Parks and Open Space Management

Saskatchewan Parks and Recreation Association Inc.

Sprayers Handbook

Produced by:

Saskatchewan Parks and Recreation Association
The Parkway Building
#210 – 3303 Hillsdale Street
Regina, Saskatchewan
Canada S4S 6W9
Telephone: 1-306-780-9231 or 1-800-563-2555
Fax 1-306-780-9257

City of Regina
Parks & Open Space Management – Community Services Department
Queen Elizabeth II Court, Box 1790
Regina, Saskatchewan
S4P 3C8

AHz Learning Technologies Inc.
2152 Scarth Street
Regina, Saskatchewan
S4P 2H6

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Introduction and Disclaimer of Liability for Use of the Document

This Parks and Open Space Management Handbook, provides a description of procedures associated with maintenance activities performed within park settings.

The concept of maintenance standards requires the application of best practices within the local operation system. To assist with the establishment of such standards, this resource provides guidelines to aid staff in addressing their daily management operations. There are, however, situations where the standards outlined may require revision by those staff implementing the procedure, to best meet their needs. Specific site conditions, operating budgets, available human resources, and capacity to offer training associated with the practices outlined in this document may warrant alterations to the procedures.

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Acknowledgments

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For customization or development of specific modules for your organization contact:
AHz Learning Technologies Inc.
2152 Scarth Street
Regina, Saskatchewan
S4P 2H6
Telephone: 1-306-543-7445
Email: ahz@ahzlearning.com

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Sprayer Introduction

The weather this morning had started out promising but there were some black clouds starting to roll in from the West. My crew was spraying a residential neighbourhood that had a severe infestation of *Tent Caterpillars*. I was just nearing the middle of the block and I spotted some children watching us in awe.

I honked my horn to signal for my crew to stop spraying. I got out of the truck and approached the children. The little girl shrunk back against her older brother. The little boy was full of questions. "What are you doing?" he asked as he looked over at the crewmembers on the deck of the truck.

I walked over to the maple tree on the corner of their lot and motioned for him to follow me, his little sister not far behind. "Do you see these caterpillars?" I asked. "We are spraying the trees so that we can control the caterpillar population." The little girl, in a very small voice asked, "Do you have to?" I explained to both of the children that if we didn't spray the caterpillars, they would strip all of the trees of their leaves, and it could take the tree years to recover…some trees may even die.

Sprayer Introduction Continued...

Their mother was just coming around the corner from the backyard. I told her that I was just explaining to the children why we had to spray the trees and motioned toward the spray truck. I asked the mother if she would mind having the children play in the backyard for the next hour or so. I assured her that the spray we were using today was not harmful; I just wanted to give the leaves a chance to dry before the kids started playing under the trees in the front.

She thanked me for taking the time to explain to the kids why we were spraying and rounded up the children to head into the backyard.

Sprayer Overview

Trees and shrubs should be monitored yearly for various pests. Monitoring counts and threshold levels are used to determine whether a control program will occur and what areas will be sprayed. In areas with high insect counts you may need to spray to reduce damage. Anything from cankerworms to caterpillars can strip the trees of all their leaves. As an example you may spray for Elm Bark Beetles (EBB), to decrease EBB populations because EBB transport the deadly Dutch Elm Disease (DED) fungus and infect the trees. Elms in Saskatchewan that are infected with DED are removed as soon as possible.

There are two different pieces of equipment communities typically use when spraying. Most often used, is a truck that has a flat deck on the back with two swivel chairs mounted on to it. This lets the crew members sit while they apply the control product.

The truck pulls a trailer which the spray hoses and tank are attached to. The other equipment used is the converted water truck / sprayer which is fondly referred to as the “worminator”. The water truck is larger and one complete unit, as opposed to a truck pulling a trailer. It has a spray deck behind the cab that offers seating for two crew members.

Sprayer Overview Continued...

In years previous, all the spraying was done using a truck while the crewmembers walked along, dragging the hoses and spraying from the ground. The truck, with the ride-on deck, is a much more time efficient way to spray, letting you cover a larger area in a shorter period of time, not to mention the wear and tear it saves on the hoses because they are not being dragged along the street. However, it is not as effective. When crewmembers walk and spray from the ground they are able to get closer to the trees. There is also less overspray, less product used and better coverage to the canopy.

The walk behind method should be used when we are spraying for the Elm Bark Beetle and when circumstances require it. When you spray for Elm Bark Beetles, you only spray the base of the tree trunk – 0.5 metres up from ground level. Because you are only spraying the bottom portion of the tree trunk and root flares, at low pressure, less product is used, there is less drift, and it is easier to reach the bottom of the tree from the ground than the spray deck on either of the spraying vehicles.

Pests To Spray

Woolly Elm Aphid *(Eriosoma americanum)* *and Woolly Apple Aphid* *(E. lanigerum)*

Hosts: Elm and Apple Trees

Identification, Life Cycle and Damage: Woolly elm aphids are green to dusty grey; woolly apple aphids are yellowish to rusty brown. Mature aphids are 1.5 to 21 mm in length.

Woolly elm aphids overwinter as eggs that are laid in bark crevices in late fall. In spring, wingless females hatch from the eggs and migrate to newly expanding leaves, where they feed and give birth to live aphids. Up to 200 winged offspring migrate to new leaves, while the wingless offspring feed on the same leaf.

Feeding by nymph and adult aphids causes young elms leaves to swell, fold, and curl around the aphid colonies. Large populations are unsightly, adversely affect photosynthesis, and decrease tree strength.

Control Product: Insecticidal Soap®

Pests To Spray Continued...

Ash Plant Bug *(Tropidosteptes amoenus)*

Hosts: Ash

Identification, Life Cycle and Damage: Nymphs and adults vary from green to tan to dark brown and are 2 to 9 mm long.

They overwinter as eggs laid in bud scales, under bark scales, or in other protected places on the tree. Nymphs emerge in the spring and feed on the under side of leaves. Ash plant bugs feed throughout the summer and undergo at least two generations per year.

Feeding punctures cause stippled brown discolorations on leaves. Damage by ash plant bugs is cumulative throughout the year and can result in leaf deformity and stunting of growth. Young seedlings can be seriously damaged.

Control Product: This pest is often not sprayed for. The required chemical controls may not be part of the integrated pest management (IPM) program.

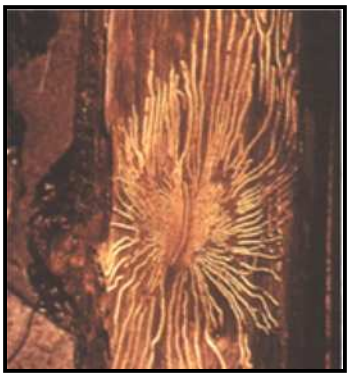
Pests To Spray Coninued…

Native Elm Bark Beetle *(Hylurgopinus rufipes)*
and Smaller European Elm Bark Beetle *(Scolytus multistriatus)*

Hosts: Elms – especially American, Siberian and Manchurian elms

Identification, Life Cycle and Damage: Both species of beetle extend from the Southern United States to Canada. These beetles are carriers of the fungus that causes Dutch Elm Disease (DED); they carry fungal spores from diseased to healthy trees.

Larvae are grub-like and white. Adults are brownish-black, thinly covered with short yellow hairs and are about 3 mm long.



In early summer adult females lay eggs in tunnels mined between the sapwood and bark. During summer, the larvae extend these tunnels in the inner bark. In our parts there is only one generation per year.

Leaves of diseased branches turn yellow to yellowish-brown and die. After the beetles emerge, the bark of infested branches and trunks is marked by numerous pinhead sized exit holes. Sawdust accumulates below infested tree parts, in cracks and crevices, or at the base of the tree.

Control Product: Dursban™ - Turf

Pests To Spray Continued...

Fall Cankerworms *(Alsophila pometaria)*
and Spring Cankerworms *(Paleacrita vernata)*

Hosts: Boxelder (Manitoba Maple), ash, oak, elm, linden and apple

Identification, Life Cycle and Damage: Cankerworm caterpillars, also called inchworms or loopers have 2 to 4 pairs of false legs, vary from green to reddish-brown to black and they have one or more white, pale green or black stripes. Mature caterpillars are about 19 mm long. Female moths are about 12 mm long, wingless and dark gray. Males are similar but have tan wings.

Fall cankerworm moths emerge, mate and lay eggs on twigs during the fall and winter. Spring cankerworm moths emerge, mate and lay eggs in early spring. Egg hatching for both species, coincides with the appearance of new leaves on their host. If the caterpillars hatch earlier, they eat the leaf buds before they unfold.

Larvae initially eat small holes in the leaves and later skeletonize them. Eventually, only the midribs of leaves remain. Cankerworm defoliation decreases tree strength and is unsightly in appearance. The stress it causes to the tree, in turn, makes it more susceptible to attack by other insects and disease.

Control Product: Bt.k (Bacillus thurnguensis Var. kurstaki)

Pests To Spray Continued...

Fall Webworm *(Hyphantria cunea)*

Hosts: Elm, plum, chokecherry, poplar, and willow

Identification, Life Cycle and Damage: Larvae are about 25 mm long, and are pale yellow with red heads and reddish-brown spots or yellow-green with black heads, a broad dark dorsal stripe and black spots. Moths are white, with reddish-orange front legs and a wingspan of 30 to 42 mm.

Pupae overwinter in cocoons in soil or duff. Moths emerge in late spring or early summer and lay eggs in hair-covered masses on the underside of leaves. Larvae emerge about 10 to 14 days later and feed in groups in webbed nests constructed around leaves at branch ends. By late summer the unsightly nests may be 1 metre across and contain excrement, dried leaf fragments, and cast skins of larvae. There are one to two generations per year.

Ornamental trees may become severely defoliated and unsightly in appearance.

Control Product: Bt.k (Bacillus thurnguensis Var. kurstaki)

Pests To Spray Continued

Forest Tent Caterpillar *(Malacosoma disstria)*

Hosts: Boxelder (Manitoba Maple), ash, oak, cottonwood and poplars

Identification, Life Cycle and Damage: The hairy larvae are pale blue with white keyhole shaped markings on their backs. Full grown larvae are about 50 mm long. The stout-bodied moths are buff-brown with two dark diagonal bands on the wings and a wingspan of 20 to 45 mm.

Eggs hatch in the spring, when leaves are expanding. Caterpillars feed in groups or clusters on leaves during early summer. Although larvae cluster around branches to rest or molt, they do not construct tents. In late summer, female moths appear and lay eggs in shiny brown masses that encircle twigs.

Infested trees are usually completely defoliated and their growth and strength is reduced. Outbreaks tend to be widespread.

Control Product: Bt.k (Bacillus thurnguensis Var. kurstaki)

Pests To Spray Continued…

Leafroller *(Archips argyrospilus)*

Hosts: Ash, elm, oak, maple, cherry, and caragana

Identification, Life Cycle and Damage: Full grown larvae are 20 to 25 mm long, light green to dusty gray with light brown to black heads and legs. Moths are pale yellow to orange-red and have a wingspan of 18 to 25 mm.

Leafrollers overwinter in the egg stage. Eggs hatch in early spring and larvae build nests by weaving leaves together with silk, adding leaves as larvae mature. They pupate in cocoons located either inside or outside the nest. Adults emerge in late summer and mate. Females lay small round masses of 100 to 150 eggs on twigs and small branches.

Larvae leave nests to feed on the opening buds, blossoms, young fruit and unfolding leaves, and later on mature leaves. Infested trees are unsightly but are seldom seriously damaged.

Control Product: Bt.k (Bacillus thurnguensis Var. kurstaki)

Pests To Spray Continued...

Prairie Tent Caterpillar *(Malacosoma californicum)*

Eastern Tent Caterpillar *(M. americanum)*

Hosts: Chokecherry, plum, willow, ash, poplar and rose

Identification, Life Cycle and Damage: Mature larvae are 50 mm long and can be quite variable in pattern. In general, most prairie tent caterpillars are pale blue with an interrupted white stripe bordered by two reddish-orange stripes down the centre of the back. Eastern tent caterpillars are similar but have a continuous white stripe down the back and black heads. Moths of both species are reddish-brown, have two oblique whitish stripes on the forewings and have a wingspan of 37 to 50 mm.

Eggs hatch when the first new leaves appear. Larvae live in colonies and construct large silk tents around a fork or branches of trees. These tents are enlarged as the larvae grow, enclosing the entire branch or even the entire tree. Adults of prairie tent caterpillars emerge in late summer and lay flat egg masses on twigs and branches. Adults of eastern tent caterpillars emerge mid summer, and have one generation per year.

Larvae skeletonize leaves outside of tents. Infestations tend to be spotty and are often unrecognized until entire trees have been defoliated. Severe infested trees are less vigorous and unsightly in appearance, but are rarely killed.

Control Product: Bt.k (Bacillus thurnguensis Var. kurstaki)

Pests To Spray Continued...

Uglynest Caterpillar *(Archips cerasivorana)*

Hosts: Chokecherry, plum, willow, ash, poplar and rose

Identification, Life Cycle and Damage: Larvae are 20 to 23 mm long and olive to greenish-yellow with black heads. Moths are bright orange with yellow hind wings and have a wingspan of 18 to 25 mm.

Uglynest caterpillars overwinter as eggs on the bark of their host. Larvae emerge during the early summer and construct extensive nests of webbing, leaves and twigs. They feed on leaves within their nests during summer and pupate in the nests in the fall. Moths emerge and lay eggs in the fall.

The nest can envelop small trees and are unsightly in appearance.

Control Product: Bt.k (Bacillus thurnguensis Var. kurstaki)

Pesticides Used

Insects and diseases pose two of the most serious threats to the health of trees. Insects can cause considerable damage to trees and shrubs by stripping them of their leaves and/or sucking out the sap, which weakens the tree, stunting its growth, and sometimes killing it. Insects may also carry or provide an entryway for fungi, bacteria, or viruses.

Pesticides, by their very nature, are designed to control pests. Because of this, crew members using pesticides must ensure they use them correctly. Always read the product label prior to using the product. Ensure that the product is registered for the target pest and follow label specifications for mixing, application rates, disposal and safety precautions.

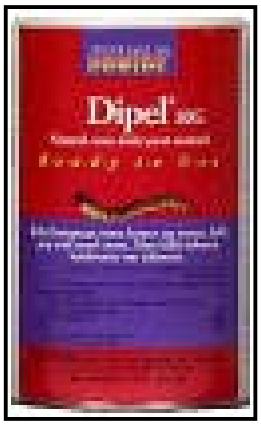
Pesticides must be handled with care. Some are toxic if swallowed, inhaled or absorbed through the skin. That's why it's so important to wear the appropriate protective clothing. Wash thoroughly with soap and water after using pesticides and before eating, drinking, smoking or using the washroom.

Ensure pesticide containers are disposed of properly. Each container must be "triple rinsed" and then sliced open before they are stored for disposal so that they cannot be reused for anything. You will learn about this process on the following pages.

Pesticides Used Continued...

Here is some information on the four main pesticides that are used by Integrated Pest Management (IPM) crews when spraying.

Dipel (Non-Toxic)



Dipel is a biological insecticide containing Bt.k (Bacillus thurnguensis Var. kurstaki) that is extremely selective when it comes to the type of insects it kills. It contains naturally occurring bacteria that are fatal to some types of larvae. It works really well against cankerworms, tent caterpillars and leafrollers.

What's great about Dipel, is that humans, beneficial insects, birds, fish, and wildlife are not affected by it. Pets and family may return to the treated area immediately after spray deposits are dry.

So how does it work? Well, caterpillars must eat a small amount of a treated leaf to get a lethal dose, so your application has to be pretty thorough. Uniform coverage of both sides of all foliage subject to attack is essential for fast and complete control. Caterpillars stop feeding within a few hours after taking a bite of the treated leaf. Death follows within a few days.

Insecticidal Soap (Non-Toxic)

Insecticidal Soap® controls many targeted pests with few potential adverse effects and it is only effective on direct contact with the insect. The most common soaps are made of the potassium salts of fatty acids and work best on soft-bodied insects.

Pesticides Used Continued...

The fatty acid breaks down the structure of the insect's cell membranes. The cell contents then leak from the damaged cells, and the insect quickly dies.

Insecticidal Soap® should be applied when conditions favor slow drying to maximize effectiveness, (i.e. in the early morning hours with dew coverage or in the early evening). Avoid treating with soaps on hot sunny afternoons that promote rapid drying of the material.

Once the Insecticidal Soap® spray has dried, there is no residual activity because soaps work only on contact. Therefore, if an insect has not been coated with the spray, walking over or ingesting plant material that has been treated with soap will not affect it. Having said that, Insecticidal Soap® is specifically formulated to have high insect killing properties, while being safe for most plant species.

Insecticidal Soap® can be mildly irritating to the skin or eyes. Even though soaps have low toxicity to humans, they should always be used with caution. Pets and family may return to the treated area immediately after spray deposits are dry.

Trounce (Natural Organic Insecticide)

Trounce is used when spraying for aphids, tent caterpillars and pear slugs. It is a pesticide which is basically Insecticidal Soap® with the addition of Pyrethrum. Pyrethrum is a natural insecticide derived from the extracts of the Pyrethrum flower. The two of these mixed together have a double whammy effect on the aphids.

Trounce is a contact insecticide, which means the spray mixture must come in contact with the aphids. Trounce is not harmful to humans, animals or the environment. Pets and family may return to the treated area immediately after spray deposits are dry.

Dursban™ - Turf (Moderately Toxic)

The pesticide Dursban™ is used when spraying for the Elm Bark Beetle. Dursban™ is part of a class of chemicals known as Organophosphates (Ops for short).

Dursban™ is a moderately toxic pesticide. It is policy to deliver notices to residents of the area where they intend to spray which informs them that spraying will occur within 24 – 48 hours weather permitting. If they are not able to spray in the 24 – 48 hour time period, residents must receive new notices. Crews spraying Dursban™ must wear all regular safety gear as well as rubberized coveralls. Dursban™ is able to enter the body through the skin or by inhalation so it is very important that the appropriate safety gear be worn when spraying.

Pesticides Used Continued...

Only the bottom half metre of the trunk needs to be sprayed, but be sure to spray the root flares. Because spraying is done by hand, on the lower part of the tree using low pressure, there is little drifting.

Once the pesticide dries, (after approximately 1 hour), a toxic effect would only be achieved through ingestion of bark. The residual chemical is effective for a maximum of two years

Workplace Safety

It is a good practice to run blood tests on individuals on the spray crews at the beginning of the season, mid season and again at the end of the season. The blood should be tested for cholinesterase inhibitor. Cholinesterase inhibitor is a chemical compound that prevents the hydrolysis of acetylcholine by the enzyme acetylcholinesterase, thereby permitting high levels of acetylcholine to accumulate at reactive sites. Some are used as drugs, some are insecticides, and certain potent ones are nerve gases that can be deadly to humans or other animals.

An individuals levels must be monitored and if your supervisor sees that thier levels are changing you could be pulled from the spray crew.

Your Day Begins….

Safety Equipment Overview

It is of the utmost importance to wear the correct safety equipment when working with the Integrated Pest Management (IPM) crews.

When you are tree spraying, your safety gear varies depending on the control product that you are using when you spray. It is important to remember that if you are using a non-toxic control product (Insecticidal Soap®Trounce or Dipel) it is acceptable to wear the cloth coveralls. These suits will help to keep you dry from any drift of spray. When you are spraying using a toxic pesticide (Dursban™) it is mandatory that the rubberized coveralls be worn. Some pesticides are able to enter the body through the skin or by inhalation so it is very important that the appropriate safety gear be worn when spraying.

In addition, the driver's safety gear is different from the crewmembers that are actually doing the spraying. The driver is in the vehicle while the other crewmembers are spraying so they are not required to wear the same safety gear as the sprayers. Periodically the driver may have to get out of the vehicle and it's during these times that they must wear their approved work boots along with a safety vest.

Safety Equipment Overview Continued

We have covered the safety gear required for the drivers; now let's take a look at the gear that is required for the sprayers. You have already learned that the safety gear varies depending on whether you are spraying with toxic or non-toxic pesticides.

Safety Gear for SPRAYERS

	TOXIC	NON-TOXIC
Safety Vests (to be worn on all roadways)	X	X
Full Face Respiratory	X	
1/2 Mask		X
Goggles	X	X
Rubberized Coveralls	X	
Cloth Coveralls		X
Rubber Gloves	X	X
CSA Approved Rubber Boots	X	X
Ear Plugs	X	X
Product Placards for Sprayers	X	X

Safety Equipment Overview Continued...

Before you leave for the job site here is a list of other items that you should make sure are in the crew vehicle.

- Product you will be spraying with that day
- Fill up hose
- Curb Key
- First Aid Kits
- Spill Kit
- Crescent / Pipe Wrench
- Replacement Mask Cartridges
- Extra fuel – Sprayer
- Two-way Radio
- Sector Map
- Product Label
- Product MSDS

Delivery of Notices to the Public

Notices should be delivered to homeowners, schools, daycares and businesses in the specified sector, 24 to 48 hours prior to spraying toxic products like Dursban. These are guidelines for delivering spray notices:

- Date stamp all notices with the date of delivery.
- When all or most houses on a block have elm trees deliver a notice to every house on the block.
- When the block has one or a few elm trees deliver a notice to the house with the elm tree and a notice to 3 houses on either side of it and the same across the street.
- Notices are not delivered on blocks that do not have any elm trees.
- When long term road construction is happening in an area and when spraying close by deliver to 3 houses into the construction area on either side. If the construction is not long term, talk to the foreman and determine if the construction crews will be gone within 48 hours. If the construction crews will be done shortly, deliver the entire area of elm trees.
- Sector boundaries are streets that often have one side of the street in one sector and the other side of the same street is the boundary for a different sector. Only deliver the side of the street that is in the sector being sprayed.
- When you are putting notices in the mailboxes, leave half of the notice hanging out of mailbox to ensure that they are seen.
- If there are apartment blocks in the sector that will be sprayed, tape the notices to the front and rear doors.

Delivery of Notices to the Public Continued…

- You need to keep recordshou of streets that have been delivered that day. The spray crews should use these sheets – this avoids streets being sprayed when they may not have been delivered.

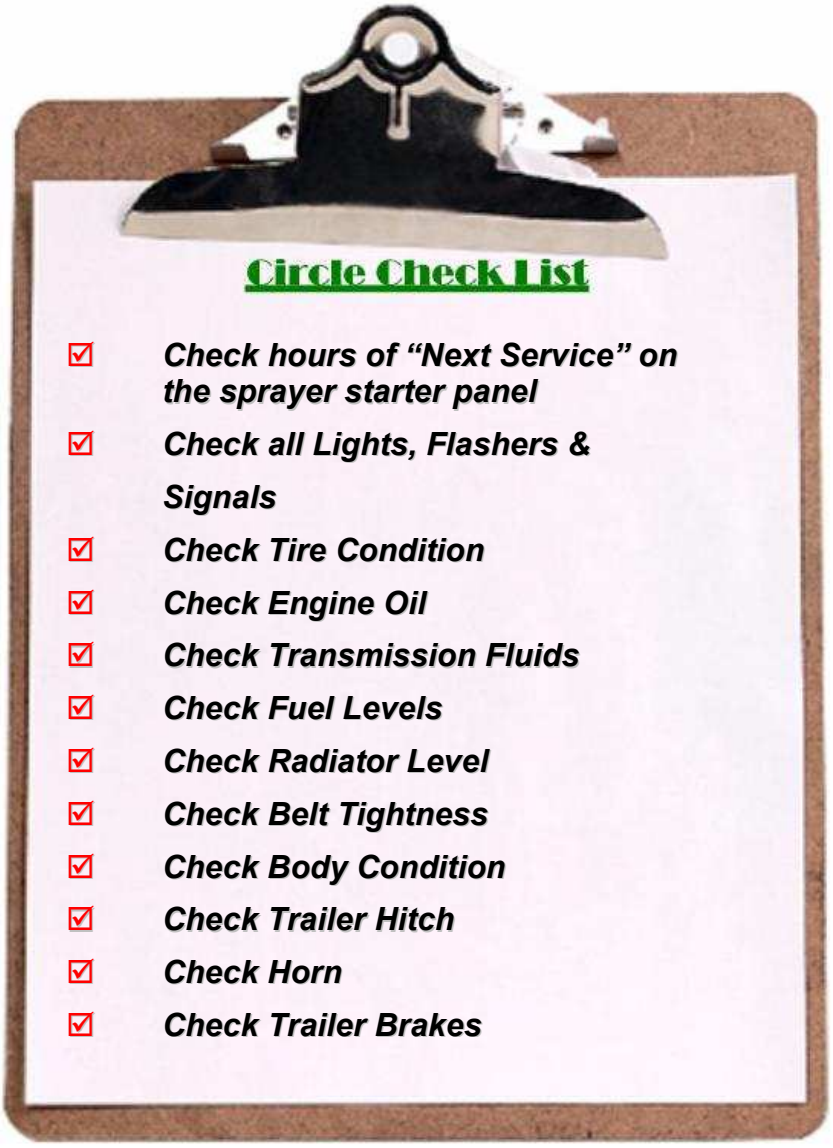
All management teams and front office staff should be notified daily by email of the sectors to be sprayed and the amount completed.

Notice Delivery Crew Checklist:

- Vehicle circle check, including fuel for the day
- Safety vests
- Sufficient notices
- Date stamps
- Ink stamp pads
- Two-way radio
- Sector map
- Pest information pamphlets
- Masking tape

Circle Check For Trucks and Sprayers

Each morning you should perform a circle check on all of the equipment.



Maintenance Check For Trucks and Sprayers

Before performing a maintenance check, be sure that the equipment is clean of dirt and contamination.

Sprayer Lingo

Below are some of the commonly referred to parts of the sprayer along with a brief description of the part.

Drain / Rinse Valve	***Located at the filter. It is used to drain and flush the filter area.***
Electric Hose Rewind	***Located at the back of the sprayer and used to wind the hose onto the drum.***
Filter	***Located between the tank and the pump. It protects the pump from contamination by filtering the mixture.***
Front Guns Shut Off Valve	***Located at the front of the sprayer. It is used to activate and de-activate pressure to the front spray guns.***
Hoses and Lines	***These are used to carry the mixture.***
Main Supply Line	***Supplies the mixture from the tank, runs it through a filter and then to the pump.***
Pressure / Flow Control Valve	***Located at the rear of the tank. It is used to set and control the flow of the mixture to the spray guns. It also controls the spray pressure.***
Quick Coupler Hose End	***These are used to connect and disconnect the spray lines from the truck.***
Rear Guns Shut Off Valve	***Located at the rear of the sprayer. It is used to activate and de-activate pressure to the rear spray guns.***
Spray Guns	***Located at the rear of sprayer, on tow vehicle as well as on the spray deck.***
Supply Valve	***Located on the supply line between the tank and the filter. It controls the flow of the mixture within the supply line.***
Tank / Reservoir	***Holding area for the water and pesticide mixture.***

Spray Crew Responsibilities

Drivers

- Watch for pedestrians, motorcycles, convertibles, etc., and sound the truck horn to get sprayers to stop.
- Pull out hoses and help crew get set up for spraying, (i.e. start motor, and adjust pressure/start pressure).
- Set up of hose at fill site while sprayers are cleaning masks, etc. When you go to fill the spray tank, the driver gets out the fill hose and connects it to the fill pipe. While he starts filling the tank, the people spraying will clean their masks and equipment.
- Coordinate area to be sprayed with other crew leads.
- Start and stop water at fill up site with curb key.
- Close windows of upcoming-parked vehicles while spraying overhead.

Sprayers

- Keep a lookout for pedestrians and traffic while spraying.
- Add control product to tank at fill up site and triple rinse the empty containers into the tank. (For triple rinse procedure, refer to section titled Filling Tank.)
- Spray product.
- Assist in rolling up the hoses after spraying.
- Complete daily logbook requirements.
- Ensure product applied to tree as required.

Safety Procedures for Spraying

When you arrive for your day of tree spraying, you will first perform your circle check of the equipment and then check to make sure that you have the required safety gear to wear for the day. You will find the safety gear stored in the black storage boxes that are on the trailer. Remember, if you are spraying Dipel or Insecticidal Soap® then you can wear the cloth suits to help keep you dry. If you are spraying more toxic products, you must wear the rubberized coveralls because some pesticides can be absorbed into your body through the skin - so cover up! If you need to, you can refer back to the section previously covered titled “Safety Equipment Overview” for the specific pieces of safety gear that are to be worn when you are spraying with toxic vs. non-toxic products.

Now you are ready to drive to the area that you are going to be spraying. Remember that everyone rides in the cab of the truck. The only time you are to be sitting on the sprayer’s operator deck is when you are actually spraying, moving to the next street or going around the block to continue spraying.

Filling Tank

You will be required to know how to fill the tank and prepare the proper mixture to spray. Filling the tank is a joint effort by all the crewmembers.

The number of times that you fill the tank will depend on the size of the area, product used, the density of the tree canopies and how often you are spraying.

Here are the steps that you will follow when you are filling the sprayer tank.

1. Go to a location that has a park standpipe for water. If you are unsure of where an outlet is located, either check the list provided to the crew or ask your supervisor.

2. Before attaching the hose to the standpipe, test the outlet first. Insert the curb key and slowly turn it to the left. Once the water begins to flow you can turn the curb key to the right to turn off the water.

3. One end of the hose can be attached to the park standpipe; the other end can be attached to the quick coupler at the side of the sprayer tank.

Filling Tank Continued…

4. Remove the screw top lid and basket to allow the water to flow into the sprayer tank.

5. The curb key controls the water pressure. When you are turning the water on make sure you do it slowly. If you open the flow of the water too quickly you risk popping the hose off which could injure someone.

6. For best results, add dry/granular products to tank while you are filling the tank. This assists with the mixing of the product.

7. Once the sprayer tank is filled to the desired level, the operator turns the curb key to the right to shut the water off.

8. The hose can be disconnected from the sprayer tank.

Filling Tank Continued…

9. Replace the basket and twist on top of the sprayer tank and then get off the trailer using a careful three-point dismount. The equipment may be slippery so be careful!

10. Now that the control product has been added to the tank, the container(s) are to be rinsed. To do this, you will fill the container(s) with water from the park standpipe, swish the water around in the container and empty it into the sprayer tank. This is to be done 3 times to each container – empting it into the sprayer tank each time. Each container is to be sliced open before they are stored for disposal so that they cannot be reused for anything. This is referred to as the “triple rinse process”.

11. Now is a good time to spray off the spray deck, tank and trailer. They get quite sticky or slippery. Spraying the residue off each time you fill the tank is very important. If the truck or its windows have a residue on them you can wash it too. As well, wash off the rubber gloves and boots, even the rain suits if necessary when you fill the tank.

12. Disconnect the hose from the park standpipe. Drain the water from the hose and put it back into the storage compartment on the truck.

13. The skilled labourer will record the product being used, the amount of product and the area being sprayed.

Starting the Sprayers on the Ride-On Sprayer

Once the water and pesticide have been added to the tank and you have driven to the area you are going to spray, the sprayer can be started. It's really quite simple to start. Insert the key and turn left to Preheat. Leave on Preheat for a couple of seconds. Hold in the Murphy switch before starting and for about 5 – 8 seconds after starting.
Then turn key to the START position and the engine will start up.
If the engine doesn't start up, wait 15 seconds and repeat the steps again.

You will notice that the hours of the "next service" are written on the panel as well. Take note of how many hours are presently on the machine. If it is getting near time for servicing or not working let your supervisor know. Arrangements can be made for the equipment to be booked in for service.

Once you have started the sprayer, let in run for a few minutes. The reason you let it run for a while is two fold. You are not only letting the engine warm up, but there are two agitators inside the bottom of the tank that only run when the sprayer is on. These agitators help mix the water and pesticide that you have added to the tank.

Starting the Sprayers on the Ride-On Sprayer Continued...

To shut down the sprayer:

1. Throttle down the engine and let it idle for 2 minutes before shutting off.
2. Turn the engine switch to the OFF position.
3. Turn the fuel valve to the OFF position.

Spraying Procedures

Now that you know all about the equipment, pests and pesticides you are ready to actually begin spraying. The spraying season is not set in stone; it varies somewhat depending on our weather conditions. For example, if we have an early spring you may begin the spraying programs earlier.

Keep in mind that whether you are using the ride-on tree sprayer or the water truck, your method of spraying is the same. First, there are a few things that need to be taken into consideration before you start spraying; the density of the tree canopy cover, wind speed, wind direction, temperature and humidity. All of these factors will affect the spray path and evaporation rate. It is also important that the truck is being driven at a slow pace - anywhere from 2 – 10 km/hour. Again, it depends on the weather conditions. The windier it is, the slower you will need to travel. Having said that, if the wind speed is over 30 km/hour, it is usually too windy to spray.

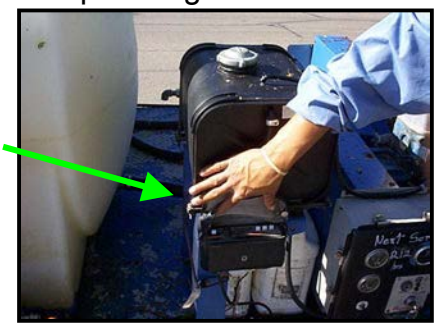
Your driver will be keeping an eye out for anyone in their front yards, children playing nearby or for vehicles that may have open windows. If they need you to stop spraying they will signal to you by honking the horn. When you hear the horn, stop spraying. The driver will get out of the truck and ask the individuals to go inside or if necessary he will go up to the door and ask the homeowner if they could have them go inside for 30 minutes or so. In the case of a vehicle having an open window the driver will close it or instruct the crew not to start spraying until they've passed it.

Spraying Procedures Continued…

Be aware of what's going on around you. With trees and fence lines the driver may not always see small children playing in a yard or pets that may be tied up. Sometimes it's easier for the crew that is spraying to notice these things because they sit higher.

Amber Light Beacon and Barricades

To ensure both personal and public safety, all your warning and arrow board lights must be functioning in accordance with traffic regulations. The power pack for the light beacon is on the passenger side of the trailer and on the far left side of the motor. It is in a leather pouch that protects it from the weather as well as drift from the spray. The button on the far left will turn on/off the light beacon.

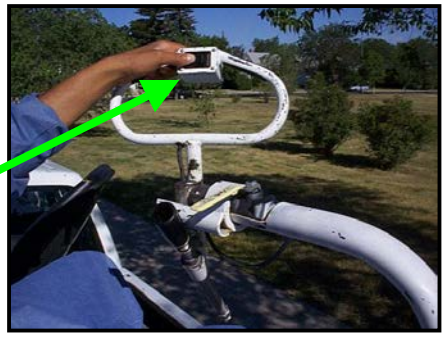


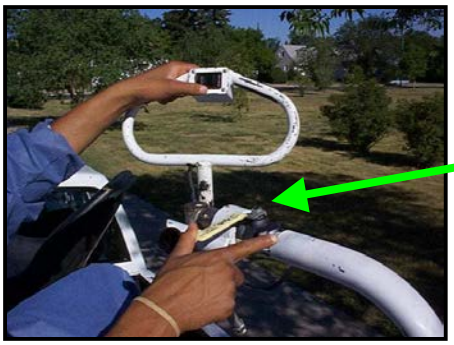
Traffic barricades must also be set in accordance with the above regulations. Since you are moving as you spray, it is difficult to set these barricades up, so check with your supervisor and get suggestions on what to do. Often your supervisor will follow and park across the street that you are spraying on, so that traffic is unable to enter. When you are done spraying one street they will follow you to the next. The procedure for this varies depending on the area that is being sprayed.

Spray Deck Chairs

These chairs make life simpler for every tree spraying crewmember around. They are so functional. Each chair will turn approximately 180° in the opposite direction of the other. In other words, between the two chairs, crewmembers can go full circle. The direction and height of the spray is controlled by moving the handlebars.

To maneuver the chair from side to side, you press either on the left or right side of the black button. If you press the left side your chair will turn left, it you press the right side of the button, your chair will go right.





The lever is the on/off valve for the product flow. It can control pressure somewhat, but the pressure is mainly adjusted on the spray wand itself.

Using the Spray Hoses

The spray guns are mounted on the handlebars of the chairs on the spray decks.

1. The sprayer hose attaches to the quick coupler under the truck deck. The hoses and lines, which connect the sprayer to the guns, are already in place under the deck bed.

2. You will then manually unwind the hose to the desired length when walking behind to spray.

3. You will have to open up the spray hoses so that the pesticide mixture from the tank is allowed to flow to your spray gun.

4. Open up the throttle. This throttle can be opened and closed by pulling it open or by pushing it closed. As well, instead of the push/pull method, you can turn the throttle to the right to open it up or to the left to close it. You can control the idle by how far you open or close the throttle.

Using the Spray Hoses Continued…

5. You control the pressure of the spray with the lever. The flow is closed when the lever is to the far left position. As you move the lever to the right, the pesticide mixture will begin to flow into the hose attached to your spray gun. These levers should be opened slowly to prevent hoses from becoming detached from the pressure.

To set the pressure of the spray hoses there is a black hexagon shaped nut that you turn. Depending on which sprayer you are using, it will be on the driver side, either at the front or the back of the tank. Loosen the nut, adjust it, watching the gauge, and then retighten it.

There are two different sizes of hoses: for overhead spraying you will use the ¾" hose which can be set between 800 – 1,000 psi.

When you are spraying for Elm Bark beetles you will use the ¼" hose which is to be set at 50 psi.

Safety First!

The metal spray decks and the trailer can become very slippery because of the drift of the spray. Exercise caution when you are filling the tanks and moving around on the spray decks.

When you are on the spray deck and spraying - your seat belt must be worn at all times.

Where to Spray

Where you spray depends on what insect you are targeting. For all insects – except the Elm Bark Beetle, your target is the canopy of the tree. As you will see in these photos, you will spray so that you cover the entire tree canopy. If the trees are side by side and their canopies touch you can use a continuous spray motion. If there are gaps between the tree canopies you'll have to shut off your gun between trees.

You can let the motor continue to run for short distances. This way the agitators in the bottom of the spray tank can continue to mix the pesticide. Whenever possible, avoid spraying too close to the houses. Resident could have windows or doors open.

When you are spraying the tree canopy, watch out for the "drift" of the spray. Drift is the movement of a pesticide through the air, not coming to rest on the trees during or immediately after spraying. There will always be some drift but you can help minimize this by adjusting your spray and being aware of the wind speed and direction.

Where to Spray Continued...

Walk Behind Spray Method

When you are spraying for the Elm Bark Beetle on elm trees only, you are only spraying the base of the tree – from ground level, up the tree trunk approximately 0.5 metres. Trees in the park areas and all other open space areas are to be sprayed along with the residential trees. Signs must be placed in all park and open space areas where spraying has occurred, at all entrances to the park, at corners and areas where people will see the signs before entering the area. They are then taken down 48 hours after spraying has occurred. Signs must display product sprayed, date sprayed, PCP # and a contact number.

All sides of the tree trunk must be sprayed. This will mean walking onto the lawn to reach the target areas. On double sprayers when one gun shuts off, the other gun gets double the pressure so be aware and be ready.

At The End of The Day

As I am walking to my car at the end of my shift I take a moment to look up at the sky. The rain held off all day but I am afraid that this evening we are going to see some rain, maybe even a thunder storm. We had a great day today, and we were able to spray a large area. My thoughts drift back to the little girl this morning and the gasp that she let out when she found out we were killing the caterpillars…if she only knew how productive our day had been.

Sprayers – Job Aid
Safety Gear

It is of the utmost importance to wear the correct safety equipment when working with the Integrated Pest Management crews.

When you are tree spraying, your safety gear varies depending on the control product that you are using when you spray. It is important to remember that if you are using a non-toxic pesticide (Insecticidal Soap®Trounce or Dipel), it is acceptable to wear the cloth coveralls. These suits will help to keep you dry from any drift of spray. When you are spraying using a toxic pesticide (Dursban™), it is mandatory that the rubberized coveralls be worn. Some pesticides are able to enter the body through the skin or by inhalation, so it is very important that the appropriate safety gear be worn when spraying.

In addition, the driver's safety gear is different from the crewmembers that are actually doing the spraying. The driver is in the vehicle while the other crewmembers are spraying so they are not required to wear the same safety gear as the sprayers. Periodically the driver may have to get out of the vehicle and it's during these times that they must wear their approved work boots along with a safety vest.

Sprayers – Job Aid
Safety Gear

We have covered the safety gear required for the drivers; now let's take a look at the gear that is required for the sprayers. You have already learned that the safety gear varies depending on whether you are spraying with toxic or non-toxic pesticides.

Safety Gear

	TOXIC	NON-TOXIC
Safety Vests (to be worn on all roadways)	X	X
Full Face Respiratory	X	
1/2 Mask		X
Goggles	X	X
Rubberized Coveralls	X	
Cloth Coveralls		X
Rubber Gloves	X	X
CSA Approved Rubber Boots	X	X
Ear Plugs	X	X
Product Placards for Sprayers	X	X

Sprayers – Job Aid
Delivery of Notices

Notices are delivered to homeowners, schools, daycares and businesses in the specified sector 24 to 48 hours prior to spraying when we spray toxic products like Dursban. As a member of the Delivery Crew, these are the guidelines for delivering spray notices:

- Date stamp all notices with the date of delivery.
- When all or most houses on a block have City elm trees, deliver a notice to every house on the block.
- When the city block has one or a few elm trees, deliver a notice to the house with the elm tree and a notice to 3 houses on either side of it and the same across the street.
- Notices are not delivered on city blocks that do not have any elm trees, where no spraying will occur.
- When long term road construction is happening in an area and we will be spraying close by, deliver to 3 houses into the construction area on either side. If the construction is not long term, talk to the foreman and determine if the construction crews will be gone within 48 hours. If the construction crews will be done shortly, deliver notices to the entire area of elm trees.
- Sector boundaries are streets that often have one side of the street in one sector and the other side of the same street is the boundary for a different sector. Only deliver the side of the street that is in the sector being sprayed.
- When you are putting notices in the mailboxes, leave half of the notice hanging out of mailbox to ensure that they are seen.
- If there is apartment blocks in the sector that will be sprayed, tape the notices to the front and rear doors.
- You need to keep and hand in a daily sheet of streets that have been delivered that day. The spray crews use these sheets – this avoids streets being sprayed when they may not have been delivered.

The management team and front office staff is notified daily by email of the sectors to be sprayed and the amount completed.

Notice Delivery Crew Checklist:

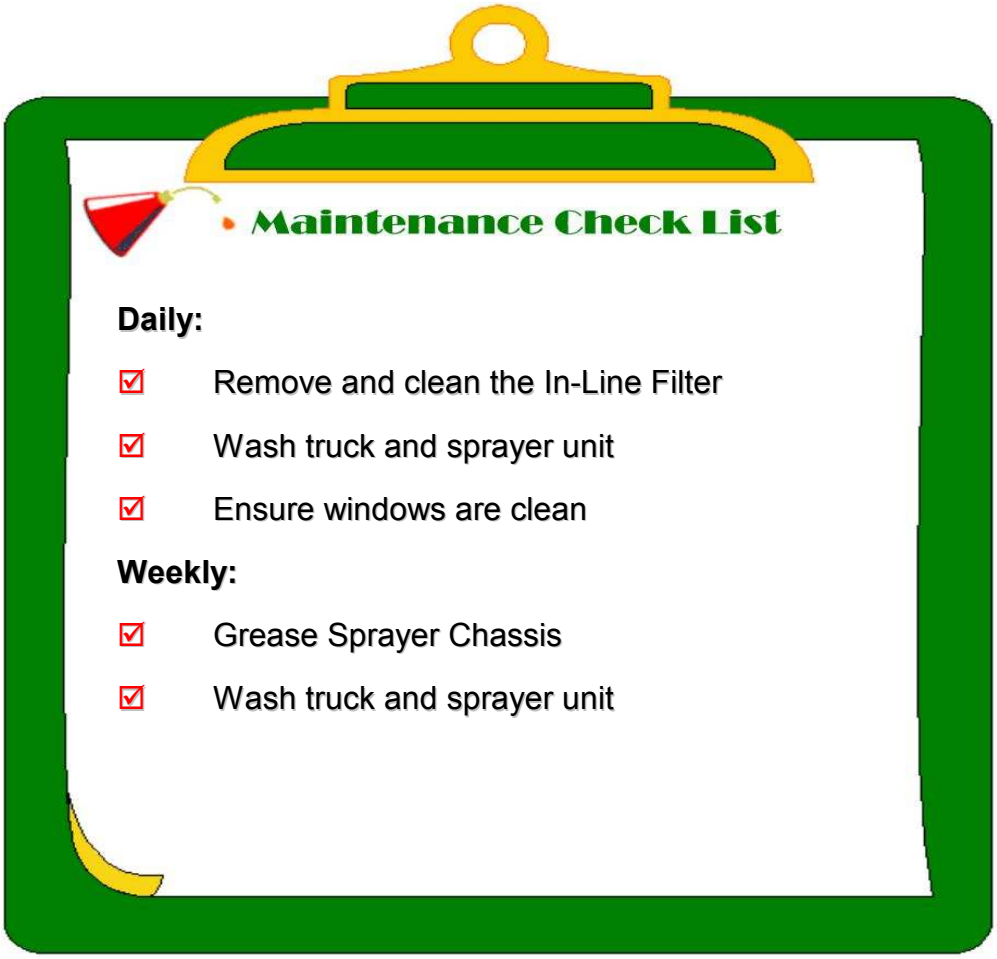
- Vehicle circle check, including fuel for the day
- Safety vests
- Sufficient notices
- Date stamps
- Ink stamp pads
- Two-way radio
- Sector map
- Pest information pamphlets
- Masking tape

Sprayers – Job Aid
Circle Check for Trucks and Sprayers

Each morning you will perform a circle check on all of the equipment.

Sprayers – Job Aid
Maintenance Check for Trucks and Sprayers

Before performing a maintenance check, be sure that the equipment is clean of dirt and contamination.



Sprayers – Job Aid
Filling Tank

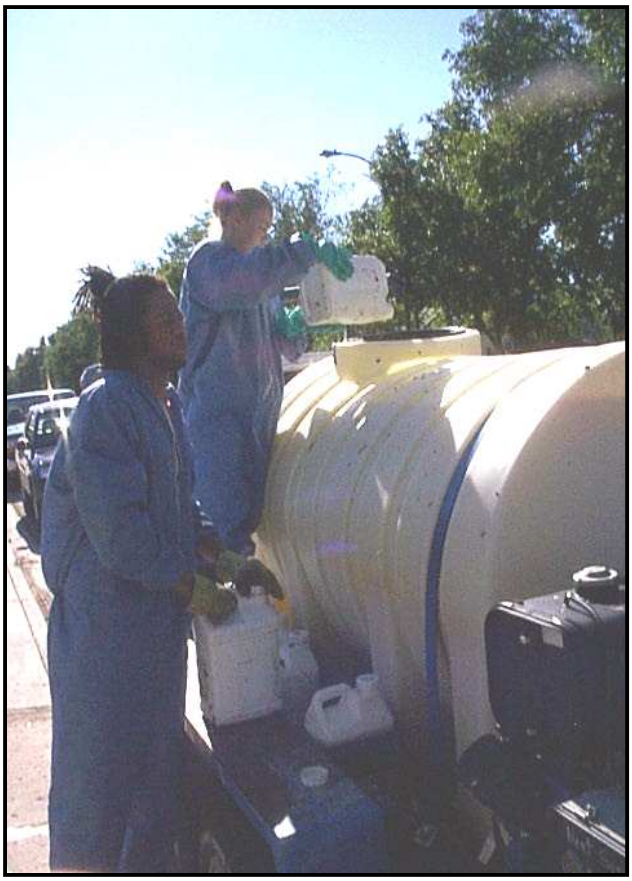
You will be required to know how to fill the tank and prepare the proper mixture to spray. Filling the tank is a joint effort by all the crewmembers.

The number of times that you fill the tank will depend on the size of the area, product used, the density of the tree canopies and how often you are spraying.

1. Go to a location that has a park standpipe for water. If you are unsure of where an outlet is located, either check the list provided to the crew or ask your supervisor.
2. Before attaching the hose to the standpipe, test the outlet first. Insert the curb key and slowly turn it to the left. Once the water begins to flow you can turn the curb key to the right to turn off the water.
3. One end of the hose can be attached to the park standpipe; the other end can be attached to the quick coupler at the side of the sprayer tank.
4. Remove the screw top lid and basket to allow the water to flow into the sprayer tank.

5. The curb key controls the water pressure. When you are turning the water on make sure you do it slowly. If you open the flow of the water too quickly you risk popping the hose off and it could injure someone.

Sprayers – Job Aid
Filling Tank



6. For the best results, add dry/granular products to the tank while you are filling it. This will assist with the mixing of the product.
7. Once the sprayer tank is filled to the desired level, the operator turns the curb key to the right to shut the water off.
8. The hose can be disconnected from the sprayer tank.
9. Replace the basket and twist on top of the sprayer tank and then get off the trailer using a careful three-point dismount. The equipment may be slippery so be careful!
10. Now that the control product has been added to the tank, the container(s) are to be rinsed. To do this you will fill the container(s) with water from the park standpipe, swish the water around in the container and empty it into the sprayer tank. This is to be done 3 times to each container – empting it into the sprayer tank each time. Each container is to be sliced open before they are stored for disposal so that they cannot be reused for anything. This is referred to as the “triple rinse process”.
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Sprayers – Job Aid
Starting the Sprayers

Once the water and pesticide have been added to the tank and you have driven to the area you are going to spray, the sprayer can be started. It's really quite simple to start.

1. Insert the key and turn left to Preheat. Leave on Preheat for a couple of seconds. Hold in the Murphy switch before starting and for about 5 – 8 seconds after starting.
2. Then turn key to the START position and the engine will start up.
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To shut down the sprayer:

1. Throttle down the engine and let it idle for 2 minutes before shutting off.
2. Turn the engine switch to the OFF position.
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Sprayers – Job Aid
Spraying Procedures

Now that you know all about the equipment, pests and pesticides you are ready to actually begin spraying. The spraying season is not set in stone; it varies somewhat depending on our weather conditions. For example, if we have an early spring you may begin the spraying programs earlier.

Keep in mind that whether you are using the ride-on tree sprayer or the water truck, your method of spraying is the same. First though, there are a few things that need to be taken into consideration before you start spraying; the density of the tree canopy cover, wind speed, wind direction, temperature and humidity. All of these factors will affect the spray path and evaporation rate. It is also important that the truck is being driven at a slow pace - anywhere from 2 – 10 km/hour. Again, it depends on the weather conditions. The windier it is, the slower you will need to travel. Having said that, if the wind speed is over 30 km/hour it is usually too windy to spray.

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Sprayers – Job Aid
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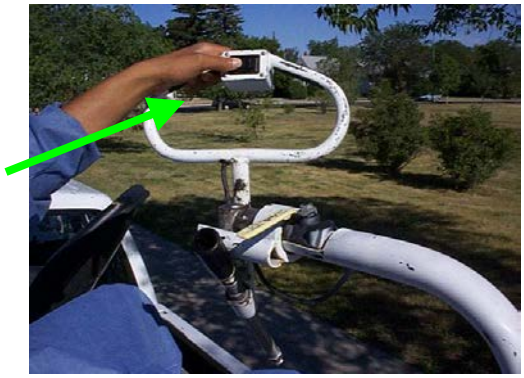

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