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University of Idaho College of Forestry, Wildlife and Range Sciences

Forest Research Nursery Waste Water Management Plan Integrated Pest Management Plan and Pesticide Safety

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The University of Idaho Forest Research Nursery

The nursery was established in 1909 to grow bareroot (field-grown) tree and shrub seedlings for conservation. In 1982, the bareroot production was phased out and replaced by growing seedlings in containers in greenhouses. The nursery emphasizes teaching, research and service. Students learn about forest planting; scientists conduct research to improve seedling quality, survival and growth; and seedlings are produced each year for the state of Idaho, private industry, and the general public.

The 15-acre nursery site is located one mile east of Mountain View Road along Idaho 8 (Troy Highway) on the University of Idaho Parker Farm and consists of a shop, cooler/storage building, three greenhouses, a shadehouse, and a micropropagation facility. The greenhouses and shadehouse have about 13,700 square feet of growing area and can produce about 900,000 seedlings each year. Six acres are enrolled in the Idaho Department of Fish and Game Habitat Improvement Program, with an additional 1.5 acres scheduled to be enrolled in fall 1993. The remainder of the Parker Farm is administered by the College of Agriculture. (See enclosed map.)

Concern for Human and Environmental Health

We are concerned about our health, as well as the health of our employees, guests, neighbors and the environment. Our nursery is an intensive agricultural operation. We grow seedlings under near optimum conditions, fertilizing and watering them regularly. An important part of managing our tree nursery is controlling pests.

The effects of intensive fertilization and pesticide control methods on human health and the environment are a chief concern in our operation, and we take special precautions to eliminate harmful effects.

GROUNDWATER CONTAMINATION FROM EXCESS FERTILIZER

The Problem

Throughout the growing season, April until November, we fertilize our seedlings with water-soluble fertilizers. Our chief concern is the nutrient nitrate. Nitrate, a form of nitrogen, is a common fertilizer used on wheat-fields and in our greenhouses. Nitrate is especially mobile in water and poses a human health risk when present in drinking water in significant quantities.

Our Solution

We begin by monitoring the nitrate levels of our well water monthly throughout the growing season. We comply with all state regulations for the application of fertilizers through irrigation water, a process known as chemigation. We are all licensed chemigators, and our chemical injecting equipment is approved by the State of Idaho.

A Wetland Water Purifier

Excess fertilizer solution, including nitrates, are pumped from the greenhouse into a 300,000-gallon wetland constructed in the fall of 1989 to treat effluent. The clay-lined wetland is stocked with aquatic plants that remove the excess nutrients. Bacteria also live in and around the roots of these plants, and they, too, are very efficient at removing nutrients. Further, some nutrients are degraded by sunlight. We monitor water quality in our wetland monthly during the active growing season to make sure the fertilizer levels in it are not excessive.

Does the Wetland Work?

Yes. We completed a detailed study of our water use and waste water quality during the 1991 growing season. The nursery discharges about 10,000 gallons each week, a mixture of plain water and fertilizer solution. The National Public Health Service has set a drinking water standard for nitrate nitrogen of less than 10 parts per million (ppm). In our wetland, nitrate nitrogen levels were almost always less than 0.2 ppm, and never exceeded 2 ppm. In fact, these levels are similar to the nitrate levels in our well water. A study published in 1991 by the University of Idaho College of Agriculture showed about 68% of the sampled wells in Latah and Benewah counties had similar nitrate levels.

Besides cleaning our waste water, the wetland is also sanctuary for over 50 species of birds and various other animals. Common visitors include geese, ducks, an occasional swan, pheasants, gray partridge, hawks and owls.

OUR PESTICIDE PHILOSOPHY

Managing pests is a full-time job at the nursery. Plants, animals, insects and fungi that disrupt our operation are pests. Pests can and do appear any time during the production cycle.

We use pesticides only as a last resort.

Between 1983 and 1991, we've reduced the number of pesticide applications from 30 to 6, and the amount of pesticide solution applied per 1000 seedlings from 5.5 gallons to 0.9 gallons, even though we now grow 60% more seedlings!

We make extensive use of preventative measures, especially sanitation, to keep pests away from our seedlings. By removing or reducing the conditions necessary for pests to flourish in our greenhouses, we reduce or eliminate the need to use pesticides. To control pests we use a combination of biological, chemical, and cultural methods. Using these measures in a formal decision-making process is called integrated pest management (IPM). The key elements of this process are: 1) establish and then use pest damage threshold levels, 2) monitor pest populations and damage levels, 3) consider all treatment methods, and 4) evaluate treatment results. These key elements are briefly described below.

Pest Damage Threshold Levels -- We decide how much disease or how many pests we will allow before taking action. This number is our action threshold. This varies by pest, tree species affected, and the age of the trees. Young seedlings are generally more vulnerable to pests than older seedlings. See appendix A for more information.

Monitoring Pest Populations and Damage Levels -- Once we have determined the action threshold for each pest, we monitor seedlings daily for insects, animals, and early disease symptoms. If something appears wrong, we identify the affected species and the pest, we determine if the problem is localized or widespread and we rate the level of damage.

Consider All Treatments -- If the pest problem exceeds our threshold levels, we have five options. These options, in increasing risk to humans and the environment, are described below.

1. Do nothing - This is generally not a viable alternative, as seedlings may be irreparably damaged or killed.

2. Cultural control - This method makes use of certain nursery practices that make the habitat or environment less favorable for pests. It can also include removing large pests by hand, or using sticky-cards to trap certain insect pests.
3. Biological control - The deliberate use of natural enemies to control pests (for example, a specific insect that eats the insect pest).
4. Biological pesticides - Presently, these are generally only for control of insects. The main ingredient of these pesticides is a specific strain of the bacteria *Bacillus thuringensis*. The bacteria infect the insect pests and kill them. Beneficial and non-targeted insects are unaffected.
5. Chemical pesticides - The use of chemicals to control pests. Included in this category are the insecticidal soaps, considered environmentally "friendly."

Treat and Evaluate -- Once we have chosen the best control method, or more commonly the best combination of control methods, we treat only the affected portion of the crop. Follow-up monitoring determines if the treatment was effective and if further control methods are necessary.

USING PESTICIDES SAFELY

In Idaho, pesticides have two general classifications, general-use and restricted-use. Application of restricted-use pesticides requires a pesticide applicators license. At the Nursery, we only use general-use pesticides, however, all of us are licensed pesticide applicators. Many of the general-use pesticides we use are the same as those you can buy at your local garden store (see appendix B). Although these chemicals are the safest pesticides available, we still treat their storage, application and disposal as serious business.

Human Safety First

Our major concern with any pest control method is its impact on human health. We take great care to prevent, reduce, and minimize the adverse effects of pest control methods on human health. We follow all rules specified by the Environmental Protection Agency for the Worker Protection Standard as printed in the Federal Register, volume 57 number 163, and effective as of August 21, 1992. These rules, plus a few we added for our nursery, are briefly described below:

1. Each time temporary employees are recalled for work, they are informed that our pesticide safety board is the central location for safety information. Besides basic pesticide safety information, this station also includes emergency information, a first-aid station, Material Safety Data Sheets which provide additional important information about chemicals used at the nursery, and a record of pesticide applications made at the nursery.
2. If a pesticide application is necessary, the following protocol is followed:
 - (a) Workers will be notified prior to pesticide applications.
 - (1) We will post on our pesticide safety board, no sooner than 24 hours before the application, the following information which will remain in place for 30 days following the application:
 - (i) location and description of the treated area,
 - (ii) the product name, its EPA number and the active ingredients,
 - (iii) the time and date of application,
 - (iv) the restricted-entry interval by law plus the voluntary restricted-entry interval imposed by nursery staff.
 - (2) Pesticide warning signs will be placed around the treatment area no sooner than 24 hours prior to application and will remain in place until the restricted-entry interval has elapsed.

- (3) Immediately prior to application, workers will be orally warned by the pesticide applicator. The applicator will announce to each worker the location and description of the treated area, the time of entry restriction, and the restricted-entry interval.
 - (b) Workers will not enter areas being treated by pesticides while the application is in progress. In addition, workers will stay at least 100 feet away from the shadehouse and at least 25 feet away from areas being treated in the greenhouse during applications.
 - (c) After the application, workers will not enter the treated area (the actual area to which pesticides were applied) until the restricted-entry interval has past. We have voluntarily added an additional 24 hours onto the mandatory restricted-entry interval (see appendix B).
 - (d) Once the restricted-entry intervals have elapsed, workers may work in treated areas. Employees not wishing to work in treated areas will be reassigned if possible, otherwise they will be sent home. We will provide safe water, soap, and single-use towels for workers to decontaminate themselves after working in pesticide treated seedlings.
3. Only full-time staff, properly trained and licensed to apply pesticides in Idaho, are allowed to apply pesticides. Applications are recorded as mandated by state law and are available for public review. We supply and annually inspect protective clothing and devices for worker safety.
 4. We attempt to only have enough chemical on hand for the current growing season. To minimize waste and disposal problems, we carefully plan our spraying operations and mix only enough pesticide to treat the affected area.
 5. An accident plan in case of pesticide spills or poisoning is posted at the Nursery in three locations: 1) inside the door of the chemical storage cabinet, 2) with the pesticide safety board, and 3) next to the telephone.
 6. University of Idaho Environmental Health and Safety Office personnel and the Moscow Volunteer Fire Department annually receive notice of the chemicals stored at the nursery, as well as their storage location. Buildings containing chemicals are appropriately designated.
 7. Empty containers are disposed according to instructions on the product label. Chemicals no longer used are disposed of through the University of Idaho Environmental Health and Safety Office.

Pesticide Applications In Our Fields

We control weeds around our greenhouses and noxious weeds in our fields. Pesticides are applied with a backpack sprayer to reduce the total acreage treated by confining spray to targeted pests. We follow the same guidelines for human health as described above as well as posting treated areas with "caution" signs. Please look for and respect the information on these signs.

SOURCES OF INFORMATION

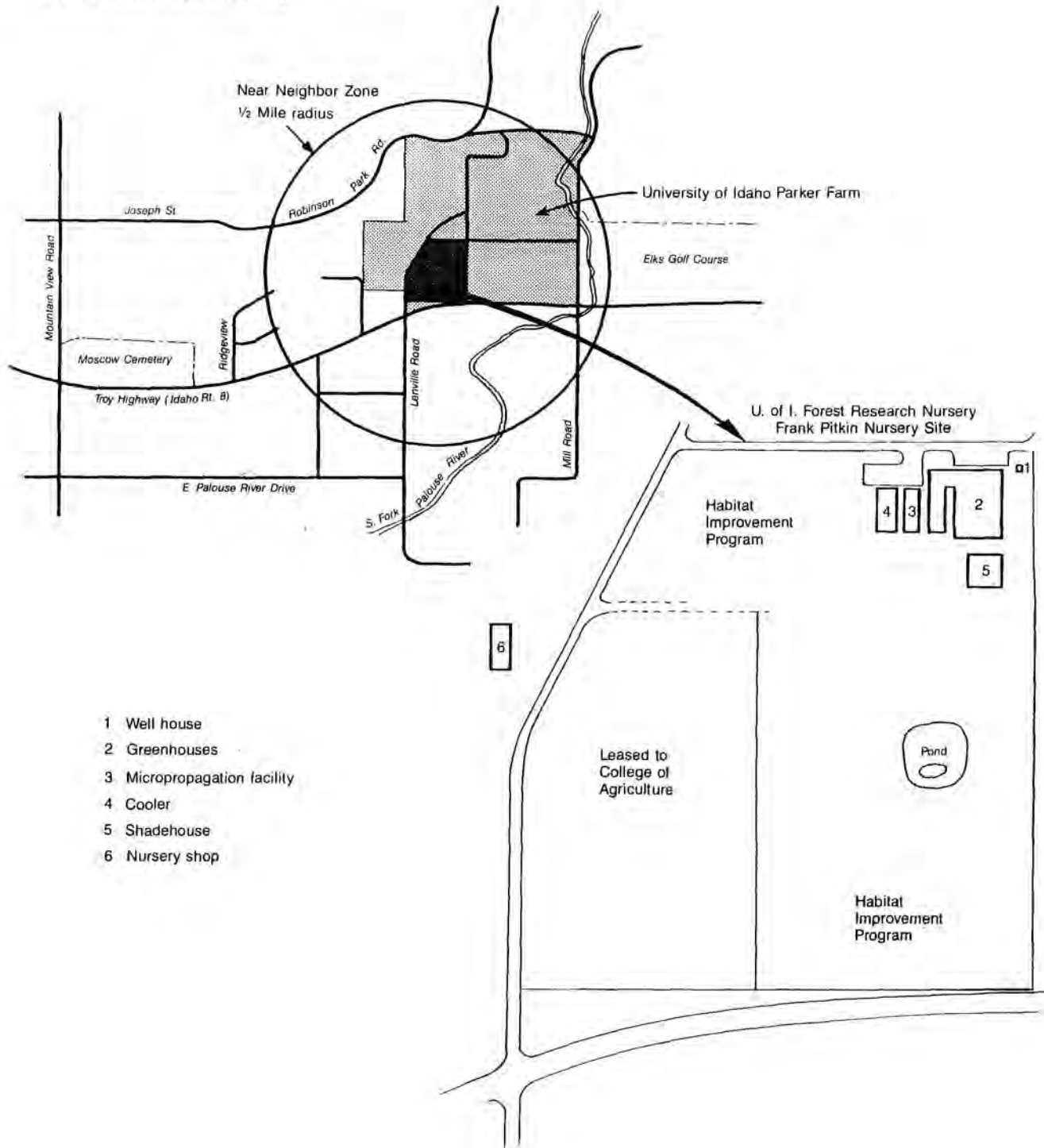
Information on pesticides was obtained from product labels, material safety data sheets and the five Nursery Pest Management, Draft Environmental Impact Statements, published between 1989 and 1991 by the USDA Forest Service.

If you have any other concerns or questions about our operation, please feel free to write us or give us a call. Our address is: Forest Research Nursery, University of Idaho, Moscow, ID 83843. Our telephone number is 885-6444. You may call nursery manager David Wenny direct at 885-7023. The University of Idaho Environmental Health and Safety Office may be reached at 885-6524.

COME VISIT US

Visitors are always welcome at our facility. We are open weekdays from 7:30 am until 4 pm. Feel free to stop by, look at our seedlings, see the research we are doing, visit our wetland, and ask questions about our operation.

Location of the University of Idaho Forest Research Nursery



Appendix A

Pesticides used at the University of Idaho Forest Research Nursery in the greenhouses (G), shadehouse (S), and field (F).

The Environmental Protection Agency has established four pesticide toxicity categories. Toxicity I pesticides carry a label with "Danger-Poison" and less than 1 teaspoon of chemical can be fatal. Nicotine is one such chemical. Toxicity II pesticides say "warning" on their labels and between 1 teaspoon and 1 ounce of pure chemical can be fatal. Caffeine falls into this category. Toxicity III pesticides are labeled with "caution" and between 1 ounce and 1 pint of chemical can be fatal. Chemicals like table salt, bleach and aspirin fall into this toxicity category. Toxicity IV pesticides carry no warning on their labels. These toxicity categories also specify how soon someone may safely enter a treated area. The Research Nursery has voluntarily added an additional 24 hours to those recommendations.

Trade name & active ingredient	Toxicity Category	Label Restricted-entry Interval	Nursery Restricted-entry Interval
	"Danger-Poison"	48 hours	72 hours
	"Warning"	24 hours	48 hours
	"Caution"	Entry allowed after dusts or mists have settled or solution has dried (2-4 hours under nursery conditions)	24 hours
Agribrom	Danger: corrosive	Potential applications per growing season: 1-3	Where applied: G General notes: Active ingredient inert upon contact with organic matter.
Dipel 2X <i>Bacillus thuringensis</i> var. <i>Kurstaki</i>	Caution	1-3	G,S Biological control. Safe for all organisms except targeted pests.

Gnatrol <i>Bacillus thuringensis serotype H-14</i>	Caution	3-6	G,S	Biological control. Safe for all organisms except targeted pests.
Benlate 50WP <i>Benomyl</i>	Caution	1-3	G,S	Leaching potential not significant (less than 0.5%)
Captan 50WP <i>Captan</i>	Caution	0-2	G	Leaching potential not significant (less than 0.5%)
Rampage <i>Cholecalciferol</i>	Caution		G,S	Treated grain ingested by mice triggers their physiology to release stored calcium. This "over-dose" of their own calcium proves fatal. Predators feeding on sick or dead mice not affected.
Dursban 2E <i>Chlorpyrifos</i>	Warning	0-1	G,S	Leaching potential not significant (less than 0.5%). Highly toxic to some birds, fish, and bees.
Diazinon 50W <i>Diazinon</i>	Warning	0-2	G,S	Leaching potential not significant (less than 0.5%). Highly toxic to waterfowl and aquatic organisms.
Insecticidal Soap <i>Potassium salts of fatty acids</i>	Caution	2-3	S	Readily biodegradable. No soil accumulation. Nontoxic to birds.
Curtail <i>Clopyralin</i>	Danger: corrosive		F	Spot spray thistle with backpack sprayer.
Banvel <i>Dicamba</i>	Warning		F	Spot spray bindweed with backpack sprayer.
Roundup <i>Glyphosate</i>	Warning		F	Spot spray weeds around buildings with backpack sprayer. No bioaccumulation and low bird toxicity. Leaching potential not significant (less than 0.5%)
Princep 4G <i>Simazine</i>	Caution		S,F	Pre-emergent to prevent weeds around buildings and in shadehouse. Leaching potential not significant (less than 0.5%).

Appendix B

PEST THRESHOLD DAMAGE LEVELS AND SUBSEQUENT TREATMENTS

PEST	PEST ATTRIBUTES	DAMAGE THRESHOLD	PREVENTATIVE TREATMENTS	TREATMENTS
Rabbits	Eat overwintering seedlings.	Any damage exceeds threshold.	Gate shadehouse.	Live-trap and relocate.
Mice	Eat freshly sown seed. Harvest seedlings for bedding.	Any damage exceeds threshold.	Maintain vegetation-free buffer zone around buildings.	Continual baiting with Rampage. Mouse traps.
Aphids	Suck sap from plants. If large populations, can deform and kill shoots.	Because of rapid population increases, treat immediately.	Maintain vegetation-free buffer zone around buildings.	Spray insecticidal soap weekly for 3 weeks. If aphids persist, apply Diazinon.
Moth Larvae	Defoliate or completely consume young seedlings.	Any damage exceeds threshold.	Maintain vegetation-free buffer zone around buildings. Refrain from using photoperiod lights until spring solstice.	Hand-pick when observed. If widespread, apply Dipel to affected area.
Fungus gnats	Larvae feed on organic matter and seedling roots.	Ten adults per block.	Set out yellow sticky-cards to trap and monitor adults.	Reduce irrigation frequency if possible. Soil drench with Gnatrol at full strength, then once a week for 3 weeks at ¼ strength.
Green-house weeds	Will kill seedlings if growing in same cell. Possible source of <i>Fusarium</i> disease.	Any weeds exceeds threshold.	Maintain vegetation-free buffer zone around buildings.	Hand-pull from containers. Spot spray with bleach if found in floor cracks.

Field weeds	Noxious weeds must be controlled. Weeds must be removed from vegetation-free buffer zone.	Any of these weeds exceed threshold.	Apply pre-emergent herbicide Princep to keep weeds from sprouting in buffer zone.	Spot-spray thistles with Curtail and morning-glory or bindweed with Banvel. Spot-spray buffer zone weeds with Roundup.
Algae & moss	Algae on floors make them hazardous to employees and guests. Moss on containers encourages fungus gnats and disrupts normal watering.	More than 20% of the surface is covered.	Power scrub floors each spring to remove any build-up from previous growing season.	Treat when necessary with Agribrom.
Damping-off	This disease is often an association of many fungi. Seedlings are killed.	15% of the blocks in a seedlot have 3-5% of their cells with disease.	Surface sterilize seeds with a bleach solution before sowing. Remove dead and dying seedlings to prevent spread.	Treat affected area or seedlot with Benlate or Banrot.
<i>Fusarium</i>	Cotyledon blight affects newly sprouted seedlings and is occasionally fatal. Root disease generally affects seedlings during hardening.	15% of the blocks in a seedlot have 3-5% of their cells with disease.	Remove dead and dying seedlings. Limit seedling stress during the hardening-off phase.	Treat affected area with Benlate.
<i>Botrytis</i>	Foliage disease occurs in late summer and early fall after seedling crowns close.	15% of the blocks have 25% of their area affected, or any blocks have 50% + infection.	Vacuum dead needles from larch. Use only early morning irrigations. Remove dead seedlings. If possible, spread blocks apart to improve aeration. Add a spreader to irrigation water to enhance evaporation from needles. Brush foliage with PVC pipe to remove free water from foliage.	Treat affected area with Botran or Benlate.

UI FOREST RESEARCH NURSERY

RIGHT-TO-KNOW INFORMATION

As an employee of the University of Idaho Forest Research Nursery, you have the right to know about chemicals, especially pesticides, used at the Nursery.

To protect you from pesticide exposure, the Nursery will take the following precautions:

- (1) Staff of the Nursery will provide you with the following general information. Pesticides can enter the body through the mouth, skin, eyes, and lungs, and they can cause skin rashes or sores and eye irritations or injuries. Pesticides may remain on surfaces even though they cannot be seen or tasted.
- (2) Before a pesticide application is made at the Nursery, written notification will be made on the pesticide safety board and workers will be orally warned concerning the location and description of the treated area, the product name, its EPA number and the active ingredients, the time and date of application, and the restricted-entry interval.
- (3) You will be moved to other areas of the Nursery to avoid exposure during treatment. You will be moved from the shadehouse if an application will be made in the greenhouses and there is any possibility the cooling fans will be operating.
- (4) Treated areas will have warning signs posted no sooner than 24 hours before the application is made and will remain in place until the restricted-entry interval has elapsed.
- (5) You will be excluded from a treated area until the minimum re-entry time has passed. Please refer to appendix B in the *Forest Research Nursery Waste Water Management Plan, Integrated Pest Management Plan and Pesticide Safety* booklet for specific information on these re-entry intervals. You will not, under any circumstances, be asked to enter a treated area until the Nursery re-entry interval has past. Preferably, one irrigation will also occur between a chemical pesticide application and you returning to the treated area.
- (5) If you wish to avoid working in treated areas after the re-entry restriction has passed, Nursery staff will attempt to move you to a non-treated area if possible. If not possible, you will be sent home.
- (6) Material Safety Data Sheets (MSDS), published by the chemical manufacturers, are provided for every chemical used at the Nursery. MSDS contain important safety information. These are located in the Right-To-Know station near the pesticide safety center. Other pertinent safety information, including emergency numbers, will also be displayed here. You are allowed access to MSDS and the pesticide safety board at any time.
- (7) You will not be asked to transport, mix, or apply pesticides.
- (8) The Nursery, as required by state law, will maintain a pesticide application record. These records will be available at any time for employee or general public review.

As a worker at the Nursery, you will follow these directions to protect yourself from pesticide exposure:

- (1) Avoid getting on your skin or into your body any pesticide that may be on plants and soil, in irrigation water, or drifting from nearby applications.
- (2) Wash your hands and face before eating, drinking, using chewing gum or tobacco, or using the toilet.
- (3) Wear work clothing that protects the body from pesticide residues. These include long-sleeved shirts, long pants, shoes and socks, and a hat.
- (4) Wash/shower with soap and water, shampoo hair, and put on clean clothes after work.
- (5) Wash work clothes separately from other clothes before wearing them again. Use hot water, heavy-duty liquid detergents, and a full water level. Rinse the washer by running an "empty load" with hot water and the same detergent.
- (6) Follow directions about keeping out of treated or restricted areas.
- (7) Ask the supervisor immediately if you have any questions about pesticides or other chemicals at the Nursery.

Yes, I have read the above information and understand it.

NAME _____

DATE _____