VERMONT WATER QUALITY

Acceptable Management Practices

Manual for Logging Professionals

VT • 2019

Acknowledgements

This document is a publication of the Vermont Agency of Natural Resources, Department of Forests, Parks and Recreation (FPR). It replaces the “Orange Book” which contained the previous AMP rule, effective on August 15th, 1987.

This Edition of the AMP manual contains the current AMP rule, effective on August 11th, 2018.

This document includes, with permission from the Maine Department of Conservation, information contained in the Maine Forest Service publication, “Best Management Practices for Forestry: Protecting Maine’s Water Quality”.

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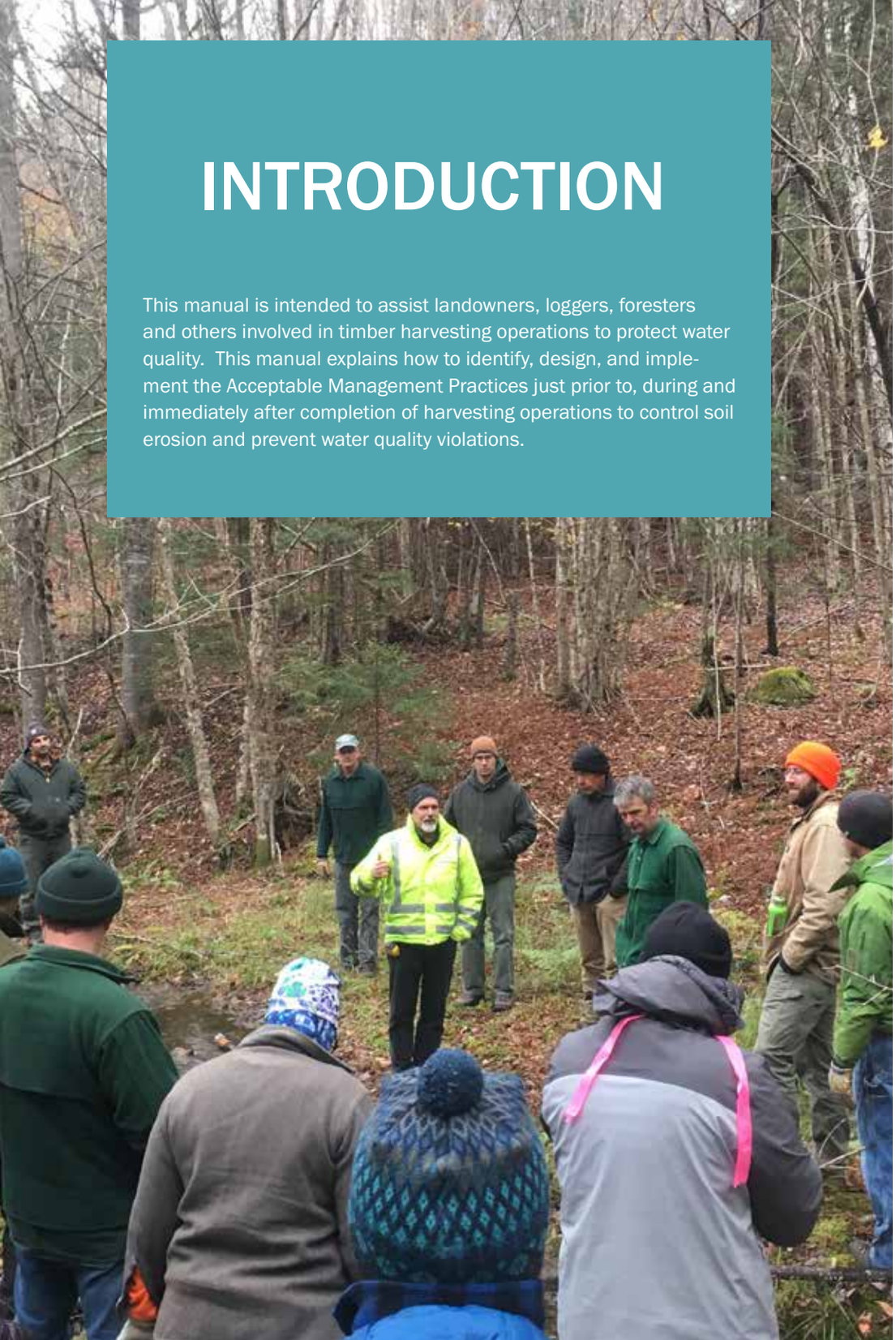


INTRODUCTION

This manual is intended to assist landowners, loggers, foresters and others involved in timber harvesting operations to protect water quality. This manual explains how to identify, design, and implement the Acceptable Management Practices just prior to, during and immediately after completion of harvesting operations to control soil erosion and prevent water quality violations.

Background of the AMPs

The "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont" ("AMPs") were first adopted on August 15, 1987 under the authority of Chapter 47 of Title 10 of the Vermont Statutes Annotated, Water Pollution Control (10 V.S.A. §1251a and 1259(f)). Act No. 64 of the Acts of 2015 amended 10 V.S.A. §2622 to require the Commissioner of the Department of Forests, Parks and Recreation to revise by rule the AMPs. The amended rule went into effect on October 22, 2016. These rules were amended again in 2018 and went into effect on August 11, 2018.

The purpose of the AMPs is to provide sound practices for loggers, foresters, and landowners to utilize, before, during, and after logging operations to comply with Vermont's Water Quality Standards.

The AMPs are intended to prevent discharges of sediment, along with other hazardous materials and woody debris (logging slash) from entering streams and other bodies of water, to control soil erosion and to maintain natural water temperature.

The AMPs apply to all logging operations in Vermont regardless of the purpose of the logging. For example, logging may be conducted for silvicultural or other forest management purposes, or logging may be conducted as a precursor to some other type of land use, such as commercial, residential or electric utility development. In all situations, the AMPs apply to the logging activity – whenever felling and moving of trees occurs, regardless of mode or purpose.

It is more effective, cheaper, and easier to prevent pollution or erosion of access roads than to fix problems after they occur. When you understand the principles behind AMP techniques, you will be able to anticipate and prevent problems before they end up costing you time and money.

While this manual focuses on water quality, there are other recommended management practices that protect wildlife habitat, soil integrity and productivity, aesthetics and other aspects of forests. Although these values are important, they are not the focus of this manual.

HOW TO USE THIS NEW MANUAL?

- AMP's are enforceable rules and are highlighted in blue blocks and outlined for easy identification.
- This manual also provides supportive information and technical guidance on the application of the AMP's. This information provides recommended practices but is not a part of the enforce able AMP rule.
- Chapter 5 includes the AMP Rule in its entirety.
- Throughout the manual, you'll find STOP signs that alert you to potential additional legal concerns. ⚠ signs point out important topics that shouldn't be overlooked.
- Color coded sections help you find pertinent information quickly and easily.
- The definitions of terms used in this manual can be found in section 5 of the AMP rule.

What is Water Quality?

Forest areas in and around waterbodies are complex systems and provide habitat for a wide range of plants and animals. These forest areas, and the waterbodies in them, are the setting for different processes that provide food, water, shelter, breeding space, and other habitat needs. For our purposes, "water quality" refers to the characteristics of water in nature that support life.

These include the natural chemical, physical, and biological aspects of streams, rivers, ponds, lakes, and wetlands. The chemical properties of water include pH, dissolved oxygen, nutrients, and the presence of chemical pollutants. The physical properties of water include such things as turbidity (how clear or cloudy the water is) and temperature. In addition, the natural processes and physical characteristics of waterbodies play an important role in water quality. Examples include channel and streambed material, the volume and speed of the water, the transport of nutrients, and the organic substrate including leaves, branches, limbs and trees.

Forest streams, lakes, and wetlands typically have excellent water quality. Forestry operations that implement acceptable management practices can protect the natural ability of a waterbody to support life. By preventing stream sedimentation, such operations can maintain streambed properties and the clean water that allows fish—and the aquatic insects they depend on—to feed and spawn. Leaving trees that shade and provide leaf litter to waterbodies limits changes in water temperature and chemical characteristics that could reduce the ability of some species to survive and reproduce. These are just the most commonly understood examples of how maintaining the properties of water in forests can protect aquatic habitats.

Although water quality is a complex subject, AMPs are intended to be relatively simple, practical steps that protect water quality. Most AMPs in this manual address turbidity by keeping sediment out of streams, though several are designed to preserve the physical integrity of waterbodies and their natural processes. If these issues are addressed, most other aspects of water quality will be protected, too.

Watershed

A watershed is all the land and waterbodies from which water drains to a given point. You can define a watershed for an entire lake, at any point on a stream, or for a river where it reaches the ocean. Watersheds range in size from just a few acres (for a small stream), to thousands of acres (for a large river). All land is part of some watershed.

It is critical to understand where water is coming from and draining to in the watershed where harvesting is planned. The amount of cutting or road construction at higher elevations can affect the amount and timing of runoff at lower elevations within the same watershed. When you know where, when, and how much water flows in the harvest area, you will be able to determine the best locations for roads and trails, and what types of AMPs you will need to control water movement.

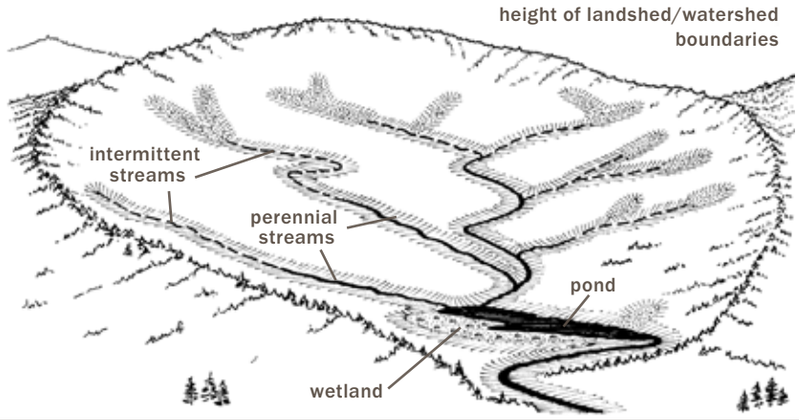
In this manual, "waterbodies" includes streams, rivers, lakes, ponds, and surface waters associated with wetlands. AMPs are designed for those areas where water is at or near the surface, and where runoff can move directly into waterbodies. These waterbodies and related areas are defined and illustrated below.

STREAMS

Forest streams in Vermont vary widely in how much water they carry, how steep they are, the shape of the streambed or channel, how much area they drain, and when they flow. There are two main types of streams that we find in Vermont:

- Perennial streams
- Intermittent streams

Watershed of pond



Perennial streams: a watercourse or portion, segment or reach of a watercourse, in which surface flows are not frequently or consistently interrupted during normal seasonal low flow periods. Perennial streams are found generally at lower elevations in the watershed.

- They generally exceed 0.25 square miles in watershed size
- They are generally fish bearing
- Perennial streams have a where flowing water has exposed the mineral bottom of soil, sand, gravel, ledge, or rock.
- Perennial streams that begin flowing subsurface during low flow periods, due to natural geologic conditions, remain defined as perennial.
- A perennial stream shall not include the standing waters in wetlands, lakes, and ponds.

Intermittent streams: are natural watercourses, with a well-defined channel, evidence of sediment transport and which regularly experiences periodic interruption of surface flow throughout its length. Most often, intermittent streams are found at higher elevations in the watershed.

- Intermittent streams have regular flow for only part of the year
- They have a defined channel and banks and are relatively continuous
- They typically do not have sufficient flow to support fish.

"Ordinary High-Water Mark"

The **ordinary high-water mark** is the place on the stream bank where the highest water levels typically occur, often during spring runoff. It is established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, or the presence of litter and debris.

One indication of the normal high-water mark is undercutting or scouring of the bank

SURFACE WATER RUNOFF

Immediately after a rainfall event, and right after snowmelt, there is often an increase in water movement within a watershed. These **surface water runoff** areas are found in low lying depressions and do not have a defined channel or sediment transport. They transport surface water only and are not fed by groundwater. These areas are temporary in nature and are not considered as "streams or other waters" in the AMPs.

- These flows have no sediment transport
- They often change in size in response to soil and weather conditions
- They have no continuous or definable channel

WETLANDS

Wetlands are areas where soils are saturated or flooded a significant part of the year, and where water-loving plants are often found. Wetland soils usually have developed special characteristics, and often have a significant amount of water moving below the surface.

Forested wetlands are dominated (or potentially dominated) by trees taller than 20 feet. Forested wetlands vary widely in their characteristics, often have relatively little water directly at the surface, and have indistinct borders. They may require considerable expertise to identify. Forested wetlands are sometimes managed for timber, with roads and trails crossing them when soil conditions allow.

Non-forested or open wetlands are not dominated by trees, though they may have some scattered trees, mostly less than 20 feet tall. They have water at or near the surface at least part of the year and may have a more or less distinct border defined by the surrounding forest. The high water and organic content of wetland soils make them considerably weaker than upland soils and difficult to work in. Non-forested wetlands are not managed for timber and should be crossed only when they cannot be avoided.

For more information on harvesting near wetlands see pg. XX

Vernal pools are a type of wetland, typically forested, which provide specialized habitat and deserve special attention. Forest management practices may directly affect vernal pools and adjacent habitat used by amphibians outside of the breeding season. Amphibians that breed in vernal pools spend most of the year (11+ months) in the surrounding upland forest, generally within 600 feet of the pool. The integrity of this "amphibian life zone" must be maintained in order to support viable populations of amphibians. In general, silvicultural practices are compatible with conservation of pools and breeding populations of amphibians, if the guidelines below are followed, along with those for the amphibian life zone (see citations).

- Heavy equipment should not be permitted in pool depressions at any time of the year.
- A forest buffer must be maintained around the surface water of a vernal pool and only partial cutting can occur such that openings in the forest canopy are minimal and continuous forest cover is maintained. The width of the buffer shall be in accordance with Table 4 as measured from the edge of the spring high-water line.
- Avoid locating landings, skid roads, or haul roads near these depressions. Rutting, siltation, or compaction in the pool depression can alter the pool's water-holding capacity, disturb eggs or larvae buried in the organic layer and alter the environment in which organisms live;
- Avoid harvesting operations in the pool depression, even during the winter. This can disturb woody vegetation that may serve as egg attachment sites or that may provide shading;
- Avoid leaving slash and tree tops from forestry operations in the pool as they can hinder amphibian movement and alter water chemistry. If slash or other woody debris accidentally fall into the pool during the breeding season (April to June), it is best to leave it in place to avoid disturbing egg masses or other breeding activity.
- An important management goal is to maintain the vernal pool depression in an undisturbed state, which may or may not be wet during the period when timber is being harvested

(Adapted from the Vermont Center for Ecostudies: Research Notes number 4 -Suggested Guidelines for Timber Harvesting Around Vernal Pools)

How Harvesting Affects Water Quality

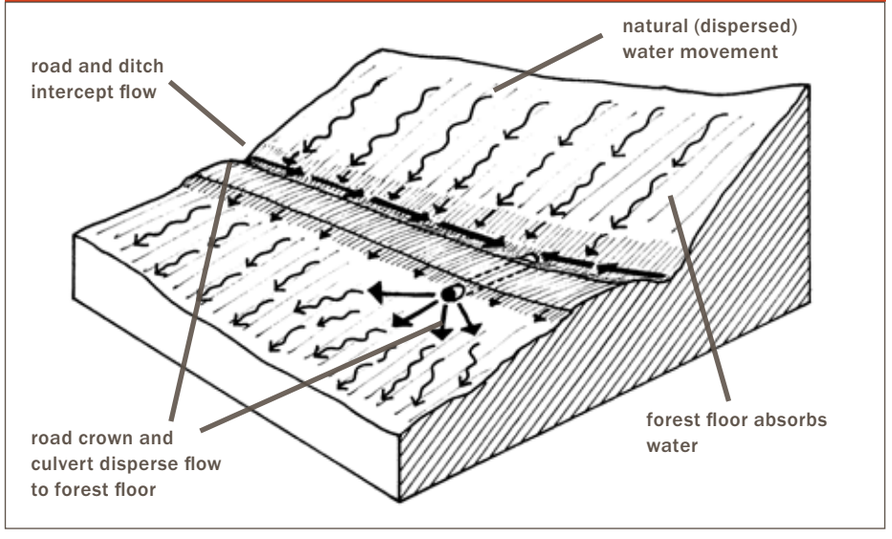
Forests play a vital role in providing for clean water. An intact forest floor, which contains wood and leaf litter, humus and fibrous roots in addition to mineral soil, is the most important element of the forest that helps to filter sediment and other pollutants from surface run-off. Because forest soils are often highly porous and permeable, rainwater can infiltrate into the soil freely.

Timber harvesting can directly impact water quality by affecting how water flows through an area. In particular, constructing roads, trails, landings, or drainage systems can:

- **Reduce the soil's absorbency.** This can occur any time the forest floor is disturbed, removed, compacted, or otherwise damaged.
- **Increase soil erosion.** The opportunity for soil to be carried away by runoff increases greatly when mineral soil is exposed, or fill is used.
- **Divert water flows.** Roads and trails can block or intercept water moving over or through the soil. The more water that accumulates, the greater the chance that it will form a channel and start eroding soil. Sometimes harvesting can cause streams to erode a new channel by blocking the stream's flow with logs or debris.
- **Concentrate water flows.** Roads, trails, landings, and their associated drainage structures can collect and funnel runoff, creating rills or gullies. In these situations, water erodes and transports exposed soil in its path.
- **Diminish the benefits of vegetation next to waterbodies.** Harvesting may reduce shade on the water's surface, reduce the amount of natural woody debris, or eliminate leaf litter that is an important food source for aquatic life. In addition, timber harvests that remove a significant percentage of the trees in a watershed can increase the amount of water moving through the soil into streams, and in some instances, increase flooding.

Usually, it is impossible to avoid disturbing some soil or concentrating some flowing water during a harvest. The important point to remember is to avoid these disturbances as much as possible, and to use AMPs to prevent them from resulting in sedimentation or erosion

Road and trail systems intercept natural water movement and concentrate it in ditches or on the road/trail surface.



Drainage systems or structures are techniques used to get water off the road, trails, or landing. These can include the road crown, ditches, turnouts, cross-drainage culverts and water bars.

How AMPs Protect Water Quality

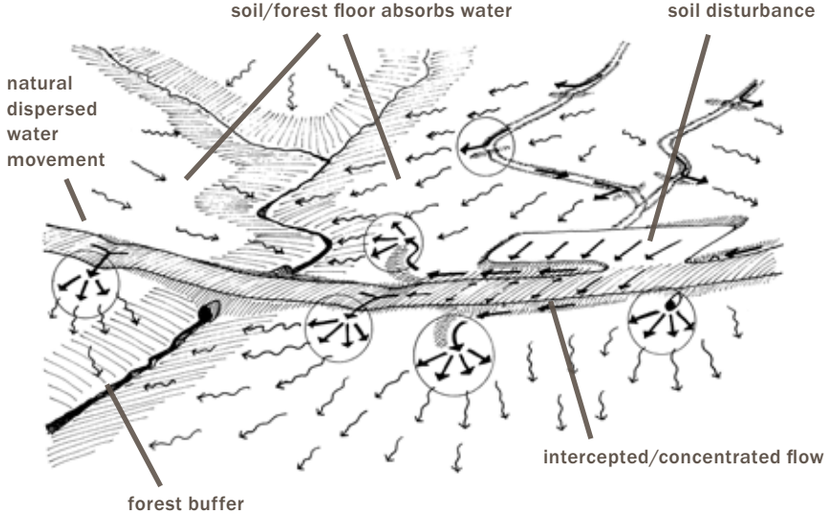
The AMPs are preventative measures that help control soil erosion and protect water quality. Proper implementation of the AMPs will help absorb and disperse runoff, retain soil nutrients, filter sediment and prevent fluctuations in water temperature.

- **AMPs minimize the risk of sediment and other pollutants getting into streams and other bodies of water.** Sediment is the primary water pollutant associated with logging. AMPs divert surface water into undisturbed, vegetated areas of the forest before it gains sufficient speed and volume to cause soil erosion. Once diverted, the natural control mechanisms of an undisturbed forest floor work to stop rapid surface water flow, absorb it, and trap sediment. Techniques such as waterbars and broad-based dips are examples of AMPs that control surface water flow.

- **AMPs maintain the natural flow of water in streams.** AMPs are designed to keep streams flowing within natural stream channels and prevent damage to the streambed and banks. Prohibiting logging slash in streams, choosing adequately sized stream crossing structures for expected peak flows and appropriate selection of stream crossing structures based upon stream conditions are all examples of AMPs that are designed to accommodate natural water flow of streams.

- **AMPs protect streambank vegetation.** Minimal disturbance to the forest floor within stream buffers maintains the high filtering and infiltrative capacity common to forest soils. Maintaining tree cover along streams minimizes stream temperature fluctuations. Root sys tems of trees along streambanks increase resistance to erosion. AMPs restrict logging equipment from driving within 25 feet of any stream or body of water and provide for minimum buffer widths where partial cutting can occur so that openings in the canopy are minimal and continuous cover is maintained.

Dispersing concentrated flow areas and protecting streams



Although implementation of the AMPs cannot guarantee that a discharge (and a water quality violation) will not occur, the AMPs constitute the best practices available to prevent discharges on logging operations.

What Constitutes AMP and Water Quality Violations?

Discharges of wastes into the waters of the State, through any means or activities, are violations of the State Water Pollution Control Act, 10 V.S.A. §1259, and the Vermont Water Quality Standards, regulations established pursuant to this statute. The AMPs are adopted under the authority of 10 V.S.A. §1259, and when implemented, relieve a person from the obligation of getting a permit for discharges associated with logging operations into waters of the State. Discharges of wastes into waters of the State that result from logging operations where the AMPs are not implemented can result in enforcement action and assessment of penalties.

Sediment, petroleum products, logging slash and other hazardous materials associated with logging are wastes under the water quality statutes, water quality regulations, and AMP regulations. If the AMPs are not correctly implemented and a discharge occurs, there is a water quality violation. In such situations, penalties may be assessed for the water quality violation as well as the AMPs that are not implemented.

If no discharge occurs, the logger or landowner cannot be fined or prosecuted for not implementing the AMPs. If the AMPs are correctly implemented, there is a presumption that the logging operation is complying with the State water quality statutes and the Vermont Water Quality Standards even if a discharge occurs as a result of logging. However, this presumption may be overcome if a water quality analysis demonstrates that there is a discharge of wastes into waters of the State due to logging, and thus, a violation of 10 V.S.A. §1259 and the Water Quality Standards (Vermont Water Quality Standards Section 2-03B.1) has occurred.

Discharge of sediment due to insufficient waterbars, and failure to maintain a forest buffer around the stream.

Who is Responsible for Implementing the AMPs?

Under the Vermont Water Pollution Control Act (10 V.S.A. §1259), no person may discharge wastes into the waters of the State without a permit. Therefore, landowners and loggers are responsible for correctly implementing the AMPs just prior to, during and immediately after logging operations. However, a landowner is ultimately responsible for any discharge that occurs on land he or she owns. Therefore, landowners should ensure that a logger working on their land correctly implements the AMPs.

Compliance with Vermont's Use Value Appraisal program (UVA) requires that the AMPs be employed to the maximum practicable extent. If the AMPs are not employed on UVA enrolled forestland but no discharge occurs, it may affect UVA eligibility without presenting a water quality violation. However, if the AMPs are not employed to the maximum practicable extent on the UVA parcel resulting in a discharge, it may affect parcel eligibility in UVA and be a water quality violation. While there is overlap between requirements of the AMPs and UVA, they should be viewed as distinct from each other.

Communicating between the forester and logger is important

WHEN A PARTICULAR AMP CANNOT BE FULLY IMPLEMENTED ON THE GROUND

To protect water quality and prevent discharge of wastes into state waters, the AMPs must be correctly implemented. However, FPR recognizes that there may be limited situations where a particular AMP cannot be fully implemented as prescribed due to physical constraints on the ground. An example of this would be when the presence of rock or ledge prevents installation of a waterbar on a skid trail, or a culvert on a truck road, according to spacing requirements as prescribed in the AMPs.

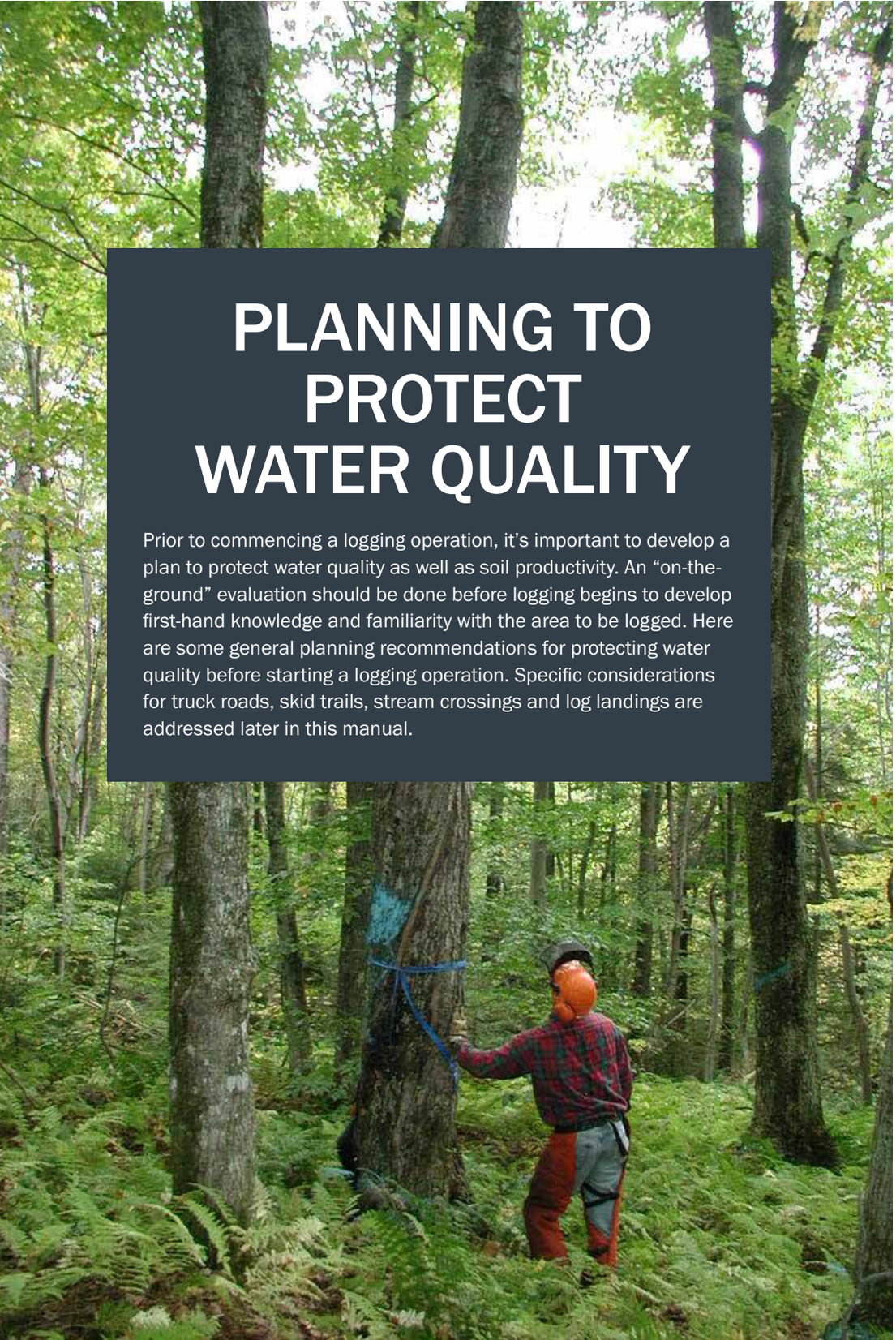
When a particular AMP cannot be fully and correctly implemented on the ground as prescribed in the rules, and a discharge results, the Department will evaluate whether the logger or landowner implemented the AMP to the maximum practicable extent in determining whether enforcement action is appropriate.

The Department also recognizes that there may be existing infrastructure (truck roads, skid trails and log landings) in place from previous harvest operations that are not in full compliance with the AMPs. An example could be a segment of skid trail or truck road that exceeds allowable grade limits or a log landing that is located within a stream buffer area.

Such non-compliant existing infrastructure should be corrected and brought into compliance with the AMPs unless the action(s) create an unstable condition where the potential for soil erosion and water quality impairment is greater than if no action was taken. These areas may only be used if the truck road, skid trail or log landing is stable, and the AMPs have been implemented and the road, trail or landing is unlikely to erode or contribute a discharge to state waters.

New construction, repairs or maintenance should always follow the AMPs.

Steep section of truck road with stone lined ditches to prevent erosion.
Also, good surface material helps maintain a good crown.



PLANNING TO PROTECT WATER QUALITY

Prior to commencing a logging operation, it's important to develop a plan to protect water quality as well as soil productivity. An "on-the-ground" evaluation should be done before logging begins to develop first-hand knowledge and familiarity with the area to be logged. Here are some general planning recommendations for protecting water quality before starting a logging operation. Specific considerations for truck roads, skid trails, stream crossings and log landings are addressed later in this manual.

Landowner Objectives and Responsibilities

Determine the harvest objectives with the landowner, forester, and logger. The first step in planning, prior to beginning work, is to communicate with everyone involved what the harvest objectives are. Discuss what's going to be cut, where, and the desired condition of the remaining forest.

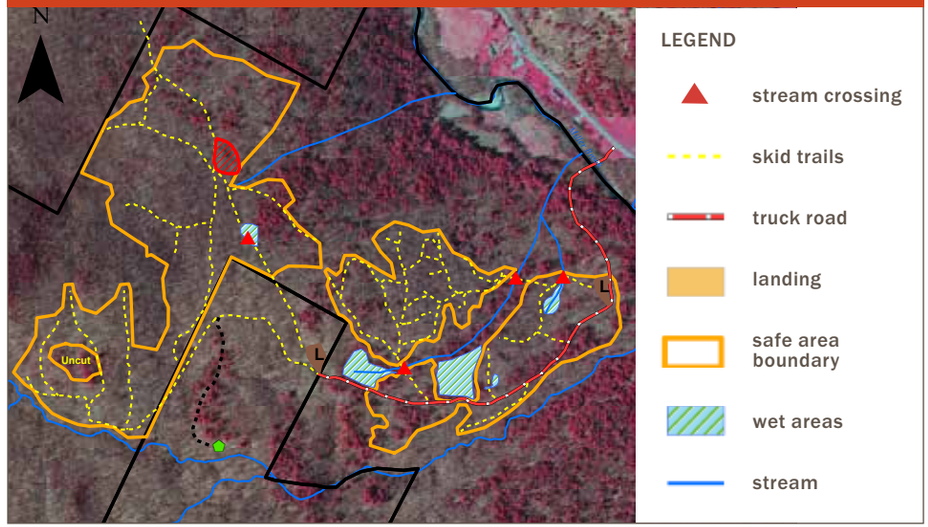
Decide who is responsible for AMPs. You will want to agree in advance (and in a written contract) who is responsible for implementing the AMPs, including deciding when to operate, locating streams, laying out the operation, and planning and maintaining the AMPs.

Landowners, foresters, and loggers should determine what laws apply on a particular harvest operation. However, a landowner is ultimately responsible for all legal requirements for activities that occur on land he or she owns. Therefore, landowners should ensure that a logger working on their land correctly implements the AMPs.

Pre-harvest Planning

Pre-harvest planning is a good business practice and avoids many problems. Planning will help reduce costs, make the job more efficient, protect roads and trails that will stay in place after the job, leave the job looking better, and protect water quality. Prior to commencing a harvest operation, it's important to develop a plan to protect water quality as well as soil productivity. Develop first-hand knowledge and familiarity with the area to be harvested. An "on-the-ground" evaluation should be done before logging begins. Here are some general planning recommendations for protecting water quality before starting a harvest operation.

Example of a map showing planning and layout on a large lot



COLLECT INFORMATION ON THE PARCEL AND WALK AROUND

Determine the harvest area limits and property boundaries on the ground. While not essential to protecting water quality, locating property boundaries is common sense and good planning. There may be survey pins, blazes, wire fences, or stone walls that mark boundaries or property corners. Forest type maps, soil or topographic maps, or aerial photos help, too.

Identify streams, open water, wetlands and other features on maps and on the ground. Maps and aerial photos can help identify surface water features, steep slopes, or poorly drained soils. Because no map is 100 percent accurate, they should be used as a reference to identify potentially sensitive areas that must be verified on the ground before logging begins. Additionally, there may be features within the area to be logged that are not evident on any maps so a thorough walk-through is a good idea.

Stream buffers, wetlands and other surface water features should be clearly designated in the field with paint or flagging. Trees and vegetation adjacent to surface water features play an important role in maintaining water quality and controlling fluctuations in stream temperature. These areas should be managed with special considerations. Stream buffers and special operating conditions within buffers are addressed on page _. Refer to Table 4 for recommended buffer widths.

ANR Atlas

Using the Agency of Natural Resources online mapping resources can be a good starting point for getting the most up to date aerial imagery, and mapping of known streams, important wildlife habitats or other features. The Natural Resource Atlas is available at:

anrmaps.vermont.gov/websites/anra5

PREPARE MAPS AND LAY OUT THE HARVEST ON THE GROUND

This includes determining how many truck roads, stream crossings, log landings and skid trails will be needed and where they should be located.
Keep them to the shortest length and smallest number possible to minimize the potential for soil erosion and maintain forest productivity. This will also help reduce logging costs.

Decide upon appropriate AMPs for the entire area to be logged before work begins.
This includes AMPs to be implemented during the active phase of logging and those to be implemented immediately after logging. Effective application of the AMPs requires planning across the entire area to be logged and throughout the duration of the operation and immediately after logging. Choose appropriate AMPs as dictated by soil and site conditions and logging equipment to be used. Take advantage of the natural terrain to maintain water flow through the area. This will reduce the number of cross-drainage features needed to divert runoff on truck roads and skid trails thus reducing logging costs.

Consider long-term needs and future logging operations on the same property.
It's important to locate, design and construct truck roads, skid trails and log landings so they can be used for future operations. Because roads are long-term landscape features, their location must be carefully chosen to meet the landowner's need for safe access, avoid long-term maintenance problems, reduce potential for degrading water quality and minimize costs over the short and long term. Identify which stream crossing structures will be left in place, if any, based upon landowner objectives and which ones will be removed after harvesting is completed. Permanent stream crossing structures need to be adequately sized to accommodate long-term flood events. Consider restricting vehicle access after the harvest if the landowner does not need it.

Handheld mapping technology

Layout of skid trails on a small lot, shown on a smartphone map application.

Mapping applications like this are a great way to utilize GPS technology and allow you to know your location on the map. These maps can be shared with foresters, loggers and equipment operators working throughout the site, and improves communication and efficiency. It also helps in planning AMP practices and for coordinating close-out practices.

When in doubt, stop! Get more information or professional advice. Call the Vermont Department of Forests, Parks and Recreation at (800) 828-1531 or go to our website at

vtforest.com
or for Harvesting information
Cutwithconfidence.com

ANTICIPATE SITE CONDITIONS

Time operations appropriately. Harvesting under frozen, snow-covered, or dry conditions can minimize the need for additional AMPs. At the same time, a range of AMPs that are appropriately chosen, installed, and maintained can extend the harvest season. Use extra caution during fall and spring when streams are high and the ground is typically wetter—you may need to use additional AMPs to control the larger volume of water.

Assess the existing infrastructure. Old roads, log landings, and skid trails can be reused or upgraded. However, in some situations, avoiding or retiring them is a better choice. Using old roads, landings, and trails may be cheaper in the short run, but may be costlier to fix or maintain later. Pre-existing conditions may also influence your choice of AMPs.

Plan to monitor, maintain, and adjust AMPs as needed, especially to deal with seasonal or weather-related changes. After installation, many AMPs require maintenance or modification. Conditions—such as the amount of water flowing in streams, soil moisture, or the depth of frost—can change quickly, even with one storm. Take into account how conditions may change and maintain or install additional AMPs as needed. Determine who will be responsible for this work. In many instances, the landowner will want to periodically check and maintain AMPs that have been installed after harvesting is done. This often prevents washouts and a loss of access while protecting water quality at the same time.

AMPs may extend the harvest season, reduce equipment wear and the amount of mud on logs, increase skidding efficiency, and protect your investment in roads and stream crossings.

During the Harvest

CONTROL WATER FLOW

Understand how water moves within and around the harvest area and decide how water flow will be controlled. Concentrated flows of water on roads, skid trails, landings, and in drainage systems develop more force and a greater ability to erode soil and carry sediment. It is easiest and most effective to control small volumes of water, before they converge and accumulate into concentrated flows.

Slow down runoff and spread it out. Many AMPs work by directing small amounts of water into areas of undisturbed forest floor where it can be absorbed.

Protect the natural movement of water through wetlands. Wetlands play an important role in the environment by storing water in wet periods and slowly releasing it back into the surrounding ground and streams. Logging roads and trail crossings can affect the flow of water within or through a wetland. This changes how much water the wetland stores, the degree of flooding that occurs, and the rate at which water leaves the wetland. Such impacts can affect the health of the wetland and waterbodies downstream. See Chapter 4 of this manual to learn more about harvesting around wetlands.

MINIMIZE AND STABILIZE EXPOSED SOIL

Those practices that limit soil disturbance and stabilize areas where mineral soil is exposed are among the most important AMPs for preventing erosion. These practices are most critical in and around forest buffers—the areas bordering waterbodies. A detailed discussion of forest buffers, how best to work in them, and soil stabilization starts on page xx. There are two major objectives:

Minimize disturbance of the forest floor, especially in forest buffers. The forest floor absorbs water and filters out sediment and other pollutants. Exposed soil, on the other hand, can erode very rapidly. Most of the sediment that ends up in streams near managed forests comes from exposed soil on roads, landings, and skid trails. Know where the forest buffers are and how to protect their capacity to absorb and filter runoff in accordance with the AMPs.

Stabilize areas of exposed soil within forest buffers and in other locations where runoff has the potential to reach forest buffers. Use AMPs during or immediately after the harvest to prevent exposed soil or fill from eroding. These techniques and materials can be used near waterbodies, at stream crossings, road cut-and-fills, ditches, landings, and skid trails. In some situations, you may need to seed and/or plant vegetation to stabilize the soil.

PROTECT INTEGRITY OF WATERBODIES

Protect stream channels and banks. Blocking or altering streams (with slash, for instance) may keep fish from swimming past the blockage. Damaged stream banks erode quickly, causing sedimentation and siltation. By protecting the physical integrity of streams, AMPs prevent these problems.

Leave enough shoreland vegetation to maintain water quality. AMPs maintain the benefits that nearby trees and plants provide waterbodies. Streamside vegetation shades the water, minimizing temperature changes. Live roots stabilize the banks and maintain the soil's physical and chemical properties. Trees along the banks drop leaf litter and woody debris that supply nutrients and become habitat for plants and animals in the stream. Shoreland vegetation plays an important role in maintaining water quality.

Vermont has a Shoreland Protection Act that regulates the shoreland within 250 feet of ponds over 10 acres in size. Contact DEC for more information at 802-828-1535, or go to their website at

dec.vermont.gov/watershed/lakes-ponds/permit/shoreland

HAZARDOUS MATERIALS

Be prepared for any emergency. Keep an emergency response kit and contact information at the site for fuel, oil, or chemical spills. Remember that fertilizers, herbicides, pesticides, and road chemicals (calcium chloride, road salt, etc.) are hazardous materials. Know whom to call for help with unexpected erosion, accidents, or other emergencies. Having a backup plan and being prepared for unexpected and special situations can help avoid or minimize negative impacts to water quality. Industry groups, equipment suppliers, and local and state government agencies all have specialists available to help.

Use and store hazardous materials properly. The best way to avoid accidental spills of hazardous materials is to store and handle them so that the chance of these types of emergencies occurring is minimized.

For more on hazard ous materials see page XX

Storage practices like this can result in a spill. Keep your fuel cans in a safe place and organized.

Exposed Soil

Stabilizing exposed soil is most important where sediment can be carried to waterbodies. Different materials may be used to reduce erosion on exposed soils.

TEMPORARY MATERIALS

Temporary materials are often ones that will rot and/or that will be replaced by natural vegetation.

Hay or straw mulch can help minimize soil movement and improve seed germination on exposed soil, and usually lasts one or two seasons, holding the soil until the natural vegetation grows back. Hay and straw are not as effective in areas of concentrated flow.
Follow the guidelines on Table 3 when applying Seed and Mulch.

***Be aware** that hay mulch typically contains non-native grass seed which can introduce invasive plants such as Japanese knotweed, Japanese barberry and honeysuckle. Seed free straw does not contain these invasive plants.

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Brush, slash, and tops from harvesting are often readily available, and are an excellent means of stabilizing exposed soils during the harvest. Brush typically does not need to be removed except if it falls below the normal high-water mark of waterbodies.

- Use brush on trails that could erode and deliver sediment to streams. Wherever possible, put brush down before the soil becomes disturbed and exposed.
- Use brush as a berm on the lower shoulder of roads running across slopes to help stabilize exposed soil and disperse water being shed off the road.
- Use brush on landings or similar high traffic areas (if it will not present a hazard to equipment).
- Use brush at the outfall of cross drain culverts, dips, water bars, and other drainage structures to help hold the soil and disperse concentrated runoff. This does not include stream crossings.

Temporary erosion control blankets are available in rolls and are made of a wide variety of materials. Usually they are biodegradable. They are often used with grass seed to establish vegetation as the blankets rot. Erosion control blankets must be in contact with the soil to prevent water flowing between the blanket and the soil. On slopes greater than 4:1, blankets may need to be anchored with staples or by other means. Blankets work best in ditch and swale sections (where there is concentrated runoff) when the slopes are gentle.

PERMANENT MATERIALS

Permanent stabilization is provided by long-lasting, sturdy vegetation, stone or artificial materials designed to withstand the force of moving water. Often, stabilization materials are used in combination with each other, providing both immediate, temporary stabilization and permanent revegetation.

Permanent vegetation or revegetation is commonly used to permanently stabilize disturbed areas. Permanent vegetation may include grasses, shrubs, and/or trees. Seeding is recommended on exposed soils within forest buffers, at waterbody crossings, and at similar critical sites that are not stabilized by other means. Most other areas will reseed naturally within two years, provided AMPs have been used to control the water flow. Follow the guidelines on Table 3 when applying seed and mulch.

Riprap or cobbles are larger stones used to stabilize ditches, heavily traveled areas, and areas of high flow. They are also used to armor steep slopes (up to 1.5:1 or 67%) and culvert inlets and outlets. You can use riprap in combination with erosion control blankets to prevent flowing water from undercutting steep slopes. Use very large stone in combination with smaller cobbles and/or blankets.

Gravel can provide adequate stabilization, especially on travel surfaces with low slopes and little concentrated flow. Ideally, gravel used in critical areas is screened and/or washed to remove the fines.

Wood chips, waste wood, or bark mulch may last several seasons, depending on the material and its depth. Occasionally, these materials are combined with soil in an erosion control mix. Spread the material to a depth of 2–6 inches, primarily on slopes less than 4:1 (25%). Wood chips, waste wood, and bark mulch are not recommended in areas of concentrated water flow or where they may be subject to wind erosion.

TEMPORARY SEDIMENT BARRIERS

Temporary sediment barriers are used to trap sediment during the construction of roads, ditches, and AMPs until other measures, especially permanent vegetation, can stabilize the site. These sediment barriers are not intended as permanent structures and should be removed after closeout, once the site has stabilized.

Compost filter socks, straw rolls/wattles

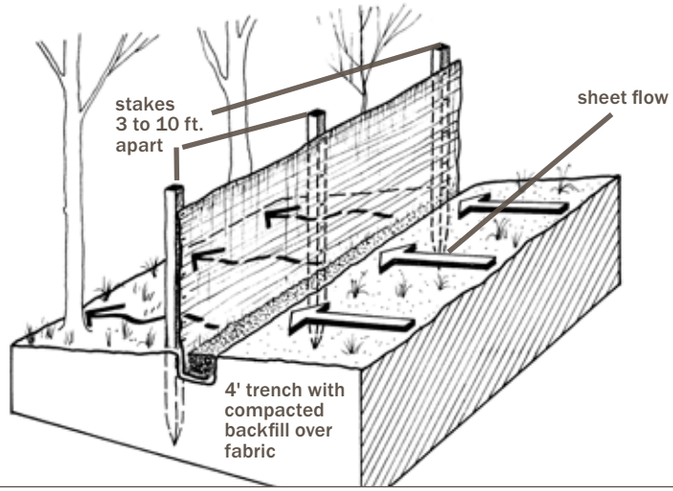
- Lay out the filter sock parallel with the slope to catch sheet flow.
- Stake the socks every 4-6 feet.
- Use socks in ditches to catch sediment, staking in 3 places, including the center of the ditch.
- Monitor the socks to ensure that they are not overflowing, adding more socks below if necessary.

Seeding

Whether you are seeding for temporary or permanent vegetation, the sowing process is the same.

- *Prepare the seedbed (if necessary) by raking, grading, removing debris, and/or smoothing the exposed topsoil.*
- *Apply the seed mix immediately after preparing the seedbed. Follow the application rates in Table 3.*
- *If possible, apply seed in the spring, fall, or after rain to help ensure germination.*
- *Consider liming and fertilizing the site before seeding, based on soil conditions, or if it is recommended by the seed supplier. Fertilizer-coated seed mixtures may also be available*
- *On critical areas (near waterbodies), dry soils, highly erodible sites, or sites seeded during the summer, mulch the seeded area with hay or straw.*
- *Do not allow vehicles or heavy foot traffic in areas that have been seeded until the cover is well established.*
- *Use fertilizer with care near waterbodies, and never put it directly in any waterbody*

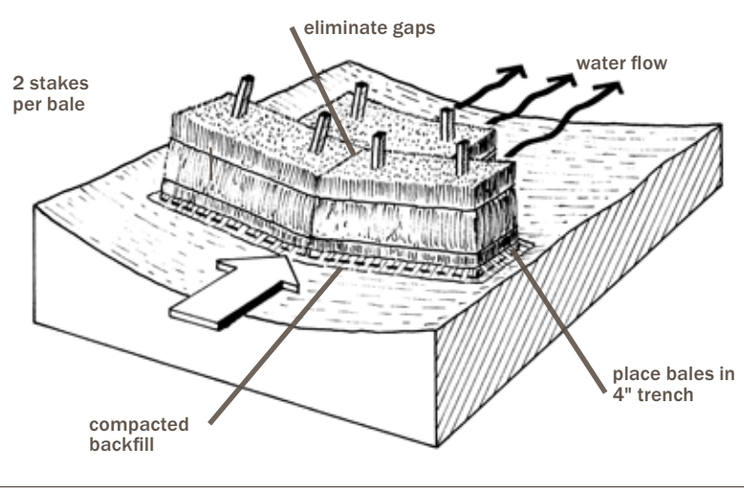
Proper silt fence installation



Silt Fence installation

- Install a synthetic filter fence by first setting stakes at least every 3–10 feet. Three feet is needed for light fabric, while 10 feet is adequate when using extra strength fabric and/or a wire mesh support fence.
- Follow the manufacturer's recommendations and choose a filter fabric capable of handling the expected water flow. The fabric may be 15-36 inches high.
- Excavate a 4-inch deep trench upslope, along the line of stakes.
- Place an 8-inch skirt of fabric in the trench; staple the other side of the fabric to the stakes; then backfill and compact the soil.

Proper installation of a haybale check dam



Haybale check dam installation

- Excavate a trench 4 inches deep and the width of the bale;
- Position the hay bales in a single row or stagger them, making sure there are no gaps between the bales where water could flow through;
- Place the bales in the trench and stake with at least two stakes per bale;
- Backfill with soil on the uphill side to keep water from flowing underneath the bale.

These are temporary measures. Remember to remove them after the harvest, or when the site has stabilized.

ACCEPTABLE MANAGEMENT PRACTICES

This chapter covers the AMPs to be used in harvesting operations as well as other important information to consider on all aspect of the harvest, from planning through close out. The AMPs are shown in blue boxes and labeled with each AMP number. The AMPs are organized and presented as follows: Truck Roads, Skid Trails, Stream Crossings, Forest Buffer, Petroleum Products and Hazardous Materials, and Log Landings.

Truck Roads

Truck roads connect log landings to a public road system. They can generally be classified as being either permanent or temporary.

Permanent truck roads are those that are open all or most of the year to vehicular travel in order to meet continuous, long-term forest management objectives. They typically have ditches and cross drain culverts and permanent stream crossings. They are most often constructed with a gravel base.

Temporary truck roads are designed and constructed for short-term seasonal use and are typically constructed with on-site material. When logging is completed, the road is closed out or 'put to bed' by removing all stream crossing structures and culverts and installing deep water-bars.

The construction and use of truck roads can sometimes cause significant water quality problems. Road construction may alter the flow of water over and through the ground. Truck roads expose soil over a large area and get heavy use. They often require permanent stream crossings.

All of these factors pose risks to the quality of nearby waterbodies. However, most negative impacts on water quality can be avoided if truck roads are designed, constructed, and maintained properly.

Well-planned and well-built roads make sense both economically, and environmentally. Following these suggestions and adhering to the AMPs will help to:

- extend the seasons the road can be used
- reduce road wear and maintenance costs
- enable trucks to haul heavier loads
- lower truck maintenance costs
- reduce travel time
- protect water quality during and after harvests.

Priorities in accordance with the AMPs

- Construct new roads outside of forest buffers, except at stream and wetland crossings.
- Where you must cross forest buffers or wetlands, minimize the length of road.
- Keep water off the road with drainage systems that are well designed and maintained.
- Divert and disperse runoff onto undisturbed forest floor outside forest buffers.

PLANNING CONSIDERATIONS

- Keep road length and width to a minimum. Building a road longer and wider than needed for its intended use will increase the amount of surface area exposed, thus increasing the potential for soil erosion.
- Examine existing roads to determine if they are the best routes to use. Consider if relocation of an existing road or segments of roads would be a better long-term option.
- Avoid steep slopes (greater than 10%), unstable soils and wet areas.
- If steep slopes are unavoidable, keep the length to a minimum.
- Avoid or keep the number of stream and wetland crossings to a minimum.
- Ensure that there is an adequate buffer between roads and streams.
- Identify appropriate soil stabilization and erosion control measures. Seeding and mulching is a simple but effective method for stabilizing exposed soil along the edge of roads.
- Determine the maintenance and closeout needs, and who will be responsible for these tasks.

Permanent and temporary truck roads shall not exceed 10 percent grade. Where no reasonable alternative exists, steeper sections exceeding 10 percent grade are allowed but shall not exceed 300 feet in length and shall be the minimum number of sections, grades and lengths necessary due to physical constraints, property boundaries and ground conditions.

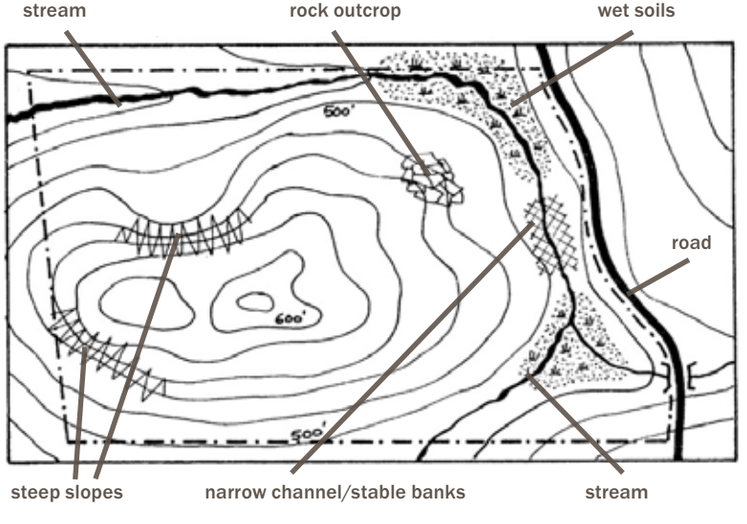
AMP 6.1.1

AMPs for truck roads are critical for protecting water quality in and around forest buffers, and for minimizing runoff.

LOCATING AND LAYING OUT NEW ROADS

Lay out new roads so that they fit the terrain, ground conditions, and equipment you will be using. It is often helpful to use topographic maps and aerial photos for this. The Vermont Agency of Natural Resources has online mapping resources available to the public for free.

Map out important features on the ground first...



Identify important features on maps, aerial photos, and in the field. Be sure to include:

- The boundaries of the property and the area to be harvested.
- Water bodies and forest buffers.
- Ephemeral, wet, or poorly drained areas next to water bodies.
- Existing roads, entrances, landings.
- Terrain features such as steep slopes, flat benches, rock outcrops, gullies, bowls, and ridges.

Spend the time walking around the site before hanging flagging.
Once you have a handle on the terrain, start laying out roads.

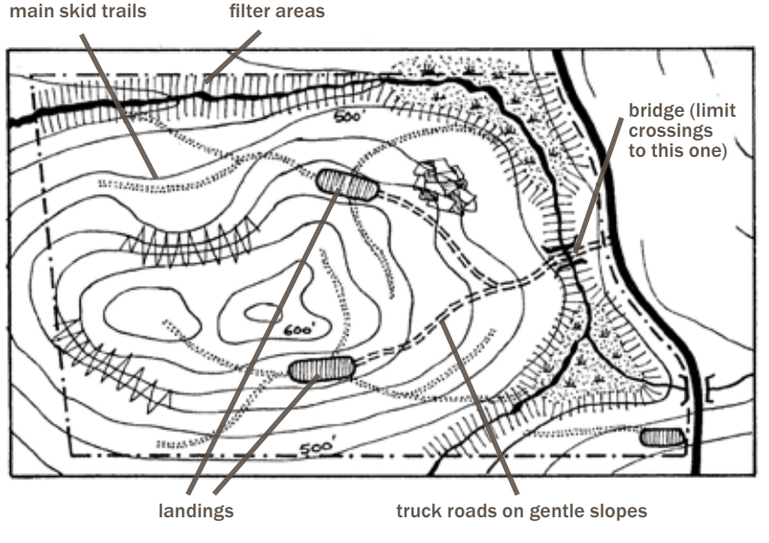
- Lay out roads where there are better-drained soils, gentle slopes (ideally 2–5%), and good stream crossing locations.
- If possible, lay out roads in wet conditions and build during dry conditions.
- Minimize the overall road length, while still meeting operational objectives, including preferred log landing locations.
- Minimize road sections where water may be difficult to drain or divert.
- Stay out of forest buffers (except at appropriate stream crossing locations), wet, or poorly drained areas, floodplains and steep slopes, outcrops, gullies, or ravines.

When utilizing old roads:

- Determine if old roads can be reused or upgraded with minimal impacts to water quality. Con sider the road's location, the existing drainage (i.e., where does the water flow?), the potential for additional drainage, and intended uses.
- Consider relocating roads, or sections of roads that:
    - Encroach on a forest buffer unnecessarily.
    - Have poorly placed or unnecessary stream crossings.
    - Have poor drainage.
    - Have unstable soils that cannot be improved (especially gullied roads, roads in ravines, or roads that collect and hold water).

These recommendations are not intended to substitute for obtaining engineering advice or abiding by regulations in the appropriate circumstances

. . .then lay out the roads, trails.



CONSTRUCTION

Protecting water quality when building new roads or upgrading old roads is important.
Follow these steps to protects the condition of, and investment in, the road.

- Shape roads to move water off the road surface using a crown, an out-slope (this may present a safety hazard in icy conditions or on curves), or an in-slope (this will often require ditches and cross-drainage structures).
- Space cross drain culverts according to Table 1, and discharge them into the forest buffer, at least 25 feet from the waterbody.

AMP 6.1.2

Drainage structures on permanent and temporary truck roads shall be correctly installed to divert the surface water runoff into road ditches or filter areas. Drainage structures shall be spaced at intervals according to Table 1 where existing soil, rock and ledge conditions allow.

AMP 6.1.3

Water entering a permanent or temporary truck road shall be moved under and away from the road and into a filter area. Culverts used for ditch drainage on truck roads shall be at least 15 inches in diameter, correctly installed to divert ditch water into a filter area and spaced according to Table 1 where existing soil, rock, ledge and road bed conditions allow.

- Use gravel, crushed stone, or other surface material (with or without geotextile) to stabilize roads, shed water, and increase the weight-bearing capacity.
- Maintain cut and fill slopes at a natural angle of repose or less (2:1 for average soils) wherever possible.
- As the construction progresses, stabilize areas of exposed soil that will receive road runoff such as cut-and-fill slopes, steep road shoulders, and erosion-prone soils in forest buffers.
- Use temporary sediment barriers to slow flowing water and trap sediment during construction.

AMP 6.1.4

**Drainage ditches along permanent and temporary truck roads shall not terminate directly into streams or other waters.
On approaches to stream crossings, ditches shall be turned out into a filter area a minimum of 25 feet away from the top of bank.**

TABLE 1

Distance (Feet) Between Drainage Structures on Truck Roads and Skid Trails

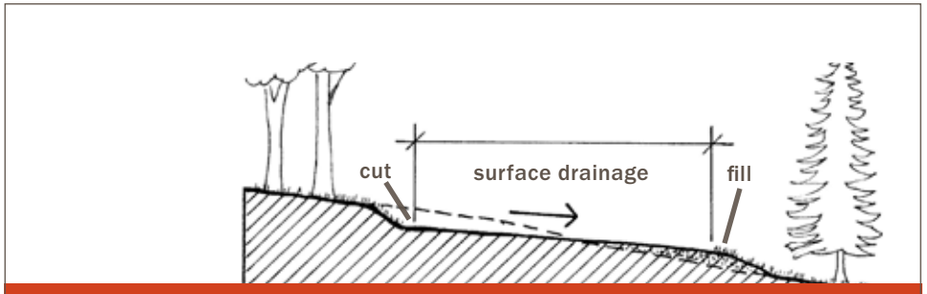
	Skid Trails		Truck Roads Permanent Truck Roads During & After Logging. Temporary Truck Roads During Logging.		Temporary Truck Roads After Logging
Road Grade (% Slope)	During Logging	After Logging	Broad-Based Dips	Ditch Relief Culverts	Waterbars
1	500	400	500	450	400
2	300	250	300	300	250
5	200	135	180	200	135
10	140	80	140	140	80
15	130	60	---	130	60
20	120	45	---	120	45
25	110	40	---	65	40
30	100	35	---	60	35
40	90	30	---	50	30

AMP 6.2.1

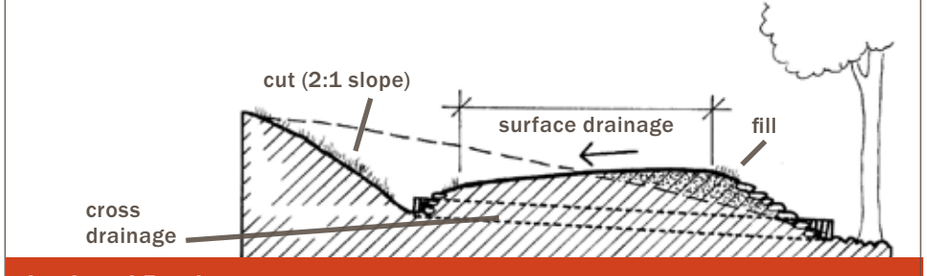
Waterbars on temporary truck roads shall be correctly installed to divert the surface water runoff into a filter area and shall be spaced at intervals according to Table 1 where existing soil, rock, ledge and road bed conditions allow.

Timing

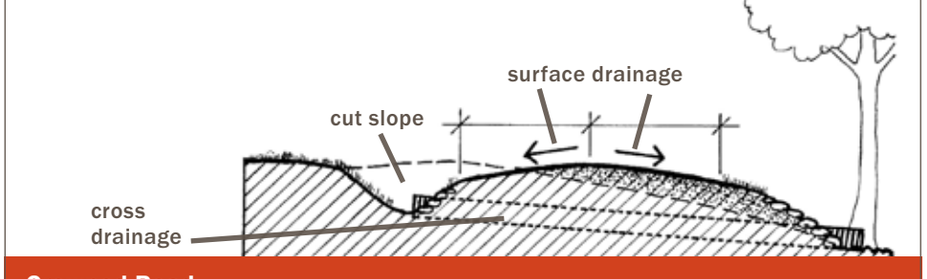
- Whenever possible, construct roads during dry periods or when the ground is frozen.
- Minimize work during heavy rains and/or wet periods.
- Plan how and when roads built during the winter will be stabilized.
- Whenever possible, build roads before you intend to use them heavily so that they have time to settle and stabilize.



Out-sloped Road



In-sloped Road



Crowned Road

Drainage and Diversion Structures

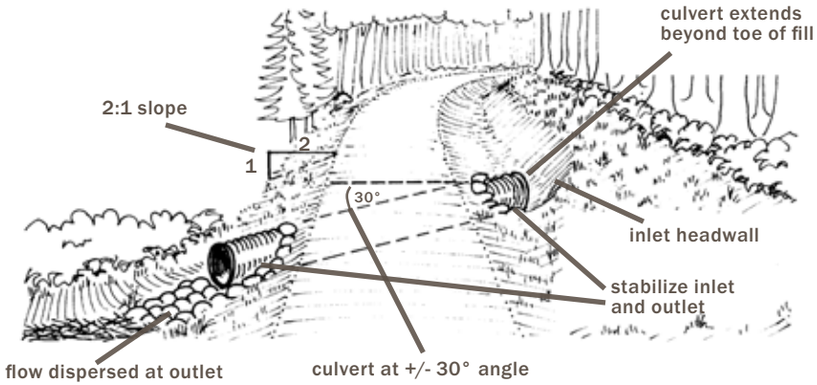
Water diversions minimize the amount of runoff that reaches waterbodies. These diversions can include waterbars, turnouts, ditches, and other structures that divert water away from the road and disperse it into areas of undisturbed forest floor.

- Divert water off the road surface and away from the road using natural dips (or grade breaks), broad-based dips, waterbars, turnouts, or similar techniques.
- Space water diversions close enough together to control the volume and speed of water. The recommended spacing varies widely, depending on the grade (steeper grades require closer spacing). Refer to Table 1 for the spacing most appropriate for the slope at hand. Choosing appropriate locations for the diversions may be more important than spacing on some sites.
- Disperse water flowing from the outlets of diversion structures or from downhill road shoulders using brush berms, riprap aprons, or other methods—before it enters the forest buffer.
- Construct settling basins outside the forest buffer if water from ditches cannot be diverted off the road onto undisturbed forest floor. Settling basins will require periodic maintenance and cleaning.
- Construct roadside ditches to carry runoff from the road surface and uphill areas. Ditches with a flattened U-shape (a broad, rounded bottom and sloping sides) are preferred—avoid straight-sided ditches.
- Install a berm or diversion headwall that directs ditch water into the culvert and protects the culvert end. Ideally, the berm is left in place during the excavation of the ditch.
- Do not terminate drainage ditches directly into streams. On approaches to stream crossings, divert ditches into the forest buffer a minimum of 25 feet from the top of bank.

Cross Drain Culverts

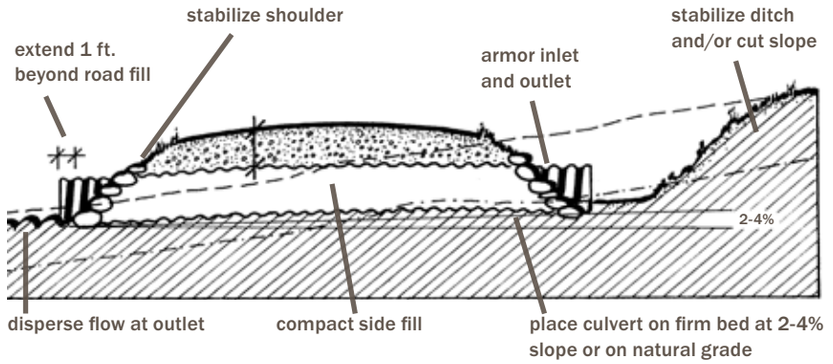
Cross-drainage culverts may be metal, plastic, concrete, or wood (box culverts). Permanent or temporary culverts are most effective when installed according to the following specifications.

Cross-drainage culvert



- Install culverts at a 2–4% slope and at a 30° angle to the road.
- Stabilize areas around the inlet and outlet with riprap or other material and extend the culvert at least 1 foot from the road fill on either end.
- Install culverts on top of adequate bedding material (native soil or, if necessary, added fill) that is free of branches or large rocks.
- Cover the culvert with compacted material to a depth of half the culvert diameter (or a minimum of 1 foot) or to the manufacturer's recommended specifications.

Proper cross-drain culvert installation



CLOSE OUT

Most erosion and sedimentation from roads happens within two years of the operation. Road closeout AMPs are best implemented before leaving the site for any extended period, or after the harvest is completed—even if you expect to use the road again. These practices prevent damage, ensuring that the road can be used again in the future. Of course, they also prevent water pollution.

- As a first step, identify the long-term monitoring and maintenance needs appropriate to the harvest site, communicate these to the landowner, forester, and logger, and decide who will be responsible for each task.
- Close out road sections as portions of the harvest are completed.
- Make sure drainage structures on temporary truck roads are correctly installed and spaced according to Table 1.
- Stabilize and seed exposed soils outside the travel surface, within forest buffers, and in areas that drain to waterbodies, see Table 3.
- Reshape and stabilize the road surface and ditches as needed.
- Remove temporary sediment barriers such as hay bales and filter fences if the site has stabilized.
- Divert water entering the road from skid trails, log landings, or other roads.
- If necessary, limit or block vehicle access to prevent damage or rutting (if this is compatible with the landowner's objectives).

MAINTENENCE

Proper road maintenance protects water quality and the road by keeping the AMPs functioning. If these structures fail, significant water pollution can result, most often during severe rainfall or snowmelt.

- Regrade the road surface if the crown is lost from heavy use. This prevents water from running in the wheel ruts. Don't leave material at the road's edge. Such "false ditches" can carry water along the road edge, bypass the AMPs, and channel the water into forest buffers or crossings.
- High shoulders should be graded or broken at regular intervals to allow runoff to drain into ditches or vegetated areas.
- Inspect ditches to make sure they have not begun to fill in, slump, or develop channels. Clear blocked ditches.
- Reshape and/or stabilize ditches as needed with erosion control mats, or by other methods.
- Stabilize exposed soils within forest buffers and areas that drain directly to waterbodies. Where your original stabilization techniques are no longer effective, re-stabilize using additional materials (mulch, brush, and/or seeding) or other techniques.
- Keep cross-drainage culverts free of debris and accumulated sediment at their inlet and outlet. Repair the outfall protection if water is eroding the soil around it.
- Maintain the riprap or other armoring at culvert ends to prevent erosion around the pipe and to protect the ends from physical damage.
- Replace culverts that have been undermined or crushed, before they fail.
- Clean out settling basins, ponds, and check dams well before they fill up with sediment.

Many of the structures used to divert water from road and trail surfaces should be maintained both during and after the harvest (unless the road is closed out). Periodically removing accumulated sediment in these structures will keep them operating as they were designed to.

Skid Trails

Much of the activity on a harvest operation happens on skid trails, away from truck roads and log landings. Trails may be used by skidders, forwarders, felling machinery, and other equipment. Most skid trails require little or no excavation, but some sections may require significant earth work. They provide temporary access for the removal of timber during logging operations.

Priorities in accordance with the AMPs

- Minimize water channeling in trails and entering buffer areas.
- Limit the amount of exposed soil.
- Leave enough vegetation to provide important natural functions within buffer areas.
- Close out trails appropriately.

PLANNING

Planning the trail layout

Locating and laying out skid trails in advance, especially main trails, can prevent problems. Consider the terrain, where the wood is, available equipment, the grade, soil conditions, skidding distance, forest buffers along streams, and stream crossings. Good planning may reduce the skidding costs and can reduce or eliminate the need for additional AMPs and structures.

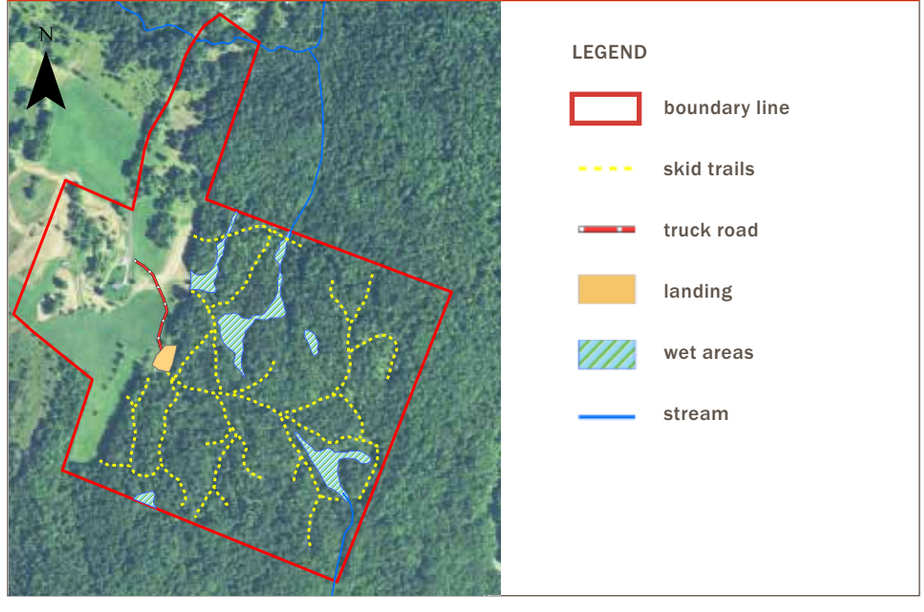
- Lay out trails for winter harvests in advance when there is no snow on the ground. Ideally, lay out trails on bare ground during wet seasons.
- Keep the number of skid trails to a minimum.
- Lay out trails to avoid waterbodies and their associated forest buffers, wet spots, seeps, and the bases of slopes.

- Examine existing skid trails to determine if they are the best routes to use. Consider if relocation of an existing trail or segments of trails would be a better long-term option.
- Avoid steep slopes (greater than 20%), unstable soils and wet areas.
- Plan to harvest during appropriate soil and weather conditions (preferably on dry or frozen ground).

Skid trails shall not exceed 20 percent grade. Where no reasonable alternative exists, steeper sections exceeding 20 percent grade are allowed but should not exceed 300 feet in length and shall be the minimum number of sections, grades and lengths necessary due to physical constraints, property boundaries and ground conditions.

AMP 6.3.1

Example of skid trail layout



BUILDING

Construct trails using simple structures that divert water. Keeping water out of the trail not only prevents erosion, but also reduces equipment wear and extends the period that the trail is usable (both during and after wet weather).

- Skid trails must be adequately drained to prevent rutting, control soil erosion and to keep sediment from entering streams and other bodies of water. Space drainage structures according to Table 1.
- When building skid trails incorporate turn-ups and construct waterbars. Critical locations to construct waterbars are on approaches to steep pitches and stream crossings.
- To correctly install turn-ups, construct them by turning the skid trail uphill a short distance, then turning downhill again. By reversing the grade in this way, water will run off the downhill side of the skid trail and into a vegetated filter area.
- Limit the amount of disturbed soil in forest buffers and make sure that any sediment is filtered out before it reaches surface water. This reduces the impact of skidding and forwarding.
- Use brush to reduce the amount of ground compaction the equipment causes, to prevent soil disturbance, and to stabilize areas of exposed soil in forest buffers.
- On heavily traveled skid trails, and in key locations near stream crossings, consider reinforcing waterbars with logs to prevent them from being filled in or flattened out.
- When logging in frozen conditions, filling waterbars with poles can help protect the waterbar so that it is still functioning after the spring thaw.

Waterbars and turn-ups shall be correctly installed on skid trails to divert the surface water runoff into a filter area and shall be spaced at intervals according to Table 1 where existing soil, rock, ledge and skid trail conditions allow.

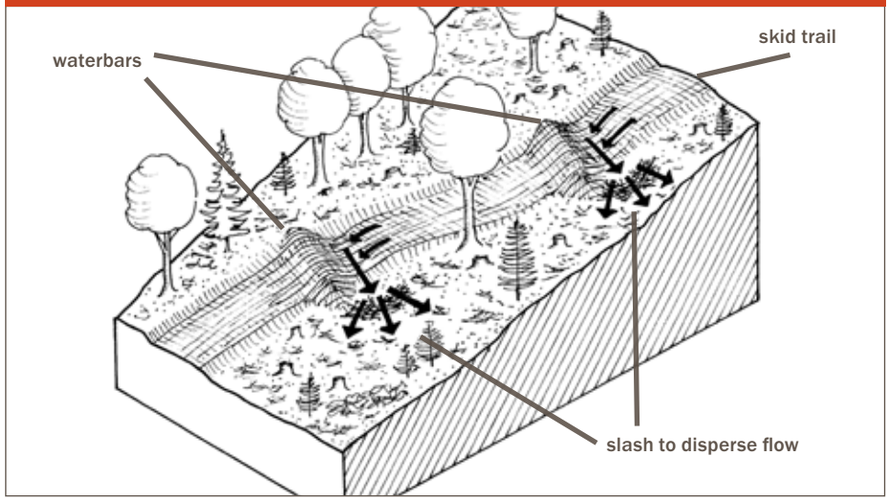
AMP 6.3.2

SPOTLIGHT: WATERBARS

Log-reinforced water bar

- Locate waterbars and other diversions frequently enough to prevent water from accumulating, based on Table 1 pg. xx.
- Make waterbars at least 12 inches deep, 12 inches high, and install them at a 30-degree angle to the trail.
- Extend the waterbar inlet and outlet 1 foot or more beyond the trail to keep the diverted water from re-entering the trail.
- Use the terrain to incorporate natural water diversions into the trail layout. A piece of ledge or natural hummock can work as a waterbar.
- When doing close out work, make waterbars twice as large as normal so they are more durable.

Waterbars



MAINTENANCE

Maintaining skid trails throughout the job will ensure compliance with the AMPs.

- Use brush on main trails and in forest buffers to prevent ruts from developing. If ruts develop, stabilize them using more brush. Waiting for drier or frozen conditions is often necessary.
- Inspect and maintain water bars periodically to prevent water channels from developing in the trails.
- Stay alert to weather forecasts of significant rain or substantial thawing.

Consider

- **limiting** equipment use, working in a different area, or doing other work until the site dries up or refreezes.
- **applying** brush to soft areas to distribute the equipment's weight before problems develop.
- **installing** additional temporary diversions, especially water bars, to prevent water from running in the trail.

CLOSE OUT

Proper closeout ensures that future problems do not develop.

- Close out unused trails as the job progresses, installing waterbars according to Table 1.
- Smooth ruts where they are likely to result in gully erosion. Smooth all ruts on approaches to stream crossings.

Ruts on skid trails shall be smoothed where soils, slopes, or depth and length of rutting, result in a likelihood of gully erosion, erosion or concentrated flow of surface water. All ruts of any depth shall be smoothed on approaches to stream crossings on skid trails within the forest buffer.

AMP 6.4.1

- Remove temporary stream crossings and seed and mulch within 50 feet of the waterway.
- Identify the long-term monitoring and maintenance needs appropriate to the harvest site and decide who is responsible for them. Communicate this to the landowner, forester, and logger.

Waterbars on skid trails shall be correctly installed to divert the surface water runoff into a filter area and shall be spaced at intervals according to Table 1, (p. 44) where existing soil, rock, ledge and skid trail conditions allow.

AMP 6.4.2

Stream Crossings

Stream crossings can have a significant negative impact on water quality. These impacts can be minimized by making sure that stream crossing structures are properly sized and installed correctly before crossing streams with equipment.

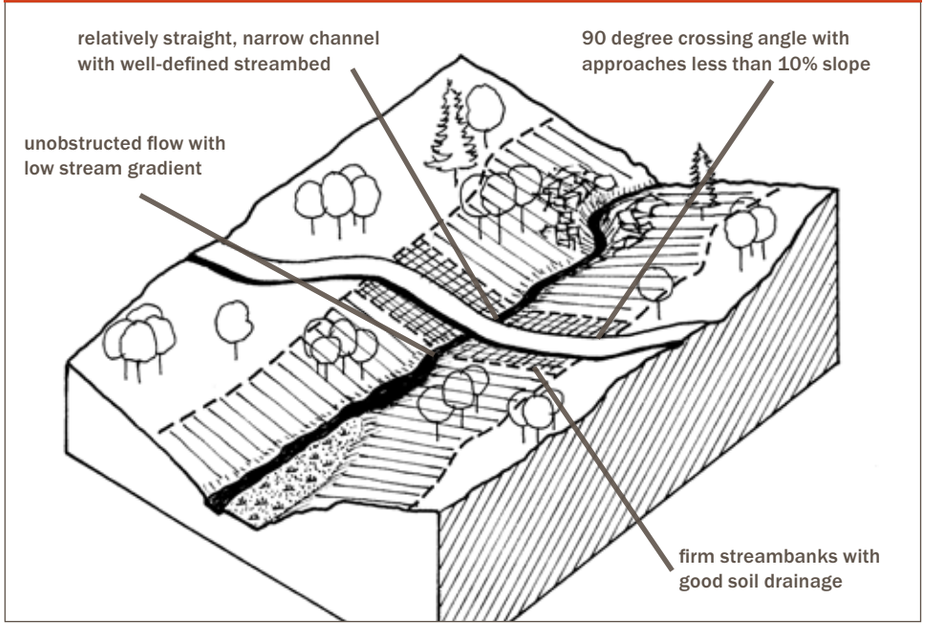
Priorities in accordance with the AMPs

- Prevent the discharge of logging slash and debris
- Minimize damage to the streambed and banks
- Avoid altering the channel or restricting the flow of water
- Maintain biological processes
- Minimize and stabilize exposed soil
- Control runoff on approaches
- Close out temporary crossing properly

Stream crossings encompass the entire area of a road or skid trail as it crosses the forest buffer on both sides of the stream, including:

- the channel itself;
- the stream banks; and
- the road or trail approaches (at a minimum, a length equal to the recommended width of the forest buffer at that point).

Characteristics of a good stream crossing



There are two types of crossings, temporary and permanent:

Temporary Stream Crossings can be a bridge, culvert, pole ford or brushed-in crossing that is temporarily installed in or over a stream channel. Temporary stream crossing structures must be removed after logging is completed or as soon as ground conditions are stable. Stream crossings on trails used by skidders, forwarders and other logging equipment are generally considered to be temporary.

Permanent Crossings are intended to be in place for many years. Truck road crossings, for example, can often be permanent features that require careful design, installation and long-term periodic maintenance. Permanent stream crossing structures are occasionally installed on skid trails if the landowner has long-term access needs. Monitor and maintain permanent stream crossing structures to make sure they are functioning correctly, are free of debris and are adequately sized for storm events.

STOP

Stream crossings that are installed for less than 12-18 months are considered temporary. Structures installed for longer than that are considered permanent and have more stringent standards. See Table 2A and 2B for requirements of each type.

PLANNING

It is illegal to discharge any waste into the waters of the State, including logging debris or slash. To avoid issues during a harvest, always plan ahead when harvesting around streams, and when installing stream crossings. It is best to install crossings during road construction and trail layout, before harvesting begins.

Streams and all waters shall be kept free of logging slash and logging debris.

AMP 6.5.1

When installing stream crossings-

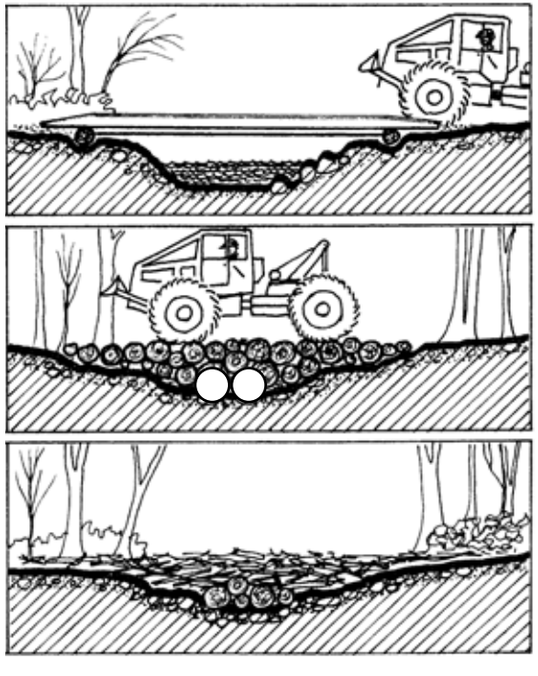
Determine if a temporary or permanent crossing is needed. Select the type of crossing that best matches the site and stream characteristics, and the need for access. If you don't need permanent access, properly installed temporary crossings may have less of an impact on water quality.

Temporary Stream Crossings include:

- Portable bridges.
- Temporary culverts or pipe arches.
- Log or poled fords.
- Poled ford with brush (winter only).

Poles with slash/brush

Types of temporary crossings



TEMPORARY/PORTABLE BRIDGE
- protect/stabilize streambank
- larger crossings
- remove at closeout

LOG OR POLED FORD
- protect bank and channel
- maintain stream flow
- small streams only
- remove at closeout

POLES W/SLASH/BRUSH
- protect bank and channel
- maintain stream flow
- winter only
- remove at closeout

Poled Ford with brush-used in Winter only.
Poled fords can be supplemented with a steel pipe to allow water to flow more easily. If pipes are installed in addition to poles and brush and are not covered with soil, they are not considered temporary culverts, but are considered a "vented ford".

Use temporary structures to keep equipment out of flowing water, to prevent sediment from entering the water, and/or to protect the banks and stream bottom. Portable, removable structures such as bridges, mats, and culverts (when they are installed without additional fill) have the advantage of being reusable.

Permanent stream crossings:
Permanent stream crossings are most often used on haul roads but may be used on skid trails when permanent access is required. They include:

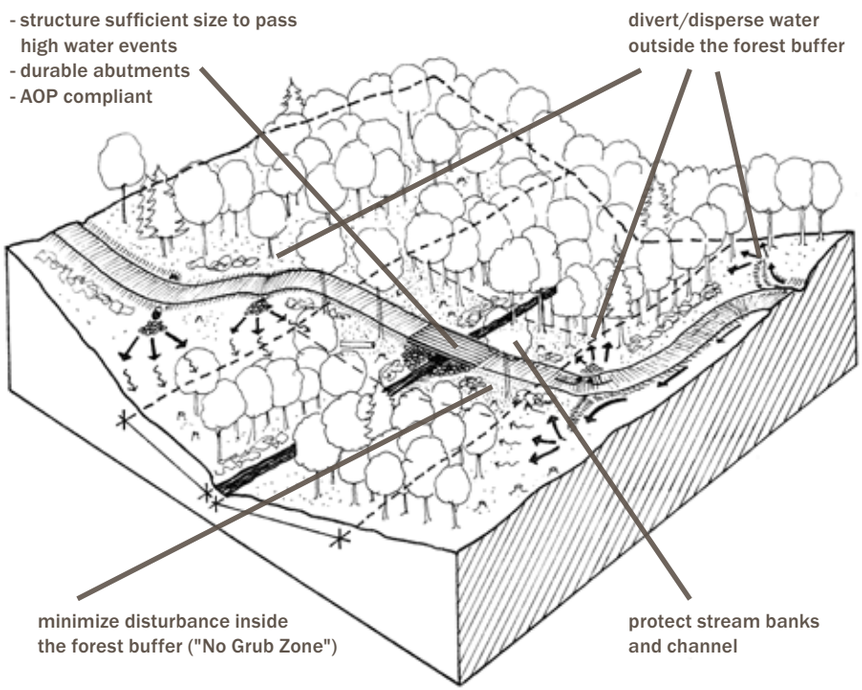
- Bridges
- Culverts/ pipe arches
- At grade fords

STOP

Before installing a permanent crossing, determine if the stream is intermittent or perennial. If the stream is perennial, you are required to get a Stream Alteration Permit. Contact your local River Management Engineer for assistance and to determine the type of permit necessary.

dec.vermont.gov/sites/dec/files/wsm/rivers/docs/RME_districts.pdf

A permanent stream crossing that minimizes water quality impacts



Permanent stream crossings on perennial streams shall be in compliance with standards set forth in the Vermont Agency of Natural Resources Stream Alteration Rule and General Permit. Environmental Protection Rule, Chapter 27, Subchapter 5.

AMP 6.5.5

TECHNICAL GUIDANCE

VT DEC guidelines on identifying Perennial and Intermittent streams.

DEFINITION OF PERENNIAL STREAM

A perennial stream is a watercourse, or portion, segment or reach of a watercourse that, in the absence of abnormal, extended or severe drought, continuously conveys surface water flow. A perennial stream shall not include the standing water s of wetlands, lakes, and ponds.

The jurisdictional exemption under 10 VSA Section 1002((10), i.e., “ditches and other constructed channels primarily associated with land drainage or water conveyance,” shall not include perennial streams that have been channelized or converted to ditches.

All other streams or portions thereof shall be considered and termed intermittent.
A stream may, along its course, cycle from intermittent to perennial to intermittent through multiple iterations.

Replacement of an undersized culvert with bridge.

Evaluative Parameters

A perennial stream may be characterized by any of the following:

1. Direct observation or compelling evidence obtained that surface flow is uninterrupted.
2. Presence of one or more geomorphic characteristics typically associated with perennial streams including:
    a. Bed forms; i.e. riffles, pools, runs, gravel bars, other depositional features, bed armor layer
    b. Bank erosion and/or bed scour
    c. Indications of waterborne debris and sediment transport
    d. Defined bed and banks.

VT DEC guidelines on identifying Perennial and Intermittent streams.

Evaluative Parameters continued.

3. Watershed size greater than 0.25 square miles (160 acres).
4. VHD data layer-derived application of USGS regression for intermittent stream flow probability.
5. Presence of aquatic organisms requiring uninterrupted flow for survival.
6. Base flows are primarily supported by groundwater recharge as indicated by bank seeps, springs or other indicators.
7. Presence of highly permeable channel (particularly streambed) boundary conditions in conjunction with occasional to frequent decline of the groundwater table below the streambed elevation.
8. Surrounding topography exhibits characteristics of being formed by fluvial processes.

Perennial stream

Intermittent stream

CHOOSING THE BEST STREAM CROSSING SITE

Select appropriate crossing locations based on site and stream conditions.
Look for:

- Relatively straight, narrow channels with well - defined banks and streambed.
- Unobstructed flow of water.
- Level or gently sloping approaches for a distance of 50 feet on both sides of the stream.
- Approaches that are at right angle to the stream channel.
- Firm streambanks with good soil drainage.
- Low stream gradient.

For polled crossings and at grade fords, select a crossing with a hard stream bed (gravel, cobble or ledge.

Stream crossings shall be made perpendicular to the stream channel unless rock, ledge or other ground conditions prevent a perpendicular crossing and no other feasible alternative crossing exists. Stream crossings shall be located where the stream channel is narrow and well defined, the banks are stable and approaches are 10 percent grade or less.

AMP 6.5.2

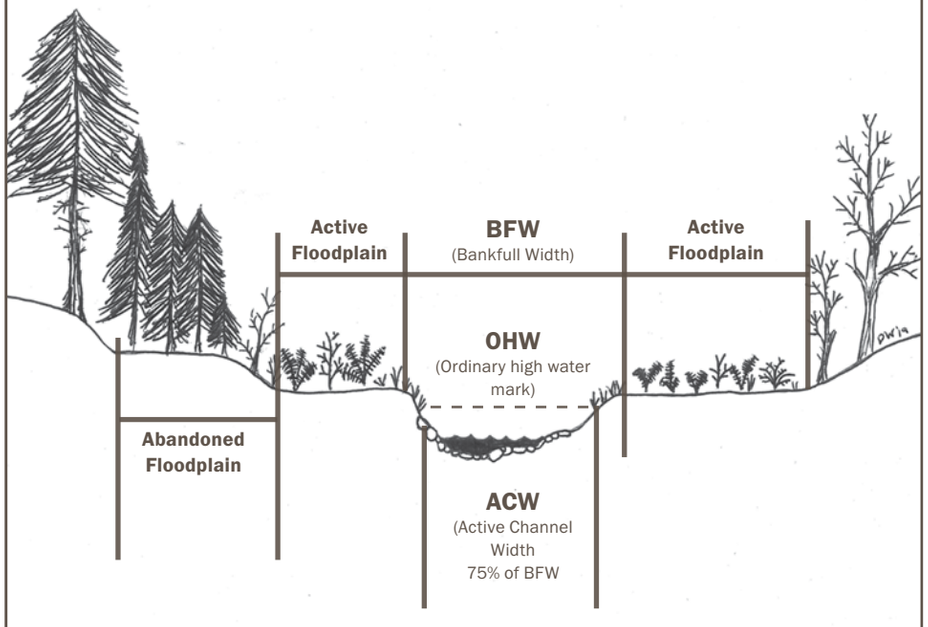
Keep in mind that the type of crossing structure will affect the efficiency of water flow. Culverts may be preferred in narrow, deep gullies or on V-shaped, steep-sided channels. Bridges or box culverts are suited for wider streams with low, flat banks.

PROPERLY SIZE THE STRUCTURE

- For permanent structures on perennial streams, consult with a River Management Engineer to properly size the structure opening. If necessary, work with a Civil Engineer to design the support structure to ensure that it will support the loads that are expected. A loaded log truck can weigh as much as 99,000 lbs.
- For permanent structures on intermittent streams, use the appropriate column from Table 2A and 2B to properly size the structure, based on the drainage area and/or the active channel width.

- For temporary structures, utilize Table 2A and 2B for proper structure size, based on the drain age area and/or the active channel width.
- Remember, undersized structures cause erosion and damage the stream. Moreover, repairing or replacing a bridge or culvert is a significant cost, and one that can usually be avoided if care is taken in designing and installing structures.

Determining Active Channel Width for Permanent Crossings on Intermittent Streams



Active Channel Width means the limits of the streambed scour formed by prevailing stream discharges, measured perpendicular to streamflow. The active channel is narrower than the bankfull width (approximately 75%) and is defined by the break in bank slope and typically extends to the edge of permanent vegetation.

Culvert sizing for crossings on intermittent streams: Determine the Active Channel Width by field measurements, **the culvert size should meet or exceed the ActiveChannel Width.** To obtain measurements go to the crossing location and obtain several upstream Active ChannelWidth measurements in riffle (fast moving water, if present) narrower channel locations. The selected channel width should be a representative average of the field measurements. In the absence of field measurements, refer to Table 2A. For intermittent streams with an Active Channel Widths 4 feet or greater, imbed the culvert 30% to maintain a natural streambed.

Drainage area can be determined at the United States Geological Service (USGS) Vermont StreamStats website using the interactive mapping tool:

streamstats.usgs.gov
OR by using the ANR Natural Resources Atlas, anrmaps.vermont.gov/websites/anra5

INSTALLING STREAM CROSSINGS

Properly installed stream crossings preserve water quality, protect your investment in the crossing, and reduce future maintenance costs.

- Prevent the discharge of logging slash and debris into streams
- Minimize disturbance to the stream banks, channel, and streambed during installation, use, and removal.
- Keep machinery out of streams unless necessary for the construction of the crossing.
- Minimize and stabilize exposed soils on the approaches within the filter area. During operations, you can stabilize the approaches with brush or other materials.
- Construct crossings with stable approaches with 10% grade or less and install diversions on the approaches to prevent channeled runoff from entering the stream from the trail or road, and to disperse it into adequate filter areas.
- Build the narrowest roads and trails possible approaching the stream crossing.
- Do not obstruct water flow or fish passage in the stream. Install culverts with the bottom resting on or below the stream bed at the inlet and outlet.
- Minimize work during wet weather or when the soil is saturated.

Logging equipment shall be kept out of stream channels, except as necessary for the construction, maintenance, use, removal and stabilization of stream crossing structures or the use of at-grade fords.

AMP 6.5.6

Stream crossings on truck roads shall be over a bridge, culvert or by constructing an at-grade ford. Culvert diameter shall be according to Table 2A, and bridge structure opening shall be according to Table 2B. Temporary bridges shall span the entire width of the stream channel. On truck roads, streams may be crossed by using an at-grade ford only where streams have low banks, stable beds (cobble or ledge) and stable, gradual approaches. Temporary stream crossing structures on truck roads shall be removed after logging is completed as soon as ground conditions are stable or within 18 months of installation, whichever is sooner.

AMP 6.5.3

Constructing stream crossings on truck roads:

Properly sizing and installing stream crossings on truck roads is very important. Doing so will prevent these structures from failing or washing out, requiring expensive repairs or rebuilding. Moreover, washouts can significantly impact a stream's water quality. If considerable excavation is necessary during periods of regular or high flow, temporarily divert the water while installing the crossings.

- Choose the best crossing structure based on the size and shape of the stream at the crossing.
- Properly size the crossing using Table 2A and 2B.
- Minimize excavation on stream banks and approaches.
- Construct road approaches using fill (instead of grubbing), leaving the forest floor undisturbed, especially outside the road profile. Consider surfacing with clean gravel or stone. This will stabilize the road surface, prevent it from eroding directly into the stream, and keep mud from being tracked onto the crossing structure.
- Use geotextile and fill on unstable soils or during wet weather.
- Set abutments back from the stream's edge.

- Design bridges using solid decking or other features to minimize the amount of material that falls through the deck and into the stream.
- Drainage ditches along permanent and temporary truck roads shall not terminate directly into streams or other waters. On approaches to stream crossings, ditches shall be turned out into a filter area a minimum of 25 feet away from the top of bank.
- Seed and mulch exposed soil on approaches within 50 feet of the stream channel immediately after the crossing installation.

TABLE 2A

Minimum Culvert Sizing for Stream Crossings

Choose the drainage area closest to your crossing site drainage area

Drainage Area (Acres)	Minimum Diameter for Temporary Culverts <18 mos. (in inches)	Minimum Diameter for Permanent Culverts on Intermittent Streams installed for a period >18 mos. by drainage area (in inches)
4	12	15
8	15	18
16	18	24
20	18	30
40	24	36
50	30	42
80	36	48
120	36	60
160	42	66
200	48	Streams with drainage areas of 160 acres or greater are likely to be perennial. Adhere to the VT VDEC Technical Guidance for Identification of Perennial Streams
320	54	
350	60	
450	66	
640	72	

For Drainage Areas greater than 640 acres, a temporary bridge is required. See table 2B

* The minimum size for permanent culverts on intermittent streams shall be as outlined above or shall be sized to accommodate the active channel as observed at the crossing site.

TABLE 2B

Minimum Bridge Structure Opening for Stream Crossings

Choose the drainage area closest to your site drainage area

Drainage Area (Acres)	Minimum Span Temporary Bridges (FEET) Distance between abutments	*Minimum Height Temporary Bridges	Mimimum Span Permanent Bridges (FEET) Distance between abutments	Minimum Height Permanent Bridges (FEET) From average streambed elevation to low chord of superstructure
<100	6	OHW	6	2.5
160	7	OHW	7	2.75
200	8	OHW		
320	10	OHW		
640	13	OHW		
960	16	OHW		
1,280	18	OHW		
1,920	21	OHW		
2,560	24	OHW		
3,200	27	OHW		
3.840	29	OHW		
4,480	31	OHW		
5,120	33	OHW		
5,760	34	OHW		
6,400	36	OHW		

Streams with drainage areas of 160 acres or greater are likely to be perennial. Adhere to the VDEC Technical Guidance for Identification of Perennial Stream
640 acres = 1 square mile

** See Below

*Minimum Height- Low chord of superstructure at or above OHW (Ordinary High Water Mark).
**AMP 6.5.3 and 6.5.4 State that "Temporary Bridges shall span the entire width of the stream channel." The minimum span for bridges shall be according to table 2B, or shall span the entire width of the stream channel as observed at the crossing site.

At-Grade Ford:

An at-grade ford is an alternative method of crossing a stream when other means are not feasible. An at-grade ford is best suited to:

- Shallow streams.
- Sites where the crossing is perpendicular to the stream channel.
- Where water depth is less than three feet.
- Where the stream has a stable streambed of cobble or ledge.
- Where the stream has stable, gradual approaches.

Minimize the amount of streambank disturbance by locating a ford where the streambanks are low. An at-grade ford should be located where the bank slopes are 2:1 to 3:1. Use clean stone to stabilize the approaches and prevent sediment from being carried or dragged into the stream. Do not excavate or remove in-stream material (e.g. boulders, large wood deposits).

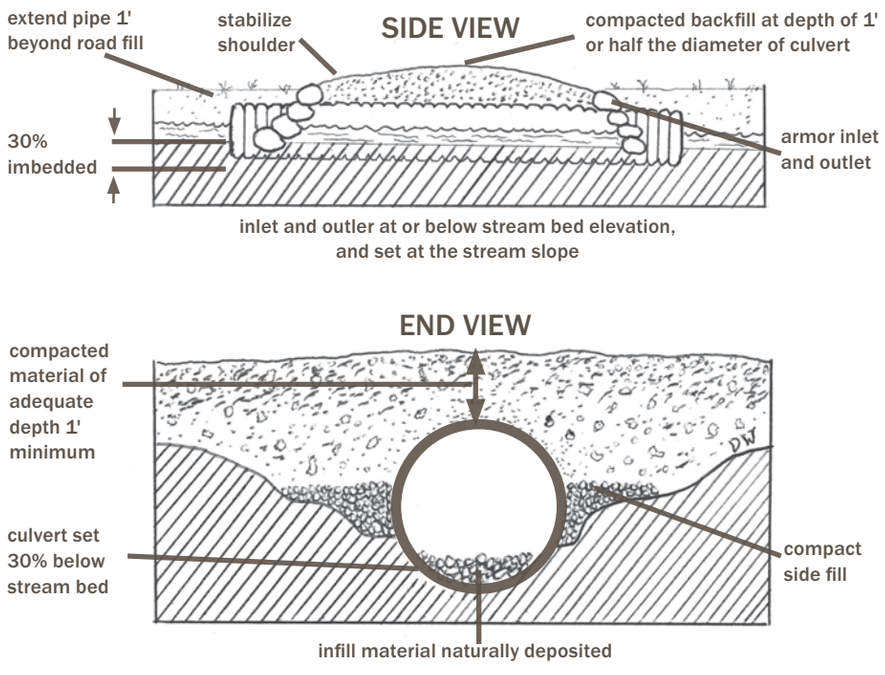
Fording a stream with a truck compared to using skidders or forwarders will minimize the number of trips and reduce the amount of disturbance to the streambed.

Culverts:

When installing permanent culverts:

- Utilize Table 2A for sizing culverts.
- Set the culverts with the bottoms slightly below the bed of the stream, and at a 2-3% slope. Avoid "hanging" culverts where the bottom of the culvert outlet is above the low water level.
- Extend the culvert inlet and outlet 1 foot or more beyond the fill or roadbed.
- Cover with compacted backfill to a depth equal to half the culvert diameter, or at least 1 foot deep.
- Stabilize the inlet and outlet of culverts and bridges using cobbles, timber abutments, or other armoring.

Proper permanent culvert installation on an intermittent stream



Constructing Stream crossings on skid trails

Stream crossings on skid trails are the most likely source of discharge on logging jobs. The most important thing you can do to protect water quality on a logging job is to properly size your crossing and install it according to recommendations.

- Choose the best crossing structure based on the size and shape of the stream at the crossing.
- Properly size the crossing using Table 2A and 2B.
- Stabilize crossing approaches with brush or similar materials, before and during operations.
- Except for the travelled portion of the skid trail, seed and mulch any exposed soil immediately after construction of the stream crossing.
- Protect the approaches by extending temporary bridges, or poles and brush, well beyond the stream bank.
- Install any temporary, portable bridges so that all portions of the bridge are above the stream's normal high-water mark. Keep abutments back from the banks, if possible.
- Install waterbars 25 feet back from the stream channel to divert sediment into the vegetated forest buffer.

AMP 6.5.4

Stream crossings on skid trails shall be over a bridge, culvert or pole ford. Brushed-in crossings are allowed but only as temporary crossings on intermittent streams and only when the ground is frozen. On skid trails, streams may be crossed by using an at-grade ford only where streambeds and approaches to streams are cobble or ledge and only if no other alternative exists. Culvert diameter shall be according to Table 2A, and bridge structure opening shall be according to Table 2B. Temporary bridges shall span the entire width of the stream channel. Pole fords are allowed on skid trails where the streambed is gravel, cobble or ledge. Temporary stream crossings that are brushed-in or that use pole fords shall be removed after logging is completed as soon as ground conditions are stable or within 12 months of installation, whichever is sooner. Temporary culverts or bridges shall be removed after logging is completed as soon as ground conditions are stable or within 18 months of installation, whichever is sooner.

Temporary Bridges

Utilizing temporary bridges is one of the most effective ways to cross streams during logging. They are less expensive then constructing permanent crossings, are relatively quick and easy to install, and provide good protection of the stream banks during installation and use. The Vermont Department of Forests, Parks and Recreation provides assistance for Vermont loggers and foresters to access temporary truck bridges and skidder bridges. To get more information about the temporary bridge program, contact the Watershed Forester, or go to

fpr.vermont.gov/forest/managing-your-woodlands/acceptable-management-practices/temporary-bridge-rentals

Temporary Truck Bridge

Temporary Skidder Bridge

MAINTAINING STREAM CROSSINGS

Temporary crossings

- During operations stabilize the soil on stream crossing approaches in the forest buffer by using slash, brush, or log corduroy.
- Prevent discharges at stream crossings by “disconnecting” surface flow from the stream using waterbars placed as close to 25 feet from the top of bank as possible.
- Periodically remove debris and other materials that may block or constrict the culvert or bridge opening.

Armor approaches to stream crossings on skid trails using brush or log corduroy to provide stream bank stability

On approaches to stream crossings, waterbars, turn-ups or broad-based dips shall be correctly installed on truck roads and skid trails to divert the surface water runoff into a filter area. They shall be installed as close to 25 feet away from the top of bank as existing soil, rock. ledge and ground conditions allow.

AMP 6.5.7

Except for the travelled portions of truck roads and skid trails, areas of exposed soil within 50 feet of the stream channel as measured from the top of bank shall be seeded and mulched, according to Table 3, immediately after installing stream crossing structures.

AMP 6.5.8

TABLE 3

Methods of Seeding and Mulching Truck Roads, Log Landings, Skid Trails and Stream Crossings

Options	Rate of Application	Timing of Application
Option 1. Hay or Straw Mulch with Annual Ryegrass	60 bales/acre or 1 ½ bales/1,000 square feet AND Annual ryegrass at 40 lbs./acre or 1 lb./1,000 square feet	Anytime
Option 2. Hay or Straw Mulch with Winter Rye	60 bales/acre or 1 ½ bales/1,000 square feet AND Winter rye at 112 lbs./ acre or 2 ½ lbs./1,000 square feet	Anytime
Option 3. Hay or Straw Mulch with Soil Conservation Seed Mix	60 bales/acre or 1 ½ bales/1,000 square feet AND Soil Conservation Seed Mix at 42 lbs./acre or 1 lb./1,000 square feet	Anytime. Best when applied between April 15 – June 15 OR August 1 – September 15
Option 4. Hydroseeding with Native Grasses or Weed Free Seed mix	Coverage and seeding comparable to the rates above.	Anytime

Permanent crossings

- Establish a regular monitoring and maintenance schedule for permanent stream crossings.
- Make sure the crossing approaches are not carrying sediment to the stream. Maintain and re-stabilize them as needed.
- Do not allow ditches to terminate directly into the stream. Runoff should be dispersed in to a filter area.
- When grading or rock-raking approaches, do not drag material onto the crossing.
- See if the abutments, armoring, and bank stabilization measures are being undermined or damaged, and replace or repair them as necessary. Severe undermining may indicate a poor location for the crossing, improper sizing, or incorrect installation, and can only be corrected by relocating or redesigning the crossing.

CLOSING OUT STREAM CROSSINGS

Determine the maintenance and closeout needs, and who will be responsible for these tasks. A well-built stream crossing is an investment that minimizes your risk of causing sedimentation and can assure long-term access. Protect that investment by knowing in advance how it will be maintained and closed out.

- Remove temporary structures, slash, and/or other materials from below the normal high-water mark when the crossing is no longer used and in accordance with the AMPs. Do not remove debris that has fallen into the stream naturally.
    - Temporary bridges and culverts need to be removed within 18 months of installation.
    - Temporary poles and brush need to be removed within 12 months of installation.
- Leave brush in place on the approaches and banks (above the normal high-water mark) to en sure ongoing stabilization when you closeout. This may limit the area of exposed soil and reduce the need for seeding and mulching.
- Remove logs used for abutments on temporary bridges unless doing so may cause more disturbance.
- After the harvest, stabilize the approaches in the forest buffer by spreading seed and mulch on all exposed soil within 50 feet of the waterway.
- Install waterbars on the approaches to the crossing as close to 25 feet from the top of bank as ground conditions allow.

AMP 6.6.1

All temporary structures on truck roads, and temporary bridges and culverts on skid trails, shall be removed from streams and the channel restored to a stable condition after logging is completed as soon as ground conditions are stable, or within 18 months of installation, whichever is sooner. On skid trails, brushed-in crossings and pole fords shall be removed after logging is completed, as soon as ground conditions are stable or within 12 months of installation, whichever is sooner.

AMP 6.6.2

After removing temporary stream crossing structures, waterbars shall be correctly installed as close to 25 feet back from the top of bank as ground conditions allow to divert the surface water runoff into a filter area. All areas of exposed soil shall be seeded and mulched a minimum of 50 feet on each side of the stream crossing. Seed and mulch at application rates according to Table 3 immediately after logging or as soon thereafter as ground conditions allow.

Forest Buffers

Forest buffers, protective strips, buffer strips, filter strips or riparian management zones are interchangeable terms for areas of forested land adjacent to streams and other bodies of water. These areas require special management considerations to protect water quality. Forest buffers have three major components that function to protect water quality and maintain stream health:

- The banks of streams (or other waterbodies) protect and contain the water channel.
- The forest floor—especially the leaf litter, woody debris, and organic soil layer—absorbs and filters water as it moves over and through the soil.
- Trees and other vegetation shade the water (minimizing changes in water temperature), stabilize the banks, and add woody debris and organic matter to the water and forest floor.

PLANNING

- Identify and delineate forest buffers on the ground before harvesting begins. Buffer widths should be according to Table 4.
- Except for necessary stream crossings, locate skid trails, truck roads and log landings outside of stream buffers.
- Adopt an operational plan that keeps the amount of ground disturbance and area of exposed soil within forest buffers to a minimum.
- Adopt a harvesting plan that provides for continuous forest cover (60-70% crown cover or B level stocking) along streams and other bodies of water for shade.
    - Maintain a diverse species composition.
    - Retain a range of both larger- and smaller-diameter trees.
    - Use directional felling to drop trees away from waterbodies. Avoid dropping slash or logs into stream channels and other waterbodies.
    - Remove slash that has fallen into waterbodies with a boom, winch, or by hand.
    - Leave any tops or stems that have fallen into the water naturally.

A forest buffer shall be left along streams and other waters in which only partial cutting can occur such that openings in the forest canopy are minimal and continuous forest cover is maintained. The width of the buffer shall be in accordance with Table 4 as measured from the top of bank.

AMP 6.7.1

Clearing trails and cutting trees, by themselves, may have a limited or temporary impact on water quality. However, when trails and trees are cut within a forest buffer, the potential for negative impacts on water quality increases. Do your homework when laying out new roads, trails and landings. Make sure that you have looked around and exhausted all possible alternatives before you decide to locate them in the forest buffer.

If you have determined that the forest buffer is the only location for a new road, trail or landing, or that an existing road, trail or landing cannot be moved outside the forest buffer:

To the maximum practicable extent, implement all other applicable AMPs

- Maximize the forest buffer area between the stream or other waters and the road or landing.
- Minimize impacts through careful location of waterbars and drainage devices.
- Double down on waterbars and other sediment control devices such as filter socks, silt fence and haybale check dams.
- Limit operations to the most suitable weather conditions.
    - Complete the work in the quickest time possible and do close out operations as soon as possible.

New truck roads, skid trails and log landings shall not be constructed within a forest buffer, except for the necessary construction of stream crossings, unless there is no feasible alternative due to existing soil, rock, ledge or other ground conditions. Truck roads, skid trails and log landings that exist within the forest buffer prior to the adoption of this rule, in whole or in part, may only be used if the truck road, skid trail or log landing is stable and the AMPs have been implemented and the road, trail or landing is unlikely to erode or contribute to discharge of sediment to state waters.

AMP 6.7.2

TABLE 4

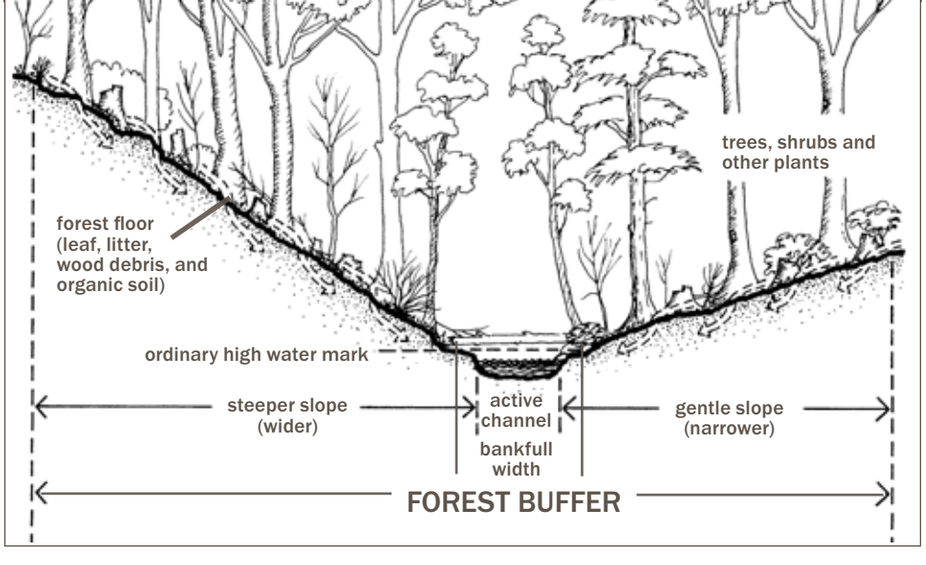
Minimum Forest Buffer Widths

Percent Slope of Land Between Skid Trails, Truck Roads or Log Landings and Streams or Other Waters	Width from Top of Bank (Feet Along Surface of Ground Measured Perpendicular to the Stream or Other Waters)
0-10	50
11-20	70
21-30	90
31-40*	110

*Add 20 feet for each additional 10 percent slope

Remember that the buffer distance is measured on each side of the stream. For example, if one side of the stream is 7% slope, the buffer distance on that side is 50 feet. If the other side is 15% slope, the buffer distance on that side is 70 feet. The total forest buffer width at location on the stream is 120 feet.

Forest Buffer



CLOSE OUT

Doing close out procedures in forest buffers takes some added techniques.

- During harvesting and closeout, keep equipment more than 25 feet from waterbodies.
- Smooth all ruts that could potentially direct runoff into the waterbody.
- Seed and mulch exposed soil with 50 feet of the waterbody.
- Ensure that water diversion devices are properly installed, and extra measures are in place if necessary, to prevent a discharge.
  - This includes extra waterbars or sediment barriers at outlets of drainage structures.

Logging equipment shall not be driven within a 25-foot wide area along streams or other waters, as measured from the top of bank except as necessary for the construction, maintenance, use, removal and stabilization of stream crossings.

AMP 6.7.3

Petroleum Products and Hazardous Waste

Timber harvesting activities require the use of hazardous materials such as fuels, lubricants, coolants, and solvents. Any of these products, when spent, may be a hazardous waste requiring special handling. Releases or spills of these products or wastes (to water, soil or air) are a hazard to the environment with certain reporting and cleanup requirements. Precautions are essential to prevent releases, and a good management plan for handling spills is necessary. Reduce liability from these materials and seek alternatives whenever possible.

Priorities in accordance with the AMPs

- Know how to handle and store hazardous materials.
- Avoid leaks and spills.
- Know how to deal with accidents.

Practices to be applied during logging:

- Inspect equipment regularly. Check all hoses, fittings and seals to prevent leakage or spills.
- Plans for preventing and handling spills should be developed. Know what state agency phone numbers to call in case of an emergency.
- Spill kits should be readily available at all sites. At minimum, kits should include plugs, clamps, a shovel, absorbent material (pads, booms, granular material), trash bags and a spill container. These kits are available commercially.
- Collect used oil, oil filters, hydraulic fluids, and all other recyclables and transport them off-site for proper disposal at your Solid Waste District or Municipal Collection.
- Equipment repair and maintenance should take place outside of forest buffers.
- Store petroleum products and other hazardous materials outside of forest buffers and remove them from the site immediately upon the completion of logging.

Petroleum products and other hazardous materials shall be stored only outside of forest buffers and shall be removed immediately upon completion of logging.

AMP 6.8.1

The proper storage, handling and use of hazardous materials are critical to the protection of water quality and ground water protection before, during and after timber harvesting operations. For more information on the proper handling of hazardous waste see the DEC website at:

http://dec.vermont.gov/sites/dec/files/wmp/HazWaste/Documents/Regulations/VHWMR_Sub8.pdf

Spills of hazardous materials are of particular concern during timber harvesting activities. What to do when you experience a spill:

- Stop the spill at its source.
- Prevent spilled material from entering waterways, drainage ditches.
- Contain spilled material using a barrier (absorbent pads or socks), temporary dike or trench, and use absorbent material to soak up spilled material.
- Remove contaminated material from the site and take it to a landfill.

STOP

Petroleum spills or releases of 2 gallons or more must be reported

To Report a Spill: Contact the VT Dept. of Environmental Conservation
During regular office hours
(M-F 7:45am – 4:30pm EST): 802-828-1138
24-Hour HAZMAT HOTLINE: 800-641-5005

National Response Center (for impacts or potential impacts to surface water): 800-424-8802. You must call and speak to someone. Email, text and voicemail messaging is not sufficient! For more information on the proper handling of hazardous waste, see the DEC website:
dec.vermont.gov/waste-management/spills

Contact the VT DEC for more information on the proper handling and disposal of hazardous materials and waste and where you can purchase spill response materials.

- Try your local equipment supplier or other commercial suppliers, such as: New Pig, Fastenal, Interstate Products, Breg Environmental, Absorbent King, Grainger, etc.
- For small business compliance assistance, contact DEC Environmental Assistance:

dec.vermont.gov/environmental-assistance
or call at 1-800-974-9559, ext 2

Log Landings

Log landings are the cleared areas in the harvest area where logs and other products are brought from the woods and piled, sorted, or stored before being loaded onto trucks. Log landings are sometimes referred to as log yards or decks. Landings are also where hazardous materials often are stored or used to maintain and repair equipment and roads. Please refer to the “Hazardous Materials” section on page XX for AMPs that deal with these substances.

AMPs will help prevent negative impacts to water quality and can extend the use of log landings during—and long after—the harvest. Landings are often the most visible part of the operation. AMPs may help maintain or improve the landing’s appearance while demonstrating conscientious work to the public.

PLANNING

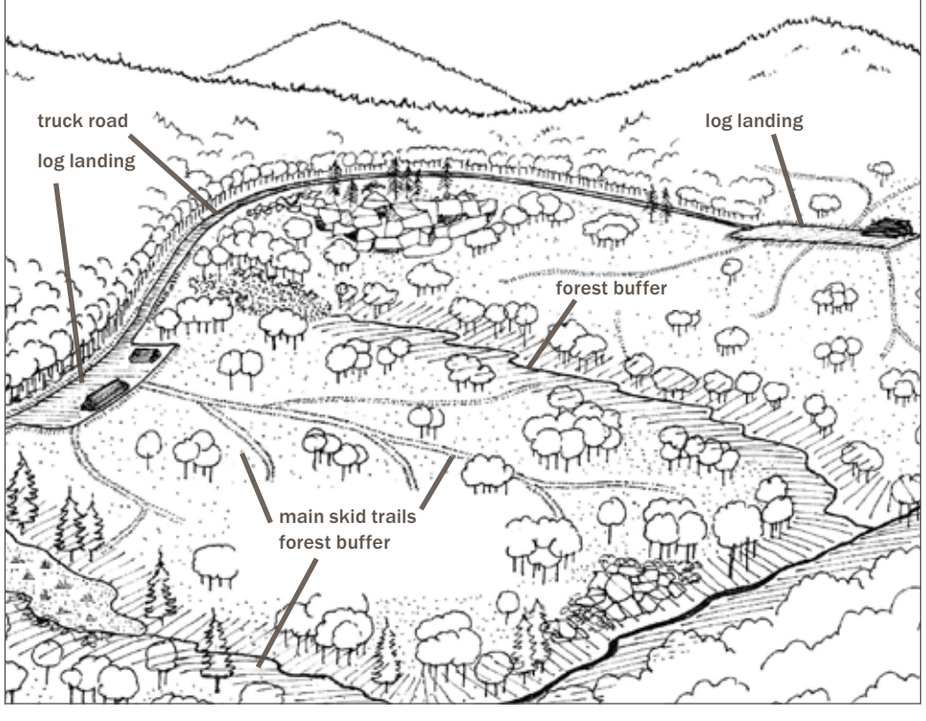
Log landings are busy places where a relatively large amount of soil may be exposed or disturbed. It is therefore important to locate landings away from water and maintain erosion controls.

- Use maps and field information to decide the best location for log landings. Preferred sites are:
  - well-drained soils
  - gently sloping (not flat) ground
  - outside forest buffers
- Keep the landing as small as possible and still meet the requirements of the equipment, the quantity and type of products, and safety.
- Mark the landing boundaries before construction begins.
- Lay out skid trails and roads so that water cannot flow into or out of the landing where they enter.
- Plan how you will stabilize exposed soil on the landing after the job.
- If landings already exist, determine if they can be reused with adequate erosion controls. If not, relocate them.

Priorities in accordance with the AMPs

- Locate landings on sites with well-drained soils and gentle slopes whenever possible.
- Locate landings away from waterbodies (including wetlands) and outside forest buffers.
- Minimize the amount of water entering the landing from roads and skid trails.
- Stabilize and maintain the landing surface.

Select landing locations carefully



AMP 6.9.1

Log landings shall not be constructed in a forest buffer except where no feasible alternative exists due to existing soil, rock ledge or other ground conditions. Log landings that exist within the forest buffer prior to the adoption of this rule, in whole or in part, may only be used if the log landing is stable and the AMPs have been implemented and the landing is unlikely to erode or contribute to discharge of sediment to state waters.

BUILDING

- Minimize the area of the landing that is stumped or grubbed. Logs may sometimes be piled on relatively undisturbed soil or forest floor, within reach of loading equipment.
- Install drainage ditches, water bars, or berms to drain the landing to areas of undisturbed forest floor, or to road drainage systems that can handle the amount of water coming off the landing.
- Surface the landing with wood chips, stone, or aggregate if it will help stabilize the surface and shed water. Use these materials on top of geotextiles, if necessary.
- During construction, install temporary sediment barriers (such as hay bales or silt fences) to keep newly exposed soil from entering waterways. See page xx for more information on temporary sediment barriers.

AMP 6.9.2

Silt fencing, check dams and drainage structures shall be correctly installed on log landings to prevent sediment from entering streams and other waters.

MAINTENENCE

- Maintain the landing surface to keep water from collecting or channeling.
- Maintain drainage structures on roads and trails to keep water from entering the landing.
- Install temporary or short-term measures (e.g., water bars) on skid trails if significant rain is likely during operations.
- Allow landings time to stabilize after changes in the weather.
  - Give them time to dry out after significant rainfall.
  - Let them freeze up before using them after warm weather.
- Rutting up landings can cause more soil movement and slow down the drainage process. It can also cause more work for the loggers and truckers and in some cases make them unusable in the short term.

CLOSE OUT

- As a first step, identify the long-term monitoring and maintenance needs, decide who is responsible for these tasks, and make sure everyone involved in the operation is notified.
- Prevent water from entering or exiting the landing via roads or skid trails. If necessary, install waterbars or similar diversions to divert flowing water to the undisturbed forest floor.
- Seed, mulch, or otherwise stabilize the landing to establish a vegetative cover. This is particularly important near waterbodies and forest buffers. If the soils in the landing are] severely compacted, some site preparation may be necessary before vegetation can take root.
- Limit vehicle access to the landing (if this is compatible with the landowner's objectives).
- Remove any temporary erosion control structures such as staked hay bales or silt fences. Make sure that permanent measures are in place.

Log landings shall be stabilized and drainage structures shall be correctly installed to prevent sediment from entering streams and other waters.

AMP 6.10.1

LOGGING ACTIVITIES AND WETLANDS

Activity in a Class I or Class II wetland or its associated buffer is prohibited unless it is an allowed use under the Vermont Wetland Rules or authorized by a permit or order issued by the Secretary of the Vermont Agency of Natural Resources. This chapter covers the Vermont Wetland rules and how to protect water quality when harvesting in or around wetlands.

Wetland Rules and 'Siviculture Allowed Uses'

Logging operations for the purposes of sustained forest management, are considered a 'silviculture allowed use' under the Vermont Wetland Rules (Section 6) as long as certain conditions are followed. This section is intended to provide guidance for anyone interested in operating within the 'silvicultural allowed use' when logging within State jurisdictional wetland and their buffer. Within this section are clear examples which are not to be considered all-inclusive. It is advised that you contact the Wetlands Office if you have any questions.

INTERPRETATION OF 'SILVICULTURE ALLOWED USE'

Silvicultural' Activities, as defined in the Vermont Wetland Rules, means those activities associated with the sustained management of forest land, including the planting, harvesting and removal of trees.

As such, the cutting and removal of trees within a class II wetland and its buffer, for long term management purposes, is an Allowed Use, **provided that:**

- the AMPs are implemented.
- the configuration of the wetland's outlet or the flow of water into or out of the wetland is not altered;
- no draining, dredging, filling, or grading occurs;
- activities comply with an approved plan when rare, threatened and endangered (RTE) species are present;
- when activities occur within deer wintering yards mapped by the Fish and Wildlife Department and within significant wetland and buffer, the activities comply with silvicultural standards for deer wintering yards, established jointly by the Departments of Fish and Wildlife and Forest, Parks and Recreation.

The provisions of no draining, dredging, filling, grading or alteration of hydrology are **not required** for the following situations:

- where beaver dams need to be removed because they impact existing haul roads;
- where existing haul roads are expanded up to a one-time 20% increase in width in wetlands;
- where new haul roads are constructed in buffer zones;

The Allowed Use **does not apply** to areas being cleared for reasons other than sustained forest management (for example, clearing of lots for future development, or conversion to agriculture).

In addition, the following activities are not considered an allowed use:

- Harvesting activities in wetlands that result in excessive rutting which alters the hydrology of the wetland. These activities are considered dredging.
- Leaving an excessive amount of log corduroy or brush in skid trails, winter haul roads or log landings in wetlands, either under frozen or unfrozen conditions, such that it alters grade or hydrology, or inhibits re-vegetation. These activities are considered fill.
- Activities in the wetland or outside the wetland that result in sediment entering the wetland through erosion. These activities are considered fill or discharge.
- Bringing in earth fill, or adding earth fill through re-grading, in wetlands for new roads or skid trails with-out the appropriate wetland permits. These activities are considered fill or discharge.

Excessive rutting is considered dredging

Harvesting activity within a Class I wetland is only an Allowed Use if the activity complies with a plan approved by the Commissioner of Forests, Parks, and Recreation. All Class I wetlands are mapped and can be viewed on the Vermont Wetlands Inventory Map available at: anrmaps.vermont.gov/websites/wetlandprojects The AMP buffer guidance for streams, also apply to any open water wetlands including vernal pools. For the complete version of the vVermont Wetland Rules: dec.vermont.gov/watershed/wetlands

The State protects wetlands which are:

- *On the Vermont Significant Wetland Inventory (VSWI) map*
- *Contiguous or connected to the VSWI mapped wetland*
- *1/2 acre or larger in size*
- *Adjacent to a stream, lake, pond, or river*
- *Vernal pools (amphibian habitat)*
- *Special and unique wetlands - i.e. bogs or fens*

SKID TRAILS, TRUCK ROADS AND LOG LANDINGS

- Skid trails through wetlands are an allowed use, provided they are temporary in nature. Permanent dredging, draining, filling, ditching or grading is not allowed without a wetlands permit. Therefore, all excessive brush (aka “fill”) used for crossing a wetland must be removed upon completion of the logging activity.
- Temporary winter haul roads through wetlands must always use frozen-in snow pack for access. Main skid trails may be used as winter haul roads.
- Sections 6.02 (restoration) and 6.04 (beaver mitigation) of the Vermont Wetland Rules refer only to existing haul roads.
- In Section 6.03 of the Vermont Wetland Rules, the construction of new haul roads is an allowed use in the buffer but not the wetland. New roads in wetlands require wetland permits. This allowed use is not for multi-purpose roads, but strictly for silviculture.
- Construction of new haul roads or the upgrade of an existing skid trail to a haul road through a wetland require a wetlands permit.
- Increasing the width of a silviculture haul road by 20% is an allowed use for a one-time improvement.
- Log landings should occur outside of wetlands. Only those frozen log landings that do not result in wetland fill may be located in wetlands. Logging debris and residues are considered fill. In order to remain in compliance, this may require the removal of slash and debris from the log landing before spring thaw.

The Reality of Harvesting in Wetlands

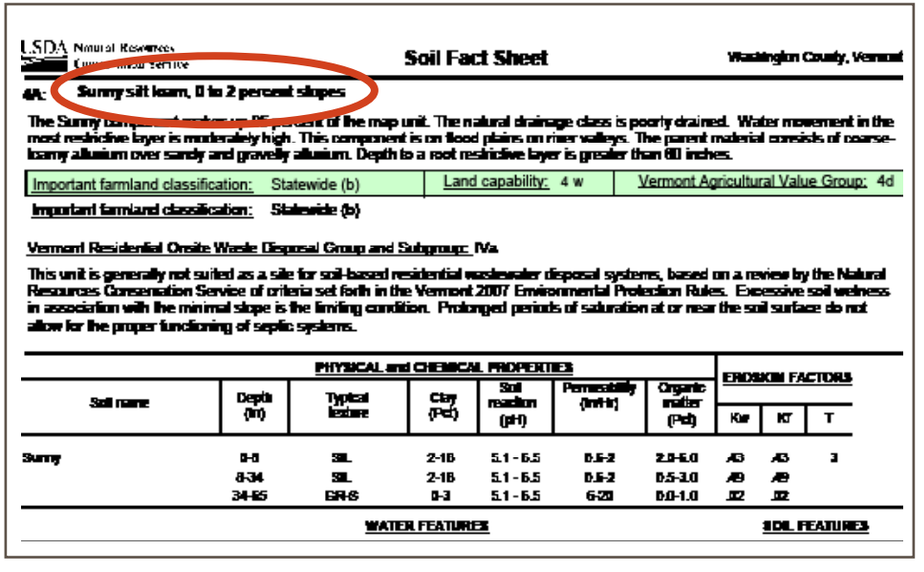
Not all wetlands are suitable for harvest. Organic substrates such as muck and peat, as well as areas with standing water or groundwater seepage, are near impossible to access with heavy equipment without extreme ruts and ground disturbance. The nature of these areas makes them difficult to freeze, and impossible to correct with equipment once disturbed (imagine trying to re-grade pudding that hasn’t set up yet). Staying within the parameters of allowed-use silviculture for the Vermont Wetland Rules is extremely problematic in these areas, so they are best avoided with heavy equipment.

Permanent impacts to wetland functions and values result from poorly planned and implemented harvest: soil substrate is disturbed, water quality is compromised, and wildlife habitat is diminished. In areas of heavy disturbance, the quality and quantity of suitable growth for future harvest is also diminished.

Other areas may only be suitable for harvest with very careful planning. Planning and timing the harvest for winter, creating a frozen road for equipment access, and/or finding suitable upland access points to avoid equipment use in wetlands are all important strategies. Research and planning are keys to success and to staying in compliance with AMPs and the VWR’s.

RESEARCH ONLINE

The VTANR Wetland Atlas maps portray important information that can help you create a plan for harvesting. In addition to the Vermont Significant Wetland Inventory maps, the site also lists hydric soils mapped by the Natural Resources Conservation Service (NRCS). Maps and soil fact sheets are available on the atlas, and also from local NRCS offices. Soil Fact Sheet that can give you valuable information to prepare for your harvest. Here are some helpful tips of what to look for on those Soil Fact Sheets:



USDA Natural Resources Conservation Service — **Soil Fact Sheet** — Washington County, Vermont

4A: Sunny silt loam, 0 to 2 percent slopes

The Sunny component makes up [illegible] percent of the map unit. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. This component is on flood plains on river valleys. The parent material consists of coarse-loamy alluvium over sandy and gravelly alluvium. Depth to a root restrictive layer is greater than 80 inches.

Important farmland classification: Statewide (b)	Land capability: 4 w	Vermont Agricultural Value Group: 4d

Important farmland classification: Statewide (b)

Vermont Residential Onsite Waste Disposal Group and Subgroup: IVa

This unit is generally not suited as a site for soil-based residential wastewater disposal systems, based on a review by the Natural Resources Conservation Service of criteria set forth in the Vermont 2007 Environmental Protection Rules. Excessive soil wetness in association with the minimal slope is the limiting condition. Prolonged periods of saturation at or near the soil surface do not allow for the proper functioning of septic systems.

	PHYSICAL and CHEMICAL PROPERTIES						EROSION FACTORS		
Soil name	Depth (in)	Typical texture	Clay (Pct)	Soil reaction (pH)	Permeability (in/hr)	Organic matter (Pct)	Kw	Kf	T
Sunny	0-8	SIL	2-18	5.1 - 6.5	0.6-2	2.0-6.0	.43	.43	3
	8-34	SIL	2-18	5.1 - 6.5	0.6-2	0.5-3.0	.49	.49	
	34-65	GR-S	0-3	5.1 - 6.5	6-20	0.0-1.0	.02	.02	

WATER FEATURES — SOIL FEATURES

Soil Name

Even if you don’t open the Soil Fact Sheet, the name will tell you a lot. Anything listed as **“muck”, “peat”, “mucky peat”, or “marsh”** are places you will want to avoid entirely. These are not mineral soils – these are partially decomposed organic material that will not support equipment. The organic nature of this material will also make it unlikely to freeze in the winter. Examples: Bucksport muck, 0 to 2 percent slopes; Peacham mucky peat, 0 to 3 percent slopes; Borohemists deep, undrained.

The name may also include descriptors like **“frequently flooded”, “ponded”** which will give you a sense of the water regime. Harvest in springtime or wet conditions will be challenging. Descriptors like “0-2 percent” slopes will give you a sense of areas that are in bottom-lands, and likely to be wetlands. Examples: Charles silt loam, 0 to 2 percent slopes, frequently flooded; Histosols and Aquents, ponded

Depth to seasonal high water table: The water table will let you know how close the water is to the surface. Soils saturated to within 12 inches of the surface are (0.0 – 1.0) feet are likely to be wetland and have conditions that will make equipment use difficult in all but frozen condition

Frequency and duration of flooding and ponding: Both elements let you know how often and how long water will be around after a rain storm or flood event. Ponded conditions are often the result of a perched water table.

	WATER FEATURES						SOIL FEATURES	
Soil name	Hydrologic group	Depth to seasonal high water table (Feet)	Flooding		Ponding		Hydric soil?	Depth to bedrock (range in inches)
			Frequency	Duration	Frequency	Duration		
Sunny	B/D	0.0-1.5	Frequent	[illegible] days)			Yes	—

Woodland management concerns, ratings and reasons: This section will tell you how suited an area is to equipment use, whether building a road is possible or recommended, and what type of erosion hazards there are for off road operations.

List of natural community types: When this includes “bogs” and “fens” the best bet is to avoid these areas. Listings of “swamps” “marshes” “floodplain forests” and “mud shores” you will need to plan and prepare to encounter wetland conditions.

LAND USE LIMITATIONS				AGRICULTURAL YIELD DATA	
Soil name	Land use	Rating	Reason [illegible]	Crop name	Yield / acre
Sunny	Dwellings with basements:	Very limited	Flooding	Grass-clover	6.4 AUM
Sunny	Pond reservoir areas:	Very limited	Seepage	Grass hay	4 Tons
				Grass-legume hay	4 Tons

[illegible] MANAGEMENT				
Soil [illegible]	Management concern	Rating	Reason	Vermont natural communities
Sunny	Harvest equip operability:	Poorly suited	<30cm to water table >=5mos	Silver Maple-Sensitive Fern Riverine Floodplain Forest, Alluvial Shrub Swamp, Alder Swamp, River Mud Shore
Sunny	Road suitability:	Poorly suited	Flooding	
Sunny	Erosion hazard (off-road):	Slight		

SITE WALKS

Depending on the time of year you visit a site, wetlands may or may not be detectable. Sites inspected only under snow cover may yield a nasty surprise when operations get underway. Walking a site during the growing season when snow is off the ground is key. Look for areas of standing water; evidence of flooding like water stained leaves, drift lines, water marks on trees; evidence of ponding and wet conditions like areas without undergrowth; soft mucky soils, and deep organic soils (mucks and peats). Wetlands are found adjacent to rivers and streams; in the lower part of the landscape in basins and depressions; and sometimes on hillsides where groundwater discharge creates seeps.

Below is a list of forested wetlands. Although the species that characterize these communities can also be found in uplands, these species should put you on alert that you may be harvesting in wetlands.

Floodplain Forests

- Silver Maple-Ostrich Fern Riverine Floodplain Forest
- Silver Maple-Sensitive Fern Riverine Floodplain Forest
- Sugar Maple-Ostrich Fern Riverine Floodplain Forest
- Lakeside Floodplain Forest

Hardwood Swamps

- Red Maple-Black Ash Swamp
- Red or Silver Maple-Green Ash Swamp
- Calcareous Red Maple-Tamarack Swamp
- Red Maple-Black Gum Swamp
- Red Maple-Northern White Cedar Swamp
- Red Maple-White Pine-Huckleberry Swamp

Softwood Swamps

- Northern White Cedar Swamp
- Spruce-Fir-Tamarack Swamp
- Black Spruce Swamp
- Hemlock Swamp

Peatlands

- Black Spruce Woodland Bog
- Pitch Pine Woodland Bog

For more information on these community types, refer to Wetland, Woodland, Wildland (Elizabeth H. Thompson and Eric R. Sorenson, University Press of New England, 2000.)

Recommended Best Practices for Crossing and Harvesting in Wetlands

Once you have determined that you have a wetland or wetland buffer that can support harvesting equipment, you come to the important question of "how do I protect the wetland features while I complete the harvest?" It is important to remember that silviculture is an allowed use only if certain things are true. One of those things is that you can't drain, dredge or fill in a wetland. Excessive rutting and excessive brushing in are not allowed. If these things take place you are no longer meeting the Allowed Use requirements. To ensure that you meet these requirements, the following actions are recommended:

BEFORE LOGGING

- Identify wetlands before the operation begins. Check for the presence of rare, threatened or endangered species or special community types. Use the online Vermont Wetlands Inventory Map.
- Find the best route to avoid entering wetlands. In situations where crossings are necessary, find the alternative that will result in the least amount of impact to the wetland. Some ways to reduce impacting the wetland include:
  - Crossing the wetland at the narrowest location.
  - Using frozen conditions to access wet areas.
- Flag your routes and sensitive areas: Make it clear which areas of wetlands can be crossed by skid trails, which areas are to be avoided with equipment, which areas are open water and require buffers, and stick to your plan.
- Make sure you can have a successful close-out: plan for installing temporary crossings in a way that they are removable when the job is complete.

DURING LOGGING

How wet is it? Do you have the appropriate weather window necessary? In most cases, harvesting in a wetland is best done in the early winter when cold nights provide for freezing in skid trails. These sites take longer to freeze than upland sites due to the extra water in the soil. Starting a job later in the winter will often not give you the cold nights that you need.

Proper equipment for the site- often there are areas that can't be accessed without first freezing in the trails. Bulldozers or smaller skidders work better for this because they don't create ruts that will hold water, making the freezing process take longer. Skidding small hitches over snow is a good way to get the ground to freeze. Problems arise when the first piece of equipment that goes in is a feller-buncher that puts all the wood in the road, and the skidding happens immediately. On soft wet ground this often causes rutting, and the trail never actually freezes until the skidding has been completed. Once this takes place, there is enough disturbance that the water flow has been altered and the site is no longer in compliance with the wetland rules (excessive rutting). Smoothing out the site is better than leaving it rutted, but the damage has already been done.

Look for obvious areas that will be hard to freeze and stay out of them. Moving water, even if it is a trickle, can keep an area from freezing under most conditions. These areas should be avoided. Deep muck soils are also difficult to freeze.

When you have to cross a wetland with a skid trail, using corduroy with brush is recommended to support the harvesting equipment. Lay down logs first, longer logs have more support, and then use tops to further spread out the weight. Remember that you can't fill in a wetland, so excessive brush (the brush that inhibits vegetation or water flow) must be removed after the harvest. Consider the use of bridge panels or crane mats as substitute to corduroy, as they may be easier to remove.

Temporary stream crossings within wetlands should be constructed only if there is no reasonable alternative. If it is necessary to construct one, you must follow the stream crossing recommendations in the AMPs. Typically, these crossings will require more brush and support of the trial up to the crossing itself. Using temporary skidder panels is a good option, as well as corduroy and brush. Crossings must be removed within 12-18 months, depending on the type of crossing. Excessive brush and corduroy must be removed as well.

Remember to keep equipment more than 25 feet from the top of bank of streams. Also, the stream buffer requirements of maintaining 60-70% crown closure along streams in a wetland or its buffer is required under the wetland rules.

Hand felling and reaching into a wetland with a cable skidder or dozer is probably the best way to harvest in a wetland with minimal disturbance.

If you encounter a situation that surprises you: the first pass caused deep ruts, the weather has changed and the ground is saturated, if you are creating large ruts, if something you think is solid is not, STOP! Install AMPs and wait until the conditions are better. In some cases, you can continue when things dry or freeze up, but in some cases you can't. You are much better off to avoid these areas than continuing to damage the wetlands, risking damage to equipment and risking a wetlands violation. In many of these poor site conditions, the cost of harvesting is higher than the value of the wood that can be harvested, making the operation a losing proposition.

IMMEDIATELY AFTER LOGGING

- Follow AMP procedures for closeout.
- Remove crossings and seed and mulch exposed soil within 50 feet of waterways.
- Install waterbars
- Remove corduroy and brush that can impede vegetative growth or water movement.
- Smooth out ruts at wetland crossings to prevent alterations in hydrology.

APPENDIX

The appendix includes the approved AMP rule, adopted August 11, 2018. Also listed are the page numbers where each AMP can be found in the manual, along with the supporting information. Also included in the appendix are Sources of Assistance, Other Laws and Regulations Affecting Logging Operations and References.

ACCEPTABLE MANAGEMENT PRACTICES FOR MAINTAINING WATER QUALITY ON LOGGING JOBS IN VERMONT - AUGUST 11, 2018

SECTION 1: INTRODUCTION

The "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont" ("AMPs") were first adopted on August 15, 1987 under the authority of Chapter 47 of Title 10 of the Vermont Statutes Annotated, Water Pollution Control (10 V.S.A. §1251a and 1259(f)). See Code of Vermont Rules 12 020 010. The initial adopted rule provided that "the AMPs are the proper method for the control and dispersal of water collecting on logging roads, skid trails and log landings to minimize erosion and reduce sediment and temperature changes in streams."

Act No. 64 of the Acts of 2015 amended 10 V.S.A. §2622 to require the Commissioner of the Department of Forests, Parks and Recreation to revise by rule the AMPs. The purpose of the acceptable management practices is to provide measures for loggers, foresters, and landowners to utilize, before, during, and after logging operations to comply with the Vermont Water Quality Standards and minimize the potential for a discharge from logging operations in Vermont in accordance with 10 V.S.A. §1259.

Pursuant to Section 2-03B.1 of the Vermont Water Quality Standards, there is a presumption that logging operations that are in compliance with the AMPs are also in compliance with the Vermont Water Quality Standards. However, any presumption provided by the Vermont Water Quality Standards shall be negated when a water quality analysis conducted according to Section 2-01(g) of the Vermont Water Quality Standards demonstrates that there is a violation of the Vermont Water Quality Standards.

Additionally, logging operations that are in compliance with the AMPs are exempt from the discharge permit requirements in accordance with 10 V.S.A. §1259(f), the stream alteration permit requirements pursuant to 10 V.S.A §1021(f), and the stormwater permit requirements pursuant to 10 V.S.A. §1264(d)(1)(C). Logging operations for the purposes of sustained forest management in compliance with the AMP's are also exempt from permit requirements pursuant to 10 V.S.A. §913(a) and Sections 6.01 – 6.05 of the Vermont Wetland Rules.

SECTION 2: POLICY AND PURPOSE

The purpose of the AMPs is to provide measures for loggers, foresters, and landowners to utilize, before, during, and after logging operations to comply with the Vermont Water Quality Standards and minimize the potential for a discharge from logging operations in Vermont in accordance with 10 V.S.A. §1259.

SECTION 3: AUTHORITY

This rule is adopted pursuant to 10 V.S.A. §2622(a) and (b), 10 V.S.A. §1259(f), 3 V.S.A. §801(b)(11) and 3 V.S.A. §2853(5).

SECTION 4: APPLICABILITY

The AMPs apply to all logging operations on public and private lands in Vermont regardless of the purpose of the logging. For example, logging may be conducted for forest management purposes or logging may be conducted for the purpose of clearing land for some other type of land use, such as commercial, residential or utility development.

SECTION 5:DEFINITIONS

For the purposes of this Rule, the following terms shall have the specified meaning:

5.1 **"Active Channel"** means the limits of the streambed scour formed by prevailing stream discharges, measured perpendicular to streamflow. The active channel is narrower than the bankfull width (approximately 75%) and is defined by the break in bank slope and typically extends to the edge of permanent vegetation.

5.2 **"Agency" or "ANR"** means the Vermont Agency of Natural Resources.

5.3 **"AMP"** or "Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont" means rules adopted under the authority of 10 V.S.A. §2622(a) and (b), 10 V.S.A. §1259(f), 3 V.S.A. §801(b)(11) and 3 V.S.A. §2853(5).

5.4 **"Approaches to Stream Crossings"** means that length of a truck road or skid trail associated with stream crossings that traverse through the forest buffer.

5.5 **"At-Grade Ford"** means a stream crossing on a truck road or, where no appropriate alternative exists, a skid trail, that is constructed perpendicular to the stream channel with approaches being properly stabilized with clean stone fill, and there is no change in existing stream channel cross-section and bed elevation except for minor bank grading at the point of the crossing.

5.6 **"Broad-based Dip"** means a drainage structure, usually used on truck roads where grades are less than or equal to 8 percent, that diverts the surface water runoff into a filter area.

5.7 **"Brushed-in Crossing"** means a temporary method of crossing intermittent streams during logging operations when the ground is frozen. Brushed-in crossings are constructed by placing logs in the bottom of the stream channel, parallel to the stream channel, and then placing topwood (tree limbs and branches) over the logs.

5.8 **"Check Dam"** means a small barrier constructed in a drainage structure, its outlet or in a small gully or other watercourse to decrease the water flow velocity, minimize channel scour and promote deposition of sediment. A check dam creates a small sediment basin. Check dams may be constructed of hay bales or other stable and semi-porous material.

5.9 "**Continuous Forest Cover"** means maintaining a minimum of 60 to 70 percent crown cover or B-level stocking as recommended in the U.S. Forest Service silvicultural guides.

5.10 **"Drainage Ditch"** means a ditch constructed along a truck road, skid trail or log landing to collect the surface water runoff and divert it into a filter area.

5.11 **"Drainage Structure"** means a device, structure or method that diverts the surface water runoff from an impervious surface such as a truck road, skid trail or log landing into a drainage ditch or filter area.

5.12 **"Filter Area"** means a vegetated area where surface water runoff is diverted and dispersed so that sediment and other pollutants are trapped and retained. A filter area can include or be within a forest buffer.

5.13 **"Forest Buffer"** means an area of forested land adjacent to streams and other waters where forest management practices are modified to protect water quality. The width of the forest buffer shall be in accordance with Table 4.

5.14 **"Forest Canopy"** means a layer or multiple layers of branches and foliage at the top or crown of a forest's trees.

5.15 "**Gully Erosion"** means a form of soil erosion where gullies of six inches deep or more are created by surface water runoff.

5.16 "**Hazardous Material"** means any material determined by the Secretary to have an unusually harmful effect on water quality if discharged to the waters of the state. Hazardous substances associated with logging operations include but are not limited to petroleum products, solvents and coolants. (

5.17 **"Intermittent Stream"** means a stream with a well-defined channel, evidence of sediment transport and which regularly experiences periodic interruption of surface flow throughout its length.

5.18 **"Log Landing"** means a place where trees and logs are gathered and sorted in or near the forest during a logging operation for further processing and transport to a mill or log yard facility.

5.19 **"Logging Equipment"** means equipment, implements, accessories, and contrivances used directly and principally in the cutting or removal of timber or other solid wood forest products. Logging equipment also includes equipment used to construct, maintain or install infrastructure necessary to and associated with the logging operation.

5.20 **"Logging Slash"** means any residual tree material, whole or part, including leaves, needles, bark, wood and root tissue, that is created as a result of a logging operation.

5.21 **"Ordinary High-Water Mark"** means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, or the presence of litter and debris.

5.22 **"Percent Grade/Percent Slope"** means a measurement of incline or decline expressed as a percentage and as determined by dividing the length of vertical rise in elevation by the length of horizontal distance. (Example: A 6% grade would be a 6-foot vertical rise per 100 feet of horizontal distance: 6 ÷ 100 = .06 or 6%)

5.23 **"Perennial Stream"** means a watercourse or portion, segment or reach of a watercourse, generally exceeding 0.25 square miles in watershed size, in which surface flows are not frequently or consistently interrupted during normal seasonal low flow periods. Perennial streams that begin flowing subsurface during low flow periods, due to natural geologic conditions, remain defined as perennial. All other streams, or stream segments of significant length, shall be termed intermittent. A perennial stream shall not include the standing waters in wetlands, lakes, and ponds.

5.24 **"Permanent Stream Crossing"** means a bridge, culvert or at grade ford that is left in place after logging is completed.

5.25 **"Permanent Truck Road"** means a road that remains in place at the conclusion of a logging operation for continued long term access and is designed for year-round use.

5.26 **"Person"** means any landowner, logger, individual, partnership, company, corporation, association, joint venture, trust, municipality, the state of Vermont or any agency, department, or subdivision of the state, any federal agency, or any other legal or commercial entity.

5.27 **"Pole Ford"** means a temporary method of crossing intermittent or perennial streams using logs placed in and parallel to the stream channel.

5.28 **"Rut"** means a depression in the soils of the forest floor or depressions in dirt roads or skid trails made from the passage of any vehicles or logging equipment.

5.29 **"Secretary"** means the Secretary of the Agency of Natural Resources or the Secretary's authorized representative.

5.30 **"Sediment"** means soil that has been eroded from the land surface and is transported and deposited in streams or waters.

5.31 **"Silt Barrier"** means a temporary sediment control device used to intercept and filter sediment from the surface water runoff to protect water quality in nearby streams and other waters. Silt Barriers include but are not limited to silt fence, compost filter socks, and filter berms.

5.32 **"Skid Trail"** means a cleared trail that is used by logging equipment during a logging operation to transport harvested trees and logs to a log landing.

5.33 **"Stable condition"** shall mean when a site is no longer eroding, and all AMPs are in place. The likelihood of erosion recurring is negligible.

5.34 **"Stream"** means the full length and width, including the bed and banks, of any watercourse, including rivers, streams (intermittent and perennial streams), creeks, brooks, and branches. "Stream" does not include ditches or other constructed channels primarily associated with land drainage or water conveyance through or around private or public infrastructure. (page xx)

5.35 **"Stream Channel"** means an area that contains continuously or periodic flowing water that is confined by banks and a streambed.

5.36 **"Streambank"** means the portion of a stream channel that restricts lateral movement of water at normal water levels.

5.37 **"Surface Water Runoff"** means precipitation and snowmelt that does not infiltrate into the soil, including material dissolved or suspended in it.

5.38 **"Temporary Stream Crossing Structure"** means a bridge, culvert, pole ford or brushed-in crossing that is temporarily installed in or over a stream channel. Temporary stream crossing structures shall be removed after logging is completed as soon as ground conditions are stable or as specified in AMP 6.5.3, 6.5.4 and 6.6.1.

5.39 **"Temporary Truck Road"** means a minimum-standard road designed for short-term use to access a logging operation. Temporary roads must be closed out at the conclusion of logging.

5.40 **"Top-of-bank"** means the location up-slope from the scoured channel of a stream, or shoreline of other waters, where an abrupt change of slope occurs.

5.41 **"Truck Road"** means a road that connects a log landing to a public road system. A "truck road" may be designed, constructed and maintained to provide either permanent or temporary access.

5.42 **"Turn-up"** means a method of construction of a downhill skid trail that diverts the surface water runoff from ditches and road or trail surfaces into a filter area by turning the skid trail up the hill a short distance then turning downhill again.

5.43 **"Waterbar"** means a type of drainage structure constructed across the width of a skid trail or truck road that diverts the surface water runoff from ditches and road or trail surfaces into a filter area.

5.44 **"Waters"** shall include all rivers, streams, creeks, brooks, reservoirs, ponds, lakes, springs and all bodies of surface waters, artificial or natural, which are contained within, flow through or border upon the state or any portion thereof.

SECTION 6: ACCEPTABLE MANAGEMENT PRACTICES

1. Truck Roads – Practices to be Applied During Logging

6.1.1. Permanent and temporary truck roads shall not exceed 10 percent grade. Where no reasonable alternative exists, steeper sections exceeding 10 percent grade are allowed but shall not exceed 300 feet in length and shall be the minimum number of sections, grades and lengths necessary due to physical constraints, property boundaries and ground conditions. (page 38)

6.1.2 Drainage structures on permanent and temporary truck roads shall be correctly installed to divert the surface water runoff into road ditches or filter areas. Drainage structures shall be spaced at intervals according to Table 1 where existing soil, rock, ledge and roadbed conditions allow. (page 42)

6.1.3 Water entering a permanent or temporary truck road shall be moved under and away from the road and into a filter area. Culverts used for ditch drainage on truck roads shall be at least 15 inches in diameter, correctly installed to divert ditch water into a filter area and spaced according to Table 1 where existing soil, rock, ledge and road bed conditions allow. (page 42)

6.1.4 Drainage ditches along permanent and temporary truck roads shall not terminate directly into streams or other waters. On approaches to stream crossings, ditches shall be turned out into a filter area a minimum of 25 feet away from the top of bank. (page 42)

6.2 Truck Roads - Practices to be Applied Immediately After Logging

6.2.1 Waterbars on temporary truck roads shall be correctly installed to divert the surface water runoff into a filter area and shall be spaced at intervals according to Table 1 where existing soil, rock, ledge and road bed conditions allow. (page 44)

6.3. Skid Trails - Practices to be Applied During Logging

6.3.1. Skid trails shall not exceed 20 percent grade. Where no reasonable alternative exists, steeper sections exceeding 20 percent grade are allowed but should not exceed 300 feet in length and shall be the minimum number of sections, grades and lengths necessary due to physical constraints, property boundaries and ground conditions. (page 51)

6.3.2. Waterbars and turn-ups shall be correctly installed on skid trails to divert the surface water runoff into a filter area and shall be spaced at intervals according to Table 1 where existing soil, rock, ledge and skid trail conditions allow. (page 52)

6.4. Skid Trails - Practices to be Applied Immediately After Logging

6.4.1. Ruts on skid trails shall be smoothed where soils, slopes, or depth and length of rutting, result in a likelihood of gully erosion, erosion or concentrated flow of surface water. All ruts of any depth shall be smoothed on approaches to stream crossings on skid trails within the forest buffer. (page 54)

6.4.2.Waterbars on skid trails shall be correctly installed to divert the surface water runoff into a filter area and shall be spaced at intervals according to Table 1 where existing soil, rock, ledge and skid trail conditions allow. (page 55)

6.5. Stream Crossings on Truck Roads and Skid Trails – Practices to be Applied During Logging

6.5.1. Streams and all waters shall be kept free of logging slash and logging debris. (page 57)

6.5.2. Stream crossings shall be made perpendicular to the stream channel unless rock, ledge or other ground conditions prevent a perpendicular crossing and no other feasible alternative crossing exists. Stream crossings shall be located where the stream channel is narrow and well defined, the banks are stable, and approaches are 10 percent grade or less. (page 63)

6.5.3. Stream crossings on truck roads shall be over a bridge, culvert or by constructing an at-grade ford. Culvert diameter shall be according to Table 2A, and bridge structure opening shall be according to Table 2B. Temporary bridges shall span the entire width of the stream channel. On truck roads, streams may be crossed by using an at-grade ford only where streams have low banks, stable beds (cobble or ledge) and stable, gradual approaches. Temporary stream crossing structures on truck roads shall be removed after logging is completed as soon as ground conditions are stable or within 18 months of installation, whichever is sooner. (page 66)

6.5.4. Stream crossings on skid trails shall be over a bridge, culvert or pole ford. Brushed-in crossings are allowed but only as temporary crossings on intermittent streams and only when the ground is frozen. On skid trails, streams may be crossed by using an at-grade ford only where streambeds and approaches to streams are cobble or ledge and only if no other alternative exists. Culvert diameter shall be according to Table 2A, and bridge structure opening shall be according to Table 2B. Temporary bridges shall span the entire width of the stream channel. Pole fords are allowed on skid trails where the streambed is gravel, cobble or ledge. Temporary stream crossings that are brushed-in or that use pole fords shall be removed after logging is completed as soon as ground conditions are stable or within 12 months of installation, whichever is sooner. Temporary culverts or bridges shall be removed after logging is completed as soon as ground conditions are stable or within 18 months of installation, whichever is sooner. (page 71)

6.5.5. Permanent stream crossings on perennial streams shall be in compliance with standards set forth in the Vermont Agency of Natural Resources Stream Alteration Rule and General Permit. Environmental Protection Rule, Chapter 27. (page 60)

5.6. Logging equipment shall be kept out of stream channels, except as necessary for the construction, maintenance, use, removal and stabilization of stream crossing structures or the use of at-grade fords. (page 65)

5.7. On approaches to stream crossings, waterbars, turn-ups or broad-based dips shall be correctly installed on truck roads and skid trails to divert the surface water runoff into a filter area. They shall be installed as close to 25 feet away from the top of bank as existing soil, rock. ledge and ground conditions allow. (page 72)

6.5.8. Except for the travelled portions of truck roads and skid trails, areas of exposed soil within 50 feet of the stream channel as measured from the top of bank shall be seeded and mulched, according to Table 3, immediately after installing stream crossing structures or as soon thereafter as ground conditions allow. (page 72)

6.6. Stream Crossings on Truck Roads and Skid Trails – Practices to be Applied Immediately After Logging

6.6.1. All temporary structures on truck roads, and temporary bridges and culverts on skid trails, shall be removed from streams and the channel restored to a stable condition after logging is completed as soon as ground conditions are stable, or within 18 months of installation, whichever is sooner. On skid trails, brushed-in crossings and pole fords shall be removed after logging is completed, as soon as ground conditions are stable or within 12 months of installation, whichever is sooner. (page 75)

6.2. After removing temporary stream crossing structures, waterbars shall be correctly installed as close to 25 feet back from the top of bank as ground conditions allow to divert the surface water runoff into a filter area. All areas of exposed soil shall be seeded and mulched a minimum of 50 feet on each side of the stream crossing. Seed and mulch at application rates according to Table 3 immediately after logging or as soon thereafter as ground conditions allow. (page 75)

6.7. Forest Buffer

6.7.1. A forest buffer shall be left along streams and other waters in which only partial cutting can occur such that openings in the forest canopy are minimal and continuous forest cover is maintained. The width of the buffer shall be in accordance with Table 4 as measured from the top of bank. (page 77)

6.7.2. New truck roads, skid trails and log landings shall not be constructed within a forest buffer, except for the necessary construction of stream crossings, unless there is no feasible alternative due to existing soil, rock, ledge or other ground conditions. Truck roads, skid trails and log landings that exist within the forest buffer prior to the adoption of this rule, in whole or in part, may only be used if the truck road, skid trail or log landing is stable and the AMPs have been implemented and the road, trail or landing is unlikely to erode or contribute to discharge of sediment to state waters. (page 77)

6.7.3 Logging equipment shall not be driven within a 25-foot wide area along streams or other waters, as measured from the top of bank except as necessary for the construction, maintenance, use, removal and stabilization of stream crossings. (page 79)

6.6.8 Petroleum Products and Hazardous Materials

6.8.1 Petroleum products and other hazardous materials shall be stored only outside of forest buffers and shall be removed immediately upon completion of logging. (page 81)

6.9. Log Landings - Practices to be Applied During Logging

6.9.1. Log landings shall not be constructed in a forest buffer except where no feasible alternative exists due to existing soil, rock ledge or other ground conditions. Log landings that exist within the forest buffer prior to the adoption of this rule, in whole or in part, may only be used if the log landing is stable and the AMPs have been implemented and the landing is unlikely to erode or contribute to discharge of sediment to state waters. (page 84)

6.9.2. Silt barriers, check dams and drainage structures shall be correctly installed on log landings to prevent sediment from entering streams and other waters. (page 85)

6.10 Log Landings - Practices to be Applied Immediately After Logging

6.10.1 Log landings shall be stabilized, and drainage structures shall be correctly installed to prevent sediment from entering streams and other waters. (page 86)

6.1.1 Table 1: Distance (Feet) Between Drainage Structures on Truck Roads and Skid Trails

TABLE 1

Distance (Feet) Between Drainage Structures on Truck Roads and Skid Trails

	Skid Trails		Truck Roads Permanent Truck Roads During & After Logging. Temporary Truck Roads During Logging.		Temporary Truck Roads After Logging
Road Grade (% Slope)	During Logging	After Logging	Broad-Based Dips	Ditch Relief Culverts	Waterbars
1	500	400	500	450	400
2	300	250	300	300	250
5	200	135	180	200	135
10	140	80	140	140	80
15	130	60	---	130	60
20	120	45	---	120	45
25	110	40	---	65	40
30	100	35	---	60	35
40	90	30	---	50	30

6.12 Table 2A: Minimum Culvert Sizing for Stream Crossings
Choose the drainage area closest to your crossing site drainage area

TABLE 2A

Minimum Culvert Sizing for Stream Crossings

Choose the drainage area closest to your crossing site drainage area

Drainage Area (Acres)	Minimum Diameter for Temporary Culverts <18 mos. (in inches)	Minimum Diameter for Permanent Culverts on Intermittent Streams installed for a period >18 mos. by drainage area (in inches)
4	12	15
8	15	18
16	18	24
20	18	30
40	24	36
50	30	42
80	36	48
120	36	60
160	42	66
200	48	Streams with drainage areas of 160 acres or greater are likely to be perennial. Adhere to the VDEC Technical Guidance for Identification of Perennial Streams
320	54	
350	60	
450	66	
640	72	

For Drainage Areas greater than 640 acres, a temporary bridge is required. See table 2B

* The minimum size for permanent culverts on intermittent streams shall be as outlined above or shall be sized to accommodate the active channel as observed at the crossing site.

AMP 6.5.5 states that “Permanent stream crossings on perennial streams shall be in compliance with standards set forth in the Vermont Agency of Natural Resources Stream Alteration Rule and General Permit. Environmental Protection Rule, Chapter 27. (page 60)

6.13 Table 2B: Minimum Bridge Structure Opening for Stream Crossings

TABLE 2B

Minimum Bridge Structure Opening for Stream Crossings

Choose the drainage area closest to your site drainage area

Drainage Area (Acres)	Minimum Span Temporary Bridges (FEET) Distance between abutments	*Minimum Height Temporary Bridges	Mimimum Span Permanent Bridges (FEET) Distance between abutments	Minimum Height Permanent Bridges (FEET) From average streambed elevation to low chord of superstructure
<100	6	OHW	6	2.5
160	7	OHW	7	2.75
200	8	OHW		
320	10	OHW		
640	13	OHW		
960	16	OHW		
1,280	18	OHW		
1,920	21	OHW		
2,560	24	OHW		
3,200	27	OHW		
3.840	29	OHW		
4,480	31	OHW		
5,120	33	OHW		
5,760	34	OHW		
6,400	36	OHW		

Streams with drainage areas of 160 acres or greater are likely to be perennial. Adhere to the VDEC Technical Guidance for Identification of Perennial Stream
640 acres = 1 square mile

** See Below

*Minimum Height- Low chord of superstructure at or above OHW (Ordinary High Water Mark).
**AMP 6.5.3 and 6.5.4 State that "Temporary Bridges shall span the entire width of the stream channel." The minimum span for bridges shall be according to table 2B, or shall span the entire width of the stream channel as observed at the crossing site.

**AMP 6.5.3 and 6.5.4 State that "Temporary Bridges shall span the entire width of the stream channel." The minimum span for bridges shall be according to table 2B, or shall span the entire width of the stream channel as observed at the crossing site.

6.14 Table 3: Methods of Seeding and Mulching Truck Roads, Log Landings, Skid Trails and Stream Crossings

TABLE 3

Methods of Seeding and Mulching Truck Roads, Log Landings, Skid Trails and Stream Crossings

Options	Rate of Application	Timing of Application
Option 1. Hay or Straw Mulch with Annual Ryegrass	60 bales/acre or 1 ½ bales/1,000 square feet AND Annual ryegrass at 40 lbs./acre or 1 lb./1,000	Anytime
Option 2. Hay or Straw Mulch with Winter Rye	60 bales/acre or 1 ½ bales/1,000 square feet AND Winter rye at 112 lbs./ acre or 2 ½ lbs./1,000	Anytime
Option 3. Hay or Straw Mulch with Soil Conservation Seed Mix	60 bales/acre or 1 ½ bales/1,000 square feet AND Soil Conservation Seed Mix at 42 lbs./acre or 1 lb./1,000 square feet	Anytime. Best when applied between April 15 – June 15 OR August 1 – September
Option 4. Hydroseeding with Native Grasses or Weed Free Seed mix	Coverage and seeding comparable to the rates above.	Anytime

6.15 Table 4: Minimum Forest Buffer Widths

TABLE 4

Minimum Forest Buffer Widths

Percent Slope of Land Between Skid Trails, Truck Roads or Log Landings and Streams or Other Waters	Width from Top of Bank (Feet Along Surface of Ground Measured Perpendicular to the Stream or Other Waters)
0-10	50
11-20	70
21-30	90
31-40*	110

*Add 20 feet for each additional 10 percent slope

SOURCES OF ASSISTANCE

Vermont Department of Forests, Parks and Recreation
Headquarters
1 National Life Drive, Dewey 2
Montpelier, VT 05620-3801
(802) 828-1531

Regional Offices:

Central Vermont- Orange, Washington and Lamoille Counties
5 Perry Street, Suite 20
Barre, VT 05641-4265
(802) 476-0170

Northwest Vermont- Chittenden, Addison, Franklin and Grand Isle Counties
111 West Street
Essex Junction, VT 05452-4695
(802) 879-6565

Southwest Vermont- Bennington, Rutland Counties
271 North Main Street, Suite 215
Rutland, VT 05701-2423
Phone (802) 786-0060

Northeast Kingdom- Essex, Caledonia and Orleans Counties
374 Emerson Falls Road
St. Johnsbury, VT 05819
(802) 751-0110

Southeast Vermont- Windsor, Windham counties
100 Mineral Street, Suite 304
Springfield, VT 05156-3168
(802) 289-0603

For more information:
To learn more about Vermont's Watershed Forestry Program, check our Web site at:
http://fpr.vermont.gov/forest/vermonts_forests/amps

LAWS AND REGULATIONS AFFECTING LOGGING OPERATIONS

Landowners should be aware that other statutory and regulatory requirements may apply to activities involving logging operations, including, but not necessarily limited to requirements to obtain permits under Act 250 (10 V.S.A. chapter 151, Land Use and Development), section 248 (30 V.S.A. 248, electric utility facilities), and Department of Environmental Conservation permits for stream alteration, storm water run-off and wetlands (Title 10 of Vermont Statutes Annotated). Lands that are enrolled in the Use Value Appraisal Program are required to implement the AMPs. However, the focus of this manual is the proper implementation of the AMPs to control soil erosion and prevent water quality violations, not other permitting requirements that may apply to logging.

Water Pollution Control: No person shall discharge any waste, substance or material into waters of the state, nor shall any person discharge any waste, substance or material into an injection well... (From 10 V.S.A. Sec. 1259(a))

The provisions of subsections (c), (d) and (e) of this section shall not regulate accepted agricultural or silvicultural practices, as such are defined by the Commissioners of Agriculture and Forests, Parks and Recreation, respectively, after an opportunity for a public hearing... (From 10 V.S.A. Sec. 1259(f))

Enforcement:
(a) If the Secretary of the Agency of Natural Resources finds that any person has discharged or is discharging any waste (by not having used acceptable management practices) or that any person has failed to comply with any provisions of any order or permit issued in accordance with this chapter, the Secretary may bring suit in the Superior Court in any county where the discharge or noncompliance has occurred to enjoin the discharge and to obtain compliance. The suit shall be brought by the Attorney General in the name of the state. The court

may issue a temporary injunction or order in any such proceedings and may exercise all the plenary powers available to it in addition to the power to:
(1) enjoin future discharges;
(2) order the design, construction, installation or operation of pollution abatement facilities or alternate waste disposal systems;
(3) order the removal of all wastes discharged and the restoration of water quality;
(4) fix and order compensation for any public property destroyed, damaged or injured;
(5) assess and award punitive damages; (6) levy civil penalties not to exceed
$10,000 a day for each day of violation;
(7) order reimbursement to any agency of federal, state or local government from any person whose discharge caused govern- mental expenditures.
(b) The Secretary, by rule, shall define those violations which are significant, based upon the magnitude, duration, consequences and causes of the violation. When a significant violation occurs, the Secretary may initiate proceedings to compel compliance by and seek penalties from the violator. A court, upon finding that such a violation has occurred, shall order compliance and retain jurisdiction to assure that compliance schedules are met. The court also shall impose penalties.
(From 10 V.S.A. Sec. 1274)

Penalty:
(a) Any person who violates any provision of (Vermont's Water Pollution Control Law) or who fails, neglects or refuses to obey or comply with any order or the terms of any permit issued in accordance with this subchapter, shall be fined not more than $25,000 or be imprisoned not more than six months or both. Each violation may be a separate offense, and, in the case of a continuing violation, each day's continuance may be deemed a separate offense.
(b) Any person who knowingly makes any false statement, representation or certification in an application, record, report, plan or other document filed or required to be maintained under this sub- chapter, or by any permit, rule, regulation or order issued under this subchapter, or who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this subchapter or by any permit, rule, regulation or order issued under this subchapter, shall upon conviction, be punished by a fine of not more than $10,000 or by imprisonment for not more than six months or both.
(From 10 V.S.A. Sec. 1275)

Alteration of Streams:
A person shall not change, alter or modify the course, current or cross-section of any stream with a drainage area greater than ten (10) square miles either by movement, fill or by excavation of ten (10) cubic yards of fill. A person proposing to alter or modify a stream shall apply in writing to the Natural Resources Agency for a permit to do so. Penalty: Maximum fine, $1,000. Each violation may be a separate offense, and, in the case of a continuing violation, each day's continuance thereof may be a separate offense.
(From 10 V.S.A. Secs. 1021, 1025)

Deposit of Sawmill Waste in Waters: It shall be unlawful for a person to deposit edgings, slabs, sawdust, shavings or any other sawmill refuse in the waters of any stream, pond, reservoir or lake in the state or on the shores or banks thereof in such a manner as to be subject to being washed in the mainstream or body of water under normal high-water conditions. Maximum fine shall be not more than $100 for each offense.
(From 10 V.S.A. Sec. 1301)

Rubbish and Garbage:
A person shall not throw, dump, deposit bottles, cans, junk, paper, garbage, old automobiles, refuse of whatever nature or any noxious things on lands of others or within 300 feet of the lands of others, public or private, or into the waters of this state, or on the shores or banks thereof, or on or within view of a public highway. Logging and sawmill operations are exempt from the restrictions concerning the distance of 300 feet and visibility from a public highway. Penalty: Maximum fine $500 or 10 days, or both.
(From 24 V.S.A. Sec. 2201)

Slash Removal: (a) A person may cut or cause or permit to be cut forest growth only if all slash adjoining the right-of- way of any public highway or the boundary lines of woodlots owned by adjoining property owners is treated in a manner satisfactory to the town forest fire wardens.
(b) Owners or operators of timber or woodlots shall leave the main logging roads through cutover areas free from slash so that tractors may pass over these roads unobstructed in order to carry men and supplies and firefighting equipment to fire suppression crews.
(c) If in the opinion of the town forest fire warden there is no fire hazard as a result of a cutting, he may issue, upon request, a statement relieving the operator of the conditions in this section. Penalty: Upon complaint of a fire warden, a person who violates the provisions of this section shall be fined not more than $50 for each offense. (From 10 V.S.A. Sec. 2648)

Logging Operations Above 2500 Feet in Elevation: Any logging activity over 2500 feet in elevation requires an Act 250 permit.
(From 10 V.S.A. Sec. 6001, (Sec. 3), 6081)

Registration of Chip Harvesters: The Commissioner of Forests, Parks and Recreation is authorized to license all whole tree chip harvesters, portable sawmills and other similar portable wood utilization equipment in Vermont.
(From 10 V.S.A. Sec. 2623(3))

Heavy Cutting: Filing of an "Intent to Cut Notification" is required if a landowner plans to conduct a heavy cut of forty acres or more, or a cut that will result in heavy cutting of eighty acres in a two-mile radius. A heavy cut is defined as "a harvest leaving a residual stocking level below the C-line as defined by the USDA Forest Service silvicultural stocking guides for the applicable timber type."
Applications and information are available at the Vermont Department of Forests, Parks, and Recreation District Offices.
(From 10 V.S.A. Sec. 2625)

Forest Property Tax Laws (a) By town meeting vote, Vermont towns may authorize their selectmen to enter tax stabilization contracts with owners of forest land to fix the amount of taxation of qualifying forest property. Both the qualifications and amount of tax relief are set by the town. Contracts may not exceed 10 years and must be available for public inspection.
(From 10 V.S.A. Sec. 2741)
(b) A town's Board of Selectmen, without voter approval, may enter tax stabilization contracts with qualifying forest landowners. While selectmen can determine the amount of tax relief to be granted, certain state requirements for property qualifications must be satisfied:
-qualifying forest land must be at least 25 acres in size and actively managed for repeated forest crops.
-stabilization agreements must provide for rollback tax, amounting to the previous three years "tax savings". This would be due if the land were converted to another use in violation of the con- tract.
-aggrieved landowners may appeal the decisions of local officials regarding applications, use value appraisal and land classification.
Tax stabilization contracts granted under this statute are subject to the general provisions of 24 V.S.A. Sec. 2741 discussed above. The difference (here) is absence of town meeting approval and the addition of certain state requirements: 25-acre parcels, rollback tax, etc.
(From 32 V.S.A. Sec. 3846)

State Land Use Tax: (a) Qualifying owners may obtain use value (rather than fair market value) appraisal on their forest land by applying to local officials. To qualify, such land must be:
-at least 25 acres in size and actively managed for repeated forest crops.
-subject to a 10-year forest management plan which must be annually recorded and certified by the Agency of Natural Resources. A State Current Use Advisory Board will provide a schedule of use values based on the class, type, grade and location of land together with its income-producing capability. This schedule will be used by local officials in appraising forest land each year.
Whenever such land is developed, a land use change tax amounting to 20 percent of the parcel's fair market value must be paid by the owner to the municipality. "Development" includes subdivision of land resulting in a parcel of less than 25 acres in size, construction activity not associated with forestry or logging or inappropriate timber cutting.
Aggrieved landowners may appeal certain decisions of state and local officials regarding applications, appraisal and classification of property.

REFERENCES

The authors of this guide have drawn freely from the following sources and these references should be considered if more information is needed:

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