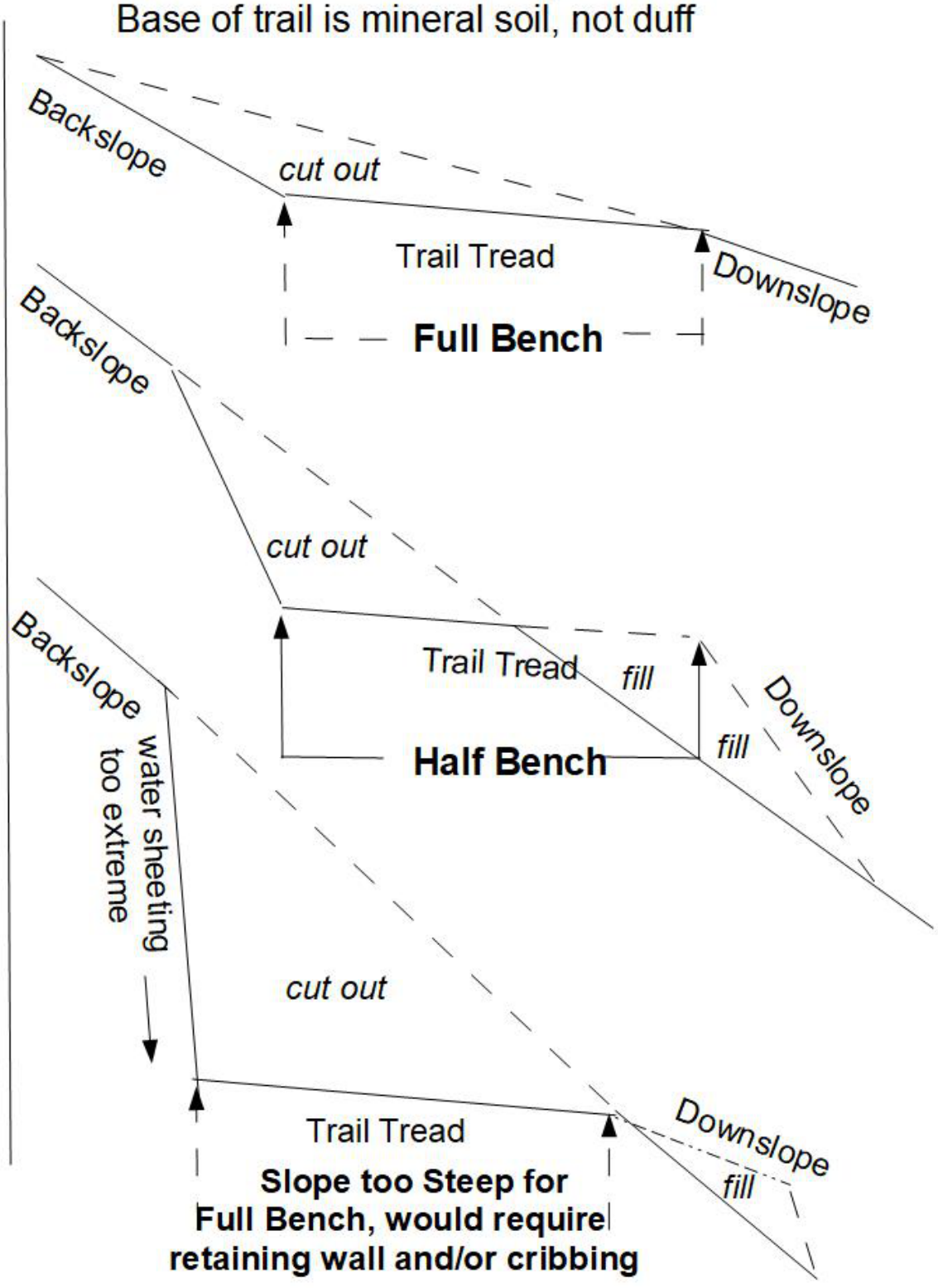


Usually, the targeted maximum incline or slope for a trail should be 6% or less (6-foot gain in elevation over 100 feet of trail). If the slope exceeds 10%, then additional mitigating actions may be necessary, such as relocating the trail, adding switchbacks, or adding more steps.

Advanced Topic - Side Hill Work

Trails are built on slopes

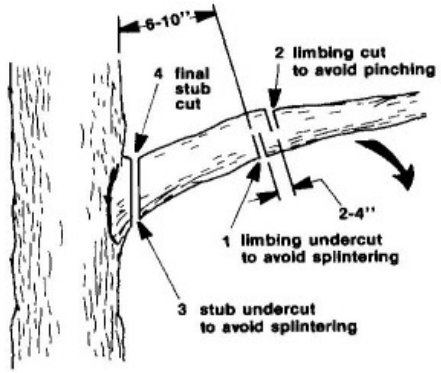
Base of trail is mineral soil, not duff



Note: The 'Half Bench' method of constructing trails is not used on the trails maintained by TATC since the moderate hillside grading in the areas of our trails allows for 'Full Bench' construction.

Brushing – is lopping and trimming in the trail corridor using loppers and hand saws - tree limbs should be trimmed flush with the trunk and saplings should be cut at ground level or just below if possible. All cuttings should be removed from the trail. Cut tree roots that are trip hazards; where a person can hook their foot under the tree root.

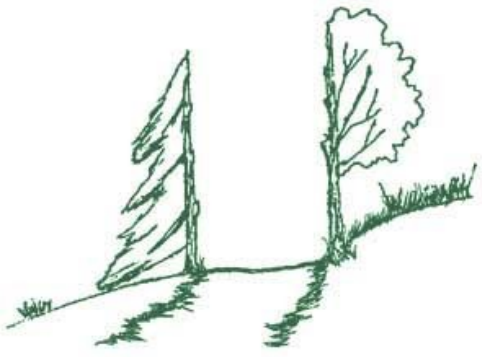
Cut branches flush with the main stem or at a fork -USDA



Proper steps in pruning

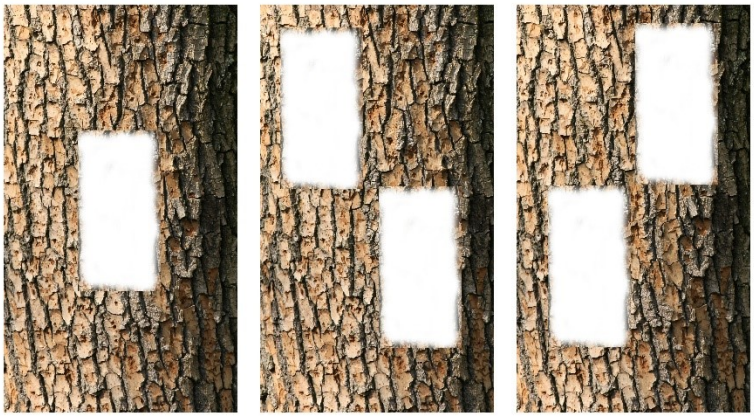
Cut saplings flush with the ground - https://naturegroupie.org/

If more than half of saplings on the sides of the trail need pruning, than cut them down, rather than create eyesores

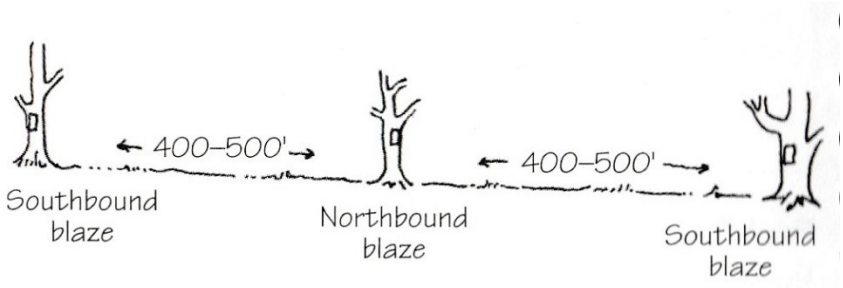


In level terrain, the corridor is cleared an equal distance on either side of the tread's centerline. For a hiking trail, this means that the corridor is cleared for 1 meter (3 feet) either side of center. On moderate to steep side slopes, a different strategy may be useful. Hikers traveling along the lower (outer) edge of the tread is a common cause of tread failure, so cut more of the brush on the uphill side of the trail and not as much on the downhill side of the trail to direct hikers away from the downhill edge of the trail.

Blazing - Blazes are painted white on the A.T. and are 2 inches wide and six inched high. Double blazes denote a change in direction, like a switchback. Many of our "double blazes" that are stacked vertically indicate a turn in the trail to direction of the side of the upper blaze. There should be no more than six blazes, facing in either direction on the trail per mile (about a six-minute walk up the trail). If you need to obscure a blaze, use brown paint. Blazes on the Mau-Har Trail are painted blue.



Straight Trail Blaze Trail Turns Left Trail Turns Right



What do you need to paint blazes

- Clothes (and yourself) that you do not mind getting paint all over
- White survey or boundary paint in a can or in an aerosol container.
- A draw knife or a wood scraper
- A paintbrush
- Paint thinner
- A 2”x6” template (optional if using a paintbrush)
- Disposable gloves
- Rags

Cutting Weeds - Also called swing blading. Using a weed cutter, or weed whip to maintain the trail corridor by cutting soft vegetation along the sides of the trail. Weeding is done 2 or 3 times a year from June to August. The sooner you can get new weeds before they go to seed, the easier it will be to keep the trail clear. The sharper the blade the less energy needed to cut.

Wear long pants, gloves, chaps, and eye protection when cutting weeds.

When used on the trail, the weed cutter will often bounce off rocks and will gouge your shins if not protected. The use of snake chaps will not only protect your shins from being gouged by the weed cutter, but they also protect your legs from snake bites.

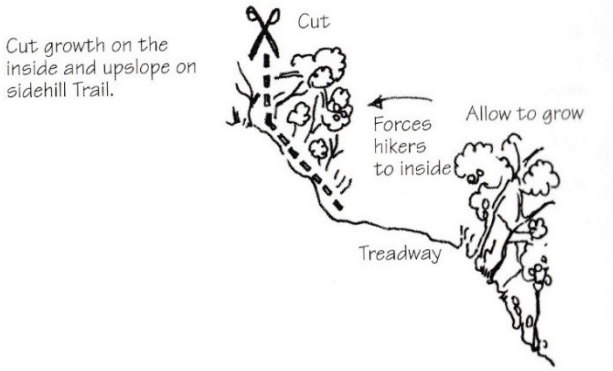
Chips from rocks can fly up and hit the user in the eye if they are not wearing eye protection, or they can hit other coworkers if nearby, although anyone cutting weeds should maintain a safe distance of at least ten feet from other workers.

Watch out for snakes, ground bees, hornets, or wasps which can be stirred up while cutting weeds.
Try not to touch the blade of the weed cutter, it may have oils from poison ivy on it. The blade should be cleaned and sharpened after use.

Cut growth on the inside and upslope sidehill of the trail, only cut on the downslope side if weeds are Obscuring more than a quarter of the treadway

Especially watch out for ticks while weeding. To protect yourself from ticks:

- Use repellent, apply a repellent that contains DEET, picaridin, IR3535, Oil of Lemon Eucalyptus (OLE), or para-menthane-diol (PMD) to exposed skin
- Use products that contain permethrin to treat clothing, boots, and socks
- Wear a hat or cap, wear a long sleeve shirt, wear gators
- Conduct a full-body tick check as soon as possible
- Carry a tick removal tool and know how to use it ahead of time
- If you find a tick, remove it right away



Clearing Blowdowns and Sawing

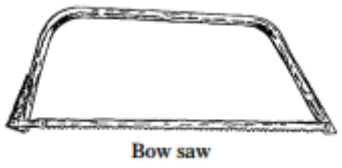
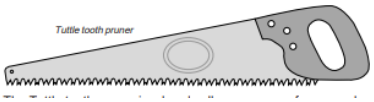
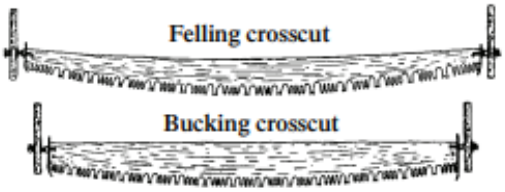
Volunteers are allowed to clear blowdowns only, not standing or leaning trees.

Only Certified A.T. Sawyers can cut trees with a bole equal to or greater than 5” in diameter, regardless of the type of tool used"

Certified A.T. Sawyer must have their A.T. Saw Certification renewed every 3 years, First Aid renewed every 2 years, and Adult CPR renewed every 2 years. Certified A.T. Sawyers must be present at the work site when blowdowns are being sawed.

Volunteer without certifications can cut saplings – any small trees with a bole less than 5” in diameter.

Tools and Gear for Sawing:

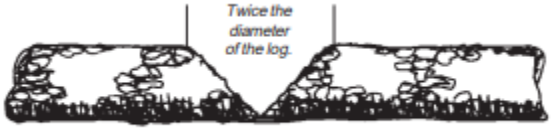
Bow Saw	Folding Pruning Saw	Pruning Saw
		
Hand Saw	**Crosscut Saws**	**Ax**
		
Wedges	**WD-40**	**Personal Protective Equipment**
		PPE: • Helmet (4-Point) • Safety Glasses with Side Shields, ANSI Z87.1 • Sturdy Boots • Gloves Long-sleeved Shirt

Spring Poles – are trees, segments of trees, limbs, or saplings, which is under stress or tension due to the pressure or weight of another object. A spring pole is potentially dangerous until properly mitigated.

Cut a sapling or branch (spring pole) that is bound down only when it is necessary. Make a series of small cuts on the compressed side of the sapling or branch to release the bind, before cutting the opposite side.

Axe Work - Before chopping, check for adequate swing clearance. Remove underbrush and overhanging branches that might interfere with your swing. Be sure your footing is stable and secure. Chop only when you are clear of other workers. Never chop anything with an ax above shoulder height.

V-Notch – start your cut so that the v-notch is twice the width of the diameter of the log.



Branching – cut branches off logs at the underside of the branch, not at the acute angle where the branch meets the tree.

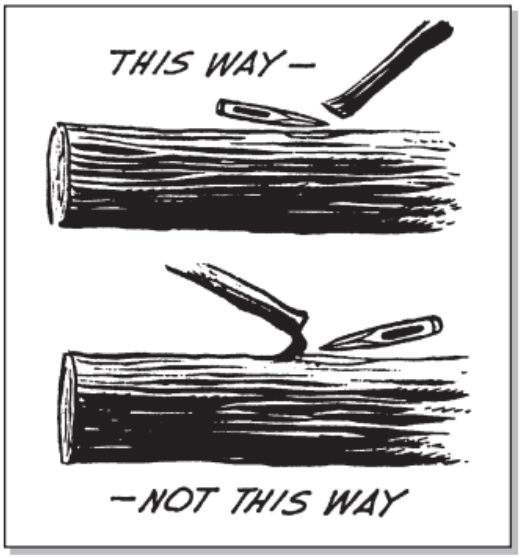
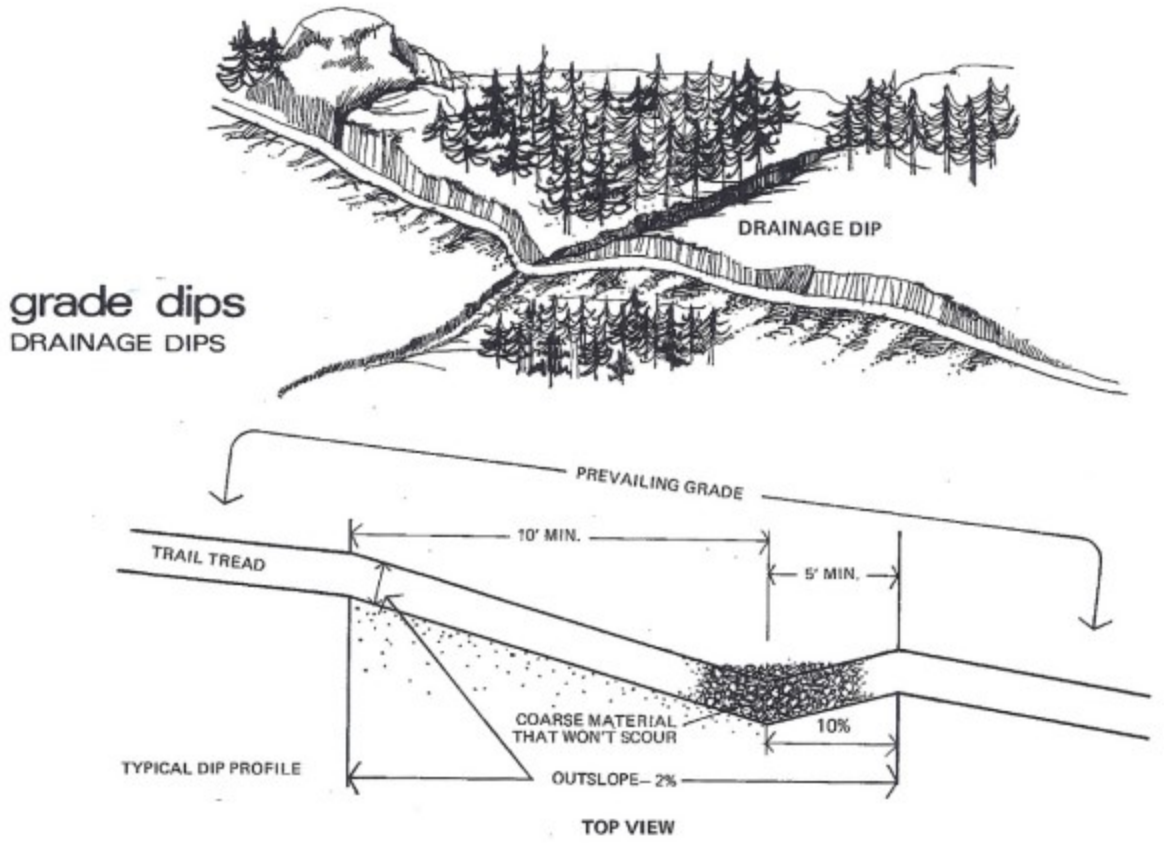


Figure 88—Cut the underside of the branch when lopping branches (drawings by Frederic H. Kock).

Grade Dips – The best grade dips are designed and built during original trail construction. These are also called terrain dips, Coweeta dips, and swales. Other versions, often called rolling grade dips, or drain dips, can be built on most sidehill trails or constructed to replace waterbars. The basic idea is to use a reversal in grade to force water off the trail without the need for any other structure. ATC now recommends that grade dips be used instead of waterbars and that when existing waterbars need replacement, they be replaced with grade dips.

The grade for a grade dip on the trail is reversed for about 3 to 5 m (10 to 15 ft), then "rolled" back over to resume the descent. A trail that lies lightly on the land will take advantage of each local drainage to remove water from the tread (Figure below).

Grade dips are much more effective than waterbars and require less maintenance. Along with outsloping, they are the drainage structure of choice. Grade dips are the most unobtrusive of all drainage structures if constructed with smooth grade transitions, and they require very little maintenance. Be sure to protect the drain outlet by placing guide structures along the lower edge of the tread above or below the outlet.



You will need to create your own gravel for use as the course material for constructing the grade dip. The gravel depth should be at least 4 inches, so this means that for an area of the treadway that is 4-foot wide and 5-foot long that is covered in gravel, that 6.7 cubic feet, or about 700 pounds of gravel will be needed.

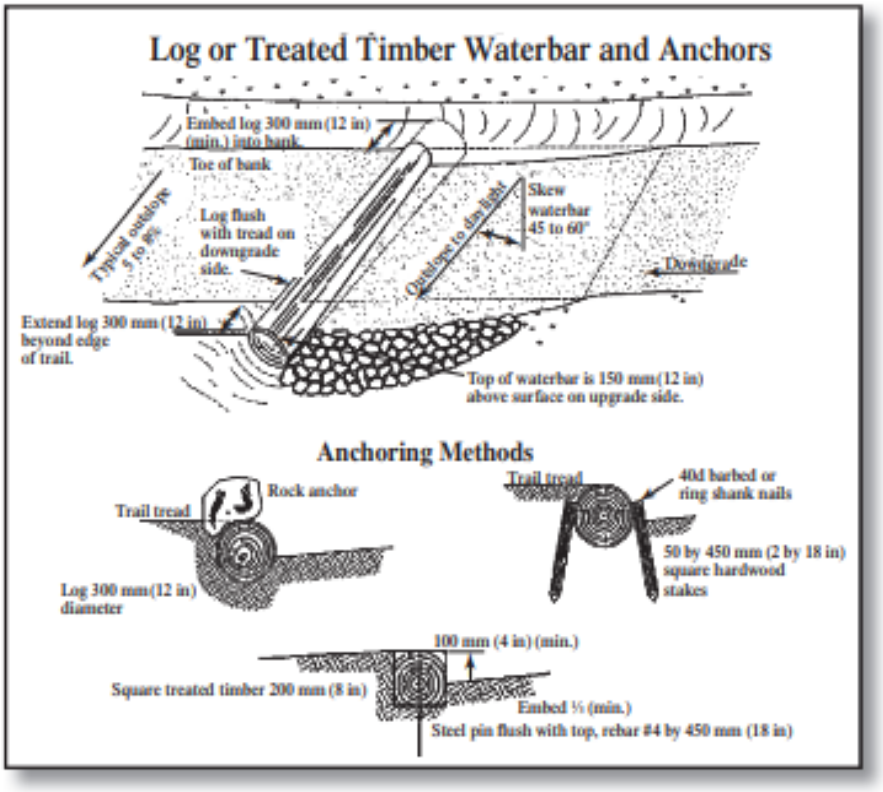
You will need an 8 lbs. sledgehammer to break up rocks to make the gravel. Try finding weathered rocks that you can more easily break up. You will also need buckets to collect and carry the rocks. Safety equipment used for installing grade dips should include gloves, safety glasses, a helmet with a face shield, chaps, and steel-toed boots. Also wear pants and a long-sleeved shirt made up of a heavier material.

Grade Dips, like waterbars, need to have organic debris cleaned out of them periodically, especially after leaf fall in the Fall. Rake out debris to the bare gravel and replace gravel washed away as needed.

Waterbars – are raised drainage structures made with logs or rocks across the trail at approximately a 45-degree angle to move water off the lower edge of the trail to help prevent trail erosion.

Equipment used to build waterbars can include: axes, wedges, pulaskis, shovels, draw knifes, hazel hoes, fire rakes, web slings, buckets, stakes, saws, and sledge hammers.

Log Waterbars



Try to use seasoned logs from downed dead trees that are at least 12” in diameter, that have been suspended off the ground and have dry cured naturally. Do not use rotten or green logs. Peel the bark off of logs used for waterbars

Clear out three inches of soil for six to seven shovel lengths, about 12” from the uphill side of the trench used for the waterbar.

The log should be buried more than halfway into the trench, to create a step-over of between three to four inches on the uphill side of the trail. The log should be outsloped about 5-percent to match the slope of the trail.

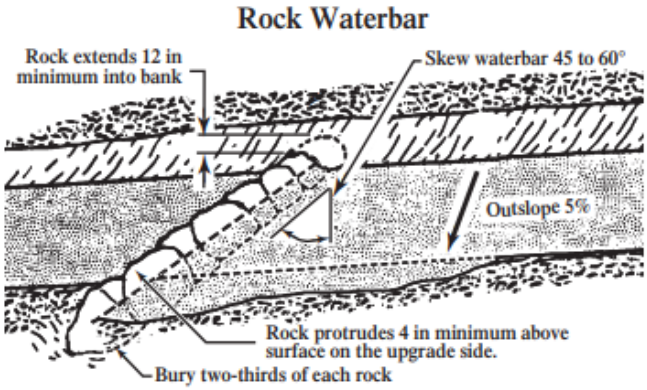
The log used for the waterbar should extend at least 12 inches off either side of the trail. Anchor either end of the log used for the waterbar with stakes or rocks.

Mineral soil cleaned from the trench and uphill from the trench can be placed behind the waterbar so the top of the waterbar is level with the soil behind it. Mineral soil is dirt that is mostly made up of minerals and contains less than 20% organic matter. An alternative to using Mineral soil would be to use crushed stone. This is definitely more work (crushing larger rocks into smaller ones with a sledge hammer), but it is less subject to erosion and helps reduce log rot by improving drainage behind and under the log.

Toss the slough and duff excavated to install the waterbar well off the trail. Slough (pronounced "sluff") is mixed soil, small rocks, and debris that has moved downhill to the inside of the tread, narrowing it. Duff is the decomposing organic matter and silt that makes up the top layer of the soil.

Hikers may decide to bypass the waterbar if there is an inviting path to do so. If people are bypassing the waterbar, close the area with brush or a pile of loose rock. This is called “uglification”, the process of placing large rocks, logs, or heavy brush at the edge of the trail to help prevent hikers from walking on the edge or around the trail.

Rock Waterbars



Whenever possible, grade dips should be constructed in lieu of waterbars, but if waterbars are to be used, then rock waterbars should be used in lieu of log waterbars, the rock waterbars last much longer than log waterbars.

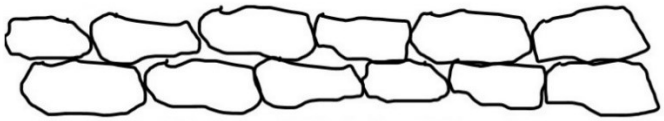
The rocks used for rock waterbars should be oblong and flattened in shape, about 12 inches high when turned on their sides, and be about 16 inches long. Rocks should be buried for most of their height and barely protrude above grade on the uphill side, with dirt backfilled behind them on the downhill side.

When placed, waterbar rocks should not wobble at all when stepped on. They should be as large as manageable with two-thirds of their height (7" to 8") buried beneath the surface.

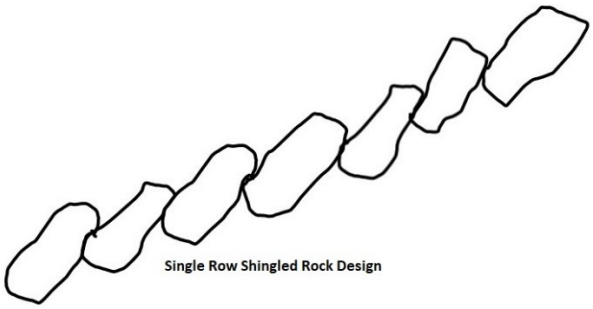
The rocks for waterbars can be placed in a single row where the ends of the rocks are butted against each other, or they can be place in a double row, with the rocks alternately staggered, or they can be staggered in a single row in a cascading shingle-like manner. The single row shingled rock design is the most effective and easiest to build, but it is also the hardest to find the right size rocks to fit together.

Use mineral soil for the ditch in front of the rock waterbar, to build up the swale, and behind the waterbar in a similar way to that described above for log waterbars. Toss slough and duff excavated well off the trail.

Single Row Design, with Rocks Butted Against each Other



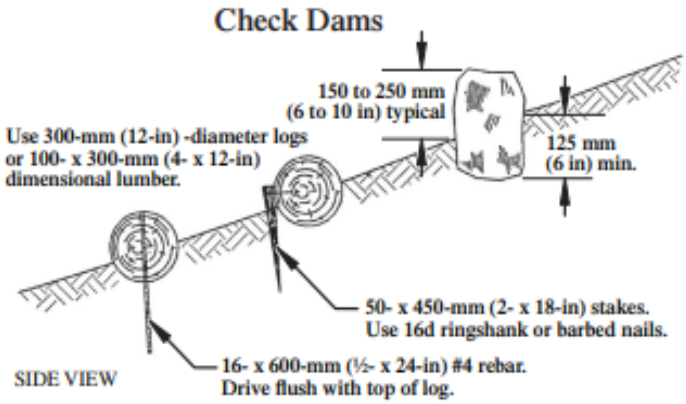
Double Row Design, with the Rocks Alternately Staggered



Single Row Shingled Rock Design

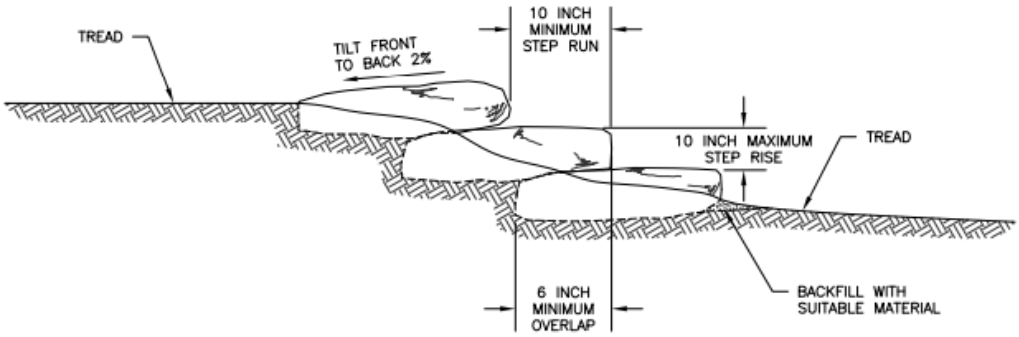
Use a Rock Hammock to Move Rocks

Check Dams – A check dam may look like a log or rock waterbar, except that it is built perpendicular to the trail, rather than at an angle like a waterbar. The purpose of a check dam is to slow water runoff so that sediments will be dropped behind the dam. Typically used on badly gullied trails to slow water and deposit sediment behind the dam.



Grade Dip and Waterbar Maintenance – Grade Dip and Waterbar drainage channels should be maintained (raked out) a minimum of twice a year. The accumulation of branches, twigs, leaves, small rocks, and organic soil will effectively block the drainage channel over time, so ensure to rake out this accumulation to the bare mineral soil.

Steps – made of rocks or logs are used to gain a lot of elevation in a short distance. Steps are common on steep hiking trails and on switchbacks.



ELEVATION VIEW

OVERLAPPING ROCK STAIRWAY

Stair Proportions

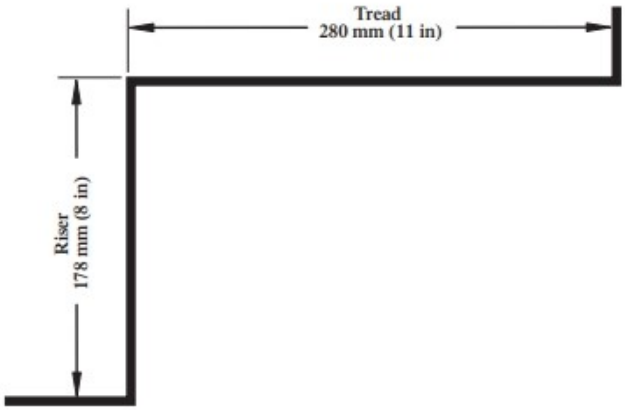
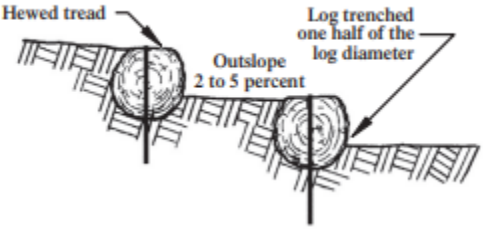


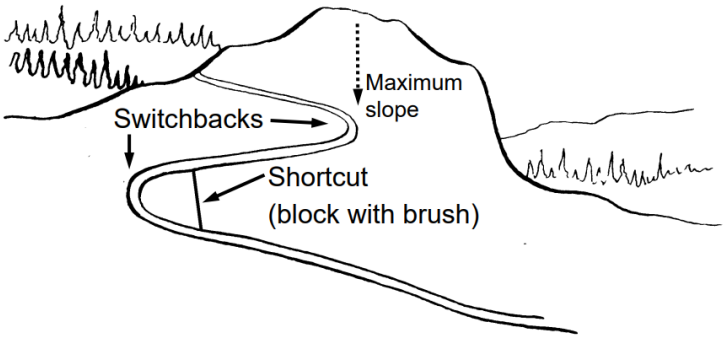
Figure 81—A general rule of thumb for stairs: twice the riser plus the tread should equal 635 to 686 millimeters (25 to 27 inches).

Individual Steps—Logs



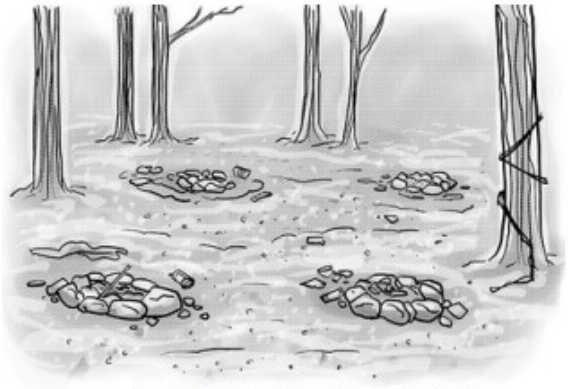
Using rocks for steps is preferred over using logs for steps, since they last longer. Remove and dispose of duff and top organic layers down to mineral soil before laying the rocks into place. Steps need to be comfortable to climb or they won't be used. This means keeping the rise a reasonable 150 to 200 millimeters (6 to 8 inches) and the run long enough to hold a hiker's entire foot, 254 to 305 millimeters (10 to 12 inches). It's helpful to corral the sides of steps with rocks to encourage users to stay on the steps. Overlap the rocks by at least 6 inches. Tilt rocks front to back by two or three degrees.

Herd Paths – also known as social trails are unofficial, unmarked trails created by the repeated passage of hikers, often leading to popular destinations or shortcuts. We often see herd paths on switchbacks. Block the herd path with logs and brush, preferably an impenetrable mass of logs, since dead brush quickly breaks down.



Campsites – there are designated campsite areas along the A.T., usually near shelters, and dispersed camping is allowed along the sides of the A.T. in Central Virginia if 200 feet away from any stream or river. However, it is sometimes necessary to remove campsites when they become problem areas due to proliferation, or to protect endangered species. Campsites are removed by obscuring them with logs, brush and ice-berging rocks.

Fire Rings – clean ash and any litter out of fire rings. Disperse the ash into the woods where it can't easily be seen, pack out the litter. If you find several fire rings in an undesignated area and there is a clear need to get rid of at least some of them, disperse the rocks and ash into the woods where it is not easily seen or retrieved, and fill and rake over the fire pit.

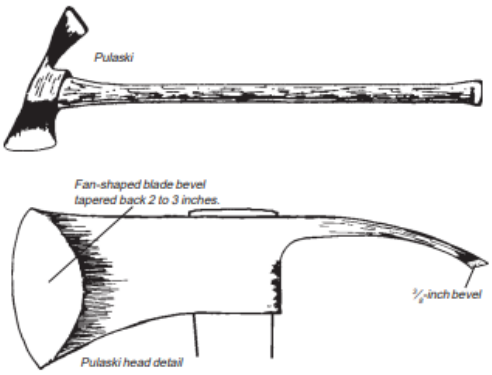


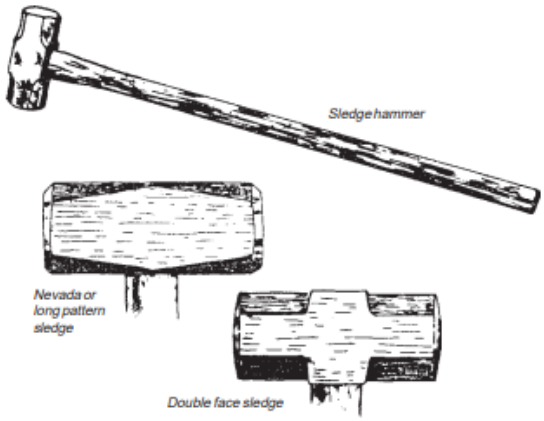
An obvious need to eliminate fire rings

Trash and Litter - Finding trash or litter along the trail is fairly rare. There is the occasional candy or power bar wrapper which is easy enough to bend over and pick up if you see them. It is more likely that you will find some unburnt trash in fire rings. It is a good idea to carry at least one trash bag to use to pick up any trash or litter. Be safe, wear gloves when picking up trash, and look out that you don't get cut or stabbed by sharp objects.

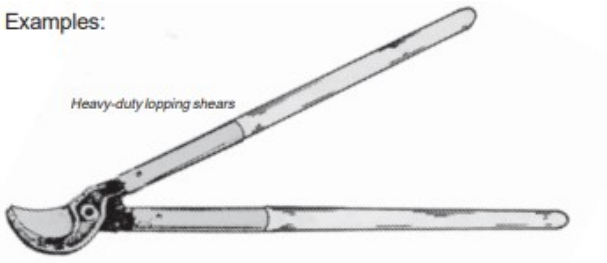
Reporting – When working individually, and not in a trail crew, report any trail conditions that need more attention, and any volunteer hours worked and travel time to the Trail Supervisor by using the Timekeeping forms loaded to TATC's website.

<u>Tools</u> (not previously shown)

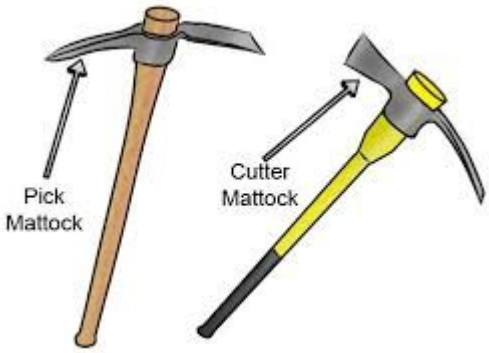




Crowbars



Fire Rake



One-Person Crosscut Saw

Protections for Appalachian Trail Volunteers

under Federal Volunteers in Parks (VIP)

and Volunteers in Forests (VIF) Programs

Volunteers working on the Appalachian Trail under the auspices of either the U.S. Forest Service (USFS) (Volunteers in Forest) or the National Park Service (NPS) (Volunteer in Parks) are covered by Volunteer Service Agreements (VSAs) and entitled to certain protections as authorized by two separate laws: • Volunteers in the National Parks Act of 1969, known as VIP; • Volunteers in the National Forests Act of 1972, known as VIF. Under the VIP and VIF acts, volunteers are considered to be federal employees for the purposes of: 1) Compensation for work-related injuries or illnesses under the Federal Employees Compensation Act, relating primarily to costs for medical care in case of injury or illness; 2) Protection from tort claims under the Federal Tort Claims Act that may be filed by anyone claiming to have sustained personal injury or property damage due to the actions of a volunteer; 3) Claims relating to damage or loss of personal property of the volunteer while performing volunteer service.

TATC Trail Maintenance Scheduling

General Maintenance Schedule

- Late Winter or early spring (or as soon as snow melts) - clear blowdowns and clean out water bars.
- Mid-June to August - cut annual growth, repaint blazes as needed.
- After leaf-fall - clean out grade dips and water bars
- Early Spring to late Fall - clear blowdowns and repair damage to trail caused by storms and erosion

2025 TATC Scheduled Trail Maintenance Trips

- April 11th-13th - Spring Backpacking Walk-Thru
- April 25th-27 - Spring Maintenance & Family Campout
- June 20th-22th - Lopperfest #1
- July 18th-20th - Lopperfest #2
- August 22nd-24th - Lopperfest #3
- October 10th-12th - Fall Backpacking Walk-Thru
- October 24th-26th - Fall Maintenance & Family Campout

❖ Special maintenance trips are scheduled in response to trail conditions

❖ TATC Section Leaders can schedule their own trips, and are expected to make at least four trips each year.

Credits:

Page 3 – Trail Corridor 1 – USDA Trail Construction and Maintenance Notebook 2007

Page 3 – Trail Corridor 2 – Appalachian Trail Club Fieldbook

Page 4 - Treadway 1 - Student Conservation Association

Page 4 – Treadway 2 - USDA Trail Construction and Maintenance Notebook 2007

Page 4 - Treadway 3 – USDA Accessibility Guidebook for Outdoor Recreation and Trails

Page 5 – Side Hill Work – Jim Sexton, TATC

Page 6 – Brushing 1 - https://www.nrcs.usda.gov/sites/default/files/2022-09/stelprdb1167386-pruning.pdf

Page 6 – Brushing 2 - Cut saplings flush with the ground - https://naturegroupie.org/

Page 6 - Brushing 3 - USDA Trail Construction and Maintenance Notebook 2007

Page 7 – Blazing 1 - https://daytripjournals.com/follow-the-blazes-trail-blazes-and-their-meaning-hiking-ontario/

Page 7 – Blazing 2 - Appalachian Trail Club Fieldbook

Page 8 – Weed Cutting 1 - Appalachian Trail Club Fieldbook

Page 8 - Weed Cutting 2 - https://appalachiantrail.org/register-blog/trail-tools-brushing/

Page 8 – Weed Cutting 3 - https://www.homedepot.com/p/reviews/Ames-36-in-Wood-Handle-Double-Blade-Weeder-2915300/204476217/3#overlay

Page 8 – Weed Whacking 4 - https://www.homedepot.com/p/reviews/Ames-36-in-Wood-Handle-Double-Blade-Weeder-2915300/204476217/3#overlay

Page 9 – Clearing Blowdowns – TATC Facebook Photo

Page 10 – Spring Pole 1 - USDA Chain Saw and Crosscut Saw Training Course Handbook

Page 10 – V-Notch - https://www.pcta.org/wp-content/uploads/2019/02/103-Basic-Saw-Crew-Training-v0119.pdf

Page 10 – Branching - https://www.pcta.org/wp-content/uploads/2019/02/103-Basic-Saw-Crew-Training-v0119.pdf

Page 11 – Grade Dips - USDA Trail Construction and Maintenance Notebook 2007

Page 12 – Log Waterbars - USDA Trail Construction and Maintenance Notebook 2007

Page 13 – Rock Waterbars 1 - USDA Standard Trail Plans

Page 13 – Rock Waterbars 2 - https://www.pisgahconservancy.org/

Page 13 – Rock Webbing – toolsfortrails.com

Page 14 – Check Dams 1 – Bill Rogers, 2017 TATC Trail Maintenance Booklet

Page 14 – Check Dams 2 - USDA Trail Construction and Maintenance Notebook 2007

Page 14 – Waterbar Maintenance – Bill Rogers, 2017 TATC Trail Maintenance Booklet

Page 15 – Steps 1 - USDA Trail Construction and Maintenance Notebook 2007

Page 15 – Steps 2 - USDA Trail Construction and Maintenance Notebook 2007

Page 15 – Steps 3 - USDA Trail Construction and Maintenance Notebook 2007

Page 16 – Herd Paths - https://cdn2.assets-servd.host/material-civet/production/images/documents/NYNJMaint101.pdf?dm=1620062749

Page 16 – Fire Rings - https://appalachiantrail.org/wp-content/uploads/2022/11/Fire-Ring-Supplemental-w.pdf