

# **Clean Equipment Protocol for Industry**

**Inspecting and cleaning equipment for the purposes of invasive species prevention**

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DRAFT



**Prepared by Joe Halloran on behalf of the  
Peterborough County Stewardship Council**

## Introduction

Invasive alien species are “a growing environmental and economic threat to Ontario. Alien species are plants, animals and microorganisms that have been accidentally or deliberately introduced into areas beyond their normal range. Invasive species are defined as harmful alien species whose introduction or spread threatens the environment, the economy, or society, including human health (Government of Canada 2004).” (Draft 2011 Ontario Invasive Species Strategic Plan)

The ecological effects of invasive species are often irreversible and, once established, they are extremely difficult and costly to control or eradicate. According to Pimental et al. (1999), invasive species in the U.S. cause economic and environmental damages totalling over \$138 billion per year, with agricultural weed control and crop losses totalling approximately \$34 billion per year. Exact figures for the total economic and environmental damages are not available for Canada. In Ontario, the cost estimate for 1 invasive species is astonishing; it has been found that Zebra Mussels cost Ontario power producers drawing water from the lake \$6.4 million per year in increased control/operating costs and about \$1 million per year in research costs (Colautti et al. 2006).

Invasive species can spread to new areas when contaminated water, mud, gravel, soil and plant material are unknowingly moved by equipment used on different sites. This method of spread is called an unintentional introduction, and is one of the four major pathways for invasive species introduction into a new area of Ontario (Draft 2011 Ontario Invasive Species Strategic Plan).

Invasive plant seed and propagules (plant material, i.e. rhizomes) have the ability to travel sight unseen in mud attached to or lodged in various parts and spaces between parts of vehicles, machinery and other mechanical equipment. A recent study at Montana State University found that most seeds (99% on paved roads and 96% on unpaved roads) stayed attached to the vehicle after traveling 160 miles (257 km) under dry conditions.

Invasive plant species are commonly transported on or in vehicles and construction equipment when they are moved to new locations. Those vehicles include four-wheel drives, excavators, tractors, loaders and all-terrain vehicles. Failure to properly clean vehicles and machinery of soils and mud that may contain invasive species seed and propagules can result in permanent irreversible environmental impacts. This can result in substantial cost to the landowner, land manager and/or the user. It could also lead to liability issue to businesses for activities and operations that result in the introduction of invasive species.

Some of the invasive species in Ontario which have been known to spread through equipment transfer include:

- Common Buckthorn (*Rhamnus cathartica*)
- Dog-strangling Vine (*Cynanchum rossicum*)
- Garlic Mustard (*Alliaria petiolata*)
- Giant Hogweed (*Heracleum mantegazzianum*)
- Glossy Buckthorn (*Frangula alnus*)
- Japanese Knotweed (*Polygonum cuspidatum*)
- Miscanthus or Chinese Silver Grass (*Miscanthus sinensis*)
- Phragmites or Common Reed (*Phragmites australis* subsp. *australis*)
- Reed Canary Grass (*Phalaris arundinacea*)
- Wild Parsnip (*Pastinaca sativa*)

These species impact biodiversity by out-competing native species for space, sunlight, and nutrients. They can also have impacts on road and driver safety by physically blocking intersection sightlines, and in the case of Phragmites and Miscanthus, may fuel intense grass fires if ignited, which can damage utility stations and hydro lines.

The harmful effects of invasive species include:

- Physical and structural damage to infrastructure
- Human health hazards (i.e. Giant Hogweed and Wild Parsnip exposure)
- Delays and increased cost in construction activities
- Environmental damage (i.e. erosion)
- Aesthetic degradation
- Loss of biodiversity
- Reduced property values
- Loss of productivity in woodlots and agriculture

### **Why cleaning vehicles and equipment is important**

This guide has been developed to assist in the construction, agriculture, forestry and other land management industries and provide equipment operators and practitioners with the tools and techniques for identification, and prevention of the unintentional introduction of invasive species resulting from their day to day work practices.

The great majority of plant invasions occur in habitats that have been disturbed either naturally or by humans (Rejmanek 1989; Hobbs and Huenneke 1992; Hobbs 2000).

It is much more costly to control invasive species after their establishment and spread than it is to prevent their spread. Prevention of invasive species spread through this method of unintentional introduction can be minimized significantly by the diligent cleaning of vehicles and equipment when leaving an existing site and moving to the next site, even if it is within the same property.

This protocol establishes a standard for cleaning vehicles and equipment and provides a guide to prescribing its application where current codes of practice, industry standards or other environmental management plans are not already in place.

Passenger and recreational vehicles as well heavy machinery are major vectors in spreading terrestrial invasive species into new areas.

Passenger and recreational vehicles include:

- 2WD and 4WD cars
- 2WD and 4WD trucks
- All Terrain Vehicles (ATV's)
- Motorbikes
- Snowmobiles

Heavy machinery includes:

- Trucks
- Tractors
- Mowers
- Slashers
- Trailers
- Backhoes
- Graders
- Dozers
- Excavators
- Skidders
- Loaders

This guide will focus on heavy machinery, which may be used in the construction, agriculture, forestry, land management and roadside/utility maintenance industries.

### **Impacts of Invasive Species on Industry**

**Construction:** In the UK, Japanese Knotweed (*Polygonum cuspidatum* or *Fallopia japonica*) is classified as a hazardous material. Construction occurring in established Japanese Knotweed stands means that the workers must sift the soil to remove root fragments and institute treatment plans to ensure that the Knotweed does not re-sprout, as it can damage housing foundations by growing through concrete and asphalt. The contractors must also thoroughly clean their equipment, and dispose of the contaminated soil at biohazard waste sites. While this has not yet happened in Ontario, Japanese Knotweed is present here.

Invasive plant species can also increase site preparation and weed control costs, and reduce property values. For example, in Vermont it was found that the presence of the aquatic invasive plant Eurasian Watermilfoil (*Myriophyllum*

*spicatum*) depressed shoreline residence property value by as much as 16.4% (Zhang and Boyle, 2010).

**Forestry/Agriculture:** Invasive plant species which become established in forests will out-compete native species and prevent forest re-generation after logging or natural disturbance. Dog-strangling Vine (*Cynanchum rossicum*) is of particular concern in conifer plantations, this species thrives in the filtered light and open soils of mature plantations, and suppresses seedling establishment of native hardwoods. If its invasion continues, very few juvenile trees will survive to fill the shrinking canopy of over-mature pines. Reforestation sites can also be affected; the thick mats of vegetation and aggressive competition from Dog-strangling Vine decrease available planting space and increase costs as larger material needs to be planted to be able to survive the competition from this invasive plant.

**Land Management (Trail Use/Maintenance):** Recreational trail use and the maintenance of trails can facilitate the transport of invasive plant material and seeds, and create open and disturbed sites which are prime locations for the establishment of invasive species. Studies have proven that trails act as corridors which assist in the spread of invasive plant species. Humans, their pets, and vehicles such as ATV's can be vectors of invasion along trails because seeds and plant pieces can be carried on equipment and clothing. In addition, frequent trampling along trails alters soil properties, limits the growth of some native species, and may favour the growth of non-native species (Kuss et al. 1985; Marion et al. 1985; Yorks et al. 1997).

**Roadsides/Utilities:** Invasive species can increase the cost of roadside and utility maintenance by requiring additional maintenance and control efforts. The presence of invasive species can also provide a safety hazard. In the case of Phragmites and Miscanthus (invasive grass species) the dead stalks which remain standing each fall provide combustible material. Fires in these stands burn intensely, and can damage utilities and hydro lines. Phragmites along roadsides is generally assumed to be spread through the transport and burial of rhizome fragments through ditching, ploughing, and other human activities that transport rhizomes on machinery. Studies have shown that vehicles and road-fill operations can transport invasive plant seeds into uninfested areas, and road construction and maintenance operations provide optimal disturbed sites for seed germination and seedling establishment (Schmidt 1989; Lonsdale & Lane 1994; Greenberg et al. 1997; Trombulak & Frissell 2000).

### **Steps to prevent the Unintentional Introduction of Invasive Species from Equipment**

Inspection and cleaning of all machinery and equipment should be undertaken in accordance with the procedures, checklists and diagrams provided in this protocol.

### **When to Inspect**

Inspection should be done *before*:

- Moving vehicles out of a local area of operation
- Moving machinery between properties or sites within the same property where invasive species may be present in one area, and not in another
- Using machinery along roadsides, in ditches, and along watercourses
- Vehicles using on unformed dirt roads, trails or off road conditions
- Using machinery to transport soil and quarry materials
- Visiting remote area where access by vehicles is limited

Inspection should be done *after*:

- Operating in areas known to have terrestrial invasive plants or are in high risk areas (i.e. recently disturbed areas near known invaded areas)
- Transporting material (i.e. soil) that is known to have, or has the potential to have, invasive species
- Operating in an area or transporting material that you are uncertain contain invasive species
- In the event of rain. If mud contains seeds, they can travel indefinitely until it rains or the road surface is wet, allowing for long distance transport. This transport may result in deposition of seeds in areas where those species did not previously exist.

### ***How to Inspect***

Inspect the vehicle thoroughly inside and out for where dirt, plant material and seeds may be lodged or adhering to interior and exterior surfaces. Remove any guards, covers or plates that are easy to remove.

Attention should be paid to the underside of the vehicle, radiators, spare tires, foot wells and bumper bars. If clods of dirt, seed or other plant material are found, removal should take place immediately, using the techniques outlined below.

### **When to Clean**

Vehicles and heavy equipment that stay on formed and sealed roads have a low risk of spreading invasive species. Cleaning is only required when inspection identifies visible dirt clods and plant material or when moving from one area to another.

Cleaning in winter in snow or open soil conditions also may be required, dependant on the work being undertaken. Regular inspection of vehicles and machinery will identify if any soil or plant material has been collected on or in vehicles and machinery.

### ***Where to Clean***

Locate the vehicle/equipment in an appropriate area for cleaning. The site should be:

- Mud free well grassed, gravel covered or a hard surface.
- Gently sloping to assist in draining water and material away from the vehicle or equipment. Care should be taken to ensure that localized erosion will not be created.
- At least 30m away from any watercourse, water body and natural vegetation.
- Large enough to allow for adequate movement of larger vehicles and equipment.

Safely locate the vehicle and equipment away from any hazards if mechanized, ensure engine is off and the vehicle or equipment is immobilized

### ***How to Clean Inside***

Clean the interior of the vehicle by sweeping, vacuuming or using a compressed air device. Particular attention should be paid to the floor, foot wells, pedals, seats and under the seats.

### ***How to Clean Outside***

Knock off all large clods of dirt. Use a pry bar or other device if necessary.

Identify areas that may require cleaning with compressed air rather than water such as radiators and grills. Clean these areas first prior to using water.

Clean the vehicle with a high pressure hose in combination with a stiff brush and/or pry bar to further assist the removal of dirt clods.

Start cleaning from the top of the vehicle and work down to the bottom.

Emphasis should be placed on the undersides, wheels, wheel arches, guards, chassis, engine bays, radiator, grills and other attachments.

When the cleaning is finished avoid driving through the waste water when removing the vehicle or equipment from the cleaning site.

### **Final Inspection Checklist**

Conduct a final inspection to ensure the following general clean standard has been achieved:

- No clods of dirt should be visible after wash down
- Radiators, grills and the interiors of vehicles should be free of accumulations of seed, soil, mud and plant material parts including seeds, roots, flowers, fruit and or stems.

Diagrams have been provided to assist in quickly identifying key areas to inspect and clean on a variety of vehicles associated with the targeted industries. These can be used in combination with vehicle checklists to ensure all areas of the vehicles have been inspected and cleaned.

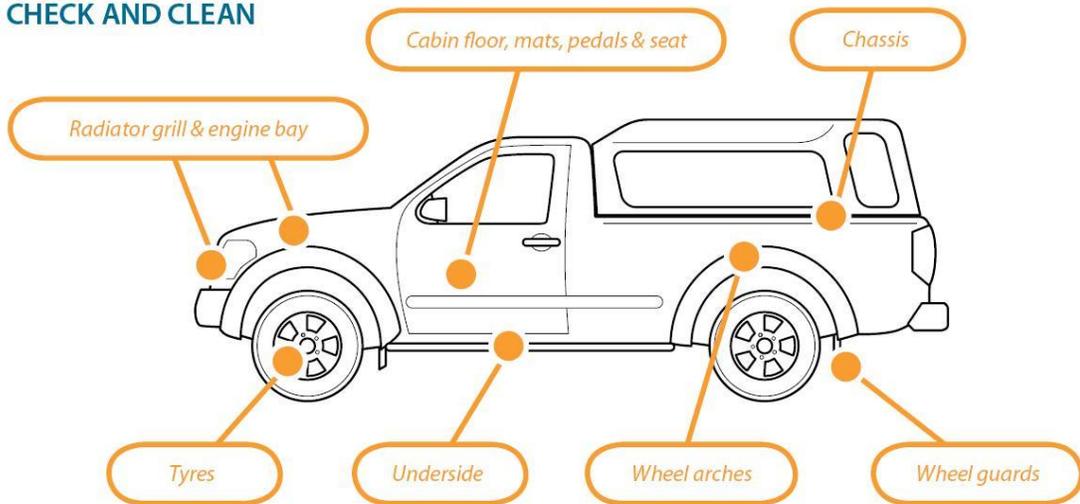
### ***Equipment Required***

- A pump and high pressure hose *OR* High pressure water unit  
*Minimum water pressure for vehicle cleaning should be at least 90 pounds per square inch. Water can be supplied as high volume/low pressure or low volume/high pressure (NOAA Fisheries Service).*
- Air compressor and blower *OR* Vacuum
- Shovel
- Pry bar
- Stiff brush or broom

## Inspection and Cleaning Diagrams and Checklists

### 2WD and 4WD Vehicles

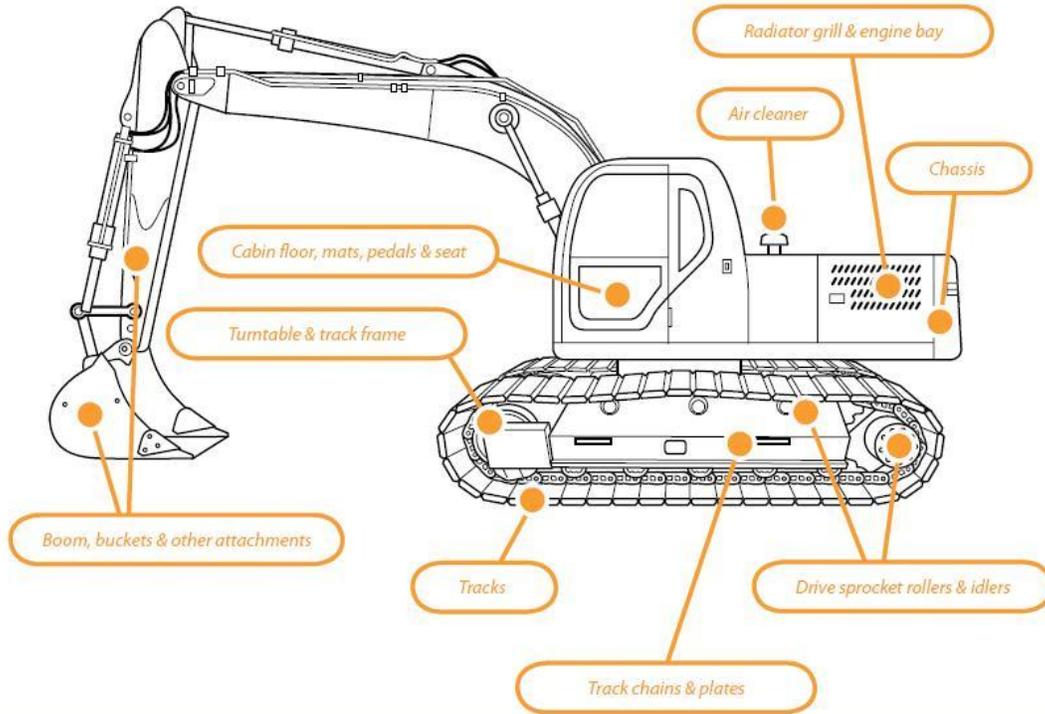
#### 4WD VEHICLE WITH KEY SPOTS TO CHECK AND CLEAN



		✓
Cabin	Floor, mats, pedals, seats	
Engine	Radiators, engine bay, grill	
Body	Underside, chassis, crevices, ledges, bumper bars	
Wheels	All wheels (including spare), wheel arches, guards	
Tray	Floor, canopy (if included)	

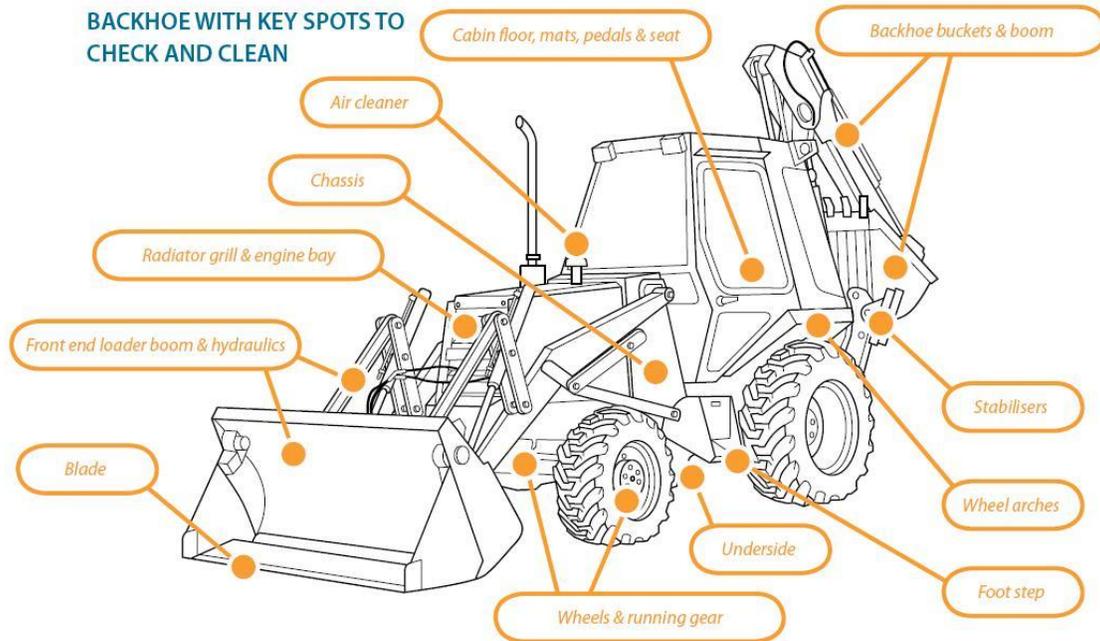
# Excavator

## EXCAVATOR WITH KEY SPOTS TO CHECK AND CLEAN



		✓
Cabin	Floor, mats, pedals, seats	
Engine	Radiators, engine bay, grill, air cleaner	
Tracks	Tracks, track frame, drive sprocket rollers, idlers	
Body Plates	Plates of cabin	
Body	Ledges, channels	
Bucket		
Booms		
Turret Pivot		

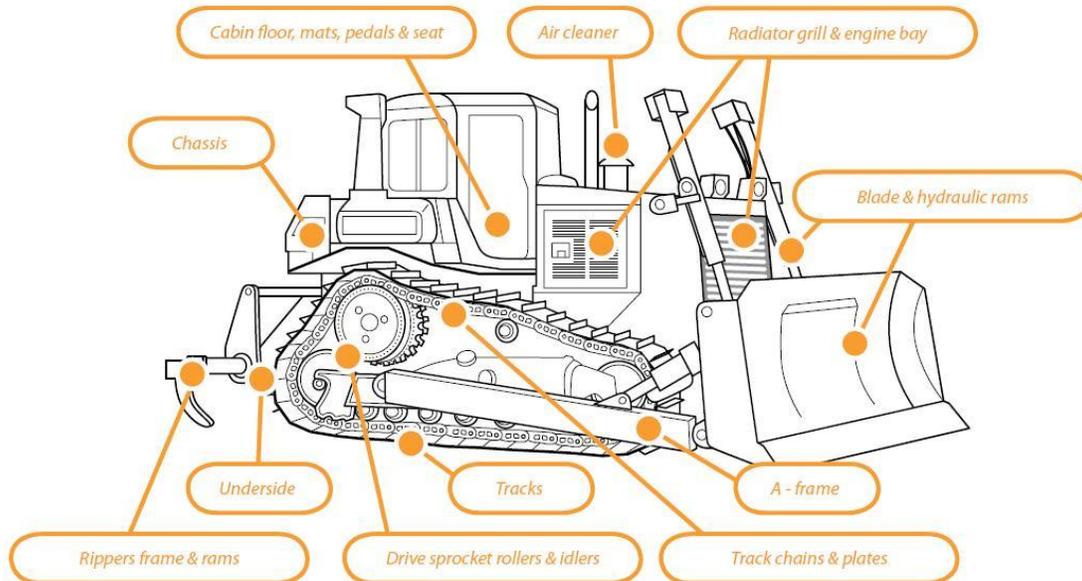
## Backhoe



Cabin	Floor, mats, pedals, seats, foot step	✓
Engine	Radiators, engine bay, grill, air cleaner	
Wheels	All wheels (including spare), wheel arches, guards	
Front end loader	Blade, hydraulics, booms	
Backhoe	Buckets, boom, hydraulics, stabilizers	

## Bulldozer

### BULLDOZER WITH KEY SPOTS TO CHECK AND CLEAN



Cabin	Floor, mats, pedals, seats	✓
Engine	Radiators, engine bay, grill, air cleaner	
Tracks	Tracks, track frame, drive sprocket rollers, idlers	
Body Plates	Belly plates and rear plates	
Body	Ledges, channels	
Blade	Pivot points, hydraulic rams, a-frame	
Ripper	Ripper frame, ripper points	

## Contacts and Resources

Draft Ontario Invasive Species Strategic Plan 2011. Government of Ontario. Online, accessed May 8, 2012.

[http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@letsfish/documents/document/stdprod\\_085804.pdf](http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@letsfish/documents/document/stdprod_085804.pdf)

Invasive Species Management for Infrastructure Managers and the Construction Industry 2008. Wade, M. Booy, O. and White, V. Online, accessed April 27, 2012  
[http://www.ciria.org/service/Web\\_Site/AM/ContentManagerNet/ContentDisplay.aspx?Section=Web\\_Site&ContentID=9001](http://www.ciria.org/service/Web_Site/AM/ContentManagerNet/ContentDisplay.aspx?Section=Web_Site&ContentID=9001)

T.I.P.S (Targeted Invasive Plant Solutions) Highway Operations. British Columbia Invasive Species Council. Online, accessed May 8, 2012  
[http://www.bcinvativeplants.com/iscbc/publications/TIPS/Highways\\_Operations\\_TIPS.pdf](http://www.bcinvativeplants.com/iscbc/publications/TIPS/Highways_Operations_TIPS.pdf)

## Reporting Invasive Species

To report invasive species, or view maps of existing records, visit the Invasives Tracking System: [www.invasivetrackingsystem.ca](http://www.invasivetrackingsystem.ca)

Or call the OFAH/MNR Invading Species Awareness Program Hotline at 1-800-563-7711

## Species Identification

- Common Buckthorn (*Rhamnus cathartica*) and Glossy Buckthorn (*Frangula alnus*)
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