NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

PEST MANAGEMENT

(ACRE)
Code 595

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 is applied as part of a Resource Management System (RMS) to support one or more of the following purposes:

- Enhance quantity and quality of commodities.
- Minimize negative impacts of pest control on soil resources, water resources, air resources, plant resources, animal resources, and/or humans.

CONDITIONS WHERE PRACTICE APPLIES

Wherever pests will be managed.

CRITERIA

General Criteria Applicable to All Purposes.

Plans for pest management shall be developed in accordance with policy requirements of the NRCS General Manual Title 450, Part 401.03 (Technical Guides, Policy, and Responsibilities) and Title 190, Part 404 (Ecological Sciences, Pest Management, Policy); technical requirements of the NRCS Field Office Technical Guide (FOTG); procedures contained in the National Planning Procedures Handbook (NPPH), and the NRCS National Agronomy Manual (NAM) Section 503.

Persons who review or approve plans for pest management shall be certified through any certification program acceptable to NRCS within the state. Producers will be able to develop their own pest management plans. These plans will be approved by an individual certified through a certification program approved by NRCS.

Plans for pest management that are elements of a more comprehensive conservation plan shall recognize other requirements of the conservation plan and be compatible with its other requirements.

All methods of pest management must comply with federal, state, and local regulations, including management plans for invasive pest species, noxious weeds, and disease vectors.

Integrated Pest Management (IPM) that strives to balance economics, efficacy, and environmental risk, where available, shall be incorporated into planning alternatives. 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 chemicals.

Use field scouting, nematode assay, pest density, pest life cycles, and economic thresholds (where available) to determine if and when pesticides should be used in an IPM program. Treatment thresholds for specific pest and crops are available from Iowa State University and Extension. Avoid unnecessary and poorly timed pesticide applications.

An appropriate set of mitigation techniques must be planned and implemented to reduce the environmental risks of pest management activities in accordance with meeting the quality criteria in the Field Office Technical Guide (FOTG) Section III. Mitigate techniques include using practices such as crop rotations and filter strips or management techniques such as banding or directed spraying to reduce total pesticide usage and avoid unnecessary and/or poorly timed pesticide applications. Management techniques and conservation practices known to be effective in reducing the negative impacts of pest management to the environment are listed in Table 1 of this standard.

Integrate pest management alternatives with other components of the conservation plan.

When developing pest management alternatives that include pesticides, the following shall apply:

- Both pesticide label instructions and Iowa Cooperative Extension Service recommendations shall be followed.
- All methods of chemical pest management must comply with federal, state, and local regulations (e.g., Food Quality Protection Act (FQPA); Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); Worker Protection Standard (WPS); and Interim Endangered Species Protection Program (H7506C).

Additional Criteria to Protect Quantity and Quality of Commodities.

As an essential component of both commodity-specific IPM and IPM general principles, clients shall be encouraged to use the minimum level of pest control necessary to meet their objectives for commodity quantity and quality. 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.

Additional Criteria to Protect Soil Resources.

In conjunction with other conservation practices, the number, sequence, and timing of tillage operations shall be managed to maintain soil quality and maintain soil loss at or below the soil loss tolerance (T) or any other planned soil loss objective. The current version of approved erosion prediction tools such as Revised Universal Soil Loss Equation, Version 2, (RUSLE2) or its successor will be used. RUSLE2 is maintained in Section I (Erosion Prediction) of the NRCS Field Office Technical Guide (FOTG) and is used to predict soil loss resulting from sheet and rill erosion.

Follow pesticide label instructions for limiting pesticide residues in soil that may negatively impact non-target plants, water, animals, and humans.

Additional Criteria to Protect Water Resources.

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

concerns. NRCS' Windows Pesticide Screening Tool (WIN-PST) shall be used to evaluate soil/pesticide interactions in Iowa.

When a chosen alternative has significant potential to negatively impact important water resources, (e.g., WIN-PST “Extra High”, “High” or “Intermediate” soil/pesticide human risk ratings in the drainage area of a drinking water reservoir), an appropriate set of mitigation techniques must be implemented to address risks to humans and non-target plants and animals. Pesticide alternatives with soil/pesticide hazard risk of “Extra High,” “High,” or “Intermediate” shall be accompanied by one or more mitigation practices. Selection of mitigating techniques shall be based on site-specific resource concerns and pesticide loss pathways. Refer to Section V of the FOTG (Conservation Practice Physical Effects) and Section III of the FOTG (Guidance Documents and Quality Criteria) for additional assistance in developing conservation alternatives. Table I contains a list of management and conservation practices which can help mitigate the adverse impacts of pesticides depending upon pesticide loss pathways. Positive/negative effects are rated as slight (+/-), moderate (++/--), or significant (+++/---).

Follow pesticide label restrictions regarding soil texture, depth to water table, and mixing/loading and application setback distances from intermittent or perennial streams or rivers, natural and impounded lakes, and reservoirs (including wetlands and sinkholes).

The number, sequence, and timing of tillage operations shall be managed in conjunction with other sediment control practices to minimize sediment losses to nearby surface bodies.

Follow pesticide label instructions for limiting pesticide residues in leachate and runoff that may negatively impact non-target plants, animals, water, fish, and humans.

Additional Criteria to Protect Air Resources.

Follow pesticide label instructions for minimizing volatilization and drift that may negatively impact non-target plants, animals, and humans.

Avoid spray drift by applying pesticides only when wind speeds do not exceed label restrictions or local, state, or federal regulations and wind direction is away from sensitive areas.

Additional Criteria to Protect Plant Resources.

Follow pesticide label for removing pesticide residues from sprayers before moving to the next crop and properly adjusting cultivator sweeps and flame burners.

Incorporate soil applied pesticides to the depth specified on the label when incorporation is recommended to minimize movement offsite and damage to non-target species.

Apply pesticides during proper climatic conditions, crop stage and condition, and soil moisture. Maintain soil pH and organic matter content in order to protect plant health.

Limiting pesticide residues in soil that can carry over and harm subsequent crops.

Additional Criteria to Protect Animal Resources.

Follow pesticide label precautionary statements and restrictions to minimize negative impacts to domestic animals, wildlife, and aquatic organisms.

Additional Criteria to Protect Humans.

Read and follow all label instructions, as well as local, state, and federal regulations

regarding posting and field re-entry restrictions on treated areas.

Handle and apply pesticides properly to protect the user and the environment from adverse effects.

All pesticide users are encouraged to take the Private Pesticide Applicators Training offered by Iowa State University. Persons planning to purchase pesticides classified as “restricted use” are required to take the training and pass a written exam to be certified by the Iowa Department of Agriculture and Land Stewardship (IDALS).

Report all incidents of accidental release of pesticides that may cause adverse environmental effects to IDNR and to the Iowa Department of Transportation if the accidental release occurs on a public roadway.

Store pesticides according to label directions and as specified by local, state, and federal regulations.

Avoid unnecessary exposure to pesticides during mixing/handling and application by wearing protective clothing and equipment specified on the label. Follow label instructions in case of accidental exposure.

CONSIDERATIONS

If commodity-specific IPM is not available, the following IPM principles should be considered:

- Prevention, such as using pest-free seeds and transplants, cleaning tillage and harvesting equipment between fields, irrigation scheduling to avoid situations conducive to disease development, etc.
- Avoidance, such as using pest resistant varieties, crop rotation, trap crops, etc.
- Monitoring, such as pest scouting, soil testing, weather forecasting, etc. to help target suppression strategies and avoid routine preventative pest control. Use field scouting, nematode assay, and economic thresholds (where available) to determine if and when pesticides should be used in an IPM program. Treatment thresholds for specific pests and crops are available from ISU.
- Suppression, such as cultural, biological, and chemical controls, that can reduce a pest population or its impacts. Chemical controls should be used judiciously in order to minimize environmental risk and pest resistance.

Adequate plant nutrients and soil moisture, including favorable pH and soil conditions, should be available to reduce plant stress, improve plant vigor, and increase the plant's overall ability to tolerate pests.

Select pesticides, which protect crops and offer the least potential for surface and ground water contamination.

Consider site characteristics such as soil, geology, water filtration, and depth to water table, proximity to surface water and tile systems, topography, and climatic conditions.

Base pesticide application on characteristics such as water solubility, toxicity to non-targeted organisms, degradation, adsorption, efficiency, and cost.

Plan erosion control practices to minimize soil loss and runoff that can transport adsorbed or dissolved pesticides to surface waters.

Follow Iowa State University recommended pesticides use programs that consider methods of avoiding pesticide resistance and shifts in the pest species.

PLANS AND SPECIFICATIONS

The pest management component of a conservation plan shall be prepared in

accordance with the criteria of this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s).

As a minimum, the pest management component of a conservation plan shall include:

- Plan map and soil map of managed site.
- Location of sensitive resources and setbacks, if applicable.
- IPM practices used and pest management practices planned. Items include:
    1. Identify the target pest(s); life cycle periods when most vulnerable to control and best mechanical, biological or chemical control method or combinations of methods.
    2. Timely field scouting and proper identification of pest problem. Field will be scouted for pest infestation and monitoring of crop conditions.
    3. When available, economic thresholds will be used for determining the need for treatment.
    4. Assess the effect that the present pest control measure(s) have on site characteristics.
    5. Evaluate alternatives and select an appropriate tactic.
- If chemical controls are included in the plan, an environmental risk analysis shall be completed for each crop and pest control chemical. Use the Windows Pesticide Screening Tool (WIN-PST) to determine the Hazard Rating of the chemical controls.
- Interpretation of Hazard Rating. Hazard Ratings are divided into five classes. These are:

    X – Extra High
    H – High
    I – Intermediate
    L – Low
    VL – Very Low

Hazard ratings of “Low “ or “Very Low” require no further action as long as they 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 a RMS. “High” ratings warrant more extensive mitigation measures than “Intermediate” rating. 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 efficacious, economically acceptable pesticide with a lower risk or an alternate method of pest control may be required to meet quality criteria for a RMS.

OPERATION AND MAINTENANCE

The owner/client is responsible for the proper implementation of this practice including operation and maintenance of all equipment. Operation and maintenance shall address the following:

- Plans shall be reviewed and updated periodically in order to incorporate new IPM technology, respond to cropping system and pest complex changes, and avoid the development of pest resistance. A plan review shall be completed when changes occur in crop rotation or when new pesticides are to be used.
- Maintain mitigation practices and/or management techniques identified in the plan in order to ensure continued effectiveness.
- Wear proper attire such as long sleeved shirts, long pants, rubber gloves, and outerwear as specified in the label directions. Follow label directions for proper washing and care

of clothing contaminated with chemicals.

- Develop a safety plan that includes telephone numbers and addresses of emergency treatment centers for individuals exposed to chemicals and the telephone number for the nearest poison control center. The Iowa Poison Information Center can be contacted 24 hours/day at :

  1-800-222-1222

  The National Pesticide Information Center (NPIC) telephone number in Corvallis, Oregon may also be given for non-emergency information:

  1-800-858-7384

  Monday - Friday
  6:30 a.m. to 4:30 p.m. Pacific Time

  For advice and assistance with emergency spills that involve agrichemicals contact Iowa Department of Agriculture and Land Stewardship at:

  515-281-8694

  The national 24-hour CHEMTREC telephone number may also be given in the event of a spill:

  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.
- Locate all pesticide mixing areas and storage, and supply areas (tanks) at least 150 feet away from any well or surface water body, and down slope of wells.
- Prevent the contamination of water supplies by keeping the filler hose or pipe out of the spray tank at all times. Install an anti-siphon device to prevent backflow. Never leave a spray tank unattended during filling.
- Store pesticides according to label directions and as specified by local, state, and federal regulations.
- Post warning signs according to label directions and/or local, state, and federal law around fields that have been treated and observe restricted entry intervals.
- Read and follow label directions and maintain appropriate Material Safety Data Sheets (MSDS).
- Calibrate application equipment according to Iowa State University Extension PAT-38 Sprayer Calibration Reference Guide and/or manufacturer recommendations before each seasonal use and with each major chemical change.
- Replace worn nozzle tips, cracked hoses, and faulty gauges.
- Assure that the pesticide applicator knows the exact location of the area to be treated and the potential hazard of spray drift or subsequent pesticide movement onto non-targeted sites.
- Dispose of pesticide wastes and pesticide containers in accordance with label directions and local, state, and federal regulations. Triple rinse pesticide containers and add rinsate to spray solution for application on targeted sites. Clean application equipment after each use and apply rinsate to an approved site according to label directions. Never reuse pesticide containers for any purpose. See Iowa State University Publication PAT-1442 Rinsing and Recycling Pesticide Containers.
- Maintain records of pest management for at least two years. Pesticide application records shall be in accordance with USDA Agricultural Marketing Service's Pesticide Record Keeping Program and the Worker Protection Standard for Agricultural

Pesticides Iowa State University Publication PAT-12 and 12A.

REFERENCES

These publications are available at County Extension Offices; Extension Distribution Center, Printing Building, Iowa State University, Ames, IA 50011; and several are available on the ISU Publications Home page at http://www.extension.iastate.edu/Pages/pubs/.

- For a complete list of pesticide related publications see Iowa State University Publication IPM 55 "Iowa State University Extension Publications Pest management and the Environment Program."
- For a list of publications on Integrated Pest management visit the Iowa State University web site at www.ipm.iastate.edu/ipm.

The following information on RUSLE2 and WIN-PST is available at the Iowa Conservation Partners Home page at: http://www.ia.nrcs.usda.gov.

- NRCS Windows Pesticide Screening Tool (WIN-PST)
- NRCS Revised Universal Soil Loss Equation Version 2 (RUSLE2), Section I of the Field Office Technical Guide.

TABLE I – Mitigation Effectiveness Guide - Reducing Pesticide Impacts on Water Quality

Note: Pest Management (595) requires environmental risk evaluation and appropriate mitigation for all identified resource concerns. This table identifies management techniques and conservation practices that have the potential to mitigate pesticide impacts on water quality. Not all techniques will be applicable to a given situation. Relative effectiveness ratings by pesticide loss pathway are "no effect" (blank), "slight effect" (+/-), "moderate effect" (++/--), and "significant effect" (+++/---). The table also identifies how the techniques function. Effectiveness of any mitigation technique can be highly variable based on site conditions and how it is designed. Therefore, with guidance provided by the table, site-specific selection, and design of mitigation techniques that are appropriate for identified resource concerns is left to the professional judgment of the conservation planner.

Pest Management Mitigation Techniques	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Management Techniques [1/]				
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/Adjuvants	++	++	+	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
Pesticide Label Environmental Hazard Warnings and BMPs	Required[2/]	Required[2/]	Required[2/]	Reduces exposure potential - label guidance must be carefully followed for pesticide applications near water bodies and on soils that are intrinsically vulnerable to erosion, runoff, or leaching
Scouting and Integrated Pest Management (IPM)Thresholds	+++	+++	+++	Reduces exposure potential - reduces the amount of pesticide applied
Set-backs	+	++	+	Reduces exposure potential - reduced application area reduces 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
Substitution – ▪ Alternative pesticides ▪ Cultural controls ▪ Biological controls	+++	+++	+++	Reduces hazard potential - use alternative pesticides with low environmental risk, substituting cultural (including burning and mechanical controls) and biological controls can reduce the need for pesticides
Conservation Practices [3/]				
Agrichemical Mixing Center (Interim)	+++	+++	+++	Reduces the potential for point source pesticide contamination
Alley Cropping (311)	+	+	++	Increases infiltration and uptake of subsurface water, reduces soil erosion, can provide habitat for beneficial insects which can reduce the need for pesticides, also can reduce pesticide drift to surface water

TABLE I - (continued)

Mitigation Technique	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Anionic Polyacrylamide (PAM) Erosion Control (450)	-	+	+++	Increases infiltration and deep percolation, reduces soil erosion
Bedding (310)	+	+	+	Increases surface infiltration and aerobic pesticide degradation in the rootzone
Brush Management (314)	+++	+++	+++	Using non-chemical brush control often reduces the need for pesticides, pesticide use requires environmental risk analysis and appropriate mitigation - see Pest Management (595)
Conservation Cover (327)	+++	+++	+++	Retiring land from annual crop production often reduces the need for pesticides, builds soil organic matter
Constructed Wetland (656)	+	+	++	Captures pesticide residues and facilitates their degradation
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
Contour Orchard and Other Fruit Area (Ac.) (331)	-	+	+	Increases infiltration and deep percolation, reduces soil erosion
Contour Stripcropping (585)		++	++	Increases infiltration, reduces soil erosion
Cover Crop (340)	+	+	++	Increases infiltration, reduces soil erosion, builds soil organic matter
Cross Wind Ridges (589A)			(+) 4/	Reduces wind erosion and adsorbed pesticide deposition in surface water
Cross Wind Stripcropping (589B)			(++) 4/	Reduces wind erosion and adsorbed pesticide deposition in surface water, traps adsorbed pesticides
Cross Wind Trap Strips (589C)			(++) 4/	Reduces wind erosion and adsorbed pesticide deposition in surface water, traps adsorbed pesticides
Deep Tillage (324)	-	+	+	Increases infiltration and deep percolation
Dike (356)	++/--	++	++	Reduces exposure potential - excludes outside water (++ leaching) or captures pesticide residues and facilitates their degradation (-- leaching)
Diversion (362)	+	+	+	Reduces exposure potential - water is diverted
Drainage Water Management (554)	++/--	++	++	Seasonal saturation may reduce the need for pesticides, drainage reduces storm water runoff, drainage increases infiltration and aerobic pesticide degradation in the rootzone during the growing season (++ leaching), seasonal saturation may bring the water table in contact with pesticide residues from the previous growing season (-- leaching)
Field Border (386)		+	++	Increases infiltration and traps adsorbed pesticides, often reduces application area resulting in less pesticide applied, can provide habitat for beneficial insects which reduces the need for pesticides, can provide habitat to congregate pests which can result in reduced pesticide application, also can reduce inadvertent pesticide application and drift to surface water

TABLE I - (continued)

Mitigation Technique	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Filter Strip (393)		++	+++	Increases infiltration and traps adsorbed pesticides, often reduces application area resulting in less pesticide applied, can provide habitat for beneficial insects which reduces the need for pesticides, can provide habitat to congregate pests which can result in reduced pesticide application, also can reduce inadvertent pesticide application and drift to surface water
Floodwater Diversion (400)	+	+	+	Reduces exposure potential - floodwater is diverted
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
Grade Stabilization Structure (410)			++	Traps adsorbed pesticides
Grassed Waterway (412)		+	++	Increases infiltration and traps adsorbed pesticides (should be applied with Filter Strips at the outlet and on each side of the waterway)
Grazing Land Mechanical Treatment (548)	-	+	+	Increases infiltration and deep percolation
Hedgerow Planting (442)			(+) 4/	Reduces adsorbed pesticide deposition in surface water, also can reduce inadvertent pesticide application and drift to surface water
Herbaceous Wind Barriers (603)			(+) 4/	Reduces wind erosion, traps adsorbed pesticides, can provide habitat for beneficial insects which reduces the need for pesticides, can provide habitat to congregate pests which can result in reduced pesticide application, also can reduce pesticide drift to surface water
Hillside Ditch (423)	+	+	+	Reduces exposure potential - water is diverted
Irrigation Land Leveling (464)	++	+	++	Reduces exposure potential - uniform surface reduces pesticide transport to ground and surface water
Irrigation System, Microirrigation (441)	++	+++	+++	Reduces exposure potential - efficient and uniform irrigation reduces pesticide transport to ground and surface water
Irrigation System, Sprinkler (442)	++	++	++	Reduces exposure potential - efficient and uniform irrigation reduces pesticide transport to ground and surface water
Irrigation System, Surface and Subsurface (443)	+	+	+	Reduces exposure potential - efficient and uniform irrigation reduces pesticide transport to ground and surface water
Irrigation System Tail Water Recovery (447)		+++	+++	Captures pesticide residues and facilitates their degradation
Irrigation Water Management (449)	+++	+++	+++	Reduces exposure potential - water is applied at rates that minimize pesticide transport to ground and surface water, promotes healthy plants which can better tolerate pests
Land Smoothing (466)	+	+	+	Reduces exposure potential - uniform surface reduces pesticide transport to ground and surface water

TABLE I - (continued)

Mitigation Technique	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Mole Drain (482)	+	+	+	Increases infiltration and aerobic pesticide degradation in the rootzone *Note – avoid direct outlets to surface water
Mulching (484)	+	+/-	+/-	Often reduces the need for pesticides, natural mulches increase infiltration and reduce soil erosion (+ solution and adsorbed runoff), artificial mulches may increase runoff and erosion (- solution and adsorbed runoff)
Nutrient Management (590)	++	++	++	Promotes healthy plants which can better tolerate pests
Pasture and Hay Planting (512)	++	++	++	Retiring land from annual crop production often reduces the need for pesticides, builds soil organic matter
Precision Land Forming (462)	++	+	++	Reduces exposure potential - uniform surface reduces pesticide transport to ground and surface water
Prescribed Burning (338)	++	++	++	Often reduces the need for pesticides
Prescribed Grazing (528A)	++	++	++	Improves plant health and reduces the need for pesticides
Range Planting (550)	++	++	++	Increases infiltration and uptake of subsurface water, reduces soil erosion, builds soil organic matter
Recreation Area Improvement (562)	++	++	++	Increases infiltration and uptake of subsurface water, reduces soil erosion, builds soil organic matter
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
Riparian Herbaceous Cover (390)	+	++	++	Increases infiltration, traps sediment, builds soil organic matter
Row Arrangement (557)	-	+	+	Increases infiltration and deep percolation, reduces soil erosion
Sediment Basin (350)			++	Captures pesticide residues and facilitates their degradation
Stripcropping, Field (586)		+	+	Increases infiltration, reduces soil erosion
Structure For Water Control (587)	-	++	+++	Captures pesticide residues and facilitates their degradation, increases infiltration and deep percolation
Subsurface Drainage (606)	+	++	++	Increases infiltration and aerobic pesticide degradation in the rootzone *Note – avoid direct outlets to surface water
Surface Drainage, Field Ditch (607)	+	+	+	Increases infiltration and aerobic pesticide degradation in the rootzone
Surface Roughening (609)			(+) 4/	Reduces wind erosion and adsorbed pesticide deposition in surface water

TABLE I - (continued)

Mitigation Technique	Pesticide Loss Pathways			Function
	Leaching	Solution Runoff	Adsorbed Runoff	
Terrace (600)	--	++	+++	Increases infiltration and deep percolation, reduces soil erosion
Tree and Shrub Establishment (612)	+++	+++	+++	Retiring land from annual crop production often reduces the need for pesticides, increases infiltration and uptake of subsurface water, builds soil organic matter
Vegetative Barriers (601)			++	Reduces soil erosion, traps sediment, increases infiltration
Waste Storage Facility (313)	+	++	++	Captures pesticide residues
Waste Treatment Lagoon (359)		+++	+++	Captures pesticide residues and facilitates their degradation
Waste Utilization (633)	++	++	++	Increases soil organic matter
Water and Sediment Control Basin (638)	-	++	+++	Captures pesticide residues and facilitates their degradation, increases infiltration and deep percolation
Waterspreading (640)	-	+	+	Increases infiltration and deep percolation
Well Decommissioning (351)	+++			Eliminates point source contamination
Wetland Creation (Ac.) (658)	+	+	+	Captures pesticide residues and facilitates their degradation
Wetland Enhancement (Ac.) (659)	+	+	+	Captures pesticide residues and facilitates their degradation
Wetland Restoration (Ac.) (657)	+	+	+	Captures pesticide residues and facilitates their degradation
Windbreak/Shelterbelt Establishment (380)			(++) [4/]	Reduces wind erosion, reduces adsorbed pesticide deposition in surface water, traps adsorbed pesticides, also can reduce pesticide drift
Windbreak/Shelterbelt Renovation (650)			(++) [4/]	Reduces wind erosion, reduces adsorbed pesticide deposition in surface water, traps adsorbed pesticides, also can reduce pesticide drift

[1/] Additional information on pest management mitigation techniques can be obtained from Iowa State University Extension pest management publications, pest management consultants, and pesticide labels.

[2/] The pesticide label is the law - all pesticide label specifications must be carefully followed, including required mitigation. Additional mitigation may be needed to meet NRCS pest management requirements for identified resource concerns.

[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.

[4/] Mitigation applies to adsorbed pesticide losses being carried to surface water by wind.

TABLE I Mitigation Effectiveness Guide - Reducing Pesticide Impacts on Water Quality is based on available research specific to the technique, related research, and the NWCC Pest Management Team's best professional judgment. The ratings are relative index values as opposed to absolute values, much like the Conservation Practice Physical Effects (CPPE) matrix. They are intended to help planners choose the best combination of techniques for their identified resource concerns. The ratings are based on the relative *potential* for a technique to provide mitigation. The technique has to be specifically designed, implemented, and maintained for the mitigation potential to be realized. Varying site conditions can result in a great deal of variation in actual mitigation effectiveness, but our relative index values indicate which techniques will generally provide more or less mitigation under a given set of conditions. Our general rule of thumb is that +'s generally have the potential to reduce losses by 10 -15 percent, ++'s have the potential to reduce losses by about 25 percent and +++'s have the potential to reduce losses by about 50 percent.

The original matrix was developed by the EPA-sanctioned Aquatic Dialogue Group and published by SETAC. The original reference is: *Aquatic Dialogue Group: Pesticide Risk Assessment and Mitigation, Baker JL, Barefoot AC, Beasley LE, Burns LA, Caulkins PP, Clark JE, Feulner RL, Giesy JP, Graney RL, Griggs RH, Jacoby HM, Laskowski DA, Maciorowski AF, Mihaich EM, Nelson Jr HP, Parrish PR, Siefert RE, Solomon KR, van der Schalie WH, editors. 1994. Society of Environmental Toxicology and Chemistry, Pensacola, FL., pages 99-111 and Table 4-2.* They provided ranges of effectiveness for various mitigation techniques. With their permission, we expanded their work for the NEDC *Nutrient and Pest Management Considerations in Conservation Planning* course materials. Richard Aycock from Louisiana was the first to put a mitigation matrix into an NRCS Pest Management (595) standard, based in large part on Table 6.2 (pages 67 - 68), and Table 6.4 (pages 71 - 72) in *Module 6, Part C-Integrating Nutrient and Pest Management with Other Conservation Practices* in our *Nutrient and Pest Management Considerations in Conservation Planning* course materials. Table 1 was built from the Louisiana matrix by adding additional management techniques and conservation practices. If you have any questions, please contact the NWCC Pest Management Team.