

**Air Quality Enhancement Activity – AIR03 – Replace burning of prunings, removals and other crop residues with non-burning alternatives**



**Enhancement Description**

The use of non-burning alternatives to dispose of prunings, removals and other crop residues from orchards, vineyards and other woody perennial crops. Non-burning alternatives include chipping, grinding, shredding, mowing or composting of these materials.

**Land Use Applicability**

Cropland

**Benefits**

Burning prunings, removals and residues produces smoke, as well as other air emissions, including volatile organic compounds (VOCs) and oxides of nitrogen (NO<sub>x</sub>) that are precursors needed for ozone formation, and various forms of particulate matter. By replacing burning with alternatives (chipping, grinding, shredding, mowing or composting), harmful air emissions will be greatly reduced, and the resulting material usually can be used as mulch.

**Conditions Where Enhancement Applies**

This enhancement only applies to acres of orchards, vineyards, and other woody perennial cropping systems that produce significant residues that have used burning in prior years.

**Criteria**

1. A system of burning prunings, removals or residues is currently being utilized on the farm.
2. Burning of such material shall be replaced by one of the non-burning alternatives (chipping, grinding, shredding, mowing or composting).
3. Wood chips and other mulch material resulting from chipping, grinding or shredding shall be used for dust control on unpaved roadways or other farm surfaces, for bio-energy purposes, for composting, or left in orchards for natural decomposition.

**Adoption Requirements**

This enhancement is considered adopted when a non-burning alternatives has been utilized in prior years as a replacement to burning.

**Documentation Requirements**

1. A map showing farm areas where these activities were conducted and applied.
2. Dates, locations and type of non-burning alternatives used.



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## References

Washington State Department of Ecology, Air Quality Program (2004). [Washington State Alternatives to Burning: Agricultural Practices to Help Eliminate or Reduce the Need to Burn](#). Edited by Donna Guske Hansen and John E. Carlson.

[http://www.ecy.wa.gov/programs/air/aginfo/research\\_pdf\\_files/AlternativesAgBurn.pdf](http://www.ecy.wa.gov/programs/air/aginfo/research_pdf_files/AlternativesAgBurn.pdf)

Western Regional Air Partnership, Fire Emissions Joint Forum (2004). [Non-burning Alternatives for Wildlands \(Task 4.3.1.1\)](#). Prepared by Jones and Stokes, Sacramento, CA.

<http://www.wrapair.org/forums/fejf/tasks/FEJFtask3.html>

Western Regional Air Partnership, Fire Emissions Joint Forum (2002). [Non-Burning Alternatives on Agricultural Lands \(Task 4.3.1.1\)](#). Prepared by Eastern Research Group, Inc. (ERG) and Enviro-Tech Communications. ERG No.: 3261.00.005.001. <http://www.wrapair.org/forums/fejf/tasks/FEJFtask4.html>

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If chipping or grinding are used, the written documentation shall include the type (i.e. brand name/model) of the equipment used, the timing of the chipping/grinding and if the chips are removed or left in the orchard.

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.

**Air Quality Enhancement Activity – AIR07 – GPS, targeted spray application (SmartSprayer), or other chemical application electronic control technology**



**Enhancement Description**

Utilize electronically-controlled or managed chemical spray application technology to more precisely apply agricultural pesticides to their intended targets.

**Land Use Applicability**

Cropland, Pastureland, Rangeland, Forestland

**Benefits**

These activities will provide improvements in water and air quality by reducing the total amount of chemical applied, and reducing the potential for airborne chemical drift when agricultural chemicals are applied. This enhancement can be used only if chemical applications are done according to label

directions. Reducing chemical drift will help to reduce both particulate matter (liquid droplets) in the air and the production of volatile organic compounds, which are an integral part of production of ozone, a pollutant in the lower atmosphere. Reduced chemical drift will improve water quality by minimizing the delivery of chemical compounds through the air to water bodies.

**Conditions Where Enhancement Applies**

This enhancement applies to all crop, pasture, range or forest land use acres.

**Criteria**

The implementation of this enhancement for precision pesticide application technology to reduce spray drift and the total amount of pesticide applied requires the use of GPS data loggers (i.e., devices that record the track, time and location of field trips for download to maps) in order to document site-specific compliance with all label requirements for drift mitigation, and additionally, one or more of the following techniques:

1. Precision guidance systems that reduce ground or aerial spray overlap to less than 12 inches
2. Variable rate technologies (VRT) that allow the rate of pesticide application to dynamically change for site specific applications
3. “Smart sprayers” that utilize automatic sensors and computer controlled nozzles to turn individual nozzles on and off
4. Computer guided application systems that integrate real time meteorological data and computer model guidance to reduce pesticide drift from aerial application
5. Re-circulating spray technologies that capture and reuse overspray to reduce overall pesticide application rate and off-site spray drift



6. Electrostatic spray technologies to reduce overall application rate and off-site spray drift

**Adoption Requirements**

This enhancement is considered adopted when site-specific compliance requirements plus one or more of the above criteria have been implemented and documented to satisfaction of the NRCS State Office.

**Documentation Requirements**

Each year the following must be supplied:

1. Type of electronic spray control technology used,
2. Dates technology is used, and
3. Acres treated.

**References**

Brown D.L., D.K. Giles, M.N. Oliver, P. Klassen. 2008. Targeted spray technology to reduce pesticide in runoff from dormant orchards. *Crop Prot.* 27(3-5):545-52. DOI: 10.1016/j.cropro.2007.08.012

Downey D. and D.K. Giles. 2005. Reducing orchard spray rates and ground deposit by using tree sensors and sprayer control. *Ann Rev Ag Eng.* 4:229-36.

Giles D.K., M.J. Delwiche and R.B. Dodd. 1987. Control of orchard spraying based on electronic sensing of target characteristics. *Trans ASAE.* 30(6):1624-30.

Giles D.K., P. Klassen, F.J.A. Niederholzer and D. Downey. 2011. *California Agriculture.* 65(2):85-89. DOI: 10.3733/ca.v065n02p85.

<http://californiaagriculture.ucanr.org/landingpage.cfm?article=ca.v065n02p85&fulltext=yes>

Tien, L. 2002. Development of a sensor-based precision herbicide application system. *Computers and Electronics in Agriculture,* 36:133-149.

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Written documentation shall include a record of sprayer calibration, brand name / model of spray control technology.

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.

**Air Quality Enhancement Activity – AIR04 – Use drift reducing nozzles, low pressures, lower boom height, and adjuvants to reduce pesticide drift**



**Enhancement Description**

Use drift reduction technologies to reduce the drift of agricultural chemicals away from the intended target when spraying.

**Land Use Applicability**

Cropland, Pastureland

**Benefits**

Drift reduction will reduce damage to non-target desirable plants and animal habitats and reduce pollution of water bodies. Reducing chemical drift will help to reduce both particulate matter (liquid droplets) in the air and the production of volatile organic compounds, which are an

integral part of the formation of ozone, a pollutant in the lower atmosphere. Reduced chemical drift will improve water quality by minimizing the delivery of chemical compounds through the air to water bodies. This enhancement assumes all chemical applications are done according to label directions.

**Conditions Where Enhancement Applies**

This enhancement applies to all crop or pasture land use acres.

**Criteria**

Implementation of this enhancement to reduce spray drift of agricultural chemicals requires the use of one or more of the following activities:

1. Use drift reduction nozzles, drops, shielding, pressure adjustment, electrostatic spray technology, or re-circulating spray technology to minimize drift of applied chemical away from targeted area while maintaining required efficacy of pesticide application.
2. Reduce sprayer pressures per the nozzle criteria to produce larger spray droplets, which have a lower tendency to drift. Do not exceed 40-45 psi sprayer pressure.
3. Reduce boom height to the minimum amount allowable (where full coverage is achieved just above the top of the plant canopy) to achieve coverage and minimize the amount of time droplets are in the air before contacting plant or soil surfaces.
4. Use spray adjuvants approved for use with the specific pesticide being applied to reduce evaporation of airborne spray droplets, keeping droplets larger so they will settle more quickly onto the targeted plants and soil.

**Adoption Requirements**

This enhancement is considered adopted when one or more of the above criteria have been implemented and documented to satisfy the NRCS State Office list of acceptable methods.



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### **Documentation Requirements**

Each year the following must be supplied:

1. Written documentation for the type of drift reduction technology used, and
2. Acres treated.

### **References**

Ozken, H.E. 2012. New Nozzles for Spray Drift Reduction. Ohio State University Extension Fact Sheet AEX 523-98. <http://ohioline.osu.edu/aex-fact/0523.html>

Witt, J. M. 2012. Agricultural Spray Adjuvants. Oregon State University Extension. <http://psep.cce.cornell.edu/facts-slides-self/facts/gen-peapp-adjuvants.aspx>

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Written documentation shall include a record of sprayer calibration (including sprayer operating pressure) and a summary of drift reduction practices utilized.

Additional References:

Managing Pesticide Drift in Wisconsin

<http://ipcm.wisc.edu/pat/download/download/driftdoc.pdf>

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.

**Air Quality Enhancement Activity– AIR08 –Nitrification inhibitors or urease inhibitors**



**Enhancement Description**

The use of an ammonia or ammonium fertilizers with a substance that inhibits the biological oxidations of ammoniacal nitrogen to nitrate nitrogen or the use of surface applied urea products with a substance that inhibits hydrolytic action on urea by urease enzyme that when applied to soils results in less urea nitrogen lost by ammonia volatilization (AAPFCO). This enhancement is only applicable to nitrogen applied within 30 days of planting. This does not apply to “pop-up” or starter nitrogen sources applied at planting time.

**Land Use Applicability**

Cropland, Pastureland

**Benefits**

When ammonia or ammonium N is added to the soil, it is subject to a process called nitrification. Soil bacteria called nitrosomonas convert the ammonia (NH<sub>3</sub>) or ammonium (NH<sub>4</sub>) to nitrate (NO<sub>3</sub>). This conversion is strongly temperature dependent and occurs quickly under warm soil temperature conditions. Using a nitrification inhibitor with early spring applications of ammonia or ammonium nitrogen will slow the conversion to nitrate until it can be readily used by crops. This will allow the crop to take up more of the N and ultimately reduce the release of nitric oxide (an ozone precursor) and nitrous oxide (a greenhouse gas) to the atmosphere. These conversion processes can produce nitrous oxide as a byproduct due to inefficiencies in the conversion processes. Nitrous oxide is a potent greenhouse gas which, on a molecular basis, has 310 times the global warming potential of carbon dioxide.

Using a urease inhibitor (with surface applied urea products) will reduce the volatilization and release of ammonia into the atmosphere that occurs as urea hydrolyzes. Urease is an enzyme produced by bacteria in the soil. It catalyzes the hydrolysis of urea into carbon dioxide and ammonia. Ammonia released to the atmosphere is a pre-cursor to PM<sub>2.5</sub> particulate matter.

**Conditions Where Enhancement Applies**

This enhancement applies to climatic areas and soils on cropland or pastureland where nitrogen fertilizer is applied AND where either nitrification inhibitors or urease inhibitors are recommended by the Land Grant University.

**Criteria**

Use either a nitrification inhibitor or urease inhibitor product (depending upon the type of nitrogen fertilizer or manure used) on the treatment acres.



1. Nutrient application rates must be within Land Grant University recommendations based on soil tests and established yield goals considering all nutrient sources. The nutrient application rate must take into account the additional nitrogen that will remain available to the plant due to the inhibition of the nitrification processes.
2. Apply the nitrification inhibitor or urease inhibitor according to manufacturer recommendations.
3. The methods used to apply the nitrification inhibitor or urease inhibitor must not increase soil surface disturbance.
4. This enhancement is only applicable for nitrogen applications that take place within 30 days prior to planting time.
5. Materials which are acceptable for this enhancement must be defined by the Association of American Plant Food Control Officials (AAPFCO) and be accepted for use by the State fertilizer control official, or similar authority, with responsibility for verification of product guarantees, ingredients (by AAPFCO definition) and label claims.

### **Adoption Requirements**

This enhancement is considered adopted when ammonia or ammonium fertilizers or urea products that contain a substance as described in the Enhancement Description above have been utilized in accordance with the Criteria of this job sheet on the land use acreage.

### **Documentation Requirements**

1. A map showing where the enhancement was applied,
2. Date(s) of application of fertilizer with inhibitor,
3. Acres of land treated,
4. Soil test results,
5. Manure analysis results (where applicable),
6. Crops grown and yields (both yield goals and measured yield), and
7. Calibration of application equipment.

Note: In lieu of documenting each individual item listed in the Documentation Requirements, a Certified Crop Advisor plan that contains each of the items may be substituted.

### **References**

Nelson, D. R. and D. Huber. 2001. Nitrification Inhibitors for Corn Production. National Corn Handbook, Iowa State University. <http://www.extension.iastate.edu/Publications/NCH55.pdf>

Rankin, M. 2011. Nitrification Inhibitors and Use. University of Wisconsin Extension. <http://www.uwex.edu/ces/crops/ninhib.htm>

The Pennsylvania State University. 2003. Starter Fertilizer. Agronomy Facts 51. <http://cropsoil.psu.edu/extension/facts/agfacts51.cfm>

AAPFCO. 2011. Association of American Plant Food Control Officials. Official Publication No. 64. AAPFCO Inc., Little Rock, Arkansas.

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The use of urease or nitrification inhibitors is necessary to qualify for this enhancement. Urease or nitrification inhibitors function by reducing the population or inhibiting the activity of the soil bacteria responsible for converting Nitrogen into forms (nitrate and nitrogen gas) that can be lost from the soil profile. Current products on the market include N-Serve, Agrotain, Instinct, Super-U and Nutrisphere-N. Written documentation shall include documentation of the fertilizer product name, method of stabilization, formulation and method of application. Slow release requirement is not applicable to starter fertilizers.

Criteria #3 Clarification: Application of inhibitors should be performed such that soil surface disturbance is minimized.

This is a 'System' type enhancement. This enhancement shall be performed on the areas (i.e. fields) identified in the Conservation Stewardship Plan each year when appropriate to do so.