NATURAL RESOURCES CONSERVATION SERVICE
MONTANA CONSERVATION PRACTICE SPECIFICATION

INTEGRATED PEST MANAGEMENT (ACRE)

CODE 595

NOTE: JOB SHEET IS A FILLABLE EXCEL FILE LOCATED ON THE SHARED DRIVE AT: STATE OFFICE>TECHNOLOGY>INTEGRATED PEST MANAGEMENT>595_JOBSHEET_DEC_2012.

DEFINITION: A site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies.

GOAL: The goal of the Integrated Pest Management (IPM) Practice is not to manage pests but to protect natural resources and prevent environmental risks from pest management activities with an efficient integrated pest management (IPM) system, and to mitigate environmental risks not preventable and are associated with chemical, biological, cultural, and mechanical pest suppression applied to prevent economic and ecological injury.

PURPOSES:

Apply Integrated Pest Management for the following purposes:

1. To prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and adsorbed runoff losses.
2. To prevent or mitigate off site pesticide risks to soil, water, air, plants, animals, and humans from pesticide spray drift and volatilization losses.
3. To prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact.
4. To prevent or mitigate cultural, mechanical, and biological pest suppression risks to soil, water, air, plants, animals, and humans.

CONDITIONS WHERE PRACTICE APPLIES

On all lands where pests will be managed, including cropland and non-cropland, natural areas and wildlife habitat, farmsteads, feedlots and other agricultural facilities.

RESOURCE MANAGEMENT SYSTEM

Many conservation practices, from Conservation Crop Rotation (Code 328) that breaks pest life cycles to Cover Crop (Code 340) that suppresses weeds and builds pesticide residue binding soil organic matter to Windbreak/Shelterbelt Establishment (Code 380) that reduces pesticide drift, prevent and mitigate pest management risks and are applied concurrently with Pest Management as part of a resource management system for a conservation management unit. A list of conservation practices and their mitigation score are in Table 2 of this specification.

General Criteria Applicable to All Purposes

IPM strategies (Prevention, Avoidance, Monitoring and Suppression or “PAMS”) shall be employed to prevent or mitigate pest management risks for identified natural resource concerns.

A comprehensive IPM plan utilizing PAM’s strategies will be developed to document how specific pest management risks will be prevented or mitigated. The IPM plan must be crop and/or land use specific and adhere to applicable elements and guidelines accepted by the local Land Grant University or Extension.

If a comprehensive IPM system is not feasible, utilize appropriate IPM techniques to adequately prevent or mitigate pest management risks for identified natural resource concerns.

Additional Criteria to Prevent or Mitigate Off-Site Pesticide Risks to Water Quality from Leaching, Solution Runoff and Adsorbed Runoff Losses

For identified water quality concerns related to pesticide leaching, solution runoff and adsorbed runoff, the current version of the USDA-NRCS WIN-PST program will be used to evaluate potential risks to humans and/or fish, as appropriate, for each pesticide to be used.

The Farm-A-Syst evaluation procedure may be used to evaluate pesticide contamination potentials for farmstead and feedlot areas.

Planners must identify fields or areas of fields that are susceptible to surface or groundwater contamination. An evaluation will be made for each field or conservation treatment unit (CTU). Pesticide environmental risk evaluation must include Windows Pesticide Screening Tool (WIN-PST). Evaluation procedures other than WIN-PST must be prior approved by the state resource conservationist. A written “Alternatives Narrative”, based on the results of WIN-PST risk assessment, must be provided to the producer describing resource concerns, outlining potential risks, and providing possible mitigation measures to adopt (see example provided in this specification).

The minimum level of mitigation required for each resource concern is based on the final risk ratings in the “WIN-PST Soil/Pesticide Interaction Hazard Ratings” Figure 1 below:

Figure 1. WIN-PST Soil/Pesticide Interaction Hazard Ratings

WIN-PST Identified Hazard Rating	Minimum Mitigation Index Score Level Needed
Low or Very Low	None Needed
Intermediate	20
High	40
Extra High	60

Use Table 2 in this specification (modified from National Agronomy Technical Note 5) to determine if planned conservation practices provide adequate mitigation. If they do not, use Table 1 in this specification (copied from National Agronomy Technical Note 5) to apply appropriate IPM techniques with this practice.

Pesticide alternatives with a soil/pesticide Hazard Risk of “Extra High” or “High” must be accompanied with one or more mitigation practices. Mitigation alternatives that are evaluated with the WIN_PST risk assessment tool (i.e., foliar application, low application rates, residue management, high efficiency IWM) and continue to result in a "High" soil/pesticide Hazard Risk must be accompanied by at least one additional mitigation practice. Pesticide alternatives with a soil/pesticide Hazard risk rating of “Intermediate” shall be accompanied by at least one mitigation practice. Selection of mitigation practices and management techniques shall be based on site-specific resource concerns and pesticide loss pathway. Table 1 contains a list of management and conservation practice alternatives, which can help mitigate the adverse impacts of pesticides depending upon pesticide loss pathways.

Additional Criteria to Prevent or Mitigate Off-Site Pesticide Risks to Soil, Water, Air, Plants, Animals and Humans from Drift and Volatilization Losses

For identified natural resource concerns related to pesticide drift, use Table 2 in this specification (copied from National Agronomy Technical Note 5) to determine if planned conservation practices provide adequate mitigation. If they do not, use Table 1 in this specification (copied from National Agronomy Technical Note 5) to apply appropriate IPM techniques with this practice. The minimum level of mitigation required for drift is an index score of 20.

For Volatile Organic Compound (VOC) emission concerns, apply at least one IPM mitigation technique from the Appendix 1: Pesticide Volatilization Section (from National Agronomy Technical Note 5 - Pest Management in the Conservation Planning Process) of this specification.

Additional Criteria to Prevent or Mitigate On-site Pesticide Risks to Pollinators and Other Beneficial Species through Direct Contact

For direct contact pesticide risks to pollinators and other beneficial species in the application area, apply at least two IPM mitigation techniques from Appendix 2: Pesticide Direct Contact Section (from National Agronomy Technical Note 5 - Pest Management in the Conservation Planning Process) of this specification.

Additional Criteria to Prevent or Mitigate Cultural, Mechanical and Biological Pest Suppression Risks to Soil, Water, Air, Plants and Animals

For identified natural resource concerns related to cultural, mechanical and biological pest suppression, (e.g., air quality concerns with burning for weed control or soil erosion concerns with tillage for weed control), natural resource concerns shall be addressed to FOTG quality criteria levels.

CONSIDERATIONS

IPM strategies that keep pest populations below economically damaging levels and minimize pest resistance should be utilized because they also help prevent unnecessary pest management risks to natural resources and humans.

For noxious weeds and invasive species control, the minimum level of pest suppression necessary to meet natural resource objectives should be used, however, for the prevention and local eradication of noxious and invasive species, the acceptable pest threshold may be zero.

IPM Prevention, Avoidance, Monitoring, and Suppression (PAMS) techniques include:

- Prevention – Activities such as cleaning equipment and gear when leaving an infested area, using pest-free seeds and transplants, and irrigation scheduling to limit situations that are conducive to disease development.
- Avoidance – Activities such as maintaining healthy and diverse plant communities, using pest resistant varieties, crop rotation, and refuge management.
- Monitoring – Activities such as pest scouting, degree-day modeling, and weather forecasting to help target suppression strategies and avoid routine preventative treatments.
- Suppression – Activities such as the judicious use of cultural, mechanical, biological and chemical control methods that reduce or eliminate a pest population or its impacts while minimizing risks to non-target organisms.

IPM guidelines from the local Land Grant University or Extension may be supplemented with information from appropriately certified professionals.

When providing technical assistance to organic producers, the IPM approach to managing pests should be consistent with the USDA Agricultural Marketing Service National Organic Program standard which includes:

- A diverse crop rotation that reduces habitat for major pests and increases habitat for natural enemies
- Use of “farmscaping” principles to create borders of beneficial species habitat
- Farming techniques to improve soil quality
- Planting of locally adapted, pest resistant crop cultivars.

When applying pesticides to their own fields, planners and producers should be aware of the potential of pesticide movement as volatilization, drift or other vector to neighboring fields where organic production is practiced in an effort to minimize any potential adverse impacts on those crops and associated certification.

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

On irrigated land, irrigation water management should be designed to avoid conditions conducive to disease development and minimize offsite contaminant movement.

Producers should be reminded that they are responsible for following all pesticide label instructions and complying with all applicable Federal, state and local regulations, including those that protect Threatened and Endangered Species.

Enhancement Considerations

1. A more intensive level of IPM focused primarily on prevention and avoidance strategies can further minimize pest management risks to natural resources and humans.
2. Precision pesticide application techniques in an IPM system can further minimize pesticide risks to natural resources and humans.

PLANS

The IPM plan shall be prepared in accordance with the criteria of this specification and shall describe the requirements for applying the practice to achieve its intended purpose.

The IPM plan shall include at a minimum:

1. Plan map and soil map of site/affected area, if applicable (use conservation plan maps if available).
2. Location of sensitive resources and setbacks, if applicable (use conservation plan maps if available).
3. Interpretation of the environmental risk analysis. **Note:** all pesticide label requirements and federal, state, and local regulations must be followed for all pesticide applications.
4. Identification of appropriate mitigation techniques. See Table 1 for pesticide risk mitigation management techniques.
5. A list of pest prevention and avoidance strategies that will be implemented, if applicable.
6. A scouting plan and threshold levels for each pest, if applicable. See Appendix 3 of this specification for guidance on critical scouting periods for weed pest management in specific crops. See Appendix 4 of this specification for specific crop pest thresholds.
7. Other monitoring plans, if applicable, such as weather monitoring to indicate when pesticide application for prevention is warranted.
8. A list of accepted pest thresholds (see Appendix 4) or methods to determine thresholds that warrant treatment, if applicable.
9. Crop sequence or rotation.
10. Identification of target pests, and when available, IPM scheme for monitoring pest pressure.
11. Printed results of pest management environmental assessments (i.e., WIN-PST, RUSLE).
12. Operation and maintenance instructions.

Note: Items 5, 6, 7 and 8 are required to document a comprehensive IPM system, but they may not be applicable when only a limited number of mitigation techniques are sufficient to address identified natural resource concerns.

Record Keeping. The following records, where applicable, shall be maintained by the producer:

1. Monitoring or scouting results including the date, pest population/degree of infestation, and the crop or plant community condition.
2. When and where each pest suppression technique was implemented.

3. When and where special IPM techniques were implemented to mitigate site-specific risks (e.g., soil incorporation of a pesticide to reduce its surface runoff to a nearby stream).

Note: Applicability will depend on the level of IPM adoption and mitigation requirements.

OPERATION AND MAINTENANCE

The IPM plan shall include appropriate operation and maintenance items for the client. These may include:

- Review and update the plan periodically in order to incorporate new IPM strategies, respond to cropping system and pest complex changes, and avoid the development of pest resistance.
- Maintain mitigation techniques identified in the plan (for example windbreaks, filter strips and other conservation practices) in order to ensure continued effectiveness.
- Calibrate application equipment according to Extension and/or manufacturer recommendations before each season of use and with each major chemical change.
- Maintain records of pest management for at least two years. Pesticide application records shall be in accordance with USDA Agricultural Marketing Service's Pesticide Recording Keeping Program and site-specific requirements.

- **Example Alternatives Narrative:** An alternatives narrative is required in all pest management plans. The alternatives narrative identifies resource concerns and provides an explanation of potential hazards caused by the interaction of soil and pesticides. The alternatives narrative also provides alternatives to treating pest problems. The producer-selected alternatives are then documented on the pest management job sheet. The following is an example of an Alternatives Narrative:

Pest Management Alternative Narrative
John Doe 05/28/2012

Tracts 1816, 14446, 1676: Fields 2 (182 acres), 5 (216 acres), 9 (97 Acres). Soils are MUSYM#2 (Abor) MUSYM#19 (Amor), and MUSYM#14 (Castner).

The crop rotation for this no-till system is wheat, barley cover crop, and lentils. Glyphosate is applied pre-plant to clean the fields of weeds. 2,4-D dimethylamine salt is used to control broadleaf weeds in the wheat and barley rotations. POAST herbicide is used post-emergence to kill volunteer cereal weeds in the lentil rotation. Ethalfluralin, Glyphosate, Trifluralin and Reglone have been or can be applied at crop maturity as a desiccant to terminate the lentil crop by rapid crop burn-down at optimum crop quality. WIN-PST was run for 2,4-D dimethylamine salt, Ethalfluralin, Glyphosate, Trifluralin, POAST, and Reglone active ingredients.

Abor is the most predominant soil in all fields but Amor is the most limited because it has the highest leaching and solution risk rating from WIN-PST for all pesticides tested and thus this narrative addresses the WIN-PST results for the Amor soil.

The purpose is to prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and adsorbed runoff losses.

2,4-D dicmethylamine salt, glyphosate, and POAST have low or very low WIN-PST leaching and solution hazard ratings to humans and fish and require no mitigation.

Reglone® *(contains diquat dibromide) has very low WIN-PST leaching human hazard and very low leaching and solution fish hazard ratings. However, the solution hazard rating for humans is intermediate requiring a minimum mitigation index score level of 20.

Ethalfluralin, also used as a desiccant, has very low or low WIN-PST leaching human hazard rating, but has intermediate solution human hazard, has intermediate or high leaching fish hazard, and has extra high solution fish hazard. The ratings require a minimum mitigation index score of 60.

Trifluralin, also used as a desiccant, has low or very low leaching human hazard ratings, but intermediate solution human hazard, has intermediate or high leaching fish hazard, and has extra high solution fish WIN-PST hazard ratings. The ratings require a minimum mitigation score of 60.

WIN-PST hazard rating of Glyphosate for solution human hazard is low, and very low for leaching and solution human and fish hazard and is an alternative for Reglone as a desiccant. Apply according to the label at the lentil hard dough stage (30% or less moisture content) at least seven days before harvest.

Mitigation Practices: Where risk analysis tools identify intermediate–high potential hazards to humans or fish, mitigation practices that serve to minimize those risks are required to ensure the protection of water resources. Minimizing groundwater contamination by leaching of a pesticide or associated metabolites are those practices that reduce or eliminate exposure or infiltration. Examples of these practices include reduced rates, foliar applications, alternative pesticides, and alternative controls.

Mitigation practices for limiting surface water contamination by runoff of a pesticide or associated metabolite (including runoff of soil adsorbed pesticides) are those practices that minimize water runoff and soil erosion. Examples of these practices are residue management, crop rotation, irrigation water management, and filter or

buffer strips. Table 1. Mitigation Effectiveness Guide–Reducing Pesticide Impacts on Water Quality may be helpful in identifying methods that will help to ensure minimization of potential problems.

Table 1. IPM techniques for reducing pesticide environmental risk

	Mitigation index value [4/] (by pesticide loss pathway)				
IPM techniques [1/]	**Leaching**	**Solution Runoff**	**Adsorbed Runoff**	**Drift**	**Function and performance criteria**
Application timing— ambient temperature				5	Reduces exposure—spraying during cooler temperatures (e.g., early morning, evening or at night) can help reduce drift losses Avoid spraying in temperatures above 90 °F
Application timing—rain	15	15	15		Reduces exposure—delaying application when significant rainfall events are forecast that could produce substantial leaching or runoff can reduce pesticide transport to ground and surface water
Application timing—relative humidity				5	Reduces exposure—spraying when there is higher relative humidity reduces evaporation of water from spray droplets thus reducing drift losses
Application timing—wind				10	Reduces exposure—delaying application when wind speed is not optimal can reduce pesticide drift Optimal spray conditions for reducing drift occur when the air is slightly unstable with a very mild, steady wind between 2 and 9 miles per hour
Formulations and adjuvants [2/, 3/]	5	5	5	5	Reduces exposure—specific pesticide formulations and/or adjuvants can increase efficacy and allow lower application rates; drift retardant adjuvants can reduce pesticide spray drift
Monitoring + economic pest thresholds	15	15	15	15	Reduces exposure—reduces the amount of pesticide applied with preventative treatments because applications are based on monitoring that determines when a pest population exceeds a previously determined economic threshold
Partial treatment	15	15	15	10	Reduces exposure—spot treatment, banding and directed spraying reduces amount of pesticide applied Assumes less than 50 percent of the area is treated
Precision application using smart sprayers	10	10	10	10	Reduces exposure—using smart sprayer technology (i.e., green sensors, sonar-based sensors, GPS-based variable rate application, computer controlled spray nozzles, etc.) can substantially reduce the amount of pesticide applied
Setbacks	5	5	5	10	Reduces exposure—reduces overall amount of pesticide applied; reduces offsite pesticide drift Assumes that the setbacks with no application are at least 30 feet wide
Soil incorporation [2/, 3/]		15	15		Reduces exposure—reduces solution and adsorbed runoff losses, but poten- tially increases leaching losses, especially for low K_{OC} pesticides Applicable to shallow mechanical or irrigation incorporation

Table 1. IPM techniques for reducing pesticide environmental risk—Continued

	Mitigation index value [4/] (by pesticide loss pathway)				
IPM techniques [1/]	Leaching	Solution Runoff	Adsorbed Runoff	Drift	Function and performance criteria
					Not applicable if pesticide leaching to groundwater is an identified natural resource concern Not applicable if soil erosion is not adequately managed
Spray nozzle selection, maintenance, and operation				10	Reduces exposure—selecting appropriate nozzle and pressure for the application, with an emphasis on higher volume spray nozzles run at lower pressures, will produce larger droplets and a narrower droplet size distribution, which reduces spray drift Proper nozzle spacing, boom height, and boom suspension, along with frequent calibration and replacement of worn nozzles and leaking tubing, can increase efficacy and reduce drift potential
Substitution—cultural, mechanical, or biological controls	15	15	15	15	Reduces risk—partial substitution of alternative cultural, mechanical, or biological pest suppression techniques reduces the application of a pesticide that poses a hazard to an identified natural resource concern Not applicable if hazards from alternative suppression techniques are not adequately managed
Substitution—lower risk pesticides [2/, 3/]	15	15	15	15	Reduces risk—partial substitution of an alternative lower risk pesticide reduces the application of a pesticide that poses a hazard to an identified natural resource concern Not applicable if the alternative pesticide is not explicitly recommended by Extension or an appropriately certified crop consultant because the NRCS cannot make pesticide recommendations
Substitution—semiochemicals	15	15	15	15	Reduces risk—using semiochemicals (e.g., mating disruption pheromones) to decrease reproductive success or control population density/location reduces the application of a pesticide that poses a hazard to an identified natural re- source concern

1/ Additional information on pest management mitigation techniques can be obtained from Extension pest management publications including IPM Guidelines and Crop Profiles, 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/ The NRCS does not make pesticide recommendations. All pesticide application techniques must be recommended by Extension or an appropriately certified crop consultant and selected by the producer.

4/ Numbers in these columns represent index values that indicate relative effectiveness of IPM mitigation techniques to reduce hazardous pesticide losses through the identified pathways.

Table 2. Montana Conservation Practices for Reducing Pesticide Environmental Risk (adapted from National Agronomy Technical Note 5)

Pesticide mitigation conservation practices [1/, 2/]	Mitigation index value [4/] (by pesticide loss pathway)				
IPM techniques [1/]	**Leaching**	**Solution Runoff**	**Adsorbed Runoff**	**Drift**	**Function and performance criteria**
Alley Cropping (Code 311)	5	5	10	10	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
Conservation Cover (Code 327)	10	10	10		Increases infiltration; reduces soil erosion; and builds soil organic matter in perennial cropping systems such as orchards, vineyards, berries, and nursery stock
Conservation Crop Rotation (Code 328)	10	10	10		Reduces the need for pesticides by breaking pest life cycles Rotation shall consist of at least two crops in the rotation and no crop grown more than once before growing a different crop
Cover Crop (Code 340) that is incorporated into the soil	5	5	5		Increases infiltration; reduces soil erosion; builds soil organic matter Assumes at least 4,000 pounds per acre of live biomass at the time of tillage
Cover Crop (Code 340) for weed suppression that is mulch tilled or no-tilled into for the next crop	10	10	10	10	Increases infiltration; reduces soil erosion; builds soil organic matter Requires at least 4,000 pounds per acre of live biomass at the time of tillage and at least 30 percent ground cover at the time of the pesticide application
Cross Wind Trap Strips (Code 589C)			10 [3/]		Reduces wind erosion and adsorbed pesticide deposition in surface water; traps adsorbed pesticides
Dike (Code 356)		10	10		Reduces exposure potential—excludes outside water or captures pesticide residues and facilitates their degradation Not applicable if pesticide leaching to groundwater is an identified natural resource concern
Field Border (Code 386)		5	10	5	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 Assumes 20-foot minimum width

Table 2. Montana Conservation Practices for Reducing Pesticide Environmental Risk (adapted from National Agronomy Technical Note 5)-continued

Pesticide mitigation conservation practices [1/, 2/]	Mitigation index value [4/] (by pesticide loss pathway)				
IPM techniques [1/]	Leaching	Solution Runoff	Adsorbed Runoff	Drift	Function and performance criteria
Filter Strip (Code 393)		10	15	10	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 Assumes 30-foot minimum width
Forage Harvest Management (Code 511)	10	10	10	10	Reduces exposure potential—timely harvesting reduces the need for pesticides
Hedgerow Planting (Code 442)			10 [3/]	10	Reduces adsorbed pesticide deposition in surface water; also can re- duce inadvertent pesticide application and drift to surface water
Irrigation System, Microirrigation (Code 441)	10	15	15		Reduces exposure potential—efficient and uniform irrigation reduces pesticide transport to ground and surface water
Irrigation System, Sprinkler (Code 442)	10	10	10		Reduces exposure potential—efficient and uniform irrigation reduces pesticide transport to ground and surface water
Irrigation System, Surface and Subsurface (Code 443)	5	5	5		Reduces exposure potential—efficient and uniform irrigation reduces pesticide transport to ground and surface water
Irrigation Water Management (Code 449)	15	15	15		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
Mulching (Code 484) with natural materials	10	10	10		Increases infiltration, reduces soil erosion, reduces the need for pesticides
Mulching (Code 484) with plastic	10	5	5		Reduces the need for pesticides. Not applicable if erosion and pesticide runoff from non-mulched areas is not adequately managed
Residue and Tillage Management, No-till/ Strip-Till/Direct Seed (Code 329)	5	10	15		Increases infiltration, reduces soil erosion, builds soil organic matter Assumes at least 60 percent ground cover at the time of application
Residue and Tillage Management, Mulch- Till (Code 345)	5	5	10		Increases infiltration, reduces soil erosion, builds soil organic matter Assumes at least 30 percent ground cover at the time of application

Table 2. Montana Conservation Practices for Reducing Pesticide Environmental Risk (adapted from National Agronomy Technical Note 5)-continued

Pesticide mitigation conservation practices 1/, 2/	Mitigation index value 4/ (by pesticide loss pathway)				
IPM techniques 1/	Leaching	Solution Runoff	Adsorbed Runoff	Drift	Function and performance criteria
Residue and Tillage Management, Ridge Till (Code 346)	5	5	10		Increases infiltration, reduces soil erosion, builds soil organic matter
Riparian Forest Buffer (Code 391)	5	15	15	10	Increases infiltration and uptake of subsurface water, traps sediment, builds soil organic matter, and reduces pesticide drift This assumes 30-foot minimum width
Riparian Herbaceous Cover (Code 390)	5	10	10	5	Increases infiltration, traps sediment, builds soil organic matter, and reduces pesticide drift. Assumes 30-foot minimum width
Stripcropping (Code 585)		15	15	5	Increases infiltration; reduces soil erosion and generally will only be treating half the area of concern
Subsurface Drain (Code 606)	5	10	10		Increases infiltration and aerobic pesticide degradation in the root zone *Note: avoid direct outlets to surface water
Water and Sediment Control Basin (Code 638)		10	15		Captures pesticide residues and facilitates their degradation; increases infiltration and deep percolation Not applicable if pesticide leaching to groundwater is an identified natural resource concern
Windbreak/Shelterbelt Establishment (Code 380)			10 3/	10	Reduces wind erosion; reduces adsorbed pesticide deposition in surface water; traps adsorbed pesticides; reduces pesticide drift

1/ Additional information on pest management mitigation techniques can be obtained from Extension pest management publications including IPM Guidelines and Crop Profiles, 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/ Mitigation applies to adsorbed pesticide losses being carried to surface water by wind.

4/ Numbers in these columns represent index values that indicate relative effectiveness of pesticide mitigation techniques to reduce hazardous pesticide losses through the identified path- ways.

Appendix 1. Pesticide Volatilization Section

Pesticide volatilization has been identified as a contributor to air quality concerns through Volatile Organic Compound (VOC) emissions that are a key precursor to ground-level ozone. The State of California has local air shed rules and regulations in place for nonattainment areas, and other States may follow.

Pesticide-related VOC emissions are influenced by the vapor pressure of the active ingredients and the way pesticide products are formulated. Emulsifiable concentrates have higher VOC emissions than other formulations. If the conservation planner identifies a VOC-related natural resource concern, one or more of the following VOC mitigation techniques must be applied:

1. Use lower VOC-emitting pesticide formulations–specifically eliminating the use of emulsifiable concentrates when other formulations are available.

2. Use precision pesticide application or smart sprayer technology including:

   a) near-infrared-based weed sensing systems
   b) map/GPS-based variable rate application
   c) sonar-based vegetation sensors
   d) computer controlled spray nozzles
   e) hoods and shields to direct applications
   f) wicks
   g) backpacks
   h) remote sensing, GIS, or other spatial information system
   i) fumigant delivery with precision application
   j) fumigant delivery with drip irrigation
   k) fumigant soil retention using precision water application.

3. Use impermeable tarps to cover fumigated areas.

4. Shift dates of fumigant application to outside the May to October time frame to move VOC emissions out of the non-attainment period.

5. Use solarization (e.g., irrigate and tarp during summer fallow) to kill pests without fumigation.

6. Use bio-fumigants or other soil treatments (e.g., thiosulfate) instead of pesticides.

7. Use steam fumigation instead of pesticides.

8. Fallow fields for several years before replanting an orchard crop or inoculate young trees (e.g., with yeast) to reduce fumigant use.

Pesticide direct contact can affect pollinators and other beneficial species in the application area while pesticides are being applied and later when pollinators and other beneficial species re-enter the treated area. Pollinators that have been exposed in the application area at sub-lethal concentrations can return to the hive and affect others. Direct exposure to pesticides in the application area can occur even when spray drift is minimized.

For more information, see How to Reduce Bee Poisoning from Pesticides available at:
http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/20772/pnw591.pdf

If the conservation planner identifies a pesticide direct contact concern to pollinators and other beneficial species, two or more of the following mitigation techniques must be applied:

1. Time pesticide applications when pollinators are least active (e.g., at night or when temperatures are low). Note that dewy nights may cause an insecticide to remain wet on the foliage and still be active the following morning, so exercise caution.

2. Time pesticide applications when crops are not in bloom and keep fields weed free to discourage pollinators from venturing into the crop.

3. Use pesticides that are less toxic to pollinators and beneficial species. **Note:** all pesticide recommendations must come from the Cooperative Extension Service or an appropriately certified crop consultant.

4. Use selective insecticides that target a narrow range of insects (e.g., *Bacillus thuringiensis* (Bt) for moth caterpillars) to reduce harm to beneficial insects like bees.

5. Use liquid or granular formulations instead of dusts and fine powders that may become trapped in the pollen, collecting hairs of bees and consequently fed to developing larvae.

6. Use alternatives to insecticides such as pheromones for mating disruption and kaolin clay barriers for fruit crops.

Appendix 2. Pesticide Direct Contact Section

If the conservation planner identifies a pesticide direct contact concern to pollinators and other beneficial species, two or more of the following mitigation techniques must be applied:

1. Time pesticide applications when pollinators are least active (e.g., at night or when temperatures are low). Note that dewy nights may cause an insecticide to remain wet on the foliage and still be active the following morning, so exercise caution.

2. Time pesticide applications when crops are not in bloom and keep fields weed free to discourage pollinators from venturing into the crop.

3. Use pesticides that are less toxic to pollinators and beneficial species. **Note:** all pesticide recommendations must come from the Cooperative Extension Service or an appropriately certified crop consultant.

4. Use selective insecticides that target a narrow range of insects (e.g., *Bacillus thuringiensis* (Bt) for moth caterpillars) to reduce harm to beneficial insects like bees.

5. Use liquid or granular formulations instead of dusts and fine powders that may become trapped in the pollen, collecting hairs of bees and consequently fed to developing larvae.

6. Use alternatives to insecticides such as pheromones for mating disruption and kaolin clay barriers for fruit crops.

Appendix 3. Critical Scouting Periods for Weed Management.* **

	Jan - Mar	April	May	June	July	August	Sept	Oct	Nov
Corn Soybeans		Vegetation Survey 1-2 WBP (esp. no-till)		Weed Survey 3-5 WAP Herbicide Evaluation		Final Weed Survey (prior to frost)			
Fall Seeded Small Grain	Weed Survey				Preharvest Weed Survey		Vegetation Survey 1-2 WBP (esp. no-till)		Weed Survey 3-6 WAP
Spr. Seeded Small Grains	Vegetation Survey 1-2 WBP (esp. no-till)		Weed Survey 3-6 WAP		Preharvest Weed Survey				
Fall Seeded Forage	Weed Survey				Vegetation Survey 1-2 WBP (esp. no-till)		Weed Survey 3-6 WAP		
Spr. Seeded Forage	Vegetation Survey 1-2 WBP (esp. no-till)		Weed Survey 3-6 WAP				Weed Survey		
Established Forage	Weed Survey		Between Cuttings	Between Cuttings	Between Cuttings		Weed Survey		

* WBP = weeks before planting; WAP = weeks after planting

** Specific dates for scouting may vary depending on your location and climate.

Appendix 4. Montana IPM Crop Pest Thresholds.*

CROP (Pest Species)	THRESHOLD/SAMPLE TECHNIQUE
ALFALFA HAY	
Alfalfa caterpillar	10 per 90° sweep
Alfalfa weevil	10 per 90° sweep
Pea aphid	300 per 90° sweep
Spotted alfalfa aphid	Dryland = 5 to 10 per 90° sweep Irrigated = undefined
Cutworms	5 per square foot of soil around plant
Blister beetles	none established
Grasshoppers	10 per square yard
Meadow spittlebug	none established
Spider mites	none established
ALFALFA SEED	
Seed Chalcid	none established
Alfalfa weevil	20 per 90° sweep
Aphids	100-300 per 90° sweep
Armyworms and cutworms	same as hay
CORN	
Aphids	100 per plant tassel emergence
Corn earworm	greater than 150 moths per pheromone trap
Corn rootworms	5 or more per plant as silking begins
Cutworms and armyworms	1–4 worms per linear foot of row
Grasshoppers	8 per square yard in field or 20 per square yard in margins
Seed corn maggot	none established
Wireworms	none established
Spider mites	none established
SMALL GRAINS	
Aphids (other than Russian wheat)	2–10 per tiller, per stem, or per head, prior to dough stage
Russian wheat aphid	
Armyworms and cutworms	4-5 per square foot
Thrips	20-50 per plant before heads form
Wheat stem maggot	none established
Wheat stem sawfly	none established
Wireworms	20% stand reduction
SUGARBEETS	
Beet leafhopper	5 per 10 180° sweeps
Cutworms	4-5% cutting of seedling beets
Flea beetles	none established
Sugarbeet root maggot	none established
Sugarbeet webworm	when 50% of leaves show eggs or small larvae

*From State of Montana Department of Agriculture

Appendix 5. Emergency Numbers

In Montana, the poison control number is: 1-800-525-5042

For advice and assistance with emergency spills that involve agrichemicals **in Montana**, **phone calls in the following order should be made:**

1ST RESPONDER – 911

2ND RESPONDER – Local sheriff or police

3RD RESPONDER – County D.E.S. (Disaster Emergency Services)

4TH RESPONDER – Montana Department of Agriculture (406) 444-3730

The national CHEMTRAC **(Chemical Transportation Emergency Center)** telephone number is:

1-800-424-9300

For non-emergency information call The National Pesticide Information Center (NPIC) in Corvallis, Oregon Monday through Friday 6:30 a.m. to 4:30 p.m. Pacific Time: **1-800-585-7378**