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BOOKMARKS

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Restricted Use Pesticides

WAYNE BUHLER, Pesticide Education Specialist

Because of their potential to cause adverse effects on human health and the environment, many of the very hazardous pesticides are classified as **RESTRICTED USE** by the U.S. Environmental Protection Agency (EPA). The label states **RESTRICTED USE PESTICIDE**, as indicated below.

RESTRICTED USE PESTICIDE

FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR BY PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR’S CERTIFICATION.

Pesticide formulations labeled RESTRICTED USE PESTICIDE can only be sold in North Carolina by licensed dealers and purchased or used by licensed commercial applicators, public operators, certified or licensed structural pest control applicators, and certified private pesticide applicators, or by persons working under their direct supervision.

PESTICIDE RESTRICTED BY NORTH CAROLINA REGULATION—ARSENIC TRIOXIDE

All pesticide formulations containing the active ingredient arsenic trioxide shall not be used or stored inside or in the immediate vicinity of any building used as a human dwelling.

The pesticide dealer shall secure the signature of the purchaser attesting to the fact that the purchaser has knowledge of the use restrictions on arsenic trioxide.

Any licensed pesticide applicator under the authority of Section 143-452 or 106-65.25 as amended of the General Statutes of North Carolina may use such formulations containing arsenic trioxide in or around human dwellings provided such use is performed in a manner consistent with the product label and

access to the pesticide by children is limited.

LOCAL NEED—24 (c) REGISTRATIONS IN NORTH CAROLINA

The North Carolina Department of Agriculture and Consumer Services has registered a number of pesticides as Special Local Need products in North Carolina (Table 1-1). The state-approved labels have been submitted to EPA for review. These products can be used for the purposes listed in this manual and as detailed on the supplemental labels. It is important to remember, however, that the products listed here are for reference only, and any information given on the product labeling takes precedence over information given in this manual.

Application of a pesticide can begin as soon as the state has registered the Special Local Need. However, the applicator must have within his or her possession a copy of the supplemental labeling, including directions for use. Within 10 days the state must notify EPA of what is registered, including a copy of the label. Within 90 days after the date of issuance of the Special Local Need registration by the state, EPA can disapprove the registration. If EPA does nothing within the 90 days, the registration automatically becomes a full federal registration for use only within the state.

If EPA should disapprove a 24 (c) label within the specified 90-day period, it is still legal for the grower to sell the agricultural commodity treated with the pesticide during the time the state label was effective because during that time, the application was legal. However, the commodity is subject to regulations governing tolerance, and residues must not exceed tolerance limits established for the pesticide.

Special Local Need - Active 24 (c) Registrations in North Carolina

The following table is provided for reference only and is subject to change at any time. If you have questions about a specific North Carolina 24 (c) registration, please contact Lee Davis, NCDA&CS Pesticide Registration Manager, (919) 733-3556 or send e-mail to: lee.davis@ncagr.gov.

TABLE 1-1. SPECIAL LOCAL NEED—24 (c) REGISTRATIONS IN NORTH CAROLINA		
Product Name	Use	SLN Number
Di-Syston 8 emulsifiable Insecticide	Asparagus aphids on asparagus	NC-860005
Reflex herbicide	Witchweed in soybeans and idle cropland	NC-870005
Monitor 4	Insects on tomatoes	NC-890007
Reflex	Nutsedge in pine seedling plantations	NC-950010
Witchaway Permiviro Systems	Witchweed in various sites	NC-980005
Envoy herbicide	Bermudagrass in centipede sod (sod farms only)	NC-000002
Goal 2XL herbicide	Witchweed control in corn (Allows planting of small grains within 10 months of last application)	NC-020001
Goal 2XL Herbicide	Witchweed in noncropland (USDA/NCDA witchweed project)	NC-020002
Dithane DF Rainshield fungicide	Diseases of tobacco	NC-020005
Select 2EC herbicide	Annual and perennial weeds in kenaf	NC-020006
Actigard 50WG plant activator	Suppression of Tomato Spotted Wilt Virus (TSWV) in flue-cured tobacco	NC-020007
Staple herbicide	Post-emergence control of broadleaf weeds in kenaf	NC-030002
Orthene 97 insecticide	Thrips in peanuts (in furrow application)	NC-030003
Orthene 97 insecticide	Slash pine flower thrips, coneworms, coneborers, and seedbugs in southern pine seed orchards	NC-030004
Stinger herbicide	Broadleaf weeds in strawberries	NC-030005
Velocity herbicide	Annual bluegrass in bermudagrass fairways and tees overseeded with perennial ryegrass	NC-030007

TABLE 1-1. SPECIAL LOCAL NEED—24 (c) REGISTRATIONS IN NORTH CAROLINA

Product Name	Use	SLN Number
Orthene 97 insecticide	Thrips on kenaf	NC-050003
Curfew fumigant	Parasitic nematodes and mole crickets in golf course turf	NC-050004
Dual Magnum herbicide	Annual grasses and certain broadleaf weeds in sweet potatoes	NC-060002
Intrepid 2F insecticide	Lepidoptera larvae on sweet potatoes	NC-060003
Gramoxone Inteon herbicide	Weeds in clary sage	NC-060004
Brigade 2EC insecticide/miticide	Allows a different timing of application (pre-plant) at a higher rate	NC-070002
Select Max herbicide	Annual and perennial grasses in clary sage	NC-070003
8.5% ethylene oxide and carbon dioxide sterilizing gas	American foulbrood and other pests	NC-070004
Thionex 3 EC insecticide	Balsam Woolly Adelgid in Fraser Fir Christmas trees	NC-080001
Manzate Pro-Stick fungicide	Diseases of tobacco	NC-080002
Penncozeb 75DF dry flowable fungicide	Diseases on tobacco	NC-080003
Tenacity herbicide	Certain winter annual broadleaf weeds in DOT wildflower beds	NC-080005
Lorsban Advanced insecticide	Reduce PHI from 120 days to 60 days	NC-090001
CoreTect tree and shrub tablets insecticide	Hemlock woolly adelgid in hemlocks	NC-090002
Safari 20 SG insecticide	Hemlock woolly adelgid in hemlocks	NC-090003
Lorsban Advanced insecticide	Allows a higher application rate to be applied to tobacco	NC-090004
Milestone VM herbicide	Herbaceous broadleaf weeds and woody plants in forests and grazed areas in and around these sites	NC-090005
Dual Magnum herbicide	Reduce PHI to 60 days when used on tomatoes at 1.67 pints of fewer per acre	NC-100001
Milestone VM Herbicide	Control or suppression of blackberry (briars), vines, and susceptible broadleaf weeds in newly planted longleaf pine.	NC-100004
Admire Pro Systemic Protectant	Reduces PHI to 60 days when used on sweet potatoes.	NC-100003
Perm-Up 3.2 EC Insecticide	Control regeneration weevils in conifer nurseries.	NC-110001
Gramoxone Inteon Herbicide	Suppress and/or control Palmer amaranth weeds in peanuts.	NC-110002
Quadris Flowable Fungicide	Control target spot on tobacco seedlings grown in greenhouses.	NC-110003
Ridomil Gold SL	Allows for application in tobacco transplant water.	NC-110004
Dual Magnum Herbicide	Control pigweed and yellow nutsedge in transplanted bell peppers.	NC-110005
Avid 0.15 EC Miticide/Insecticide	Control nematodes on golf course greens.	NC-110006
Select Max Herbicide	Allows for use without an adjuvant when applied to certain vegetables.	NC-110007

The Safe Use of Pesticides

WAYNE BUHLER, Pesticide Education Specialist

GENERAL SAFETY INSTRUCTIONS

- Use pesticides only when needed.
- Always ask the advice of an expert on problems of pests and pesticides.
- Use the correct pesticide for the problem.
- Know any hazards that the pesticide might present.
- Read and follow the label.
- Commercial pest control operators, farmers, and other applicators of organophosphate and carbamate pesticides should contact their physician at the beginning of the season. At this time, you should inform the physician of the types of pesticides you will be using. The physician will determine the level of enzymes in your blood that may be affected by the use of certain pesticides. While discussing the pesticides to be used, review the signs and symptoms of pesticide poisoning.
- Know what you are to do in the event of an accident. *Plan ahead.* Call your physician or 911 immediately in the event of an accident.
- Have your physician's phone number programmed into your phone. In an emergency, time is extremely important.
- Take time to explain the safe use of pesticides to employees.
- Check your application equipment for leaks or clogged lines, nozzles, and strainers.
- Calibrate your equipment frequently for proper output, using water.
- Check respirator for cleanliness, clean filter, and proper fit.
- Check gloves and other protective clothing for holes and cleanliness before each use.
- Make sure plenty of clean water, detergent, towels, and a clean change of clothing are available.
- Do not permit delivery of pesticides unless a responsible representative is on hand to receive and properly store them.
- Make sure that people have been warned and livestock and pets that may be exposed have been removed from the area to be treated.
- Notify beekeepers who maintain beehives in the vicinity of a pesticide application.

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- Cover food and water containers.
- Never eat, drink, or smoke when handling pesticides.
- Wash your hands before eating, smoking, or drinking.
- Make sure the time intervals between date of application and reentry, harvest, slaughter, or milking will comply with those given on the label.
- Rinse pesticide containers before recycling or disposal. (Put rinsate in sprayer tank.)

Select the Appropriate Product

Pesticides are classified according to their hazard potential to humans, animals, and the environment. Hazard potential to humans is based on animal test results and/or use experience. Each pesticide is identified with one of the following signal words: **“DANGER,” “WARNING,” OR “CAUTION.”**

“DANGER” on the label tells you the product has the highest toxicity to humans. The word **“POISON”** (in red) and the skull and crossbones are also required on the label of highly toxic materials. If **“DANGER”** is printed on the label without the word **“POISON”** and the skull and crossbones symbol, the pesticide can cause severe skin injury or irreversible eye damage.

“WARNING” identifies products with moderate toxicity.

“CAUTION” identifies those pesticides that are least toxic to humans.

Table 1-2 further defines the signal words that are printed on a pesticide label.

TABLE 1-2. PESTICIDE SIGNAL WORDS

Signal Word on Container	Toxicity to Humans	Amount Required to Kill an Adult if Swallowed
CAUTION	Slightly toxic	An ounce to a pint
WARNING	Moderately toxic	A teaspoon to an ounce
DANGER*	Very toxic	A taste to a teaspoon

*DANGER with the word “poison” and the “skull and crossbones” symbol means the pesticide is very toxic if swallowed or inhaled. Without the word “poison” and the “skull and crossbones” symbol, DANGER usually means that a pesticide has a high potential as a skin or eye irritant.

Contrary to common belief, the signal word **DOES NOT** tell you how well a pesticide will control a pest. For example, **“DANGER”** means the pesticide can be more dangerous to *you*, not that it is more toxic to pests than a product labeled with **“CAUTION.”**

Because of the risks involved in handling, many of the very hazardous pesticides have been **“RESTRICTED”** and can be bought and applied only by or under the direct supervision of certified or licensed individuals. These pesticides bear the words **“RESTRICTED USE PESTICIDE”** on the label.

Follow Label Directions

The label tells you how to use the pesticide properly and safely. Use a pesticide only on crops, animals, or other sites as the label directs. **Use the recommended rate, and apply the pesticide at the time and in the manner stated.**

Obey all precautions for using a pesticide safely, such as “Keep out of reach of children;” “Keep away from pets;” “Do not use near fire, sparks, or flame;” “Do not inhale, ingest, or allow to get on skin;” “Do not store near food, feed, seed, or animals;” “Do not contaminate water supplies;” and any other warnings stated on the label.

Wear Protective Clothing Called for on the Label

While people generally realize the danger in getting pesticides in the mouth or eyes or breathing gaseous fumes, they are frequently unaware of how harmful many pesticides are when absorbed through the skin. Anytime you handle or apply pesticides, wear at least a long-sleeved shirt and long-legged trousers made of a closely woven fabric, socks, and liquid-proof shoes. Wear the personal protective equipment listed on the label.

With most **DANGER-** and **WARNING-**labeled pesticides, a respirator covering the nose and mouth and goggles or a face shield protecting the eyes are necessary. Again, the label will tell you the kind of protective equipment you need.

Use Proper Application Equipment

You cannot apply a pesticide properly or safely unless you have the correct equipment. Small jobs around the home with less hazardous pesticides may be done with simple equipment such as a pump-up sprayer, hose attachment sprayer, granular applicator, or hand duster. Larger jobs and those where more hazardous materials are used often require specially designed equipment. Contact your county Cooperative Extension Service agent, pesticide dealer, or equipment dealer if you need further advice on proper equipment for applying pesticides.

Know Emergency First-Aid Procedures

In case of suspected poisoning — stomach cramps, dizziness, vomiting, heavy sweating — follow the label’s first-aid advice and **IMMEDIATELY** call a doctor or take the person to a hospital. Take the pesticide label with you because the doctor needs it to prescribe the proper treatment.

If you spill a pesticide on yourself, remove any contaminated clothing immediately. Wash your skin immediately with soap and water. **DO NOT USE AN ABRASIVE OR PETROLEUM-BASED CLEANER**, as this would allow the pesticide to penetrate your skin more easily.

If an individual is exposed to pesticide vapors, get him to fresh air. Start artificial respiration if the person has stopped breathing. If a pesticide is splashed in the eyes or mouth, rinse it out with large quantities of clean water for at least 15 minutes. If swallowed, read the label to see if you should induce vomiting (this could be harmful, depending on the pesticide). Never give anything by mouth to an unconscious individual.

The doctor may want to call a poison control center for specific treatment of pesticide poisoning. (The number of the Carolinas Poison Center is **1-800-222-1222.**)

HAZARD AND TOXICITY OF PESTICIDES

Do not depend on toxicity values as the only factor to be considered regarding the hazards of a chemical to human beings or other animals. Users of pesticides should be concerned with the *hazard(s)* associated with the exposure to the chemical and not the *toxicity* of the material itself. Hazard and toxicity are *not* synonymous.

Toxicity is the inherent capacity of a substance to produce injury or death.

Hazard is a function of two primary variables, *toxicity* and *exposure*, and is the potential threat that injury will result from the use of a substance in a given formulation or quantity. Some hazards do not involve toxicity to man or other animals. For example, sulfur, oils, and numerous other chemicals are considered safe or relatively safe to animals, but may pose considerable hazard to some plants (phytotoxicity).

A pesticide may be extremely toxic but present little hazard to the

applicator or others when used:

- in a very dilute formulation;
- in a formulation that is not readily absorbed through the skin or readily inhaled;
- under conditions to which humans are not exposed;
- only by experienced applicators who are properly equipped to handle the chemical safely.

On the other hand, a chemical may exhibit a relatively low mammalian *toxicity* but present a *hazard* because it is normally used in a concentrated form, which may be readily absorbed or inhaled.

PESTICIDE TOXICITY TO PEOPLE

Most pesticides are harmful to people if they are handled or applied in an unsafe way. A pesticide may harm a person if it is:

- swallowed (oral toxicity);
- breathed (inhalation toxicity);
- allowed to get on the skin or in the eye (dermal toxicity).

Children may be poisoned when a pesticide is left where they can eat it, play in it, or drink it. Pesticides should **not** be stored in unlabeled containers, such as soft drink bottles. A few pesticides give off harmful vapors that must not be breathed. Some applicators are poisoned when they allow pesticides to contact their skin. Oil-based pesticides (such as emulsifiable concentrates) penetrate the skin in greater quantity and more quickly than dusts, granules, or wettable powders. Sun-burnt or hot, sweaty skin with cuts or abrasions allows more rapid penetration.

PESTICIDE HAZARDS TO THE ENVIRONMENT

A pesticide may not affect people the same way it does the environment. Some pesticides may not harm the environment, even though they are moderately to highly hazardous to people. And some pesticides that are only slightly hazardous to people may cause greater environmental damage. A restricted use pesticide may be hazardous to people, the environment, or both.

A given pesticide may be hazardous in the air (particle or vapor drift), soil, or water. It may leave harmful residues in food or injure nontarget plants and animals, such as fish, bees, birds, other wildlife, and domestic animals.

Some pesticides are potentially more harmful to the environment because they last for a long time once they are applied. Others may accumulate in the body and cause poisoning. Most uses for persistent, accumulative pesticides (such as DDT) have been cancelled in the United States. Some uses of other persistent pesticides are now restricted.

Wildlife Exposure: Managing the Risk

Wildlife may contact residues of pesticides applied to forests, aquatic habitats, farmland, rights-of-way, turf, and gardens. Pesticide poisonings to wildlife may be caused by runoff to surface water during rainfall, spray drift, foraging on pesticide-treated vegetation or insects, or consumption of pesticide-treated granules, baits, or seeds. Also, secondary poisoning occurs when an animal eats prey species that contain pesticide residues.

Fortunately, not all pesticides have detrimental effects on all wildlife, nor do pesticide residues necessarily have serious consequences for wildlife. Before using pesticides, get advice from wildlife, conservation, and pesticide professionals at universities and state and federal agencies on the choice and proper use of pesticides and alternative pest control strategies.

Also, consider strategies to improve wildlife habitats.

Implementing the following suggestions will benefit wildlife while allowing you to control pests. As you look over the suggestions, keep in mind that you must also be in compliance with all pesticide product labels.

Be Careful Around Natural Areas

- All wildlife need natural areas in which to feed, rest, reproduce, raise young, and take shelter. Create habitats by encouraging and promoting the growth of native vegetation. This also reduces the need for mowing.
- Plant disease- and insect-resistant trees and shrubs, thereby reducing the need for pesticides.
- Always store pesticides and wildlife feed separately, and do not feed wildlife near pesticide storage and mixing areas.

Wildlife Benefit When You Understand and Follow Pesticide Labels

- Keep wildlife habitats in mind when reading pesticide labels.
- Compare labels and select highly specific products that pose less risk to nontarget species. Read the label carefully, and use the lowest effective rate.
- Calibrate equipment carefully to assure that the pesticide is applied at labeled rates.
- Get the EPA *Endangered Species Protection* bulletin from the Web at <http://www.epa.gov/espp> (click on "Bulletins Live!") or by calling 1-800-447-3813. Follow the limitations stated in the bulletin.
- Take heed of the label. The environmental wildlife precautions on labels are based on scientific and regulatory actions. They must be followed. It's the law, it's good business, and it's the right thing to do.
- Consult the NCDA&CS's Pesticide Section or your county Cooperative Extension center for label clarification or to determine potential pesticidal impacts on wildlife. Also, consult natural resource agencies, natural heritage programs, and the Nature Conservancy for additional information about wildlife, native vegetation, and endangered species.

Be on the Alert for Wildlife Before and During Pesticide Application

- Avoid spraying near areas frequented by wildlife, especially flocks of birds, or, if possible, reduce the application rates.
- Homeowners should search for bird and mammal nests before spraying fruit or ornamental trees, shrubs, or lawns, and then avoid applications near those areas.
- Use mechanical, cultural, and biological pest control tactics when available and practical. For example, tillage, crop rotation, pest-resistant plants, natural predators, and trapping can help control pests.
- Scouting and pest identification are critical components of wise pesticide use. To save money and reduce impacts on wildlife, apply pesticides only when pests are present at unacceptable levels.
- Remember to guard against pesticide drift and runoff. Apply pesticides under low, directional wind conditions, and use adjuvants when appropriate. Buffer zones of unsprayed crops or grass strips adjacent to important habitats will help protect wildlife.
- Do not apply pesticides when heavy rain is imminent. Surface runoff may move some pesticides into ponds, streams, and wetlands inhabited by wildlife. In urban areas,

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such runoff may flow into storm drains leading directly to streams and rivers.

- Multiple pesticide applications may have cumulative effects, especially during breeding season. Reduce the frequency of applications when possible, and target each application to the specific site of the pest instead of making applications over entire fields or lawns. Spot treating weeds and insects in lawns and gardens will reduce the amount of pesticide applied.
- Where practical, do not apply pesticides in and around field edges and corners, fencerows, set-aside acreage, nesting sites, vegetation near streams and wetlands, and areas dedicated to wildlife except to spot-treat state-listed noxious weeds. Especially sensitive areas include endangered species habitats, native plant communities, and sinkholes.
- Check the label for instructions on incorporating or watering pesticide granules into the soil. These techniques allow the pesticide to reach the target pests more readily, and foraging birds are less likely to ingest them.
- Never spray leftover pesticides or wash equipment near wetlands, rivers, streams, creeks, potholes, ponds, marshes, sinkholes, wildlife habitats, or drains leading to these areas. Dispose of leftover pesticide as specified on the label.
- For rules and guidelines on protecting honey bees, see section on Bee Protection below and in Chapter 5, Reducing the Risk of Pesticides Poisoning to Honey Bees.
- For additional information, contact your county Cooperative Extension center or call the NCDA&CS's Pesticide Section at 919-733-3556. You may also be interested in the following Extension publications, which are available through your county Extension center: AG-463, *Pesticides and Wildlife*; and the AG-463 fact sheet series on using integrated pest management on specific crops, including soybeans, tobacco, cotton, and peanuts

(This section was written by Henry Wade, Environmental Programs Manager, NCDA&CS, Pesticide Section.)

HAZARDOUS CHEMICALS RIGHT-TO-KNOW ACT

The Hazardous Chemicals Right-To-Know Act (N.C.G.S. 95-173 *et seq.*) was adopted by the N.C. General Assembly in 1985. The purposes of this Act are (1) to see that firefighters have all the information they need to respond to chemical emergencies and (2) to ensure that citizens have access to sufficient information to make informed judgments about hazards in their communities.

All employers, both public and private, who normally use or store at least 55 gallons or 500 pounds of any hazardous chemical must comply with this law. Although the full requirements of this act do not apply to farms with 10 or fewer full-time employees, the employer must tell fire departments whom to contact in case of an emergency.

If you receive a Material Safety Data Sheet (MSDS) with a product you purchase, you will know the material has been classified as hazardous. The MSDS gives health-related information, emergency and first-aid procedures, and other information needed to use, store, and dispose of the chemical properly.

NORTH CAROLINA WORKER PROTECTION STANDARD REGULATIONS

The Worker Protection Standard (WPS) requires the agricultural employer to reduce the risks of pesticide exposures associated with hand labor and handling tasks by providing persons employed by

him with specific pesticide safety training, personal protective equipment and a means to mitigate pesticide exposure through emergency assistance. The primary requirements for compliance are listed below.

- Provide pesticide safety training to both workers and handlers.
- Provide label-specified personal protective equipment to the appropriate employee.
- Post warnings, oral notification or both to inform employees of pesticide applications, restricted entry intervals (see below), and restricted areas.
- Provide a central information area where the following are accessible:
 1. Emergency medical information (name, telephone numbers, and address of nearest medical facility);
 2. Pesticide-specific information (location of the area to be treated, product name, EPA registration number, active ingredient(s) of pesticide, time and date the pesticide is scheduled to be applied and time and date the application was completed, and the restricted-entry interval for the pesticide). Each day of application must be recorded as a separate application record. Recorded information must be retained for a period of two years.
 3. The WPS pesticide safety poster.
- Provide ample decontamination supplies (single-use towels, soap, water, and clean change of clothing if required).

RESTRICTED ENTRY INTERVALS

The restricted entry interval (REI) is the time after the end of a pesticide application when entry into the treated area is prohibited. The agricultural employer must not allow or direct any worker to enter or remain in the treated area before the REI has expired except under the conditions of *early entry*.

Early entry provisions of the Worker Protection Standard (WPS) allow trained and labeled specified early entry PPE equipped workers to enter a treated area during the REI to perform "no contact" activity, such as changing nozzles or repairing application equipment, or short-term activities with "limited contact" activity, such as moving irrigation equipment or opening ventilation systems. Note here that avoiding contact by using early entry PPE does not qualify an activity as "no contact."

The conditions for "limited contact" early entry activities are:

1. Worker's contact with the treated surfaces is minimal and limited to the feet, lower legs, hands, and forearms.
2. Pesticide product does not have a statement in the labeling requiring double notification.
3. PPE for early entry conforms with the label requirements or includes, at least coveralls, chemical resistant gloves, socks, chemical resistant footwear, and eyewear, if eyewear is required by the label.
4. No hand labor, such as hoeing, picking, pruning, is performed.
5. The time in the area under REI for any worker does not exceed 8 hours in a 24-hour period.
6. Workers do not enter the area during the first 4 hours after application and not until applicable ventilation criteria and label specified inhalation exposure levels have been reached.
7. Agricultural employer must give an oral or written

notification of the specifics of the early entry. Notification must be given in a language that the workers understand.

PREHARVEST INTERVALS

The preharvest interval is the time in days that must pass between the last application of a pesticide and harvesting a food or feed crop. The interval varies with the pesticide, depending largely on its persistence (how long the pesticide lasts) on or in the crop as well as on the pesticide's toxicity.

For example, one insecticide label for peach tree borer on peaches states: "Make only one application per season. Do not apply within 14 days before harvest." Fourteen days is the preharvest interval, and it means peaches cannot be harvested from an orchard where this pesticide has been applied until at least 14 days have passed. If harvested sooner, the peaches cannot be legally sold.

If you do not obey the preharvest interval, your crop can be seized and destroyed, and you can be fined. Most importantly, if crops are harvested and consumed before the preharvest interval has passed, people or animals may be poisoned.

AERIAL APPLICATION LIMITATIONS

If you expect to have your crops sprayed by an aerial applicator, in order to obey N.C. Pesticide Regulations, you must carefully *plan the location of these crops*. Certain areas are restricted, and aerial pesticide applications cannot be made to these areas unless certain rules are followed.

DO NOT SPRAY (or otherwise allow pesticides to be deposited):

1. In any congested area unless permission is granted by appropriate authorities;
2. Within 300 feet of the premises of schools, hospitals, nursing homes, churches, or any building used for business or social activities if either the premises or the building is occupied by people;
3. Within 100 feet of a residence;
4. On a right-of-way of a public road or within 25 feet of the road, whichever is the greater distance;
5. In or near any body of water, if the pesticide is labeled as toxic or harmful to aquatic life, unless such aquatic life is the target of the pesticide.

Farmers can prevent potential problems by not planting crops near those areas just described and by always following directions on the pesticide label concerning the spraying of crops, especially near sensitive and restricted areas. The Bee Protection section below also reviews the limitations on aerial application.

BEE PROTECTION

Anyone who hires an aerial applicator to apply a pesticide **labeled as toxic to bees shall notify all beekeepers with registered apiaries** located within 1/2 mile of the area to be treated. This notification must not take place less than 24 hours nor more than 10 days before the application.

A list of beekeepers with registered apiaries may be obtained in one of these ways:

1. The Plant Protection Section of the N.C. Department of Agriculture & Consumer Sciences (NCDA&CS) will, upon request, mail a list of all registered apiaries to all aerial applicators licensed in North Carolina (call 919-233-8214). This list will have the names of any beekeepers who have registered apiaries located within the required 1/2 mile from

the target area.

2. The Pesticide Section of the NCDA&CS will mail a list of those registered apiaries to farmers who have been identified by the beekeeper on the Apiary Registration Form as having farms within 1/2 mile of the applicable apiary. The failure of a beekeeper to list a farmer on the Apiary Registration Form does not relieve the farmer of the responsibility for notifying the beekeeper when an aerial application of a bee-toxic pesticide will be applied within 1/2 mile of the registered apiary.

The list of registered apiaries is mailed on the first day of each quarter. Revised lists will be issued on the first day of each successive quarter. The lists of revised registered apiary locations will become effective on the fifth day of the first month of that quarter. The registration period will be effective for the calendar year and applies only to the listed apiary locations. Moving an apiary to a new site does not provide protection under the law, unless the new site is also registered.

The farmer can notify the beekeeper orally or in writing of the approximate time the pesticide application will be made and the type of pesticide to be used. Acceptable written notification is by mail or by notice left at the beekeeper's residence or at an alternate location designated on the apiary registration list. Oral notification can be by telephone or in person to the beekeeper or the alternate person designated on the apiary registration list.

PROTECTING SURFACE AND GROUNDWATER

Groundwater makes up 96 percent of the world's total water resources. Ninety percent of rural residents and 50 percent of the people in the United States depend on groundwater as their source of drinking water. Although only very small amounts of pesticides have been detected in North Carolina's groundwater, we must reduce the likelihood of pesticides entering groundwater and surface water so that future water quality problems are not encountered.

What can pesticide users do to prevent groundwater and surface water contamination?

Follow Label Directions Exactly

The pesticide label will give you valuable information concerning that pesticide's potential dangers of contaminating water and the environment. When applying a pesticide, the timing and placement instructions on the label must be followed correctly to ensure that the pesticide is applied properly. Applying a pesticide when heavy rains are predicted could lead to water contamination. Likewise, placing a pesticide on top of the soil, when it should be incorporated, not only minimizes pest control but could lead to unnecessary runoff into surface water and perhaps groundwater.

Use Integrated Pest Management Practices

Cultural practices, such as crop rotation and cover crops, not only reduce pest populations, but they also maintain and improve good soil and water conditions. Careful pest monitoring will also ensure that pesticides are used only when needed.

Prevent Spills and Back Siphoning

Pesticides spilled near wells, sinkholes, surface waters, or anywhere else can move into surface water and groundwater. Avoid mixing and loading pesticides near wells and other water sources. Use a long hose from the water source to the sprayer so if any spills occur, they will be farther away from the clean water supply. If a spill takes place, be sure to clean it up and move the contaminated soil to a place where it will not seep into the water or otherwise harm the environment. If the contaminated soil cannot be applied to a labeled site that does not exceed the rate

Chapter I — Pesticide Use and Safety Information

of application described on the product label, it must be disposed of at an approved waste disposal facility. When using water from a hose to dilute pesticides in a spray tank, do not allow the hose to be submerged in the spray tank. Failure to do this can lead to a backflow situation where pesticides may be siphoned back into the water supply. The Chemigation section of this chapter also stresses regulations required to prevent the backflow of pesticides into water supplies.

Dispose of Wastes Properly

It's illegal and dangerous to dispose of pesticides improperly. If pesticides, their containers, or other hazardous materials are discarded where they can contaminate the water supply or environment, you (and your family) could drink pesticide-contaminated water. This contamination could move into your neighbors' or livestock's water supply as well as affect wildlife and conditions of soil and air. Don't take it for granted; many pesticides don't just disappear. Your responsibility for these hazardous materials includes proper disposal.

The guidelines for disposing of such materials can be found first on the pesticide label. Follow these instructions for disposal carefully. (See the sections in this chapter on Disposal of Pesticides and Disposal of Empty Pesticide Containers.)

Surface Water Protection.

If there is more water in the soil than the soil can absorb, water (with pesticides in it) may flow into the groundwater or run off into streams, rivers, and lakes. Prolonged heavy rains and too much irrigation will also produce excess surface water. Pay attention to weather forecasts, maintain proper irrigation scheduling, and use strip crops to restrict potential surface water problems. The chemigation regulations in this manual are also designed to reduce both surface water and groundwater contamination.

Land Characteristics

The geology of the land plays a key role in protecting groundwater and surface water. If the groundwater is within a few feet of the soil surface, pesticides are much more likely to reach groundwater. If pesticides are applied to an area that drains into a sinkhole, irrigation or moderate rainfall may carry some of the pesticides directly into the groundwater. You must select pesticides carefully when either groundwater is close to the soil surface or soil permeability is great (see Evaluating the Potential for Groundwater Contamination section).

N.C. Well Construction Standards—and in some cases more stringent local regulations relating to well location, casing, grouting, and other requirements—help ensure that groundwater is not contaminated. For example, North Carolina Regulations require that the well casing be at least 12 inches above the soil surface and that the casing be cemented at least 20 feet below the soil surface.

Soil Characteristics

Soil texture (sand, silt, clay), soil permeability, and soil organic matter all play a major part in pesticide movement. Soils containing large amounts of organic matter and clay, for example, will hold (absorb) some pesticides before they reach groundwater. But pesticides are more likely to move into the groundwater through sandy soils—low in organic matter and clay—and loose, porous soils. Table 1-4 gives the relative leaching potential ratings for Southeastern U.S. soils.

Pesticide Characteristics

Some pesticides move into the soil more easily than others. Those with high water solubility are more likely to seep into the soil than those pesticides with extremely low water solubility.

Table 1-3 gives the relative mobility (movement) of certain pesticides in soils. These pesticides are listed by both common

and brand names.

Other sources of groundwater contamination include abandoned and uncontrolled waste sites, landfills, holding pits and ponds, leaking storage tanks, and septic tanks.

CHEMIGATION

Applying pesticides to land, crops, or plants through an irrigation system is called chemigation. A limited number of pesticides are cleared for application through chemigation. *Chemigation is only legal when the pesticide product label has directions for such uses.*

The North Carolina Pesticide Board has adopted chemigation regulations to protect water resources from pesticide pollution by reducing the potential for backsiphoning or direct injection of pesticides into water sources.

Farmers, greenhouse operators, nurserymen, golf course operators, turf growers, and others must comply with these regulations.

The types of irrigation equipment covered by these regulations include, but are not limited to, drip or trickle, center pivot, lateral move, traveler gun, and solid set systems. The regulations do not apply to hand-held hose-end sprayers that are constructed so that an interruption in water flow automatically prevents any backflow to the water supply.

Protected water resources include, but are not limited to, private ponds, lakes, rivers, streams, canals, wells, and public water systems.

The following antipollution devices must be installed and maintained on an irrigation system that is applying any pesticide. These safety devices must meet the following qualifications.

Automatic low pressure drain—located on the bottom of the horizontal irrigation pipeline between the discharge side of the irrigation pump and the inlet side of the double check valves. This device shall be level and have an orifice size at least 3/16 the diameter of the irrigation pipe. The top of the drain shall not exceed beyond the inside surface of the bottom of the irrigation pipeline and shall be at least 2 inches above grade. **The drain shall discharge at least 20 feet from any water supply. Furthermore, the discharge must be controlled to prevent it from reentering the water supply.** In the event that the mainline check valves leak slowly, solution will drain away from, rather than flow into, the water supply.

Inspection port—located between the irrigation pump discharge side and the inlet side of the mainline check valves. The inspection port may be part of the vacuum relief valve. The purpose of the inspection port is to allow an individual to observe whether or not the mainline check valves are leaking.

Vacuum relief valve—located on the top of the horizontal irrigation pipeline between the discharge side of the irrigation pump and the inlet side of the double check valves. The orifice size of the valve shall be 3/16 of the diameter of the irrigation pipe. The purpose of the vacuum relief valve is to allow air into the pipeline when the water flow stops, preventing the creation of a vacuum that could lead to backsiphoning.

Double check valves—located between the irrigation pump discharge (or pressure side) and the point of pesticide injection into the irrigation pipeline. These valves must be within 10 degrees of horizontal. The purpose of the double check valves is to prevent solution from draining or backsiphoning into the irrigation water source and polluting the groundwater or surface water. These check valves must have positive closing action and

a watertight seal. Note: For irrigation systems that contain media filters, refer to the section below entitled “Chemigation systems that contain media filters.”

Check valve—located on the pesticide line between the point of pesticide injection into the irrigation system and the pesticide injection unit. The purpose of the check valve is to stop flow of water from the irrigation system into the chemical supply tank. It should be constructed of chemically resistant materials. This check valve should always be flushed with clean water after injecting a chemical to prevent the deposition of chemical precipitates. Whenever a Dosatron, DosmaticPlus, or a similar metering device is used, the check valve needs to be positioned near the metering device on its outlet side. If this metering device is on a bypass line, this check valve must be located on the main irrigation line immediately downstream of the bypass line.

Flow interruption device, solenoid valve—located in the pesticide supply line between the pesticide injection unit and the pesticide supply tank or container. The purpose of the solenoid valve is to provide a positive shut off on the chemical injection line. This prevents both chemical and water from flowing in either direction if the chemical pump is stopped. Because this valve will be subjected to different chemicals, it must be compatible with the chemicals being injected. The valve should be inspected often to assure that it is performing properly. A solenoid valve is not required with the Dosatron, DosmaticPlus, or a similar hydraulic injection device.

Functional systems interlock—The irrigation pump and the chemical injection pump must be interlocked or connected so that if the irrigation pump stops, the chemical injection pump will stop. The functional systems interlock ensures that a pesticide is applied with water through the irrigation system. The Dosatron, DosmaticPlus, or a similar hydraulic injection device does not require the functional systems interlock.

Illegal Techniques

1. Some pesticide product labels prohibit application of the product by any irrigation system. Others prohibit applications through certain specific irrigation systems.
2. It is illegal to inject a pesticide into an irrigation system on the suction (or inlet) side of the irrigation pump.
3. It is illegal to connect an irrigation system directly to a public water system when applying any pesticide.

NOTE: When a public water system is used, the water must first be discharged into a reservoir tank. An air gap at least twice the inside diameter of the fill pipe must exist between the end of the fill pipe from the public water system and the top rim of the reservoir tank.

Chemigation Systems That Contain Media Filters

Some chemigators are using chemigation systems that have one or more sand-containing media filters. Surface water, and in some cases, groundwater, flows through these filters to remove debris that would clog the small orifices of the emitters on drip irrigation systems. **The injection of pesticides into the irrigation line must be on the outlet side of all media filters.** This prevents pesticide from passing through the media filters and contaminating the debris, which will be discharged into the environment whenever the media filters are backflushed.

Any water dumping or open dumping of pesticide dilutions is an illegal discharge of a pesticide in violation of NC Pesticide Board rule 2 NCAC 9L .0604. Further, pesticide product labels have enforceable language on the illegal disposal of pesticides.

Additionally, a check valve is required between the outlet side of all media filters and the point of pesticide injection into the irrigation line. If the injection system has bypass piping, a check valve would be positioned between the outlet side of all media filters and the inlet side of the bypass on the irrigation pipeline.

The purpose of the check valve mentioned in the above paragraph is to reduce the risk of media filter contamination if a backsiphonage occurs. Systems operating without this safeguard could dispose of pesticides unintentionally during a backflush cycle. This would be illegal. The chemigator can be fined for any illegal disposals.

Any chemigation system that is not in compliance with pesticide regulations will be issued a stop-use order. This order can only be released when a follow-up inspection indicates that the appropriate antipollution devices have been installed.

Hand-Held Hose-End Sprayers

Hand-held hose-end sprayers are allowed on the outlet side of a water hose. This device must contain a check valve that will prevent any backsiphoning from the pesticide reservoir into the water hose.

Use of devices connected to a faucet or spigot that siphon pesticide from reservoir or container is not permitted in North Carolina.

System Inspections

One of the requirements of the regulations is that the system operator must inspect the antisiphon devices and the functional systems interlock during periods of chemigation to ensure that they are functioning properly. If components of the system are defective, they must be repaired or replaced before any chemigation is employed with a pesticide.

Representatives of the NCDA&CS, Pesticide Section, may inspect an irrigation system used for chemigation at any time. If the system is not in compliance with the regulations, a stop-use order will be issued by the Department, and the system must be inspected again by the Departmental representative before the stop-use order can be removed.

For Additional Information

For a copy of regulation 2 NCAC 9L .2000—Chemigation or the chemigation and fertigation brochure, visit the NCDA&CS Web site at <http://www.ncagr.com/SPCAP/pesticides/sitemap.htm>, or call the Pesticide Section at 919-733-3556.

This section on chemigation was written by Henry Wade, Environmental Programs Manager, NCDA&CS, Pesticides Section.

Evaluating the Potential for Groundwater Contamination

When estimating the groundwater contamination potential (GWCP) index for a pesticide at a given site, the characteristics of the soil at the site must also be evaluated. Soil properties are as important as a pesticide's chemical properties in determining mobility and risk to groundwater. See Table 1-4. Soil Leaching Potential (SLP) Indices. The GWCP index for a pesticide on a given soil is the mean of the PLP index and the SLP index, i.e.; $GWCP = (PLP + SLP)/2$. More detailed formulas are given at the end of the following table.

TABLE 1-3. RELATIVE PESTICIDE LEACHING POTENTIAL (PLP) INDICES AND RATINGS FOR COMMONLY USED PESTICIDES

The PLP value will change with changes in application rate. Values in this table are calculated using average rates.*
KEY: Very High (VH) = 90 to 100, High (H) = 70 to 89, Moderate (M) = 50 to 69, Low (L) = 30 to 49, Very Low (VL) = 0 to 29

Common Name	Brand Name	Application Method	PLP	Rating
HERBICIDES				
2,4-D	Weedone	foliage	45	L
2,4-DB	Butyrac 200	foliage	41	L
acetochlor	Harness	soil	53	M
acifluorfen	Blazer	foliage	42	L
alachlor	Lasso	soil	55	M
ametryn	Evik	foliage	45	L
amitrole	Amizole	foliage	51	M
AMS	Ammate	foliage	74	H
arsenic acid	Hy-Yield	foliage	39	L
asulam	Asulox	foliage	47	L
atrazine	AAtrex	soil	56	M
benefin	Balan	soil	31	L
bensulfuron	Londax	foliage	20	VL
bensulide	Prefar	soil	57	M
bentazon	Basagran	foliage	48	M
bispyribac	Velocity	foliage	45	L
bromacil	Hyvar	soil	85	H
bromoxynil	Buctril	foliage	30	L
butachlor	Machete	soil	36	L
butylate	Sutan	soil	48	L
cacodylic	Rad-E-Cate	foliage	19	VL
carfentrazone	Aim	foliage	26	VL
carfentrazone	Aim	soil	23	VL
chlormimuron	Classic	soil	19	VL
chlorsulfuron	Glean	foliage	28	VL
clethodim	Envoy	foliage	40	L
clodinafop-prop	Discover	foliage	1	VL
clomazone	Command	soil	42	L
clopyralid	Stinger	foliage	46	L
cloransulam-me	First-Rate	soil	34	L
cloransulam-me	First-Rate	foliage	25	VL
cyanazine	Bladex	soil	41	L
cyanazine	Bladex	foliage	37	L
cycloate	Ro-Neet	soil	47	L
cyhalofop-bu	Clincher	foliage	1	VL
DCPA	Dacthal	soil	47	L
desmedipham	Betanex	foliage	27	VL
dicamba	Banvel	foliage	49	L
dichlobenil	Carson	soil	55	M
dichlorprop	DP-Amine	foliage	44	L
diclofop	Hoelon	foliage	50	M
diclosulam	Strongarm	soil	33	L
difenzoquat	Avenge	foliage	0	VL
diflufenopyr	Distinct	foliage	21	VL
dimethenamid	Frontier	soil	46	L

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Common Name	Brand Name	Application Method	PLP	Rating
diphenamid	Enide	soil	54	M
dimethipin	Harvaid	foliage	70	H
diquat	Diquat	foliage	15	VL
dithiopyr	Dimension	foliage	45	L
diuron	Karmex	soil	65	M
DSMA	Ansar	foliage	39	L
endothall	Aquathol	aquatic	64	M
EPTC	Double Play	soil	53	M
ethalfuralin	Sonalan	soil	25	VL
ethamesulfuron	Muster	foliage	28	VL
ethofumesate	Nortron	soil	52	M
fenarimol	Rubigan	foliage	44	L
fenoxaprop	Whip	foliage	24	VL
fluzifop	Fusilade	foliage	30	L
flufenacet	Define	soil	43	L
flumetsulam	Broadstrike	soil	50	M
flumiclorac	Resource	foliage	14	VL
flumioxazin	Valor	soil	45	L
flumioxazin	Valor	foliage	29	VL
flumeturon	Cotoran	soil	62	M
fluridone	Sonar	aquatic	34	L
fluroxyclofen	Compete	foliage	18	VL
floxypyr	Starane u	foliage	45	L
fluthicet-me	Action	foliage	17	VL
fomesafen	Reflex	foliage	49	L
formasulfuron	Option	foliage	37	L
fosamine	Krenite	foliage	16	VL
glufosinate	Ignite	foliage	8	VL
glyphosate	Roundup	foliage	20	VL
halosulfuron-methyl	Permit	foliage	23	VL
haloxyfop	Galant	foliage	48	L
hexazinone	Velpar	soil	73	H
imazamethabenz	Assert	foliage	47	L
imazamox	Raptor	foliage	43	L
imazapic	Cadre	foliage	49	L
imazapyr	Arsenal	foliage	65	M
imazaquin	Scepter	foliage	44	L
imazethapyr	Pursuit	foliage	52	M
imazethapyr	Pursuit	soil	49	L
ioxynil	Totril	foliage	22	VL
isoxaflutole	Balance	soil	23	VL
isoxoben	Gallery	soil	47	L
lactofen	Cobra	foliage	25	VL
linuron	Lorox	foliage	42	L
linuron	Lorox	soil	48	L
MAA	MAA	foliage	37	L

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Common Name	Brand Name	Application Method	PLP	Rating
MAMA	MAMA	foliage	37	L
MCPA	Chiptox	foliage	45	L
MCPB	Thistrol	foliage	51	M
mecoprop	Mecomec	foliage	58	M
mesotrione	Lexor	soil	39	L
metolachlor	Dual	soil	63	M
metribuzin	Sencor	soil	52	M
metsulfuron methyl	Ally	foliage	16	VL
molinate	Ordram	soil	52	M
MSMA	Daconate	foliage	35	L
napropamide	Devrinol	soil	52	M
naptalam	Alanap	foliage	63	M
nicosulfuron	Accent	foliage	30	L
norflurazon	Zorial	soil	51	M
oryzalin	Surflan	soil	41	L
oxadiazon	Ronstar	soil	39	L
oxyfluorfen	Goal	soil	24	VL
paraquat	Gramoxone	foliage	6	VL
pebulate	Tillam	soil	45	L
pendimethalin	Prowl	soil	20	VL
phenmedipham	Spin-Aid	foliage	21	VL
picloram	Tordon	soil	68	M
pinoxaden	Axial	foliage	8	VL
primisulfuron	Beacon	foliage	29	VL
prodiamine	Barricade	foliage	28	VL
prometon	Pramitol	soil	95	VH
prometryn	Caparol	soil	51	M
prometryn	Caparol	foliage	42	L
pronamide	Kerb	soil	48	L
propachlor	Ramrod	soil	50	M
propanil	Stam	foliage	27	VL
propham	Chemhoe	soil	50	M
prosulfuron	Peak	foliage	27	VL
pyrazon	Pyramin	foliage	51	M
pyridate	Tough	foliage	28	VL
pyrithiobac	Staple	soil	41	L
quinclorac	Facet	foliage	47	L
quizalofop	Assure	foliage	31	L
rimsulfuron	Matrix	soil	41	L
rimsulfuron	Matrix	foliage	14	VL
sethoxydim	Poast	foliage	29	VL
siduron	Tupersan	soil	63	M
simazine	Princep	soil	62	M
sulfentrazone	Authority	soil	54	M
sulfometuron	Oust	foliage	37	L
sulfometuron	Oust	soil	42	L
sulfosulfuron	Certainty	foliage	23	VL
TCA	Varitox	soil	94	VH
tebuthiuron	Spike	soil	78	H
terbacil	Sinbar	foliage	51	M
terbutryn	Igran	foliage	34	L

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Common Name	Brand Name	Application Method	PLP	Rating
thiazopyr	Visor	soil	57	M
thifensulfuron methyl	Pinnacle	foliage	20	VL
thiobencarb	Saturn	soil	45	L
topramezone	Impact	foliage	1	VL
tralkoxydim	Achieve	foliage	43	L
triallate	Avadex-2	soil	38	L
triasulfuron	Amber	foliage	21	VL
tribenuron	Express	foliage	18	VL
triclopyr	Garlon	foliage	54	M
trifluralin	Treflan	soil	25	VL
trifloxysulfuron	Envoke	foliage	21	VL
triflusulfuron	Debut	foliage	12	VL
vernolate	Vernam	soil	44	L
GROWTH REGULATORS, DEFOLIANTS, DESICCANTS				
chlormequat	Cycoceel	foliage	4	VL
clofencet	Genesis	foliage	62	M
dimethipin	Harvade	foliage	72	H
ethephon	Super Boll	foliage	71	H
fumetralin	Prime+	foliage	22	VL
mefluidide	Embark	foliage	25	VL
mepiquat	PIX	foliage	4	VL
MH	Royal MH	foliage	49	L
pyraflufen	Ecopart	foliage	1	VL
sodium chlorate	Defol	foliage	80	H
thidiazuron	Dropp	foliage	30	L
tribufos	DEF	foliage	25	VL
FUNGICIDES, BIOCIDES				
azoxystrobin	Heritage	foliage	42	L
benomyl	Benlate	foliage	43	L
captan	Captan	foliage	54	M
carboxin	Evershield V	seed	13	VL
chlorothalonil	Bravo	foliage	33	L
copper hydroxide		foliage	41	L
DCNA	Botran	foliage	29	VL
dimethomorph	Acrobat	foliage	37	L
dodine	Syllit	foliage	1	VL
ethoprop	Mocap	soil	60	M
etridiazole	Terrazole	soil	17	VL
fenarimol	Rubigan	foliage	59	M
fenbutatin oxide	Vendex	foliage	38	L
fenhexamid	Elevate	foliage	14	VL
flutolanil	Moncut	foliage	39	L
fosethyl-Al	Alliette	foliage	9	VL
Iprodione	Rovral	foliage	27	VL
mancozeb	Dithane	foliage	38	L
maneb	Manzate	foliage	40	L
metalaxyl	Ridomil	soil	59	M
metiram	Polyram	foliage	4	VL
myclobutanil	Nova	foliage	32	L
oxamyl	Vydate	foliage	46	L

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Common Name	Brand Name	Application Method	PLP	Rating
oxythioquinox	Morestan	foliage	24	VL
PCNB	Terraclor	seed	28	VL
penconazole	Topaz	foliage	28	VL
propamocarb	Previcur	foliage	17	VL
propiconazole	Tilt	foliage	30	L
tebuconazole	Folicure	foliage	27	VL
terbufos	Counter	seed	31	L
thiabendazole	Mertect	foliage	37	L
thiophanate	Topsin	foliage	18	VL
thiophanate-methyl	Cercorbin	foliage	41	L
trifloxystrobin	Stratego	foliage	8	VL
triflumizole	Procure	foliage	27	VL
triphenyltin acetate	Fentin Acetate	foliage	20	VL
triphenyltin chloride	Fentin Chloride	foliage	20	VL
triphenyltin hydroxide	Super Tin	foliage	20	VL
vinclozolin	Ronilan	foliage	18	VL
zineb	Dithane	foliage	35	L
ziram	Zirex	foliage	41	L
INSECTICIDES, ACARICIDES, MITICIDES, NEMATOCIDES				
acephate	Orthene	foliage	52	M
acetamiprid	Assail	foliage	27	VL
aldicarb	Temik	soil	67	M
aldoxycarb	Standak	foliage	72	H
amitraz	Mitac	foliage	11	VL
azinphosmethyl	Guthion	foliage	22	VL
bendiocarb	Turcam	seed	26	VL
bifenthrin	Biflex	foliage	0	VL
carbaryl	Sevin	foliage	37	L
carbofuran	Furadan	foliage	54	M
carbofuran	Furadan	soil	73	H
carbosulfan	Advantage	foliage	11	VL
chlordimeform	Galecron	foliage	6	VL
chlorfenvinphos	Birlane	soil	40	L
chlorfenvinphos	Birlane	foliage	35	L
chlorobenzilate	Folbex	foliage	26	VL
chlorpyrifos	Lorsban	foliage	27	VL
chlorpyrifos	Lorsban	soil	30	L
clofentezine	Ovation	foliage	1	VL
cyfluthrin	Baythroid	foliage	0	VL
cyhalothrin	Karate	foliage	11	VL
cypermethrin	Ammo	foliage	0	VL
cyromazine	Trigard	foliage	39	L
deltamethrin	Decis	foliage	1	VL
diazinon	Diazinon	foliage	41	L
dicofol	Kelthane	foliage	33	L
dicrotophos	Bidrin	foliage	39	L
dietholate	Eradicane-Extra	soil	26	VL
diflubenzuron	Dimilin	foliage	0	VL
dimethoate	Dimethoate	foliage	47	L
disulfoton	Di-syston	foliage	33	L

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KEY: Very High (VH) = 90 to 100, High (H) = 70 to 89, Moderate (M) = 50 to 69, Low (L) = 30 to 49, Very Low (VL) = 0 to 29

Common Name	Brand Name	Application Method	PLP	Rating
endosulfan	Thiodan	foliage	18	VL
esfenvalerate	Asana	foliage	2	VL
ethion	Ethion	foliage	34	L
ethoprop	Mocap	soil	61	M
fenamiphos	Nemacur	soil	58	M
fenoxycarb	Logic	soil	0	VL
fenpropathrin	Danitol	foliage	0	VL
fenthion	Baytex	foliage	27	VL
fenvalerate	Asana XL	foliage	9	VL
flucythrinate	Pay-Off	foliage	0	VL
fluvalinate	Spur	foliage	0	VL
fonofos	Dyfonate	soil	29	VL
formetanate	Carzol	foliage	28	VL
hexythiazox	Hexygon	foliage	9	VL
hydramethylnon	Amdro	foliage	0	VL
imidacloprid	Timax	foliage	1	VL
indoxacarb	Steward	foliage	4	VL
lambda-cyhalothrin	Karate	foliage	0	VL
lindane	Lindane	foliage	55	M
malathion	Cythion	foliage	13	VL
methamidophos	Monitor	foliage	53	M
methidathion	Supracide	foliage	27	VL
methomyl	Lannate	foliage	43	L
methoxychlor	Marlate	foliage	7	VL
methoxyfenozide	Intrepid	foliage	20	VL
methyl parathion	PennCap-M	foliage	11	VL
mevinphos	Phosdrin	foliage	30	L
monocrotophos	Azodrin	foliage	61	M
naled	Dibrom	foliage	25	VL
oxamyl	Vydate	foliage	46	L
oxydemetonmethyl	Metasystox-R	foliage	49	L
parathion	Ethyl-Parathion	foliage	19	VL
PCNB	Terraclor	soil	37	L
permethrin	Ambush	foliage	0	VL
phorate	Thimet	soil	48	L
phosmet	Imidan	foliage	37	L
phosphamidon	Dimecron	foliage	53	M
profenophos	Curacron	foliage	15	VL
propargite	Comite	foliage	39	L
propoxur	Baygon	foliage	49	L
pymetrozine	Fulfill	foliage	7	VL
spinosad	Tracer	foliage	11	VL
sulprophos	Bolstar	foliage	27	VL
temephos	Abate	aquatic	0	VL
terbufos	Counter	soil	31	L
thiamethoxam	Platinum	seed	54	M
thiamethoxam	Centric	foliage	12	VL
thiodicarb	Larvin	foliage	24	VL
tralomethrin	Scout	foliage	0	VL
trichlorfon	Dylox	foliage	38	L
trimethacarb	Landin	soil	38	L

TABLE 1-3. RELATIVE PESTICIDE LEACHING POTENTIAL (PLP) INDICES AND RATINGS FOR COMMONLY USED PESTICIDES

The PLP value will change with changes in application rate. Values in this table are calculated using average rates.*

KEY: Very High (VH) = 90 to 100, High (H) = 70 to 89, Moderate (M) = 50 to 69, Low (L) = 30 to 49, Very Low (VL) = 0 to 29

Common Name	Brand Name	Application Method	PLP	Rating
zetamethrin	Fury	foliage	1	VL
FUMIGANTS				
1,3-dichloropropene	Telone-2	soil	79	H
chloropicrin	Larvacide	soil	65	M
dazomet	Basamid	soil	92	VH
metam sodium	Vapam	soil	94	VH
methyl bromide	Brom-O-Gas	soil	100	VH
MOLLUSCICIDES				
metaldehyde	Deadline Bullets	soil	41	L

*Formulae used to determine the values in Table 1-3 include the following:

$$PLP_{value} = \frac{(\text{Application rate of kg. ai/ha.})(\text{fraction hitting the soil})(T/2)}{Koc}$$

Where $T \frac{1}{2}$ = half life of the parent compound under field conditions

Koc = soil organic carbon binding value

$$PLP_{INDEX} = (\text{Log } PLP_{value})(14.3) + 57$$

TABLE 1-4. RELATIVE SOIL LEACHING POTENTIAL (SLP) INDICES AND RATINGS FOR SOILS IN THE SOUTHEASTERN UNITED STATES

The SLP index will change slightly for the site where the soil series is located. Values in this table are calculated using the profile description of the original site where the soil was named.

KEY: Very High (VH) = 90 to 100, High (H) = 70 to 89, Moderate (M) = 50 to 69, Low (L) = 30 to 49, Very Low (VL) = 0 to 29

Soil	SLP	Rating	Soil	SLP	Rating	Soil	SLP	Rating	Soil	SLP	Rating
Alamance	69	M	Corolla	95	VH	Johnston	22	VL	Plummer	79	H
Alpin	84	H	Coxville	36	L	Kalmia	77	H	Ponzer	08	VL
Altavista	73	H	Craven	66	M	Kenansville	84	H	Portsmouth	26	VL
Appling	62	M	Creedmoor	64	M	Kureb	100	VH	Pungo	00	VL
Arapahoe	39	L	Croatan	14	VL	Lakeland	84	H	Rains	45	L
Argent	58	M	Cullowhee	77	H	Leaf	35	L	Rimini	84	H
Augusta	66	M	Dare	09	VL	Lenoir	32	L	Rion	64	M
Autryville	68	M	Davidson	55	M	Leon	84	H	Roanoke	57	M
Aycock	68	M	Deloss	29	VL	Liddell	47	L	Roper	16	VL
Ballahack	20	VL	Dogue	67	M	Lignum	63	M	Rosman	55	M
Barclay	77	H	Dorovan	10	VL	Louisburg	81	H	Rumford	84	H
Bayboro	04	VL	Dothan	66	M	Lumbree	53	M	Seabrook	84	H
Baymeade	87	H	Dragston	80	H	Lynchburg	40	L	Stallings	58	M
Belhaven	10	VL	Duckston	98	VH	Lynn Haven	61	M	State	73	H
Bibb	75	H	Dunbar	35	L	Madison	68	M	Stockade	35	L
Blaney	73	H	Duplin	62	M	Mandarin	89	H	Tarboro	90	VH
Blanton	82	H	Durham	72	H	Marlboro	63	M	Tate	46	L
Bojac	82	H	Echaw	84	H	Marvyn	44	L	Tatum	64	M
Bonneau	70	H	Edneyville	54	M	Masada	37	L	Toisnot	68	M
Braddock	64	M	Emporia	67	M	Mayodan	63	M	Tomahawk	86	H
Bragg	64	M	Enon	77	H	Mccoll	24	VL	Tomotley	52	M
Brookman	07	VL	Evard	70	H	Mecklenburg	69	M	Torhunta	29	VL
Buncombe	87	H	Exum	69	M	Meggett	29	VL	Vance	66	M
Butters	83	H	Faceville	58	M	Munden	81	H	Varina	62	M
Byars	21	VL	Fanin	70	H	Nahunta	41	L	Vaucluse	76	H
Cainhoy	89	H	Foreston	81	H	Nankin	63	M	Wagram	71	H
Candor	79	H	Fork	72	H	Nason	41	L	Wahee	43	L
Cape Fear	13	VL	Fuquay	73	H	Nimmo	78	H	Wakulla	85	H
Caroline	64	M	Gaston	63	M	Nixonton	82	H	Wando	87	H
Cecil	60	M	Georgeville	59	M	Norfolk	67	M	Wasda	18	VL
Centenary	85	H	Gilead	62	M	Ocilla	53	M	Watauga	46	L
Chandler	47	L	Goldsboro	70	H	Onslow	70	H	Wedowee	64	M
Charleston	83	H	Goldston	78	H	Orangeburg	67	M	Weeksville	34	L
Chastain	40	L	Grantham	44	L	Ousley	84	H	Wehadkee	48	L
Chester	44	L	Grifton	61	M	Pacolet	63	M	White Store	61	M
Chewacla	47	L	Gritney	34	L	Pactolus	85	H	Wickham	75	H
Chipley	61	M	Hayesville	40	L	Pamico	53	M	Wilbanks	43	L
Chowan	35	L	Helena	66	M	Pantego	12	VL	Wilkes	82	H
Clifton	40	L	Herndon	63	M	Pasquotank	52	M	Winnsboro	82	H

TABLE 1-4. RELATIVE SOIL LEACHING POTENTIAL (SLP) INDICES AND RATINGS FOR SOILS IN THE SOUTHEASTERN UNITED STATES

The SLP index will change slightly for the site where the soil series is located. Values in this table are calculated using the profile description of the original site where the soil was named.

KEY: Very High (VH) = 90 to 100, High (H) = 70 to 89, Moderate (M) = 50 to 69, Low (L) = 30 to 49, Very Low (VL) = 0 to 29

Soil	SLP	Rating	Soil	SLP	Rating	Soil	SLP	Rating	Soil	SLP	Rating
Colvard	88	H	Hullete	62	M	Paxville	40	L	Winton	72	H
Conaby	23	VL	Hyde	17	VL	Pender	69	M	Woodington	58	M
Conetoe	85	H	Invershield	70	H	Perquimans	44	L	Worsham	43	L
Congaree	28	VL	Johns	78	H	Pinkston	73	H	Yaupon	72	H
									Yonges	57	M

SAMPLE CALCULATION FOR GWCP INDEX: Acetochlor (PLP index = 55 M) applied to an Alamance soil (SLP index = 69 M).
 GWCP index = $55 + 69 / 2 = 62$ M.

TABLE 1-5. GROUNDWATER CONTAMINATION POTENTIAL (GWCP) RISK OF PESTICIDE-SOIL COMBINATIONS

Obtain numbers for PLP and SLP for your soil and pesticide from Tables 1-3 and 1-4, respectively.

Pesticide Leaching Potential (PLP) Rating	Soil Leaching Potential (SLP) Rating				
	0–29 Very Low	30–49 Low	50–69 Moderate	70–89 High	90–100 Very High
0–29 Very Low	Very Low Risk	Very Low Risk	Low Risk	Low Risk	Moderate Risk
30–49 Low	Very Low Risk	Low Risk	Low Risk	Moderate Risk	Moderate Risk
50–69 Moderate	Low Risk	Low Risk	Moderate Risk	Moderate Risk	High Risk
70–89 High	Low Risk	Moderate Risk	Moderate Risk	High Risk	High Risk
90–100 Very High	Moderate Risk	Moderate Risk	High Risk	High Risk	Very High Risk

PROPER PESTICIDE STORAGE

Safe and proper storage can extend the shelf (storage) life of your pesticides, keep the containers in good condition, and keep the labels clean and legible.

Only rules for storing pesticides on the farm and in household situations are presented here. If you store restricted use pesticides in commercial storage facilities, you must meet additional requirements as outlined in Regulation 2 NCAC 9L.1903–.1913. Details on these requirements can be obtained at your county Cooperative Extension Center or by calling the Pesticide Section of the NCDA&CS at (919) 733-3556.

Household and Farm Situation Storage Rule (simplified)

1. This rule applies to all pesticides.
2. Store pesticides to prevent leaking and to aid inspection.
3. Do not store formulated pesticides in unlabeled containers. The following minimum information must be shown clearly and prominently on any containers of formulated pesticides:
 - a. common chemical name (such as carbaryl for the product Sevin)
 - b. percentage of each active ingredient
 - c. EPA registration number
 - d. signal word (DANGER, WARNING, CAUTION)
 - e. use classification (restricted use or general use).
4. Do not store pesticides (formulated products or dilutions) in

any food, feed, beverage, or medicine container that has previously been used for such purposes or that is specifically designed to contain only those products.

5. Do not store pesticides in a way that could contaminate foods, feeds, beverages, eating utensils, tobacco, or tobacco products or otherwise result in accidental ingestion by people or domestic animals. In addition, pesticides should not be stored in such a way that could contaminate other pesticides, seeds, or fertilizers.
6. Store pesticides based on the following:
 - a. storage recommendations, if any, on their labels, and
 - b. labels on all other products, including nonpesticide products held in the same storage area.
7. When unattended, store pesticides to prevent unauthorized access.
8. Store pesticides in an area that is dry (does not accumulate water) and well-ventilated.
9. Pesticide storage areas should be free of combustible materials—such as gasoline, kerosene, or petroleum solvents other than those associated with pesticide application—and debris like wastepaper, rags, or used cardboard boxes that may provide an ignition source. They must also be separated from other operations that present a fire hazard, such as welding or burning. Take appropriate care to reduce fire hazards when providing supplemental heating to storage areas during the winter.

DISPOSAL OF PESTICIDES**Reduce the Need for Disposal of Unwanted Pesticides**

Because of the expenses, environmental hazards, and legal responsibilities associated with the disposal of pesticides and other hazardous waste, the best solution is to minimize or eliminate the need for disposal altogether. Careful planning of spray programs is essential in order to avoid purchasing more pesticides than will actually be needed for a particular application or season. However, in spite of careful planning, farmers (and homeowners) will occasionally need to dispose of unwanted pesticides. In addition, there are old, obsolete, or banned pesticide products in storage throughout the state that require disposal. Some of these materials are in containers that are structurally unsound and have incomplete or no labeling. The following information will aid in accomplishing disposal in the safest, most economical, and environmentally acceptable manner possible.

Donation of Excess Pesticides

If no longer needed, unopened containers of recently purchased pesticides may possibly be returned to the local dealer or manufacturer/formulator for a refund. If this cannot be arranged, the pesticide may be sold or donated to a neighbor or to someone who can and will use it properly. If donation is a possibility, there are two important factors that must be taken into consideration.

1. A pesticide designated RESTRICTED USE on the label must not be given to someone who is not a certified applicator.
2. A pesticide that has been banned or one for which all uses have been cancelled should not be donated to another person.

NCDA&CS Disposal Systems Program for Excess Pesticides

If donation of unwanted pesticides is not a possibility, two other options are available. The NCDA&CS has a Pesticide Disposal Assistance Program for farmers and homeowners. This service is provided on an individual request basis with no fees charged. Specific requests for assistance should be made to Derrick Bell, NCDA&CS Pesticide Waste Specialist, (919) 733-7366, ext. 327 or 328.

Commercial Hazardous Waste Disposal

In some situations the NCDA&CS may not be able to provide the disposal assistance that is needed. Commercial disposal companies, permitted by the U.S. Environmental Protection Agency (EPA) through the Resource Conservation Recovery Act (RCRA) program are available to dispose of pesticide wastes.

While all pesticides are hazardous substances, not all are legally classified as RCRA hazardous wastes. However, because pesticides cannot be legally disposed of at county landfills, a permitted disposal facility is an option that may have to be used.

The NCDA&CS will furnish a listing of hazardous waste disposal companies upon request. Anyone contemplating this option is advised to contact several firms, compare costs, and ask for and check references. All paper work (manifests) generated by the disposal should be retained permanently.

One must not assume that disposal of a pesticide (which is also a RCRA hazardous waste) at an EPA permitted facility eliminates all further legal responsibility for that product. The person who generates a hazardous waste (farmer/homeowner) is legally and financially responsible for that material for as long as it remains in existence. Therefore, even though destructive disposal (incineration) may cost more than nondestructive disposal (landfilling), there are worthwhile, long-term benefits for using the incineration method.

In summary, the disposal of some pesticides via commercial disposal companies involves RCRA regulations. There are

stringent requirements for storage, transport, and disposal of hazardous waste and severe penalties for failure to comply with the regulations. For information regarding hazardous waste management and disposal contact:

Division of Waste Management, Hazardous Waste Section, N.C. Department of Environment & Natural Resources, P.O. Box 27687, Raleigh, NC 27611-7687.

Disposal of Excess Spray Solution from Tank and Equipment Rinses

As already indicated, proper planning and careful calculations should eliminate the need for disposal of large quantities of excess spray solutions. Small quantities should be sprayed out along field borders or on the row ends. Care must be taken not to exceed the labeled application rate.

Tank and equipment rinses should also be applied along field borders or on the row ends. If decontamination solutions, cleaners, detergents, ammonia, chlorine bleaches, etc., are used to remove residues, adequate dilution may be necessary to prevent soil and plant injury.

DISPOSAL OF EMPTY PESTICIDE CONTAINERS**Metal, Plastic, or Glass Containers of Liquid Formulations (5 Gallons or Fewer)**

Before pesticide containers can be accepted for recycling or disposed of properly, they must be rinsed by one of the following methods:

Pressure rinsing

1. Drain the container into the spray tank for 30 to 60 seconds after the last amount starts to drip.
2. Insert tip of the pressure nozzle through the side of the pesticide container near its base.
3. While holding the container so the opening can drain into the spray tank, spray the inside of the container for at least 30 seconds.
4. Drain all rinse water into the spray tank.

Triple rinsing

1. Drain the container into the spray tank for 30 to 60 seconds after the last amount starts to drip.
2. Fill the containers 1/3 full with water, cap, and shake thoroughly. Empty this rinse water into the spray tank.
3. Repeat the above rinse procedure at least two more times, adding each amount of rinsewater to the spray tank.
4. Punch holes in the bottom and sides of metal and plastic containers. The holes will prevent the containers from being reused and will indicate that they are indeed empty.

Properly-rinsed plastic pesticide containers can be delivered to a container recycling collection site. Nearly every county in North Carolina has one or more of these sites. Call your County Extension Center for directions to the nearest collection site. Properly rinsed metal or glass pesticide containers can be taken to a county solid waste collection system or to a county landfill.

Metal or Plastic Drums (30- to 55-Gallon)

1. Rinse and drain these containers into the spray tank.
2. Attempt to return drums to dealer or distributor (recycling).
3. If you are not successful, attempt to donate drums to a drum reconditioner (contact Pesticide Disposal Specialist, NCDA&CS, Derrick Bell, (919) 733-7366 ext. 327 for information on drum reconditioners operating in the state).
4. If steps 2 or 3 above fail, attempt to dispose of rinsed drums

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in the county sanitary landfill. This may not be possible in some cases because of the difficulty for landfill personnel to verify that the drums have been properly rinsed.

5. If the above procedures fail, contact the Solid and Hazardous Waste Management Branch (919) 733-2178 for assistance with pesticide drum disposal.

Containers of Non-Liquid Pesticides

1. Shake container into the applicator tank until all the pesticide has been removed.
2. Tear open the container to make sure it is completely empty.
3. If the pesticide is a wettable powder and the container can be triple rinsed with water, do so. Add the rinseate to the tank.
4. Puncture, crush, or otherwise render the container incapable of being reused and then place in the solid waste collection system or carry to a county sanitary landfill facility.
5. If large containers can be returned for recycling, do so.

CONTROLLING PESTICIDE DRIFT

Once discharged from the application equipment, pesticides may drift through the air and injure susceptible plants or sensitive animal life before the pesticides actually reach the target area. Movement through the air may be by spray drift, vapor, or dust.

If herbicides are allowed to drift, they can often cause extensive damage to susceptible crops. Drift of other pesticides—although not as likely to injure nearby crops—can damage livestock, bees, fish, and people, in addition to leaving illegal residues on crops.

Spray drift is the movement of airborne spray particles beyond the target. The amount of spray drift is influenced by the (1) droplet size, (2) amount of wind, and (3) height from which the spray is released.

When using ground equipment certain precautions can reduce spray drift.

1. Select nozzles that produce a minimum proportion of small droplets in relation to overall droplet size. The droplet size is influenced by pounds of pressure per square inch (psi) and the nozzle's design (opening size). Lower pressures and larger openings, for example, tend to produce larger droplets and less drift. Standard fan nozzles operate at 30 to 40 psi. But whirl chamber nozzles and low-pressure fan nozzles work at 15 to 20 psi. So select the largest nozzle opening that will provide enough gallons per acre for penetration, uniform coverage, mixing with the pesticide, and effective control.
2. Spray when wind velocity is at a minimum, when temperatures are moderate, and preferably before adjacent susceptible crops emerge. Where a susceptible crop has emerged, spray when the wind is moving away from the crop or consider leaving an untreated strip along the edge of the field.
3. Adjust the boom as close as possible to the target without losing uniform distribution of the pesticide. To bring the boom closer to the target, space the nozzles closer together or use wide-angle nozzles. The boom's height above the ground affects how long it takes a spray droplet to reach the ground. Usually wind velocities are lower closer to the ground.

Special nozzles that produce large droplets have been developed to control this drift from aerial application. Also, invert emulsions and drift control agents can be used.

Vapor drift occurs when vapor or fumes move from the area of application. Vapor drift may damage susceptible crops or may simply reduce the effectiveness of the herbicide or pesticide.

Ester formulations of 2,4-D may volatilize in hot weather and drift to susceptible crops. Therefore, select amine and sodium salts of 2,4-D that less prone to volatilize. Still take steps to prevent spray particle drift.

Fumigants like methyl bromide and chloropicrin **drift** after they turn into a gas. Make sure the covers or buildings where these chemicals are applied are airtight and that application equipment lines and tanks do not leak.

MIXING AND LOADING PESTICIDES

People often get into trouble when mixing and loading pesticides. Some common problems are discussed briefly here.

Tank Mixes

Tank mixes (combinations of two or more pesticides in the spray tank at time of application) may fall into one of two categories:

- Instructions provided for such use on one or more labels of registered products.
- Tank mixes that are recommended by the Cooperative Extension Service or are common agricultural practices.

Tank mixes recommended on labels are obviously consistent with the label.

Tank mixes will not be deemed "use inconsistent with the label" if:

1. the products in the mix are applied at a dosage rate not to exceed the label instructions for use of any product in the mix used singly for the same set of pests on the same crop; and
2. the label on one or more of the products does not explicitly instruct against such mixture.

The only mixtures proven effective and safe are those specified on product labels. The user applies all other mixtures at his own risk with respect to effects on crops and application equipment, applicator safety, environmental effects, and preharvest interval tolerances.

Compatibility

Some pesticides will not mix (are not compatible) with other pesticides or with liquid fertilizers in spray-tank mixtures. For example, wettable sulphur cannot be mixed with Lorsban or Morestan. Some herbicides are not compatible with liquid fertilizers and herbicide oils. Any time you plan to mix two or more pesticides, first make sure they are compatible. Follow the specific directions on the label to test for compatibility if you still have questions. Also remember that a pesticide may mix physically with another pesticide, but the activity of one or both may be altered (based on their chemical or biological incompatibility).

Adjuvants

Adjuvants are inert ingredients that are added to pesticide formulations or tank mixes to increase the effectiveness of the pesticide's active ingredients. Adjuvants may be wetting agents, emulsifiers, spreaders, stickers, penetrants, drift reduction agents, thickeners, buffers, and compatibility agents just to name a few. Adjuvants should not be used unless they are needed. Many times the pesticide formulation already contains all the adjuvants needed for the application.

On the other hand, many herbicide and other pesticide formulations require that a surfactant, penetrating agent, or other adjuvant be added to the spray tank to increase the pesticide's effectiveness. Read the label to find out what should or should not be added to the pesticide formulation to give you the best possible control.

Formulation Sequence

If you use more than one pesticide formulation (WP, WDG, DF, L, EC) in a spray tank, there is a proper order for adding them.

1. Add a small amount of water or other liquid carrier to the spray tank.
2. Dry materials go into the spray before liquid chemicals. If a wettable powder (WP) is used, put it in first as follows: Make a slurry with the wettable powder by adding a small amount of water to it until it forms a gravy-like consistency. Slowly add this slurry to the tank with the spray tank agitator (mixer) running.
3. Dry flowables (DF) or water-dispersible granules (WDG) go in second. Flowables should be premixed (1 part flowable to 1 part water) and poured slowly into the tank.
4. Liquid flowables (F or L) should be added third. Exception: When using Furadan 4F, this material should be put in last. Liquids should also be premixed (1 part liquid chemical to 2 parts water or liquid fertilizer) before blending in the tank. Many labels will give you the proper pesticide mixing sequence.
5. Emulsifiable concentrates (EC), should be combined last.

Safety Warning

When mixing and loading pesticides, you usually work with concentrated pesticides. Accident reports have shown that the danger of being poisoned may be greatest at this time. Wear the appropriate gloves and other protective clothing to avoid getting a pesticide on you or your clothing.

If a pesticide gets into your eyes, immediately rinse them with plenty of clean water; continue for at least 15 minutes. (The label on some pesticides calls for longer flushing times). If pesticides get on your skin, wash them off with water. Remove contaminated clothing and wash it separately from the family laundry before wearing any of it again. Clothing saturated with a highly hazardous pesticide (labeled DANGER) should be disposed of the same way you would discard the pesticide. Remember: Injuries from most pesticide accidents can be prevented if you know what to do and do it FAST. Take the person to a doctor if you suspect pesticide poisoning.

CLEANING SPRAYER SYSTEMS

Most people are aware that spraying sensitive crops with a sprayer that has been used earlier to apply certain pesticides can lead to crop damage. Most pesticides can be washed out of sprayers. Dicamba (Banvel), 2,4-D, 2,4-DB, and MCPP are more difficult to wash out, however, and many crops are very sensitive to these herbicides. So it is best to have a separate sprayer to apply these herbicides. Certain crops are very sensitive to sulfonylurea herbicides (Classic, Canopy, Gemini, Glean, Harmony), but these can easily be washed out of sprayers if the proper procedure is used.

Before applying a pesticide with a sprayer that was previously used for some other pesticide, always wash out the sprayer thoroughly. It is best to wash out the sprayer immediately after use. Some pesticide labels give instructions on how to properly clean that pesticide out of the sprayer. If the label does not contain this information, that does not imply that residues of that particular pesticide in a sprayer will not harm other crops.

PESTICIDE RECORD-KEEPING REQUIREMENTS

The U.S. Department of Agriculture (USDA), through the 1990 Farm Bill, and the North Carolina Pesticide Board, through the N.C. Pesticide Law of 1971 (NCPL), require that applicators, dealers, and agricultural employers record certain pesticide information. The NCDA&CS, Structural Pest Control and Pesticides Division administers and enforces record keeping provisions under the state law and through a cooperative agreement with USDA. Records must be kept for certain lengths of time and made available to representatives of the NCDA&CS and USDA upon request.

Table 1-6 summarizes the pesticide application records required by federal and state regulations for certain pesticides and for compliance with the Worker Protection Standard (WPS). Readers are encouraged to read the actual laws and regulations for more detailed information. Dealers, certified applicators, licensed aerial and ground applicators, and agricultural employers all have some responsibilities for recording pesticide information.

Agricultural employers who hire pesticide handlers, workers, or both must display application information as required by the WPS. This information must be posted at a central location accessible by employees prior to application and kept for 30 days after the expiration of the restricted-entry interval (REI). Under new state law, the time when the application was completed must be recorded. This and all other required record-keeping items must be maintained for a period of two years after the REI expires.

Pesticide dealers in North Carolina are required to keep sales records for all restricted-use pesticides. The 10 elements that are required for each restricted-use pesticide sale are:

1. Date of sale;
2. Initials of sales clerk;
3. Name of certified or licensed applicator;
4. Certification or license number from card;
5. Expiration date as shown on the card;
6. Product brand name;
7. EPA registration number;
8. Number of individual containers;
9. Size of individual containers;
10. Total quantity sold.

TABLE 1-6. SUMMARY OF PESTICIDE RECORD-KEEPING REQUIREMENTS FOR GROWERS AND APPLICATORS

Required Items	USDA Requirements for Private & Commercial Applicators (Restricted Use Pesticides)	NCPL ¹ Requirements for Commercial Applicators & Public Operators (Restricted Use Pesticides)	NCPL ¹ Requirements for Aerial Applicators (All Pesticides)	Federal & State Requirements for Agricultural Employers (WPS*) (Agricultural Use Pesticides)
Brand name/product name	ü	ü	ü	ü
EPA registration number	ü	ü	ü	ü
Total amount of pesticide used	ü	ü amount/unit of measure (e.g. acre)	ü amount of formulated product or active ingredient/acre PLUS amount of tank mix/acre	—
Date of application	ü	ü and time application completed	ü and time application completed	ü time application is planned must be posted prior to application, then time application is completed must be added
Description/location of treated area	ü	ü	ü	ü
Crop, commodity, or stored product	ü	ü	ü	—
Size of area treated	ü	ü	ü	—
Name and address of property owner or operator	—	ü	ü	—
Name of applicator	ü	ü	ü	—
Name of licensee	ü or name of supervisor	ü	ü name of contractor and signature of record keeper	—
Certification number	ü	—	—	—
Active ingredients	—	—	—	ü
Restricted entry interval	—	—	—	ü
Record must be...	completed within 14 days of application and kept 2 years (commercial applicator, only, must furnish records to customer within 30 days)	kept 3 years	completed within 72 hours after application and kept 3 years	completed prior to application and posted for 30 days after the Restricted-Entry Interval expires based on federal law. State law requires it be kept for 2 years after the REI expires.
For these records, each day of application must be recorded as a separate application.				

*The federal Worker Protection Standard has been adopted by reference by the N.C. Pesticide Board. This standard requires that pesticide information be posted in a central location on an agricultural establishment.

¹ NCPL = North Carolina Pesticide Law

Source: North Carolina Department of Agriculture and Consumer Services

Record-keeping forms for the USDA restricted-use pesticide regulation and the Worker Protection Standard are available on line at <http://ipm.ncsu.edu/pesticidesafety/>.