



Extension

THE STEWARDSHIP NETWORK: NEW ENGLAND TRAINING GUIDES

Trail Maintenance for Volunteers

Volunteer Handbook

Skills, tips, and advice for working on New England trails



The Stewardship Network
New England

Trail Maintenance for Volunteers

Skills, tips, and advice for working on New England trails

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Trail Maintenance for Volunteers

The purpose of this guide is to help you, as a volunteer, perform basic trail maintenance to make trails in your care safer and more sustainable.



There are many reasons why volunteers are great for trails. Whether you volunteer for a trail club, serve as a steward of conservation land with trails, or serve on your town’s conservation commission or trails committee, you can play a critical role in maintaining safe and sustainable trails.

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*“I took a walk
in the woods
and came out
taller than the
trees.”*

—Henry David
Thoreau



Volunteers and Trails

When you volunteer on a trail, you become connected to that place in a special way. It's a great way to connect people to local conservation lands, and benefit your community at the same time. Volunteering for trails can be hard work, but overcoming challenges and spending time in nature can be endlessly rewarding.



People who love hiking or other trail activities, such as running, biking, or skiing, can volunteer to give back and make sure the trails they use are long lasting and safe. A volunteer trail workday or event (Think "Trail Fest" or "Community Clean-Up Day") can also be a great way to engage new people and cultivate the next generation of stewards. Volunteering to care for a trail and encouraging others to help will plant the seed for a future where people continue to enjoy and steward the open spaces in their communities.

Is volunteering on trails right for you?

It is important to consider whether volunteering on trails is the right volunteer job for you. Trail work can be a fun way to explore nature while contributing to the important work of stewarding recreational trails.

However, it also requires the physical ability to hike over varied terrain while carrying tools and a level of comfort with navigating in the woods. See the companion handbook, *Outdoor Skills for Conservation Volunteers*, for help on map and compass skills, and the "Safety Recommendations" section on page 25 for helpful tips on staying safe while on the trail.

Because trail work projects vary in physical challenges and skills required, it's important that you are aware of your personal limitations. You should always feel comfortable declining a task that's beyond your abilities, or ask for additional instruction or training if further technical knowledge is needed. You may come across members of the public recreating on the trail while you're volunteering, so it's important to conduct yourself in a professional manner, and follow the best practices outlined in this guide.



About this Handbook

The trail maintenance skills described in this handbook are best learned in combination with field-based instruction from someone experienced in trail maintenance and construction. This handbook is recommended for volunteers who want to better understand how to take care of trails and when to look for assistance from someone with more experience or a professional trail contractor.

While many elements of trail maintenance can inform how you think about designing and constructing new trails, this handbook is not intended to be a guide for new trail design and construction. Additional training and, more likely, professional contractors that specialize in trail layout and design are recommended for planning and building new trails. There are many existing trails across New England that need a volunteer's care. We encourage you to seek out, enjoy, and help improve and celebrate the existing trails in your community.



Why Do Trails Need Help?

Water and erosion due to poorly designed and placed trails are the most common trail problems in New England. Have you hiked on mountain trails that seem to go straight up to the summit? These steep trails were created to be expedient, not sustainable. Heavier water flows occur on steep terrain and the trail often provides the path of least resistance for water to flow downhill, which will erode the trail over time.

Have you travelled on flat trails in low areas that seem more like a swamp than a trail? Trails that are on level terrain or in poorly drained soils require specialized management to keep them dry and in good condition. All too often trails through areas with poor drainage become larger and wider as the users continue to go around the affected wet area. No one wants to walk or ride through a mud pit! Widened, muddy trails can cause long term damage to the ecosystem around the trail and require attention.

People also impact trails simply by using them over time and in various ways. You can imagine how years of hiking, biking, or horse riding can wear on the trail. The source of the problem is that the ground along trails compacts over time or is displaced. As people repeatedly travel down the center of the trail, loose soil builds up along the edges and can turn the trail into a water trough. Loose soil and leaves will then wash down the trail and create dams and diversions that worsen the problem.

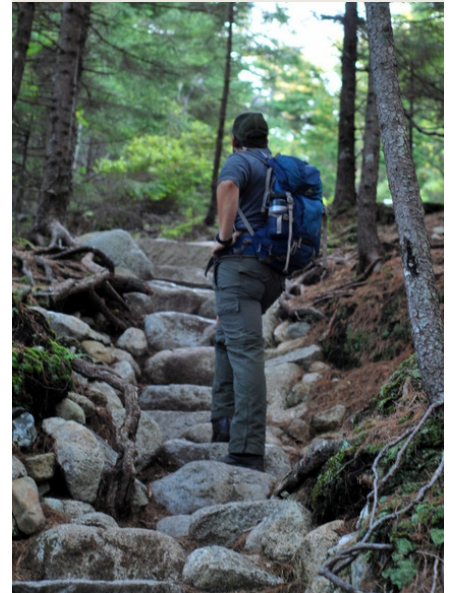
In addition to being inconvenient for recreational users, trails that have water and erosion problems can also be unsafe. While you can check the weather and prepare for a rainy day on the trail, a chronic wet area on an otherwise dry trail exposes you to the risk of not having adequate footwear or a change of clothes. Slips, trips, and falls are more likely to happen when the trail is wet. Eroded trails in steep areas or in the backcountry can be extremely dangerous.

If trail volunteers had a mantra, it would be, "Get the water off the trail and the trail out of the water." As a volunteer, your priorities should be to:

- Reduce the amount of water that stays on the trail
- Reduce the speed of the water moving down a trail
- Reduce the erosion caused from use over time
- Encourage users to stay on the established tread (trail surface)

It sometimes feels like an unending battle, but volunteers can easily learn the best techniques to keep trails in good condition.

History of Trails



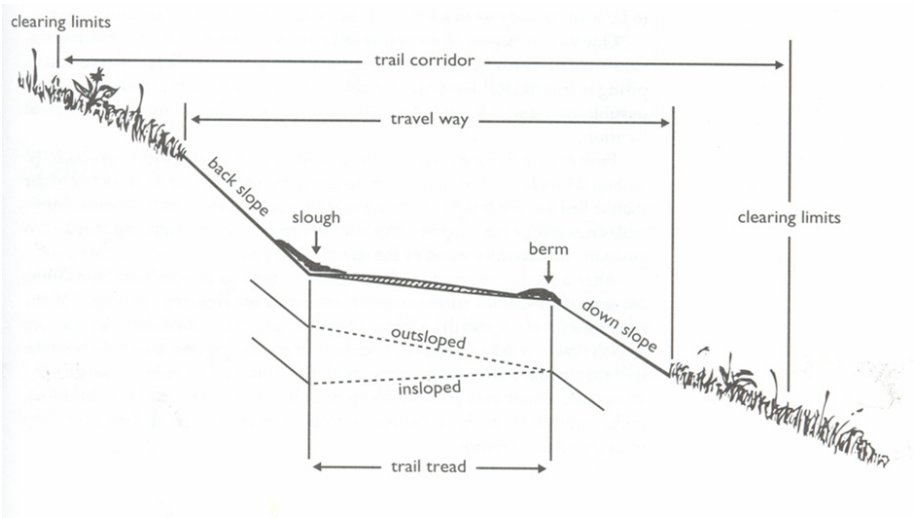
Prior to the late 1800s and early 1900s, little thought was given to trail sustainability, or how trails would hold up to use over time. No one could have predicted the increased impact on trails that began in the 1950s, skyrocketed in the 1970s, and continues today through hiking, trail running, mountain biking, and other forms of recreation. Over the past few decades, as the awareness for protecting trails has grown, modern techniques and methods have been developed that focus on longevity and sustainability of trails.



Trail Terminology

To become more familiar with trail maintenance, it is helpful to understand some basic vocabulary. All volunteers working on a trail should know these terms and what they mean to prevent confusion. You'll use these terms to communicate with your trail manager, volunteer coordinator, landowner, or the organization or agency responsible for the trail.

Parts of a Trail



Trail tread

This is the actual surface that is traveled upon. Hiking trails are usually between 18"-24" in width. Mountain bike trails are typically similar to or smaller than hiking trails. Trails used by horses are often 4 ft. wide. Always check with the landowner or trail manager to see if there are local specifications for the trail you're working on.

Trail corridor

The space that the trail passes through including the trail tread and area cleared of vegetation.

Clearing limits

The area of vegetation that is cleared for the trail to pass through. This averages as much as 4'-8' in width and 8'-12' in height depending on the location, vegetation, and trail users. Cross-country ski and equestrian trails are typically wider and taller to accommodate snow pack or the height of a horse with rider.



NOTES



Special terms for trails on sloped terrain

Grade

Sometimes called running slope, the grade is the slope as you travel (or run) along the trail. Trails with steep grades require a much higher level of maintenance.

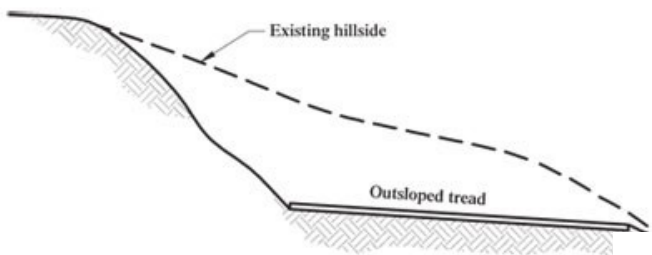
Side-slope

The overall slope of the terrain where the trail is built. A trail on more or less flat ground may still have a side-slope if the terrain around it is gradually sloped.

Bench trail

Trails that are built into hillsides are called bench trails. In a bench trail, the entire tread is cut out of the hillside.

A bench trail is **outsloped** (typically 3 to 5 %) to allow water to flow off the trail on the downhill side.



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

Backslope

The uphill side of a bench trail.

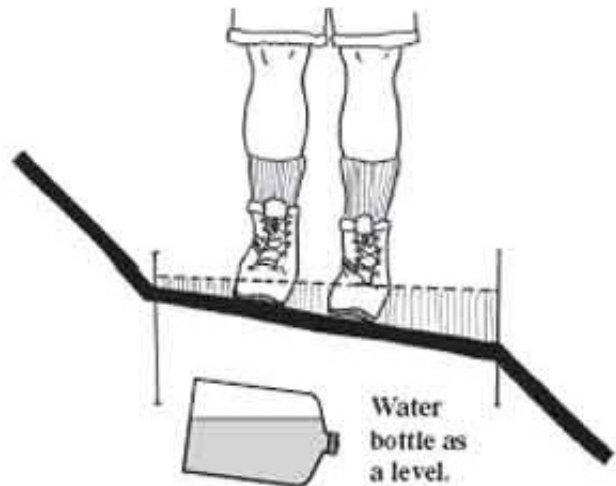
Downslope

The downhill side of bench trail.

Hinge (Heel)

With your back to the uphill side of a side-sloped trail, the heels of your feet mark the hinge or heel of the trail tread. It is the point between the trail tread and the lower edge of the backslope.

It should be slightly higher than the critical edge, or toe of the trail to allow water to move off the trail.



Critical Edge (Toe)

With your back to the uphill side of a side-sloped trail, the toes of your feet mark the critical edge, or toe of the trail tread. It marks the spot between the trail tread and the downslope that needs to be kept clear to allow for the passage of water, hence the term "critical."

3. Shovels

Shovels are not specialized trail tools, but they are surprisingly versatile for basic trail maintenance. Shovels can be used for clearing drainages and moving loose soil during tread work. They are available in various blade shapes and handle lengths. The common, or round-point, shovel weighs between 5 and 6 pounds and its head measures about 8 by 12 inches. If a shovel feels too heavy or large, choose a smaller version—remember, you will need to carry your tools! The square shovel is a flat-bottomed model intended for shoveling loose materials, not digging.

When scooping materials, bend your knees and lift with your legs, not your back. Push the shovel against your thigh, which serves as a fulcrum. This makes the handle an efficient lever and saves your energy and your back. Don't use the shovel to pry objects out of the trail or the handle is likely to break—that's a job for a pick or rock bar.



4. Grubbing Tools

There are a variety of grubbing tools that can be used when moving loose soil, sediment, leaves or removing roots or small rocks. Small hoes, such as grub or hazel hoes are handy trail tools. They are often lighter weight and easier to carry than a shovel, and can do a good job of moving loose soil, sediment, and leaves. They are the ideal tools to use when working in heavy duff, like when constructing a new trail, but they also come in handy for tread maintenance. The beveled edge of a hoe can also be used to chop small roots in your way.



5. McLeods

The McLeod combines a heavy-duty rake with a large, sturdy hoe. While McLeods are well-known for constructing new trails, they are also excellent tools for re-establishing tread when material from the backslope sloughs onto the trail. A McLeod is essential for compacting tread. The flat head of the tool is used for tamping down and evening out soil on the tread. McLeods aren't as useful in rocky or unusually brushy areas.



Top 5 Things Volunteers Can Do for Trails

When it comes to trail maintenance, it sometimes feels like there is always more work needed than the people or time to do it. Don't get discouraged! Regular maintenance and solving problems as they arise will help to prevent further damage and more difficult and costly work later. In this section we will outline the top 5 things volunteers can do to maintain and care for trails. Before you get started on any trail maintenance project, be sure to get approval from the land manager or landowner.

1. Taking a Trail Inventory

The first step for any trail volunteer is to figure out what work is needed on the trail and to prioritize a list of projects or tasks. We call this a trail inventory, and it's a great job for volunteer trail stewards or adopt-a-trail volunteers. Before you set out to take an inventory, inquire to see if the land or trail manager already has an existing trail inventory. If there is none or one needs updating, then it's time to plan a trail inventory walk. Your overall goal is to determine if the trail is user-friendly and if it is likely to remain in good condition over time.

Each of the following factors will help you make your assessment:

A. Monitor trail conditions on a regular basis

Walk the trail in the fall before the first snow, then again in the spring after the snow melts. The best time to check trail conditions is on a rainy day so you can see first-hand how the trail responds to water. Also check conditions after heavy rain or wind storms.

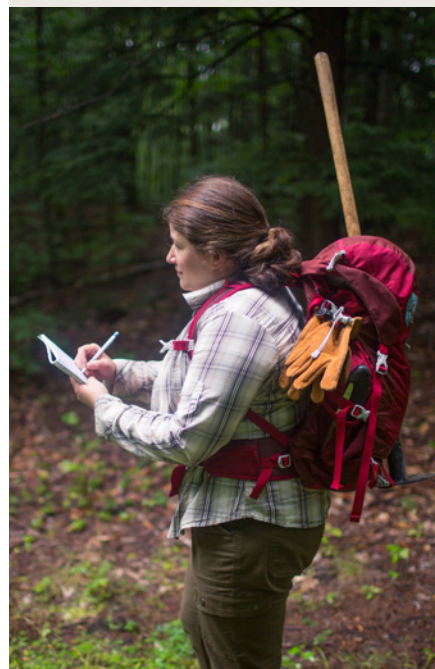
Are there problems that prevent the trail from being used?

Note any blowdowns (a tree that has fallen across the trail) or other problems making the trail impassable. Try to put yourself in the shoes of a first-time user of the trail. Is the trail easy to follow or could someone become lost? Trails without signs or blazes are a common occurrence. Consider that many people are uncomfortable using a trail without signs or trail markers.

B. Is the trail safe for use?

Look for sections that are hazardous, such as a dead tree suspended over the trail or a washed out bridge. Determine if any problems can be corrected with simple measures. Can the downed tree be removed easily or will it require a chain saw and timber felling skills?

Suggested Supplies for a Trail Inventory



GEAR

- ☐ Drinking water and snack
- ☐ Appropriate clothing and footwear for terrain and weather
- ☐ Gloves
- ☐ Small trash bag for picking up litter
- ☐ Sunscreen
- ☐ Protection from insects
- ☐ First aid kit
- ☐ Cell phone with fully charged battery
- ☐ Backpack to carry supplies

C. Is the trail in the right place?

Sometimes re-routing sections of a trail may be the best solution, but always strive to use the existing trail first. An example of when a trail needs to be re-routed is if the trail passes through a sensitive natural area that's being negatively impacted, or if a very wet, lowland trail can easily be moved to higher ground nearby. Re-routing a trail requires consideration of impacts on the landscape, and environmental review for rare plants, wildlife, soil or water impacts. Check with the land manager or landowner before you begin work on a re-route project.

D. Prioritize the basics

Consider what can be done for basic maintenance and what problems require further expertise, additional volunteers, or simply can wait until later. If there is significant erosion, the issue may require help from experts. Look for ruts or gullies within the trail corridor, or sections of the trail that look like a trench. If users are widening the trail to avoid a problem area, note the possible source of the issue (usually wetness, but can also be due to roots or significant erosion) and whether the problem seems chronic or temporary (e.g. seasonal with spring rains). Approximate the size (width, length, and depth of any ruts or tracks) of any wet and muddy sections of the trail.

E. Can the work be done by volunteers?

Consider whether limited training is sufficient or if the work requires professional expertise. See page 18 for more help on determining solutions to significant erosion issues on the trail.

Suggested Supplies for a Trail Inventory

TOOLS

- ☐ Trail map (if available)
- ☐ Topo map
- ☐ Compass
- ☐ Waterproof notepad (or bring a waterproof baggie for your notebook)
- ☐ Pen or pencil
- ☐ Flagging tape (use to temporarily mark problem areas)
- ☐ Camera or Smartphone (Many smartphones now capture the latitude and longitude position of your photos, which is helpful in locating trail problems)
- ☐ Optional: GPS or Smartphone to mark problem areas.
- ☐ Field tape measure (or measure your pace! See the companion handbook, *Outdoor Skills for Conservation Volunteers* to learn how)
- ☐ Loppers*
- ☐ Folding pruning saw*
- ☐ Small grubbing tool, such as a hoe or spade (shovel)*

*Volunteers often like to carry some combination of these tools or similar with them when conducting a trail inventory so they can do basic maintenance as it arises and time allows. See pg 6 for the section, "Tools for the Trail."



2. Cleaning Out Drainages

Many trails have existing features that help keep the trail dry and prevent erosion. Drainages range in appearance and structure. See page 20 for more about common erosion control structures. One of the first things volunteers can do is help maintain existing drainages.

You may or may not have noticed drainages as a trail user, since well-made drainages will not detract from the experience of using a trail. Look for sections of the trail that have a natural-looking dip and show evidence that water has flowed off the trail. These are called knicks or rolling grade dips and need to be kept clear of dirt and leaves. Other drainages are more obvious, such as water bars, which utilize rocks or logs angled across the trail tread to direct water off the trail. There are also open and closed culverts, ditches that run along the side of a trail, and other structures called turnpikes, which raise the trail out of flat, poorly-drained areas. These all need to be checked for clogging of dirt and leaves, as well as for potential repairs (note problems in your trail inventory).

The purpose of drainages is to help move water off the trail quickly and efficiently, so water doesn't build up on the trail, erode the tread, or flow down the trail. Over time, dirt, sticks, leaves, and other sediment will accumulate in drainages and clog them. The result is very similar to a clogged drain. A hoe, rake, or shovel are effective tools for removing these materials. The following are recommendations for clearing out drainages.

A. Start clearing on the uphill side of the drainage

Pull loose dirt and materials toward you as you move downhill.

B. Maintain a wide drain on the downhill side

Water should have a clear path off the trail that extends downhill. This can be 6-10 feet wide for some grade dips. It can also be helpful for the drain to extend outward in a fan-shape, so it widens as it extends away from the trail.

C. Spread loose dirt and leaves on the downhill side of the trail

This prevents loose materials ending up back in the drainage after another storm event. Extra dirt can be used to reshape and strengthen a reinforced grade dip.

D. Trim any saplings or low hanging branches growing in the drainage

Any saplings or branches that are growing in the downhill side of the drain will become magnets for clogging further dirt and leaves.



NOTES



3. Brushing and Clearing the Trail Corridor

Have you ever been on an overgrown trail? You might get scratched up from branches or raspberry bushes growing into the trail, and sometimes it can be difficult to even locate the trail. A visible trail corridor is an essential part of trail maintenance and helps make the trail more welcoming and safe.

Simply carrying loppers and a small pruning saw when out for a hike or trail assessment and pruning as you go can make for an efficient method of maintenance. To do this correctly, you need to know how wide the trail should be and how much vegetation to clear.

Every trail will have different needs for clearing limits. Always check with the landowner, trail manager, or agency that is responsible for the trail and use their specifications. Most trails are cleared to 4'-8' in width and 8'-10' in height, but this depends on the type of users and overall needs of the trail. For a simple check on a hiking trail, you should be able to walk through with outstretched arms as a measure for clearing. When the trail begins to look like a highway, you've cleared too much! Trails permitting use by motorized vehicles or horses will require more width and height.

The best trails will also look and feel natural even after a recent brushing. Your goal should be to minimize signs of human impact as much as possible. People use trails to explore natural areas and it's important to think about the aesthetic aspects of the trail experience. You want natural features to draw the trail user's eyes, not overly-cleared trees or piles of cut brush. The following recommendations will help you find the right balance for your trail.



A. Cut grass and weedy growth as needed

Keep in mind these plants will often grow back in one season. This is more of a problem for lightly used trails with significant sections of grass or weedy growth. Weed whips and motorized brush cutters are effective in managing this growth. Mowers can be used to maintain trails through open meadows or fields.

B. Regularly cut back bushes and shrubby growth

Removing branches where they meet the main stem is most effective. This is sometimes referred to as a "five-year haircut" though it might only last a couple of years. If the sapling or shrub will continue to impede trail traffic, it's best to remove it entirely. Loppers and pruning saws are the most effective tools for this. Always cut flush to the ground to minimize tripping hazards or unsightly stumps.



C. Pull out plants that send out a lot of new growth after cutting

Some plants, particularly saplings or shrubs, will respond with significant new growth when cut to the ground level. It's more effective to pull these plants out entirely rather than cutting them. Brush pullers can be an effective tool for this. Otherwise, chop or saw out the roots with loppers or pruning saws that are marked for use in the dirt. Using sharp tools in the dirt will dull them very quickly, so use already dull tools. Otherwise, clear away the dirt before cutting or use a grubbing tool to cut and extract roots. Hobblebush (aptly named as its big leaves encroach on the trail), with a tangled root system that often trips hikers, is a common example of a plant best pulled out by its roots.

D. Prune tree branches back to the growth collar

This allows for the tree to heal more quickly and makes the trail corridor look more natural. Don't leave any stubs or sharp ends that protrude into the trail corridor, as these can be a safety hazard and make the trail look less cared for. No "hat-hanger" stubs, please!

E. Maintain healthy tree symmetry when cutting branches

If too many branches are removed from one side, remove the entire tree. Over-pruned trees are unlikely to survive, and then will become trail hazards when they die so close to the trail.



These over pruned trees are best removed.

F. Discard cut brush and branches well off the trail

If on a hillside, discard brush on the downhill side to prevent water dams on the uphill side. Avoid creating piles, and spread out brush and branches at least 10' away from the trail, if possible. Any green brush and branches that you cut will soon wilt and turn brown, becoming an eye sore if left along the trail. Toss the cut end of branches and trees away from the trail so that the bright, fresh-cut stubs aren't visible. Try grabbing the cut butt ends of multiple branches and drag them off the trail. This makes it much easier when in a forest with thick brushy areas, and will also ensure your cut ends end up away from the trail.

Avoid Leaving "Hat-hanger" Stubs

These can be a safety hazard and make the trail look less natural.



4. Maintaining the Tread

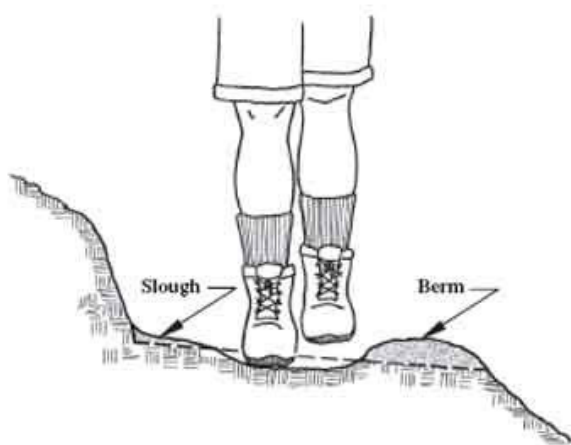
Tread maintenance and erosion control are arguably the most important trail work that needs regular attention. It will be helpful for you to review the trail terminology, particularly the special terms for side-sloped trails, on page 5. Also refer to the definition for slope and grade in the sidebar.

The tread of the trail is where all the action takes place. Recreational use causes the tread to wear over time and requires regular maintenance. The amount of maintenance needed will depend on a number of factors. A trail used by large numbers of people in all seasons will have a tread that's more susceptible to erosion. The soil type and texture of the tread will also influence how water will drain and if the tread can stand up over time. For instance, tread built on mineral soil is more durable and sustainable than tread built on organic humus, or duff, that's often found on the surface of the ground just below any leaf litter. If you're familiar with different soil types, a mixture of sand, silt, and clay is ideal for durable trail tread.

Small problems with the tread can be quickly fixed by making stops while conducting a trail inventory or while brushing and clearing the trail corridor. Rather than a list of general recommendations, we'll show you common tread maintenance problems that can be easily fixed.

Techniques for Solving Common Tread Problems

Problem: The trail is a trough



A trough has formed in the center of the trail between the "slough" and "berm."

Solution: Remove the loose soil that impedes water flow

Slope and Grade Explained

Slope and grade of the trail are an essential part of the design and maintenance of trail tread. **Slope** refers to the angle across the width of the tread and it is critical for an **outslope** to be built into the trail tread on a bench trail. The tread is outsloped when the angle of the tread is pitched toward the downhill side of the trail. The overall slope of the hillside where the trail is built is called the **sideslope**. **Grade** or running slope refers to the angle of the trail as you walk (or run) on it, and is measured by percent. This is the relationship between rise and run, or the change in elevation over a horizontal plane. In other words, the grade of the trail indicates how steep it is for the user traveling along the trail. Outslope, sideslope and grade will determine how quickly and efficiently water will flow off the trail. This will have an impact on how the tread holds up over time.



Over time and with high use, a trough will form in the trail that prevents water from exiting off the trail. As the center of the tread starts to compact, loose soil will build up and create a berm on the critical edge (toe) and a slough on the hinge (heel). Remember if you are standing with your back to the uphill side of the trail, the heel of your foot indicates the hinge and your toe indicates the critical edge. To fix this problem, simply remove the slough and berm, leaving the trail outsloped so water will run off. It's ideal for the hinge and critical edge to be gently rounded and appear natural versus an abrupt cut with sharp edges. A hoe, McLeod, or shovel are effective tools for moving loose soil (see the section, "Tools for the Trail" on page 6). Sometimes your foot can get the job done in a pinch! Troughs are especially problematic for bench trails cut into a hillside, because water travelling down the entire hillside (called "sheet flow") will collect in the trail and further erode the tread. However, troughs can also occur on flat terrain that sees high use over time.



Problem: Trail creep

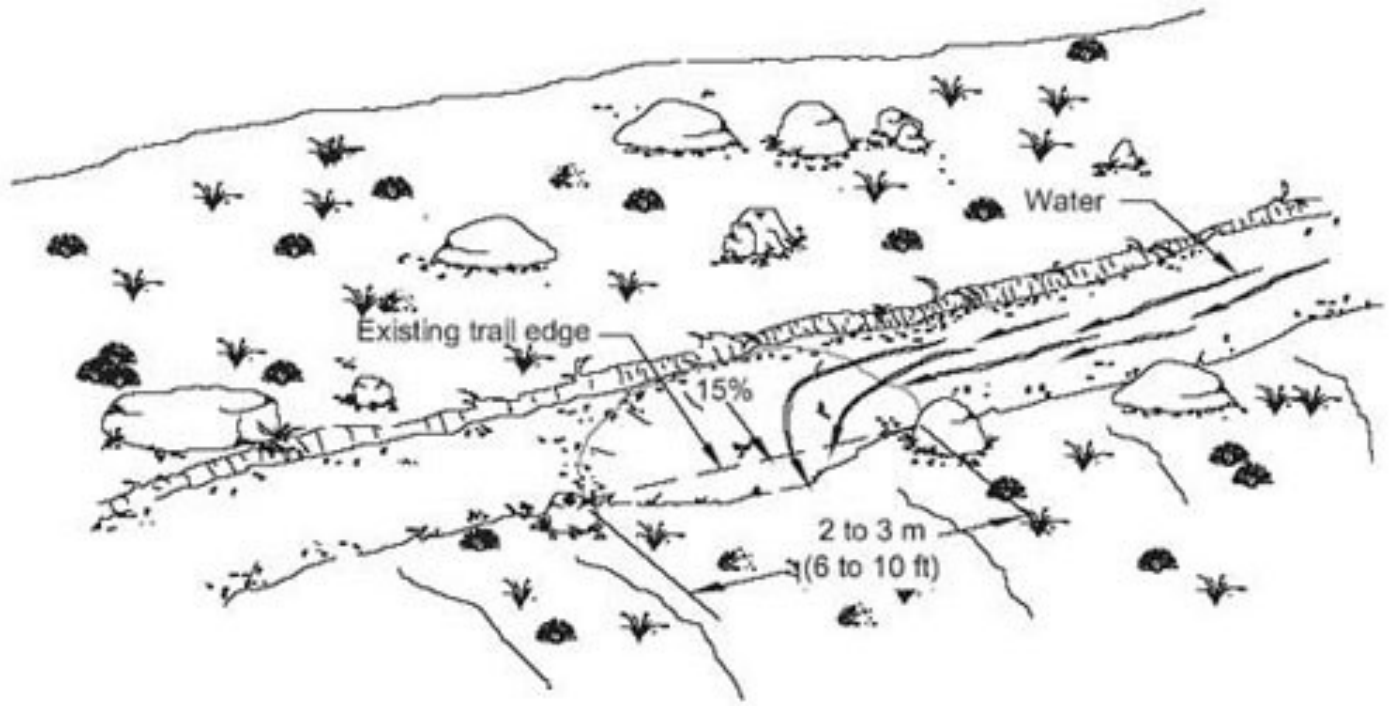
Solution: Remove any loose soil or slough that has spread across the tread

Trail creep happens on hillsides where loose soil on the uphill side of the tread (backslope) has eroded to create a slough at the hinge (heel) of the trail and continues to spread across the trail. This can force hikers to travel closer to the critical edge (toe) of the trail, causing it to break down and erode. Remove the slough material that accumulates so the user can use the entire width of the tread. A hoe, McLeod, or shovel are effective tools for this work. Trail creep is likely to happen on steep hillsides where the angle of the backslope is too sharp and prone to erosion, and can be reduced by reshaping and creating a less steep backslope.

NOTES

[illegible]

Problem: Water flows down the trail and forms puddles in flat areas



Solution: Add a knick

A knick is a small diversion that you can create to redirect water off the trail. Knicks are outsloped drains. They are cut into the critical edge (toe) of the tread, outslope slightly in the center, and extend off the trail to lower ground to redirect the water. They are appropriate for smaller amounts of water on sections with lesser grades. Knicks need to be cleaned often, since with slow water flow, sediment can easily build up. A hoe, McLeod, or shovel are effective tools for removing the build-up of sediment or leaf matter in a knick.





Problem: Trail tread has many roots in it

Solution: Trim the roots that are a tripping hazard or parallel with the tread

As the tread compacts over time, roots that were once buried will start to appear in the trail. Trim any that are an obvious tripping hazard. Roots that are parallel with the tread are more likely to create slipping hazards when wet. You may think that ideally the tread should be free of roots, but it depends. On backcountry trails, roots or rocks in the trail can be an acceptable obstacle that makes the user experience more challenging and fun. If roots are flush or nearly flush with the trail and not a tripping hazard, leave them. Loppers or a pruning saw specifically marked for use in the dirt should be used to remove roots. A hoe, McLeod, or other tools with a cutting edge (also marked for use in the dirt) can also work well for removing roots.

NOTES



5. Maintaining Blazing and Signage

A trail should be easy to follow from the visible tread and a nicely cleared corridor. This is not always the case in open or rocky areas, areas with lots of deciduous trees, or areas where pines shed their needles, making the tread invisible. In the wintertime, snow will cover the tread of any trail. It's important to mark trails in a way that allows the user to follow them, but not create so many markers that it detracts from the natural aesthetics of the trail.

Most trails are marked using painted blazes or small tags nailed to trees. Both methods work well and each has advantages and disadvantages. Always check with the land manager or landowner to see if there is an established method of blazing and receive approval in advance before adding blazes or signs to a trail. We recommend the following guidelines when blazing trails.

1. It is always better to have fewer blazes than too many

This one might surprise you, but one of the biggest concerns with blazing and signs is when there are too many! The visual impact of a trail with too many markers detracts from the experience of being in a natural area.

2. Use your line of sight to determine where to place blazes

As a rule of thumb, you should only see one blaze at a time while moving along the trail. If you stand beside your current blaze or a few more steps past, the next blaze should be as far in the distance as possible, but still clearly in your line of sight. Give consideration to how the blaze appears from both directions of travel. It's best to blaze in one direction, then walk the opposite direction to blaze the other side of the trail in a staggered pattern. It's important to avoid placing blazes for two directions on the same tree. If a storm takes a blaze tree down, it's better to lose one blaze rather than two! When the trail is obvious due to very clear tread, corridors, or if the trail has a long, straight section, markers can be placed even farther apart. It's best to blaze before deciduous trees shed their leaves so you can ensure your blazes can be seen when leaves are on the trees.

3. Prioritize junctions and turns

Blazing is critical at important junctions and at turns that might otherwise be missed. Junctions and turns are sometimes marked with two blazes, one above the other, leaning towards the direction of travel or stacked to the left or right of the bottom blaze to show the direction of a turn.

Too Many Blazes



Too many markers, like the blazes on the trail above, detract from the experience of being in a natural area.

Custom Signs



Custom trail signs, such as this "You are Here" junction post in Londonderry, NH, are another option for land managers.

4. Paint a 2" by 6" rectangle on live and sizeable trees

A good painted blaze is typically placed vertically at least 6' high on trees that are visibly healthy and are medium to large. Blazes painted too low on the tree can be hard to follow in winter when snow changes the depth of the trail tread. Blaze colors vary depending on what the landowner or agency desires, but consistency in the system is important. Standard latex house paint and a foam brush or mini-roller work well. Create a cut-out template or stencil to help keep blazes consistent.



5. Avoid painting on rocks

Most trail managers prefer not to paint on rocks, but it may be the only option in some locations. Become familiar with the system used by your trail manager or agency. When trees aren't available, consider marking your trail using cairns, which are small stacks or piles of rocks that show the trail route. By carefully stacking the stones, these can last a long time without much maintenance. Be mindful to the surrounding environment when selecting stones. Avoid taking stones from sensitive areas or on slopes where you might compromise soil stability. Do not remove stones from historic stone walls.

6. If using small aluminum or plastic markers, leave room for the tree to grow

Small aluminum or plastic markers are nailed on to the tree using aluminum nails (which don't interfere with saws or tools later, if the tree needs to be removed and valuable timbers won't have rust streaks in their wood). It's important to leave some room for the tree to grow by not driving the nail tight to the tree.

Mapping Trails



www.TrailFinder.info

Do people in your community know where they can find local trails? It's easy to overlook the value and importance of mapping your trails, making them easy to find and use. People are more likely to appreciate the value of and help care for local trails over time if they use them regularly. Trail Finder is a new website that allows landowners and trail managers to upload trail maps all in one place. Currently, the website includes trails in both New Hampshire and Vermont. Check it out and consider adding your trails to the map! In Maine visit www.mainetrailfinder.com.



Building on the Basics: Erosion Control Methods

The answer to the question, “How do I know when I need more expertise?” will almost always be “it depends.” Once you’re comfortable with the basics, like cleaning out drainages or brushing a trail corridor, you might be interested gaining more skills to help solve common problems that you’ll find on trails.

Erosion control is the number one trail maintenance issue, and often the simple solutions described earlier in this guide are insufficient to fix erosion problems caused by water in the trail. These problems can certainly be tackled by volunteers with the caveat that hands-on training is a must for safety, skill-building, and learning what to do in widely variable situations.

It will be helpful for you to keep in mind that trail work is an art as much as it is a science or technical skill. There is no one solution to any given erosion or water problem on the trail. Additional training from experienced professionals will help you learn how to design and install erosion control structures, but moreover hands-on practice in the field and experience with trial and error will help you know what to do with problem areas on your trail. Sometimes a structure you try the first time will not work and water will still be an issue. That is when you can reassess your problem and try a new solution. Sometimes you will want to change course once you’ve already started grubbing out an old, no longer functioning drainage, for instance. You’ll need to look at the terrain around the trail and see where the water wants to go once you start manipulating the ground.

When you are inventorying your trail, you simply need to mark problem areas, not come up with solutions. However, you should consider and note factors that might lead you to determine your problem spot needs more than a simple solution and start considering different options for structures.

- ☐ **Is there a significant amount of surface water on the trail and evidence of the user going around the wetness and widening the trail? Look for signs of standing water, such as mud or darkened leaves.**
- ☐ **Is the grade of the trail quite steep (greater than 15%)? Look for signs of water being washed away, ruts or gullies within the trail corridor, or sections of the trail that look like a trench.**

Timber Tip:



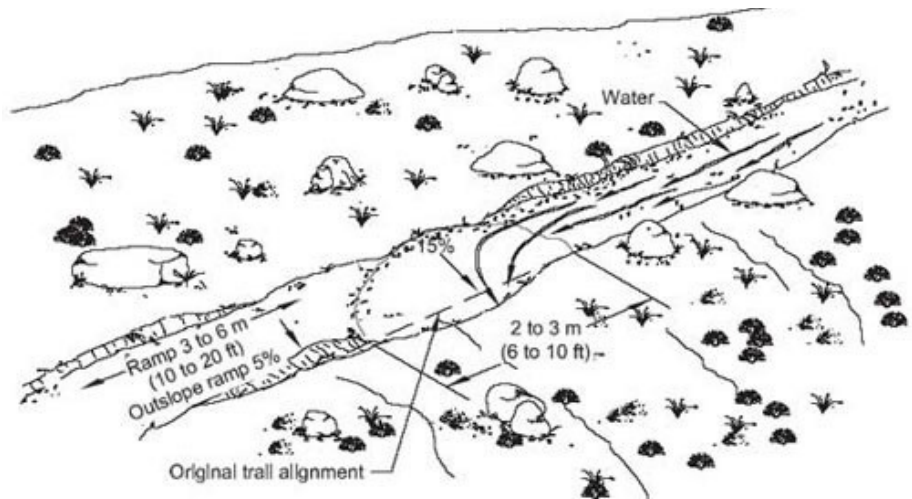
Avoid using down and dead logs for any trail projects. Dead wood will not last as long and bark left on wood speeds up its decomposition. If possible, enlist an experienced sawyer to fell a nearby live tree and use native timber for your trail projects. Certain types of trees are more resistant to rot and are ideal for trail structures. Black locust or white oak will last the longest, but are uncommon. Eastern hemlock is a good alternative. Species such as pine, maple, and birch are not preferred.

Sometimes a downed log is a tempting quick fix to define the trail tread or keep users on the trail, but more often than it becomes a blockade for water trying to exit the trail.

If you checked either of the above boxes, it's time to consider installing erosion control structures. The best way to learn how to build these erosion control structures is in the field from someone with trail construction expertise. However, it's helpful to have an introduction to the different types of structures and to know how they are built. Whether you take the plunge into creating these structures someday or not, knowing how to recognize them will help you, as a volunteer, keep them in good working order and recognize when replacements or upgrades are required.



Rolling grade dips help direct water off steeper sections of trail. Another name for a rolling grade dip is a grade reversal. The steeper the grade, the longer and deeper the rolling grade dip becomes. These are typically built into



the design of a new trail, though they can also be installed in existing trails, but they require some design work and planning. They are best placed where natural dips occur or where trails curve around large trees or rocks. Smaller, simpler versions of rolling grade dips are called knicks (described earlier on page 16) and are commonly added to existing trails.

Reinforced grade dips (water bars) are similar to rolling grade dips, but include a reinforcing bar of rock or timber, covered in soil, set at an angle of 45-60 degrees to the trail. Rock is more durable than wood for these structures, however timber is often faster to install. Though they are more compact than a rolling grade dip, the structure should still start at the upper edge (hinge or heel) of the trail and extend beyond the outer edge (critical edge or toe) to prevent water from coming back on the trail. As with any drainage or erosion feature, water needs to flow freely away from the exit point of the trail.

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Check dams are structures used when the trail is in a location where water cannot be diverted off the trail, such as in a badly eroded area or trench. Timber or rock structures are placed perpendicular to the trail (and direction of the side-slope or overall slope of the terrain), and allow soil to collect behind the structure. Eventually these create what are essentially steps in the trail. These structures are also called check steps when soil or crushed gravel are purposefully filled in the back of the timber or rock. They stop the down cutting motion of erosion and hold the tread intact.

Rolling grade dips and reinforced grade dips both require periodic maintenance in order for water to flow freely off the trail. In general, rolling grade dips require less routine maintenance than reinforced grade dips and similar erosion control structures built from timber and rock. Rolling grade dips (and knicks) also work well on trails with bikes, strollers, and other wheeled articles. A final advantage? They look more natural than most other erosion structures.

Structures for Flat Terrain

Is your trail on level terrain and in poorly drained soils, with no nearby uplands for a trail reroutes? While reinforced grade dips and check dams are useful for controlling water on steep slopes, level terrain and poorly drained soils offer a different set of challenges. Structures that are specialized for flat areas include turnpikes, boardwalks, and puncheons or bog bridges. Other measures include the use of geo-tech fabric, culverts, and specialized drainage techniques. Every situation is different and these structures are beyond the scope of this guide, which is the tip of the iceberg in terms of what volunteers can do on trails.

However, standing water in a trail is a common problem on New England trails and there are two simple structures worth noting. Step stones and bog bridges are described below so you have a better idea whether

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these structures are right for your trail and skill level as a volunteer, but we recommend learning these skills with hands-on instruction. Consider consulting a trail construction reference, attending a workshop, or hiring a trail contractor for further training (see pages 29-30).

Step Stones

Throwing down a rock in the trail sometimes seems like an easy fix to keeping trail users out of standing water in the trail. This can be effective, but it can also be done poorly. Consider whether a step stone is the best fix for your problem before you place one in the trail.

Who uses the trail?

Rock stepping stones are ineffective for mountain bike trails or other multi-use trails that are used by wheeled vehicles or horses. If spaced too far apart, mountain bikes will go around the rocks, further eroding the trail tread around the rocks. With proper planning, step stones can be laid low to the ground in a manner referred to as paving, thus allowing a bike and ski friendly passage.

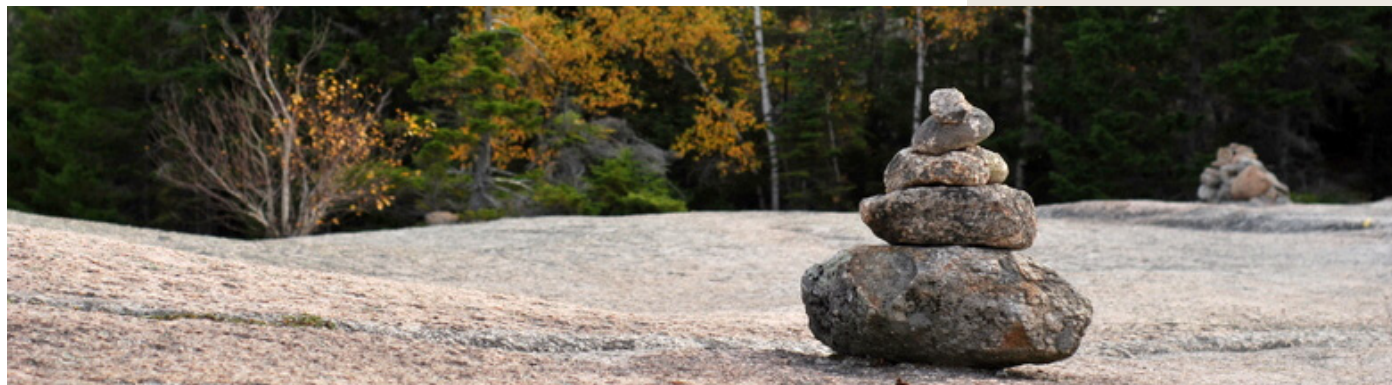
Are there large rocks nearby?

If you can lift the rock, it's too small. If you can move it, recreational users will most certainly move it, especially if they see your helping step as an obstacle. Ideally the rock should also be wide and flat, so it's easy to step on, and $\frac{1}{2}$ to $\frac{2}{3}$ of it at minimum should be buried to ensure it doesn't wiggle or come loose. When dealing with rocks work smarter, not harder. Rock work can be dangerous and there is a serious risk that you can crush fingers, hands, or feet. Be aware of your surroundings and keep people around you at a safe distance. Make slow, thoughtful movements, and consider seeking further training before attempting rock work or using a rock bar (also called a pry bar) to help you move rocks.

Structures Turned Obstacles



Have you ever come across step stones or structures in the middle of a trail that is completely dry? Suddenly they become annoying obstacles in the trail! Users will go around them, widening the trail tread. This happens when structures are thrown down during the spring thaw, when trails may have wet areas due to melting snow and spring rains. If the wet spot is temporary and the trail is not heavily used in the spring, leave it be.



Bog Bridges

Also known as puncheon, split log bridge, or Alaskan boardwalk, the bog bridge is a simple structure made of wood that can cross flat, muddy areas of the trail or protect sensitive wetlands, plants, and soils. Rather than step stones, a bog bridge is helpful for improving wet trail sections that are longer than what 1 or 2 stones can help. A bog bridge can also be made to be friendly for mountain bikes, which a step stone cannot. The construction is straightforward and volunteer-friendly, but trail managers use a variety of techniques to ensure the bog bridges will last as long as possible. Depending on the type of wood used, the environmental conditions, and quality of construction, a bog bridge can last as long as 10 years. There are only three simple components, but many different methods, materials, and tools used to construct them.

- Two base logs called sills.
- One or two large boards or half logs called stringers.
- Spikes or nails to hold the sills and stringers together.

With guidance from professional trail contractors or an experienced volunteer, you can learn about specialty tools, safety, and how to create something that will last. Remember to always consult your land manager or landowner before creating new trail structures. Regularly check the Stewardship Network: New England website to learn about training opportunities.



While on the trail:

- Use personal protective equipment such as gloves (see sidebar).
- Wear sturdy footwear, long pants, and long sleeved shirts. Long pants and sleeves are helpful when working with sharp tools or in brush, especially when poison ivy is present. Pants made of a thicker material are better than a thin or lightweight hiking pant.
- Set a comfortable pace and recognize physical limitations of the group. Take rest breaks, encourage good hydration and eating habits. Remember that fitness levels can vary a lot – be alert to others that may be more tired than you.
- Share work tasks to alleviate repetitive stresses. Rotating tasks is also a great way for volunteers to learn new skills.
- Be aware of good posture. Stand comfortably and plant your feet firmly on the ground. Be especially careful when working in wet, slippery conditions. Adjust your position to prevent slipping or dropping tools.
- Remember “Heads up and butts down” when lifting. It’s very important to be careful when lifting so as not to strain your back. Use your legs and keep your back straight.
- Maintain a safety circle of about 10 feet between workers as a safe operating distance when using chopping and cutting tools. This is also called your tool radius. Remember the adage, “Give yourself a dime.” When working close to others, communicate clearly and keep an eye out for your fellow workers. Be ready to toss your tool aside and jump out of the way. Avoid cutting toward any part of your body.
- Think about every move. If you are working with rocks or logs, think ahead so you are not standing in the wrong place when they move. Using skills and tools smartly is better than brute strength and unnecessary force.
- Carry sharp tools at your downhill side. Grasp the handle at about the balance point with the sharpened blade forward and down. If you fall, throw the tool well off to the side.



Personal Protective Equipment



Gloves are important to wear with all types of trail maintenance, but leather gloves should be used when working with sharp tools. Protective eyewear is a good idea to wear at all times. It keeps stray branches, mud, and debris out of your eyes, and can even be helpful for keeping bugs like black flies out of your eyes. Hard hats usually aren't needed for basic trail maintenance, but are recommended if you are swinging tools over your head or are moving heavy objects like timber logs or rocks. Hard hats are also a good idea anytime you are lopping overhead branches.



- When not using tools, place them with the head on the uphill side and away from the trail. Keep handles far enough off the edge of the trail so they are not a tripping hazard. Never leave tools with sharp edges in tree trunks, stumps, or the ground where the exposed portion of the tool will present a hazard
- Cover the blades of cutting tools with a sheath to protect both the sharp edge and yourself. They should be covered whenever not in use, including carrying, loading, or storing. Store tools safely when placing them in vehicles and fasten them down.

Upon returning from the trail:

- Inform all individuals previously notified of your safe return.
- Thoroughly examine your body for ticks and exposure of any sort.

Hunting Season

Due to the wide variety of game found in New England, hunting is in season a majority of the year. In order to avoid the possibility of mistaken identity, it is a good idea to wear bright colors such as an orange hat, vest, or gloves. A list of general hunting season dates to be aware of are listed in the sidebar.

Refer to state wildlife agency websites for exact start and end dates for the current year and more information about hunting precautions.

Be Aware:

New England Hunting Season Dates (Approximate)

Late April

Youth turkey-hunting weekend

Early May – Late May
Spring gobbler season
(wild turkey)

Starting Early September
Black bear
(dates vary for method and WMU)

September – January
Waterfowl
(Dates vary by species and zone)

Mid-September – Mid-December
Deer/archery and fall turkey/archery

Mid-October (1 week)
Turkey/shotgun

September – March
Small game and furbearers
(dates vary by species and region)

October – December
Pheasant

Mid-October – Late October
Moose (by permit only)

Late October
Youth deer-hunting weekend

Early November
Deer/muzzleloader

Mid-November – Early December
Deer/regular firearms



Poison Ivy, Poison Oak, and Poison Sumac

These species of plants can cause uncomfortable and painful rashes when they make contact with the skin. Go to poisonivy.aesir.com/view for information on identification and treatment.

Lyme Disease Precautions

When doing field work in the spring, summer, or fall, ticks are always a risk. Ticks often carry Lyme disease. Indicators of Lyme disease may include a “bull’s eye” ring around a tick bite. UNH Cooperative Extension is a good resource for tick identification, Lyme symptoms, and tick activity levels; go to extension.unh.edu/articles/Its-Tick-Season-Protect-Yourself.

Lyme disease is caused by a bacterium *Borrelia burgdorferi*, which lives in the black-legged tick (*Ixodes scapularis*). In the nymph stage, these ticks are extremely small and will often hide in hairy areas of your body. As the tick ingests blood, its body becomes more swollen. Most Lyme disease cases are associated with a bite during the tick’s nymph stage, when 10-36% may be infected with Lyme disease spirochetes. Nymphal ticks are about the size of a pinhead, difficult to spot, and active during the late spring and summer months. Adult ticks are active in fall, warm winter days, and spring. They’re larger, easier to spot, and therefore associated with fewer cases of Lyme disease, even though more of these ticks are infected with Lyme disease spirochetes.

Prevention

- Deer ticks are most prevalent in late spring and early summer in areas of low-lying vegetation in wooded, brushy, or overgrown grassy habitats (less likely in fields).
- Wear a long-sleeved shirt and long pants tucked into socks or boot tops, or wear gaiters. Light-colored clothing makes it easier to see and remove ticks.
- Insect repellent on clothes and exposed skin can reduce tick attachments.
- Early detection of tick bites is key: conduct regular tick checks on exposed skin and check your whole body daily. Transmission of the bacterium is unlikely if tick is removed within 24 hours of attachment.
- Serious consequences of Lyme disease can be prevented by treatment in its early stage with oral antibiotics. Seek early diagnosis and treatment of suspected tick-borne infections.

Tick Removal

- Do not apply creams, alcohol, or heat to an attached tick: this may cause a more severe infection from the tick’s release of stomach contents.
- Use tweezers to grasp the body of the tick as close as possible to your skin and pull slowly with a constant yet gentle pressure to extract the tick.
- Keep the tick in a vial for medical documentation.
- Seek medical attention immediately if you develop any of these symptoms:
 - Rash associated with bite location, often in the shape of a “bull’s eye” (up to 40% of infected people do not have a rash symptom).
 - Flu-like symptoms (fever, fatigue, headache, chills, or body aches)
 - Later symptoms include more severe medical problems such as joint and neurological complications





Further Training

As mentioned earlier, the skills in this guide are best learned in the field with an experienced instructor. There are many ways to do this!

- Check with your local conservation groups, like regional land trusts, to see if they provide trail maintenance or construction training that is open to the public.
- The Stewardship Network: New England, based at the University of New Hampshire Cooperative Extension, partners with other groups to offer trail maintenance trainings. Visit our online calendar to find upcoming trainings: newengland.stewardship.org/events-training.
- Attend a volunteer workday with a local volunteer trails organization or club. If you're not sure what type of projects will be involved or if any experience is necessary, don't hesitate to contact them and ask what skills are required and if they will provide on-site training.
- Consider holding your own volunteer trail workday. It's a chance to put many hands to work to accomplish bigger or more technical trail maintenance projects and an opportunity invite or hire a trail professional to offer assistance, input, and help with training during the workday. For more information on working with groups of volunteers, see the *Quick Tips for Planning a Trail Work Day* handout.
- There are many trail contractors located in the New England area who specialize in trail work and are good resource for further training or assistance with larger projects or technical work. To see a list of New England trail professionals and organizations, or to submit your business to our list visit: newengland.stewardshipnetwork.org/trails



Resources

The following are resources used in compiling this guide, and are references that may be of further use in learning about trail construction, maintenance, and design.

- *AMC's Complete Guide to Trail Building and Maintenance*. 4th ed. Appalachian Mountain Club. AMC's Trails Department. 2008.
- *Appalachian Trail Design, Construction, and Maintenance*. 2nd ed. The Appalachian Trails Conference. Birchard, William, Jr.; Proudman, Robert D. 2010.
- *Appalachian Trail Fieldbook*. Appalachian Trail Conference. 2003
- *Handtools for Trail Work*. U.S. Department of Agriculture Forest Service, Missoula Technology and Development Center. Hallman, Richard. 1988 (rev. 2005).
- *Lightly on the Land: The SCA Trail Building and Maintenance Manual*. 2nd ed. Student Conservation Association and The Mountaineers. Birkby, Robert C. 2005.
- Pacific Crest Trail Volunteer Learning Center (Free Online Resource): <http://www.pcta.org/volunteer/learning-center/>
- *Trail Construction and Maintenance Notebook*. U.S. Department of Agriculture Forest Service. Hesselbarth, Woody; Vachowski, Brian; Davies, Mary Ann. 2007. Available online: <http://bit.ly/ForestServiceTrails>
- *Trail Solutions: IMBA's Guide to Building Sweet Singletrack*. International Mountain Bicycling Association. 2004.

Illustration Credits

Sources for Illustrations

- Page 4: Parts of a Trail. *Lightly on the Land: The SCA Trail Building and Maintenance Manual*. 2nd Edition (2006). Courtesy the Student Conservation Association.
- Pages 5, 12, 14-16, 21: *Trail Construction and Maintenance Notebook*. 2007. Courtesy the U.S. Department of Agriculture (USDA) Forest Service.

Sources for Photographs

- Page 1: Removing slough and berm from a bench trail. Photo by Emma Tutein / UNH Cooperative Extension (UNHCE).
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- Page 26: Tool carrying and Personal protective equipment. Photos by Emily Lord / UNHCE.
- Page 27: Lopping tree flush to the ground. Photo by Emily Lord / UNHCE.
- Page 28: Poison ivy and adult deer tick. Stock photos.



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