



Maintaining the Cross Vermont Trail



Cross Vermont Trail Association
Trail Maintenance Guide for Volunteers
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CVTA's work to support a vibrant community of volunteer trail maintainers has been helped by the Lake Champlain Basin Program and The Canaday Family Charitable Trust.

Thank you for your interest in helping take care of the Cross Vermont Trail!

Maintaining trail is hard work, but it's work that anyone can enjoy doing.

The purpose of this Guide is to get you started on knowing what work needs to be done on your section of trail, and provide tips on how to do it effectively so you get the most out of the time you spend.

The Guide will always be a work-in-progress! Anyone who has done a bunch of trail maintenance already, please read through it and let us know what you think - give us your two cents that we can add in.

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<i>Check these things:</i>	<i>Look for:</i>	<i>If needed, do this maintenance work:</i>
Tread Surface	Is the tread smooth, firm and unobstructed?	Sweep, rake; clear debris; regrade or repair.
Plants Growing Into the Trail	Is the trail clear of growing plants, including a cleared area a couple feet on each side of the tread?	Cut and mow.
Drainage Structures	Is water running off and away from the trail, gently? Are ditches and culverts same shape size as when they were first built?	Shovel out drainages, keep them from filling up; clear leaves and sticks and other debris, keep ditches and culverts from clogging. ID need to recrown tread or rebuild washouts.
Signs	Are all the signs still there? Are they working? Need for new signs?	Check on them annually, report if missing or damaged, replace with new ones. Report if need to add new or remove unneeded signs.
Major Structures (bridges, retaining walls, railings)	Do they look like they are working as originally designed?	Check on them annually, report if damaged or deteriorating. Help with special maintenance or reconstruction projects.

And further reading . . .

Links to more detailed "how-to" information about trail management and trail maintenance skills.

Things to know before going out to maintain the trail.

What is the Cross Vermont Trail

Mission and Purpose:

"The purpose of the Cross Vermont Trail Association is to assist municipalities, recreation groups, and landowners in the creation and management of a four-season, multi-use trail across the state of Vermont for public recreation, alternative transportation, and awareness of our natural and cultural heritage."

The Cross Vermont Trail makes real the vision of Trails for All Americans - that " all Americans be able to go out their front doors and within fifteen minutes, be on trails that wind through their cities, towns or villages." Ultimately, the trail is envisioned to be a network of community paths that connect together neighborhoods and downtowns, schools, and also parks, forests, and wildlife areas.

The "Cross Vermont Trail Association" (CVTA) began in 1993 when people saw these needs:

- Some local towns and landowners are building shorter trails, but they lack connection to each other. We answer the need for a statewide organization to support the connection of existing trails into a complete network.
- Some local towns and landowners are interested in having trails in their area, but lack the resources for construction on their own. We answer the need for a non-profit organization that can raise funds and recruit volunteer effort to help build new trails from scratch.

So what does this mean for trail maintenance?

If the main point of the Cross Vermont Trail is making connections among community paths, then Cross Vt Trail maintainers do two main jobs:

- 1.) Along the entire Cross Vermont Trail route, we observe and report on all the various local trail sections, and we advocate and support that they be maintained well so that they are open, inviting, and connected together.
- 2.) On some sections of the route, Cross Vermont Trail Association is responsible for actually carrying out regular maintenance work on the trail structures – so that they are as accessible as possible, welcoming to all community members.

Why do we have primary responsibility for maintenance on only *some* sections?

Because of the history of how the trail is being built.

On the one hand, many local sections of trail are being built by local organizations, and the CVTA wishes only to support, or even just cheerlead, their efforts. The local organizations have primary responsibility for maintaining their sections of trail. Local CVTA members can still help maintain these sections, it just means working with the local organization as well as with the CVTA. The

main job of the CVTA in these places is to observe how the trails are doing, advocate for their maintenance as needed, and offer to help as appropriate.

On the other hand, many gaps exist between local trails. Often the gaps exist because no local organization has the resources to take on the additional responsibility of building and maintaining additional miles of trail - especially trail that is peripheral to their local area. So the CVTA steps up to fill in the gaps between the areas of responsibility of neighboring but unjoined jurisdictions.

The result of this history is that our maintenance "to-do list" can be quite different from one section of the Cross Vermont Trail to the next. The purpose of this Guide is to introduce you to the complete list of things that *could* be on the "to-do list" - and then tell you how to get the actual list for your section.

The CVTA trail database and the "to-do" list for each section of trail.

CVTA maintains a central database where we track all the maintenance categories that are described in this Guide. For each portion of the trail we can print out a simple report that assembles a summary of the background information needed by the maintainer of that section.

Some sample database printouts are attached to the end of this Guide to give you an idea of what sorts of information they include.

Whose job is it to maintain each part of the trail?

The job of observing the trail at least once a year, and reporting what shape it is in . . .

CVTA does this for every section of the Cross Vermont Trail network. Sometimes we are the only people making these observations, but usually it is in conjunction with others – town committees, other user groups, and so on.

When observing the condition of the statewide route, we especially pay attention to the transitions between different local jurisdictions to make sure that the connections between adjoining parts of the trail are continuing to work well.

The job of physically carrying out maintenance work . . .

Your section of trail may fall into one of several categories . . .

1.) CVTA has lead responsibility. We need to make sure and do it.

- *Example:* A High School grants permission for a trail to be built across a portion of school property, but only on the condition that CVTA keep the trail maintained and open without liability for any staff time or material expense to the school in the future.

2.) CVTA has shared responsibility. We need to make sure that it gets done after planning it together with our partner so that what we do works for their use of the trail as well as ours.

- *Example:* A landowner grants permission to both CVTA and a snowmobile club to maintain a trail across their property. We work together on maintenance so that the trail works well both for

snowmobile use and for four season non-motorized use. And we coordinate so that we can make efficient use of all of our time.

3.) Another organization has lead responsibility for maintenance.

- *Example:* A city has built and maintains a developed, paved "rec path". It forms part of the statewide Cross Vermont Trail route. The city public works department appreciates reports about condition of the trail, and they may invite volunteer groups to help with the work. But they have the lead responsibility.

What sorts of uses is each part of the trail open to and maintained for?

Part of regular trail maintenance is to observe and track how the trail is used over time, and to be aware of the physical maintenance needs that may arise as a result of different patterns of use.

Things to look out for:

- is the trail being used in a way that doesn't have land owner permission?
- is trail use being impacted by non-trail use?
- do people avoid using the designated trail, and instead create "bootleg" trails?
- and, not a problem, but something to be aware of, is the trail heavily used in winter and what are additional maintenance needs required for popular winter trails.

Uses that have landowner permission.

Bicycle, pedestrian, and four season non-motorized use are almost always included in the allowed uses for trails CVTA helps to maintain.

In addition, other uses (snowmobile, equestrian, etc) can be primary uses of a section of the Cross Vermont Trail network. The exact list is up to the land owner. CVTA can provide you with a list of the allowed and expected uses for your stretch of trail.

Each section of trail is maintained in certain ways to accommodate the allowed and expected uses. All the trail standards talked about in this Guide are specifically tailored to bike/ped trails that ideally also comply with ADA Accessibility Guidelines. Additional things would have to be kept in mind for trails with additional users. For example, equestrian trails are cleared taller. Snowmobile trails are cleared wider. And so on. It is typically not the job of the Cross Vermont Trail maintainer to tend to these "additional" tasks - rather it is the job of the CVT maintainer to coordinate with whoever our partner maintainers are, so that together we can maintain the trail for all the desired uses.

Sometimes unauthorized types of use may cause physical damage to the trail. If trail structures are built for one kind of use, but are used by another, they may need unexpected amounts of maintenance or they may fail under the additional load. Conversely, there may be unauthorized use which doesn't actually cause any physical problem on the trail. But since the landowner has asked that the this use not occur, we would still want to know if it is observed happening.

Is trail use being impacted by non-trail use?

Garbage dumping, for example, is clearly a non-trail use with negative impacts which leads to a regular maintenance job (picking up trash). Observing and tracking over time impacts like this is an important service done by regular maintainers – which can help us come up with long term solutions.

Sometimes our job is to help coordinate non-trail use with trail use in a way that works for everyone. For example, a land owner may give permission for a logging operation to work near or along the trail.

Do people avoid using the designated trail, and instead create other "bootleg" trails?

Sometimes trail users don't "stay on the trail." This causes additional maintenance needs, and usually points out some underlying flaw in the original trail design that needs to be figured out and fixed.

There are three basic types of bootleg trails:

- Going around a portion of the trail which needs repair (like a muddy place); the solution is to fix the trail.
- "Short cutting" between two sections of trail (like cutting a switchback); the solution is to do something that makes the short cutting less obvious or desirable, such as adjusting the layout of the official trail, or putting in some sort of distraction or screening like landscaping that gets people's attention off of the shortcutting; as a last resort can try putting in signs and fences.
- Making side trails to get to attractive features such as the shore of pond. Solution is build designated access to attractive features if possible. If not possible, then need to distract people from wanting to go to the attractive feature using the same tricks used to deal with "short cutting". If there is already a designated access trail, sometimes the bootleg trails are solved simply by posting clear signage/ a map directing people to the designated trail.

Winter Use

The Cross Vermont Trail is, by definition, a four season trail. So, what are the maintenance needs for winter use of the trail?

For the most part, the regular maintenance required for (and performed during) snow free portions of the year will also fulfill the maintenance required for winter use.

As always, maintainers should be aware of partner organizations that are also maintaining the trail, and with whom any Cross Vermont Trail maintenance should be coordinated. One of the most common groups that we share maintenance with is local snowmobile clubs who are obviously maintaining for winter use.

There may be special conditions for winter use of the trail for the maintainer to be aware of. For example, trails in Deer Wintering Areas may require special signage educating trail users, and CVTA would be committed to maintaining these signs.

Clearing height - some trails will need to have branches cleared taller for winter use than summer use, because the height of the clearing needs to be measured from top of the snow covered tread; and because snow laden branches will droop lower into the trail corridor.

Signs and trail marking - some sections of trail may need to have their trail signage or marking installed in a way that is mindful of winter conditions; as with clearing, this usually means placing them higher up in order to account for the snow depth.

Trail grooming - the CVTA does not groom trails. However, some sections of the trail route are groomed, such as by the local snowmobile club.

Snow pack maintenance on ungroomed trails - avid cross country skiers and other pedestrian winter trail users may want to do some "shovel scale" maintenance of the snow pack along sections of ungroomed trails. For example, early in the winter season, maintainers may shovel snow onto trail bridges, and the like, in order to get a head start on the snow pack in these spots where it develops slower and melts away faster.

Winter maintenance on "urban" sections of trail, such as paved municipal rec paths - municipalities take the lead on winter maintenance for these paths, and CVTA maintainers should learn what each town plans to do. Some towns will leave paths snow covered, while others will plow them like they plow the streets so that they can still be used as bike/ped paths in the winter.

What about sections of path that are along side roads and get buried under the snow that is plowed off of the road? Unfortunately, there is currently no answer to this situation. Sometimes the price we pay in order to be able to build a trail at all in narrow corridors, is to build the trail next to roads and accept that the trail will be obscured by road plowing for part of each year.

Are there landowner, permit or other conditions that govern how we maintain a trail section?

Landowners, regulatory permits, or other project partners may have placed particular conditions on a trail section, saying what can and cannot be done there by maintainers. CVTA keeps a master database of all these obligations, and can provide a simple write up of them for each section of trail so that maintainers can be sure to know about the things that we promised to always be mindful of when maintaining the trail.

When should you go out on the trail and do maintenance work?

Some jobs are regular. Expect to have to do them every year, maybe several times a year. These include:
sweeping/raking/clearing the trail tread; cutting back plants growing into the trail; cleaning out drainage structures.

Other jobs are occasional. Expect to check on them every year, but probably don't have to do any actual maintenance work in most years. These include: signs and major structures.

Ideally, each section of trail gets a maintenance visit three times per year.

- In the spring, walk through and clean up the trail from the winter. Clear debris from the trail, cut back brush and clean drainages. Make sure trail is open and ready to go for the summer season.
- In the summer, catch up on summer specific jobs (like cutting fast growing vegetation), or maybe carry out a special project identified during an earlier trip, such as repairing a board in a railing and so on.
- In the fall, clean out the drainages again from the summer's worth of accumulated material. If needed, do any work needed to maintain the trail for winter use.

Observations and the cycle of annual maintenance

One of the most basic things you can do to maintain a trail is just look and see what needs to be done.

In general, look for two types of things: immediate concerns and long term trends.

- Immediate concerns include things that blocking the trail, like a large fallen tree and things that are dangerous, like a bridge railing that is rotten.
- Long term trends. If you go back to the same trail year after year you can appreciate things like "this trail is getting wider" or "this gully is getting deeper."

Who do you tell your observations to? Yourself and whoever manages the trail.

- Yourself - make notes to yourself, such as "next time I come out on this trail, I will bring a replacement for that missing sign."
- CVTA and other trail managers, so we can track needs over time, and know where to best focus our energies together.

Things to do when you go out to maintain the trail.

Tread Surface

The tread of the Cross Vermont Trail should be "Smooth and Unobstructed" and "Firm and Stable." As a rule of thumb, if an ordinary bicycle can easily roll along the trail, then the tread is probably OK.

Firm and smooth tread is mostly a matter of building trail strongly in the first place - then repairing/reconstructing occasionally as needed over time (in the same way that roads are regraded or repaved periodically.) The regular maintainer can touch up the tread in small areas, but the main job is keep an eye on things, and keep track of when larger repair projects need to be planned.

Unobstructed tread, though, is mostly a function of regular maintenance – sweeping and raking. Not the most glamorous aspect of trail work, but certainly one that makes a big day to day difference in the usability of a trail. Leaves, pine needles that form a mat, fallen branches, wind blown garbage from a nearby road – it adds up!

Definition of Smooth and Unobstructed

In practice, aim for "as smooth as possible." The largest bumps should be only 2" tall at most (and that's a big bump for an ordinary bicycle.)

The maximum width of gaps in the treadway (such as the space between deck boards) is 1/2". And gaps should only run perpendicular to the to direction of travel. (Wheels would fall down into gaps running the direction of travel.)

Definition of Firm and Stable

"Does not give away significantly under foot; does not shift from side to side. Can run a wheel across it without leaving a rut." When you kick into it, with a booted heel for example, you can penetrate only about 1/3" at most.

Examples of not firm/not stable: sandy loose and shifty; loose gravel or "pea" gravel (which is loose and shifty because it does not have the variety of sizes including fine particles which help the gravel bind together when compacted); large gravel and/or stones (loose and shifty and/or bumpy and jarring); muddy.

Reasons for not firm and smooth

If drainage structures no longer working (or were never built in the first place) then:

- water running along trail causes erosion, making gullied rough surface, washing away finer gravel and soil and leaving larger, loose/bumpy gravel and stones
- water saturates trail and makes tread muddy and sloppy
- water puddles on the trail, as standing water or as slippery ice

Even if drainage structures are working, traffic will eventually displace surface material and wear in the tread, making it cupped, rutted or pot holed. This holds water on the trail with all the related problems. A temporary fix is to dig "droolers" into the sides of the trail, letting water flow off to the side of an otherwise cupped tread. In the long run, the fix is to regrade the trail, ideally with added surface material.

Tree roots can make large bumps in gravel trails, or break up pavement. It is a tough problem to address. Can cut out the root (and newly built trails should always cut out tree roots under the tread if possible), which is a big job. Can add more surface material and grade the trail over the roots.

Notes on tread surface material

Gravel: a smooth and firm surface can be achieved if it is made up of a mixture of gravel sizes ranging from about 1/2" in diameter down to "rock dust" (aka "crusher fines"). A mixture of this full range of sizes, especially the fines, is important because it creates the most compacted gravel surface. This can be relatively expensive to do on trails – and we rely on regular maintainers to help prioritize where to spend the available money for gravel.

Dirt: plain old dirt can be firm and stable if it is appropriate soil to start with, and if it is compacted. Things to watch out for:

- Since most users will follow the "beaten track" it may mean that the surface compacted by use ends up being a "single track" and thus be too narrow for the users who need a wider tread (like wheel chairs, baby buggies, etc.) of which there may not be enough to beat out a wider track
- "Good dirt" may be hard to come by. In central Vermont, often the native dirt along the trail is organic (unstable and muddy) or it is clay (slippery) or it is sand (shifty).

Concrete or asphalt: are smooth and firm when new, but eventually deteriorate. Regular maintainers can help by keeping organic debris from building up, and by cleaning out grass and vegetation growing in cracks. Over a span of decades, pavement like this will need reconstruction.

What about grass growing on the tread?

In some stretches of trail, grass will grow on the tread surface.

Likely to happen:

- where gravel or compacted dirt surface, or where pavement is cracked
- where there is more sunlight
- on the edges of the trail where use is less- the grass won't grow in the center line of the trail where traffic wears it away - but will grow along the edges of the tread where traffic is lighter.

In practice, what is the maintenance need? If tread is otherwise in good shape - firm, smooth etc, - then closely mown grass is OK. However, species of plants that grow in thick bunches (some grasses), or that have thick stalks (burdock) are **not** OK. The need to keep the grass closely mowed, and to clear other vegetation, can be a very significant regular maintenance job.

Plants Growing Into the Trail

Clearing width and height.

Height: 8' minimum, 10' better. AKA: if you can reach up and touch it, it should probably be cleared.

Width: At least one foot beyond the edge of the tread on each side; two or three feet is better; more than that not needed. AKA: if you are standing on the trail, and reach out and touch it, then could clear it.

- Except, if the original trail was constructed with trunks of mature trees flush with the edge of the trail, then it is OK to leave them in place (i.e. no need to cut them out as a part of regular maintenance - we already decided to leave them when we built the trail.)

(By the way, this is the clear width to all items along the side of the trail, not just plants but also things like sign posts.)

Reasons for clearing.

Because plants growing into the trail physically block it.

Because plants growing flush with the edge of the trail cause people to "shy away" which may have the effect of narrowing the amount of trail that gets used, or may even push people off the trail as they "shy around" plants on one side and into cleared area on the other.

Plants growing right up to the edges of the trail at curves and corners also block sight lines so people coming from opposite directions may not see each other approaching around a bend.

Woody branches from trees and bushes.

How to cut off a branch so that it does not harm the rest of the plant.

- cut branches at a "node" where the branch forks off of another branch or the trunk; so that don't leave long dead branches sticking out.
- cut the branch close to where it starts, but not flush with the base of the branch. Leave just enough sticking out (less than an inch) so the "branch collar" (aka "branch shoulder" aka "the slightly thicker part of the branch at its base") is left uncut; so that you minimize harm to the rest of the plant.

In addition to minimizing harm to the plants, Cutting at the "nodes" also creates a natural looking edge to the trail, with the vegetation "feathered" like forest edge would normally look, rather than having everything cut off in straight lines like trimming a hedge.

If you need to cut more than half of the branches on a tree or bush, it may be better to simply cut down the whole plant flush with the ground.

Cutting back brush may need to be done as much as annually in some trail sections. This is because trees and bushes will grow enthusiastically into the open, light filled area of the trail.

"Soft green" vegetation.

Fast growing vegetation like grass, nettles, ferns, other "soft green" plants will crowd up to and into the tread in some stretches of trail. Become familiar with your stretch of trail and aware of if these sorts of plants grow along it, and if so how fast they grow. May need to be cut several times a year.

The most dangerous job – cutting blown down trees.

Professional loggers say that chainsawing a tangle of blown down trees - or standing dead trees ("snags"), or trees that are broken off and hanging in the air ("widow makers") - is one of the most dangerous things you could ever do in the woods. Even cutting blow downs with hand tools may be unsafe, as the tension in the wood is very great. So, keep in perspective that the most important job of the CVTA maintainer is to observe and report the need for dangerous clearing of this sort. We can get skilled professional operators to actually go in and do any large scale, dangerous work that comes up.

Plants to not cut.

Be aware if any landowner, regulatory or other conditions specify limits on clearing of plants.

Knowledge of noxious, invasive weeds.

Honeysuckle, Knotweed, Barberry, Chervil, and Buckthorn are example of noxious invasives present along some stretches of the Cross Vermont Trail. They form thick stands which are a problem because they grow into the trail fast. Also, some are thorny or are skin irritants. Learn how to identify them. They grow back aggressively when trimmed - so don't bother just trimming a few branches. Cut the whole plant off flush with the ground. They will resprout and need to be cut back again repeatedly, but eventually their vigor will be reduced. Also, learn how to control them without accidentally propagating and spreading them further. Contact CVTA to learn more (ug!)

Poison Ivy.

Parts of the Cross Vermont Trail network travel through prime habitat - historically disturbed rights-of-way along old railroads – for poison ivy. Learn to recognize and avoid contact with it. If it is present in an area that attracts people (such at a scenic spot) then we could put up signs educating trail users to be wary. If it is growing into the trail, then contact CVTA and we will work out a way to safely remove it.

Drainage Structures

Many lengths of trail don't need specific drainage structures. A correctly built tread – which has a gentle crowned shape, higher in the middle and lower on the sides – will shed water off the to sides along it's whole length.

But, many places also need more help to deal with the water. These structures need regular, annual maintenance to work properly.

Water v. Drainage Structures.

Water wants to do three things:

- run along trail and wash it out
- saturate trail and make it muddy, slippery, unstable
- after running off the trail, cause erosion downhill of the trail, or pollution into waterways nearby

Which are prevented by four kinds of well built and well maintained drainage structures:

- uphill sideditch
- cross drain (such as culvert or small bridge.)
- drainage dips and tread grading
- gentle exit ditches designed to release water slowly, and not just "move the problem" downhill

Uphill sideditches and cross drains described:

- They capture water from uphill and take it past the trail without letting it actually get onto the trail.
- Uphill side ditches run parallel to the trail tread. They capture diffuse water traveling across a broad area. Could be ground water, or seeps, common in Vermont woods. Or could be surface water "sheet flowing" across the ground during rainstorms and snowmelt. The uphill side ditches gather the water and funnel it along, eventually sending it across the trail at a "cross drain".
- Cross Drains, such as culverts or small bridges, allow collected water to travel across the route without impacting the trail.

Drainage dips described:

- Water running along and then off of the trail is a factor everywhere the trail exists. (Because of rainfall if nothing else). In many places water simply drains off the side of the trail without the need for special structures. However, all trails eventually become cupped, rutted or potholed, which traps water on the trail. Once trapped, water continues to accumulate on the trail until it reaches a critical mass, enough to cause damaging erosion.
- Dips take water that is already on the trail, and get it off. Also called waterbars, and many other names (some unprintable.)
- The idea behind drainage dips is that the trail is a little bit "rolling"; regularly moves slightly up and then slightly down. Since water always runs down hill, if trail regularly turns back uphill then the water will run off to the side at the upturns.

Exit ditches:

- Amazingly – on trails, the most common reason for failure of cross drains and dips is that they are built without exit ditches, or with exits that dead end. Usually they dead end at an obstacle like a large boulder or tree. You can see why someone would stop digging. This leads to rule #1 of building and maintaining drainage structures: take care of the exit first, then work back from there to the trail. If you can't exit the water, there's no point to any of the other work.
- The trick to a long lasting exit ditch is to get the water to "daylight" (meaning, carry it to the point where it naturally runs away from the trail on it's own) while at the same time releasing the water gently (so as to not simply displace erosion from the trail to some other place downhill). Another aspect of gentle exits is to release the water to a place where it can spread out and soak back into the ground (which is to say, don't drain the ditch directly into a natural waterway).

Maintenance that drainage structures need.

Drainage structures have two problems:

- 1.) Either they silt up and fill in - most functioning drainage structures will eventually fill in and need to be dug out. Trail maintainers should look forward to doing this job a lot.
- 2.) Or they scour out and erode - this is less common; if it happens it means that the structure was not built correctly in the first place and needs to be fixed.

So, silting up and filling in is normally what the regular maintainer finds each year. Ditches and cross drains clog up with sediment and with sticks and leaves and other debris. Once they clog up the water has to find somewhere else to flow, which is usually up onto the trail - causing problems there. The fix is to take a shovel, hard rake, hoe, your preference, and clean out the drainages once or twice a year.

When maintaining drainage structures, the simplest thing to do is to maintain the original shape and size the structure. This is easier if the ditches, dips and drains are maintained regularly - often enough so that you can still tell what the original shape and size was! If they go unmaintained for too long, they may fill in so completely that you can't tell what the original size was. If they go unmaintained for really long, you have to pull out tree stumps to get them working again!

The correct size and shape for ditches, dips and drains varies on a case by case basis. But here are some rules of thumb.

Generic size for hand built ditches:

- Make wide ditches with flat bottoms and gradual angled sides.
- The base of the ditch should at least a foot wide, and two feet is better if there is room.
- Make the sides gradual; sloping like the sides of very gradual letter "V" and not straight up and down like the letter "U".
- In general, the way to make a ditch carry more water is make it wider rather than deeper (because deep, narrow ditches just clog up quicker.)
- But the depth matters, too, of course. For one thing, the depth of the ditch has to trend steadily down, so that the water flows along it. A second factor is that side ditches need to be deeper than the level of the trail tread. Their job is to catch water percolating underground and divert it from saturating under the tread.
- (Smaller ditches do work, just not as well and not for very long. You have to clean them out more often.)

Generic size for drainage dips:

- A classic drainage dip forms a very gradual "swoosh" in the tread, making a long gradual sideways "S" shape - where the grade gradually goes down (to form a "dip"), then gradually goes up (to form a "berm"), then goes back down to the regular tread level.
- The exact measurements of the dip and berm vary widely depending on the spot where you are working. However, as a general rule dips need to be spread out over a lot more distance than most people tend to think at their first attempt. Here is a good rule of thumb for the measurements of the dip and berm on a typical stretch of the Cross Vermont Trail: start at the regular tread level, then gradually go down about 6 inches over the course of at least 6 feet,

then gradually go up about 1 foot over at least 9 feet, then back down about 6 inches over another 6 feet – see what we mean? A lot of distance!

- The most common mistake people make when digging a drainage dip is to just dig a narrow trench across the trail. Don't do that. It's faster, of course, but it ruins the smooth tread surface we have worked so hard to make, and in any case it doesn't do a good job of carrying water off the trail since a narrow trench collapses and fills in quickly.
- Over time the low point of the dip will fill in with sediment, and the high point of the dip will be worn down by traffic. The regular trail maintainer should expect to use a shovel or hoe to reestablish the shape of the dip every year.
- An alternative to a constructed drainage dip is to build the original trail tread with a flowing series of gradual ups and downs that are based on the topography of the ground. This makes the drainage happen more naturally and requires less reshaping of the tread. The regular maintainer should know where these drainage points are along the trail, and keep the side of the trail cleared out so the water can sheet off at them. Without regular maintenance at these locations, the tread will cup or rut, and the side of the trail will build up with debris, trapping water on the trail.

Hand built and maintained ditches, dips and drains are a big part of the maintenance work along "simple, in the woods" sections of trail. Other sections of trail, such as paved municipal recreation paths, probably have much larger drainage and runoff treatment structures which would not be maintained by volunteers. So in those areas the job of the CVTA maintainer would be just observe if the structures are working well and not causing a problem along the trail.

Signs and other trail marking

Check on signs and trail marking annually.

Know where the current signs are supposed to be, and just check on them once a year. Report if signs are damaged or missing. Also report if you observe a need for additional signs (or fewer signs!)

Physically installing signs.

- Call up CVTA office to get signs, we have replacement copies, ready for use.
- Also contact CVTA for tips on how to best install signs, vandal resistant tricks.
- And be aware that signs are the kind of thing that tend to have a lot of landowner or other conditions attached to them. Just ask for the particulars for your area.

Types of signs along the Cross Vermont Trail route:

- Highway signs – the large metal sign with a green oval. This is a federal required sign for use on roads and some paved paths.
- Trail signs – a smaller metal sign, blue and green, used as a "trail blaze" on off road trails.
- information signs – many kinds, including simple caution type signs up to trailhead kiosks.

Understanding how people follow the trail route.

- 1.) A lot of times, they just follow it, the path is obvious and doesn't need signage.
 - all the maintenance that we do to keep the physical trail open and inviting to use also contribute to making the route clear (and minimize the need for signs, which saves money and time.)

2.) Sometimes, even when the trail is obvious, if it goes a long time without a sign, users begin to worry that they might have "missed a turn" or something to that effect. So occasional signs are put up along the route to "reassure" users that they are still on the route.

- The entire route of the Cross Vermont Trail should have these occasional "reassurance" signs. The job of the maintainer is to know where they are, and to check on them once a year, and report if they need repair or replacing.

3.) Intersections need the most signs. The question for the for the Cross Vermont Trail maintainer is "whose signs are guiding trail users through the intersection?"

- In many places, the Cross Vermont Trail route is following a local trail or is following along a road shoulder. In these cases, the signage for the local trail or the road signs will steer people through intersections. For example, if trail users know that they are following "Main Street" then they can just follow the signs for Main Street, there doesn't necessarily need to be a Cross Vermont Trail sign at every intersection that Main Street has with every other road.
- However, in other places, the CVTA has the primary responsibility for signing the trail route, and so actual Cross Vermont Trail signs are needed to clarify every potentially confusing intersection. For example, if the trail is traveling through the woods, and crosses numerous intersections with snowmobile trails, it is important to place Cross Vermont Trail signs at every intersection to steer people on the correct trail and avoid having them accidentally turn down another trail where a landowner may not have given permission for non-snowmobile use.

Once you know what signs are "supposed" to be on your trail you can keep any eye on them and repair replace as needed – and also keep an eye on whether or not the current set up is really what works best, keeping track of the possible need to change up what signs are being used.

Lots more on signs along Cross Vt Trail at: http://crossvermont.org/our_trail/signs-about.htm.

Major Structures

This is one of the simplest jobs that trail maintainers do - though it occasionally leads to the most complex maintenance jobs.

The job of the maintainer is to be aware of the major structures on your section of trail. Go take a look at them once a year. Call the CVTA if you see something that concerns you.

Examples of major structures: bridges, retaining walls, railings, gates, and other spots along the trail that were built in a specific way but may eventually need to be rebuilt or redone (such as a constructed intersection between the trail and a road; or such as a large amount of trees planted to buffer the trail from a nearby house, and so on.)

Examples of concerns: wooden structures rotting, concrete structures cracking, gates or railings damaged from impacts or vandalism.

CVTA can set you up with information about the major structures on your stretch of trail. If the structures were built by CVTA, then we also have records from the construction (so you can compare how they look now to how they were supposed to have looked when built; can

understand how they were put together; can know how long the original builders thought the structures were intended to last.)

CVTA will hire professional inspectors to review major structures in a formal way, as needed. Of course there is no intention that regular trail maintainers be asked to make professional engineering judgments about the soundness of any structure. However, having volunteer trail maintainers "keep an eye on things" helps us to stay on top of maintenance needs that crop up year to year.

Repairs to major structures often end up being important, worthwhile volunteer projects. Contact CVTA if you are interested in taking on a project like this.

Links to more information.

This information is generally available on the internet - or contact CVTA directly to borrow copies.

Vermont Trails and Greenways Manual is a good place to start, at vermonttrailsandgreenways.org.

Pedestrian and Bicycle Facility Planning and Design Manual produced by the Vermont Agency of Transportation is free online. The basic source of information for all the places where the Cross Vermont Trail follows regular roads, and for the places where the path is built as a developed "front country" shared use path.

<http://vtransengineering.vermont.gov/bureaus/mab/local-projects/bike-ped>

Designing Sidewalks and Trails for Access produced by Federal Highway Administration and available for free online. This is a good, clear description of common sense ways that trails can be built so that they are physically accessible to a wide range of people.

www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/sidewalk2

Trail Construction and Maintenance Notebook and *Hand tools for Trail Work* produced by the US Forest Service and available for free online. Much good information on building and maintaining trails by hand, with volunteer work crews, and in less developed, forest land areas.

www.fhwa.dot.gov/environment/recreational_trails/publications/fs_publications

Trail Solutions: IMBA's Guide to Building Sweet Singletrack produced by the International Mountain Bike Association. It costs money, but it's well put together - especially good at describing the nitty gritty of maintaining hand built trails in less developed settings. IMBA can be reached at www.IMBA.com.

Vermont Invasive Exotic Plant Fact Sheet Series produced by Vermont Departments of Environmental Conservation, and Fish and Wildlife, and Forests Parks and Recreation, of the Vermont Agency of Natural Resources, and the Nature Conservancy of Vermont and available free at www.nature.org/vermont. Learn which plants growing into the trail are noxious invasives that will need extra work to control.

Guide for the Development of Snowmobile Trails produced by Vermont Association of Snow Travelers. Contains much good information on trail building in general, as well as specific things to keep in mind when maintaining trails that are used by snowmobiles. www.vtvast.org

Equestrian Design Guidebook for Trails, Trailheads, and Campgrounds produced by US Forest Service and Federal Highway Administration. Available free online at www.fhwa.dot.gov/environment/recreational_trails/publications/fs_publications.

Trails for the Twenty-First Century produced by the Rails to Trails Conservancy. It costs money, but is a good book - especially as an inspirational overview of the nationwide movement to create long distance multi-use paths. Rails to Trails Conservancy also has a clearing house of trail information posted online, which can be reached at www.railtrails.org.

And last but not least - www.americantrails.org – "The world's largest online trails resource."

**Cross Vermont Trail
Background Information on "Sample City Trail"**

Trail Reference Number	Section: 1	Sequence: 5	Length: .43 mi
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Western Termini:	jct rec path and Anderson St.
Eastern Termini:	jct rec path and Bailey St.

Maintenance Responsibility:	Another organization does the maintenance
Management Partner:	City of Bigcityton public works dept. Contact: Jane Jones Phone: 802-111-1111

Use:

<input checked="" type="checkbox"/> bicycle	<input type="checkbox"/> snowmobile	<input checked="" type="checkbox"/> accessible
<input checked="" type="checkbox"/> pedestrian	<input checked="" type="checkbox"/> skinny tire bicycles	<input type="checkbox"/> atv
<input type="checkbox"/> cross country skiing	<input type="checkbox"/> equestrian	

Surface Type: [concrete/asphalt](#)

Brushing Needed?: [No](#)

Drainage Maintenance Needed?: [No](#)

Permit Conditions:

Description: -	Reference documents on file? -
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Sign Inventory:

type: Highway Sign	location: 20' east of jct rec path with Anderson St., facing west.
post: metal-u	
image on file?: Yes	

Sign Inventory:

type: Highway Sign	location: 20' west of jct rec path with Bailey St., facing east.
post: metal-u	
image on file?: Yes	

Major Structures:

type: other	description: Cedar hedge to screen trail from neighboring houses.
Year Built: 2004	
Reference documents on file?: Yes	

**Cross Vermont Trail
Background Information on "Sample Country Trail"**

Trail Reference Number	Section: 3	Sequence: 2	Length: 1.64 mi
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Western Termini:	jct path and Rte 99 at parking lot
Eastern Termini:	jct path and Little Rd

Maintenance Responsibility:	Shared responsibility for maintenance
Management Partner:	VroomVroom Snowmobile Club Contact: Bob Smith Phone: 802-222-2222

Use:

<input checked="" type="checkbox"/> bicycle	<input checked="" type="checkbox"/> snowmobile	<input checked="" type="checkbox"/> accessible
<input checked="" type="checkbox"/> pedestrian	<input type="checkbox"/> skinny tire bicycles	<input type="checkbox"/> atv
<input checked="" type="checkbox"/> cross country skiing	<input type="checkbox"/> equestrian	

Surface Type: [gravel](#)

Brushing Needed?: [Yes](#)

Drainage Maintenance Needed?: [Yes](#)

Permit Conditions:

Description: Trail passes near Deer Wintering Area. Maintain signage educating users to stay on trail, keep dogs under immediate control. Minimize cutting of softwoods.	Reference documents on file? Yes
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Sign Inventory:

type: Trail sign	location: .75 mile east of jct Rte 99, facing west
post: pt-4x4	
image on file?: No	

Sign Inventory:

type: Information	location: .26 mile west of jct with Little Rd.
post: other	
image on file?: Yes	

Major Structures:

type: Bridge	description: 16' span wooden bridge over Bubbling Brook.
Year Built: 2006	
Reference documents on file?: Yes	