USDA
NATURAL RESOURCES
CONSERVATION SERVICE

DELAWARE CONSERVATION
PRACTICE STANDARD

PEST MANAGEMENT

CODE 595
(Reported by Acre)

DEFINITION

Utilizing environmentally sensitive prevention, avoidance, monitoring, and suppression strategies to manage weeds, insects, diseases, animals and other organisms (including invasive and non-invasive species), that directly or indirectly cause damage or annoyance.

PURPOSES

This practice may be applied for one or more of the following purposes:

- To maintain or improve the quantity and quality of agricultural crops;
- To minimize the negative impacts of pest control on soil, water, air, plants, animals. and/or humans;
- To control undesirable insects, nematodes, diseases, nuisance wildlife, or weeds (including noxious weeds and invasive plants).

CONDITIONS WHERE PRACTICE APPLIES

This practice may be applied on all lands where pest management is needed.

This practice does not apply to controlling plant and animal pests in ponds, lakes, and reservoirs where fish and other aquatic species are desired for domestic or recreational use. Refer to the conservation practice standard for Fishpond Management (Code 399).

CONSIDERATIONS

Consider the following site conditions:

- Surrounding land uses, including the distance to neighboring residences, and the distance to sensitive resources such as wells, springs, wetlands, and streams;
- Existing vegetation on the site and in adjacent areas;
- Soil characteristics, including organic matter content, pH, slope, surface residue, and soil moisture. Improving soil condition can improve plant vigor and increase the plant's overall ability to tolerate pests. Utilize evaluation tools such as the revised universal soil loss equation (RUSLE) and the Soil Conditioning Index (SCI) to estimate soil loss and soil quality.

Integrated Pest Management (IPM) is a sustainable approach to pest control that combines the use of prevention, avoidance, monitoring, and suppression strategies to maintain pest populations below economically damaging levels, to minimize pest resistance, and to minimize harmful effects of pest control on human health and environmental resources.

IPM suppression systems include biological controls, cultural controls, and the judicious use of chemical controls. The use of a trained IPM professional or consultant to develop and implement the IPM strategy is strongly encouraged.

CRITERIA

Criteria Applicable to All Purposes

Plan and implement an approach to pest management that increases the likelihood of success, reduces reliance on any one tactic, delays resistance to pesticides, and reduces the need for emergency actions (which usually involve a limited choice of chemical

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

alternatives).

All methods of pest management shall comply with federal, state, and local regulations, including management plans for invasive pest species, noxious weeds, and disease vectors. Compliance with the Food Quality Protection Act (FQPA); Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); Worker Protection Standard (WPS); and Interim Endangered Species Protection Program (H7506C) is required for chemical pest control.

IPM, which strives to balance economics, efficacy, and environmental risk, shall be incorporated into planning alternatives.

IPM programs available in Delaware are administered through the Delaware Cooperative Extension. Information is available on their web site http://www.udel.edu/IPM/index.html. The following manuals contain commodity specific IPM program information and recommendations for Delaware:

1. Integrated Pest Management Scouting Guidelines for Field Crops. *Cooperative Extension Service, the University of Maryland System, and Maryland Institute of Agriculture and Natural Resources.*

2. Vegetable Pest Management, Pest Identification and Biology Scouting Procedures and Recommended Actions. *Maryland Cooperative Extension Service and Delaware Cooperative Extension Service.*

Utilize the local cooperative extension county offices for other IPM commodity specific information. If commodity specific IPM is not available, the following IPM principles should be used: (see Table 1 for specific IPM strategies):

1. PREVENTION – Preventing pest populations;

2. AVOIDANCE – Avoiding pest populations;

3. MONITORING – Identifying the extent of pest populations and/or the probability of future populations to help target suppression strategies and avoid routine preventative pest control;

4. SUPPRESSION – Using cultural, biological, and chemical controls to reduce a pest population or its impacts. Chemical controls should be used judiciously in order to minimize environmental risk and pest resistance.

All methods of pest management must be integrated with other components of the conservation plan.

Clients shall be instructed to pay special attention to all environmental hazards and site-specific application criteria listed on pesticide labels and contained in Delaware Cooperative Extension and crop consultant recommendations. All chemicals will be according to the manufacturer's label.

Additional Criteria When Pesticides Will Be Used

Pest management related environmental risks, including the impacts of pesticides in ground and surface water on humans and non-target plants and animals, must be evaluated for all identified water resource concerns.

The NRCS Windows Pesticide Screening Tool (WIN-PST) will be used to evaluate soil pesticide interactions in all fields where pesticides will be applied. The WIN-PST Hazard Rating Report will include Soil/Pesticide Interaction Screening Procedure 2 (SPISP2) ratings for Leaching Potential, Solution Runoff Potential, Adsorbed Runoff Potential, and Human and Fish Hazard Ratings. WIN-PST hazard ratings are divided into five classes, as follows:

1. X (Extra High);

2. H (High);

3. I (Intermediate);

4. L (Low);

5. VL (Very Low).

Hazard ratings of "Low" or "Very Low" do not require any additional action as long as pesticides are used according to the label and meet quality criteria for Resource Management Systems (RMSs).

Hazard ratings of "Intermediate" or "High" require mitigation measures to meet quality criteria for an RMS. "High" ratings warrant more extensive mitigation measures than "Intermediate" ratings. Mitigation measures may not be effective for "Extra High" hazard ratings if resources are highly sensitive or a high degree of resource protection is desired. In these cases, an alternate method of pest control or an efficacious, economically acceptable pesticide with a lower risk may be required to meet quality criteria for an RMS.

Table 2 contains a list of mitigation techniques (management and conservation practices) that can help reduce the adverse impacts of pesticides, depending upon pesticide loss pathways. For each mitigation technique, Table 2 provides a rating for its relative effectiveness by pesticide loss pathway and describes the technique's functions. Effectiveness of any mitigation technique can be highly variable based on site conditions and on how the technique is applied. Therefore, with guidance provided by Table 2, site-specific selection and design of mitigation techniques are left to the professional judgment of the conservation planner.

The number, sequence, and timing of tillage operations shall be managed in conjunction with other erosion control tactics and practices, in order to minimize sediment losses to nearby surface water bodies. Clients shall be encouraged to pay special attention to pesticide label instructions for limiting pesticide residues in leachate and runoff that may negatively impact water quality. In addition, pay special attention to pesticide label instructions concerning application techniques to avoid adversely affecting non-target plants, animals, and humans.

Use the following precautions, as appropriate:

1. Minimize volatilization and drift;

2. Prevent misdirected pesticide applications by removing pesticide residues from sprayers before moving to the next crop;

3. Follow the recommended label rotational intervals to avoid injury to subsequent crops in a rotation;

4. When pesticide incorporation is recommended, incorporate to the depth specified on the label;

5. Apply pesticides at the proper crop stage, pest growth stage or life cycle, and under appropriate climatic conditions, and only when the economic threshold is exceeded.

SPECIFICATIONS

Plans and specifications for pest management shall be prepared in accordance with the previously listed criteria. Plans and specifications shall contain sufficient detail concerning pest management to ensure successful implementation of this practice. Documentation shall be in accordance with the section "Supporting Data and Documentation" in this standard.

OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan shall be prepared for each management unit. Appropriate job sheet(s), fact sheets, or other information sheets may be used to serve as the management plan as well as supporting documentation and shall be provided to the client. These sheets shall be referenced in the conservation plan narrative.

Include the following requirements as appropriate:

1. Review and update the plan periodically in order to incorporate new IPM technology, respond to cropping system and pest complex changes, and avoid the development of pest resistance;

2. Maintain mitigation techniques identified in the plan in order to ensure continued effectiveness;

3. Use appropriate sanitation practices (e.g., pruning, mowing, removal of diseased or infested plant materials, elimination of alternate hosts, etc.) to reduce sites for pest carryover and life cycle completion. Monitor adjacent areas that may provide habitat or host plants that contribute to the maintenance or build-up of pest populations;

4. To control the spread of plant diseases and weeds, clean equipment after use and before storing;

5. Calibrate application equipment according to Cooperative Extension Service and/or manufacturer recommendations before each seasonal use and with each major chemical change;

6. Replace worn nozzle tips, cracked hoses, and faulty gauges.

Chemical Safety

Develop a safety plan for individuals exposed to chemicals, including telephone numbers and addresses of emergency treatment centers for individuals exposed to chemicals and the telephone number for the nearest poison control center. The Maryland Poison Control Center can be contacted at 1-800-222-1222. The Philadelphia Poison Control Center can be contacted at 1-800-722-7112.

The National Pesticide Information Center (NPIC) telephone number in Corvallis, Oregon may also be given for non-emergency information: 1-800-858-7378, Monday – Friday, 6:30 a.m. to 4:30 p.m. Pacific Time.

For advice and assistance with emergency spills that involve agrochemicals, provide the local emergency telephone number. The national 24-hour CHEMTREC (HAZMAT Emergency Communications Center) telephone number may also be given: 1-800-424-9300.

Follow label requirements for mixing/loading setbacks from wells, intermittent streams and rivers, natural or impounded ponds and lakes, or reservoirs.

Dispose of pesticides and pesticide containers in accordance with label directions and adhere to federal, state, and local regulations.

Read and follow label directions.

Record Keeping

The USDA requires private pesticide applicators to keep a record of all restricted use pesticide (RUP) applications. Refer to Delaware Department of Agriculture, Pesticide Section, "Pesticide Record Keeping Book for Private Applicators" for additional information.

The Federal pesticide record keeping regulations require all commercial applicators to furnish a copy of the required data to the customer within 30 days of the RUP application. These records must be maintained for two years following application by the customer.

Record Keeping for Integrated Pest Management Record keeping for integrated pest management should address Prevention, Avoidance, Monitoring, Suppression (PAMS). Refer to Table 1 "Integrated Pest Management Principles and Strategies" for suggested activities. The local Cooperative Extension Service can provide current IPM guidelines specific to agronomic crops.

Following Worker Protection Standard (WPS) Requirements

Any producer that employs non-family individuals must comply with WPS requirements. These requirements are specified on product labels under "Directions for Use" section which includes information on protective equipment, restricted entry, and posting.

Minimum Record Keeping when Pesticides are Applied Minimum record keeping should include the following:

- Field/Tract
- Crop or Site Treated
- Application Date
- Product Name
- Target Pest
- Rate Used
- Size of Area Treated
- Weather Conditions

SUPPORTING DATA AND DOCUMENTATON

The following is a list of the minimum data and documentation to be recorded in the case file:

1. Assistance notes shall include dates of site visits, name or initials of the person who made

the visit, specifics as to alternatives discussed, decisions made, and by whom;

2. Plan map of the managed site indicating treatment areas and location of sensitive resources and setbacks, if applicable;

3. Record all identified water resource concerns;

4. Environmental risk analysis from WIN-PST for probable pesticide recommendations by crop (if applicable) and pest, if chemical pesticides will be used, when a water resource concern has been identified. Include an interpretation of the environmental risk analysis in the narrative statement on the conservation plan;

5. Identification of appropriate mitigation techniques to address the identified water resource concern;

6. Operation and maintenance requirements;

7. Delaware's Pest Management Jobsheet;

8. Additional documentation may be required by specific programs.

REFERENCES

1. Cooperative Extension Service, the University of Maryland System, and Maryland Institute of Agriculture and Natural Resources, *2003*. Integrated Pest Management Scouting Guidelines for Field Crops. EB236.

2. Maryland Cooperative Extension Service and Delaware Cooperative Extension Service, 2003. Vegetable Pest Management, Pest Identification and Biology Scouting Procedures and Recommended Actions. EB237.

3. Maryland Department of Agriculture, *Pesticide Law*. State of Delaware Code, Title 3, Part II, Chapter 12. http://www.state.de.us/deptagri/pesticides/laws.htm

4. National IPM Network, Northeastern Pest Management Center. Northeast Region IPM. http://northeastipm.org/

5. Penn State University, 2003. The Agronomy Guide. College of Agricultural Sciences. http://AgGuide.agronomy.psu.edu/pdf.htm

6. USDA, Natural Resources Conservation Service. Conservation Practice Standard for Fishpond Management, Code 399. Delaware Field Office Technical Guide, Section IV.

7. Delaware Department of Agriculture. Pesticide Record Keeping Book for Private Applicators.

TABLE 1: INTEGRATED PEST MANAGEMENT PRINCIPLES AND STRATEGIES	
PREVENTION **"Preventing Pest Populations"**	• Using pest free seeds and transplants. • Preventing weeds from reproducing. • Irrigation scheduling to avoid situations conducive to disease development. • Cleaning tillage and harvest equipment. • Using field sanitation procedures. • Eliminating alternate hosts or sites for insect pests and disease organisms.
AVOIDANCE **"Avoiding Pest Populations"**	• Crop rotation. • Choosing cultivars with resistance to pests. • Using trap crops or pheromone traps. • Choosing cultivars with maturity dates that may allow harvest before pest populations develop. • Not planting in certain areas where pest populations are likely to cause crop failure (alternative land use).
MONITORING **"Identifying the extent of pest populations and/or the probability of future populations"**	• Surveys and scouting programs including trapping, weather monitoring, and soil testing. • Keeping records of pest incidence and distribution for each field. Records form the basis of crop rotation selection, economic thresholds, and suppressive actions.
SUPPRESSION **"Using cultural, biological, and chemical controls to reduce a pest population or its impacts"**	**CULTURAL CONTROLS** • Crop rotations. • Narrow row spacing. • Optimized in-row plant spacing. • Alternate tillage approaches. • Cover crops or mulches. • Using crops with allelopathic potential in the rotation. • Cultivation, hoeing, hand weeding. • Pruning, vacuuming. • Mowing for weed control. • Trap crops, or baited or pheromone traps for certain insects. • Exclusion devices for insects, disease management, or wildlife. **BIOLOGICAL CONTROLS** • Mating disruption for insects. • Conserving naturally occurring biological controls. **CHEMICAL CONTROLS** Used as a last resort and following sound management that includes: • Cost-benefit should be confirmed before use. • Pesticides should be selected based on least negative effects on environment and human health, in addition to efficacy and economics. • Applications should be limited to areas where pests actually exist or are reasonably expected (spot treatment). • Sprayers or other application devices should be calibrated prior to use and occasionally during the use season. • Chemicals with same mode of action should not be used continuously.

	• Mitigation practices should be used as necessary.

TABLE 2: PRACTICE SUMMARY GUIDE FOR PESTICIDE LOSSES

Pest Management Mitigation Techniques [1/]	Pesticide Loss Pathways			Functions
	Leaching	Solution Runoff	Adsorbed Runoff	
Ratings for Management Techniques[2/]				
Application Timing	+++	+++	+++	Reduces exposure potential – delaying application when significant rainfall events are forecast can reduce pesticide transport to ground and surface water; application when conditions are optimal can reduce the amount of pesticide applied; also delaying application when wind speed is not in accordance with label requirements can reduce pesticide drift to surface water.
Formulations	++	++	+	Reduces exposure potential – formulations and/or adjuvants that increase efficacy allow lower application rates.
Lower Application Rates	+++	+++	+++	Reduces exposure potential – use lowest effective rate.
Partial Treatment	+++	+++	+++	Reduces exposure potential – spot treatment, banding, and directed spraying reduce amount of pesticide applied.
Scouting and IPM Thresholds	+++	+++	+++	Reduces exposure potential – reduces the amount of pesticide applied.
Setbacks	+	++	+	Reduces exposure potential – reduced application area reduces the amount of pesticide applied; can also reduce inadvertent pesticide application and drift to surface water.
Soil Incorporation—mechanical or irrigation	---	+++	+++	Reduces exposure potential for surface losses, but increases exposure potential for leaching losses.
Ratings for Conservation Practices [3/]				
Brush Management (314)	+++	+++	+++	Using non-chemical brush control often reduces the need for pesticides; pesticide use requires environmental risk analysis and appropriate mitigation.
Conservation Cover (327)	+++	+++	+++	Retiring land from annual crop production often reduces the need for pesticides and builds soil organic matter.
Conservation Crop Rotation (328)	++	++	++	Reduces the need for pesticides by breaking pest lifecycles.
Contour Buffer Strips (332)		++	++	Increases infiltration, reduces soil erosion.
Contour Farming (330)	_	+	+	Increases infiltration and deep percolation,

				reduces soil erosion.

TABLE 2: PRACTICE SUMMARY GUIDE FOR PESTICIDE LOSSES

Pest Management Mitigation Techniques [1/]	Pesticide Loss Pathways			Functions
	Leaching	Solution Runoff	Adsorbed Runoff	
Ratings for Conservation Practices [3/]				
Cover Crop (340)	+	+	++	Increases infiltration, reduces soil erosion, builds soil organic matter.
Diversion (362)	+	+	+	Reduces exposure potential – water is diverted.
Field Border (386)		+	++	Reduces runoff and suspended sediment.
Filter Strip (393)		++	+++	Reduces runoff, traps sediment.
Forage Harvest Management (511)	++	++	++	Reduces exposure potential – timely harvesting reduces the need for pesticides.
Forest Stand Improvement (666)	++	++	++	Reduces the potential for pest damage and the need for pesticides.
Grassed Waterway (412)		+	++	Increases infiltration and traps adsorbed pesticides.
Nutrient Management (590)	++	++	++	Promotes healthy plants, which can better tolerate pests.
Pasture and Hay Planting (512)	++	++	++	Reduces the need for pesticides, builds soil organic matter.
Prescribed Grazing (528A)	++	++	++	Improves plant health and reduces the need for pesticides.
Residue Management, No-till and Strip-Till (329A)	+	++	+++	Increases infiltration, reduces soil erosion, builds soil organic matter.
Residue Management, Mulch-Till (329B)	+	++	+++	Increases infiltration, reduces soil erosion, builds soil organic matter.
Residue Management, Ridge Till (329C)	+	++	+++	Increases infiltration, reduces soil erosion, builds soil organic matter.
Residue Management, Seasonal (344)	+	+	+	Increases infiltration, reduces soil erosion, builds soil organic matter.
Riparian Forest Buffer (391)	+	+++	+++	Increases infiltration and uptake of subsurface water, traps sediment, builds soil organic matter.
Sediment Basin (350)			++	Captures and degrades pesticide residues.
Stripcropping (585)		+	+	Increases infiltration, reduces soil erosion.
Structure for Water Control (587)	-	++	+++	Captures pesticide residues and facilitates their degradation, increases infiltration and deep percolation.

TABLE 2: PRACTICE SUMMARY GUIDE FOR PESTICIDE LOSSES

Pest Management Mitigation Techniques 1/	Pesticide Loss Pathways			Functions
	Leaching	Solution Runoff	Adsorbed Runoff	
Ratings for Conservation Practices 3/				
Tree/Shrub Establishment (612)	+++	+++	+++	Moderate to significant reductions in pesticide uses, increases infiltration and uptake of subsurface water, builds soil organic matter.
Waste Storage Facility (313)	+	++	++	Captures pesticide residues.
Waste Treatment Lagoon (359)		+++	+++	Captures pesticide residues and facilitates their degradation.
Water and Sediment Control Basin (638)	-	++	+++	Captures pesticide residues and facilitates their degradation, increases infiltration and deep percolation.

1/ Not all techniques will be applicable to a given situation. These mitigation techniques are rated for positive (shown as "+", "++", "+++") or negative (shown as "-", "--", "---") effects. Ratings with a single "+" or "-" have slight effects. Ratings with double characters have moderate effects. Ratings with triple characters have significant effects. Effectiveness ratings not having entries (blank) have no effects. These positive and negative effects are relative to the site conditions.

2/ Additional information on pest management techniques can be obtained from Delaware Cooperative Extension pest management publications, pest management consultants, and pesticide labels.

3/ Details regarding the effects of Conservation Practices on ground and surface water contamination by pesticides are contained in the Conservation Practice Physical Effects matrix found in the National Handbook of Conservation Practices.