



5.0 TRAIL DESIGNER’S TOOLBOX: GUIDELINES TO PLAN, DESIGN AND CONSTRUCT TRAILS IN NORTH GRENVILLE

A well-designed and properly maintained trail system is a critical part of the users’ experience and enjoyment. For some users, the way a facility has been designed and maintained will significantly influence their decision to return and use that trail at a later date. Trails that have been thoughtfully designed and constructed also perform better over their lifespan, provide minimal impacts to the surrounding environment, are easier to maintain and may result in fewer concerns or issues of liability. The better the quality of the design and construction, the more attractive it will be to users, the more it will be used, and the longer it will be before requiring upgrades.

Trail users vary widely in terms of age and physical ability, and have their own sense of what the experience should be, depending on the type of use they are interested in or what user group they consider themselves to be a part of. A **“one size fits all”** design approach does not apply to trails, and it is important to try and match the trail type and design with the type of experience that is desired. A recognizable and consistent high quality design will create a community asset where user experience, enjoyment and safety are maximized.

Information included in these guidelines is based on currently accepted design practices in North America, and ongoing research and experience gained during the implementation of the 150 Kms of Trails, and other municipal undertakings such as the County Road 43 EA and current municipal recreation programs. The guidelines are not intended to be prescriptive, rather should be treated as a reference to be consulted during the development and construction of the trail network. They are not meant to be inclusive of all design considerations for all locations, nor are they meant to replace **“sound engineering judgment”**. These guidelines are not intended as detailed solutions to specific problem areas. A site-specific design exercise involving a detailed site inventory should be applied as part of the analysis to arrive at final decisions for any section of the trail network. Therefore, care should be given in the strict application of these guidelines to all situations and location because it may limit the ability to implement a trail in a constrained corridor when an area specific design solution might be more appropriate.

5.1 How to Use These Guidelines

The purpose of these guidelines is to assist trail planners, designers and managers in making informed decisions about the design of these facilities. The guidelines provide general information about users and their needs as well as broad and specific design parameters for key trail facility features. Where appropriate, summary tables are provided to highlight recommended design treatments and/or considerations in addressing these key features. A number of the individual guidelines contained in the Trail Designer’s Toolbox provide an indication of **“minimum”** and **“preferred”** conditions or dimensions for proposed trail alignments and facilities.





“Minimum recommended” conditions typically reflect a situation that is at the lower end of the spectrum in terms of user level of service and in some cases user safety. The minimum recommended condition may be considered a threshold that the design or condition should not fall below, and the minimum recommended condition may be considered in locations where anticipated use is very low, and/or significant constraints do not enable the provision of the preferred condition.

“Preferred” conditions or treatments reflect conditions that typically serve a broader range of uses and a greater number of trail users. Achieving the preferred condition or treatment may also provide a longer service life span.

The application of these guidelines in the development, implementation, and operation of individual sites will require specific consideration of a number of factors including public safety, local, regional and/or provincial jurisdictional requirements, building codes and by-laws.

Where existing on and off-road community trails and facilities are to be incorporated as part of the North Grenville Trails system but do not meet the minimum recommended conditions described in these Guidelines, the following approach should be considered:

1. Examine the community trail or route to identify any design issues, or areas that may be seen as a potential risk to users.
2. Assess whether the trail is reasonably capable of handling anticipated levels of use.
3. Set up a monitoring program to identify emerging problems.
4. If necessary, establish an upgrading program to address areas of risk and/or emerging problems, as this helps to create awareness and appreciation towards the issue(s), and determines ways in which they can be resolved so that at least the minimum recommended guidelines can be achieved over time.
5. Set up a maintenance program to ensure that all designated trails are in the best possible condition to achieve the objectives of this strategy.





Recommendation 5-1:

The trail design guidelines presented in the 'Trail Designer's Toolbox' as part of the North Grenville Integrated Community Trails Strategy be adopted as the basis for trail design in the Municipality.

Recommendation 5-2:

That Municipal staff should be directed to remain current with best industry design practices through attending trail design seminars and conferences.

Recommendation 5-3:

That area specific design solutions that are consistent with good engineering judgment should be considered, given that the strict application of the recommended trail design guidelines in the Integrated Community Trails Strategy may not be appropriate for all situations and locations, and could also limit the ability to implement a trail in a constrained corridor.

5.2 TRAIL USERS AND NEEDS

When developing and applying guidelines, it is important to consider the characteristics and preferences of potential users. In North Grenville, potential user groups include pedestrians / hikers, cyclists, cross country skiers / snowshoers, in-line skaters, users with mobility aids, all of which are self-propelled. The following sections briefly describe each of these user groups, how they tend to use the trails and some of the design parameters/needs that should be considered.

5.2.1 Pedestrians

Pedestrians can generally be divided into several sub categories:

- Walkers;
- Hikers; and
- Joggers and Runners.

Walkers

A study conducted by Environics International on behalf of Go for Green (1998) reported the following top five reasons for walking in Canada:

- Exercise / Health;
- Pleasure;
- Practicality / Convenience;





- Environmental Concern; and
- Saving money¹.

Because walking is such a basic activity and a freedom that is enjoyed by most people, guidelines that facilitate this activity must be established for all potential users. Planners and designers should also consider the needs of walkers with baby strollers or walking aids, carrying picnic baskets or other equipment, and walkers in pairs or in groups, such as a class of school children. Planners and designers need to be aware that potential users may have sensory, cognitive or ambulatory difficulties.

It is important to consider pedestrians who walk for utilitarian or transportation purposes (trips focusing on shopping and errands or walking to work and school). Where no sidewalks are provided and there are no road shoulders, the Ontario Highway Traffic Act allows pedestrians to walk on the edge of the roadway, facing oncoming traffic².

Hikers

Hikers are often considered more of the elite of the recreational walking group and may challenge themselves to cover long distances. Multi-use pathway and trail planners should assume that there will be keen pedestrian users, even in remote or highway environments, despite the fact that the frequency may be very low.

Runners and Joggers

Although the motive for runners and joggers is primarily fitness and exercise, they may share more in terms of profile characteristics with distance hikers than they do with leisure walkers. Runners enjoy the trails at higher speed and over distances between 3 and 15 km or more and tend to prefer to run on granular, natural (earth) and turf surfaces as they provide more cushioning effect.

5.2.2 Cyclists

Recreational cyclists would be considered to have the similar motives as leisure or fitness walkers. The mechanical efficiency of bicycles allows users of all ages to significantly increase their travel speed and distance, often allowing them to experience much more countryside by cycling rather than walking.

¹ Go for Green, and Envirionics. Rep. 1998. Print.

² Ministry of Transportation. *Ontario Highway Traffic Act*. Rep. 1990. Print.





Some bicycles can travel easily over stonedust and gravel surfaces, whereas traditional narrow-tired touring and racing bicycles require well compacted granular surfaces or asphalt pavement. Distances covered vary widely and is dependent upon the fitness level and motivation of the individual cyclist. Many inexperienced cyclists feel unsafe sharing the road with automobiles, and therefore off-road multi-use pathways and trails, shared with pedestrians, can offer recreational and commuter cyclists a more secure environment to enjoy the use of their bicycles. Those that travel the longer distances are more likely to focus a significant portion of their route on the roadway network, and often seek out quieter, scenic routes over busier roads.

When using roads, cyclists generally travel 0.5-1.0 m from the curb or other obstruction because of the possibility of accumulated debris, uneven longitudinal joints, catch basins, or concern over hitting a pedal on the curb or handlebar on vertical obstacles. However, when cyclists use or cross a public roadway they are considered vehicles by law and are expected to follow the same traffic laws as motorized vehicles³.

Speed limits and warnings should be posted along multi-use trails to discourage fast riding and aggressive behaviour. Cyclists other than young children should be discouraged from cycling on sidewalks because of potential conflicts with pedestrians and dangerous conditions resulting from driveways and intersections. Many municipalities have prohibited sidewalk cycling through by-laws.

5.2.3 In-Line Skaters, Skateboarders and Non-Motorized Scooter Users

In-line skating, skateboarding and the use of non-motorized scooters are becoming increasingly popular among all age groups, particularly in urban areas. Although in-line skaters may have more in common with cyclists than pedestrians when considering travel motive and speed, they are not considered “vehicles” by the Ministry of Transportation for Ontario (MTO). Some municipalities have responded on an individual basis to the question of where to allow in-line skaters to travel through by-laws, however, no standards have been widely adopted. In some municipalities, in-line skaters, skateboarders and scooter users have been prohibited from using either roadways or sidewalks by local by-laws. Consequently, they are avid users of hard-surface off-road facilities and may travel some distance to reach a facility that suits their needs.

³ Region of Hamilton-Wentworth Transportation, Operations & Environment Division. *Shifting Gears: A New Cycling Plan for Hamilton-Wentworth*. Rep. Hamilton-Wentworth, December 1999. Print





This user group prefers a very smooth, hard surface, and loose sand, gravel, twigs, branches, fallen leaves and puddles can be significant hazards. Though skateboarders and scooter users can quickly become pedestrians by dismounting, they too are vulnerable to the effect of grades (both up and downhill) and require ample manoeuvring space. An inability to come quickly to a complete stop can be a significant concern for all but the most experienced users in this group.

5.2.4 Wheelchair and Electric Scooter Users

Trail users who rely upon wheelchairs (both motorized and non-motorized) and electric scooters have varying levels of mobility. Some use wheelchairs occasionally due to injury, however, others due to permanent paralysis and other medical conditions require the use of these devices on a full time basis.

The ability of a wheelchair or scooter user to negotiate a trail will depend upon the type of trail and the type of wheelchair or scooter. Where trails are developed to be accessible to all users, there will be a need to obtain input from these users to determine the type of trail surface and width required.

'All-terrain' wheelchairs exist to promote potential use of non-universally accessible (hiking) trails. Such wheelchairs could be made available at the North Grenville Municipal Centre or other trail head locations for use by individuals who require a wheelchair or scooter to travel around but would like to experience some of the non-universally accessible trails in the Municipality.

5.2.5 Equestrian

Trail riding on horseback is an established trail use in North Grenville. Horseback trail riding is most desirable in quiet, rural settings, however, there are occasions when equestrian users require access to public roads, trails and road rights-of-way. Ontario's Highway Traffic Act permits equestrians on provincial roads, although many municipalities place restrictions on riding in urban areas.

Trails are becoming increasingly important to equestrian users as roads become paved. As trails are developed in North Grenville, equestrian activities beyond solely horseback riding shall be considered. For example, 'driving', via carts and wagons, are held in Ferguson Forest and Limerick Forest. Trail enhancements shall give consideration to a variety of equestrian uses, including technical considerations, such as occasional turning areas for carts and wagons, and large hitch teams where appropriate. Dead-end trails shall be avoided where possible. Consideration shall be given to brush-clearing maintenance programs to provide a minimum clear vertical height of 3-metres along designated equestrian routes.





Input from the equestrian community regarding trail use by horseback riders was received during the development of the North Grenville Integrated Community Trails Strategy. It is recommended that the equestrian community continue to be granted access to key rural off-road trail corridors, such as the Ferguson Forest Centre, provided that trails can be suitably designed for shared use. It may also be appropriate for the Municipality to assist organized local equestrian groups from time to time in identifying and developing opportunities for exclusive use. Horses generally travel between speeds of 5-10 km/hour. Longer trails, with shorter connecting trails, are generally preferable to horseback riders. For the purposes of trail design, a 2-hour round trip, covering 10-20kms is a desirable trail network and distance for equestrian use. **Unopened road allowances identified on the Network Plans represent excellent opportunities for equestrian activities.**

Safety is a significant consideration when horses must mix with motorized vehicles and other trail users. Trail width should accommodate a shy distance of 0.6 m, to allow for uneasy horses to shy to one side of the trail, and pull-out sections should be regularly located to allow for passing of other equestrians or other trail users. Visual barriers such as vegetation or solid fences are also recommended where trails are adjacent to roadways or areas of high activity (i.e. sports fields) where the motion may alarm the horse.

Where bollards are used to limit trail access, it should be noted that mounted riders generally cannot pass through bollards spaced less than 1.5 m apart, unless they are less than 0.9 m high. This spacing will enable ATV users to access these trails, however if ATV use is to be restricted, but equestrian use permitted, a “step-over” gate design can be used. Where equestrian uses extend beyond solely horseback riding, design consideration must be given to operable gates that allow wagons and carts to pass through.

Parking areas for equestrian uses need ample turn-around space for trailers, and a solid aggregate base. Maintenance programs must be adjusted to accommodate multi-purpose trails that accommodate equestrian uses to avoid rutting of the trail resultant of horse traffic.

5.2.6 All-Terrain Vehicles and Snowmobiles

The use of ATV's is increasing throughout Ontario and snowmobile clubs have been in existence for a long time in Ontario. There is an increase in demand for trails throughout North Grenville for motorized uses. Most of the clubs work with private landowners to develop trails, but occasionally access to public trails and road rights-of-way is required. This could result in a conflict with other trail users if the trails are not designed and signed to accommodate the mix of users.

Motorized uses on trails are typically more prevalent in large rural areas. Clubs often look to find routes that will connect to networks developed by other organized clubs. However, there





are times when the Municipality may want to assist the clubs in identifying and developing opportunities for exclusive ATV and snowmobile use and to partner with them to maintain the trails.

Snowmobile club members with valid OFSC (Ontario Federation of Snowmobile Clubs) memberships are the only ones who are permitted on the trails. This will assist in developing a positive attitude toward these trail users.

Recommendation 5-4:

That the characteristics and preferences of trail user groups need to be accommodated in the application of the recommended trail design guidelines for each trail and be context sensitive to the location and type of trail planned.





5.3 GENERAL DESIGN PARAMETERS

Careful consideration should be given to the physical, aesthetic and environmental requirements for each trail type. In many instances physical design criteria related to operating space, design speed, alignment and clear zones are often governed by the needs of the fastest, most common user group on the majority of the trails, that being the cyclist. This is not to say that all trails should be designed to meet the requirements for cyclists, however when multi-use trails are being designed it is prudent to use parameters for the cyclist. When considering single or specialty uses, such as BMX or freestyle biking, designers should consult directly with the user group and/or design manuals that are specific for that use.

Trail user operating space is a measurement of the horizontal space that the user requires. In the case of in-line skating and cycling, the space includes room required for side to side body motion used to maintain balance and generate momentum. [Table 5.1](#) outlines minimum and preferred operating space for different uses.

Operating Condition by Trail User Type	Minimum (metres)	Preferred (metres)
One way travel (one wheelchair user)	1.2	1.5
One way travel (two pedestrians)	1.5	2.0
One way travel (one cyclist)	1.2 (in constrained locations)	1.5+
One way travel (one in-line skater)	2.3	3.0
Two way travel (two cyclists)	3.0	3.0+
Two way travel (two wheelchair users)	3.0	3.0+





Recommendation 5-5:

That the Municipality adopts the minimum and preferred trail user operating space widths identified in Table 5.1 of the Integrated Community Trails Strategy.

Roads are designed to accommodate vehicles that move at a significantly higher rate of speed than bicycles, therefore it is assumed that horizontal alignment of on-road routes will be ample to accommodate cyclists and other trail users.

Sight stopping distance is defined as the distance required for a trail user to come to a full controlled stop upon spotting an obstacle. It is a function of the user's perception and reaction time. Once again, stopping sight distances for off-road trails are typically governed by the distance required for cyclists since pedestrians and other trail users (with the exception of in-line skaters) can typically stop more immediately than cyclists, regardless of the trail configuration. In terms of in-line skaters, however, no definitive data currently exists concerning stopping distance, the experiences and observations of in-line skaters, indicate that an in-line skater travelling near the same speed as a bicycle can stop in a distance equal to or less than that of a cyclist. Therefore, basing stopping distance on the distance required for a cyclist should accommodate all other expected self-propelled trail users including in-line skaters.

5.4 ACCESSIBILITY

Approximately one in eight Canadians suffer from some type of physical disability, however, this increases with age.

The Accessibility for Ontarians with Disabilities Act (AODA) states that "The people of Ontario support the right of persons of all ages with disabilities to enjoy equal opportunity and to participate fully in the life of the province"⁴. Within the AODA, Bills 118 and proposed Bill 125 recognize the need to provide for accessibility standards, improve opportunities and facilitate the removal of barriers in order to enable persons with disabilities to fully participate in the life of the Province⁵.

Universal Trail Design is a concept that takes into consideration the abilities, needs, and interests of the widest range of possible users. In regards to trail design, it means planning and developing a range of facilities that can be experienced by a variety of users of all abilities.



⁴ Canada. Province of Ontario. Ministry of Community and Social Services. *Accessibility for Ontarians with Disabilities Act*. By Ministry of Community and Social Services. 2005. Web. Spring 2010. <<http://www.mcscs.gov.on.ca/en/mcscs/programs/accessibility/OntarioAccessibilityLaws/2005/index.asp>>.



⁵ Ontarians with Disabilities Act - Bill 118 and 125, 2001





Principles of universal trail design can be summarized as follows:

Equitable use: provide opportunity for trail users to access, share and experience the same sections of trail rather than providing separate facilities;

Flexibility in use: provide different options for trail users in order to accommodate a variety of experiences and allow choice;

Simple, intuitive and perceptible information: whether conveying trail information through signage, maps or a web site, communicate using simple, straightforward forms and formats with easy to understand graphics and/or text;

Tolerance for error: design trails and information systems so as to minimize exposure to hazards, and indicate to users any potential risks or challenges that may be encountered;

Low physical effort: trails may provide for challenge but should not exceed the abilities of the intended users; where appropriate, rest areas should be provided; and

Size and space for approach and use: trails and amenities should provide for easy access, comfort and ease in their usage.

Where possible and practical, trails should be designed to be accessible to a wide range of users at all levels of ability. It must be recognized, however, that not all trails throughout the system can be fully accessible, though the use of all-terrain wheelchairs may increase accessibility to the trail network. Designing trails to be within the threshold (5%) for universal access will not only overcome this significant barrier but it will help to reduce the potential for erosion of the trail surface. The following are some additional considerations for making existing and new trails accessible:

- Designers should consult the most current standards available;
- Where the trail requires an accessibility solution that is above and beyond what is normally encountered, a representative of the North Grenville Accessibility Advisory Committee should be consulted early on in the process to determine if it is practical and desirable to design the specific trail to be fully accessible;
- Where it has been determined that full accessibility is appropriate, the accessibility representative should be consulted during the detailed design process to ensure that the design is appropriate; and
- Work collaboratively with the North Grenville Accessibility Advisory Committee to consider developing signage/content to clearly indicate trail accessibility conditions,





which allow users with mobility-assisted devices to make an informed decision about using a particular trail prior to travelling on it.

Recommendation 5-6:

Where practical, new multi-use spine trails and trailheads be designed to be Universally Accessible and existing and new trails should be signed to indicate whether they are Universally Accessible.

5.5 PERSONAL SECURITY

To the extent possible, trails should be designed to allow users to feel comfortable, safe, and secure. Although personal safety can be an issue for all, women, the elderly and children, are among the most vulnerable groups. Principles of Crime Prevention Through Environmental Design (CPTED) should be considered and applied to help address security issues concerning trail use, particularly in locations where trails are infrequently used, isolated or in areas where security problems have occurred in the past.

The four main underlying principles of CPTED are:

- Natural Access Control: deters access to a target and creates a perception of risk to the offender;
- Natural Surveillance: the placement of physical features and/or activities that provides for natural visibility or observation;
- Territorial Reinforcement: defines clear borders of controlled space from public to semi-private to private, so that users of an area develop a sense of proprietorship over it; and
- Maintenance: allows for the continued use of space for its intended purpose⁶.

Specifically related to trails, the following CPTED-related design criteria include:

- Good visibility by having routes pass through well-used public spaces;



⁶ Crowe, Timothy D. "Crime Prevention Through Environmental Design." *CPTED Ontario Home Page*. CPTED Ontario, 2002. Web. 30 Sept. 2010. <<http://www.cptedontario.ca/>>.



- Have good signage that tells users where they are along the trail system, in order to obtain help;
- Provide “escape” routes from isolated areas at regular intervals;
- Maintain sight lines and sight distances that are appropriately open to allow good visibility by users;
- Provide trailhead parking in highly visible areas;
- Minimize routing close to features that create hiding places such as stairwells, and dense shrubs;
- Design underpasses and bridges so that users can see to the end and beyond; and
- Use signs near entrances to identify and suggest alternative routes.

Recommendation 5-7:

The Municipality of North Grenville has regard to the principles of Crime Prevention Through Environmental Design (CPTED) when designing new trails or improving existing trails.

5.6 TRAIL LIGHTING

Lighting of trails in North Grenville must be carefully considered. Very few municipalities make the decision to light their entire trail system for a number of important reasons, including:

- The cost of initial installation can be prohibitive, in some cases exceeding \$40,000 per kilometer not including power supply;
- Staff time and material cost for proper monitoring and maintenance;
- Energy consumption;
- Excessive light pollution, especially in residential rear yards and adjacent to natural areas (though this can be controlled with proper shielding);
- Potential detrimental effects on flora and fauna, especially with light pollution in natural areas such as woodlots;





- The potentially false sense of personal security created by lighting in the night-time environment; and
- Inability of the human eye to adapt to the high contrast resulting from brightly lit and dark shadowed areas adjacent one another.

While lighting the entire trail system is not recommended, there may be some locations where lighting might extend the hours of use and enjoyment by the community and visitors. The decision to light a trail or not, should be made on a site specific basis, and where it has been determined that lighting is appropriate. In addition, the quality and intensity of lighting should be consistent with prevailing standards for the setting being considered.

5.7 TRAIL TYPES

5.7.1 Multi-use Trails

Main **multi-use trails** are typically designed to accommodate the widest spectrum of users. **Table 5.2** provides recommended guidelines for trail width and surface treatments for Major and Minor trails according to location type throughout North Grenville. **Spine or main trails** are wider, typically have a granular surface (i.e. limestone screenings) and may have an asphalt surface where warranted in places of high trail use or areas of high erosion. **Local neighbourhood or secondary trails** are generally narrow and follow the topography more closely than main trails. Intended trail uses should be considered when selecting trail surface as some surfaces tend to exclude certain uses.

Recommended/Preferred Guideline by Trail Hierarchy*		
Trail Location	Spine Trail Network	Local Neighbourhood Trails / Special Use Trails
Major municipal-wide destination (i.e. Major municipal parks, Community Centre, Civic complex, trails in utility / linear green corridors)	3.0-3.5m wide, to accommodate small wheeled users and urban rail trails where they pass through core areas and major municipal-wide destinations.	2.4-3.0m wide granular surface. Hard surfaces will be used for in-boulevard multi-use trails where erosion is an ongoing problem or for locations where





Table 5.2 Recommended/Preferred Guideline by Trail Hierarchy*

Recommended/Preferred Guideline by Trail Hierarchy*		
Trail Location	Spine Trail Network	Local Neighbourhood Trails / Special Use Trails
	<p>Generally granular surface. Hard surfaces will be used for in-boulevard multi-use trails where erosion is an ongoing problem or for locations where a wide range of uses (i.e. small wheeled uses) are intended.</p> <p>Consider width and turning radii of service access vehicles when designing trails in utility corridors.</p>	<p>a wide range of uses (i.e. small wheeled uses) are intended.</p>
Minor municipal parks, stormwater management areas with trails	<p>2.4-3.0m wide granular surface.</p> <p>Hard surfaces will be used for in-boulevard multi-use trails where erosion is an ongoing problem or for locations where a wide range of uses (i.e. small wheeled uses) are intended.</p>	<p>2.4m wide granular surface.</p> <p>Hard surfaces will be used where erosion is an ongoing problem.</p>
Natural Area Buffers, Rural Areas	<p>2.4m wide granular surface.</p> <p>Trail hardening for maintenance concerns only – use soil bonding agents.</p>	<p>1.5m wide granular surface</p> <p>Trail hardening for maintenance concerns only-use soil bonding agents.</p>
Woodlots and Conservation Areas (urban and rural areas)	<p>2.4m wide granular or woodchip surface.</p>	<p>0.5 – 1.5m wide woodchip surface.</p> <p>May be granular (compacted stonedust/limestone screenings) or smooth earth surface where disabled access is desired.</p>

Comment [r1]: Confirm is there are utility corridors - if no remove





Table 5.2 Recommended/Preferred Guideline by Trail Hierarchy*

Recommended/Preferred Guideline by Trail Hierarchy*		
Trail Location	Spine Trail Network	Local Neighbourhood Trails / Special Use Trails
Wetlands: includes Treed Swamps, Marshes, Shrub Thickets/ Meadow Marshes, Marshes (urban and rural areas)	Width and surface type to be considered in the context of site conditions	Width and surface type to be considered in the context of site conditions
* = Standards are to be achieved where possible. Some variation from standard width and surface type will be applied on a site by site basis when considering local environmental constraints and/or access needs for people using mobility devices.		

Minimum trail corridor widths will vary based on the location of the trails and whether it is located in a constrained linear corridor or a wildlife corridor:

- Where trails are to be located within designated wildlife corridors, a minimum 20.0m corridor width should be provided, where possible, which includes the trail and trail clear zone as well as a suitable buffer from the wildlife passage area in the corridor.
- Trail links between residential or commercial lots that connect to the trail system should be designed with a minimum 6.0m corridor width and a minimum 3.0m trail in the centre of the corridor. If the trail link is to include a row of trees along each side of the corridor, the corridor width should be increased to 12.0m.
- Walkway connecting links that consist of a 2.0m concrete sidewalk are to be located in a minimum 6.0m corridor.

Recommendation 5-8:

In designated wildlife and trail corridors, a minimum 20m corridor width should be provided, where possible that includes the trail and trail clear zone as well as a suitable buffer from the wildlife passage area in the corridor.





Recommendation 5-9: Trails links between residential or commercial lots that connect to the trail system should be designed with a minimum 6.0m corridor width and a minimum 3.0m trail in the centre of the corridor. If the trail link is to include a row of trees along each side of the corridor, the corridor width should be increased to 12.0m.

Recommendation 5-10: Walkway connecting links that consist of a 2.0m concrete sidewalk are to be located in a minimum 6.0m corridor.

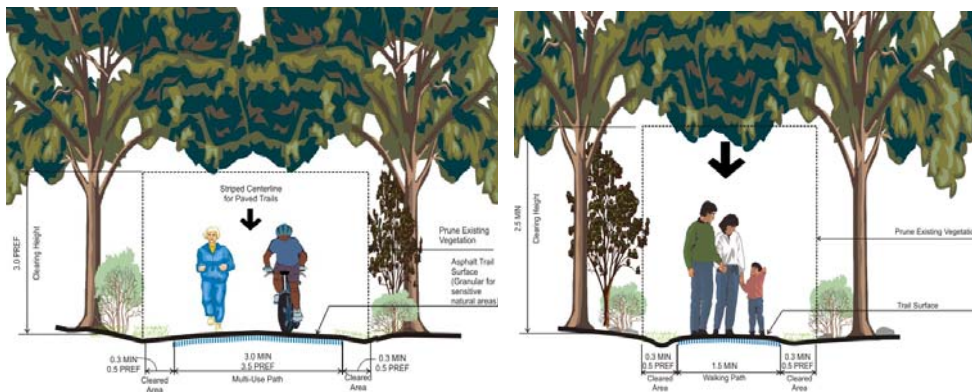


Figure 5.1 - Examples of Multi-Use Trail Sections

There are a number of options for trail surface materials, each with advantages and disadvantages related to cost, availability, ease of installation, lifespan and compatibility with various trail users groups. **Table 5.3** provides a summary of the most commonly used trail surfacing materials along with some advantages and disadvantages of each. There is no one trail surface material that is appropriate in all locations, and material selection during the design stage must be considered in the context of the anticipated users and location. Asphalt is the most commonly used hard surface and stonedust / “Screenings” is likely the most widely accepted granular surface.





Table 5.3 Comparison of Trail Surfacing Materials

Type	Advantages	Disadvantages
Concrete	<p>Smooth surface, can be designed with a variety of textures and colours, providing flexibility for different urban design treatments.</p> <p>Long lasting, easy to maintain.</p>	<p>High cost to install.</p> <p>Requires expansion joints which can create discomfort for users with mobility aids.</p> <p>Must be installed by skilled trades people.</p> <p>Is not flexible and cracking can lead to heaving and shifting, sometimes creating large step joints.</p>
Asphalt	<p>Smooth surface, moulds well to surrounding grades, and is easily negotiated by a wide range of trail user groups.</p> <p>Relatively easy to install by skilled trades.</p> <p>Patterned and coloured surface treatments are available; however patterning in surface may be difficult for some user groups to negotiate.</p>	<p>Moderate-high cost to install.</p> <p>Must be installed by skilled trades people. Has a lifespan of 15-20 years depending on the quality of the initial installation. Poor base preparation can lead to significant reduction in lifespan.</p> <p>Cracking and “alligating” occurs near the edges, grass and weeds can invade cracks and speed up deterioration.</p> <p>Must be appropriately disposed of after removal.</p>
Granulars	<p>Pit Run: Mixed granular material “straight from the pit” containing a range of particle sizes from sand to cobbles. Excellent for creating a strong sub base, relatively inexpensive.</p>	<p>Not appropriate for trail surfacing.</p>
	<p>‘B’ Gravel: Similar characteristics to Pit Run with regulated particle size (more coarse than ‘A’ Gravel). Excellent for creating strong, stable and well drained sub bases and bases. Relatively inexpensive.</p>	<p>Not appropriate for trail surfacing.</p>





Table 5.3 Comparison of Trail Surfacing Materials

Type	Advantages	Disadvantages
	<p>'A' Gravel: Similar characteristics to 'B' Gravel, with smaller maximum particle size. Excellent for trail bases, may be appropriate for trail surfacing in rural areas and woodlots. Easy to spread and re-grade where surface deformities develop.</p>	<p>Subject to erosion on slopes.</p> <p>Some users have difficulty negotiating surface due to range in particle size and uneven sorting of particles that can take place over time with surface drainage.</p>
Granulars	<p>Clear stone: Crushed and washed granular, particles of uniform size, no sand or fine particles included. Excellent bedding for trail drainage structures and retaining wall backfilling, if properly levelled and compacted, makes an excellent base for asphalt trails.</p> <p>Recycled Crushed Concrete: Concrete from curbs and sidewalks that have been demolished can be crushed to meet specifications for recycled concrete. When properly compacted it creates an excellent base for hard surfaced trails.</p>	<p>Not appropriate for trail surfacing.</p>
	<p>Stone fines (Screenings): Mixture of fine particles and small diameter crushed stone. Levels and compacts very well and creates a smooth surface that most trail users can negotiate easily. Easy to spread and re-grade where surface deformities develop. Inexpensive and easy to work with. Widely used and accepted as the surface of choice for most granular surfaced trails.</p>	<p>Subject to erosion on slopes.</p> <p>Wheelchair users have reported that stone shards picked up by wheels can be hard on hands.</p> <p>May not be suitable as a base for hard surfaced trails in some locations.</p>





Table 5.3 Comparison of Trail Surfacing Materials

Type	Advantages	Disadvantages
Mulches and Wood Chips	<p>Bark or wood chips, particle size ranges from fine to coarse depending on product selected, soft under foot, very natural appearance that is aesthetically appropriate for woodlot and natural area settings.</p> <p>Some user groups have difficulty negotiating the softer surface; therefore this surface can be used to discourage some uses such as cycling.</p> <p>May be available at a very low cost depending on source, and easy to work with.</p>	<p>Breaks down over time, therefore requires "topping up".</p> <p>Source of material must be carefully researched to avoid unintentional importation of invasive species (plants and insects).</p>
Earth/Natural Surface	<p>Native soils existing in situ. Only cost is labour to clear and grub out vegetation and re-grade to create appropriate surface. Appropriate for trails in natural areas provided that desired grades can be achieved and that soil is stable (avoid organic soils).</p>	<p>Subject to erosion on slopes.</p> <p>Different characteristics in different locations along the trail can lead to soft spots.</p> <p>Some user groups will have difficulty negotiating surface.</p>
Soil Cement, and soil binding agents	<p>Soil Cement (a mixture of Portland Cement and native/parent trail material). When mixed and sets it creates a stable surface that can be useful for "trail hardening" on slopes, particularly in natural settings.</p> <p>Soil Binding Agents (a mix of granulars and polymers that create a solid, yet flexible surface that may be appropriate for "trail hardening" on slopes in natural areas).</p> <p>Limits volume and weight of materials to be hauled into remote locations.</p>	<p>Useful for specific locations only.</p> <p>Soil binding agents tend to be expensive and have been met with mixed success.</p>





Table 5.3 Comparison of Trail Surfacing Materials

Type	Advantages	Disadvantages
Wood (i.e. bridges and boardwalks)	Attractive, natural, renewable material that creates a solid and level travel surface. Choose rough sawn materials for deck surfacing for added traction.	Requires skill to install, particularly with the substructure. Gradually decomposes over time, this can be accelerated in damp and shady locations, and where wood is in contact with soil. Expensive to install.

Recommendation 5-11: That the Municipality of North Grenville’s multi-use spine trail system in parks and linear corridors be designed with a trail width of 3.0m. In constrained corridors the trail width should not be less than 2.4m for a multi-use trail.

Recommendation 5-12: That the Municipality’s multi-use spine trail system continues to be designed and constructed with a granular surface. However, trail segments in parks or in areas where erosion is a concern may have an asphalt or concrete surface as a maintenance design solution or to accommodate a wider range of users.

5.7.2 Boulevard Multi-use Trails

A boulevard multi-use trail can be used where the characteristics of the boulevard are suitable. Intersections, including driveways and roadways are potential conflict points. Intersecting roadways are a particular concern as motor vehicles making right hand turns may not be anticipating the speed at which some users of the boulevard multi-use trail may be traveling (i.e. cyclists and in-line skaters). Therefore, the boulevard multi-use trail has limited application. The following are some general roadway characteristics where the application of a boulevard trail may be considered:

- Urban arterial, collector or rural roads where there is ample right of way between the edge of the road (curb for urban cross section and shoulder for rural cross section) and





the limit of the right-of-way to maintain a minimum separation between the road and the trail;

- Routes that provide connections between important destinations or links between off-road trails where no parallel route(s) exist nearby;
- Routes that are intended to provide short connections between long off-road trail segments (i.e. 4 – 6 blocks or less where other alternatives are not available); and
- Along corridors where there are limited commercial or residential driveway crossings. The following guideline thresholds have been applied in several other municipalities and are suggested for North Greenville.

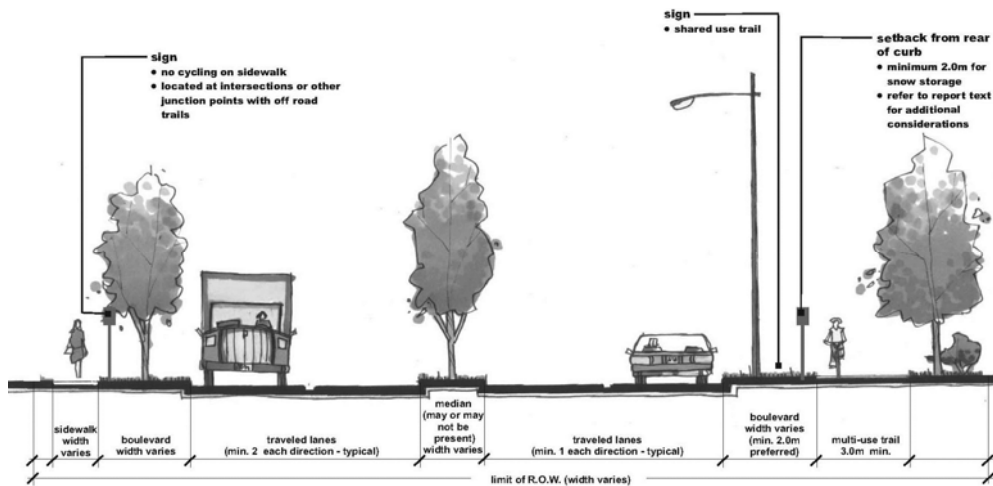


Figure 5.2 - An Example of a Boulevard Multi-Use Trail Cross Section





Table 5.4 Driveway Crossings Thresholds for Boulevard Multi-use Trails

Number of Driveway Crossings / Intersections Per Km	Guideline Recommendation for Boulevard Multi-use Trail
0-3	An ideal application for boulevard multi-use trail.
4-10	Consider applying on-road paved shoulders or bike lanes, where other conditions noted above can't be met.
>10	Boulevard trail not recommended. Pedestrian trail users should be directed to follow sidewalks, bicycle lanes should be installed on-road for cyclists.

Recommendation 5-13: When implementing Boulevard Multi-use Trails, utilize the following design elements:

- ✓ A setback from the curb is required to provide space for snow storage, to provide an adequate clear zone from site furniture and utility poles and in some cases street tree plantings. Where street tree plantings are included, the preferred setback is 3.0-4.5 m from the curb. Where no trees are included and vehicle speed is 60 km/hr or less, the preferred setback can be reduced to 2.0 m;
- ✓ The setback should be achieved throughout the length of the route with the exception of intersections where the trail should cross with the formal pedestrian crossing;
- ✓ Signing in advance of, and at roadway intersections, to inform cyclists to stop, dismount and walk across intersections as required by the Highway Traffic Act, or a suitable crossing design to permit cyclists to legally ride through intersections after stopping but without dismounting;
- ✓ Stop or yield signs (decision on a site-by-site basis) at driveways, depending on the number of driveways and the distance between each;
- ✓ A treatment at road intersections (i.e. swing gate) to separate “lanes of traffic” in each direction. The treatment must be spaced adequately to allow for the passage of bicycles with trailers;
- ✓ Open sight lines at intersections with driveways and roadways;





- ✓ A centre yellow line be considered for hard surface trails to separate directions of travel and to guide riders overtaking pedestrians and slower moving riders; and
- ✓ Curb ramps at driveways and roadway intersections where trails intersect.

When new roads are being built or existing roads are being reconstructed, the alignment of the centre line of the road within the right-of-way should be examined where the Strategy recommends an off-road connection. For example, when a road is being reconstructed from a two lane rural to a three or four lane urban cross section and the potential for a boulevard trail has been identified, an offset road centreline within the road right-of-way can provide additional boulevard space on one side. This will provide more space for the development of the boulevard trail and/or increased separation distance between the road and the trail. Where boulevard trails are implemented on one or both sides of a road, it is reasonable to assume that they can perform the same function as the sidewalk; therefore it is not necessary to install both a trail and sidewalk on the same side of the road. The boulevard trail should be clearly signed (i.e. trail and shared use signage) so that users are aware that the segment is multi-use and not pedestrian only.



Figure 5-3 General Boulevard Multi-use Examples





Where boulevard trails are provided as multi-use primary or secondary trail connections, some cyclists may still prefer to, and have the legal right to, cycle on the road. The addition of bicycle lanes or cycle tracks should be evaluated during the design stage for new roads and upgrading of existing roads even where boulevard trails are provided. Where it is not appropriate or feasible to include bicycle lanes, consideration should be given to providing a wide curb lane to accommodate cyclists, along with other improvements to make the street more bicycle friendly (e.g. bicycle friendly catch basin covers and sharrow pavement markings).

5.7.3 On-Road Connections

One of the objectives of the Strategy is to develop a trail network that is off-road, wherever possible, recognizing that in some cases an off-road alignment is not possible even in the long term. Where public land (other than the road right-of-way) is not available and access agreements for trails on private lands are not feasible, it is necessary to provide connecting links using the road network. Where this is the case, pedestrians and other small-wheeled users (strollers, in-line skaters, users with mobility-assisted devices, etc.) are expected to use sidewalks in urban areas and road shoulder in rural areas, whereas cyclists are expected to use the road. Bicycles are designated as a vehicle under the Highway Traffic Act (HTA) and as such are required to obey all of the same rules and regulations as automobiles when being operated on a public roadway. The Ministry of Transportation (MTO) and the Transportation Association of Canada (TAC) have developed standards for the design of on-road facilities and signing for on-road-bike system. In North Grenville, a number of options exist for on-road cycling routes including paved shoulders, bicycle lanes, wide curb or shared lanes and signed routes. In addition to the commonly encountered situations to which relatively simple guidelines can be applied, there are often situations where the proper design requires a bicycle system design specialist who is familiar with not only the common guidelines, but also with innovative techniques that have been successfully applied elsewhere.

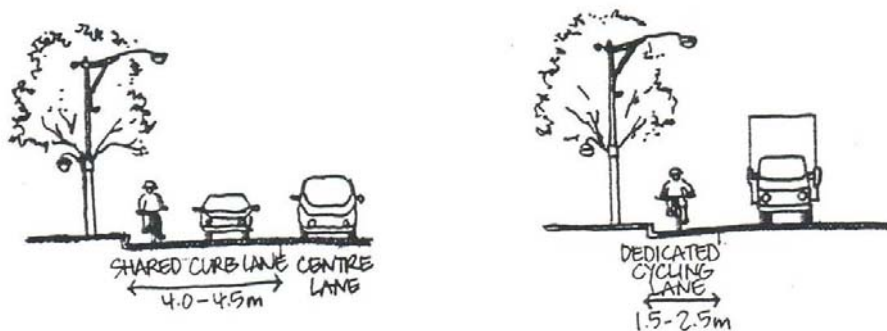


Figure 5.4 - Example of Shared Curb Lane and Dedicated Cycling Lane
Practical Design Guidelines for the Corridor of County Road 43 as a Public Space, June 2001.





Paved Shoulders

Paved shoulders provide a space for cyclists on rural cross-section roads (with shoulders, no curb and gutter). Pedestrians can use paved or granular shoulders where necessary (traveling in a direction facing traffic). Paved shoulders are typically recommended on rural cross section roads where traffic volume and speed are high. Roads with poor sight lines and high truck volumes are additional situations where paved shoulders should be considered.

Bike Lanes

Bike lanes are typically located on urban cross-section roads (with curb and gutter) to create a physical space reserved for cyclists. In many municipalities, persons who use mobility-assisted devices also use this space. The diamond symbol and bicycle symbol painted on the pavement, in addition to roadside signs are useful on higher volume and higher traffic roadways. In areas where on-street parking is permitted, continuing the bike lane is the ideal method where space permits. Where road right-of-way widths are limited, where narrowing or removing traffic lanes is not feasible, and/or where the relocation or removal of parking is not an option, the bike lane must be properly terminated, which includes proper signage. The Bikeway Traffic Control Guidelines for Canada (Transportation Association of Canada 1998) should be consulted for additional details and specifications.

Wide Curb or Shared Use Lanes

Wide shared use lanes, sometimes also referred to as wide curb lanes are used on roads where vehicle speeds or traffic volumes are higher than those associated with signed routes (e.g. arterial and collector roads). Where necessary or desirable, the shared use arrow or “Sharrows” can be painted on the road at regular intervals to inform road users to expect cyclists, and to assist the cyclist in understanding the preferred location to travel.

Signed Routes

Signed routes are typically found along roads where traffic volumes and vehicle speeds are low. Typical of quieter residential streets (low volume and low speed) and urban areas (higher volume and low speed), cyclists can share the road with motor vehicles and there is no need to create a designated space for cyclists. Signs located at intersections and at regular intervals in rural areas help trail users find their way and alert motorists to the presence of cyclists. Along signed routes where the street is very narrow, “**share the road**” signs can also be erected to encourage cooperative behaviour between cyclists and motorists. In some areas, particularly urban residential neighbourhoods, traffic calming techniques such as through travel restrictions for cars, traffic circles and reduction in the number of stops signs can be used to create “**bicycle**





priority streets” which allow the cyclist to travel more efficiently by not having to stop at frequently placed four way stops.

5.8 TRAIL CROSSINGS

A significant challenge when implementing a trail system is how to accommodate trail users when crossing roads. In the case of arterial and busier collector roads, options generally include:

- Grade separated crossings (bridges and underpasses including both shared and pedestrian/trail only facilities);
- Directing users to cross at an existing signalized or stop-controlled intersection;
- Utilizing a mid-block pedestrian signal or Intersection Pedestrian Signal (IPS); and
- At a mid-block location with a pedestrian island or refuge.

The IPS and pedestrian refuge are described in further detail in the following sub-sections.

5.8.1 A Midblock Pedestrian Signal

A midblock pedestrian signal is a device to assist pedestrians crossing major streets and is a more positive and effective pedestrian crossing device than a pedestrian crossover (PXO).

A midblock pedestrian signal includes:

- Standard traffic signal indications to control traffic on the major street; and
- Standard pedestrian “Walk” and “Don’t Walk” indications, activated by push buttons, for pedestrians wishing to cross the major street at the trail crossing.

Midblock pedestrian signals may be considered when:

- A trail crosses a high volume and / or multi-lane road;
- A grade separation is not practical; and
- There is no other controlled crossing within 150 m of the trail crossing.





Vehicles approaching from the side street will be permitted to turn onto the main street only when it is clear and safe to do so, yielding the right-of-way to both pedestrians crossing the main street as well as vehicles traveling along the main street.

5.8.2 Pedestrian Refuge Islands^[r2]

Pedestrian refuge islands are medians that are placed in the centre of the roadway separating opposing lanes of traffic. They allow trail users to cross one direction of traffic at a time, with a location in the centre of the roadway to wait for a gap in traffic for the other direction. They are particularly suited for roadways with four to five lanes since the cognitive requirements to select a gap in traffic traveling in two directions in four lanes is considerably higher than that required for cross two lanes of traffic. A number of jurisdictions have implemented Pedestrian Refuge Islands.

Guidelines for the typical design elements for a pedestrian refuge island are as follows⁷:

- Islands are typically a minimum of 6 m in length;
- Island width should be at least 1.8 m wide, but 2.4 m is preferred to accommodate wheelchairs in a level landing 1.2 m wide plus 0.6 m wide detectable warning devices on each side. The 2.4 m width will also accommodate bicycles in the refuge;
- Curb ramps are provided to allow access to the roadway and island for wheelchair users, and detectable warning devices (0.6 m in width) should be placed at the bottom of the curb ramps;
- The pathway on the island is constructed of concrete, not asphalt. The visually impaired can better detect the change in texture and contrast in colour supplemented by the detectable warning devices to locate the refuge island;
- Appropriate tapers are required to diverge traffic around the island based on the design speed of the roadway;
- The pathway on the island can be angled so that pedestrians are able to view on-coming traffic as they approach the crossing;
- Illumination should be provided on both sides of the crossing;



⁷ Traffic Engineering Council Committee TENC-5A-5, *Design and Safety of Pedestrian Facilities: A Recommended Practice of the Institute of Transportation Engineers*, Institute of Transportation Engineers, Washington, D.C., March 1998.





- Signage associated with the pedestrian refuge island includes **“Keep Right”** and **“Object Marker”** warning signs installed on the island facing traffic, and **“Pedestrian Crossing Ahead”** warning signs installed on the roadway approaching the crossing. **“Wait for Gap”** warning signs can be installed on the far side of the crossing and on the refuge island if pedestrians are failing to cross in a safe manner;
- Crosswalk markings are not provided unless the crossing is at an intersection controlled by signals, stop or yield signs, or controlled by a school crossing guard; and
- Railings on the island to control pedestrian access are not recommended because they are a hazard in potential collisions (spearing of a driver or pedestrian). Some pedestrians will walk in front of or behind the island to avoid the railings, a less safe refuge location than on the island.



Figure 5.5 - Example of a Pedestrian Refuge Island, Guelph, Ontario





5.8.3 Trail Crossing at Minor and Major Roads

In the case of lower volume, lower speed roads the crossing can be accomplished with greater ease. The figure on the following page illustrates the key aspects of trail crossings of roadways.

Trail crossings of minor roads should include the following:

- Creation and maintenance of an open sight triangle at each crossing point;
- Trail access barriers;
- Signing along the roadway in advance of the crossing point to alert motorists to the trail crossing (advisory signs);
- Signing along the trail to alert trail users of the upcoming roadway crossing;
- Alignment of the crossing point to achieve as close to possible a perpendicular crossing of the roadway, to minimize the time that trail users are in the traveled portion of the roadway; and
- Curb ramps on both sides of the road.

Pavement markings, to delineate a crossing, should not be considered at “uncontrolled” trail intersections with roads as trail users are required to wait for a gap in traffic before crossing at these locations. Pavement markings designed to look like a pedestrian cross over may give pedestrian and trail users the false sense that they have the right-of-way over motor vehicles, which is contrary to the Highway Traffic Act of Ontario for uncontrolled intersections.

In some locations signing on the trail may not be enough to get trail users to stop before crossing the road. Under these circumstances or in situations where the sight lines for motorists are reduced and/or where there is a tendency for motorists to travel faster than desirable, the addition of other elements into the trail crossing may be necessary. Changing the trail alignment may help to get trail users to slow and stop prior to crossing. Changes to the streetscape may also provide a cue and traffic calming effect for vehicles.



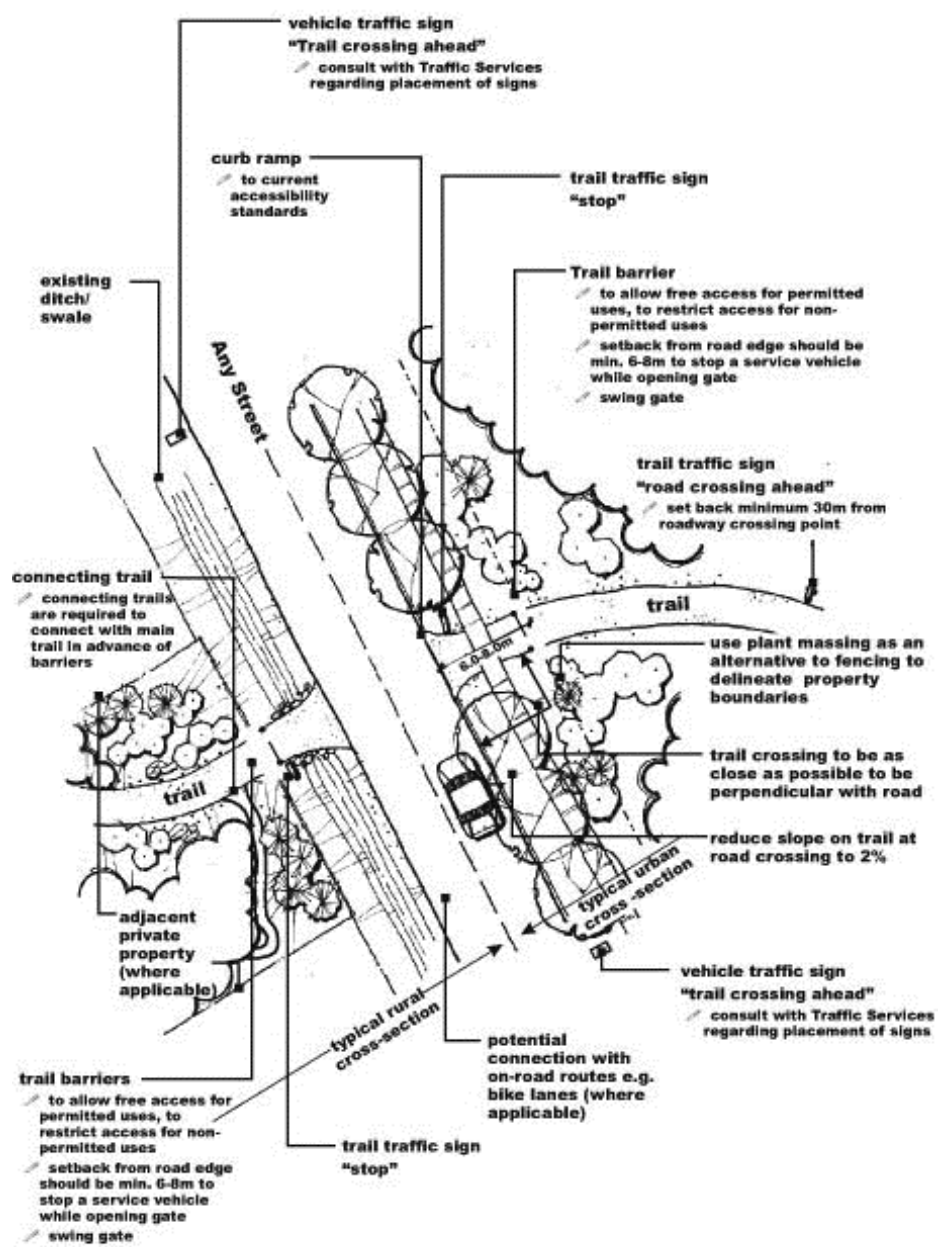


Figure 5.6 - Elements of a Typical Trail Crossing





5.8.4 Active Railway

Currently, in order to establish a pathway crossing of an active rail line, proponents must submit their request directly to the railroad company. Submissions need to identify the crossing location and its basic design. Designs should be consistent with Draft RTD-10, Road/Railway Grade Crossings: Technical Standards and Inspection, Testing and Maintenance Requirements (2002) available from Transport Canada. In the event that an agreement cannot be reached on some aspect of the crossing, then an application may be submitted to the Canadian Transportation Agency, who will mediate a resolution between the parties. Contact information is below.

Canadian Transportation Agency
 Ottawa, ON
 K1A 0N9
 Telephone: 1-888-222-2592



Figure 5.7 - Example of an At-Grade Trail Crossing of a Railway, Newmarket, Ontario





5.8.5 Gates and Barriers

Access barriers are intended to allow free flowing passage by permitted trail user groups, and prohibit access by others. Barriers typically require some mechanism to allow access by service vehicles and emergency access. Depending on site conditions, it may also be necessary to provide additional treatments between the ends of the access barrier and limit of the trail right of way to bypassing of the barrier altogether. Each access point should be evaluated to determine if additional treatments are necessary. Additional treatments can consist of plantings, boulders, fencing or extension of the barrier treatment depending on the location. There are many designs for trail access barriers in use by different trail organizations; some are more successful than others. They can be grouped into three categories: Bollards, Offset Swing Gates and Single Swing Gates.

Bollards

The bollard is the simplest and least costly barrier, and can range from permanent, direct buried wood or metal posts, to more intricately designed cast metal units that are removable by maintenance staff. An odd number of bollards (usually one or three) are placed in the trail bed in order to create an even number of “lanes” for trail users to follow as they pass through the barrier. Although the removable bollard system provides flexibility to allow service vehicle access, they can be difficult to maintain as the metal sleeves placed below grade can be damaged by equipment and can become jammed with gravel and debris from the trail bed.



Figure 5.8 - Example Trail Crossing with Bollards, Aurora, Ontario





Swing Gates

The single swing gate combines the ease of opening for service vehicle access, with the ease of passage of the bollard. Gates also provide a surface/support for mounting signage. The swing gate should provide a permanent opening as shown in the illustration below to allow trail users to flow freely along the trail.

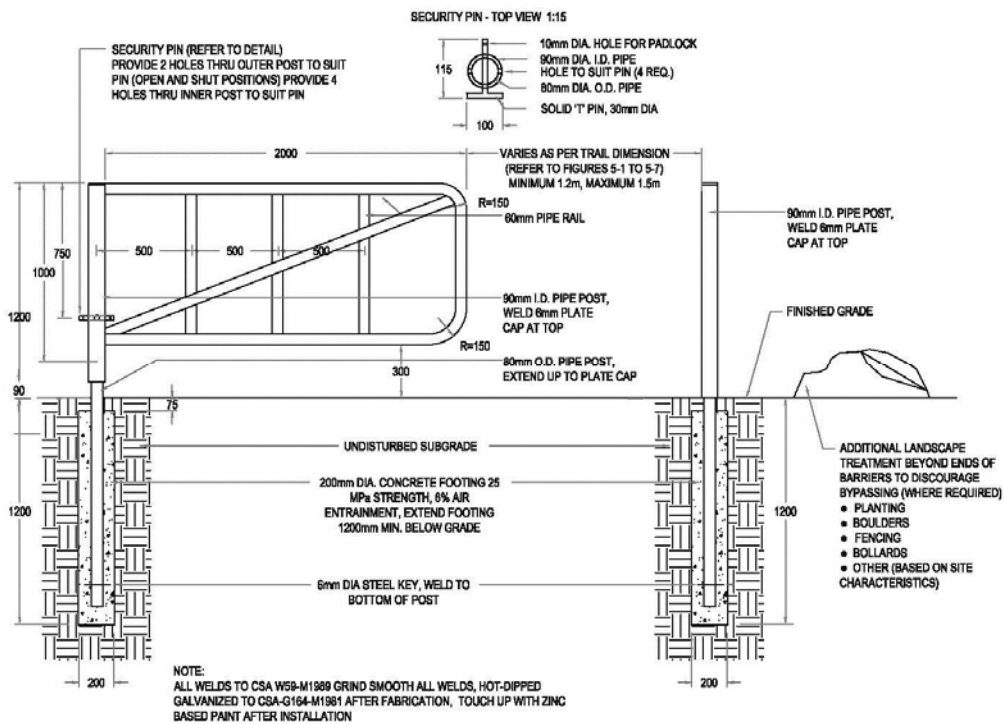


Figure 5.9 - Light Duty Swing Gate Trail Barrier, City of Guelph

The offset gate is similar to the single swing gate, except that barriers are paired and offset from one another. Although they can be effective in limiting access by unauthorized users and can be easily opened by Operations staff, some groups including cyclists, especially cyclists pulling trailers and wheelchair users, can have difficulty negotiating the offset swing gate if the spacing between the gates is not adequate.





Figure 5.10 - An Example of a Swing Gate, North Grenville, Ontario

(Note: that this gate does not provide a permanent opening to allow trail users to flow through freely.)

In urban areas the single swing gate is recommended for most applications. In some locations bollards may be sufficient. In rural locations, a more robust single swing gate should be used.

Recommendation 5-14:

At-grade mid-block trail crossings of collector and arterial roadways should be controlled by a pedestrian signal or pedestrian cross over if a grade separation is not practical, or the trail crossing should be relocated to the nearest controlled intersection.

Recommendation 5-15:

That trail crossings of local minor roads at mid-block locations include advance advisory pedestrian crossing signs on the roadway approaches and a yield or stop sign on the trail approaches.

5.9 OFF-ROAD TRAIL STRUCTURES

5.9.1 Bridges

Where possible, the trail network should make use of existing bridges, including pedestrian bridges, vehicular bridges and abandoned railway bridges in appropriate locations. In cases where this is not possible a new structure will be needed and the type and design of a structure needs to be assessed on an individual basis. The following are some general considerations:





- In most situations the prefabricated steel truss bridge is a practical, cost effective solution;
- In locations where crossing distances are short, a wooden structure constructed on site may be suitable;
- Railings should be considered if the height of the bridge deck exceeds 60 cm above the surrounding grade, and should be designed with a “rub rail” to prevent bicycle pedals and handlebars from becoming entangled in the pickets;
- When considering barrier free access to bridges, an appropriate hardened surface should be employed on the trail approaches and bridge decking should be spaced sufficiently close to allow easy passage by a person using a mobility-assisted device; and
- Decking running perpendicular to the path of travel is preferred over decking running parallel, as the latter is more difficult for use by wheelchairs, strollers, in-line skates and narrow tired bicycles.

5.9.2 Underpasses and Tunnels

Often an underpass or tunnel is the only way to cross significant barriers such as elevated railways and multi-lane highways. Designing trails through underpasses and tunnels can be challenging because of the confined space. Underpasses should be wide enough to accommodate all trail users whether they are traveling by foot, bicycle, in-line skates, wheelchair or other forms of transportation. Where feasible, it is suggested that trail widths through underpasses be equal to or greater than that of the approaching trail.



Pedestrian trail Bridge



Trail Underpass





Recommendation 5-16:

The following are recommended design criteria for underpasses, tunnels and trails through culverts:

- ✓ The minimum recommended underpass or tunnel width for a multi-use trail is 3.6 m. Where the structure exceeds 18 m in length, in high traffic and/or urban areas the width should be increased to 4.2 m or greater;
- ✓ For shorter length underpasses, a vertical clearance of 2.5 m is usually sufficient;
- ✓ For longer structures a vertical clearance of 3.0 m should be considered. If service and/or emergency vehicles are to be accommodated within the underpass, an increase in vertical clearance may also need to be provided;
- ✓ Underpasses and tunnels can be a security concern and also present maintenance challenges. To address these issues, tunnels should be well lit with special consideration made to security, maintenance and drainage. Approaches and exits should be clear and open to provide unrestricted views into and beyond the end of the structure wherever possible;
- ✓ Abutments should be appropriately painted with hazard markings;
- ✓ Offensive graffiti and debris should also be removed promptly and regularly; and
- ✓ Ideally, the transition between the trail and underpass crossing should be level and provide for accessibility. In the case where an underpass crosses beneath ground-level travel ways, ramps should ideally be provided to provide a transition down to the lower grade under the passage, with grade or alignment changes being taken up by the access ramps wherever possible.

5.9.3 Elevated Trailbeds and Boardwalks

Where trails pass through sensitive environments such as marshes, swamps, or woodlands with a large number of exposed roots, an elevated trailbed or boardwalk is usually required to minimize impacts on the natural feature. If these areas are left untreated, trail users tend to walk around obstacles such as wet spots, gradually creating a wider, often braided trail through the surrounding vegetation. The turnpike and low profile boardwalk are two relatively simple yet effective methods for secondary and special use (i.e. hiking only) trails.





The turnpike is a low tech, low cost method that works very well in areas where organic soils are encountered. Various geosynthetic products have also been successfully used to overcome difficult soil conditions.

5.10 TRAIL SIGNAGE

North Grenville is made up of both urban and rural communities which have their own identity. Local identity has evolved over time, in some cases the result of the architecture, landscape, land use, cultural history and residents. Trail themes can add a local flavour to individual trails or loops, creating an overall unique quality to the trail network. It also provides an additional opportunity and incentive for neighbourhood associations and interest groups to become unified as partners in developing and maintaining the trails throughout the entire Municipality.

Other jurisdictions have taken this approach using a variety of methods including:

- Adding a distinct trail name or additional logo plate while maintaining other common design elements of the signs;
- Creating neighbourhood/district gateway nodes in key locations where the edges of neighbourhoods are considered to be; and
- Creating distinct interpretive themes for different neighbourhoods.
- Signage is a critical element of the trail network and serves many important functions including:
 - Providing instruction regarding traffic operations (for both motorists and trail users);
 - Providing information regarding safety while traveling (i.e. maximum travel, upcoming hazards, junctions and crossings);
 - Advertising the network to attract new users;
 - Orienting and guiding trail users as they travel throughout the network, which can also be used as reference points to guide Emergency Services personnel to a specific trail location;
 - Providing information about the routes, nearby services and trail-related events;





- Informing users of their responsibilities while on the network; and
- Providing interpretation of local historical, cultural, natural and other resources.



Figure 5.11 - Trail Signage, North Grenville, Ontario

Good signing systems have common characteristics, including:

- Clearly, concisely and consistently communicate information related to identification, direction, regulation and operation of the trail;
- Informing, but not distracting, trail users and detracting from the visual quality of overall trail experience;
- Graphics and internationally recognized symbols instead of excessive text to overcome language barriers;
- Visibility at night through the use of reflective materials should also be considered in locations where low light and night use is anticipated;





- A design that is timeless, in-scale and visually integrated with the landscape without creating unnecessary clutter; and
- High quality, durable (including resistance to ultraviolet radiation), vandal resistant quality materials and finishes.

5.10.1 Signage Strategy

An effective way of coordinating trails throughout a municipality is by developing a brand to promote the trails network. North Grenville has developed a brand which is currently being used on signs which depict the trails designed under the 150 Kms of Trails project. The use of the signage and the brand should continue to be used and expanded through the development of a Signage and Branding Strategy. The Branding Strategy will continue to support the use of the current logo (as shown below) to depict trail use throughout the Municipality. This logo should continue to be used on the signs along the network and on the website as well as be incorporated into all maps, guides and other promotional materials to promote the trails of North Grenville which will increase awareness and use of the trail system. The logo is versatile enough to be used on multiple sign types and promotional materials and is an attractive and effective tool in identifying trails for users of all ages and abilities. This branding can be used to draw visitors or trail users to different attractions and destinations along the trail or within the Municipality which will promote not only the use of the trail system but also draw new visitors to local activities and venues.



Figure 5-12 North Grenville's Designation Signage [r3]



The signs shown below can be adapted and used by North Grenville as part of their signing and branding strategy.



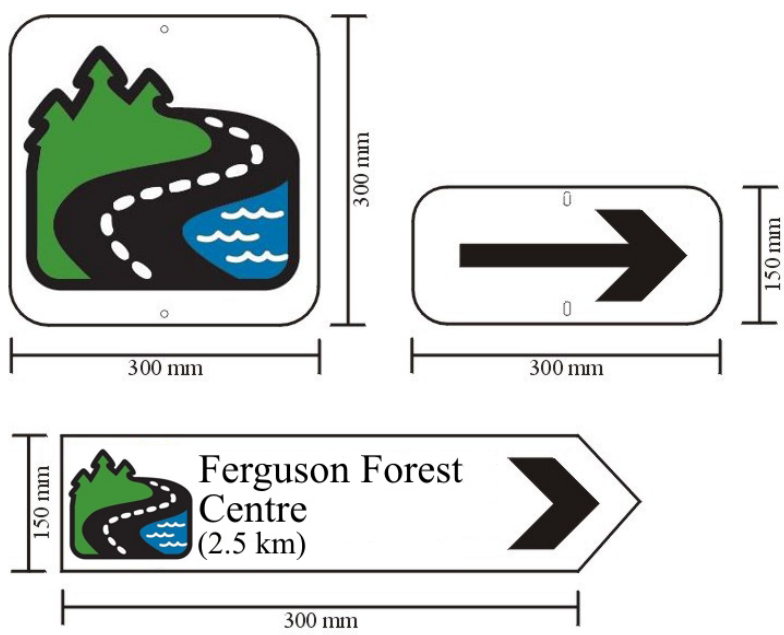


Figure 5-13: Example of Designation Signage

Currently, the Municipality of North Grenville uses the following logo for designation signage to mark their “150 kilometres” trail system which includes:

- Ferguson Forest Centre Management Trail;
- Limerick Forest Chalet Trail;
- Rideau Canal Lockstation – Burritts Rapids Tip-to-Tip Trail;
- University of Guelph – Kemptville Campus Agroforestry Trail; and
- Various on-road routes as identified in the 150 Kilometres of Trails.





5.10.2 Sign Types

The design and construction of the network should incorporate a hierarchy of signs each with a different purpose and message. This hierarchy is organized into a “family” of signs with unifying design and graphic elements, materials and construction techniques. The unified system becomes immediately recognizable by the trail user and can become a branding element. Consistent with this approach is the correct use of signage, which in-turn reinforces the trail’s identity. Generally the family of signs includes:

Orientation and trailhead signs, which are typically, located at key destination points and major network junctions. They provide orientation to the network through mapping, other appropriate network information as well as any rules and regulations. Where network nodes are visible from a distance, the signs can act as a useful landmark. In some municipalities, orientation signing has also been used as an opportunity to sell advertising space. This not only provides information about local services that may be of interest to trail users, but it may also help to offset the cost of signs and/or trails.

“Rules of the Trail” signs, which should be posted at public access points to clearly articulate which trail uses are permitted, regulations and laws that apply, as well as trail etiquette, safety and emergency contact information. Reminder signs may be needed at some locations such as **“Please stay on the Trail”**. At trailheads, this information can be incorporated into trailhead signs. In other areas, this information can be integrated with access barriers.

Regulatory signs, which are required throughout the system. Where traffic control signs are needed (stop, yield, curve ahead, etc.), it is recommended that recognizable traffic control signs be used (refer to the Ministry of Transportation for Ontario’s (MTO) Manual of Uniform Traffic Control Devices, 1996).

Interpretive signs, which should be located at key trail features having a story to be told. These features may be cultural, historical, or natural. Interpretive signs should be highly graphic and easy to read. They should be located carefully in highly visible locations to minimize the potential for vandalism.

Route marker and trail directional signs, which should be located at regular intervals throughout the network and at intersections. The purpose of route marker signs is to provide a simple visual message to users that they are on an approved network route.

Recommendation 5-17:

That the Municipality build upon their logo currently used for the “150 kilometres” trail system by completing a trail signage design and branding study to establish a set of trail signing standards for the Municipality.





Recommendation 5-18

That the proposed trail signing design and branding study include consultation with the Strategy Steering Committee members, local residents, artists and other interested stakeholders, and that this consultation include a public workshop or design charrette.

Recommendation 5-19:

That the Municipality undertake the proposed trail signing design and branding study in 2012.

5.11 TRAILHEADS AND TRAIL AMENITIES

Major trailhead areas are generally proposed for important community destinations such as community centres. Because of their high visibility and proximity to other recreation facilities, they help to raise the profile of the trail system, and some of the necessary facilities and amenities may already be present or located nearby. In some locations it may be possible to share parking and washrooms with other community facilities or other partners (e.g. School Boards for parking, Conservation Authority for parking and washroom facilities). A well-designed trail staging area typically incorporates the following elements:

- Regular and accessible (handicapped) parking with an appropriate number of spaces in relation to the anticipated level of use of the nearby trail, with the flexibility to increase the number of spaces where warranted by future demand;
- Trail access barriers;
- Easy access to and from the trail;
- Ample room to load and unload equipment;
- Secure bicycle parking facilities;
- Waste receptacles;
- Lighting (may or may not be included, depending on location and site context);
- Signing;
- Washrooms;





- Seating and/or picnic/informal activity space (more often associated with a major trailhead); and
- A food concession and/or other entrepreneurial facilities (i.e., canoe rentals, bicycle rentals) may also be available, depending on the size and setting.

A trail gateway is articulated with a sign indicating to the trail user that they have entered North Grenville. This is the first opportunity to introduce the North Grenville trail logo and character of the trail system as expressed through the design of the sign and the trail gateway. In cases where the trail gateway is located in a rural setting it may be limited to simply a sign. Where the trail gateway is in an urban setting or in a prominent location, a more elaborate treatment may be desirable and include a plaza setting with hard surfacing, kiosks, landscape treatments and furnishings.



Figure 5-14: Example of Trailhead Signs in North Grenville, Limerick Forest Chalet Trail and Burritts Rapids Tip-to-Tip Trail, respectively

5.11.1 Seating and Rest Areas

Seating provides the opportunity to pause along the trail at points of interest or just to rest. Young children, older adults and those with disabilities will need to rest more frequently than others. Benches are the most common form of seating, but walls of appropriate height and width, large flat boulders, and sawn logs are some alternatives depending on the trail setting. Where seating/rest areas are planned, the design should consider a 1 m wide level area with a curb or other appropriate wheel stop for mobility-assisted devices. Staging areas, trail nodes and heavily used trails typically require a higher density of seating opportunities. For heavily used trails it is reasonable to provide some form of seating at approximately 500 m intervals.





Recommendation 5-20:

Where seating / rest areas are planned, implement a 1.0m wide level area with a curb or other appropriate wheel stop for mobility-assisted devices. For heavily used trails it is reasonable to provide some form of seating at approximately 500 m intervals.

5.11.2 Washrooms and Waste / Recycling Receptacles

Washrooms must be provided along the trail. Typically, they are located at major trailheads and where possible make use of existing facilities (i.e., at community centres and in major parks). As trail use continues to increase, and as the network becomes denser, it may be necessary to provide additional facilities. Where this is necessary, they must be placed where they can be easily accessed for maintenance and surveillance. Many trail groups have used portable washrooms prior to installing permanent facilities, which provides the opportunity to determine the most appropriate location for permanent washroom facilities before the investment is made in design and construction.

Waste and recycling receptacles are an absolute necessity throughout the trail network. Generally they should be located at regular intervals and in locations where they can be easily serviced. Mid block crossing points, staging areas, trail nodes and in association with other site amenities such as benches and interpretive signs are ideal locations. They must be monitored and emptied on a regular basis to prevent unsightly overflow. Several municipalities are reporting good success with below ground trash receptacles in heavily used areas. These have a larger capacity, are “out of sight” and may result in fewer odours as trash is stored at cooler temperatures.



Figure 5-15: Example of a Trail Lookout/Interpretive Node, Ottawa-Carleton Trailway near Stittsville, Ontario





Recommendation 5-21:

That information signs be provided along the trail and on the Municipality's Trail Network map to identify the location / direction to publicly accessible washrooms and waste and recycling receptacles.

Recommendation 5-22:

Waste and recycling receptacles should be located at mid block crossing points, staging areas, trail and trail nodes and in association with other site amenities such as benches and interpretive signs.





5.11.3 Bicycle Parking

Adequate bicycle parking facilities at key locations throughout the network will allow trail users to confidently secure their bicycles while pausing along the trail, enjoying nearby attractions, reaching their destination, or taking a trail journey on foot. Key locations for bicycle parking include trailheads, major trail nodes and lookouts. Proper bicycle parking facilities should be considered where multi-use trails intersect with pedestrian-only trails. The provision of bicycle parking facilities in these locations along with signing explaining the reasons for restricting bicycle use will help to discourage cycling on unsuitable trails, reinforce trail etiquette and encourage the proper use of the trail system.

Racks, whether as single units or grouped together, should be securely fastened to a mounting surface to prevent the theft of a bicycle attached to a rack. Another alternative is to create a bicycle rack that is large enough that it cannot be easily lifted or moved from its position with bicycles attached. Bicycle racks should be placed as close as possible to the trail facility that it serves, but not in a location where they would inhibit trail user flow.

Generally bicycle parking devices/facilities should:

- Enable the bicycle to be securely locked to the device without damaging the bicycle, and be easy to use without the need for detailed instructions;
- Be placed along key trail routes, connections and other destinations where cyclists are expected;
- Be placed in public view where possible, where they can be viewed by passers-by, trail attendants, fellow workers, etc.;
- Present no hazard to pedestrians;
- Be easily accessible from the road or trail; and
- Be arranged so that parking maneuvers will not damage adjacent bicycles.



Figure 5-16: Bicycle Parking at Transitway Station, Ottawa

Recommendation 5-23:

Establish bicycle parking guidelines for North Grenville, including bicycle parking requirements for new developments as part of the proposed Integrated Community Trails Strategy.





5.12 TRAILS IN NATURAL AREAS AND ENVIRONMENTAL BUFFERS

Trail users often seek natural areas such as woodlots and wetlands where they can find some relief from the urban environment. Natural areas provide opportunities to enjoy and interpret nature, and to pursue some trail activities that are not possible in more traditional parks. In many cases, trails are compatible with natural areas, in some cases they are not. Creating the balance between providing public access and the need to conserve and/or protect the resource itself can be a difficult goal, especially in situations where there is a large population of residents nearby or surrounding the feature. This often serves to increase the pressure on the very resource that users seek and enjoy.

Where trails are to be located in natural areas it is important that they be sited and designed appropriately and that the area be monitored for the effects of inappropriate use and/or overuse. If trails are not carefully planned, designed, constructed and maintained in these areas, people will create their own trail routes sometimes in sensitive locations where it would be preferable not to have trails at all. Proper planning, design and construction of trails, coupled with public education can go a long way to achieving the balance between use and protection.

Change in natural systems is inevitable, especially where there are significant changes in the character of lands surrounding the natural area. Managing change is the key and this involves deciding what an acceptable limit of change should be, and having a plan in place should the change exceed the acceptable limit. Using background ecological data such as the Ecological Land Classification (ELC) system, a natural area can be divided into different zones based on sensitivity to disturbance. Using sensitivity mapping, decisions can be made regarding trail closures, rerouting, design strategies as well as a definition of indicators of disturbance over and above an acceptable threshold. Critical wildlife habitat may also be used in delineating management zones. Consultation with both the Rideau Valley and South Nation Conservation Authorities and the local branch of the Ministry of Natural Resources is recommended as part of the trail design process where sensitive vegetation communities and significant wildlife habitat occur.

In some cases trails (and people) should not be in natural areas. Vegetation communities that are highly sensitive to disturbance and narrow, constrained wildlife corridors are two examples where trails may not be appropriate. In these cases, it is advisable to provide alternative trail routes and information (e.g., signing, public information campaigns, etc.) explaining the management decision to exclude trails from the area. When designing trails through sensitive natural heritage features the following general considerations should include:

- Route or reroute to avoid the most sensitive and/or critical habitats;
- Interpret sensitive species away from their location;





- Consider and evaluate alternative routes and design treatments;
- Balance the effect of alternatives;
- Use previously disturbed areas where possible and appropriate;
- Maintain natural process;
- Limit accessibility;
- Incorporate habitat enhancements; and
- Complement and highlight natural features.

Recommendation 5-24:

Where trail routes are being proposed within environmental buffers surrounding natural sensitive heritage features, the conditions in the buffer (width, slope, etc.) must be sufficient to support the development of a trail such that the intended function of the buffer is not compromised.

5.13 UTILITY CORRIDORS AND TRAILS

Pipeline and hydro corridors, are examples of linear corridors that provide excellent opportunities for trail development and should be considered for the development of trails in North Grenville. Utility lines in urban areas often have a substantial easement, and in many cases are used informally as trail routes, as they tend to provide direct connections to a variety of destinations over long distances. A number of municipalities have recently adopted practices and policies whereby emergency service access must be provided to manholes along sanitary sewer lines in river corridors in the event of an emergency. For example, the City of London now provides emergency service access to sanitary sewer lines running through their valley lands, and these routes are also used as main or trunk trails throughout the city.

5.14 TRAIL ACCESS AND ACTIVE CONSTRUCTION ZONES

Planning for the safety and movement of trail users through construction zones is as important as planning for vehicular movement, and should be considered an integral part of the construction staging and traffic management plan for any project. The Institute of





Transportation Engineers' (ITE) manual for Design and Safety of Pedestrian Facilities⁸ and the American Association of State Highway and Transportation Officials' (AASHTO) Guide for the Planning Design and Operation of Pedestrian Facilities⁹ provide guidelines for the development, management and monitoring of pedestrian walkways through construction zones. The Ontario Traffic Manual Book 7: Temporary Conditions provides guidelines and requirements in the Ontario context for pedestrian and cyclist access through road construction sites. These guidelines can be applied to trail construction zones in areas outside road rights-of-way as well.

Planning for the safe passage of trail users through or beside active construction zones may vary depending on the proximity of the route to the active construction zone, the type and duration of construction and the volume of pedestrian traffic expected.

The designated route must not be used for storage of construction equipment, materials, or vehicles. Furthermore, stopping or parking of work vehicles beside the temporary route should be discouraged as this may indirectly encourage the movement of workers, materials and equipment across the pedestrian path of travel.

Crossings of the temporary route should be minimized. Where construction access routes must cross the path of travel, signals, flag persons or police officers should be considered as a means to control movements. This is most important in high volume trail zones and near locations that children and seniors frequent.

Daily inspection of the temporary route is required. Modifications should be made to adapt to changes in the nature of the construction site, to further direct trail user movement where the route is not functioning as planned or where unanticipated conflict points are observed. Good engineering judgment should always be employed.

Recommendation 5-25:

The Municipality of North Grenville should require a trail management plan for all active construction zones when a trail or trail crossing is impacted. Key principles in the development of an appropriate plan include:

- ✓ Separate trail users from conflicts with work site vehicles, equipment and operations;
- ✓ Separate trail users from conflicts with the main flow of vehicular traffic moving through, around or along side the work site; and



⁸ Donaldson, G.A., in Design and Safety of Pedestrian Facilities: A Recommended Practice of the Institute of Transportation Engineers, March 1998



⁹ American Association of State Highway and Transportation Officials. Guide for the Planning, Design and Operation of Pedestrian Facilities, July 2004





- ✓ Provide trail users with a safe, accessible and convenient route that duplicates as nearly as possible the most desirable characteristics of sidewalks or pathways.

5.15 TRAIL CLOSURES AND REHABILITATION

From time to time it will be necessary to temporarily close sections of trails or entire routes to public access. Situations such as inundation by water, culvert washout or general trail construction are typical reasons for temporary trail closures. As these situations arise, users must be informed well in advance of the closure. If the closure is planned, advance notices should be placed at all access points for the affected section(s). In the event of an emergency closure, notices must be placed at these locations immediately following the discovery of the problem. Signing and temporary barricades, notification in community newspapers, on local radio stations and the North Grenville website are possible methods of informing users of temporary trail closures.

Recommendation 5-26: When temporary trail closures are planned, inform users in advance by placing trail closure notices at all trail access points.

Permanent trail closures may be required at some point in the life cycle of the trail, especially in the case of trails in woodlots and other natural settings. It is important when closing a trail to rehabilitate the landscape to match the surrounding conditions, inform trail users that it has been closed, and to provide reasons for the closure. The following illustration describes the key elements of a typical permanent trail closure and rehabilitation in a naturalized setting, which include:

- Slope stabilization, using engineered material and methods for severely eroded slopes;
- Terracing, using locally collected low-tech materials for eroded slopes of moderate and low severity;
- Live staking using locally collected cuttings from appropriate species;
- Plantings with appropriate native species (may include plants salvaged from nearby sites that will be cleared for development, roadway widening etc.);
- The application of erosion blankets and mulches;





- Seeding with mixes that are appropriate for the site in which they are to be applied;
- Scarification of the surface of the trail to be closed and covering it with forest litter (leaves, branches, and limbs) in a naturalistic manner which can help to reinforce the message that the trail is closed, reduce erosion, and supply nutrients to plants during establishment;
- Placement of a detector object at the beginning of the closure area so that the closure can be detected by visually impaired users; and
- Erecting signage describing the closure to inform users of the conditions and “Water Me” signs for newly planted trees.

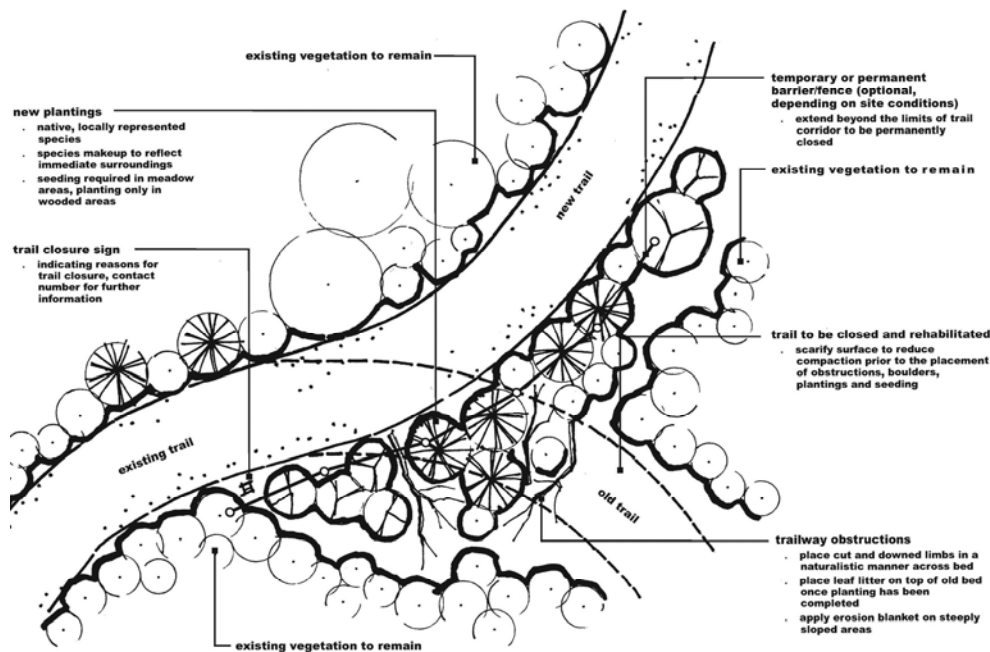


Figure 5-17: Typical Trail Closure and Rehabilitation in a Naturalized Setting

5.16 TRAILS AND NEW DEVELOPMENT

Community trails are an integral part of the urban fabric and are a key component of the recreation and transportation system. New developments must be planned for the efficient movement of people for utilitarian and recreation purposes. This includes not only roads and





sidewalks, but also trails that must make connections among neighborhood destinations and the municipal-wide trail network.

Developers are expected to work through an iterative process with municipal staff, beginning early in the planning stages to create a trail network within their development area that reflects the intent of the Integrated Community Trails Strategy. Providing developers with information about the network, desired connections and design expectations will only serve to strengthen this relationship.

It is expected that proposals for new development areas (both greenfield and infill) will contain a network of on-road bikeways and off-road trails that reflect the density, variety, hierarchy and character that is consistent with the Integrated Community Trails Strategy.

Specifically this implies the planning and development of:

- A network of trails that overcome physical barriers, make appropriate connections to important destinations and enhance connectivity with the existing or planned system of trails surrounding the development area;
- A network of trails that is both sensitive to, and takes advantage of, inherent qualities of the natural and cultural landscape features within the development area; and
- A careful examination of a variety of factors including topography and drainage, slopes, soil conditions, plant and animal communities, microclimate and human comfort, historic/cultural resources, public education opportunities, significant views and vistas should be part of the process to integrate trails in new developments.

In new development areas trails should be constructed prior to or concurrently with the construction of other infrastructure and homes. Where trail construction will not take place until a later date, there is often conflict as residents claim that they were not aware of plans for trail construction even if this intention has been clearly indicated in municipal planning documents. Developers should be encouraged to be very proactive about notifying prospective buyers where trails are to be located at the time they are selling lots. Providing information at sales offices, including information in sales packages and erecting signs in locations where trails are to be constructed may help to alleviate difficulties at a later date.





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