

County of Lanark
IPM Vegetation
Management Plan

CVI IPM Services

County of Lanark

IPM Vegetation Management Plan

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Introduction

Lanark County's long-term vegetation goal is to establish diverse roadsides with abundant pollinator habitat. We restore roadsides by controlling invasive plants, planting or seeding disturbed soil, restoring roadsides following noxious weed control, and by participating in new projects aimed at improving pollinator habitat.

This program relies on Integrated Vegetation Management (IVM) for roadside management which incorporates the use of all methods of control to reduce a weed or brush concern. This is an Integrated Pest Management (IPM) approach to management of vegetation on roadsides and other rights-of-way such as rail lines and power lines.

IVM focuses the methodology of IPM for the management and control of weeds and brush in non-crop areas. These include cultural practices, use of competitive vegetation, biological weed control, planting of allelopathic species that improve pollinator habitat, mechanical, manual and physical vegetation control; and chemical vegetation control (Monet 1992). Control is applied as required to zones of the roadside as well as using targeted methods and physically or chemically selective methods to reduce herbicide use and impacts (Ballard et al. 2004).

IVM principles incorporate the use of two or more methods of control, as opposed to using only one method that may disrupt other vegetation that provides natural control. Alternative vegetation management techniques extend to a multi-level approach using the techniques listed above but also involving administrative and public relations methods including staff training, community involvement programs and public education.

Characteristics of County of Lanark Road System

Lanark County looks after the main roads within the County of Lanark (Appendix 1 provides the road names and numbers), excluding Highways 7 and 15 which are maintained by the province.

Lanark County encompasses the following Towns and Townships:

Towns

- Carleton Place
- Perth
- Smith Falls
- Mississippi Mills

Townships

- Beckwith
- Drummond / North Elmsley
- Lanark Highlands

- Montague
- Tay Valley

The Townships carry out their own maintenance programs such as weed and brush control as needed.

Description

There is a total County road distance of 561 km (1124 lane-km). Roads are two lanes with paved or gravel shoulders and 12 km of urban roads which include 1 km of four lane roadway in Carleton Place. Roadside width ranges from 5 m from edge of gravel to fence line (bush line), to 15 m wide or wider. A ditch is normally present within the roadside and usually marks the edge of the maintained area due to limits on vehicle access (such as mowers) and water location following rain events.

Area Characteristics

The soils and natural vegetation in Lanark County have a major impact on road vegetation control operations. The soils Lanark are in part rocky, limited or none soil areas in the west and north of the county with exposed sections of granite and rocky soil that are not arable land, but remain forested or covered by pockets of significant wetlands, both swamps and bogs. The southern and eastern parts of the country have more agriculturally productive areas of sandy loams or areas of more alkaline soils resulting from the lakebed of the ancient Champlain Sea.

The forested areas in Lanark County fall in the Great Lakes-St. Lawrence Forest region. The natural forests are mixed deciduous and conifer species listed below. The following native forest trees species are example of trees that are brush concerns within clear zones and wild life sight zones within roadsides.

- eastern white pine
- red pine
- eastern hemlock
- eastern white cedar
- white spruce
- balsam fir
- sugar maple
- red maple
- red oak
- basswood
- yellow birch
- white birch
- large tooth aspen

Brush species found commonly on roadsides are wind-dispersed species such as aspen, ash and maples; sumacs which create thickets by suckering; and rhizomatous species such as aspens.

Facilities

The County maintains two office buildings and central patrol yard, two satellite patrol yards, and three gravel pits (Appendix 2)

Public Works Managed Facilities:

Administration & Public Works Building/Garage
99 Christie Lake Road, Perth, ON K7H 3C6

Almonte Depot (Leased property from MTO)
4752 County Road 29 North, Almonte, ON

Union Hall Depot, includes communication tower
1982 Wolf Grove Road, Almonte, ON

McDonald's Corners Pit, patrol yard is same location as pit.
4704 McDonald's Corners Road, McDonald's Corners, ON

King Pit, inactive sand pit north of Tatlock, ON

Bottle Lake Pit, inactive sand pit west of Lavant, ON

Trails

The County maintains four trails covering approximately 94 km in total (Appendix 3):

- Baird Trail (approx. 2 km)
- Conboy Trail (2.8 km)
- Glen Tay - Havelock Trail (approx. 30 km)
- Ottawa Valley Recreation Trail (approx. 61 km)
- Tay River Pathway (Trail) (approx. 1 km)

Vegetative Characteristics with Respect to Vegetation Management Issues

The roadsides, trails and facilities within the county have typical vegetation and specific control issues. It is critical to include control noxious and invasive weeds that are present at low levels, such as phragmites, Japanese knotweed, dog-strangling vine and wild chervil and poisonous invasive noxious weeds such as giant hogweed that may come in from neighbouring regions. Control is much easier to achieve when these species are present at low levels. Leaving these plants to expand on their own results in the momentous task of controlling wild parsnip in Lanark County.

Agricultural areas

- Shoulder zone either paved or ballast (gravel)
- Mown, grassed zone in most areas along road from 1 to 3 m. wide
- Typical roadside of grassed and natural species right up to fence line
- Natural wet-area vegetation in zones
- Issues include
 - Poisonous species for children, workers and farm animals
 - Wild parsnip, giant hogweed, cypress spurge, leafy spurge and poison ivy are noxious weeds in Ontario
 - Other noxious weeds
 - Other noxious weed species include thistles, ragweed, knapweed, sow thistle, wild chervil, dog-strangling vine and buckthorn,
 - Milkweed is no longer a noxious weed
 - Tall weeds or brush interfering with site lines
 - Maintenance of ditches for runoff water including the noxious weed phragmites

Rural property areas

- Shoulder zone either paved or ballast (gravel)
- Mown grassed zone in most areas along road from 1 to 3 m wide up to ditch line
- Vegetation types in the zone beyond the ditch line
 - Grassed and natural species in roadside typically right up to fence line
 - Natural wet-area vegetation in zones
 - Natural mixed vegetation right up to fence line
 - Natural woody vegetation right up to fence line, especially in northwest part of the county
- Issues include
 - Poisonous species for public especially children
 - Wild parsnip, giant hogweed, cypress spurge, leafy spurge and poison ivy are poisonous noxious weeds in Ontario
 - Tall weeds or brush interfering with site lines
 - Adjacent to agricultural and horticultural properties
 - Other noxious weed species include thistles, ragweed, knapweed, sow thistle, wild chervil, dog-strangling vine and buckthorn
 - Maintenance of ditches for runoff water including the noxious weed phragmites

Forested areas (Great-Lake St. Lawrence forest type) with or without rural properties

- Shoulder zone either paved or ballast (gravel)
- Few areas with grassed zone along road from 1 to 3 m wide up to ditch line

- Other areas with rocky terrain and rock cuts limiting vegetation along roadside and access beyond ditch line
- Vegetation beyond ditch line
 - o Natural woody vegetation right up to fence line
 - o Natural mixed vegetation right up to fence line
 - o Natural wet-area vegetation in zones
- Issues include
 - o Poisonous species for public especially children
 - Wild parsnip, giant hogweed, leafy spurge and poison ivy are poisonous noxious weeds in Ontario
 - o Trees, brush and tall weeds interfering with site lines
 - Critical need for driver safety to see animals crossing from beyond the safety clear zone
 - o Maintenance of ditches for runoff water including the noxious weed phragmites

Facilities (non-public) and gravel pits

- Grassed zones in non-crop areas, paved or ballast (gravel) loading areas; paved parking or equipment areas; and paved or unpaved laneway areas
- Issues include
 - o Poisonous species
 - o Noxious weeds in agricultural areas
 - o Invasive weeds in forests and natural areas such as dog-strangling vine
 - o Maintenance of access
 - o Snow storage
 - o Maintenance of ditches for runoff water including the noxious weed phragmites

Public facilities and trails

- Grassed, ballast (gravel) or paved parking and equipment areas
- Paved or unpaved laneway areas
- Natural mixed vegetation areas
- Natural wet-area vegetation in zones
- Issues include
 - o Poisonous species as indicated above
 - o Noxious weeds in agricultural areas (see above)
 - o Problem invasive weeds in forests and natural areas such as dog-strangling vine
 - o Maintenance of safe access (concern with poisonous species)

Vegetation Goals for Different Types of Areas

Lanark County has the long-term vegetation management goal to establish roadsides with a diverse and extensive pollinator habitat. It is important to carry out plantings or rely on naturalization to increase the diversity of flowering species along roadsides in Lanark County.

Roadside plant diversity for IVM management includes

- A diversity of natural species that flower throughout the growing season to support pollinator insects
- Dense vegetation cover to provide natural, biological weed control
- Species that provide natural, biological tree and brush control

It is critical to carry out vegetation control operations with the long-term vegetation management goal in mind. The use of spot applications wherever possible limits injury to desirable roadside plant species.

Within the County, there are mown grassed zones along most roadways. Beyond this strip or beyond the ditch line, the vegetation ranges from cultivated turf and herbaceous species to a woody and herbaceous species mix.

Suitable planting mixtures for roadside and facilities vegetation include:

- Grassed areas where desirable
 - o Low maintenance turf species on roadsides
 - o Medium maintenance turf species for regularly mowed areas in facilities
- Competitive old field and other herbaceous species for tree and weed control
 - o Include species such as competitive ferns
 - o Naturalized or planted or seeded
 - o List of species in Appendix 4
 - o Lanark County native seed mixes in Appendix 5
- Legume communities are generally planted, often combined with turf species
 - o Crown vetch
 - o Bird's-foot trefoil
- Short and low-lying shrub species
 - o Naturalized or planted
 - o List of species in Appendix 4
- Short tree species of suitable mature height
 - o Naturalized or planted
 - o List of species in Appendix 4

Integrated Vegetation Management (IVM) Program

Monitoring

Monitoring is the backbone of an effective IVM program. The purpose of monitoring or carrying out weed audits is to record the general or exact locations of the weeds or brush of concern for planning, for information and to for contract management. This includes information for direction of contractors, providing digital weed location data to contractors, and quality control activities relating to completion and effectiveness of control work.

Monitoring focuses on primary weed concerns and for planning of future control work. Monitoring also focuses on recording of effective competitive-pollinator vegetation cover, that was planted or that established naturally.

The needs for monitoring can change from season to season. Timing can be based on program needs, weeds species stage of growth or on treatments. Monitoring records can be used to track progress of control of specific weeds

- For example, the inventory map in Appendix 6 shows roads with wild parsnip infestations and density of infestations in 2015 (Appendix 6)
- The comparison sample inventory map in Appendix 7 shows roads with wild parsnip infestations and density of infestations in 2021 (Appendix 7)
- These two maps show the progress made in wild parsnip control programs over the 6 growing seasons

Examples of weed monitoring information includes:

- Weed/brush species and locations
 - o In safety clear zone include any species of weeds or brush above 0.6 m mature height
- non-treat zones
 - o 5 m is a workable length that can be left untreated for truck mounted applications
 - o 1 m is a possible workable length that can be left untreated for hose and hand-gun applications
- On other roadside areas and facilities areas
 - o Poisonous plants, primarily wild parsnip and poison ivy are the top weeds of concern
 - o All noxious weeds in agricultural areas
 - o Problem invasive plants such as common reed grass (phragmites) and wild chervil
 - o New invasive/noxious weeds that are of concern including giant hogweed and dog-strangling vine species that are both present in neighbouring municipalities
 - o Tall herbaceous plants and brush

- That can obscure entry of deer, moose and other animals onto road and that will attract these animals.
 - Weeds that can spread into safety clear zone
- Other items to potentially monitor
 - Sensitive areas such a wetlands and other non-spray zones that can be digitally provided to contractors
 - Desirable and planted vegetation that should not be damaged by operations
 - This information can be permanently located on the County GIS and updated as needed

Regular required monitoring

Monitoring for early detection of invasive and noxious weed locations is critical to provide cost effective and complete control.

Universal use of EddmapS (current version) is recommended as a tool or parallel storage for all weed locations and to update reports following successful control

- Regularly download reports of weed locations from EddmapS and other online source by County Staff
 - On a monthly or seasonal basis
- Promote to public to use EddmapS for any sightings or tracking information they have

In addition to the regular annual monitoring of roadsides, other County operations could incorporate early detection monitoring of invasive species during regular work by County staff. Any reports would be followed up by critical, same season visits and a complete monitoring of the site in question

- Monitoring by weed inspector for noxious weed locations
- Monitoring during work by road patrols, other road maintenance staff and staff inspections of road infrastructure

Support this work

- Provide a list of species of concern
- Provide monitoring sheets or a digital monitoring link for devices
- Provide digital links with photos of the species of concern

Public Reporting as an additional source of early detection

- Use of Lanark County website as one option for public reporting as well as a site for weed information
 - Provide information on invasive and noxious weed of concern
- Promote EddmapS use with public

Timing of monitoring

- Pre-season control plan at the time suitable to determine weed cover and for contract preparation
- Weed species-based timing
 - o Wild parsnip
 - in fall after seedling emergence and to monitor rosettes
 - in spring from early May to the end of May to monitor seedlings and rosettes
 - o Poison ivy, sumac and dog-strangling vine are visible in September/October with fall red/yellow colour and seed heads or spent seed pods
 - o Phragmites that is uncut will be fully emerged by July ahead of fall treatment
 - o Giant hogweed in early summer with large leaves and flower heads from June to August
- Quality control monitoring incorporating post-season/pre-season monitoring
 - o Treatment based timing
 - Where weed(s) was previously detected and recorded
 - Where treated in previous years
 - o Control monitoring intervals will be determined by treatment impacts on weed/brush plants
 - Two months after treatment (if applicable for the herbicide used)
 - Weed species based for effectiveness monitoring
 - For wild parsnip and poison ivy evaluate August to September
 - Evaluate wild parsnip (fall treated), dog-strangling vine, phragmites (common reed grass) and giant hogweed evaluate in early summer after spring emergence
 - o Revision to control plan
 - evaluate weed control and new invasions
 - in-house field review of program
 - preliminary contract information

Monitoring Procedures

Monitoring process will be different on facilities and trails, but the monitoring process will follow a similar procedure.

Quality control and post-season/pre-season monitoring is done to evaluate control programs, review control result and for planning operations the following season. The purpose is to review:

- Initial symptoms of herbicide impact on weeds within a week while retreatment is possible
- Effectiveness of each herbicide program on controlling the weed targets
- Follow-up control if required in treated area
- Application concerns
 - o Weather
 - o Applicator
 - o Buffers
 - o Non-spray zones
- Consider IVM needs such as herbicide rotation
- Adjust programs for following season
- Compare control programs from year to year and over period of years

Monitoring Process on Roadsides

Monitoring (auditing) is carried out on specific weed and brush species as well as the location of non-spray areas including sensitive habitat areas, the locations of effective competitive-pollinator vegetation cover and other non-spray zones:

- weed/brush species
- non-treat zones
 - o 5 m is a workable length that can be left untreated for truck mounted applications
 - o 1 m is a possible workable length that can be left untreated for hose and hand-gun applications
- road section identifiers
 - o road asset identifiers
 - o latitude and longitude (using GPS)
- methods used to identify weed and other vegetation patches
 - o start/stop (linear), point or polygon (most accurate, time consuming)
 - o additional information on width across the roadside or size of control area, weed/brush species, characteristics

Linear method is commonly used because it relates to on/off control of application equipment. Additional information is required on the width of the weed patch as to whether additional far-reaching nozzles need to be operated on application equipment or if off-road equipment or backpack equipment is required.

If only a narrow zone along the roadside is to be treated, then this additional information may not be required.

Monitoring Process on Trails and at Facilities

Monitoring on trails and around facilities would be carried out for similar reasons, but control operations are commonly done manually with hose and handgun or back-pack sprayers. Monitoring would be done of specific weed and brush species as well as the location of sensitive areas and non-spray zones.

- Weed/brush species
- Non-treat zones
 - o 1 m is a workable length that can be left untreated
- Location identifiers
 - o Latitude and longitude (using GPS)
 - o How to identify
 - Start/stop, polygon, point
 - Information on size, width across trail, laneway or other areas for control
 - Recording of hard features to use as location markers (or use of ones previously recorded) such as rail lines, buildings, fences

The linear method of data collection would be suitable for monitoring weeds on trails. Additional information is required on the width or area of the weed patches (or use of polygon method) for contract management and planning.

Weed/Brush and Vegetation Recording Sheets

It is recommended that a method of digital recording be used to keep a record of the locations and background information on areas of problem weeds/brush and of non-treat zones. Recording Sheets or digital files could be filled in during regular monitoring and/or patrol operations.

- Ability to be printed off if required
- Suggested information
 - o Physical location (unless recorded by GPS)
 - o Weed species (botanical and/or common name)
 - Take and enter photo if not sure of species
 - o Zone along road
 - o Estimated or measured width of area (indicated which)
 - o Density
 - o Control concern
 - o Person requesting control and contact info (where applicable)

Storage of Collected Information

- The final required step for all monitoring information is entry on the Country GIS system. This allows for future reference and for comparison between monitoring periods.

- Additionally, as mentioned above, regular (monthly or seasonal) download should be made of reports/updates of weed locations from EddmapS
- Recording weed/brush locations
 - Use of GIS in County Mapping System
 - Building on the program already in place
 - Locations
 - Using road section identifiers (up to 10 km long)
 - Using GPS (or other identifiers) – way points (latitude and longitude)
 - All entered-in county GPS program

Use of Monitoring Information

- Pre-season planning
 - Program planning
 - Budgeting
- Contract management
 - Contract preparation based on areas needing treatment
 - Use for information to contractor
 - Digital or hard copies
 - Quality control
 - Program revision and planning
 - In fall or early spring for treatments required following season
 - Tracking progress from year to year and over period of years
 - Collect and maintain photographic record of progress
- Herbicide application
 - Control of GPS operated sprayers
 - Exact treatment locations can be programmed
 - Include sensitive habitat areas, locations of effective competitive-pollinator vegetation cover and other non-spray zones
 - Sprayer operators can also take records
 - Exactly where treatments applied
 - Amount of herbicide used
 - Date and time of application
 - This information provided to client in digital or paper format

Zonal Management with Height Thresholds

Vegetation control and maintenance activities can be done in stepped zones along the roadsides or in set areas (from point A to point B as an example) to reduce the total area of control activities and to provide a natural transition to the neighbouring vegetative cover. With this type of spot management, the desirable vegetation will fill in the area over time due to self-seeding or vegetative growth.

In areas with zones of suitable, non-weedy vegetation, the amount of herbicide used will be reduced due to spot application. This will reduce the area for control, increase the area of pollinator habitat and will reduce costs. Figure 1 provides two examples of zoned roadsides. The top photo shows a zone of competitive sumac that is tall along the forest edge controlling invading weeds and brush. The roadside zone has mown grasses and other low vegetation. The other example (below) shows a zone of dense brambles along the brush line with a mown grass/low vegetation zone along the roadside. The brambles (red fall colour) in the roadside on the right area have prevented maple seedling growth (yellow fall colour) which has occurred on the left side of the photo.



Figure 1. Zonal roadsides showing natural growth of sumac (top) or naturally established raspberry controlling weed red maple and brush growth (bottom). These species flower at different times of the season.

Appendix 9 shows a zoned cross-section of a typical road in Lanark Country with the zone designations for the turf/clear zone and wildlife zone with acceptable heights of mature vegetation within each zone.

Monitoring should reflect these zones or spot designations. These zonal designations can be recorded on the County GIS maps for reference and for contract management so they can be protected when desirable and competitive species are present.

Zones

Zones will be defined based on acceptable mature plant heights based on specific roadside/trail geometries and usage. The zones include the physical Shoulder Zone, Ditch Zone and Fence Line Zone.

Linear Roadside Physical Zones

These are the physical zones along the roadside relating to physical design and terrain of the roadside.

- Shoulder Zone is along the roadside
 - Width of 1 to 15 m or to the ditch line
 - Slopes off from road pavement for road drainage
- Ditch Zone is any wet areas on the ROW of any shape
 - Generally artificial wetlands
- Fence Line Zone is composed of different types of terrain and vegetation
 - Remaining zone from ditch to fence line
 - It includes intersections, horizontal curves or other large areas that are part of Fence Line Zone

Zones Safety Height Standards for Roadside Vegetation

These height zones are not related to physical zones but are based on the safety requirements for traffic, public safety and maintenance. The heights and widths of these zones can vary (Appendix 9)

Safety clear zone

- First 7 m from the shoulder (from the roadside cross section)
- Vegetation goal is to be 1 m or less to provide clear line of sight for drivers and maintenance workers

Wildlife sight zone

- Width of 1 to 15 m
- Other vegetation including mature herbaceous and woody plant height limit of 1.2 m to 1.5 m
- Could be right to the fence line on narrow ROWs

Remaining areas beyond Wildlife Sight Zone

- No mature plant height limit

Safety barrier requirements

- Clear of all vegetation
- Standard of 2 m wide typically and 1 m wide in sensitive areas such as wetlands

Landowner Maintained Non-spray Zones

- Set-up with landowner agreements
- Areas being maintained and clean of weeds of concern by landowners
- Maintained to meet County Zone Safety Height Standards
- Potential areas for planting of competitive species that provide pollinator habitat
 - o Plantings must be in appropriate zones to meet County Zone Safety Height Standards

Vegetation Zones along Recreational Trails

- 1.2 m height within 2 m from trail ballast
- Reduces encroachment of vegetation into the ballast
- Safety factor for trail traffic that is crossing and passing
- Any height of vegetation beyond 2 m from the trail ballast

Operational Vegetation Characteristics in Zones

Suitable vegetation characteristics will be used in designated zones

- Based on parameters such as physical qualities, prevention and habitat qualities, vegetation community heights, site location and usage of each site
 - o Mature height
 - Maximum mature height of 1.5 m for herbaceous and woody species in wildlife sight zones (typically zones beyond ditch line)
 - o Competitive ability
- Established stands of competitive and pollinator habitat species are the ideal vegetation to protect and develop where suitable within the roadside ROW
 - o Both herbaceous and woody species

Control Through Prevention

Personal Protective Equipment Concerns

For any work in poisonous weeds such as wild parsnip, poison-ivy and giant hogweed use of personal protective equipment (PPE) to prevent skin exposure is important for staff, contractors, volunteers and any public working on their properties.

The Ontario Invasive Plant Council's (OIPC) "Wild Parsnip Best Management Practices in Ontario" contains a detailed guide of safety gear, proper use and removal procedure and clean-up in case of accidental exposure.

http://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/OIPC_BMP_WildParsnip_Feb182014_FINAL2.pdf

Organization of operations along with equipment cleaning is essential for effective, long-term control of wild parsnip and common reed grass (Phragmites) control and will assist in poison-ivy control. Both these minimize equipment movement of seed or other plants parts to new areas.

Pattern of Operations to Reduce Human Weed Spread

Organization of operations within a day or a defined period of work, along with equipment cleaning are essential for wild parsnip, common reed grass (Phragmites), dog-strangling vine, and poison-ivy control. Both these approaches minimize equipment and people movement of seed, rhizomes and other plant parts of invasive and poisonous species such as wild parsnip, dog-strangling vine, phragmites (common reed grass) and poison ivy.

Annual basis

- Ideally control work and mechanical operations such as mowing, ditching and construction-related operations should occur at the time of the season when there are no seed or flower heads present or prior to seed head development on the weeds of concern
 - o For example, with wild parsnip this ideal period would be fall to late spring when only rosettes are present and new seed heads have not formed
- The appropriate timing for other species would be earlier in the growing season before flowering or fruit-set depending on the species

Project basis

Where any invasive weed species are located, mechanical operations such as mowing, ditching and construction-related operations should ideally be done from the least

infested areas within the County or least infested local sites, working toward the more heavily infested areas or sites.

- Use county map of weed audits to determine organization of operations on a regular basis
 - Adjust the operations plans as weed locations become known and as weed database is updated
 - Even adjusting operations organizations on each job site will minimize weed spread, for example from dense patches.
 - Effective equipment cleaning during these operations will reduce the spread of seed and other plant parts (propagules)
- A wild parsnip audit was completed in 2015 prior to 2015 and 2016 work (Appendix 6). Audits of wild parsnip have been completed yearly since then.
- In 2021 a wild parsnip weed audit was completed as part of monitoring prior to the control work in 2021 and the quality control work ahead of the 2022 season (Appendix 7).

Mandatory Equipment Cleaning to Reduce Human Weed Spread

Equipment cleaning should be required for all mechanical operations coming in contact with weedy vegetation, including mowing, ditching, weed control and construction operations.

It is highly recommended to discuss the importance of this equipment cleaning for invasive plant control during start-up meetings for any contract operators doing work within the County.

Research has characterized the movement of plant propagules by workers and equipment including seeds and plant parts that can regenerate into new plants.

- Various studies have found that worker as vectors can collect up to 400 seeds per 100 m on their boots. It is important to realize how effectively boots collect seeds – in one situation they found 63 viable purple loosestrife seeds on a pair of boots.
- Not cleaning one's boot before moving further on the site would result in purple loosestrife spread if the worker then walked through the wetland or down a wet ditch.
- ATV equipment collects up to 1,100 to 3,100 seeds per km.
- Tracked equipment contributes about 10 times that of ATV's due to plants parts being captured by the inside and outside of the tracks.
 - This convoluted track structure makes tracked equipment more difficult to clean and necessitate more time required for thorough equipment cleaning.

Research on a powerline in New York State found that rights-of-way were more invaded near areas with early successional (undeveloped) cover, weedy vegetation and near residential areas (Dovciak, M. I. *et al.*, 2017 and Quant J.M. *et al.*, 2015). Movement was worse in wet conditions with dew or following rain since wet seeds stick more easily and drainage run-off will carry seeds of various sizes. Seed can move throughout the year in unexpected ways such as in collected snow (Figure 2).

The New York study found that invasive plants made up about 7% of the plants moved. Any movement of pieces or seeds of one invasive plant can start a new infestation. Seven percent of 1,100 seeds from an ATV (see above) could potentially produce 77 plants.

The study also evaluated cleaning techniques. Scaping/brushing alone of equipment missed at least 30-50% of the plant propagules collected. Power washing was required to get a more effective cleaning before moving the equipment.



Figure 2. Remember that seed can be moved at any time of the year requiring invasive weed control in County sites such as snow dumps. Melt and run-off of the seed contaminated snow piles can spread seed through streams and ditches.

Equipment cleaning should be required:

- start-up equipment cleaning before any equipment with a new/returning contractor is first brought on-site or at the County office before starting work
- for all mechanical operations coming in contact with weedy vegetation, including mowing, ditching and some weed control and construction operations
- before equipment leaves a work site to return to the respective shops for the day
- or before equipment moves to a new area for work

The Ontario Invasive Plant Council (OIPC) has developed a clean equipment protocol for use by industry for all potential of equipment and vehicles. This procedure could be

required for all contracts during the growing season on Lanark County sites and be initiated for all Lanark County staff work. This is critical for Lanark staff since these workers are on Lanark County roadside sites regularly throughout the year.

It is highly recommend that equipment cleaning use the “Clean Equipment Protocol for Industry” developed by the Ontario Invasive Plant Council (Appendix 1, Full protocol: https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf One page summary (shown below in Appendix 1): https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/CEP-One-Page-Summary_FINAL.pdf

It is important to incorporate clean equipment procedures in contracts

- All ditching, mowing and plant control work. Construction projects may already have equipment cleaning procedures that the clean equipment procedure can be incorporated into.
 - This can be written into RFP’s, contracts, and in-house procedures
 - Bids without acknowledgment of the clean equipment procedures could be returned to have it amended in the contract
- On site methods to leave seed where found:
 - Washing after scraping and brushing which removes an extra 30 to 50% of plant parts
 - Cleaning equipment on each vehicle
 - Brushing and washing both equipment and boots
 - 95 L (25 gallon) tank and power wash hose
 - Alternatively, an option is to have mobile cleaning equipment moving from site to site or to have cleaning stations on job sites
- Regular inspections of cleaning as part of quality control inspections
- Recreational trail cleaning stations should be set-up with signage combined with other promotional information boards about noxious weed control

Herbicide Choice and Rotation

For optimum results, it is important to match herbicides used to the weed/brush species being controlled. Post treatment monitoring will indicate whether control was effective and if there are unexpected results that are widespread that may indicate development of herbicide resistance.

Herbicide resistant individuals of plants are present in all plants populations. Overuse of any herbicide could result in development of herbicide resistance to that family of herbicides. Rotation of herbicides used is important to preventing resistance from building up.

- Products with combinations of two herbicides assist in delaying resistance.

- Rotate to herbicides with different families of chemicals or *change to a different method of control such as mechanical methods* every few years to control any herbicide resistant plants that are present
- Use of cultural methods and competitive vegetation whenever possible to augment control

Control in Areas with Public Access

Herbicide use is limited in areas with public access so control must be focused on mechanical and cultural methods including use of competitive vegetation.

It is important to review the products permitted in these areas since the list of acceptable products changes on a regular basis to include additional products.

Options for Control of Specific Weeds

Worker knowledge

All workers carrying out weed control operations must have training in both the identification of weeds to be controlled and identification of the desirable and competitive plants that should not be disturbed

- This moves from the concept that if a plant is not a grass then it is a weed
- This reduces disturbance of specialized plantings and destruction of areas of competitive plants on roadside and trail areas
- Regular site visits as part of contractor monitoring could support the program by conducting on-site confirmation and verification of the existing desirable plants with the contract weed control staff

Control of Site Line (Tall) Weeds and Weeds along Guide Barriers

- Annual, biennial and perennial weeds (see specific weed issues below)

Mechanical/manual control

- Mowing or manual cutting
- Cutting weeds will reduce weed height but will not kill the weeds
 - Regular mowing or manual cutting can reduce the height of vegetation in the safety clear zone and along guide rails. It will not control many biennial and perennial species so these will regrow, but if mowing/cutting is done regularly, it will maintain a safe height for safe road operations and to maintain visibility.

- Scalping and very, low cutting heights that are less than 15 cm (6 in) will reduce the vigour and thickness of the roadside turf since it reduces the depth of rooting of the turf
 - Roadside turf grows under stressful conditions so any additional stresses such as scalping will kill turf areas requiring re-establishment of these areas

Herbicide control

The benefit of herbicide control is to kill the biennial and perennial weeds. Spot applications of post-emergence selective products can be used to control emerged weeds and retain the grasses. Selective applications can be either *physically selective*, applied as spots applications or as broadcast to specific areas or *chemically selective* using products such as herbicides that kill broad-leaved weeds but do not affect the grasses.

Spot applications should be used to target the weeds and reduce the amount of herbicide application whenever competitive species are present.

- Selective broadcast applications can be done on sections of a roadside with a vehicle mounted sprayer, turning the sprayer on and off for various lengths of roadside
- Spot applications can also be done with hose and handgun from a vehicle or by walking with back-pack sprayers
 - Hose and handgun or back-pack applications are suitable for control of individual weeds or groups of weeds within desirable/competitive vegetation or within sensitive sites

Combinations of herbicide treatments are more effective to control a wider range of weed species than either herbicide alone and will have a slower development of resistance. Note that resistance can still develop so rotation of herbicides or methods of control every few years is required.

Combination programs

- Mowing followed by herbicide application once weeds have regrown to proper stage for effective herbicide control
 - This method is used for phragmites control but regrowth of any weeds to the *correct developmental stage for control, for example flowering, is essential* for effective control
- Cut-surface treatments should be applied to all cut woody plants at the time of cutting
 - Provides the best and least expensive control using cutting (compared to return visits to control escapes or for application of herbicide to plant regrowth)
 - Saves time and reduces the need for return visits to site

- Stem/basal bark or foliar applications of herbicides on woody plant regrowth after cutting

Control by competitive, weed resistant vegetation communities

There are compatible/competitive species that often develop naturally on site to provide weed and brush control while maximizing natural pollinator habitat. Incorporating zones of this permanent vegetation should be utilized as an additional, biological weed and brush control.

In addition, areas of these plants are being seeded or planted. Lanark developed a suitable seed mix and has recently updated the mix (Appendix 5). Many of these species are unavailable as seed plants or are difficult to transplant or seed. The mixes that have been developed have been found to be effective for spot planting or cooperative planting of roadsides.

- Planted, competitive species that will survive in gravelly areas adjacent to roadsides
- When manually removing weeds, immediately replant with Lanark seed mix in any disturbed spots or areas. Carrying a mix of seed combined with dry sand, vermiculite or soil is ideal. Alternatively small patches of erosion mat can be put on the spot with staples.
- Planted competitive species beyond ditch line – bird’s-foot trefoil, crown vetch, native competitive species (Appendices 8 to 9)
- Naturally occurring, competitive species wherever they occur and meet the height requirements of the zones they are in
- Regularly mown, *medium to high maintenance* turf
 - Note that the low maintenance, thin turf that is typical of unmown, unfertilized and non irrigated roadside sites is not competitive against weed/tree invasion
 - Yearly fall fertilization is an option to thicken turf
 - Over-seeding with a suitable seed mix is an option for thin areas (Appendix 8)
 - It is critical that mowing or other maintenance does not scalp, compact or stress the turf plants
 - The above ground height of turf plants reflects the depth of the root system

Natural vegetation has grown on all roadsides beyond ditch line and where turf planting has not occurred. In many places, this results in natural competitive species occurring

in monocultures and mixed plant communities. A list of suitable, native, competitive species has been provided in Appendix 4.

It is important to identify competitive species on an ongoing basis for several reasons:

- Established stands can be encouraged to thrive and spread within the roadside providing additional pollinator habitat
 - o Signage of these areas will assist in contract management as well as promote the program to the public
- Established stands of these competitive species can compete with adjacent weedy infestations
- When 5 m long or larger areas of these competitive species are not infested with weeds of concern, roadside herbicide applications or maintenance operations can easily avoid these pollinator habitats as 'sensitive' areas (non-spray zones)
- Appendix 4 provides additional, native species that are suitable for planting or seeding in adjacent areas or other parts of the County. These species are being used in the Lanark seed mixes and cooperative plantings
 - o The suitability of these species for planting has been based on:
 - Level of competitiveness against invading tree species
 - Whether they readily establish by seeding or transplanting
 - Whether they are available as seed or planting stock
 - o Species such as black-eyed Susan and evening primrose grow naturally in many areas and are readily available by seed
 - These species add colour
 - Since these species (especially black-eyed Susan) germinate readily they can be used as a contract tool to provide a visual marker for effective completion of seeding
 - These two species grow in scattered, open patches and as a result are not competitive against weed or tree invasion
 - o In contrast, New England aster, other asters and goldenrod species are common throughout Lanark County. These species have allelopathic qualities, that is natural chemicals that inhibit growth of other plants and seedlings. They also growth in vigorous, dense stands that spread readily. These characteristics make stands of these species highly competitive against tree and weed seedlings (Figure 3). Their seed availabilities may change from year to year, but usually several species are available.
 - o Many woody shrubs and short trees provide dense, often allelopathic cover that reduce tree invasions on sites (Figure 1, bottom)

- Ballard, Whittier and Nowak from New York State have prepared an excellent reference guide, *Northeastern Shrub and Short Tree Identification. A Guide for Right-of-way Management*. These include most of the species suitable for Lanark County roadsides.
- Many of these species can be seeded

Control of Brush

Mechanical/manual control

- Mechanical mowing
 - Regular mowing of scattered brush can reduce the height of woody vegetation in the safety clear zone
 - Mowing *will not kill* broad-leafed woody species, but it will maintain a safe height for safe road operations.
 - Mechanical mowing when brush becomes very dense does not control the trees, since there will be vigorous regrowth of the stumps/stems the following year
- Manual cutting of trees will reduce the stand but there will be vigorous regrowth of the stumps/stems the following year up to 3.5 m in the first season due to the established root systems
 - Manual cutting below the first stem (generally less than 5 cm) will kill conifers.

Herbicide control

- *Spot foliar applications* and *basal bark/stem applications* are superior for control of individual or small groups of woody weeds within desirable/competitive vegetation or within sensitive sites (Figure 4) since there is usually no follow-up work required.
 - Less disturbance to site, no clean-up required as with cutting and not follow-up herbicide application required which reduces the cost.
 - Less issue of missing of stems than with cut-surface treatments to cut stumps
- Spot applications of foliar post-emergence products will control brush during the growing season
 - Applications must be done to plants less than 2 m in height
 - Spot applications can be done on sections of a roadside with a vehicle mounted sprayer, turning the sprayer on and off
 - Spot applications can be done with hose and handgun from a vehicle or with back-pack sprayers.

- Basal bark stem/streamline or other lower bark applications of herbicides will control individual trees at any time of the year.
 - o These applications use substantially less herbicide than foliar herbicide applications and result in less brown-out.
 - o If done in the fall or winter, the effect is more natural.

Combination programs

- Cut-stem control of brush
 - o Cutting of brush followed by herbicide cut-stem applications (cut-surface applications) or foliar herbicide applications in subsequent years will kill and prevent regrowth of brush
 - o Herbicide application needs to be done immediately after cutting
 - o It is more efficient to do a cut-surface application at the same time as cutting
 - Only one contract visit to the site is needed so reduces cost
 - The location of cut stumps is known to the contract staff doing cutting

Control of brush by competitive, weed resistant vegetation communities

Planted competitive species or naturally occurring competitive species that prevent tree germination and growth beyond ditch line will reduce the invasion of trees and many weeds. These native species are excellent pollinator species that can be seeded or that develop from natural stands.

It is important to observe what local species have the impact of reducing problem brush and to add them to the list of compatible vegetation on a regular basis. For example, in Figure 1 the thick cover of red raspberry effectively reduced the red maple seedling establishment on this site from falling seed from the forest trees. Many roadside areas in Lanark County are covered by natural stands of *Juniperus communis*, ground juniper.

Competitive species that reduce tree and weed establishment

- Competitive species include bird's-foot trefoil, crown vetch, specific aster and goldenrod species, brambles, low junipers, dense low tree/shrub species and many other native competitive species (Appendix 4).
- Native herbaceous plant communities (Figure 3) and woody (short tree and shrub) communities (Figure 1) provide thick cover and dense shade, shading out wild parsnip and other weed seedlings or preventing their growth with natural chemicals.
 - o These plants also provide dense protective cover for rodents that in turn promotes herbivory of woody plants (Niering and Egler 1955, Bramble et al. 1990) – the feeding by animals on plant stems, seedlings and seeds.

- Goldenrods and aster species have allelopathic qualities that reduce tree and weed seedling establishment and growth due to chemicals left by plant debris of these species (Brown 1967, Horsley 1977) as well as aggressively competing with and shading out tree seedlings (Figure 3)
- All these species enrich pollinator habitat
- Physically selective control will be required to remove any invading tall tree species of any size that develop in these native zones to limit injury to the planted or naturally occurring competitive species
 - Control work is easiest and least expensive when these trees are young since there is less disturbance to site; no clean-up required as with cutting and no follow-up herbicide application required which reduces the cost.
 - Knowledgeable workers will be able to distinguish between young stems of tall trees as opposed to desirable shrubby or short tree woody species.
 - Example of physically selective treatments are spot applications including foliar, basal bark or cut stem treatments
 - Foliar treatments can be spot application with back-packs or physically selective applications with HTV/truck mounted sprayers with hose and handgun
 - Basal bark or cut stem would be spot application with back-packs

Control of Weeds Affecting Roadside Barriers, Pavement and Other Structures

Mechanical/manual control

- Mechanical and manual mowing
 - Regular cutting or mowing can reduce the height of vegetation around structures
 - Regular grading of ballast will disturb seedlings and reduce weed growth
- Mechanical removal from ditches
 - Mechanical removal of plants and debris limiting water flow in roadside ditches (ditching) carried out to remove dense or tall plants and other material
- Neither operation will kill biennial and perennial species, but if done regularly, can maintain a safe height for operations
- Species such as phragmites will regrow vigorously from the remaining root system requiring more frequent cutting for effective height control

Herbicide control

- Spot applications or physically or chemically selective broadcast applications of foliar post-emergence products with residual control will provide season-long control around structures, along guiderails and in maintenance yards.

- If products are used with no residual control, repeated applications will be required during the growing season requiring more herbicide product.

Combination ditching control

- Foliar chemical control of invasive perennial weeds prior to ditching operations
 - Requires planning and coordination to achieve effective control ahead of the required plant disturbance by ditching
 - Control may need to occur in dry conditions
 - Involves multiple departments for effective operation
- Follow with mechanical control to remove plant detritus from ditches
 - Final step of mechanical removal of plants and debris limiting water flow in roadside ditches (ditching) carried out to remove dense or tall plants and other material
- The combination will control species such as phragmites by killing the root system to prevent re-emergence.

Weed Species of Concern in Lanark County

Weed control issues

Site lines (tall) weeds

Noxious weeds affecting agriculture

Brush

- Any tree species that will grow to a mature height too tall for operations or that will impede visibility in a specific zone
- Does not include competitive shrub and short tree species

Weeds affecting road structure

Specific invasive and/or noxious species of concern

- Wild parsnip
- Poison ivy
- Sumac
- Phragmites (Common reed grass)
- Dog-strangling vine
- Japanese knotweed
- Giant hogweed (being monitored since present in neighbouring Counties)



Figure 3. Zone of allelopathic flat-topped aster and goldenrod species under a power line on a roadside in Ontario



Figure 4. Directed spot treatment of these woody plants with minimal impact on competitive, native cover on a right-of-way in Ontario

Weed Issues in Specific Areas

Production agriculture areas within county

- Identified limits for control activities are based on neighbouring land use
- Poisonous weeds - parsnip, poison ivy, giant hogweed
- Noxious weeds in Ontario
 - o Include Canada thistles, some biennial thistles, knapweed, dog-strangling vines, European buckthorn, leafy spurge, kochia, sow-thistles
http://www.omafra.gov.on.ca/english/crops/facts/noxious_weeds.htm
 - o In areas affecting agricultural (including horticultural) operations
 - o Note that no milkweed species are noxious weeds
- Site lines (tall) weeds

Rural residential areas and towns

- Poisonous weeds – wild parsnip, poison ivy, giant hogweed
- Site lines (tall) weeds

Recreational trails and maintenance facilities

- Poisonous weeds – wild parsnip, poison ivy, giant hogweed
- Zone width each side of trail or facility
 - o Generally 2 m on each side of trail
 - o Changes as required or as per location

Safety barriers and ditches

- Phragmites (common reed grass), sumac
- Common safety barrier weeds that hide barriers – sweet clover, ragweed, phragmites (common reed grass), grasses
- Tall weeds impacting site lines

Information on problem weeds (see section below for wild parsnip)

Poison ivy

- Biology relating to control and spread
 - o Perennial woody species with different forms – low or tree climbing
 - o Flowers in late May or early June
 - o Main spread is by birds dispersing seeds
 - Horizontal spread of stems is minor, reportedly less than 10 cm per year (Mulligan and Jenkins 1977)

- Movement of seed by maintenance equipment, vehicles, recreational vehicles, and workers or visitors to site
 - Especially in wet or dewy conditions
 - Forms patches by rhizomes or viny stems that can transfer systemic herbicides
 - Herbicide uptake is effective at time of full leaf emergence, flowering or later
- Source of infestations to be aware of as related to control
 - Local, nearby infestations on neighbouring properties as far as local birds fly.
 - Movement of seed by maintenance equipment, vehicles, recreational vehicles, and workers or visitors to site and along paths.

Staghorn sumac (sumach)

- Benefits of sumac on roadsides
 - Strong soil and bank stabilizer that out-competes invading weeds and brush due to dense, shading canopy.
 - Total control on roadsides is not recommended.
 - Zonal plantings along fence line/forest edge are desirable on roadsides for brush control and erosion protection.
 - Concerns about animal visibility could require control of as much as 50% of the roadside depth of sumac or in specific areas such as corners with wildlife sightline concerns.
 - Control in these areas will be a regular on-going operation
- Biology relating to control and spread
 - Perennial species with extensive, spreading root system
 - Forms dense thickets due to suckering from roots
 - Red, showy fruits that remain on stems over winter
 - Cut stems break down and seal over within an hour after cutting
 - Herbicide uptake best when flower bud present, also in winter
 - Application timing not as critical, since winter or spring applications can be effective
- Source of infestations as related to control
 - Local, nearby infestations on same or neighbouring properties Underground roots sending up new shoots from root suckers
 - Capital projects
 - Important to provide input to limit locations of designed plantings of sumac
 - Use of alternative species such as grey dogwood or low growing sumac species.

Phragmites (common reed grass)

- Biology relating to control and spread
 - Perennial, grass species with aggressive rhizomes/ stolons

- Flowers late in year from late August on
- Reproduces primarily by rhizomes but also by seed spread
- Prefers wet sites, but will grow in range of conditions including dry, gravel maintenance yards
- Impossible to physically remove plants and rhizomes
- Herbicide uptake at time of flowering or later. All foliage required for optimum herbicide uptake
 - Mowing or cutting plants right before treatment reduces foliar area and in turn reduces amount of herbicide plant takes up
 - Early mowing and treatment of regrowth is effective if plants are allowed to develop mature leaves
- Source of infestations to be aware of as related to control
 - Movement of seed and rhizomes/stolons by road maintenance equipment (ditching equipment), road vehicles, operations that disturb the soil, recreational vehicles
 - Seed movement on the boots and clothing of workers or people that drive, ride or walk-through plants. Especially in wet or dewy conditions
 - Capital projects
 - Bringing in or movement of contaminated soil

Dog-strangling vine

- Biology relating to control and spread
 - Perennial plant propagated *only by seed*
 - *One older publication indicates that dog-strangling vine has rhizomes, but this is not true*
 - Only reproduces by seed which is wind dispersed
 - Plant has a crown that produces multiple, viny stems each season
 - Important to remove isolated plants or groups of plants first which are easiest to control and will limit spread to new areas
 - Large infestations difficult to control due to dense growth that limits walking and seed bank; require multiple year program of control treatments with follow-up monitoring
- Source of infestations to be aware of as related to control
 - Local, nearby infestations on neighbouring properties especially on windward side due to wind dispersal of seed
 - Movement of seed by maintenance equipment, vehicles, recreational vehicles, and workers or visitors to site. Especially in wet or dewy conditions

Giant hogweed

- Biology relating to control and spread
 - Short-live perennial, dies the year that it flowers

- Has a crown and a deep taproot
 - Spread by seed only, but 98% of seed germinates in the first year
 - Heavier seed wind or water dispersed a short distance of about 10 m but will float longer distances in water
- Source of infestations to be aware of as related to control
- Local, nearby infestations on neighbouring properties up to 10 m away from fence line
 - Due to water dispersal of seed, monitor for locations around water bodies
 - Soil movement due to ditching, cultivation, and capital projects
 - Movement of seed by maintenance equipment, vehicles or recreational vehicles (Figure 5).
 - Important to remove isolated plants or groups of plants first which will reduce further spread.
 - Concentrate on high-priority areas such as popular natural areas, area along water ways or areas at sides of trails where people may encounter plants

Control of Weed Species of Concern

Control of Wild Parsnip

Biology relating to control and spread of wild parsnip

- Short-live perennial, dies the year that it flowers (sometimes called a biennial)
 - Has a crown and a taproot
 - Spread only by seed, seed lasts 2 to 3 years
 - Up to 80% of the seed germinates in the year after dispersal with less than usually less than 10% germinating the year of dispersal (Baskin and Baskin 1979, Hendrix 1984)
 - Since the plant is frost hardy, seed germination will begin early in the spring (April through May in Lanark County)
 - Seed wind dispersed a short distance of about 5 m up to a maximum of 13 m.
 - Produces a low rosette until the year of flowering, can survive up to 6 years in shaded, poor, crowded conditions
 - In the spring, the rosettes which will not bolt (flower) emerge about a month earlier than plants which will flower (Baskin and Baskin 1979)
 - Susceptible to disturbance that cuts the root just below the crown
 - Foliar herbicides absorbed by green, rosette foliage
- Source of infestations to be aware of as related to control
- Local, nearby infestations on neighbouring properties up to 10 m away from fence line
 - Possible water dispersion of seed
 - Soil movement due to ditching, cultivation, and capital projects

- Movement of seed by maintenance equipment, vehicles, recreational vehicles, and workers or visitors to site. The seed will move on equipment, vehicles or clothing and boots especially in wet or dewy conditions.

Protection from wild parsnip toxicity

PPE important for worker and volunteer protection from toxic plant juices. Suitable protection or shields should be used for all work. Equipment and PPE cleaning is required before leaving any site to reduce spreading of seed to other sites.

Once dry the plant juices lose toxicity.

Control Process for Wild Parsnip Infestations

The process of control of wild parsnip is based on the location of the infestations, the size, the density and continuity of the wild parsnip patches.

Control is done by on/off selective broadcast application to larger continuous patches that have no breaks in the infestations. This can also apply to dense areas or areas of light, continuous cover of wild parsnip.

Patches of wild parsnip can be controlled by spot application of selective broadcast methods or by hose and hand-gun application to smaller patches. Smaller patches can be effectively controlled by hand grubbing of plants with removal of seedheads from the site.

Seed head removal can be combined with mowing and other mechanical control.

Natural development of competitive vegetation and spot planting of any disturbed site with custom seed mixes will reduce wild parsnip re-establishment over time.

Mechanical/manual control of wild parsnip

- Does not control wild parsnip seed present in the soil
- Cleaning of equipment is critical between sites to reduce movement of seed
 - Combined benefits of removing seed and cleaning toxic plant juices from equipment to protect workers
- Plan mowing operations to move from less densely infested to more densely infested areas
- Mowing Wild Parsnip to Prevent Seed Production
 - Wild parsnip plants die after flowering, so mowing flowering plants is not necessary to control the plants

- To prevent seed set, it would be necessary to mow after each cluster (umbel) has flowered but before seed set which is very difficult for the following reasons
 - Timing one or two mowing operations per season is extremely difficult, especially with contract mowing of many roads
 - Wild parsnip plants have variable flowering times starting late May, peaks in July and August in Lanark County area, continuing to late summer
 - Within each plant, flowering of different umbels varies over 10 to 14 days
 - In addition, seeds are shed on primary umbels up to a month before tertiary umbels, so some umbels will have seeds when others are starting to flower
- If mown too early the plant just re-flowers
- If mown too late, the operation ends up spreading seed and spreading the infestation
- Regular weekly or bi-monthly mowing of high maintenance turf will prevent flowering and seeding
 - Only suitable for turf
 - Mowing is not suitable for sites with established herbaceous and woody short tree/shrub species, since mowing decreases the competitive ability of these companion species or even kills them
- Manual Removal of Seed Heads to Reduce Seed Load on a Site
 - Wild parsnip plants with seeds are clipped between the nodes to prevent reflowering
 - Clipping can be used to prevent plants from seeding late in the season or to prepare a site ahead of mowing.
 - Seedheads are collected in garbage bag which are sealed and left to sit in full sun, so the seed debris decompose naturally before disposal
 - This prevents seed spread at waste sites
 - Co-operators could perform this method as well
 - Suitable PPE is a requirement
- Hand digging or grubbing (using a spade for example) both very effective in killing established wild parsnip if the roots are cut just below the crown
 - No concern for plant removal if done early in season before wild parsnip starts flowering
 - Black garbage bag mulching of pulled plants is critical for flowering plants, but not necessary with rosettes before flowering
 - Suitable PPE is a requirement. This is generally a safer method early in the season due to shorter height of early season rosettes if removed plants are left or are handled carefully to avoid skin contact
 - Co-operative projects could use hand digging or grubbing method as well

- Hand pulling plants is very effective especially in wet or very dry soil conditions which makes the root easier to pull out
 - Black garbage bag mulching of pulled plants is critical for flowering plants, but not necessary with rosettes
 - Co-operative projects could use this method as well
 - Suitable PPE is a requirement
- Mechanical cultivation is very effective in killing established wild parsnip if the roots are cut just below the crown
 - If done early in the season, there will be no spread of new seed
- Apply a custom seed mix to fill in the gaps left by wild parsnip after hand removal or digging or reseed cultivated areas. This replaces and enriches the disturbed vegetation with competitive, pollinator-friendly species.

Herbicide control of wild parsnip

- Application of post-emergence product to control rosettes in late spring or fall, ideally before flowering
 - Fall treatment programs can extend to early October since wild parsnip is not frost sensitive and will absorb product if the foliage is green (Scott Olan, OMECC, personal communication), however herbicide activity may be slower as the temperatures fall
 - Window from late August to early October
 - Spring applications when foliage has fully emerged ideally before flowering
- Two to four consecutive years of herbicide application or other controls would be required to exhaust the seed bank and break the cycle of re-infestation
- Ideal to combine application (tank-mix with) with a residual product to control new seedlings especially on ballast, along guiderrails and other open sites

Resistant vegetation communities for wild parsnip

- Regularly mown, medium to high maintenance turf can provide some control of wild parsnip and can be treated with selective broadcast applications
 - Note that *low maintenance, thin turf* is not competitive against wild parsnip
 - Regular high mowing (20 cm), over seeding of thin areas and yearly fertilization will thicken up turf areas

- Low mowing will scalp turf and starve the turf root system making it more shallow and less tolerant to stress
- Crown vetch
- Native herbaceous and short tree and shrub woody communities that provide thick cover and dense shade, shading out wild parsnip seedlings
 - Goldenrods and aster species have a dense, very competitive cover and allelopathic qualities that reduce wild parsnip seed establishment (due to chemicals left by plant debris that inhibit plant establishment and growth) as well as aggressively competing with and shading out wild parsnip seedlings (Kenney and Fell 1990, Kline 1986)
- It is important to observe what local species have the impact of reducing wild parsnip and to add them to the list of compatible vegetation.

Public relations for wild parsnip

- Signage of problem areas or include on trail information signs
 - Identification characteristics of wild parsnip with photos
 - Steps to prevent movement of seed
- Scrubbing stations with signage for vehicle/bicycle/shoe cleaning
 - Identification characteristics of wild parsnip with photos
 - Steps to prevent movement of seed
 - Possibly include scrubbing stations for trails along the roads

Control of Common Reed Grass (phragmites)

Mechanical/manual control

- Mowing or cutting is effective if done at least 4 to 5 times per year
 - Cleaning of equipment critical between sites to prevent rhizome or seed spread
- Physical removal of root/rhizome not effective.
- Movement of contaminated soil is a serious issue.

Herbicide control

- Foliar herbicide application using effective herbicides, made to plants in the fall is most effective
 - Window when flowering from late August to early October
 - Spring applications not effective
- Cutting of plants is not recommended before product applications since this reduces amount of foliage and thus amount of product taken up.
 - If cut, let plants regrow to full height before treating

Replant with resistant vegetation communities

- Using transplants for fast establishment in disturbed sites
- Re-vegetate as soon as possible after total control or to sections or spots as controlled
- Plant communities suitable for wet areas
 - Native wet area herbaceous or low height woody communities that provide dense shade and aggressive growth
 - Goal would be competitive wet area species such as joe-pye weed, meadowsweet spirea, steeple bush spirea, wet area asters and goldenrods (suitable for transplants or seeding), (Appendix 4)
 - Regularly mown, medium to high maintenance turf
 - Solid bird's-foot trefoil, tall fescue along wet areas (both suitable for seeding)

Control of Poison Ivy

Mechanical/manual control

- Repeated cultivation provides effective control since poison-ivy does not readily establish from stem fragments

Herbicide control

- Foliar herbicides at appropriate time of year to fully emerged leaves, preferably before flowering
- Combined with residual product to control new seedlings.

Replant with resistant vegetation communities

- As with wild parsnip, replant with communities that reduce poison ivy establishment from seed spread by animals

Public Relations

- Signage of problem areas or include on trail information signs
 - Identification with photos
 - Steps to prevent movement of seed
- Scrubbing stations for vehicle/ bicycle/shoe cleaning

Control of Sumac

Mechanical/manual control

- Mowing or brush mowing or hand cutting
 - Mowing will reduce height, but large root remains intact, and plants will regrow and branch to produce thicker, denser stands
 - Would need to be repeated multiple times per year
 - Will impact other pollinator habitat and competitive, tree preventing species that may be present

Herbicide control

- Foliar systemic herbicides applied in late summer or fall once flower buds have formed is most effective since translocation will kill whole plant even if part treated
 - Treatment at any time of year provides good control
 - If less than a quarter of the plant is treated, then only part of the plant will be controlled.

Combination treatments

- Brush cutting followed by stem herbicide treatments ideally within an hour only control the part of the sumac plant that was cut, but rest of plant remains viable.
 - Example of cut-surface product for control – 3 to 5 years of control then seedlings or rhizomes of remaining plant moved back in, but plants never grew back to original size.

Cultural Control

- Provide information on alternative species to grow instead of sumac for designers choosing plant material for Capital contracts or other developments
 - Other shrubs, low sumac species or low tree species (See Appendix 4)

Control of Dog-strangling Vine

Mechanical/manual control

- Mechanical equipment nor manual control do not control dog-strangling vine seed in soil; follow-up monitoring required

- Cleaning of equipment is critical between sites to reduce movement of seed
 - Mow from less densely infested to more densely infested areas
- Black garbage bag mulching of seed pods (if seed present) and pulled or cut crowns of the plants is important
- Mowing
 - Single mowing will not kill dog-strangling vine plants
 - Mowing at least 2 times per season will keep viny growth down to allow access to areas and control new seedlings.
 - To kill plants, mowing would need to be repeated on whole area at least 4 times per year for a number of years
 - Mowing is not suitable for sites with established herbaceous and woody short tree/shrub species, since mowing decreases the competitive ability of these companion species or even kills them
- Hand pulling stems can control small stands with repeated pulling over several years
- Hand digging of crowns is very effective in killing established dog-strangling vine if all the crown is removed
- Clipping to remove seed pods before dispersal eliminates seed production

Herbicide control

- Post-emergence herbicide program required to control plants
- Two consecutive years of herbicide application required to control all emerged plants on medium dense and densely covered sites
 - In very heavy stands, a second application in first year will kill plants shaded from spray in first application
 - Application the second year required to control escapes and new seedlings
- Follow-up monitoring and control necessary to control any new seedlings
- Identification of sources of wind-blown seed and control of these other areas is critical for permanent dog-strangling vine control.

Control of Giant Hogweed

Mechanical/manual control

- Mechanical control is not recommended due to the risk of sap on the equipment, risk to workers and movement of seed on equipment

- Hand digging (using a spade for example) is very effective in killing first or second year giant hogweed plants
 - Best and most effective to conduct early in spring when foliage is small
 - Critical to remove all the crown and entire tap root or plants will re-grow
 - Only effective with young plants since tap root up to 1 m deep in older plants
- PPE important for worker protection from toxic plant juices especially considering plant height

Herbicide control

- Post-emergence herbicide program to control established plants
 - Foliar application once leaves are full size in late spring/early summer
 - Follow-up application later in season, which allows two treatments per season, and in subsequent years to control escapes and new seedlings
- Follow-up monitoring and mid season control necessary to control any new seedlings
- PPE important for worker protection from toxic plant juices especially considering plant height (Figure 5)



Figure 5. Giant hogweed growing along a trail in central Ontario. The establishment of new plants along the trail because of seed dispersal is evident in the photo.

Herbicide Information

- Publication 75 Guide to Weed Control
- Produced by OMAFRA
 - <http://omafra.gov.on.ca/english/crops/pub75/pub75toc.htm>
 - Registered herbicide and control recommendations for roadside vegetation management
 - Sections on wild parsnip, poison ivy and other poisonous and invasive weeds
 - effectiveness of rating of herbicides of weed species and brush species
 - Updated every two years

Decision Trees for Primary Weeds of Concern

Wild Parsnip Decision Tree					
Limits of Location	Infestation	Vegetation Goal	Method	Issues	Effectiveness and follow-up
Any area or No spray zone due to homeowner or environmental sensitivity	Less than 50 plants	Turf with accessible wild parsnip*	Low mowing at least bi-monthly	Homeowner or contractor – cleaning of equipment for safety and spread	Good to poor* Repeat required at least 1 to 3 years for rosettes and new seedlings
Any area or No spray zone due to homeowner or environmental sensitivity	Less than 50 plants	Herbaceous species or shrubs	Spudding or hand pulling*	PPE and disposal of poisonous plants	Excellent Repeat required at least 3 years for missed rosettes and new seedlings
Any area that is flat and accessible for mowing equipment, 3:1 slope or flatter	Patches or solid zones of infestation	Turf with accessible wild parsnip*	Low mowing at least bi-monthly	Contractor – cleaning of equipment for safety and spread	Good to poor* Repeat required at least 3 years for rosettes and new seedlings
Any area	Patches or solid zones of infestation	Turf, herbaceous species or shrubs	Targeted herbicide application, product with selectivity if possible	Re-vegetation of areas where majority of plants injured	Excellent Repeat required at least 2 years for missed rosettes and new seedlings.
Area suitable for re-seeding	Less than 50 plants	Turf, tall herbaceous species, shrubs	Glyphosate applications for spring/fall and following spring at pre-planting; cultivation	Establishment with plugs/plants established site sooner. Seedling less expensive.	Excellent As indicated, repeat herbicide application required at least 1 year to missed rosettes and new seedlings.

*Field observations have found that mowing sites with established herbaceous and woody shrub species decreases competitive ability of companion species and increases density of flowering wild parsnip stems. Poorly timed mowing can increase the number of wild parsnip the following year.

Poison Ivy Decision Tree					
Limits of Location	Infestation	Vegetation Goal	Method	Issues	Effectiveness and follow-up
No spray zone due to homeowner or environmental sensitivity	Less than 20 plants	Herbaceous species or shrubs	Hand cutting or low mowing	PPE, poisonous sap on equipment; disposal of plant material	Suppression Repeat required yearly until infestation controlled
Any area	Patches or solid zones of infestation	Herbaceous species or shrubs	Targeted herbicide application, product with turf selectivity if possible.	Pre-emergence control as part of product to prevent seeding-in	Good to excellent Repeat required yearly to get misses and new seedlings

Glyphosate is less effect in fall. Some products provides foliar control as well as pre-emergence control to prevent selective control of new seedlings and is option for fall control in turf areas.

Sumac Decision Tree					
Limits of Location	Infestation	Vegetation Goal	Method	Issues	Effectiveness and follow-up
Any area or no spray zone	Small patches	Turf with access	Mowing 2-3 times per year		Good - suppression Repeat yearly
Any area or No spray zone	Small patches	Herbaceous species or shrubs	Manual cutting 2-3 times per year		Good - suppression Repeat yearly
Any area	Patches or solid zones of infestation	Turf with access	Low mowing 1 or 2 times per year		Good - suppression Repeat yearly
Any area	Patches or solid zones of infestation	Turf, herbaceous species or shrubs	Targeted herbicide application, product with selectivity if possible.		Excellent to suppression, depending on application Repeat every 2 nd to 3 rd year

Foliar spray less effective due to hairy foliage. Cut and treat to fresh cut stems most effective.

Common reed grass (phragmites) Decision Tree					
Limits of Location	Infestation	Vegetation Goal	Method	Issues	Effectiveness and follow-up
Any area or No spray zone due to homeowner or environmental sensitivity	Small patches	Turf with access	Low mowing 4-5 times per year		Good - suppression Repeat yearly
Any area or No spray zone due to homeowner or environmental sensitivity	Small patches	Herbaceous species or shrubs	Manual cutting 4-5 times per year		Good - suppression Repeat yearly
Any area	Patches or solid zones of infestation	Turf with access	Low mowing 4 times per year		Good - suppression Repeat yearly
Any area	Patches or solid zones of infestation	Turf, herbaceous species or shrubs	Targeted herbicide application in fall to un-cut plants	Re-vegetation of areas where majority of plants injured	Excellent to suppression, depending on application Repeat every 2 nd to 3 rd year

Re-vegetation with transplants is possible after total control. Goal to have competitive wet area species.

Legislation Specific to Weed Control Programs

Pesticide and Application Legislation

Federal Pest Control Products Act

- Deals with sale, storage, use, transportation and disposal of pesticides
- Registered pesticides have specific weeds listed
- Health Canada/ PMRA has a label search site
<http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>

Provincial Pesticides Act and Ontario Regulation 63/09

- Applicators must have required licence
- Roadside herbicide control operations and recommendations require an Industrial Exterminators Licence including Public Works IPM Certification
- Public trail control operations require a Landscape Exterminators licence including applicable IPM certification (confirm with local OMECC representative based on site characteristics)
- Also determines posting requirements and worker training requirements
<https://www.ontario.ca/page/pesticide-licences-and-permits>
- IPM Reporting
 - OMECC requirement for each Property Operator
 - copies of herbicide usage on all properties on file by March 31 each year
 - to meet April deadline

Timing legislation

- Migratory Birds Convention Act limits herbicide application or maintenance work including cutting or mowing in areas frequented by migratory birds during nesting.
 - These areas should be marked as environmentally sensitive areas.

Buffer requirements

- Specific buffers are laid out on each herbicide label
 - Product and site specific
 - Relates to specific conditions such as location of water bodies, soil type or sensitive vegetation
- Avoid specific designated protected areas and wetlands

Noxious weed legislation

- Control of noxious weeds is required in areas affecting agricultural (including horticultural) operations
- There are currently 25 weeds considered noxious in Ontario. These include wild parsnip and poison ivy. No milkweed species are considered noxious in Ontario.
 - o Listed on OMAFRA Noxious Weed site with information links on many of the weeds.
http://www.omafra.gov.on.ca/english/crops/facts/noxious_weeds.htm

Seeding/Re-vegetation of Disturbed Areas

Both low maintenance turf and legume communities such as crown vetch or bird's-foot trefoil can be seeded in. Other seed mixes can be used to establish native herbaceous or low height woody communities.

The type of seed selected for planting will depend on the property use adjacent to the road (farm, residential, rural homes or forested).

In low maintenance sites such as roadsides, unmaintained zones around facilities and along trails, seeding will not replace the natural regenerating vegetation, but will mix in with natural regeneration to provide the desired character. Even when seeding turf or legumes, there will be naturalized species mixed into the final vegetation.

Seeding with Competitive Species that Reduce Weed and Tree Infestation

- Options for establishment that may be quicker than natural regeneration
 - o Seeding/planting with natural regeneration 75
 - enriching the natural site so that new vegetation will dominate.
- A sample seed native aster goldenrod Old Field seed mix has been included (Appendix 8) (Cain 1997).
- A similar mix is found in MTO OPSS 804 specifications with incorrect seeding rate.
- Native Old Field seed mix
 - o use of native aster and goldenrod species that establish easily from seed
 - o longer establishment period compared to improved turf species
 - erosion mats or other erosion products maintain site; provide protection for germinating plants; and results in more even growth
 - nurse grasses provide early competitive advantage against annual and biennial weeds and provide early cover
 - nurse grasses at low rates using fast growing, short-lived, clumping species such as perennial ryegrass give way to permanent once established

Re-seeding of Roadside Turf Following Road Construction or Disturbance

- MTO seeding turf seed mixes, legume and native seed mixes and the standard seeding specification (OPSS 804) and the standard seeding specification (OPSS 804) have been provided in Appendix 8.
- - o these mixes of grasses and legumes promote rapid grass establishment using improved turf and legume species
 - these are vigorous species compared to native species and have been improved by breeding and selection for various qualities
 - the native seed mix is comprised of species that have germinated well on roadside sides when seeded in late season to provide overwintering stratification of many of the seed species
 - o all these mixes use fast germinating nurse grasses to provide early competitive advantage and early cover
 - o MTO standard seeding mix which has been used in Lanark produces a fine fescue mixed stand for drier areas with a finer turf texture

Public Education and Information

Public and Internal Communications Program

Regular communications

- Internal update regularly on operations with all operations staff
 - Mechanical control and other staff need to be part of the program
 - o Safety concerns of poisonous plants
 - o Value of equipment cleaning
 - o Methods of equipment cleaning, suggest yearly training by OIPC group
 - o Working from least infested to most infested areas
 - o Locations of sites of competitive vegetation and pollinator habitat
- Making sure these staff and any staff who area dealing with the public are up to date on all aspects of the control project
- Possible locations on website
 - Suggestion of weekly or bi-monthly reminders of current growth stage of wild parsnip, common reed grass (phragmites), poison ivy with sample photos
 - During herbicide application regular updates on progress
 - o Recommended by Scott Olan, OMECC
 - o Update as often as is convenient, but the more often, the better

Promotion of Pollinator Habitat

Signage at native seed mix planting sites and natural competitive pollinator sites.

Web site promotion of competitive pollinator habitat sites

- Photos of different sites that are competitive against weeds and trees provide pollinator habitat
- Photos of different species that are competitive against weeds and trees provide pollinator habitat
- Information of the species being used in seed mixture
- Information on planting methods
- Seed mixes and sources of seed

Herbicide posting

- Newspaper
- Possibility of signs in special locations
 - Public use areas
 - Areas with heavy concerns
 - Near schools
- Provide supporting information on website (already being done)
 - Recommended to continue to update public as often as realistic on current locations of control work.

Public educations programs

- Information that would assist landowners in wild parsnip or poison ivy control or prevention on their roadside sites and properties
 - Currently found on Lanark County health site and OIPC site
 - Put direct links to the control pages on these sites
 - PDF of OICP Best Management Practices for Wild parsnip, Phragmites and other invasive weeds of concern
 - Any other sites
- Reporting site
 - For people to report locations of wild parsnip
 - For people to report locations of pollinator habit plantings and natural sites
 - Possible use of form to fill out
 - Use of Early Detection and Distribution Mapping System (EDDMapS) which is an Ontario site run by Federation of Anglers and Hunters, provincially supported
 - Has a phone app for reporting
- Meetings

- Have a regular yearly meeting on Wild Parsnip Program as well as other invasive weeds to monitor
 - Plans for current season
 - Promotion of other methods of control being used
 - Promotion of use of competitive species that improve pollinator habitat
 - Timing prior to herbicide application program
 - Update on progress of control operations
 - Progress of control
 - Have new topics to do with wild parsnip
 - Involve the community in wild parsnip program
 - Control on their properties; methods of control
 - Reporting new stands of weeds and competitive pollinator habitat
 - Other aspects
 - Focus on how to control wild parsnip and other invasive weeds on their own properties
 - Emphasizing PPE
 - Preventing weed spread
 - Promotion of alternative method operations
 - Presentation on Lanark County Adopt a Road Noxious Weed trial results
 - Results of mowing and digging trial
 - Suggest one year - have a presentation on specific herbicide uptake by plants, volatility & breakdown.
- Agricultural meetings
 - Communicate with the local weed inspector and Agricultural researchers and outreach staff to make presentations about or write articles or promote somehow to farmers about the importance and how to control wild parsnip.
 - Outreach with growers of perennial crops such as nurseries, Christmas tree producers, orchards, small fruits may have issues with wild parsnip and other invasive weeds.
 - Especially methods of control in non-crop areas around farms to help limit its spread and establishment.

Brochures or publications

- Have PDF's available online and at information desks
 - Direct links online
 - Fact sheets, colour brochures
 - Include links and possibly hard copies of OIPC invasive plant publications

Web based information

- Easily accessible with biological, control and useful health and safety information
- Focus on poisonous nature and control methods in public areas
- Preventing Weed Spread
- Promotion of alternative control methods
- Promotion of pollinator habitat sites
 - Information on planting methods
 - Seed mixes and sources of seed
- Information with links to multiple sources
 - Leeds, Grenville and Lanark health unit – have a direct link to their wild parsnip page
 - OIPC – Best Management Practices for many invasive weeds
 - OMAFRA weed pages
 - Possibly other community wild parsnip pages

Required Reporting to Council and OMECC

OMECC IPM reporting

- Annual report required on herbicide used in the county
- Copy of report kept in County

Council reporting

- Use of wild parsnip and other weed monitoring information on the progress of control programs
 - Areas treated
 - Control results of treatments
- Ideally post-season/pre-season tool for revision of wild parsnip/ other weed control plans for subsequent growing season

References

**Excellent ID and training guide*

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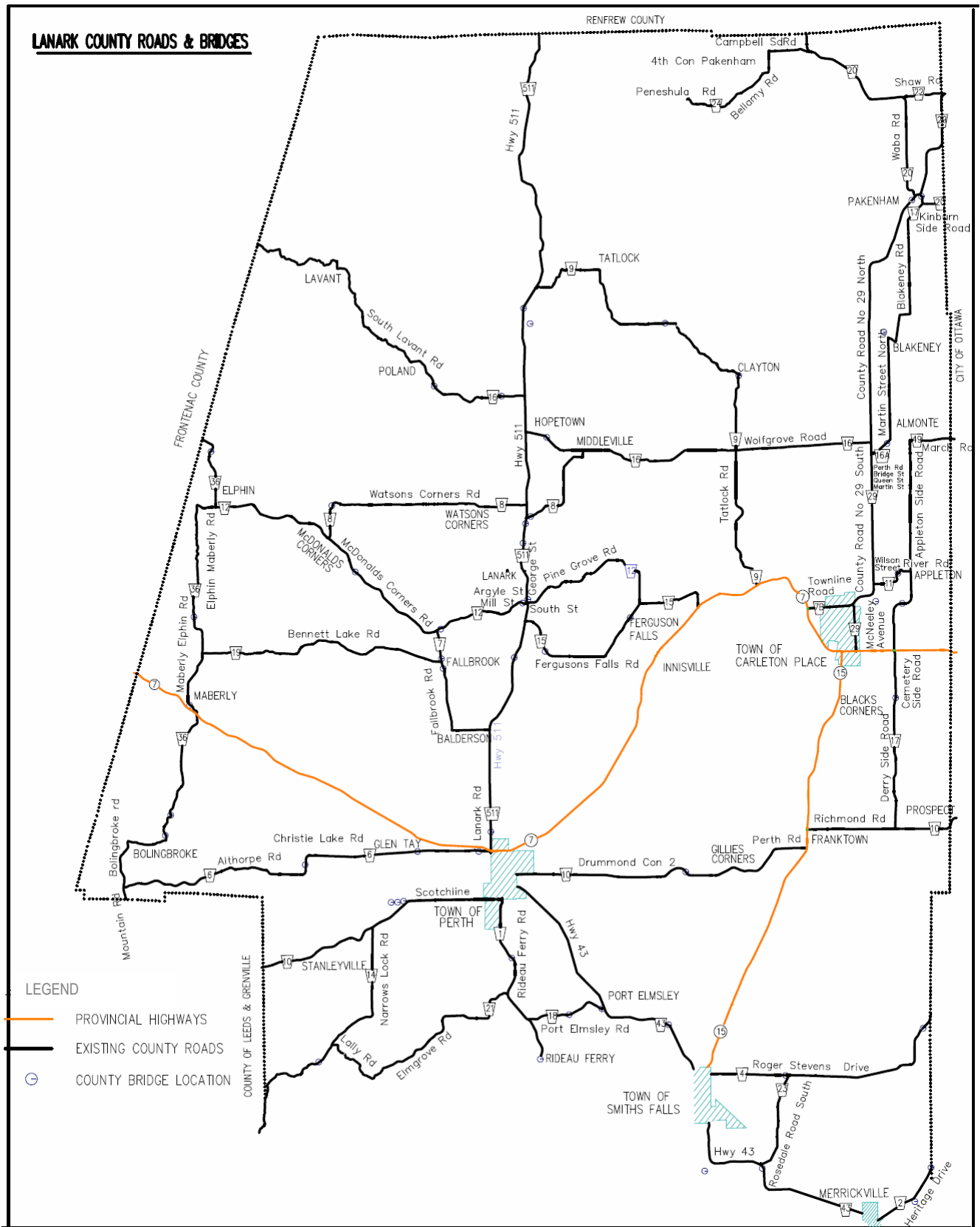
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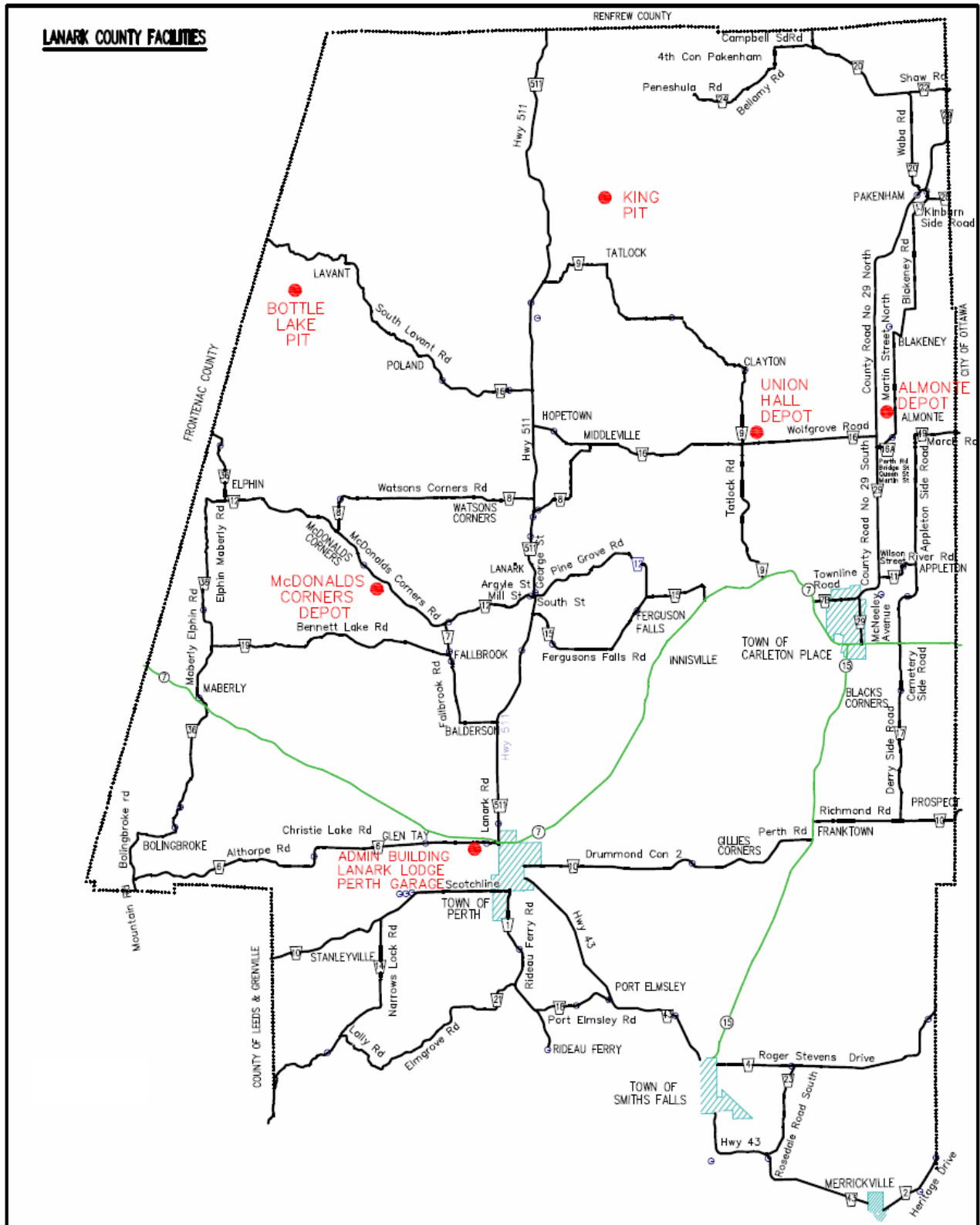
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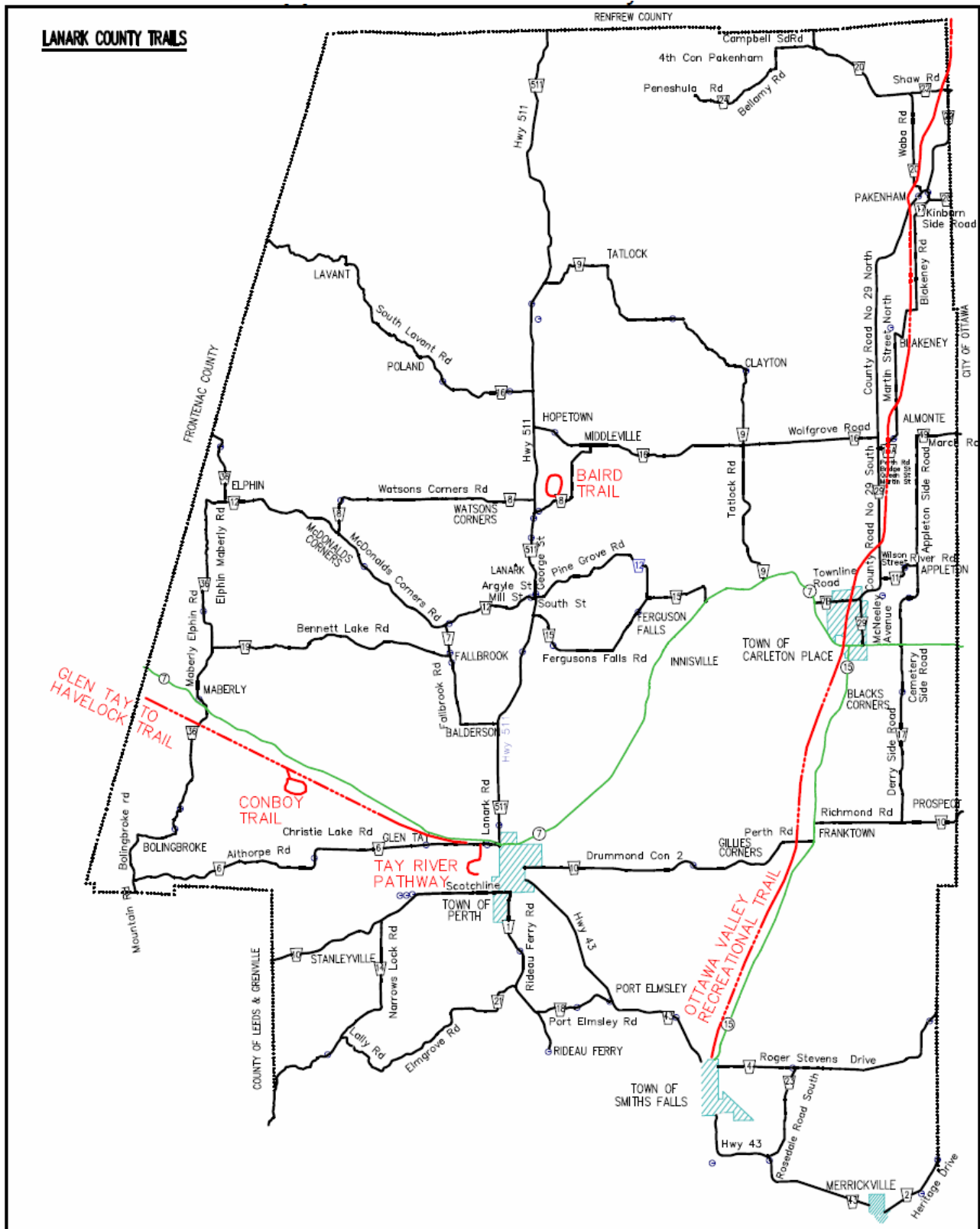
APPENDIX 1. Lanark County Road System



APPENDIX 2. Lanark County Facilities



APPENDIX 3. Lanark County Trails



APPENDIX 4 Suitable plant species for roadside naturalization or planting

Suitable shrub and short tree species for clear zones, with mature height <0.6 m	
bearberry	<i>Arctostaphylos uva-ursi</i>
bunchberry	<i>Cornus canadensis</i>
creeping or trailing juniper	<i>Juniperus horizontalis</i>
twinflower	<i>Linnaea borealis</i>
partridgeberry	<i>Mitchella repens</i>
dwarf raspberry	<i>Rubus pubescens</i>
lowbush blueberry	<i>Vaccinium angustifolium</i>
Suitable shrub and short tree species for wildlife clear zones, with mature height 0.6 to 1.2 m	
bristly sarsaparilla	<i>Aralia hispida</i>
serviceberry, juneberry	<i>Amelanchier humilis</i>
shadbush, serviceberry	<i>Amelanchier sanguinea</i>
New Jersey tea	<i>Ceanothus americanus</i>
narrow-leaved New Jersey tea	<i>Ceanothus herbaceus</i>
leatherleaf	<i>Chamaedaphne calyculata</i>
sweet-fern	<i>Comptonia peregrina</i>
bush honeysuckle	<i>Diervilla lonicera</i>
black huckleberry	<i>Gaylussacia baccata</i>
ground juniper	<i>Juniperus communis</i>
sheep laurel	<i>Kalmia angustifolia</i>
Virginia creeper	<i>Parthenocissus vitacea</i>
shrubby cinquefoil	<i>Potentilla fruticosa</i>
wild black currant	<i>Ribes americana</i>
prickly currant	<i>Ribes cynosbati</i>
wild currant	<i>Ribes hirtellum</i>
prickly wild rose	<i>Rosa acicularis</i>
northern dewberry	<i>Rubus flagellaris</i>
swamp dewberry	<i>Rubus hispidus</i>
meadowsweet	<i>Spirea alba</i>
steeplebush	<i>Spirea tomentosa</i>
snowberry	<i>Symphoricarpos alba</i>
cranberry	<i>Vaccinium macrocarpon</i>
deerberry	<i>Vaccinium stamineum</i>
summer grape	<i>Vitis aestivalis</i>
fox grape	<i>Vitis labrusca</i>
frost grape	<i>Vitis riparia</i>
Suitable herbaceous species for clear zones, with mature height <0.6 m	
pearly everlasting	<i>Anaphalis margaritacea</i>
field pussytoes	<i>Antennaria neglecta</i>
wild strawberry	<i>Fragaria virginiana</i>

gray goldenrod	<i>Solidago nemoralis</i>
Suitable competitive herbaceous species for wildlife clear zones, with normal height from 0.6 to 1.5 m. (Height range indicated - normal height less than maximum); suitable for seeding	
yarrow (naturalized) (0.3-0.7 m)	<i>Achillea millefolium</i>
purple-stemmed aster (0.4-1.7 m)	<i>Aster puniceus</i>
panicked aster (0.3-1.5 m)	<i>Aster lanceolatus</i>
flat-topped aster (0.3-2.0 m)	<i>Aster umbellatus</i>
wild bergamot (0.6 to 1.2 m)	<i>Monarda fistulosa</i>
black-eyed Susan (0.3 to 1.2 m)	<i>Rudbeckia hirta</i>
Canada goldenrod (0.3-1.5 m)	<i>Solidago canadensis</i>
tall goldenrod (0.5-2.0 m)	<i>Solidago gigantea</i>
grass-leaved goldenrod (0.6 to 1.2 m)	<i>Solidago graminifolia</i>
late goldenrod (0.3-1.2 m)	<i>Solidago juncea</i>
rough-stemmed goldenrod (0.3-1.6 m)	<i>Solidago rugosa</i>

APPENDIX 5. Lanark County native seed mixtures

2019 Lanark County Native Seed Mixture

No.	Company	Species	Quantity (g)	Percentage
1	St. W	Swamp Milkweed	1200	4%
2	St. W	Bebb's Sedge	300	1%
3	St. W	Fringed Sedge	300	1%
4	St. W	New Jersey Tea	300	1%
5	St. W	Showy Tick-Trefoil	400	1%
6	St. W	Flat-topped Aster	600	2%
7	St. W	Canada Wild Rye	7500	23%
8	St. W	Bottlebrush Grass	1500	5%
9	St. W	Slender Wheat Grass	4900	15%
10	St. W	Virginia Wild Rye	7500	23%
11	St. W	Joe-Pye Weed	300	1%
12	St. W	Boneset	300	1%
13	St. W	Sneezeweed	95	0%
14	St. W	Common Evening-Primrose	2505	8%
15	St. W	Hairy Beard-Tongue	1500	5%
16	St. W	Gray Goldenrod	200	1%
17	St. W	New England Aster	600	2%
18	OCS	Common Milkweed	1500	5%
19	OCS	Black-eyed Susan	1500	5%

St. W – St. Williams Nursery

OSC – Ontario Seed



LANARK COUNTY Native Seed

Instructions

1. Store seed in a resealable container.
2. To prepare seeding area remove weeds, cultivate and pack soil. Avoid over packing and smoothing out the soil completely.
3. Blooms best in full sun areas.
4. Sow in late fall (best time) or early spring, avoid summer planting or in times of drought.
5. The mix will thrive in moist-mesic, well drained soils.

Suggested Application Rate is 15-20kg/ha
Standard: 40-60 seeds/sq foot
or 3/4-1 tbsp sq/foot

SEED MIX SPECIES:

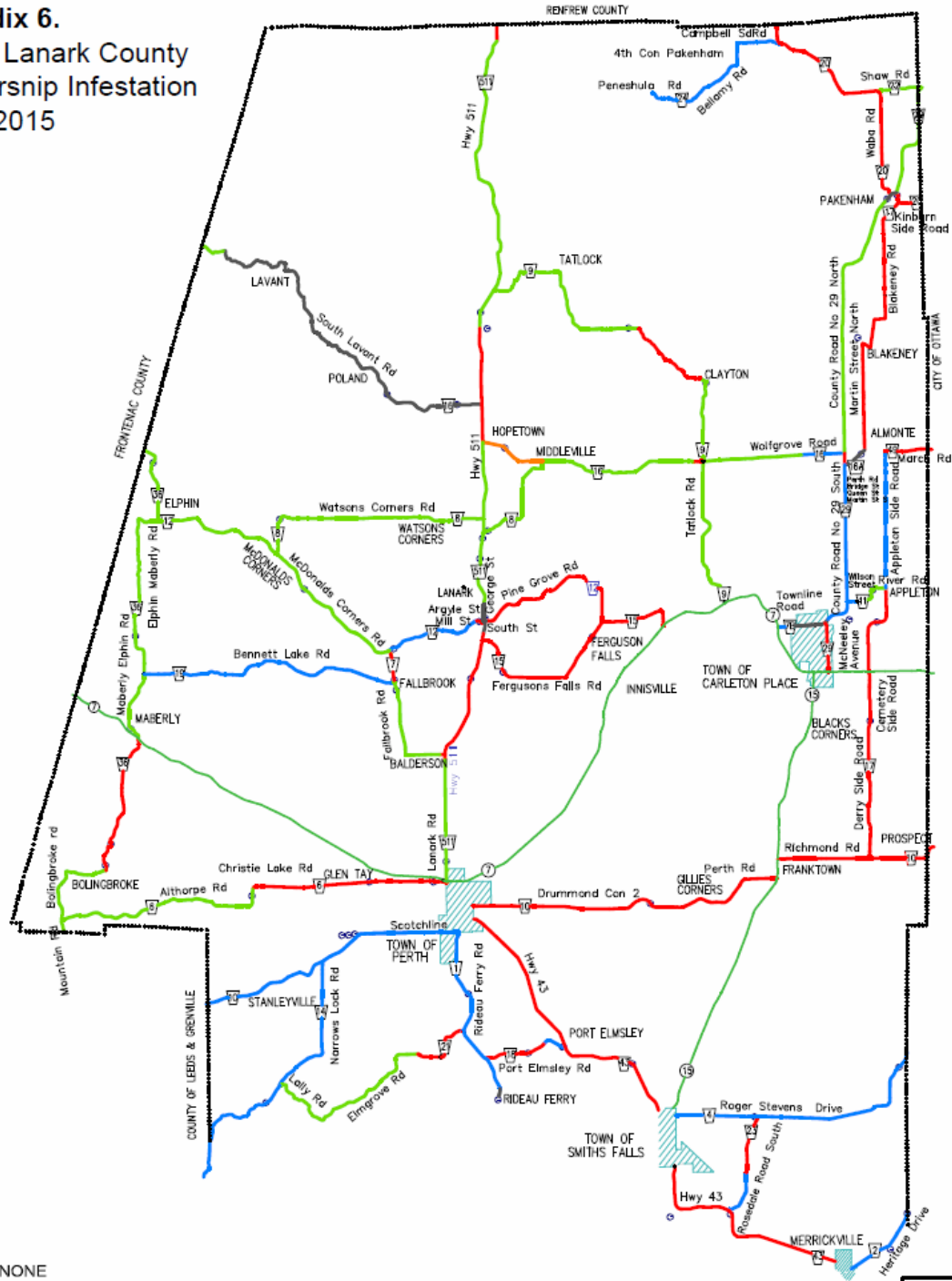
- Swamp Milkweed (*Sclepias incarnata*)
- Bebb's Sedge (*Carex bebbii*)
- Fringed Sedge (*Carex crinita*)
- New Jersey Tea (*Ceanothus americanus*)
- Showy Tick-Trefoil (*Desmodium canadense*)
- Flat-topped Aster (*Doellingeria umbellata*)
- Canada Wild Rye (*Elymus canadensis*)
- Bottlebrush Grass (*Elymus hystrix*)
- Slender Wheat Grass (*Elymus trachycaulus*)
- Virginia Wild Rye (*Elymus virginicus*)
- Joe-Pye Weed (*Eupatorium maculatum*)
- Boneset (*Eupatorium perfoliatum*)
- Sneezeweed (*Helenium autumnale*)
- Common Evening-Primrose (*Oenothera biennis*)
- Hairy Beard-Tongue (*Penstemon hirsutus*)
- Gray Goldenrod (*Solidago nemoralis*)
- New England Aster (*Symphotrichum novae-angliae*)
- Common Milkweed (*Asclepias syriaca*)
- Black-eyed Susan (*Rudbeckia hirta*)



2022 Lanark County Native Seed Mixture

Common Name	Scientific Name	%
Red (Swamp) Milkweed	<i>Asclepias incarnata</i>	5.00%
Fringed Sedge	<i>Carex crinata</i>	1.00%
Canada (Showy) Tick Trefoil	<i>Desmodium canadense</i>	4.00%
White Flat Top Aster	<i>Aster umbellatus</i>	5.00%
Canada wild rye	<i>Elymus canadensis</i>	8.00%
Bottle Brush Grass	<i>Elymus hystrix</i>	9.00%
Virginia Wlid Rye	<i>Elymus virginicus</i>	8.00%
Spotted joe pye weed	<i>Eutrochium maculatum</i>	3.00%
Boneset	<i>Eupatorium perfoliatum</i>	3.00%
Common Evening-primrose	<i>Oenothera biennis</i>	8.00%
Hairy Penstemon	<i>Carex crinata</i>	5.00%
Gray Goldenrod	<i>Solidago nemoralis</i>	8.00%
New England Aster	<i>Symphyotrichum novae-angliae</i>	3.00%
Common Milkweed	<i>Asclepias syriaca</i>	5.00%
Black eyed Susan	<i>Rudbeckia hirta</i>	5.00%
Blue Vervain	<i>Verbena hastata</i>	3.00%
Wild Bergamot	<i>Monarda fistulosa</i>	8.00%
Virginia Mountain Mint	<i>Pycnanthemum virginianum</i>	5.00%
Calico Aster	<i>Symphyotrichum lateriflorum</i>	2.00%
Slender Wheatgrass	<i>Agropyron trachycaulum</i>	5.00%
Fox sedge	<i>Carex vulpinoidea</i>	1.00%
Anise (lavender)Hyssop	<i>Agastache foeniculum</i>	3.00%

Appendix 6.
Audit of Lanark County
Wild Parsnip Infestation
May 4, 2015



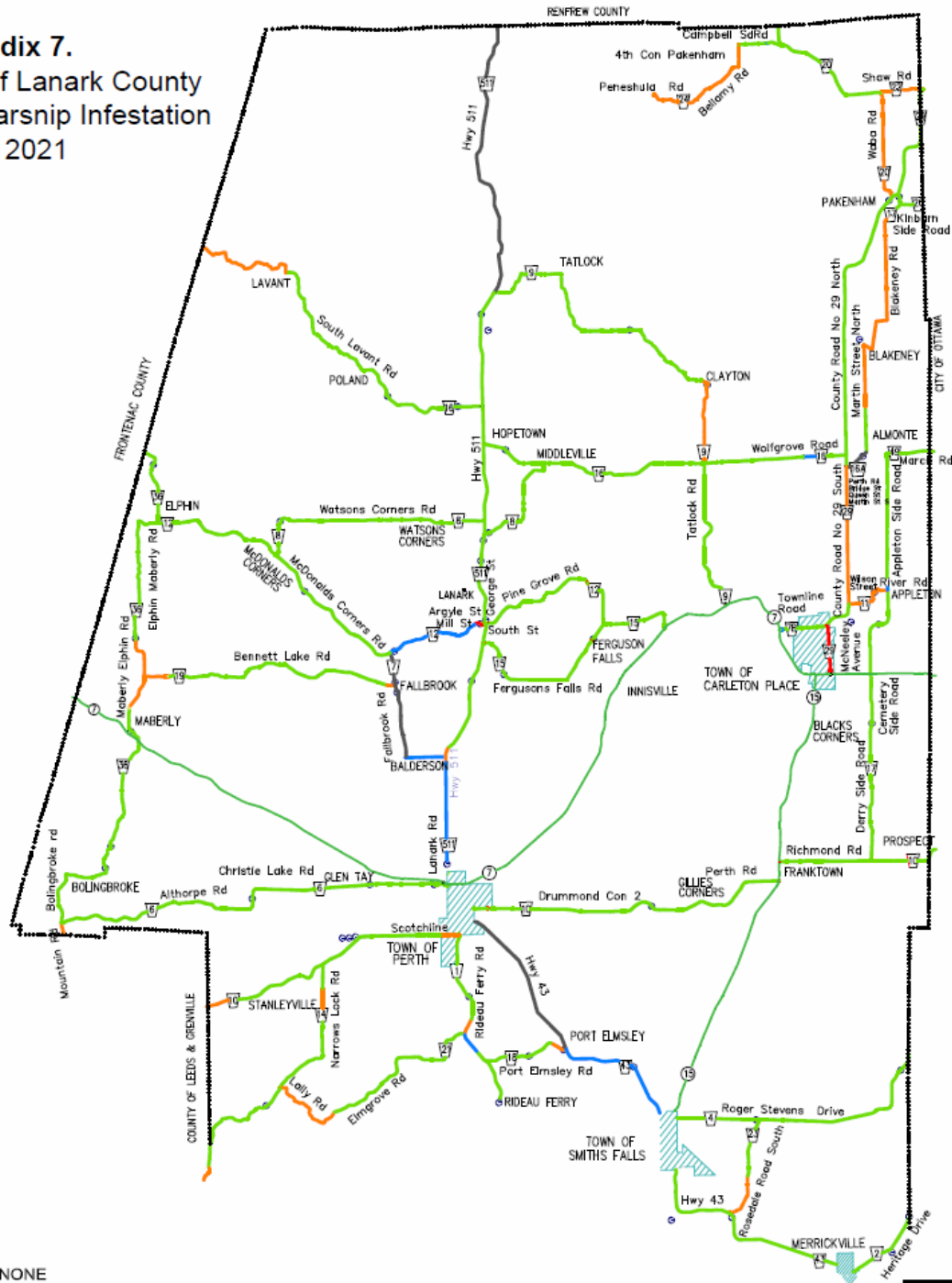
- NONE
- VERY LIGHT
- LIGHT
- MEDIUM
- HEAVY

LANARK COUNTY

LANARK COUNTY
NOXIOUS WEED
SUMMARY 2015

DATE 03-10-2017	BY MATT BULLOCK	DRAWN BY K. DUFF	
KEY PLAN			
DRAWING No. 1			

Appendix 7.
Audit of Lanark County
Wild Parsnip Infestation
May 4, 2021



- NONE
- VERY LIGHT
- LIGHT
- MEDIUM
- HEAVY

LANARK COUNTY

LANARK COUNTY
NOXIOUS WEED
SUMMARY 2021

DATE 05-14-2021	REVISED DATE NONE	DRAWN BY KJL	CHECKED BY KJL
KEY PLAN			
DRAWING No. 1			

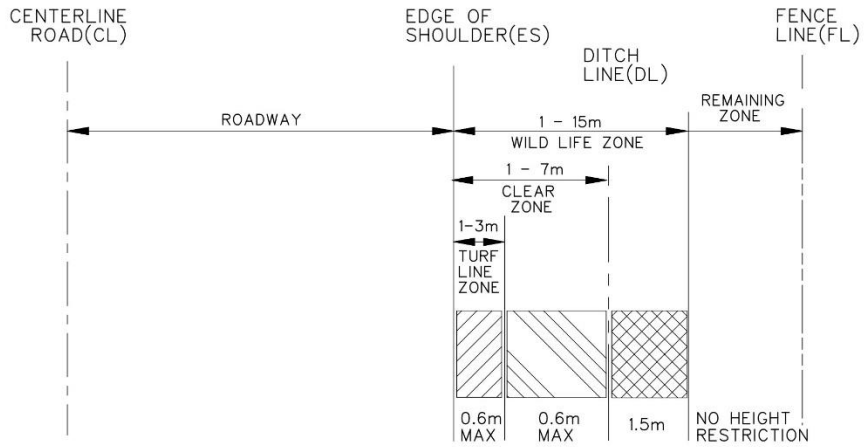
APPENDIX 8. OPSS 804 2014. MTO Standard Roadside Mix

MTO Standard Roadside Grass Seed Mixture	Percentage Composition
Creeping Red Fescue: <i>Festuca rubra</i>	52%
Kentucky Bluegrass: <i>Poa pratensis</i>	10%
Perennial Ryegrass: <i>Lolium perenne</i>	35%
White Clover: <i>Trifolium repens</i>	3%
Permanent Species Seeding Rate (kg/ha)	170
Nurse Grasses	
Fall Rye Grain or Winter Wheat Grain	60
Nurse Grass Seeding Rate (kg/ha)	60

MTO Old Field Seeding Mix – correct seeding rate due to small seed size. (Cain 1997)

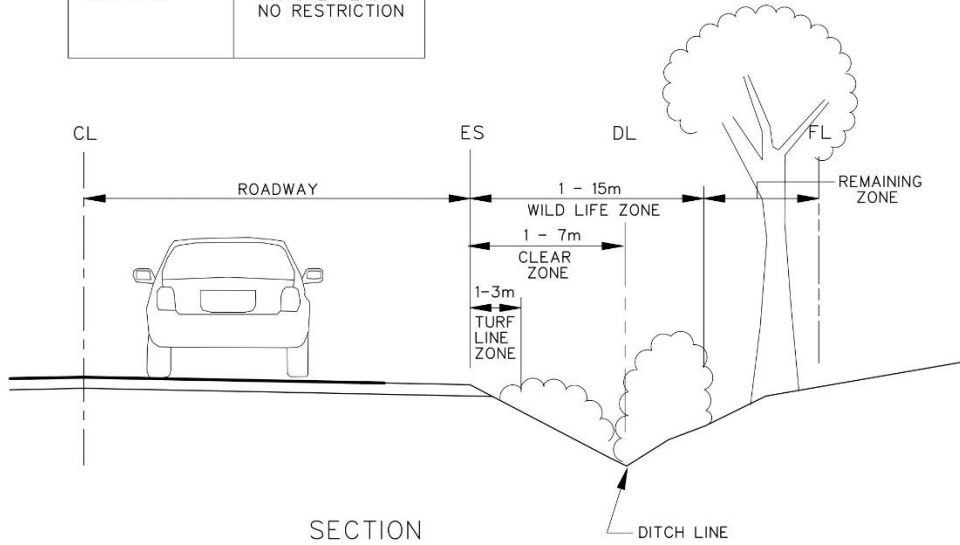
Old Field Species	Percentage Composition
Flat-topped Aster: <i>Aster umbellatus</i>	37%
New England Aster: <i>Aster novae-angliae</i>	15%
Purple-stemmed Aster: <i>Aster puniceus</i>	15%
Canada Goldenrod: <i>Solidago canadensis</i>	12%
Panicled Aster: <i>Aster simplex/lanceolatus</i>	8%
Heath Aster: <i>Aster ericoides</i> or Frost Aster: <i>Aster pilosus</i>	5%
Grey-stemmed Goldenrod: <i>Solidago nemoralis</i>	5%
Grass-leaved Goldenrod: <i>Solidago graminifolia</i>	3%
Permanent Species Seeding Rate (kg/ha)	2.5
Nurse Grasses (rate kg/ha)	
annual ryegrass	25
oats	25
perennial ryegrass	15
Nurse Grass Seeding Rate (kg/ha)	65

APPENDIX 9



PLAN

LINE ZONES	MATURE PLANT
TURF & CLEAR	HEIGHT LIMIT OF 0.6m
WILD LIFE	HEIGHT LIMIT OF 1.5m
REMAINING	MATURE PLANT NO RESTRICTION



SECTION

APPENDIX 10. Potential additional invasive weeds

Keep current on upcoming invasive and noxious weeds that are present or moving through other regions of Ontario.

Important to be on the look-out for any of these species moving into neighbouring Counties.

Himalayan balsam

Buckthorn (ongoing Lanark area buckthorn control program)