United States Department of Agriculture
Natural Resources Conservation Service

Air & Water Quality Enhancement Activity – Pesticide Management

Pesticide Management

Pest management can impact water quality and air quality through the offsite movement of pesticides. Pesticides can move away from the site of application via surface runoff, leaching, drift, and volatilization. Pesticide residues in drinking water can be a hazard to humans. Pesticide residues in surface water can negatively impact aquatic life. Pesticide drift can impact non-target vegetation and other sensitive receptors, including wildlife. Pesticides can also volatilize to form other air pollutants, including ozone precursors and fine particulate matter.

Benefits

These activities will result in substantial improvements in both water and air quality by reducing off-site pesticide movement through leaching, solution runoff, adsorbed runoff, airborne drift and volatilization.

Criteria for Pesticide Management Enhancement Activity

Implementation of this enhancement requires a participant to apply and/or maintain a high level Integrated Pest Management (IPM) system (Level A) or 2 or more pesticide risk mitigation activities applicable to all enterprises (Level B)

A. **Utilize a High Level Integrated Pest Management System with Pesticides Applied only as a Last Resort for Managing Pests and for Reducing Environmental Risk**. This is applicable to cropland and or rangeland settings. A high level IPM system must go beyond basic pest management by including pest prevention and avoidance mitigation techniques, and only utilizing pest suppression techniques when pest monitoring indicates that an economic pest threshold has been exceeded. Mitigation techniques include both IPM management techniques and Conservation Practices. Appropriate mitigation is selected based on environmental risk evaluation with tools like the Revised Universal Soil Loss Equation 2 (RUSLE 2) for evaluating the use of tillage for weed control, and the NRCS Windows Pesticide Screening Tool (WIN-PST) for evaluating the use of pesticides. Cultural and biological control techniques are used when they are efficacious and cost effective.

B. **Use Two or More Pesticide Risk Mitigation Activities--**The two activities must be in addition to activities documented in the A) Soil and Water Eligibility Tool, or B) Grazing Land Eligibility Tool.
   1. Use precision pesticide application technology to reduce spray drift and the total amount of pesticide applied. This can include:
      a. Precision guidance systems that reduce ground or aerial spray overlap to less than 12 inches [e.g., Global Positioning Systems (GPS) and Real Time Kinetics (RTK)]

   b. "Smart sprayers" that utilize automatic sensors and computer controlled nozzles to turn individual nozzles on and off as appropriate to target weeds or foliage
   c. Computer guided application systems that integrate real time meteorological data and computer model guidance to reduce pesticide drift from aerial application [e.g., AIMMS , Wingman™GX, and NextStar™ Flow Control]
2. Use GPS data loggers that document site-specific compliance with all label requirements for drift mitigation
3. Use chemical adjuvants proven to reduce pesticide drift
4. Maintain windbreaks where pesticides are applied to reduce and/or intercept spray drift.
5. Weed Mapping – completed annually to assist in establishing priority control areas and monitoring progress.
6. Targeted Grazing – utilizing livestock grazing as a tool to manage and control undesirable plants

References:

Hapeman, C.J., Mcconnell, L.L., Rice, C., Torrents, A., Goel, A., Prueger, J.H., Harman-Fetcho, J.A., Smith, R.D., Bialek Kalinski, K.M., Drakeford, L. 2006. Reducing the risks of pesticide exposure via atmospheric transport. Proceedings of the Workshop on Agricultural Air Quality: State of the Science. 1:674-676.

Schneph, M., Cox, C., editors. Environmental Benefits of Conservation on Cropland: The Status of Our Knowledge. 2006. Soil and Water Conservation Society. Chapter 5 - Pest management practices, pesticide mitigation by R. D. Wauchope and Chapter 6 - Pest management practices, integrated pest management by H.M. Linker.

Thomson, S.J., Price, R.R., Smith, L. 2007. Integrating Spray Plane-Based Remote Sensing and Rapid Image Processing with Variable-Rate Aerial Application. NAAA/ASABE Paper No. AA06-001. National Agricultural Aviation Association, Washington, D.C.

Wills, G.D., Hanks, J.E., Jones, E.J., Mack, R.E. 2006. Effect of the drift control adjuvants hm 2005b and hm 9752 on efficacy and droplet size of glyphosate applied with teejet exended range spray nozzles. Proceedings of Southern Weed Science Society. Vol.59; 57

Integrated Pest Management:
http://www.ipmcenters.org
http://www.ipminstitute.org/Fed_Agency_Resources/IPM_elements_guidelines.htm
http://www.ipminstitute.org/Fed_Agency_Resources/NRCS_&_IPM.htm
http://www.epa.gov/pesticides/factsheets/ipm.htm

Air & Water Quality Enhancement Activity – Pesticide Management

Precision Application:
Implementing Site-Specific Management: Ess, D. R., S. D. Parsons, C. R. Medlin. Sprayer Technology – Controlling Application Rate and Droplet Size Distribution On The Go. Dept. of Agricultural and Bio Engineering, Purdue University, West Lafayette, IN.
http://www.ces.purdue.edu/extmedia/AE/SSM-5-W.pdf

Adjuvants:
Y. Lan, W.C. Hoffmann, B.K. Fritz, D.E. Martin, J.A. Lopez, Jr. 2007. Drift Reduction with Drift Control Adjuvants. American Society of Agricultural and Biological Engineers, 2007 ASABE Annual International Meeting, Minneapolis, MN.
http://asae.frymulti.com/request.asp?JID=5&AID=23651&CID=min2007&T=2

J.A. Ferrell, G. E. MacDonald, and J. Tredaway Ducar. Adjuvants. University of Florida Extension.
http://edis.ifas.ufl.edu/pdffiles/WG/WG05000.pdf

Windbreaks and Drift Control:
Tamer Ucar, Franklin R Hall. 2001. Windbreaks as a pesticide drift mitigation strategy: a review. Pest Management Science, vol 57 no 8, pp 663-675
http://www3.interscience.wiley.com/cgi-bin/fulltext/85005758/HTMLSTART

Ralph B Brown, Margaret H Carter, Gerald R Stephenson. 2004. Buffer zone and windbreak effects on spray drift deposition in a simulated wetland. Pest Management Science 60:11, pp 1085-1090.
http://www3.interscience.wiley.com/cgi-bin/fulltext/109581800/HTMLSTART

Weed Mapping:
DiPietro. D., Kelly, M., Schoenig, S., Johnson, D., and Yacoub, R. 2002. California Weed Mapping Handbook. California Department of Food and Agriculture.

http://cain.ice.ucdavis.edu/weedhandbook

Nevada Weed Mapping Activities. 2005. Nevada Department of Agriculture, Plant Industry Division.

http://agri.nv.gov/nwac/PLANT_NoxWeedMapping.htm

Targeted Grazing:
Launchbaugh, K. and Walker, J. 2006. Targeted Grazing: A Natural Approach to Vegetation Management and Livestock Enhancement. American Sheep Industry Association.

http://www.cnr.uidaho.edu/rx-grazing/Handbook.htm

United States Department of Agriculture
Natural Resources Conservation Service

Air & Water Quality Enhancement Activity – Pesticide Management

Level A

1: Utilize a high level Integrated Pest Management system with pesticides applied only as a last resort for managing pests and for reducing environmental risk. This is applicable to cropland and or rangeland settings.

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. This level is appropriate for both cropland and rangeland settings.

A high level IPM system must go beyond basic pest management by including pest prevention and avoidance mitigation techniques, and only utilizing pest suppression techniques when pest monitoring indicates that an economic pest threshold has been exceeded. Mitigation techniques include both IPM management techniques and Conservation Practices. Appropriate mitigation is selected based on environmental risk evaluation with tools like the Revised Universal Soil Loss Equation 2 (RUSLE 2) for evaluating the use of tillage for weed control, and the NRCS Windows Pesticide Screening Tool (WIN-PST) for evaluating the use of pesticides. Cultural and biological control techniques as well as lower risk pesticides and lower risk pesticide application techniques are used when they are efficacious and cost effective.

Required Elements:

- Attach copies of the IPM systems used on your operation/enterprise. The systems should cover all of the offered acres where pest management is used. Each system should describe the resource concern(s), target pest(s), pest management alternatives, environmental risk analysis using the appropriate tools (RUSLE2, WIN-PST, etc) and the mitigation required to reduce the risk to acceptable levels.
- Briefly describe how the IPM systems used on your operation/enterprise have reduced pesticide related water and air quality resource concerns.

United States Department of Agriculture
Natural Resources Conservation Service

Air & Water Quality Enhancement Activity – Pesticide Management

Level B

1: Use precision pesticide application technology to reduce spray drift and the total amount of pesticide applied. This is applicable to cropland and or rangeland settings.

Precision pesticide application technology can include any of the following:

- Precision guidance systems that reduce ground or aerial spray overlap to less than 12 inches [e.g., Global Positioning Systems (GPS) and Real Time Kinetics (RTK)]
- Variable rate technologies (VRT) that allow the rate of pesticide application to dynamically change for site specific conditions as determined by the operator, maps or sensors (this may include remote sensing and/or precision guidance)
- "Smart sprayers" that utilize automatic sensors and computer controlled nozzles to turn individual nozzles on and off as appropriate to target weeds or foliage
- Computer guided application systems that integrate real time meteorological data and computer model guidance to reduce pesticide drift from aerial application (e.g., AIMMS , Wingman™GX, and NextStar™ Flow Control)

Required Elements:

- Describe in detail the kind or precision pesticide application technology used on the offered acres, how it operated to reduce spray drift, and the total amount of pesticide applied

Air & Water Quality Enhancement Activity – Pesticide Management

2: Use GPS data loggers that document site-specific compliance with all label requirements for drift mitigation. This is applicable to cropland settings.

GPS data loggers can be used to precisely document where pesticides are applied thereby confirming compliance with product label requirements, such as setbacks from sensitive areas, and pesticides being applied in solution.

Required Elements:

- Provide copies of product labels for each pesticide used on the offered acres and clearly identify any requirements for drift reduction on each label
- Describe the data logger used on the offered acres and how the logger was used to meet product label requirements for drift reduction
- Provide the data logger output from the offered acres

Air & Water Quality Enhancement Activity – Pesticide Management

3: Use chemical adjuvants proven to reduce pesticide drift. This is applicable to cropland settings.

A pesticide adjuvant is broadly defined as any substance added to the spray tank, separate from the pesticide formulation, to improve the performance of the pesticide. As small droplets can travel farther than larger droplets, some chemical adjuvants function as drift retardants by increasing mean droplet size. Adjuvants can include everything from wetting agents to feeding stimulants. When used properly, they can be very effective at reducing the amount of pesticide required and the amount of spray drift.

Required Elements:

- Provide a list of pesticide products that you use and the adjuvants used with each product to reduce drift
- Provide adjuvant receipts or other documentation substantiating both purchase and use

Air & Water Quality Enhancement Activity – Pesticide Management

4: Maintain windbreaks where pesticides are applied to reduce and/or intercept spray drift. This is applicable to cropland settings.

Shrub and/or tree windbreaks can reduce movement of applied pesticides by reducing wind speeds within the field and by intercepting pesticides in the air stream as air passes through the windbreaks. Windbreaks can also help mix the drifting compounds vertically in the air by disrupting airflows at the field edge thereby reducing the pesticide concentration in the air.

Any producer using this enhancement activity shall adhere to the relevant air quality design criteria put forth in Conservation Practice Standard 380, Windbreak/Shelterbelt Establishment.

Required Elements:

- Provide a map showing the locations of windbreaks on the offered acres. Include the general direction of the wind during pesticide applications. Also provide drawings of cross sections of your windbreaks showing the shrub and/or tree species, in-row spacing of the shrubs and/or trees, the general heights of species in each row, and distances between the rows if the windbreak is multi-row.

5. Weed mapping-completed annually to assist in establishing priority control areas and monitoring progress. This is applicable to rangeland settings.

Weed mapping can be utilized to provide a framework for area-wide and site-specific management plans, to establish priorities for treatment, and to monitor success of treatment over time. Information can be shared with regional weed management authorities to assist in coordinating control efforts.

Required Elements:

- Provide a map showing location of weed pests as well as plant number estimates.
- Describe how information was utilized in making pest management decisions.

Air & Water Quality Enhancement Activity – Pesticide Management

6. Targeted Grazing utilizing livestock grazing as a tool to manage and control undesirable plants. This is applicable to rangeland settings.

Targeted grazing is the application of a specific kind of livestock at a determined season, duration, and intensity to accomplish defined vegetation goals. Targeted grazing can be utilized to control noxious weed, manage weedy brush and trees, and other undesirable vegetation. Payment based on actual targeted acres.

Required Elements:

- Statement identifying the species targeted for control or management, the kind of grazing animal, timing and rate of grazing necessary to suppress target species.
- Maintain record of grazing treatments applied and effects on target species.