Guidelines for Construction and Maintenance of ATV Trails inside Protected Public Water Supply Areas

Newfoundland Labrador

November 2017

Legal Disclaimer

This guide is intended to provide general information on the construction of ATV and multiuse trails inside Protected Public Water Supply Areas within Newfoundland and Labrador. The guide is for information purposes only and is not intended to provide safety, regulatory, or design advice. The Government of Newfoundland and Labrador is not responsible the content, accuracy, reliability, or currency of the information contained within. Information in this guide is provided without warranty, guarantee, or responsibility of any kind, either express or implied. The Government of Newfoundland and Labrador is not liable for any loss or damages of any nature, either direct or indirect, arising from use of the information provided in this guide.

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1.0 Introduction

Newfoundland and Labradorians have long enjoyed the recreational activity of all-terrain vehicle (ATV) usage. Traditionally, the activity was used to gather resources from inland areas not easily accessible by other means. Today however, a large network of roads from forestry roads to the old railway bed are used for recreational ATVing.

Over 40,000 ATVs are estimated to be used in Newfoundland and Labrador with the majority being operated on the island portion of the province (CPAWS, 2011). With over 7500 kilometres of authorized trails, there exists ample opportunities for ATV enthusiasts to enjoy the natural environment (Norman, 2010). With that enjoyment comes the risk of degradation of the environment; ATVs have large, gripping tires that travel directly on the ground and can cause trail damage, especially in wet conditions when the soil is more vulnerable. Proper construction and maintenance practices allow users a more enjoyable ride while minimizing damage to the environment.

It is essential that we protect the highly important and vulnerable areas such as the numerous watersheds that supply drinking water to communities. This guideline document has been developed with the protection of water supply areas in mind but can be used as a general reference by all trail developers. Trails that are planned using the practices outlined in this guide will help protect and preserve our natural environment as well as contribute to the sustainability of trail networks for future generations.

1.1 Purpose

The scope of this document is to act as an aid for the development and planning of new ATV trails that are located inside Protected Public Water Supply Area (PPWSA) boundaries. It is general in nature and is meant to be used as a supplement to experienced trail developers with knowledge of local conditions. This guide is intended for use as a reference for community groups, non-profit groups, proponents and anyone involved in ATV trail planning and development inside PPWSAs. This document covers items related to trail construction such as environmental factors, design construction and maintenance of ATV trails within PPWSAs.

There are numerous safety and precautionary considerations when constructing a trail, including protective gear, proper tools for the job, and appropriate training of workers. All necessary safety precautions should be taken during any development, however this document does not address and should not be used to ensure that safety precautions are implemented.

1.2 What is a PPWSA?

A PPWSA is a drinking water drainage area, as delineated by the Department of Municipal Affairs and Environment (MAE), in part or whole, that has been protected under Section 39 of the Water Resources Act (SNL2002 Chapter W-4.01). This document considers surface water supplies only. Public water supplies managed by a municipality or local service district (LSD) are considered for protection under the Water Resources Act. Once a watershed is protected, proponents must apply to the department for a Permit for Development Activities, in order to receive approval from the Minister of Municipal Affairs and Environment to carry out any activity or development within the protected area.

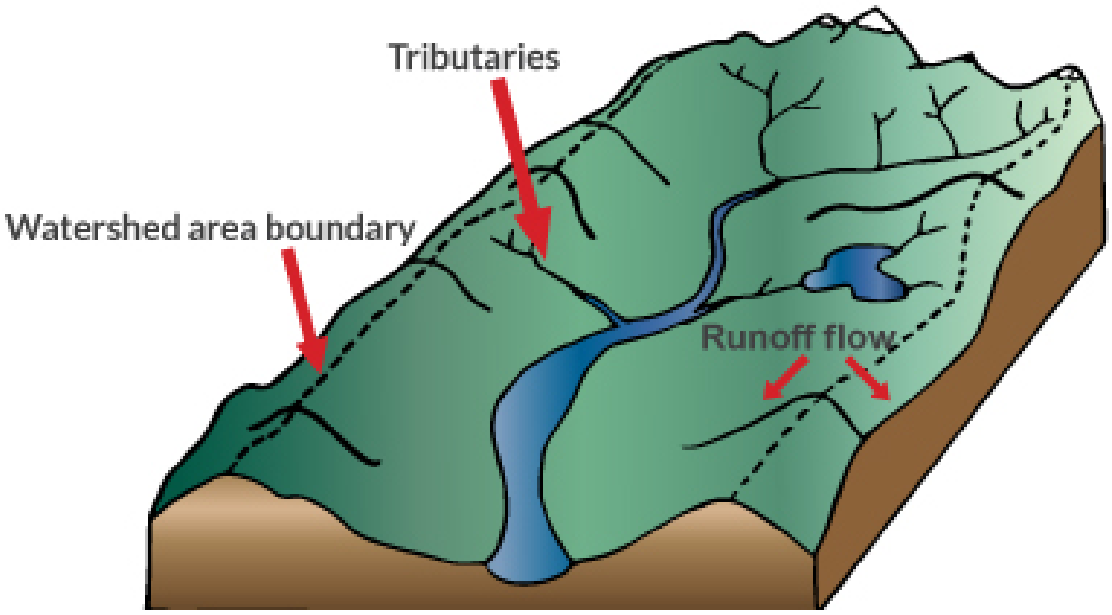

Figure 1 - Illustration of a watershed boundary.

1.3 What is an ATV?

ATV is an abbreviation for All Terrain Vehicle. An ATV can be defined as a motorized vehicle with multiple low pressure tires or a track intended for off highway usage. ATVs have a set of handlebars for steering by the operator who straddles a seat. Technically speaking, snowmobiles, four wheelers (or quads), three wheelers (trikes), and mountain bikes are considered ATVs under this definition.

For the purposes of this document, ATVs are taken to mean three or more wheels, which will disregard snowmobiles and bikes. The reasoning for this is related to the amount of potential damage caused by each different type of vehicle; snowmobiles cause little soil disturbance due to their inherit nature and bikes have less contact with the ground than other motor vehicles.

Figure 2 - Photo of All Terrain Vehicles.

2.0 Erosion & Sedimentation

Two of the greatest threats to both the long-term sustainability of any trail system and drinking water quality are erosion and sedimentation. Erosion into bodies of water can cause numerous negative effects such as increase turbidity and temperature, change the aquatic ecosystem, clog intake screens, interrupt stream flow, transport contaminants, etc. It is extremely important that erosion and sedimentation processes be considered at the initial planning phase of any trail development.

Erosion is the process by which the surface of the earth is worn away by the action of water, glaciers, winds, waves, etc. Sedimentation is the eventual deposition or accumulation of the eroded sediment. Erosion and sedimentation are natural processes that cannot be eliminated, so trails must be designed to minimize the extent of these processes to ensure the integrity of the PPWSA. The following sections define some of the major preventative measures that can be used when designing your ATV trail.

A large number of factors contribute to the vulnerability of an area to erosion and sedimentation issues; climate, soil type, topography and land cover being the major natural factors. These factors are discussed in the following sections with a focus on how they relate to trail development.

2.1 Climate

Climate can be defined as the sum of the meteorological elements that characterize the average and extreme atmospheric conditions over a long period of time at any one place or region of the earth's surface
(Dept. of Environment and Lands, Government of Newfoundland and Labrador, 1992). Northern Labrador has a cold, arctic climate while the interior regions have a continental climate,

lending itself more towards snowmobiling than ATVing in this portion of the province. The island portion has milder winters and cool summers with moderate to high levels of precipitation throughout the province. Precipitation is an important factor when it comes to trail development as rainfall, spring melt, and runoff events will highly impact any trail system. Generally speaking, expect heaviest rainfall in the fall months and the highest runoff in the spring months of late April and May. It is at these times of the year that trails need to be monitored more closely for potential impacts and damage.

If more specific localized information is needed, climate data can be obtained from the department website through its Real Time Streamflow and Climate Information system (http://www.mae.gov.nl.ca/wrmd/ADRS/v6/Graphs_List.asp). Mean annual precipitation and runoff information will give trail planners a good idea of how much to expect in a given area of the province. Irrespective of the local conditions, the weather in Newfoundland and Labrador is highly variable and unpredictable and thus, proper trail design and maintenance is essential to the sustainability of the trail system and the protection of the PPWSA.

2.2 Soil

The type of soil along any proposed trail route will have a considerable effect on cost and sustainability. The Department of Fisheries and Land Resources offers soil mapping for most regions of the island, which are readily available online (http://www.faa.gov.nl.ca/agrifoods/maps/). Although these soil maps were developed mostly for agricultural purposes, they provide helpful information for trail design.

The most common soil type found in Newfoundland and Labrador is a course to medium textured, sandy loam glacial till (Robin, 1983). Sandy loam soils tend to be good for trail construction as they have a low percentage of clay particles mixed with a varying amount of sand and silt particles allowing for adequate drainage. Some addition of material may be necessary to balance out the proportions of particles for a more adequate trail surface. Higher elevations with well-drained soils such as gravely, course or loam type soils are ideal and generally have a low cost to develop. Peat, bog and wet organic soils are the least desirable because they are expensive to develop and sensitive areas that should be avoided. It is important to note that any development in a wetland in this province requires separate approval under Section 48 of the Water Resources Act (SNL 2002 c W-4.01).

Naturally exposed bedrock surfaces, a likely occurrence in many areas of Newfoundland and Labrador, can make for good trail surfaces. It does, however, depend on the slope and smoothness of the bedrock, as it can become slippery and dangerous in wet conditions.

Another option in determining whether the soil is adequate for trail development is to travel a proposed trail route and test the soil texture with your hands, commonly called the “feel” method by geologists. Start by placing a small amount (approximately one tablespoon) of soil in your palm. Add about three to five drops of water to the soil and knead. Now squeeze the soil in your hand – does it remain in a ball? If it does not, the soil may be high in sand content and will not be ideal for trail development without having to add in clay particles. The below flow chart will help you to further approximate soil texture.

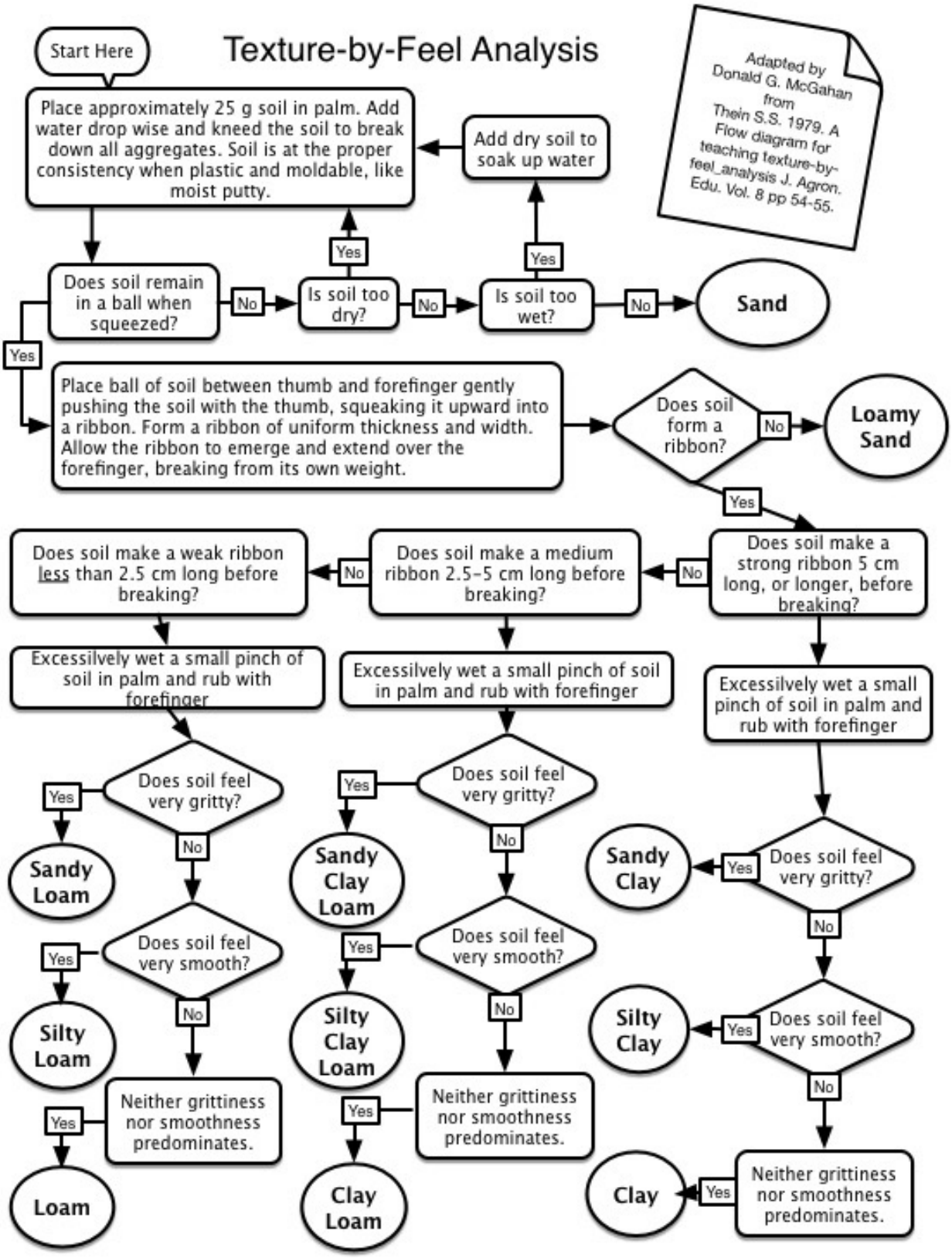

Figure 3 - Flowchart of soil texture determination by the "feel method". (McGahan, 2013)

2.3 Topography

It would be impossible to properly plan a trail without the use of topographical maps. The Surveys and Mapping Division of the Department of Fisheries and Land Resources is the primary producer of geomatics data and services in this province. Topographical mapping is available across all of Newfoundland and Labrador at both 1:250,000 and 1:50,000 scale. Aerial photography is also available for some areas, and Google Earth may also be considered a useful resource for planning.

Slope is an important factor that can be derived from topographical maps. Slope refers to the gradient, or measure of steepness, of a given area and can be measured as a ratio, angle, or a percentage. For the purposes of this document, we will describe slope as a percentage. Slope can be derived easily from a topographical map using the contour lines. The closer the contour lines on a topographical map, the steeper the slope. To calculate average slope along a proposed segment of trail, you will need to determine the difference in elevation from the beginning of the trail segment to the end, which is referred to as the "rise". Be careful here; your average slope will not be accurately reflected if your trail segment crosses a valley or the crest of a hill! Next, you need to determine the length of the segment, also referred to as the "run". Run can be measured using a ruler and applying the map scale ratio. Keep in mind that the rise and run need to be given in the same units of length; feet and meters are common units used; however, as long as the units are the same, the calculation will be accurate.

$$\text{Slope percentage} = \frac{Rise}{Run} x100$$

Slope can be accurately determined in the field using a handheld instrument called an Abney hand level. This is a common piece of equipment for surveyors and should be utilized by a registered land surveyor to do on-site checks along the steeper sections of the proposed trail route.

Generally speaking, the higher the slope, the greater the potential for erosion. And since our aim in planning a trail route is to minimize erosion, avoiding steep terrain is essential. It is not recommended to develop multi-use trails on slopes above 25 per cent (Department of Natural Resources, 2005). Trails that follow the natural contours of the land will require less drainage features and thus less maintenance and capital cost, so aiming for mild to moderate slopes is ideal.

Table 1 - General slope categories (Department of Natural Resources, 2005).

Slope Category	Slope %
Flat to mild	1 – 5
Moderate	6 – 12
Steep	13 – 25

2.4 Land Cover

Land cover refers to the physical material at the surface of the earth, which may include grass, forest, barren, wetland, shrub, or water to name a few. The type of cover along a proposed trail route is important to the cost of development, erosion potential, and ultimately, the enjoyment of a trail to users; for example, vegetative cover in buffers of streams and bodies of water act as safeguards to negate negative effects to water quality. Vegetative buffers slow down the movement of water on the surface during runoff events, allowing adequate time for water to penetrate the ground. These vegetative buffers should be avoided when planning your trail route.

3.0 ATV Trail Design

3.1 Legislative considerations

Prior to any field evaluation, liability considerations should be discussed. Proponents are liable for trails they develop and public safety must be kept in mind. Liability insurance is outside the scope of this document but should be strongly considered by any proponent considering an ATV trail development.

There exist numerous legal requirements that must be considered before any trail undertaking can begin. The listing below is not an all-inclusive list of potential requirements for a trail development, rather it is a list of the most common requirements. Other permits or permissions may be necessary depending on specifics of a proposed development.

Water Resources

All developments within a PPWSA will need approval from the Minister of Municipal Affairs and Environment under Section 39 of the Water Resources Act (SNL 2002 c W-4.01). Permits are also required for work affecting a body of water such as installation of culverts, infilling, and bridges in or near wetlands under Section 48 of the Water Resources Act (SNL 2002 c W-4.01). Applications are available on the departmental website at http://www.mae.gov.nl.ca/ or contact your regional Water Resources Management Division office.

Land Ownership

Under the Lands Act, proposed trails located on Crown land must apply for a License to Occupy (LTO) prior to development. About 88 per cent of the land in this province is Crown land so this will apply in many cases (Department of Municipal and Intergovernmental Affairs, Government of Newfoundland and Labrador, 2015). Applications for Crown land are available on the Department of Fisheries and Land Resources website at http://www.flr.gov.nl.ca/lands/index.html.

If a trail is located on private land or inside a municipal boundary, permission is necessary from the landowner and/or community. Landowners and municipalities should be aware and involved in the planning of any trail system.

Environmental Assessment

If a proposed trail is greater than 10 kilometres in length it is required to be registered as per Section 48 of the Environmental Assessment Regulations, 2003, under the Environmental Protection Act. A guide to the environmental assessment process and other relevant information is available at http://www.mae.gov.nl.ca/env_assessment/index.html.

Forestry

A proposed trail through a forested area may require a cutting permit. The Department of Fisheries and Land Resources issues forestry harvesting permits to commercial and domestic cutters. Further information is available online at http://www.faa.gov.nl.ca/forestry/permits/index.html or contact the nearest Forest Office for more information.

Other Considerations

The Motorized Snow Vehicles and All-Terrain Vehicles Act and all associated regulations Resources must be strictly adhered to.

The Provincial Archaeology Office administers the Historic Resources Act; and as such, any plans for new trails should be cleared by this office prior to construction. Applications for Licenses to Occupy will be referred to this office for review and input, as well as other relevant government departments.

If an ATV or multi-use trail is to be advertised as a tourist attraction, liability issues should be considered. Liability insurance, for example, may be available to municipalities but not for non-profit organizations. Public safety issues should remain at the forefront of any proposed trail system.

There may be other permits and/or regulations that pertain to a specific trail system. All efforts must be made to obtain pertinent development permits and/or follow any regulations that may be relevant in each case.

3.2 Evaluating Trail Route

The first and most important phase of any trail development will be the initial planning phase before any fieldwork can begin. Proper assessment of the trail route will allow developers to plan for the least costly and lowest maintenance option, thereby affording the proponent a more sustainable ATV trail.

It is important to keep in mind that the higher number of drainage features needed on a particular route will equate to a higher level of maintenance. Choose a route that requires fewer engineered structures to lower upfront and future maintenance costs.

Initial planning should include the necessary drainage control measures to minimize damage to the trail and thus lessen the threat to drinking water quality. Long-term maintenance is necessary to correct damage done by erosion and sedimentation over time. See Section 4.0 for more details on drainage concepts and control measures that will be critical in the route development.

Prior to considering the route of a trail, existing land uses should be identified; for example, are there any active quarries, cottages, or timber harvesting activities in the vicinity? Other land use activities may hinder the approval of a proposed trail and should be considered in the initial stages of route planning. Conflicting land use issues must be resolved before construction can begin.

3.3 Corridor and Tread

The corridor is defined as the area including the trail surface, or tread, overhead space height, and width including area of vegetation cleared for visibility purposes. Specific ATV construction standards do not exist in Newfoundland and Labrador. However, for use inside PPWSAs, the department recommends minimum trail standards as follows:

- Minimum five feet (1.5 metres) tread width (assuming single lane trail) including periodic wider areas for turn around and passing purposes
- Minimum horizontal clearance of one foot (0.3 metres) per side of tread
- Minimum eight feet (2.4 metres) vertical clearance above tread

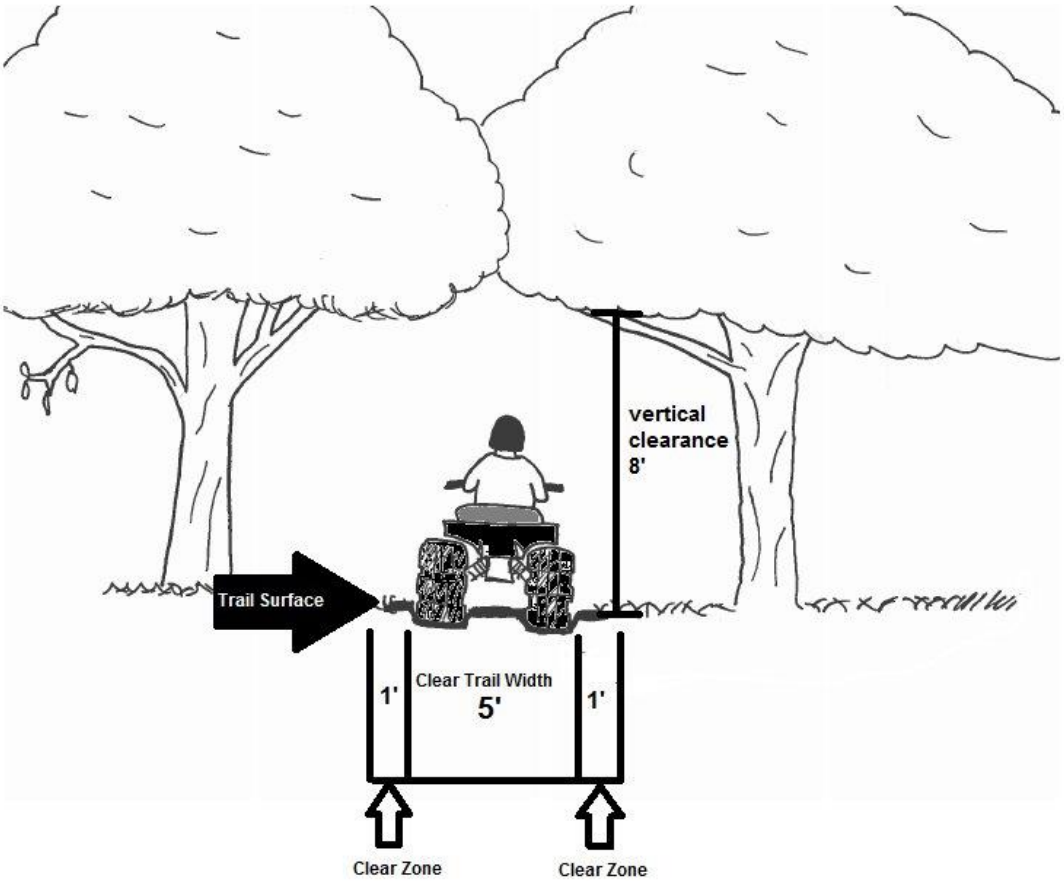

Figure 4 - Illustration of recommended ATV trail standard clearances in PPWSAs. (Parsons Harland Bartholomew and Associates Inc. et al, 2011).

Clearance may be increased for visibility around turns or in dense forested areas. This work may include removal of rock, brush, trees and stumps, debris, shrubs, etc. Large, heavy boulders or trees may be an issue to remove, so be sure to assess the trail route and take note of what type of

equipment may be required. Safety is a major concern during this phase of trial construction and trained experienced professionals should be utilized.

A good rule of thumb is to leave the trail as natural as possible when it is practical. It is not always necessary to completely remove things such as roots. For example, if roots are perpendicular to the tread and not protruding upward, ATVs can easily move over them and they will not contribute to erosion like parallel roots may. Brush cutting is easier work but will need to be done more frequently as fast growing plants will quickly invade.

Tread type is also an important consideration in ATV trail construction. The type of tread used will depend on the particulars of the location and will vary along the trail. The best option, if practical, is to use the naturally occurring or native soils already present.

Surfacing or hardening of trail surface should be considered when the native soil has a high erosion potential (ie. high organic content). Surfacing refers to the removal of native soil and addition of new material – crushed gravel or crushed stone in gradation #3 mix (3/8 inch sieve) is a good option for ATV trail surfacing (Department of Natural Resources, 2005). Hardening can also be considered which refers to the addition, or augmenting, of the existing soil to create the balanced soil mix of sand, silt and clay particles that is ideal for tread surface. This usually involves adding a physical soil binder, or clay particles, which can get costly and time consuming. Armoring can be considered over shorter lengths of trail and involves using other materials such as large rocks to slightly elevate and pave the surface. It can be an effective, cheaper solution to increase the erosion resistance.

3.4 Signage

Signage, or trail markers, along the trail system is necessary to regulate the flow of traffic and provide essential information to users. It can direct users in the appropriate direction, warn users of hazardous conditions, or restrict users to certain areas. Signs should be placed at eye level (to an ATV user) in appropriate locations where users can view them upon approach.

Entrance markers are often useful to indicate the beginning of a trail system aka trailhead. Additional information can be included on entrance signs such as the length of the trail or a trail map. Directional trail markers are typically arrows that point in the direction of traffic flow. These are useful at intersections or when there is a sharp turn in the trail. Caution markers, typically yellow diamond shaped signs, are important to warn users of hazards such as a steep inclines, water crossings, or simply to slow down if there is a sharp turn, especially on single lane trails where you may encounter an ATV traveling in the opposite direction. Stop and yield signs are necessary at intersections or crossings for safety reasons. Other informational signs may include mile markers, speed limit signs, or lookout locations.

Figure 5 - Typical signage that may be found along a trail route.

Correx signs (24” x 24”) are available from the WRMD office in your region and should always be placed periodically along any trails inside your PPWSA to remind users that they are inside a protected watershed area. These signs warn users of the potential for criminal charges under the Water Resources Act (SNL 2002 c W-4.01). These are provided free of charge, but is the responsibility of the community to post them on the trail or any other routes that provide access to the PPWSA.

Figure 6 - PPWSA signage available from WMRD regional offices.

4.0 Drainage Concepts and Features

Given this provinces topography and climate, choosing a route that requires zero drainage features is an unlikely scenario. However, choosing a route with the least amount of these types of features will lower costs and maintenance requirements. The following sections describe the most common types of drainage concepts and features that are relevant to ATV trail design.

4.1 The Half Rule

The ‘half rule’ concept (Figure 7) states that the grade along the trail should not exceed half the average grade of the surrounding hillside. For example, if the average slope of the surrounding hill is 18 per cent, the trail grade should be less than 9 per cent. This will allow for adequate drainage of water across the path of the trail.

Following this rule will affect the trail route and help to place trails along courses that are, in general, the least resistant to erosion. By not following this rule while developing the route,

water may travel along the trail, causing erosion problems that will be very difficult to correct post-construction. A trail straight down a hill is known as the 'fall line'. Fall lines follow the path of least resistance and will be the shortest path to the bottom of the hill. However, the inherent nature of fall lines make them the worst choice for a trail as water will also follow this path and erode the trail very quickly This type of route will make it impossible to maintain and very impractical and dangerous for ATV use.

Building on flat terrain is also not the best option for ATV trail construction. Trails located in flat areas will collect water and become a collection basin rather than allowing water to drain. A slight outslope or angle is necessary in order to drain water from the trail. Sometimes flat terrain cannot be avoided, and options such as a raised bed can be used. See more on this concept in Section 5.3.

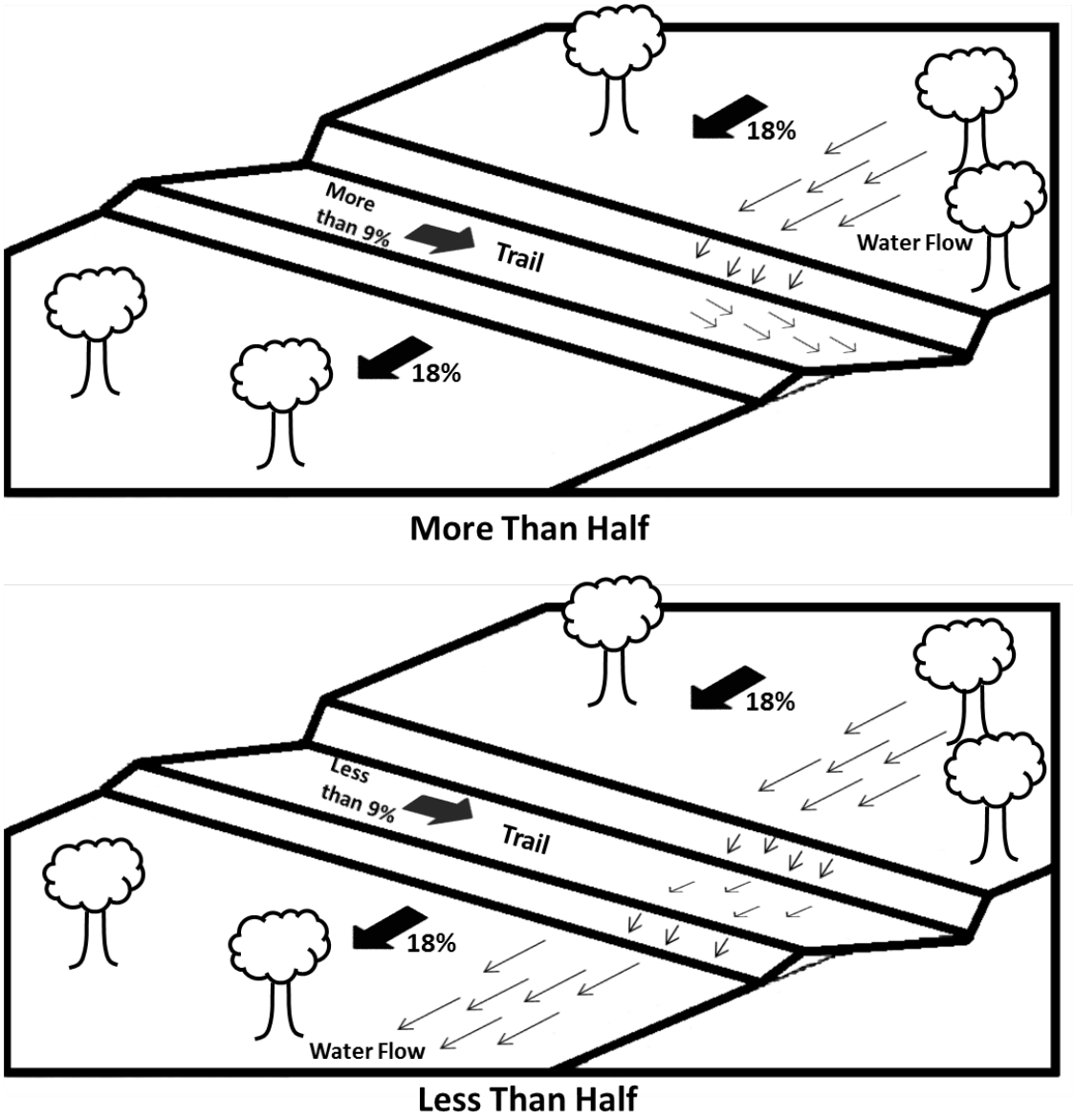

Figure 7 - Illustration of the half rule concept.

4.2 Outsloping

Outsloping (Figure 8) is a general concept used in trail design on side hills, or trails that transverse a slope. It refers to a subtle downhill slope, typically about five per cent grade, of tread along the length of the trail (Woody Hesselbarth, United States Dept. of Agriculture, 2007). Outsloping will ensure water flows across the trail and continue downhill as opposed to along the trail surface. If water is allowed to flow along the trail, it will inevitably gain speed and erode the trail.

Outsloping tread surfaces will require regular maintenance and are usually the first feature to erode as use of the trail and natural events will quickly wear down the surface. Heavy use will cause a 'dip' in the center of the trail, so regular re-grading is necessary. Regular and consistent re-grading of well used trails will ensure that integrity of the trail for both enjoyment and protection of the PPWSA.

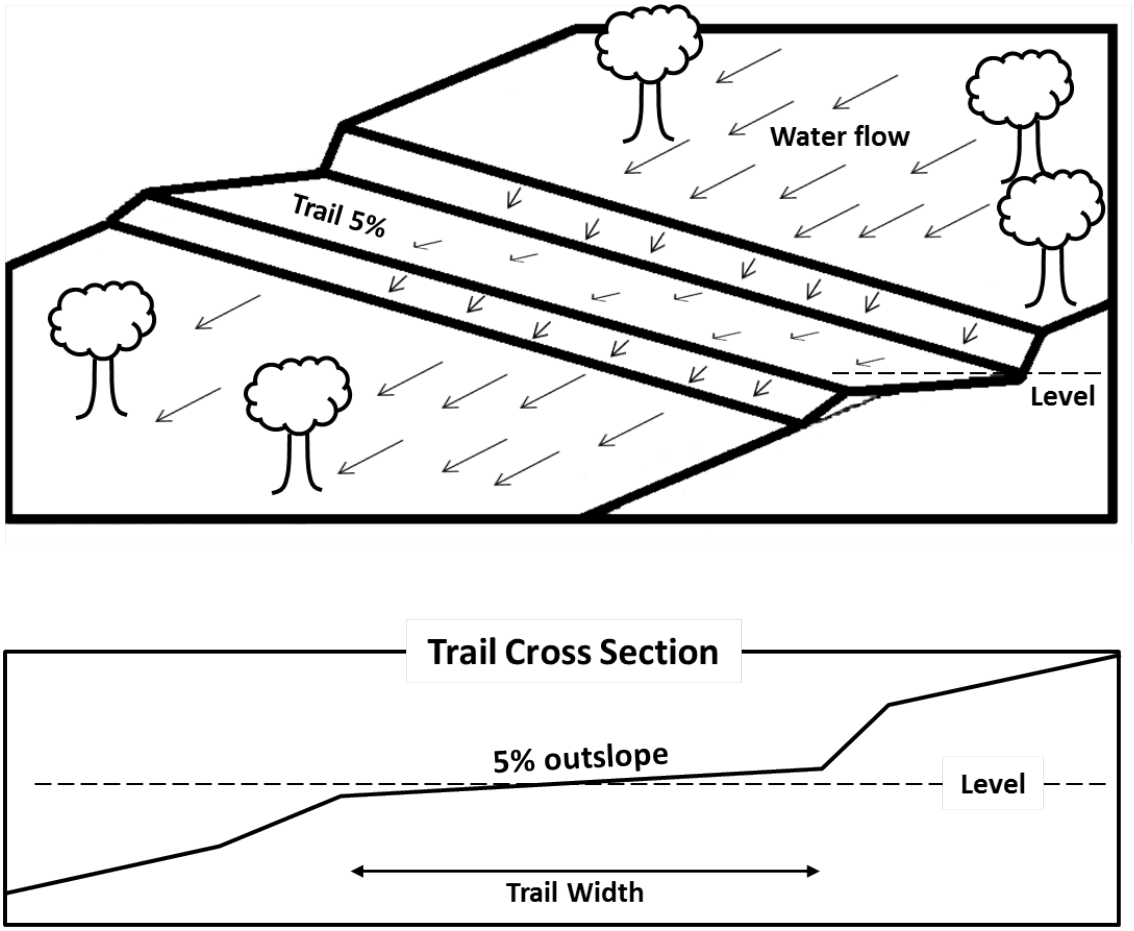

Figure 8 - Illustration of outsloping concept.

4.3 Water Bars & Ditches

A water bar (Figure 9) is a common drainage feature which uses a log barrier (or other types of material such as rock) angled 30-45 degrees (or greater on steeper slopes) downslope across a trail segment to divert water off the trail surface to the lower edge. The steeper the slope of the trail, the more water bars may be required. Placement should be near the top of hills to divert water before it can cause rutting and repeated at recommended intervals shown in Table 2.

Table 2 - Water bar spacing recommendations (State of New Hampshire, Dept. of Resources and Economic Development, Division of Parks and Recreation, 2004).

Grade (%)	Spacing between water bars (meters)
2	76.2
5	41.1
10	24.4
15	18.3
20	13.7
30	10.7

Water bars are often incorporated into other types of drainage features such as switchbacks and climbing turns.

Careful consideration should be given when installing water bars, as improperly installed bars will not provide the proper drainage and only impede on the trails enjoyment by users. The bars should extend out over the edges of the trial by at least 12 inches; outlet ends should be reinforced with rock and no more than 2 – 4 inches above the level of the tread as shown in Figure 10 (Parsons Harland Bartholomew and Associates Inc. et al, 2011).

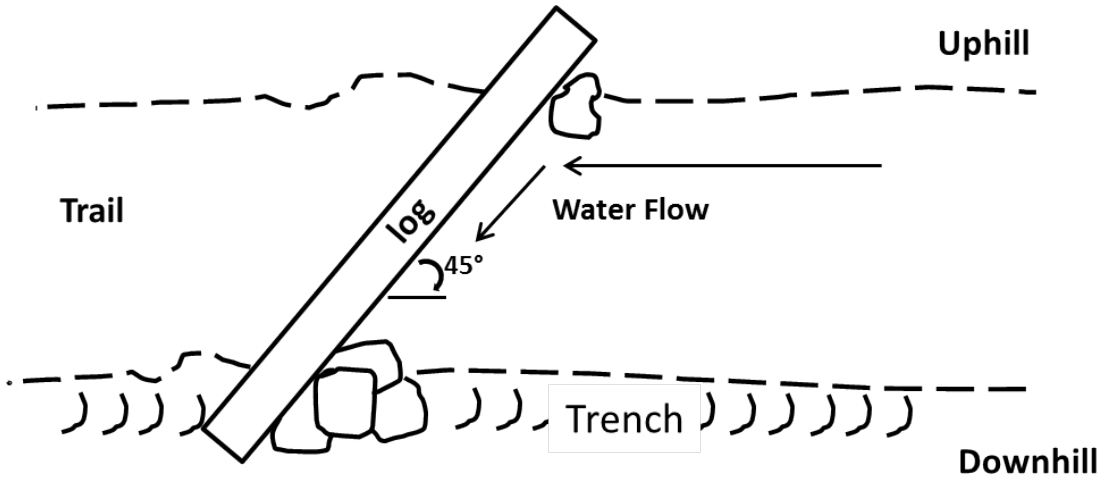

Figure 9 - Log water bar installation.

Figure 10 - Photo of installed water bar. (Ebel, 2017)

4.4 Grade Reversals

A grade reversal (Figure 11), otherwise known as a dips or swales, refers to a discrete change in grade along a short length of trail to direct water off the trail at a low point. These design features are useful on side hill trails with moderate to steep slopes and can be used often along the trial (every 7-15 metres or 23-49 feet). Grade reversals are much easier to install in a new trail than to incorporate into an existing trail. Grade reversals tend to be less maintenance than water bars as they do not require materials such as wood and are built into the trail design. On steeper slopes with higher traffic, grade reversals will need to be closer together and reinforced with coarse tread material to avoid excessive sediment deposit.

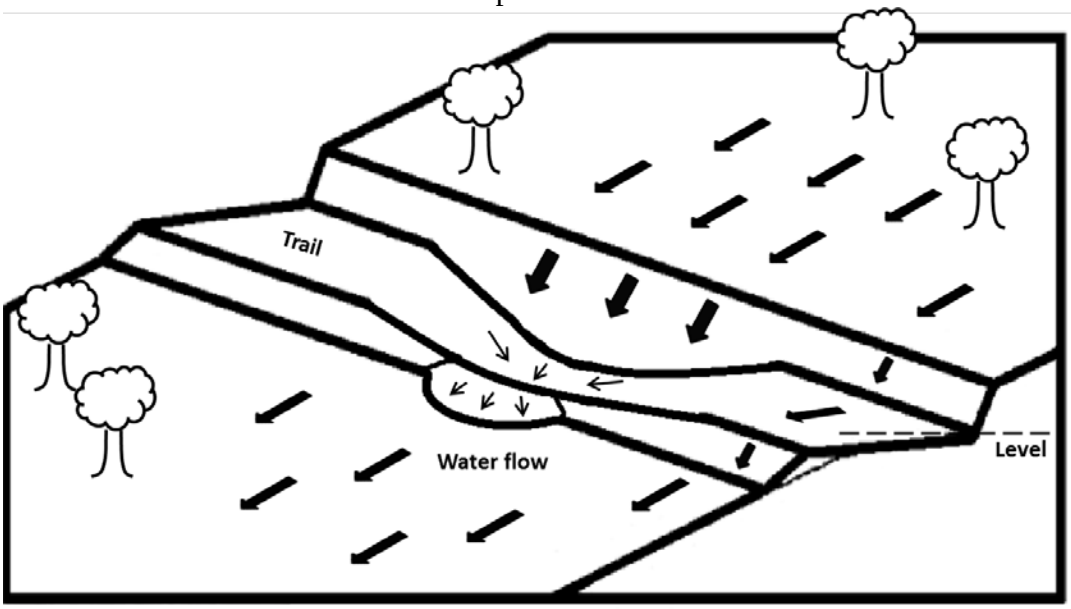

Figure 11 - Illustration of a grade reversal.

4.5 Climbing Turns and Switchbacks

Directional reverse features such as climbing turns and switchbacks (Figure 12) can become expensive to incorporate however when properly designed and constructed, offer effective access on steeper terrains, and can last a long time with low maintenance demand. They often incorporate other design features such as outsloping and grade reversals.

A climbing turn (Figure 13) is a large radius turn that climbs at the same rate as the slope itself. They are easier and cheaper to install than switchbacks and are generally used on mild to moderate slopes. Switchbacks (Figure 14), in comparison, are used on steeper terrain and are generally more costly and require more maintenance than climbing turns. They incorporate a much sharper turn, or smaller turning radius, with a level landing area. Do not use a climbing turn when a switchback is necessary; slopes above 15 per cent should use switchbacks. A properly trained and experienced professional should be accustomed to installing these types of drainage features.

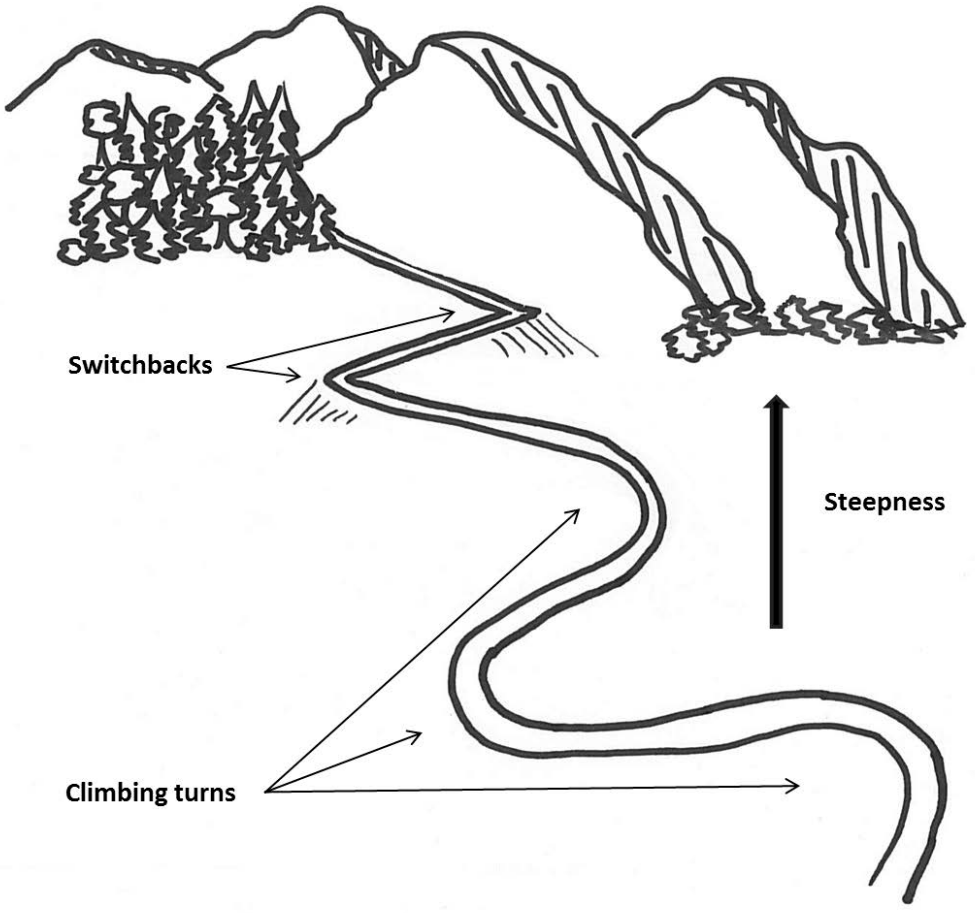

Figure 12 - General overview of switchback and climbing turn in a trail system.

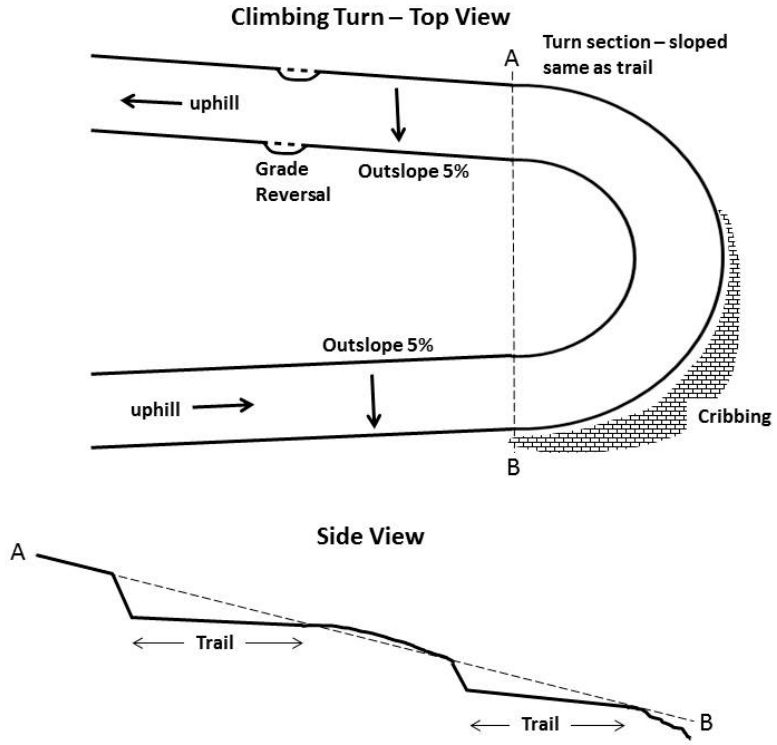

Figure 13 - Illustration of a climbing turn.

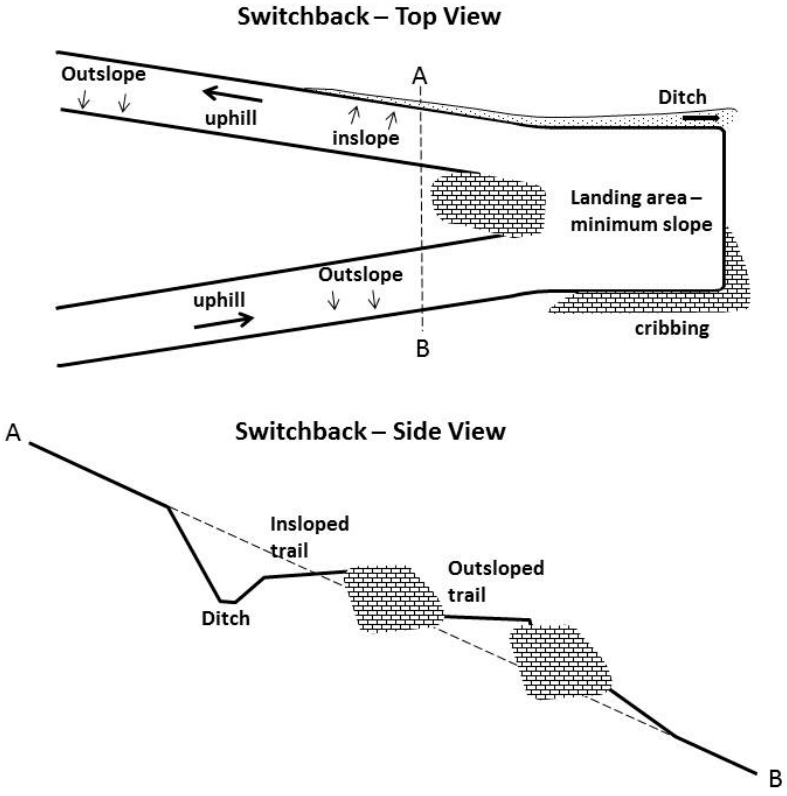

Figure 14 - Illustration of a switchback.

5.0 Wet Soil Crossings

Wet areas, wetland or bogs require specialized design components as they are more sensitive to development and tend to degrade quickly if not properly designed. The following options are just a few of many that can be used. Depending on the amount of water retention in an area, different techniques can be utilized.

In the boggiest areas, raised decks or puncheons will provide protection to the ground from ATVs. In muddy areas, corduroy or raised fill may be adequate. An experienced trail designer should be consulted to design and properly construct the type of wet-area feature best suited to your ATV trail requirements.

5.1 Raised Plank Decking and Puncheon

A raised plank deck (Figure 15) is typically a wooden plank fixed boardwalk that is supported by piers and bolts. This type of structure can be used when the underlying soil can support a pier/piling, which are the upright wooden stakes driven into the ground used as the support system for decking. If the soil is too wet to allow for stable pilings, a puncheon (Figure 16) can be used. This is similar to a decking, but does not utilize pilings. Instead, rough cut sill logs or lumber are placed directly along the ground perpendicular to the trial route every 3 feet (0.9 metres) or so. Distance between logs or lumber will depend on how wet the area is; the softer the soil, the closer they should be placed. They work as the base for stringers that support the wooden plank deck.

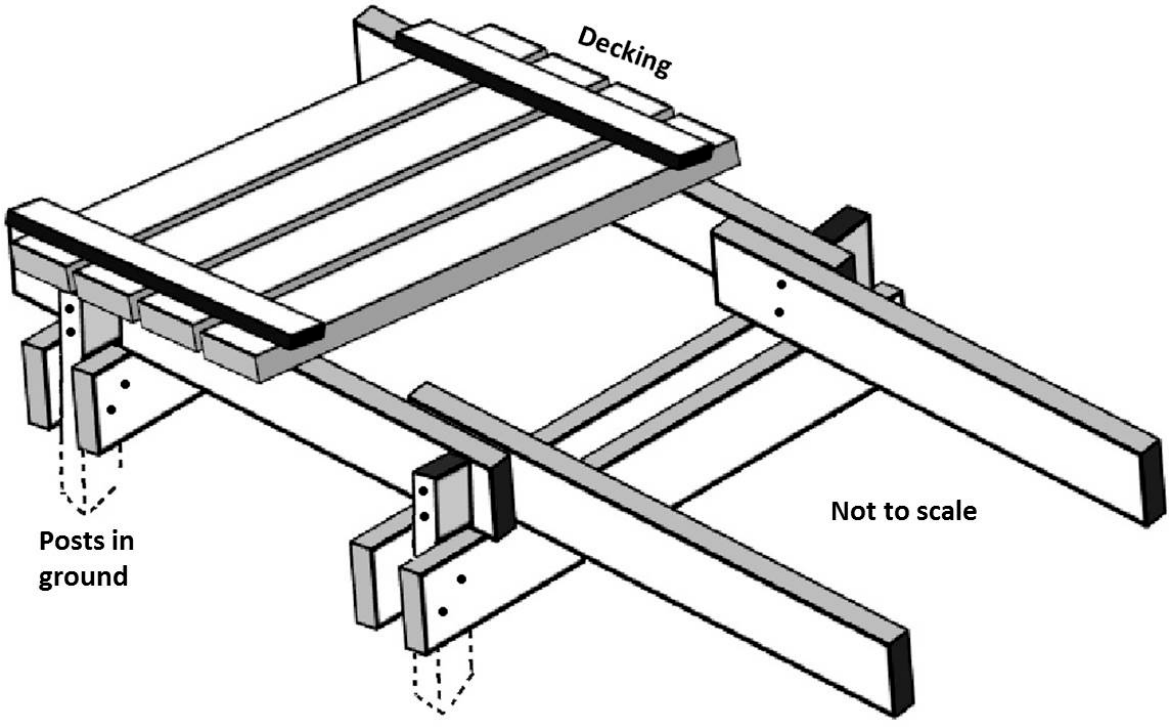

Figure 15 - Illustration of raised plank decking.

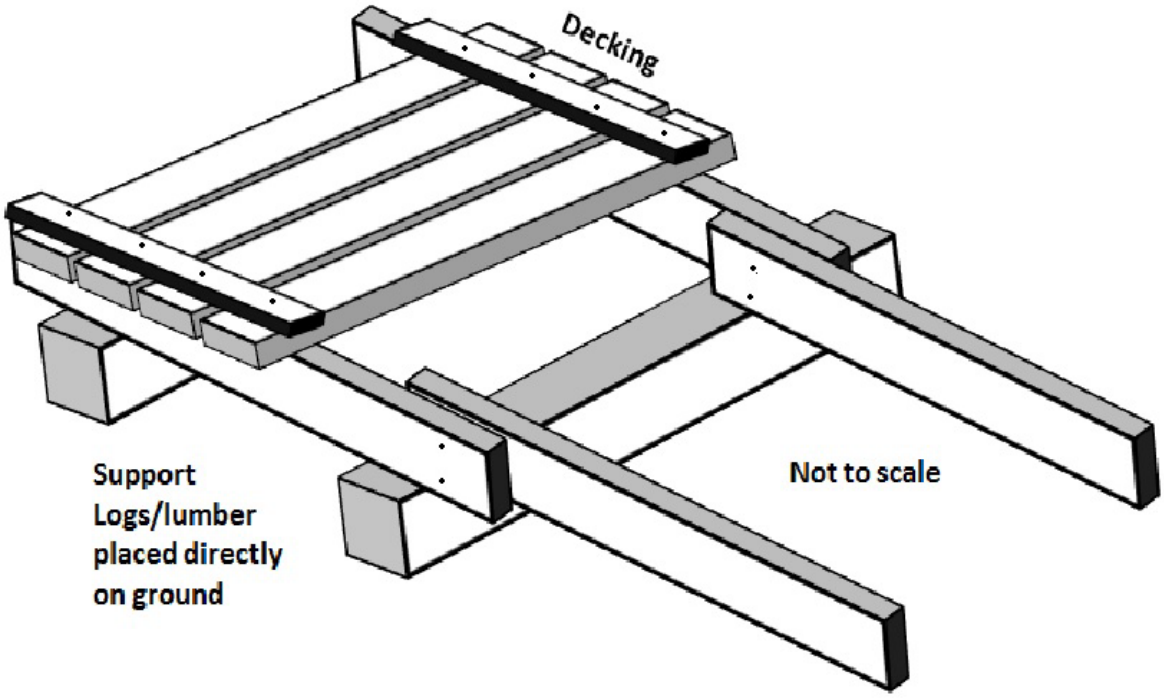

Figure 16 - Illustration of puncheon.

5.2 Corduroy

Another common type of structure that can be utilized in wet or muddy areas are corduroys (Figure 17), or rough cut logs with the bark stripped placed perpendicular to the trial along the muddy area with no separation between logs. This is a very simplistic technique that can utilize local timber. Please note that a cutting permit is required if you plan to cut any trees. These structures are not as environmentally friendly as raised planks or puncheons.

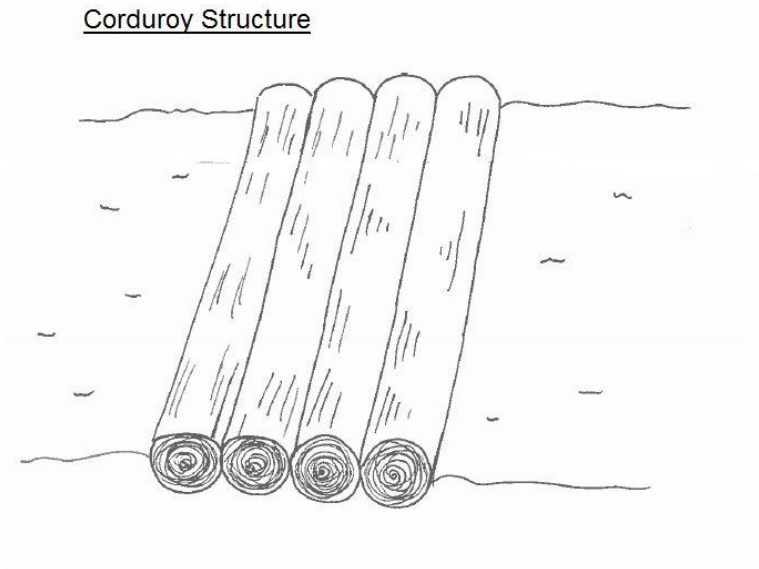

Figure 17 - Illustration of corduroy structure.

5.3 Raised bed/fill

An option for minor wet areas is to use fill to elevate the trail surface above the wet area. This is the least favorable method as it may change the natural surface drainage. This method consists of using fill material (offsite or onsite) to build up the trail tread above the water table. Drainage pipes and/or side ditches are needed with frequent leadoff ditches to divert water away from the trail. Log stringers may be used to help keep fill in place. This type of structure is also known as a turnpike (Figure 18) and should only be used on level areas with well-drained soils.

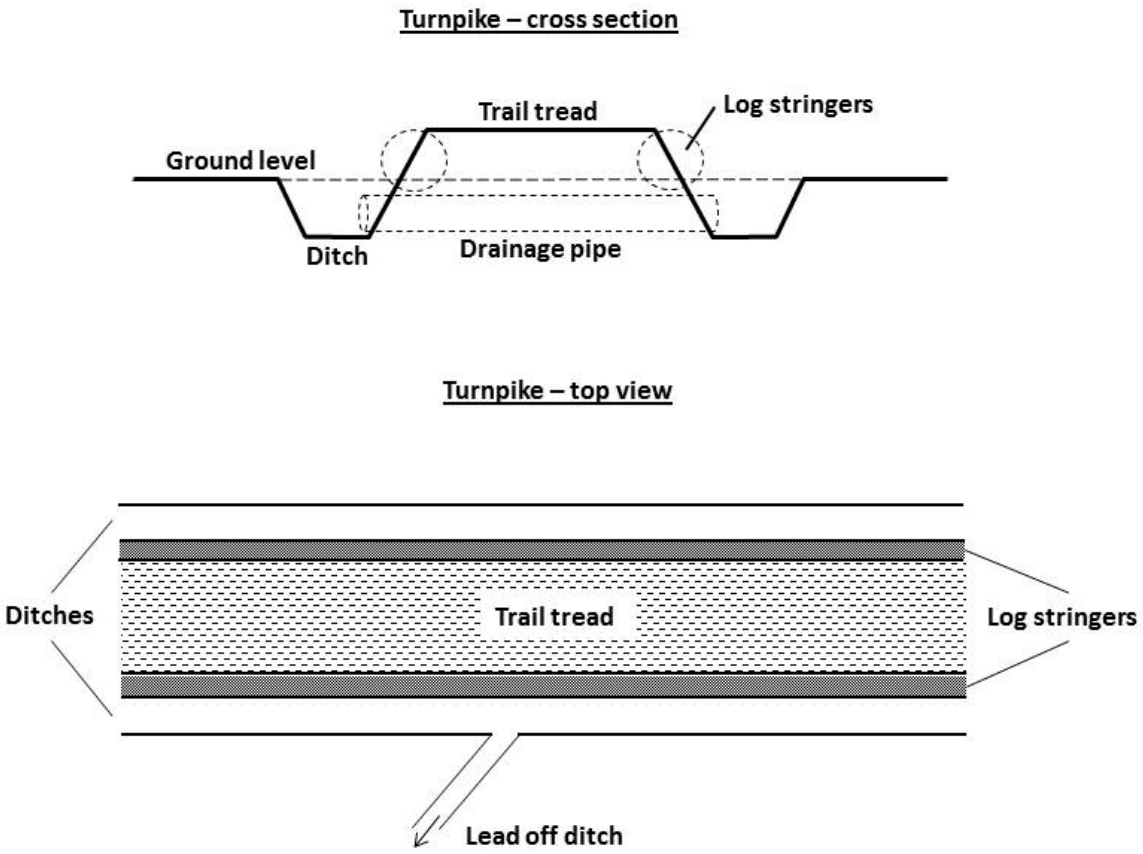

Figure 18 - Illustration of turnpike.

6.0 Water Crossings

WRMD regulates all alterations to bodies of water in compliance with Section 48 of the Water Resources Act (SNL 2002 c W-4.01). Environmental permits are required for stream crossings that appear on a 1:50,000 scale topographic map from the Water Rights, Investigations and Modeling Section as well as the Drinking Water and Wastewater Section for work inside all PPWSAs.

An alteration to a body of water permit that may be necessary in trail construction may include installation of culverts, bridges, fording, stream modifications, dredging, or debris removal. Guideline documents are available for various types of alterations including stream crossings by ATVs. These guidance documents provide detailed information on specifications for construction and installation. They are available online, along with permit application forms, at http://www.mae.gov.nl.ca/waterres/regulations/appforms/index.html. If your trail route has any stream crossing locations, please refer to these documents for further information.

7.0 Management, Monitoring and Maintenance

7.1 Management

It is critical that ATV trails be managed by an official group with the appropriate financial and personnel capacity. Typical management groups in this province may include municipalities, local service districts or incorporated non-profit groups (such as The Burin Peninsula Trailway Inc. or East Coast Trail Association Inc.). Applications for major trail systems inside PPWSAs will not be accepted by the department from an ad-hoc group. Individuals can apply for a permit, but these are typically for shorter, specific access trails and not recreational or lengthy trail systems.

Long-term management of ATV trails is crucial due to their inherit nature to degrade more rapidly than any other type of trail system. Even the most well-designed trail will degrade over time without a proper maintenance and management plan. Effective management includes monitoring the trails conditions on a regular basis and after any major rain events, as well as completing maintenance and repairs based on outcomes of monitoring activities. Without proper management, ATV trails can become a safety hazard for users, damage the environment and impact the drinking water quality within the PPWSA.

7.2 Monitoring

Regular field visits along the trail route are necessary to assess current trail conditions. The frequency of visits will depend on the trail operator's capacity to do so and the level of traffic. Trails with high traffic should be monitored more frequently than low traffic trails. Monitoring a newly developed trail throughout its first year can help identify any design flaws. If a particular design or drainage feature does not seem to be working effectively, changes may need to be incorporated into the trail. If capacity is an issue, asking users to report back to trail operators is a good compromise. Keeping a record of monitoring activities is highly recommended and can

comprise of written logs, GPS coordinates, pictures, and maps. Things to look for when monitoring include:

- condition of the trail tread
- damage to drainage features
- damage to infrastructure such as culverts or bridges
- erosion or sedimentation occurrences
- horizontal clearance along the trail
- evidence of undesirable activities, such as ATV users going off-trail
- damage to signage

Periodic, short-term closures of trail systems may be necessary during high rain events to avoid excessive erosion. A common time of year for these types of closures is spring and fall, when the rain and runoff are at their highest potential. If trails are closed during these times, it will aid in the longevity of the trail system and lower maintenance costs. Closure signs can be posted at the entrances to the trail and/or a notice in the local newspaper or public location can be used to communicate anticipated closures.

7.3 Maintenance

Maintenance and repairs should be completed soon after issues or concerns are identified through monitoring activities. Conduct maintenance activities in early spring before the high traffic season begins. Priority should be given to any drainage feature maintenance as these are the highest value-added components of your trail system. Water bars are particularly prone to clogging on steeper slopes and require regular maintenance. These types of small drainage fixes before and during high traffic season will ensure the integrity and safety of the trail. Tread maintenance required to restore original grades to allow for proper drainage should also be considered high priority. Vegetation maintenance can wait until low-usage seasons such as late fall if necessary. Cutting back invasive vegetation such as alder bushes in the corridor is necessary for the safety and visibility of users, especially on single path trails. Other maintenance activities can include replacement of signage, infrastructure repairs, or debris removal. Experienced trail builders should be hired to conduct any major maintenance activities.

8.0 Abandonment and Restoration

It may be necessary for an old trail to be closed if it is deemed a hazard to water quality. This is not always an easy task in high traffic or popular trails. If users are accessing cottages or recreational areas using an ATV trail, they may be likely to either continue using the trail or cut a new trail. Both of these have the potential to aggravate negative water quality impacts inside PPWSAs.

Trails that are no longer needed should be restored to natural surrounding conditions to deter ATV users. This may involve resurfacing and re-grading tread to blend into natural conditions, removing any signage and stream crossing infrastructures, planting native species of trees, shrubs, or trees, and allowing natural vegetation to regenerate.

9.0 Key Points and Contacts

Protection of public water supply areas is an essential aspect to safe and clean drinking water for the people of this province. Given the high value in recreational activities, an integrated, sustainable approach is necessary when managing activities inside these essential areas.

As erosion and sedimentation can cause major impairment of water quality, a chief goal when planning an ATV trail inside a PPWSA is to lower that risk as much as possible. This can be done by gathering information on the known conditions, planning the route appropriately, keeping key trail-building concepts in mind, and optimizing the usage of drainage features. Wetlands should be avoided, as they are sensitive areas that have a critical role to play in our natural environment including improving water quality. Long-term monitoring and maintenance plans are also required.

With the proper planning up front, and long-term goals kept at the forefront, the public can safely use ATV's inside watershed areas, thus enjoying not only the recreation activity, but also the peace of mind that drinking water supplies are properly managed and safeguarded.

If you have any questions regarding activities/developments inside PPWSAs and the permitting process, please call the WRMD office nearest you:

Western and Labrador: (709) 637-2542
Central: (709) 292-4280
Eastern: (709) 729-4817

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