GUIDE FOR THE DEVELOPEMENT OF SNOWMOBILE TRAILS

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be used to connect two corridors to each other. Secondary Trails are generally for local use only and have variable trail widths and grooming conditions. Due to the variability of the conditions and locations of these trails, secondary trails may also provide a more primitive recreational experience.

B. Trail Classes

Trail classes describe the general level of development of a snowmobile trail including the width of grooming equipment it is designed to handle. On the Statewide Snowmobile Trail System, there are two types of trail classifications.

1. Class 1 Trails

Class 1 trails have trail-treads at least 12 feet wide, wider in curves, and must be capable of handling groomer power units and drags at least eight feet wide (Table 3, Page 15). They are cleared to an effective height of at least 12 feet (Table 4, Page 17). All culverts and bridges must be sufficiently wide to accommodate grooming equipment eight feet wide. Bridges must be built according to engineering designs approved by the government agency or user group responsible for such matters to accommodate groomers up to ten tons. The traveled portion of Class 1 trails can be much wider than 12 feet and must be capable of handling two-lane traffic. Where possible, add an additional two feet of width to improve safety in high use areas.

2. Class 2 Trail

Class 2 trails have trail treads that are at least eight feet wide, wider in curves, and must be capable of handling groomer power units and drags at least four feet wide (Table 3, Page 15). They are cleared to an effective height of at least ten feet (Table 4, Page 17). All culverts and bridges must be sufficiently wide enough to accommodate grooming equipment four feet wide. Bridges must be built to accommodate groomers up to 2,000 pounds. Class 2 trails can be wider than six feet and may have variable grooming if any at all depending on the local club responsible for maintaining the trails in the area.

C. Landowner Relations

Construction and maintenance of snowmobile trails is an ongoing consideration and important to the landowner as well as the club. Trails must be constructed and improved during the months when snow is not present and regularly groomed during the winter months. Signs are generally put up in the fall and taken down in the spring. Trails must be limbed and de-brushed in the summer or fall, and in the spring fences and gates must be closed and litter as well as other trail related structures must be removed. Winter work cannot substitute for proper dry season planning, improvement and maintenance. Excellent trail conditions are the result of long hours of work and indicate a dedicated trails coordinator, good maintenance practices, adequate equipment and willing workers. Good relations will foster more productive partnerships with landowners.

ready for your preliminary visit. You will be presenting your trail proposal, showing the map with the proposed route, asking for approval of the route (or suggestions for an alternate route) and for permission for the route finally agreed upon. Be sure that the landowner understands the trail construction specifications, for example, cleared width and height, bridges, etc., for which you are requesting permission.

The asking of permission and assurance of responsibility will go far toward allaying landowner fears. Approach them as official representatives of an organized group rather than as individuals, and explain the advantages of an authorized trail in preventing unlawful trespass. Be prepared to discuss liability insurance issues, your grooming and maintenance program, inappropriate uses, trail closure and future plans.

Above all, maintain good relationships as today's refusal may change into tomorrow's approval. Remember that full cooperation with the landowner is a must. It is their land and their wishes must become your law. Be prepared to discuss handshake agreements, revocable permits, leases, rights-of-way, conservation easements, and fee ownership.

3. Return visit

Once the landowner has approved the original concept and has had the opportunity to say exactly where the trail should cross his property, it is usually possible to obtain actual permission on the spot or on a return visit. Keep landowners informed of your activities through a regular newsletter or an annual thank you note. Invite the landowners to a supper or other event.

Understand what specific requirements the landowner has. Explain the club's commitment to regular trail maintenance and responsible trail use.

4. Written Landowner Permission

It is important that once permission is granted, the club representative obtains written landowner permission. There is an official three-page form that identifies the Landowner whom is granting the permission, the snowmobile club obtaining the permission and the period for which the permission is valid. The permission form explains the limitations of the liability of the landowner for personal injury and property damage.

F. Public Landowners

Close working relations with personnel from the appropriate municipal, state, or federal agency is very important.

When you are contemplating a project on the public lands, contact the appropriate public representative well in advance of your work, preferably before you contact adjacent private landowners. It's pertinent to start planning for projects a year or more in advance. These representatives are familiar with the rules,

4. *Do not disturb sites for endangered species, and habitats for rare plants or animals.*
5. *Do not disturb historic/cultural sites, including burial grounds, homesteads, cemeteries, and travel routes. Also be conscientious of stonewalls, and utilize existing openings or "bar-ways" if possible. If trail layout requires passing through a stonewall and utilization of an existing opening in the wall is not possible you must first ensure the landowner is agreeable to the re-location of the stones. If so, ensure that the stones are neatly piled along the existing wall or in a previously agreed upon location that is nearby in case reconstruction of the wall if necessary at a future date.*
6. *Avoid steep slopes where soil erosion could become a problem (more on this under trail development).*
7. *High elevation areas: these can be subject to high-intensity storms, and highly erosive soils with a very limited capacity to store runoff. Runoff can be very "flashy," i.e., sudden large amounts of runoff after rainstorms. Re-vegetation can also be slower, so be especially certain to follow the guidelines below. Erosion control is of utmost importance at high elevations.*
8. *Stream crossings where small amounts of sedimentation can severely damage fish habitat and water quality (more on this under trail development).*
9. *Conifer stands: although they can add much scenic variety to a trail, avoid long stretches of trail under conifer stands, (evergreens like spruce, pine, fir, and hemlock). These species tend to capture snow and prevent it from reaching the trail below. On wide trails there is less need to be concerned with this factor.*

   Other areas like ponds and lakes also require careful planning to avoid site damage and minimize safety risks to people.

D. Topographic Considerations

To help retain a good snow cover on the trail surface, avoid direct southern exposures and cleared ridge tops.

Trails should be laid out so that they "slab" across side slopes; they should not run straight up or down the slope. Trails running straight up a slope can be difficult to keep drained and are much more susceptible to catastrophic washouts since runoff often cannot get off a trail running straight up and down hills. Water bars and dips must be excessively high, skewed, or long to avoid such erosion. Water buildup in the trails during the winter can also result in unmanageable moguls and ice conditions.

Ridgelines, upper side slopes, knolls, shoulders of slopes, and other convex shaped
"water shedding" topography are preferable to concave area such as swales and lower side slopes, which tend to be wet or to collect water. Generally, on higher or

2. Field Layout Procedure

Take with you the following equipment:

- A clinometer or other instrument to measure percent grades;
- Your U.S.G.S. topographical map showing the proposed location; some land managers have aerial photos that can be very helpful.
- A compass to relate to the map;
- A walkie-talkie to keep in touch with each other;
- A scale or ruler that corresponds to the map scale (for taking distances from your map);
- Red, blue or other brightly colored flagging tape;
- Several small stakes for flagging the trail location where there is no vegetation of sufficient size (an archery quiver is an easy means of carrying the stakes).

Work in pairs. The lead person should scout the terrain ahead looking for the most desirable route. In hilly areas, the lead person must check grades very frequently to be certain not to exceed the recommended maximum listed in Section III, B, (Page 15). At this stage, try to avoid significant obstacles, large trees, shallow bedrock areas, and wet, slow draining areas and other similar conditions. The lead person then stations him/herself within sight or sound of the other at the next outstanding feature of the trail (curve, crest of a hill, notable landform, etc.). The partner should then proceed toward the lead person, tying the plastic ribbon to vegetation or stakes along the way. Repeat this procedure until the entire trail length has been flagged. You may encounter obstacles that require going back to relocate and re-flag previous sections.

Pay particular attention to the trail alignment. Avoid sharp bumps and corners. Remember, the tighter the corner, the wider the trail needs to be to accommodate the same width of grooming equipment. See the section concerning Trail Width, (Page 15). Adjust flagging here and there as necessary to improve or avoid nuisance or hazardous situations, to include interesting points not previously identified, to reduce the steepness of the trail, etc. If you are using public lands, this is a good time to get the local administrator out on the trail. Be sure you can explain your reasons for your choice of terrain and specific locations. This interaction will be beneficial for a good understanding of the needs and restrictions.

Your last step is to mark the final centerline by tying additional ribbon at intervals close enough (15' to 20') to be visible one from the other, so that the construction crew will know exactly where to place the tread. Your trail design is now complete except for obtaining necessary permits.

Favor locations where soil depth exceeds 3 feet.

Soil texture has a major influence on soil drainage and erosion. Texture refers to the sizes of individual soil particles. Clay and silt are the smallest particle sizes, and soils containing high amounts of these particles tend to be muddy when wet or cracked and dusty when dry. They are susceptible to compaction and erosion, especially on steep slopes. Likewise, soils composed mostly of sand, which has the largest particle sizes, are extremely unstable and should be avoided. Single-texture soils may be suitable for trail use if gravel-sized particles are embedded in the soil. The best soils for trail use are loam soils that contain a mixture of sand, silt and clay. Boardwalks or corduroy may be required on trails built on sand or clay soils.

Table 1 - Soil Textural Classes

Sand	**Loose and gritty. Will not form a ball.**
Loam	**Smooth (flour-like), but slightly gritty. Forms a ball, but ribbon usually breaks easily.**
Silt	**Smooth like flour, no grittiness. Forms ribbon that breaks under own weight.**
Clay	**Smooth and sticky when wet. Forms ribbon that is long and pliable.**
Organic (peat & muck)	**High amount of decomposed material and water. Black to brown color. Wetlands, low areas.**

To identify a soil's textural group, moisten a small amount of soil to the consistency of putty. Make a small ball of soil and squeeze it between your thumb and forefinger, pressing the thumb forward to form the sample into a ribbon. Table 1 describes each soil by textural class.

J. Road and Railroad Crossings

Your club may have to use existing railroad crossings on active railroads unless you obtain permission to cross them at other locations. Choose road or rail road crossings for clear visibility and safety over convenience. Always try to cross at right angles since most snowmobiles do not steer well on pavement or could become entangled in railroad tracks on angled crossings. Adequate sight distance along the road in both directions is required as shown in Table 5 (Page 18). Do not cross at curves where sight distance is reduced.

Avoid crossing roads or railroads where they lie above the surrounding area (where you have to climb a steep bank to get to the road or railroad). Approaches should be

B. Trail Specifications

Snowmobile trails should be built to the specifications listed below for several reasons:

- safety for both snowmobilers and groomer operators.
- protection of the environment by choosing locations with the least impact and by reducing soil erosion or sedimentation into streams.
- to protect the investment in the trail.

1. Trail grade (steepness)

Grade is the measurement of trail slope generally expressed as a percentage. Percent grade is equal to the vertical distance divided by the horizontal distance times 100. A sustained grade (any grade that remains the same for more than 1,000 feet) generally should not exceed 10 percent, although this limit may be exceeded for short distances up to a maximum of about 25 percent. Loam soils with a mixture of sand, silt and clay generally sustain traffic on steep slopes better than soils with sand, silt or clay alone. Excessively steep slopes can be difficult to groom and are more susceptible to erosion than gentler sloping trails.

Table 2 - Description of Different Trail Grades

Percent Grade	Description
0% - 2%	Nearly Level
3% - 6%	Gently Sloping
7% - 12%	Moderately Sloping
13% - 18%	Moderately Steep
19% - 26%	Steep
26% & Greater	Very Steep

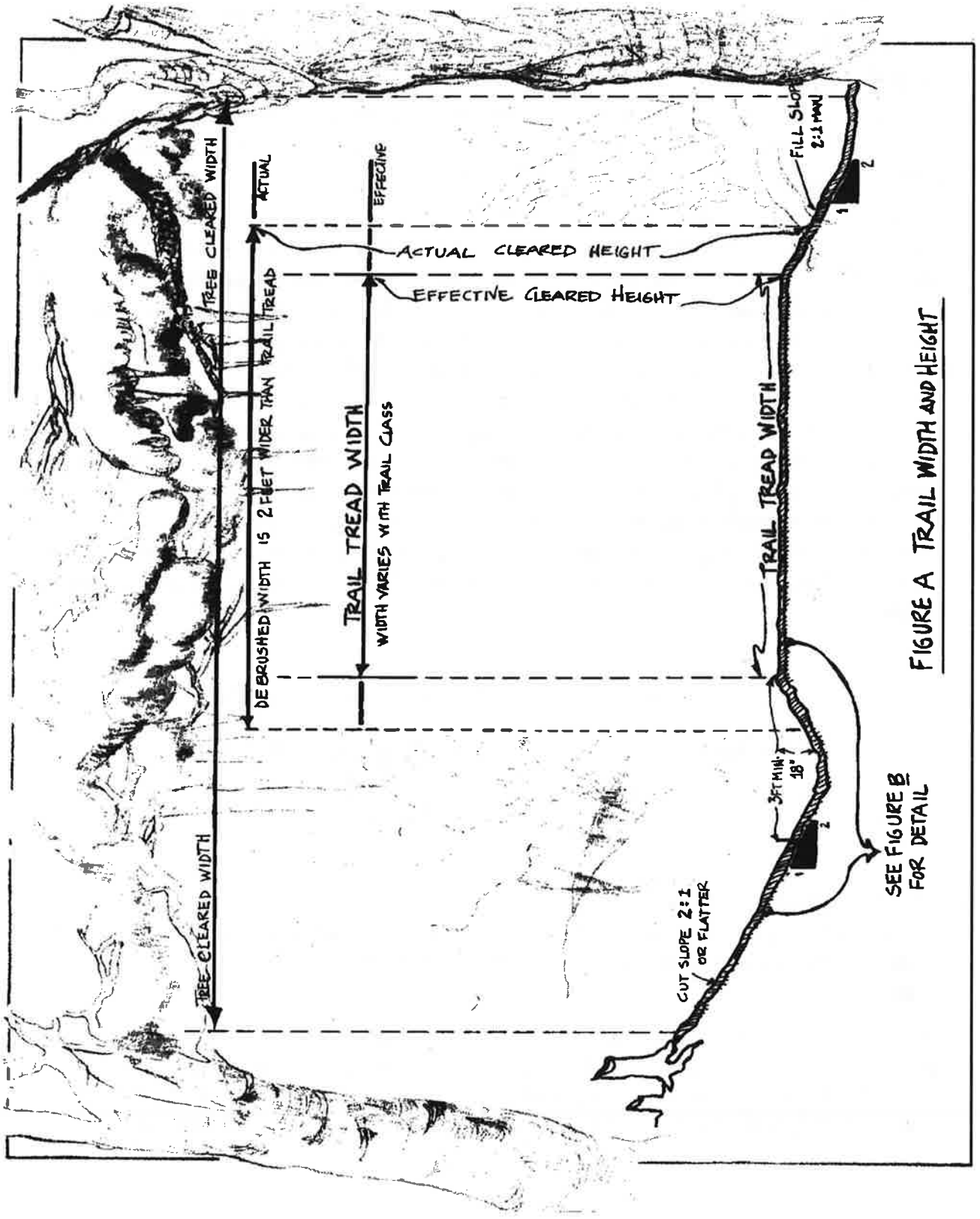
2. Trail width – (See Figure A - Page 16)

There are three parts to trail width, the cleared width, the tread width, and curve widening.

a. Cleared Width

This is the width of the cleared area through a wooded area. It includes the tread width, the space necessary for ditches, and enough additional clearing to avoid leaving trees along the tops of cut banks with root systems largely removed and subject to toppling over. It also depends upon the steepness of side hills the trail crosses; steep side hills require additional cleared width since cut banks and fill slopes are longer on steep side hills. The cleared width will be highly variable within any class of trail.

Figure A - Trail Width and Height



5. ***Vertical alignment***
   Vertical alignment refers to the rise and fall (bumps and dips) in the trail-tread. Avoid rises over which a snowmobiler cannot see (blind spots). Also avoid dips so abrupt that a snowmobile could be thrown airborne and possibly out of control at normal trail speeds. Never leave bumps and dips in curves.

6. ***Tread smoothness*****
   A smooth trail-tread allows a trail to be groomed and ridden upon much earlier and later in the season. On corridor trails, all trees, saplings, shrubs, blow-downs, vines, stumps, rocks, and roots, which protrude more than 4" above the overall trail-tread, should be removed over the entire width of the trail-tread surface. Consider smoothing non-corridor trail treads to the same standard. Hazardous trees outside the trail-tread should be removed.

   ***** If there is an obstacle adjacent to the trail tread that cannot be removed, be certain to identify it with a reflective barricade, stakes, or snow fence to warn of holes, rocks or other obstacles for the grooming operator and snowmobiler. This area should be properly signed.*

7. ***Sight distances at road and railroad crossings***
   The sight distances recommended in Table 5 apply to all road and railroad crossings for all trail classes.

Table 5 - Sight Distances at Road and Railroad Crossings***

Posted Highway Speed (MPH)	Recommended Minimum Sight Distance in Feet in Both Directions from Trail
20	125
25	275
30	330
35	385
40	440
45	499
50	550
55	715

***** *Vermont Agency of Transportation minimum corner sight distance.*

Greater sight distance is required when vehicles approaching on highway are traveling downhill toward trail crossing.

8. ***Aesthetics in trail construction***
   The appearance of the trail after it is built is extremely important. It leaves a strong message with landowners, non-snowmobilers, and public administrators

three classes of trail and they can be used on grades up to 35% and sometimes steeper. Their ability to fell trees directionally and push them to the ground is a great labor saver and safety factor in dense woods. They can pick up large stumps or whole logs and place them in a manner that is aesthetically pleasing. They can push even larger materials well off the trail. They can dig out large stumps and boulders more easily than any other type of equipment because of their ability to pry upward with great leverage. With the ability to swivel and reach, excavators can place stones and boulders over the side of a trail for cribbing or for riprap at bridge sites. They cause less disturbance while preparing stream crossings because they do not need to work directly in the stream. A tracked excavator is also well suited to working in soft muddy conditions. Since it does not have to travel back and forth repeatedly over muddy areas, the soils stay firmer and are less likely to turn to "soup." Thus, even if the conditions are very soft, it can leave a smooth finished surface behind it. A 22-ton tracked excavator will often leave a shallower imprint in mud than a person.

A particularly effective combination is a tracked excavator with a "twist-a-wrist" grade-style (toothless) bucket. Contrary to intuition, with a good operator at the controls, a toothless bucket is quite effective at removing boulders. When combined with the twist-a-wrist, it has the added advantage, very important in wooded areas, of being able to ditch and turnpike or in slope a trail behind itself instead of having to work out to the side. It leaves smooth, neat ditches, cut slopes, and trail treads behind it. It can quickly and neatly remove excess soil, stone, and other debris to the side of the trail without leaving debris berms as a bulldozer often does. The toothless bucket leaves a fine smooth finished product as it moves on, and makes excellent water bars even in muddy areas. Tracked excavators look big and expensive, but in wooded, stony, or muddy conditions, they are the most efficient piece of equipment to use, especially with the correct attachments.

b. *Wheeled excavators and tractor-style backhoes*
Because of their poor maneuverability and high bearing pressure, wheeled excavators are not suitable for use in wooded, steep, or muddy conditions. They can be very useful in open areas on firm ground. Four-wheel drive and other backhoes can be useful for a variety of small fix-up and repair jobs, but generally are not well suited to heavy construction or reconstruction except in an accessory capacity in limited situations.

c. *Bulldozers*
Traditionally, bulldozers have been thought of as the most useful type of equipment for constructing snowmobile trails. With the advent of today's tracked excavator, bulldozers are no longer the preferred piece of equipment in mountainous terrain, but they still are useful in gentle terrain, for towing heavy bridge parts to remote locations, etc.

Snowmobile trail-treads should be free of obstructions as described in the Specifications, Section II, B, above.

Trail-tread construction should attempt:

- To provide a tread surface that will safely accommodate grooming equipment;
- To control surface water and groundwater runoff to reduce soil erosion and reduce the chance for ice buildup (boils), especially on hills, and
- To provide a firm tread surface.

a. Trail tread structures to control erosion and "harden" trail surface

1. Ditches

- Constructing ditches along trails is very important because they move water alongside a trail to a point where it can safely be diverted into vegetated areas away from waterways. Ditches are constructed wherever the natural topography doesn't allow water to move away from the trail.
- The side slopes of ditches should be constructed at a low angle (2:1 ratio) so they are stable.

Ditches shaped as shown in Figure B should be excavated along the edge of any section of trail where surface or groundwater creates slow draining or muddy trail surfaces. Seeps during the winter can turn into serious ice buildups that can be exceedingly dangerous for snowmobilers and especially dangerous for large grooming equipment. Muddy trail surfaces are subject to rutting and erosion by wheeled vehicles during snow free months. Well-drained trail surfaces also require less cold weather and snow than do muddy, wet trails to begin early season snowmobiling. Snow will also last longer late in the season if water cannot accumulate underneath the snow pack and melt it from below. Leaves, branches, and natural silt loads tend to fill new ditches relatively quickly, so that ditches correctly made may appear to be too large at the time of construction. The smallest ditches should be 18-24 inches deep and three feet wide at the top. This will help maintain stable ditch slopes. Larger ditches also are less likely to be plugged by debris like leaves and twigs. Many times, ditches carrying water year round will need to be deeper and wider than the minimums described above.

On side slopes, ditches will only be needed on the uphill side of the trail. On level areas, or where trails run straight up hills (not recommended), ditches may be needed on both sides of the trail.

If groundwater control is needed, but, space is not available for ditches as described here, a different trail configuration will be needed. See the section on"In sloping."

2. Broad based dips

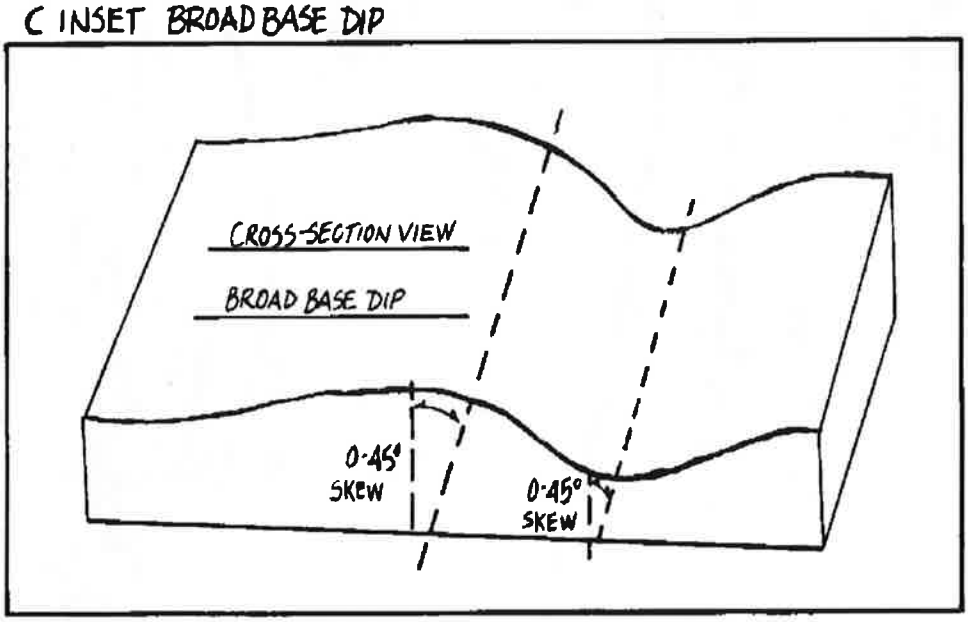
Broad based dips, Figure C, are a type of water bar that helps to control erosion when installed at regular intervals along trails, especially on hills. A properly constructed broad based dip will leave a depression in the trail-tread but will not leave a bump protruding above the prevailing surface of the trail. See Table 7, (Page 30) for dip-spacing guidelines.

- Broad Based Dips are another drainage structure often used to avoid the use of culverts.
- The broad based dip is constructed by digging a section of increased trail gradient followed by a section of reverse gradient that brings the structure back to the original trail sub grade. The bottom of the dip is out sloped to act as a water catchment and drainage channel. Spacing of broad based dips is dependent on the gradient of the trail and can be determined by the following formula:

  Spacing = 400/Slope % + 100 feet

  The catchment area should be lined with crushed stone or another type of stabilizing material.

Figure C - Broad Based Dip



3. Reinforced water bars

Broad based dips and water bars having berms reinforced with rocks or logs should not be used on snowmobile trails. Under low snow conditions, they can be an obstruction causing serious damage to snowmobiles and injury to the operators. Grooming equipment can snag on rocks and logs frozen into the berms causing serious equipment damage.

4. Bridges

Bridges are one of the highest-risk and most expensive parts of snowmobile trails. Use only the standard plan(s) in this manual, the 4-beam bridge plans available from the VAST office and on our website, or plans provided by state or federal administrators, or plans prepared by professional engineers for specific sites or applications. Always consider both the static load (snow load) and the live load (groomer and drag) when determining the design weight of bridges. Be certain to look to the future and design bridges to handle the weight of grooming equipment that might be using the bridge during its life. A sample approved plan for a bridge in varying lengths is enclosed at the back of this manual. Remember that bridges should not be visually overpowering, and that materials, colors, forms, and textures should all be subdued and blend well into the character of the surrounding area.

When deciding whether to use a bridge or a culvert, take into account the volume and "flashiness" of flows, cost of materials and installation, effects on fish passage, the amount of sedimentation of aquatic habitats, etc. Bridges are often used in place of larger culverts or where culvert size is impractical because of the waterway area. Also see the section on stream crossings in Section II H, (Page 10).

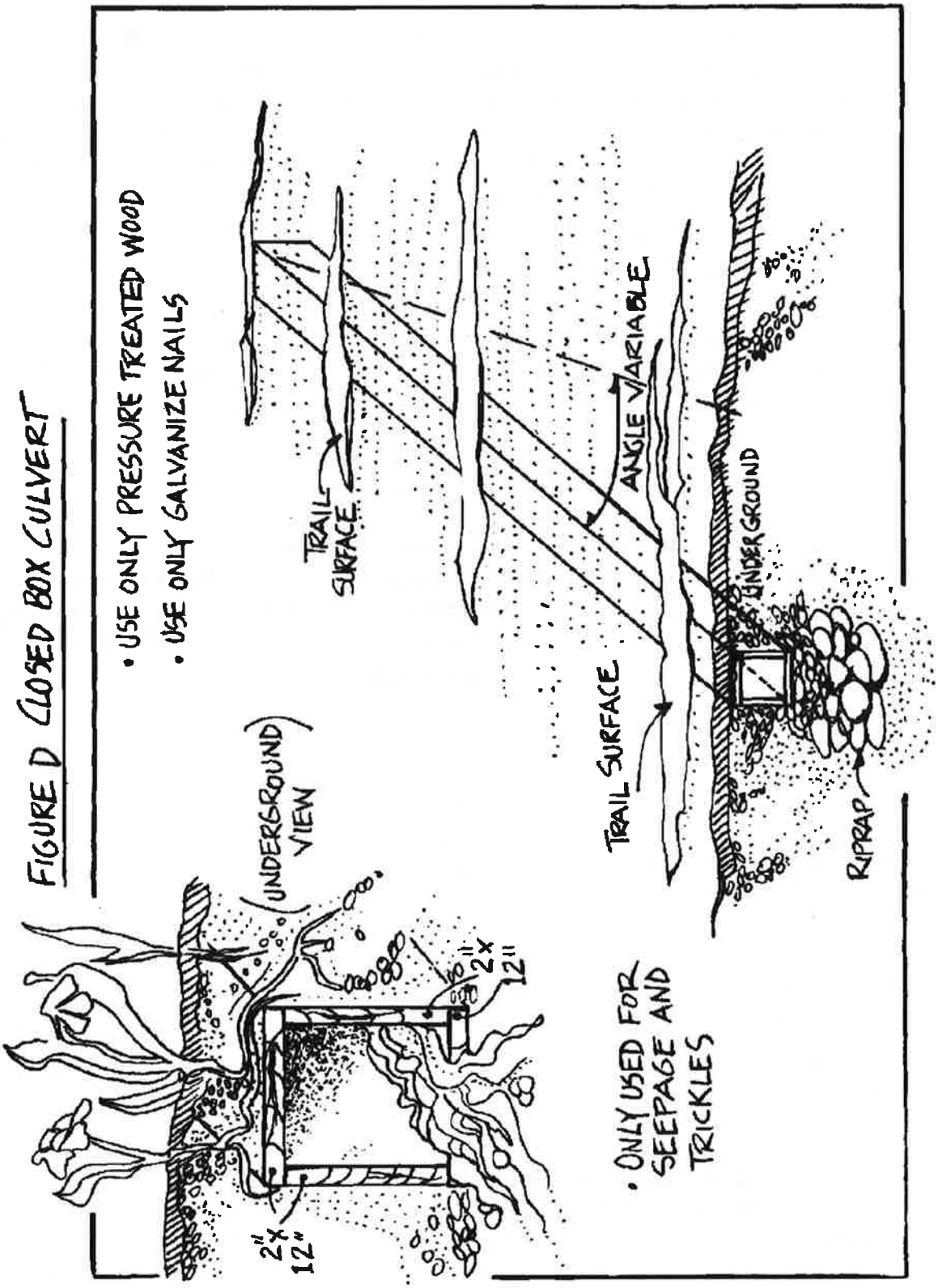
5. Culverts

Culverts are used where the flow of water across a trail during the winter is such that it permanently or periodically melts the snow surface creating a hazardous melt-out area.

Culverts have advantages and disadvantages to consider carefully before using them. A manufactured culvert can be expensive. It can be subject to heaving in cold climates especially if it is backfilled with native soil (which may be all that is practically available in remote areas). After it heaves, water can "pipe" down the outside of a culvert and wash out the backfill around it. Culverts can be plugged by downed trees or branches, which then cause the culvert to be over topped and washed out.

The velocity of water can suddenly increase in a culvert because the stream channel is constricted and the friction of the stony stream bottom is eliminated in the culvert. Thus "plunge pools" form at the outlet end of many culverts. The combination of high water velocities inside the culvert

Figure D - Closed Box Culvert



Good judgment and experience are required to determine the location for dips. Wet, slow draining areas, especially on hilly sections of trail may require more dips than Table 7 calls for. Small streams may need their own dip or culvert regardless of the distance to the next dips. Some soils require many more water bars than others. At high elevations, it's nearly impossible to install too many water bars since the rainfall intensity is often much greater than at lower elevations and since the soils there have a limited water-holding capacity. A single storm can suddenly generate large amounts of runoff. An adequate number of broad based dips and ditches are necessary to avoid trail-tread erosion.

Cross-drainage (broad based dips and culverts) is extremely important. If you do not have experience at determining cross-drain locations, you should get help from others in your club, from local public-land administrators, or from other government agency or private experts.

Table 7 - Cross-Drainage Spacing

Trail Grade *(Percent)*	**Distance Between Water bars or Broad Based Dips**	**Distance Between Culverts**
1%	400 ft	450 ft
2%	250 ft	300 ft
5%	135 ft	200 ft
10%	80 ft	140 ft
15%	60 ft	130 ft
20%	45 ft	120 ft
25%	40 ft	65 ft
30%	35 ft	60 ft
40%	30 ft	50 ft

8. Turnpiking

Turnpiking, Figure E, (Page 31), is the process of removing soil material from ditches in wet and slow draining areas and placing it on the trail-tread to raise the elevation of the tread above the bottom of the ditch or above the prevailing ground level. This can greatly improve drainage. Turnpiking is best done with an excavator since the native soil material removed from ditches sometimes can be "soupy." This material will normally firm up in a few days to a week or two depending upon the nature of the soil. Once it firms up, it stays firm. Turnpiking is very effective if used in combination with ditches.

b. Snowmobile trail-tread configuration

1. Level side-to-side

Preferably, snowmobile trail-treads should be level side-to-side to ease the task of grooming. Where the trail tread is level side-to-side on the trail as well as the terrain on both sides of the trail, turnpiking can be used to build the trail tread up.

2. In sloping

Where there is seepage into the trail tread but, because of terrain limitations or other factors, there is not room to construct a ditch, the tread can be sloped inward at about a 10% grade toward the uphill side of the trail. The in-sloped section of the trail forces water to flow along the uphill side of the trail until it reaches the next broad based dip or culvert. This will prevent seepage from crossing the trail but does not provide a level travel surface and a clearly defined edge between the water and the trail surface.

3. Out sloping

Never out slope a winter trail. Runoff is free to flow across the trail-tread and can freeze onto the trail surface. Snowmobiles and grooming equipment can slide off the trail in this very hazardous situation.

c. Erosion and sediment control and re-vegetation

Controlling erosion and sediment transport into streams and water bodies is important to protect the productivity of the land, to keep surface waters clean, and to avoid introducing sediment that can harm aquatic life. Controlling erosion and sediment are environmentally responsible goals reflecting wise stewardship of natural resources.

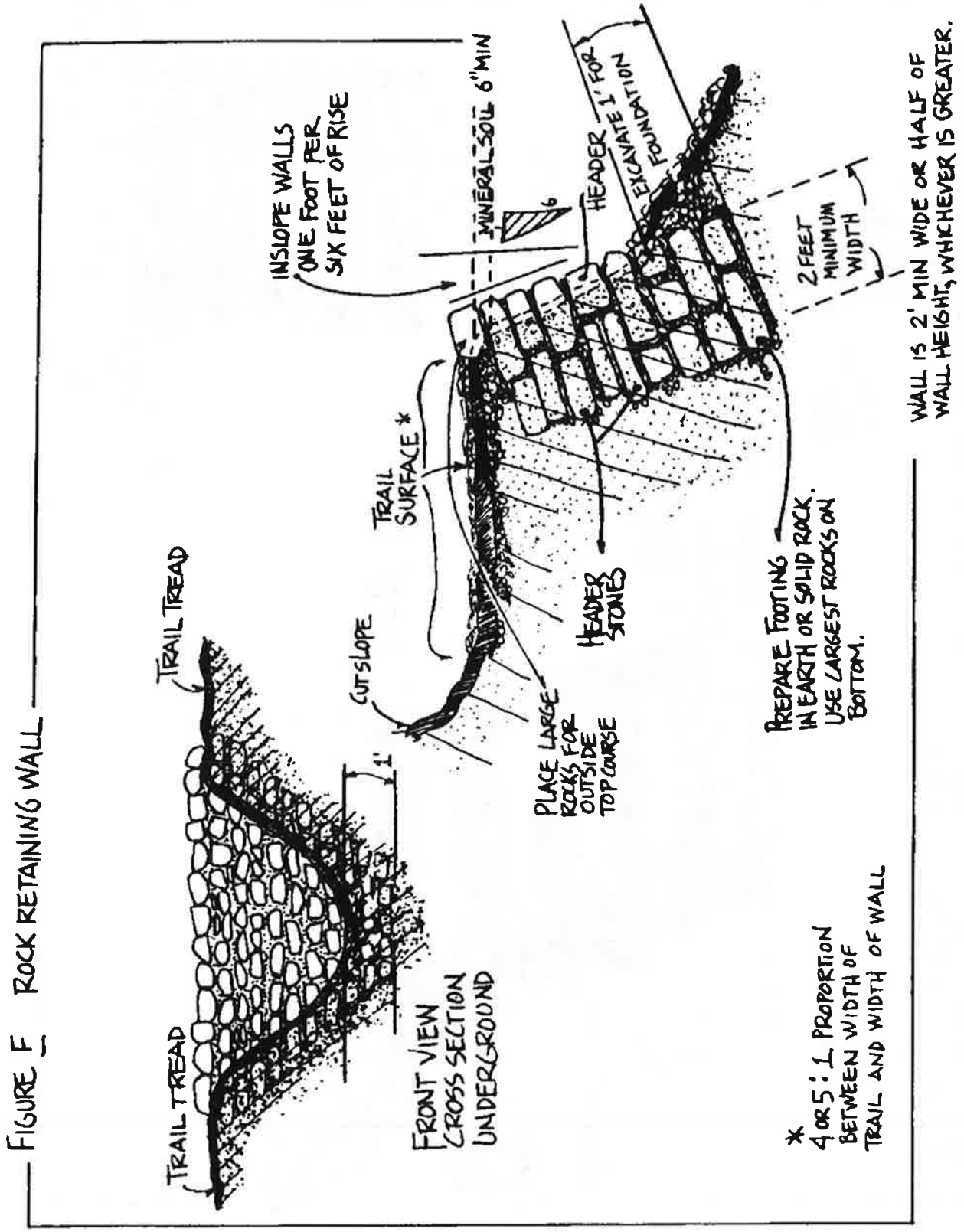
1. Cut bank and fill-slope stability

Constructing trails across a slope will require "bench" construction, i.e., excavating a level trail-tread out of the side slope. This will leave a cut bank on the upper side of the trail and a fill slope on the downhill side of the trail. The angle of cut banks and fill slopes needs to be flat enough so they remain stable and do not slump (collapse).

In general, for every vertical foot of height, cut banks and fill slopes should be sloped back at least two feet (otherwise noted as a 2:1 slope). This means that when the top of a cut slope is five feet vertically above the bottom of the ditch or trail-tread, it should be sloped back at least 10 feet from the edge of the trail or the bottom of the ditch if there is one.

Many factors can affect slope stability: (1) the texture of the soil (silts, fines sands, highly organic layers); (2) surface or groundwater movement over or

Figure F - Rock Retaining Wall



3. Filter strips

Filter strips are areas of undisturbed soil that separate streams, trails, parking lots, and other constructed areas from streams and other bodies of water (Figure H). Filter strips trap sediment naturally before it reaches surface waters. Filter-strip width is based on the steepness of the slopes along the body of water and on the composition of the soils.

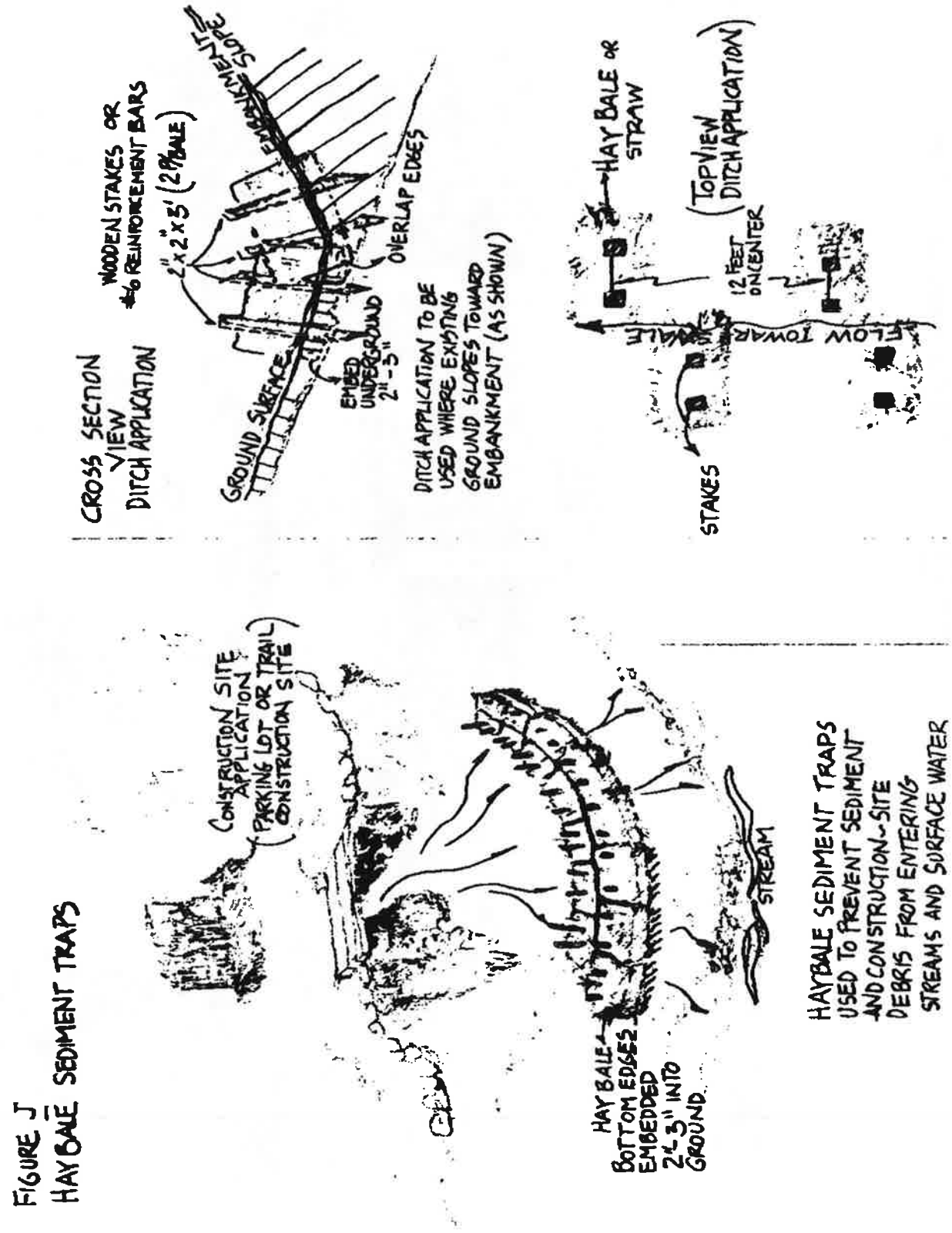
Table 8 - Filter-Strip Width

Stream bank Slope	Width of Filter Fabric Needed
1%	50 ft
10%	65 ft
20%	95 ft
30%	25 ft
40%	155 ft
50%	185 ft
60%	215 ft
Add 20% to the width of filter strip in poor soils	

4. Sediment traps

In areas where soils will remain disturbed for long periods of time, such as those near bridge sites, parking lots during construction, or other critical areas along streams, lakes, or ponds, sediment traps should be installed to collect sediment before it reaches streams or bodies of water. These sediment traps can be made of bales of hay laid end-to-end across drainage ways. Stake the bales to the ground so that running water cannot move them (Figure I). Similarly, Geo-textile fabric can be attached to stakes to act as check- dams to collect sediment (Figure J). Sediment traps must be maintained to remain effective. Before they overtop, clean out collected sediment and remove it to a location where it cannot harm surface waters.

Figure I - Hay Bale Sediment Traps



5. Re-vegetation

For best re-vegetation results, spread seed mix as you progress with construction while the soil is still soft. All disturbed areas and trails should be seeded. In some cases, such as those near stream crossings or in soils subject to intense heating and drying, trails or cut banks and fill slopes should be mulched also. Hay mulch should be spread at two tons per acre, (100 pounds or two average-size bales per 1,000 square feet), immediately after seeding. This protects the sprouting seed from the heat of the sun, retains moisture in the soils, and helps prevent rain from washing seed away.

In densely wooded areas, a seed mix suitable for shady areas will be required. On critical areas, fertilizer should be applied at the time of seeding. Nearly any commercially available granular fertilizer like 10-10-10 at a rate of 250 pounds per acre, (six pounds per 1,000 square feet), will suffice. However, some of the new slow release fertilizers, made in varying formulations, are particularly well suited to sandy, gravelly areas or to otherwise poor soils. Using a slow release fertilizer at a rate of 250 pounds per acre, (six pounds per 1,000 square feet), can eliminate the need for adding ground limestone when soil acidity inhibits re-vegetation.

Most states have developed seed mixes suited to their respective climates. Use the seed mix recommendations provided by the local governments or soil conservation agencies locally. You may need to ask for shade-tolerant seed mix recommendations for wooded areas.

IV. Trail Reconstruction/Rehabilitation

Sometimes a section of trail is so badly damaged from natural events like tropical storms and floods that repairs could be more costly and cause greater impacts on the environment than relocating the trail. Always consider both options before making plans to reconstruct a trail. Try to stabilize the old route to the extent feasible before abandoning it.

V. Safety

Safety is easy to ignore. Some trail workers feel that applying safety precautions shows a lack of experience or lack of fortitude. Contrary to those beliefs, using safety precautions indicate wisdom, good common sense, a desire to avoid disabling injury, and a strong desire to live to a ripe old age.

Safety of the trail workers and snowmobilers is the number one, most important

It is vital that all machine operators be knowledgeable, experienced persons, who have a healthy respect for the power of their equipment and for the sensitivity of the natural environment in which they are working. Safety considerations are too important to be left to chance; they should be discussed and agreed upon before the work is commenced.

Last, but certainly not least, knowledge of first aid and a first aid kit are absolutely essential. Every person or crew doing trail work must have one. The kit should contain the items listed in Figure K at a minimum for backcountry work and should also include a pocketknife, flashlight, dry matches, and a candy bar. Also, basic tools, a towrope, and extra basic parts for your equipment might save a long walk out. THINK SAFETY, whether you are laying out, maintaining, or riding your snowmobile trail.

Appendix A - Standard Bridge Plans

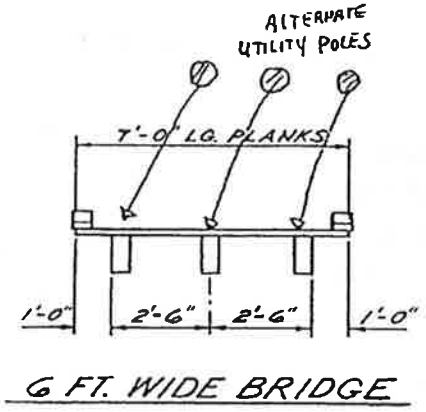
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

Treated Timber Trail Bridge Superstructure

Structural Design _____ Date _____
Checked _____ Date _____
Drawn _____ Date _____
Checked _____ Date _____
Project Criteria Checked _____ Date _____
Approval Recommended _____ Date _____
Approved _____ Date _____

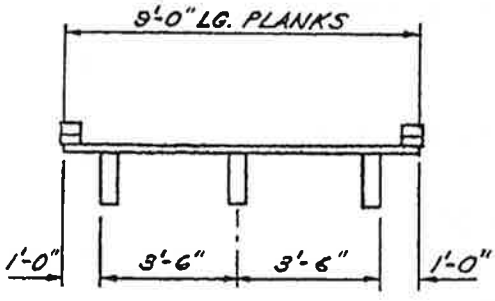
Note: Bridges on GMNF must be reviewed and approved by District Ranger/Designee

6 Ft. Wide Bridge	
Bridge & Stringer Length	**Stringer Size Fb=1550 psi**
10 ft	4" x 10"
14 ft	4" x 10"
18 ft	4" x 12"
22 ft	6" x 10"
26 ft	6" x 12"
30 ft	6" x 14"
34 ft	6" x 16"
38 ft	6" x 18"



6 FT. WIDE BRIDGE

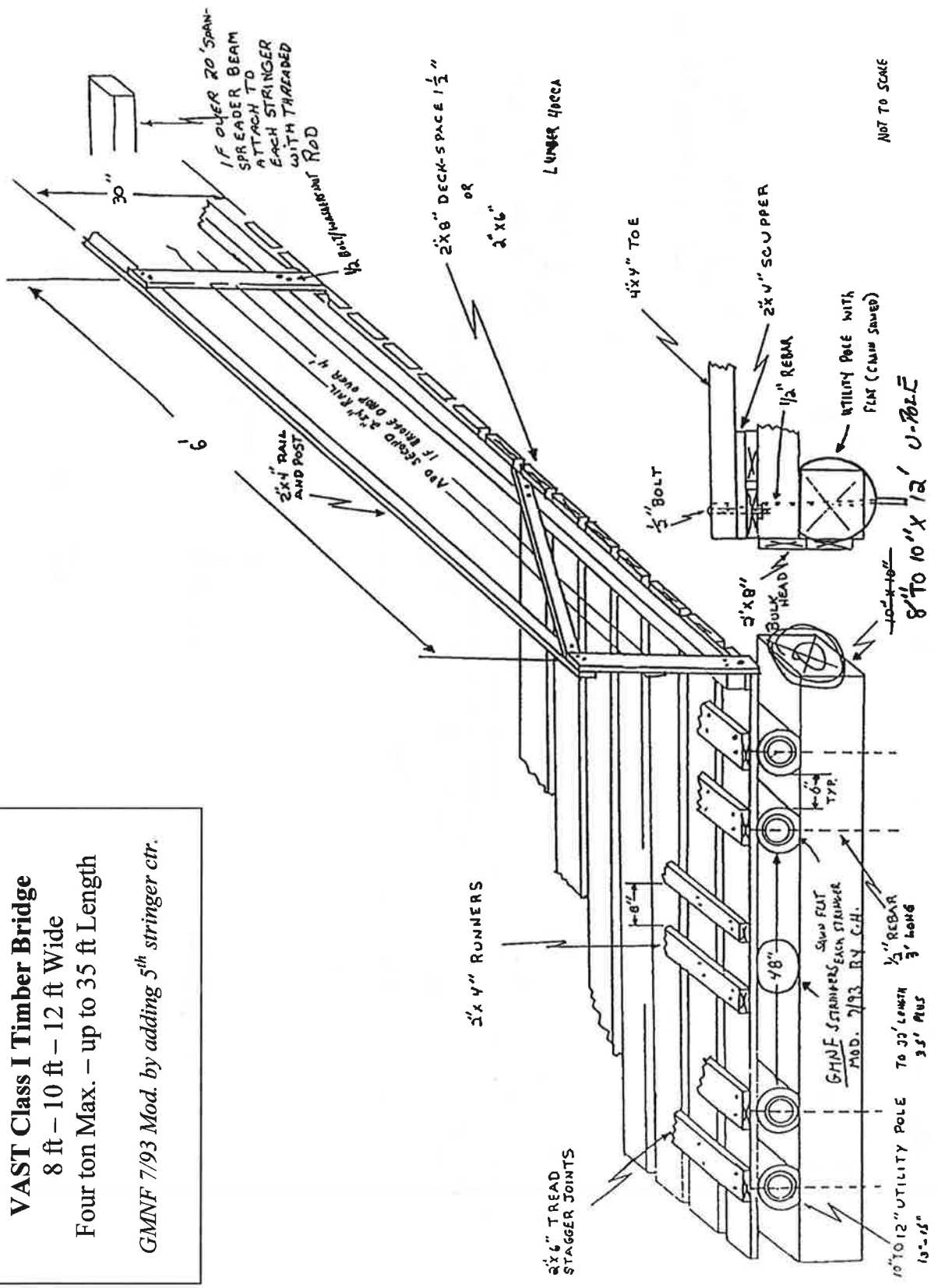
8 Ft. Wide Bridge	
Bridge & Stringer Length	**Stringer Size Fb=1550 psi**
10 ft	4" x 10"
14 ft	6" x 10"
18 ft	6" x 12"
22 ft	6" x 14"
26 ft	6" x 16"
30 ft	6" x 18"
34 ft	6" x 20" or 8" x 18"
38 ft	6" x 22" or 8" x 20"

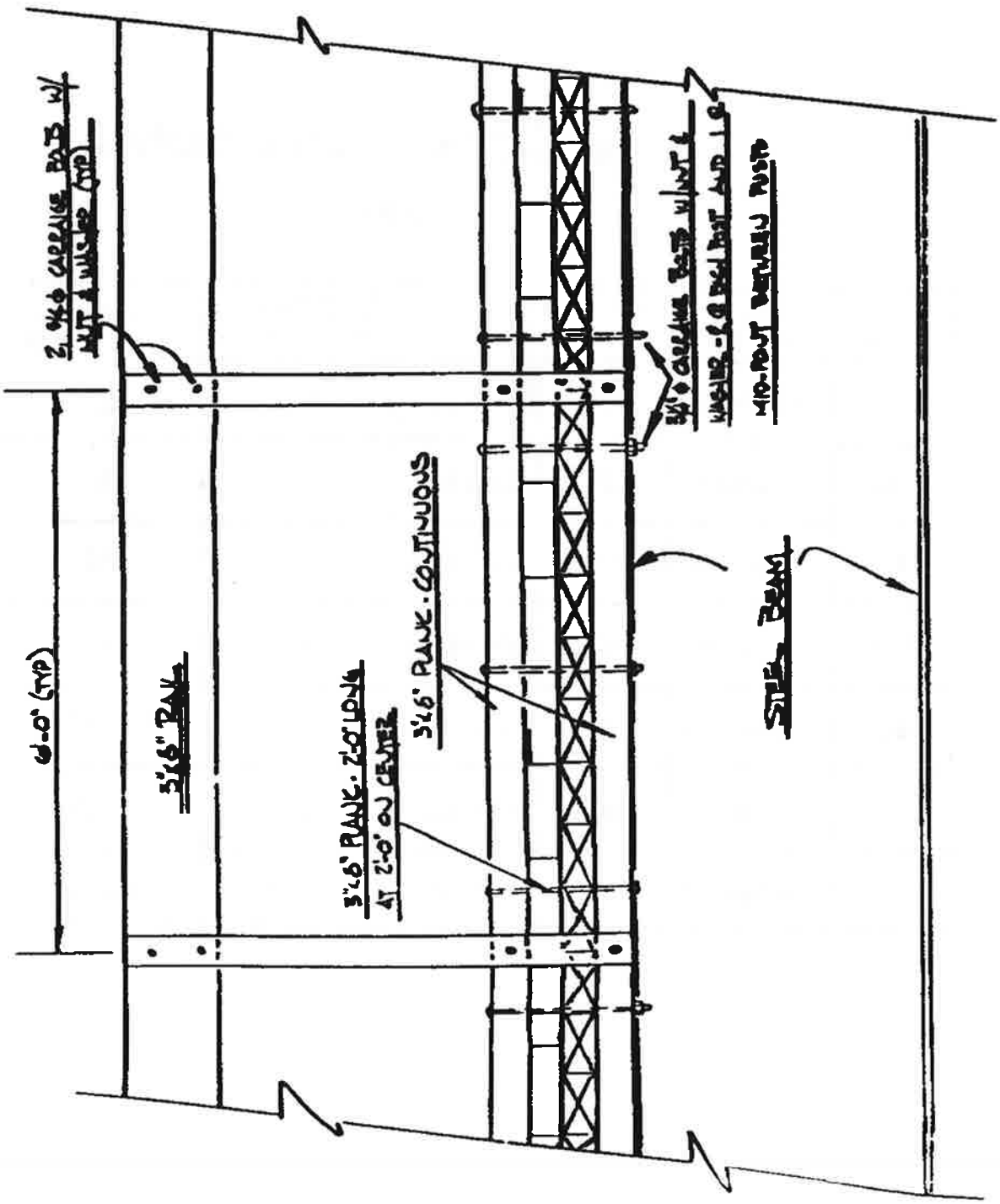


8 FT. WIDE BRIDGE

VAST Class I Timber Bridge
8 ft – 10 ft – 12 ft Wide
Four ton Max. – up to 35 ft Length

GMNF 7/93 Mod. by adding 5th stringer ctr.




6'-0" (TYP)
5'-6" RAIL
5'-6" RAIL - CONTINUOUS
5'-6" RAIL - 2'-0" OC CENTER

Vermont Association of Snow Travelers, Inc.
26 Vast Lane
Barre, VT 05641
T 802.229.0005 • F 802.223.4316
www.vtvast.org

Construction Grant-In-Aid Project Application

Project Number

(A project number will be assigned upon approval)

The following affiliated snowmobile club of the Vermont Association of Snow Travelers, Inc. is applying for funding of a snowmobile trail development and/or maintenance project.

Club Information

Club Date

Club Address *Street*

Town, State, Zip Code County

Project Information

Project Coordinator: Phone Number:

Project Location: Town:

Land Ownership:
[ ] Private [ ] Municipal [ ] State [ ] Federal

Project Description

Other

Total Trail Distance Involved

Total Bridge Distance

Estimated Project Cost

Equipment $

Materials $

Total $

Permits Required

Please check all that apply

[ ] Stream Bank Alteration [ ] Wetland [ ] Zoning [ ] Act 250

[ ] No permits are required for this project:

Note: It is the club's responsibility to obtain all necessary Federal, State or Local permits connected with this construction project. The VAST Trails Administrator can help you determine your needs as necessary.

Field Inspection

The outlined trail construction/maintenance project has been reviewed and has been found to be in compliance with the VAST Guide for The Development of Snowmobile Trails.

County Trails Coordinator: Date:

Submit this application, a map showing the exact location of this proposed trail project, copies of necessary permits (if any) and the signed landowner(s) permission statement form(s).

Applications must be at the VAST office by June 30th!

Funding will not be approved without the above!!

For Office Use Only

This project has been reviewed and has been found to be in compliance with the VAST Guide for The Development of Snowmobile Trails.

VAST/SSTP Project Number: County:

Project Estimated Cost: Funding Alloted: $

Approved by VAST Trails Administrator: Date:

Permit Contact Information

The following is a partial list of contacts from the Department of Environmental Conservation (DEC), Agency of Transportation (AOT) and U.S. Army Corps of Engineers. This is only a partial list of contacts for some of the most common permits obtained by VAST Snowmobile Clubs. You may need additional permits for your particular project. We recommend that you check with local zoning and any ordinance that map apply to your project. Contact the appropriate specialists if there is even the slightest chance that you may need one of the following permits. You may contact your regional office and/or a ***Permit Assistant Specialist*** for further information. *(See map on front)*

Protection Of Historic Sites *(Criterion # 8 of ACT 250)*
Division of Historic Preservation 828-3049

Use Within 500' Of A Limited Access Highway
Agency of Transportation *(Utilities Section):* 828-2485

Work Within State Highway Right Of Way
Agency of Transportation *(Utilities Section):* 828-2485

Railroad Right Of Way & Crossings
Agency of Transportation
(Operations Division (Rail Section)): 828-5719

Wetlands
Department of Environmental Conservation
Regional Offices:
Main Office- Montpelier 828-1556
Rutland-786-5900
Essex Junction-879-5656
Barre-476-0190
St. Johnsbury-751-0130
Springfield 885-8855

Federal Permit For Work In Rivers And Streams
U.S. Army Corps of Engineers: 872-2893

Act 250 Permitting

ACT 250, Vermont's development and control law, is administered by nine District Environmental Commissions, comprised of citizens appointed by the Governor, and supported by staff (District Coordinators) in five Regional Offices. *(See map on front)*

You may need an ACT 250 Permit if any of the following applies to your project.

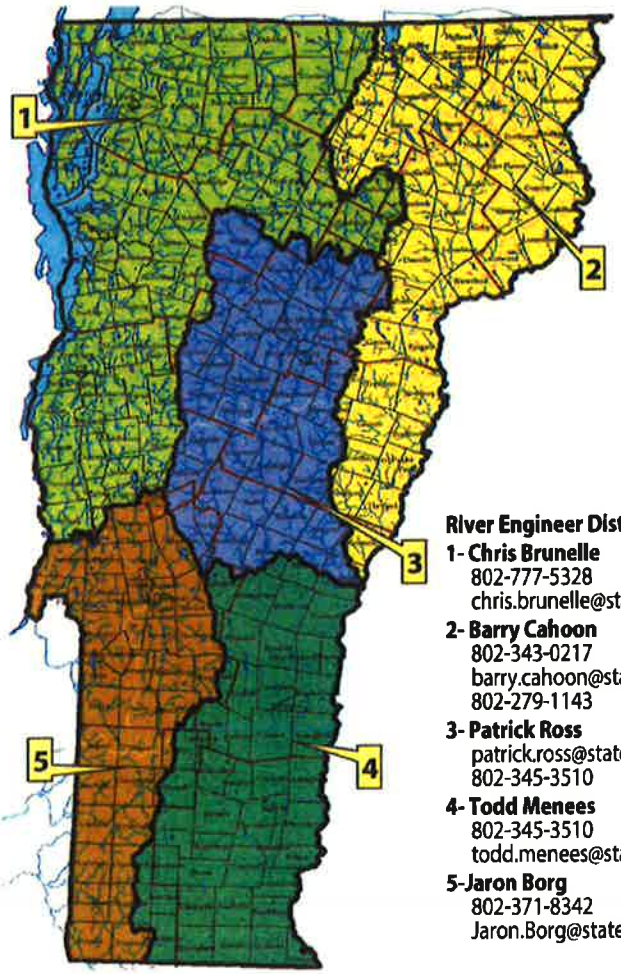
- Construction will disturb more than 10 acres, or is part of a larger project that will involve more than 10 acres of land.
- Construction is taking place above 2,500 feet in elevation.
- The land in which your project will be taking place on is currently under jurisdiction of ACT 250.

Additional Contact Information

Department Of Public Safety
Sergeant J. R. Underhill, Recreational Enforcement Unit
Commander: 878-7111 x 2014
Jere Johnson, Education Coordinator: 878-7111 x 2211

Secretary Of State
Corporations: 828-2386
Professional Regulation: 828-1505

Stream Alteration Engineer Districts



River Engineer Districts

1- Chris Brunelle
802-777-5328
chris.brunelle@state.vt.us

2- Barry Cahoon
802-343-0217
barry.cahoon@state.vt.us
802-279-1143

3- Patrick Ross
patrick.ross@state.vt.us
802-345-3510

4- Todd Menees
802-345-3510
todd.menees@state.vt.us

5-Jaron Borg
802-371-8342
Jaron.Borg@state.vt.us