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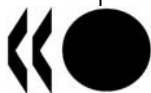
ENVIRONMENT DIRECTORATE
JOINT MEETING OF THE CHEMICALS COMMITTEE AND
THE WORKING PARTY ON CHEMICALS, PESTICIDES AND BIOTECHNOLOGY

Series on Pesticides
No. 50

REPORT OF THE OECD SEMINAR ON PESTICIDE RISK REDUCTION THROUGH BETTER
NATIONAL RISK MANAGEMENT STRATEGIES FOR AERIAL APPLICATION

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OECD Environment, Health and Safety Publications
Series on Pesticides

No. 50

**REPORT OF THE OECD SEMINAR
ON PESTICIDE RISK REDUCTION
THROUGH BETTER NATIONAL RISK
MANAGEMENT STRATEGIES
FOR AERIAL APPLICATION**

24 February 2009, San Francisco, United States of America

IOMC

INTER-ORGANIZATION PROGRAMME FOR THE SOUND MANAGEMENT OF CHEMICALS

A cooperative agreement among **FAO, ILO, UNEP, UNIDO, UNITAR, WHO and OECD**

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ORGANISATION FOR ECONOMIC COOPERATION AND DEVELOPMENT

Paris 2010

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OECD Guidance for Industry Data Submissions on Plant Protection Products and their Active Substances-Dossier Guidance (1998, revised 2001, 2005)

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Report of the [1st] OECD Workshop on Pesticide Risk Indicators (1997)

Report of the OECD/FAO Workshop on Pesticide Risk Reduction (1995)

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FOREWORD

This document is the report of the OECD *Seminar on Pesticide Risk Reduction through Better National Risk Management Strategies for Aerial Application* that took place on 24 February 2009, in San Francisco, United States of America. It was hosted by the US Environmental Protection Agency (US-EPA) and was chaired by Dr. Wolfgang Zornbach of the German Federal Ministry of Food, Agriculture and Consumer Protection.

This was the tenth in a series of Seminars organised by the OECD Pesticide Risk Reduction Steering Group, a sub-group of the OECD Working Group on Pesticides. These Seminars focus on key issues in pesticide risk reduction of concern to OECD governments. The Seminars are intended to provide an opportunity for OECD governments to discuss the issues together with non-governmental stakeholders and to develop recommendations for further OECD activities.

After a series of presentations on governments' and other stakeholders' approaches with aerial application (copies of all presentations are in Annex 3), the Seminar discussed the various issues associated with pesticide aerial application, such as risks and benefits, technical developments, and communication and information aspects. The Seminar recommended that the OECD promote information exchange on aerial application and develop a code of best/good practices for aerial application.

The draft report of the Seminar was approved out-of-session by the Working Group on Pesticides by written procedure that was finished on 20 March 2010.

This document is being published under the responsibility of the Joint Meeting of the Chemicals Committee and the Working Party on Chemicals, Pesticides and Biotechnology, which has agreed that it be unclassified and made available to the public.

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INTRODUCTION

1. This report presents the results and recommendations of an OECD Seminar on ways to achieve pesticide risk reduction through better national risk management strategies for aerial application. This one-day Seminar, held on 24 February, 2009 was chaired by Wolfgang Zornbach (Germany), Chairman of the OECD Risk Reduction Steering Group (RRSG), and took place in San Francisco, United States (US).

2. The US Environmental Protection Agency (US-EPA) planned and organized this Seminar as well as the field trip that took place the day before in the San Joaquin Valley, California. The field-trip day comprised several visits, including a stop at a small ‘agricultural airport’ where a presentation on issues dealing with aerial application and a demonstration of on-site research on aerial pesticide drift (using a wind tunnel) were given to OECD participants. The field trip proved very helpful in the context of the RRSG Seminar that took place immediately the day after.

3. This Seminar was the tenth in a series of Seminars organised by the OECD Pesticide RRSG, a sub-group of the OECD Working Group on Pesticides (a group composed primarily of representatives of the 30 OECD governments but that also includes representatives of the European Commission and other international organisations, the pesticide industry, and the environmental community). RRSG Seminars focus on key issues in pesticide risk reduction of concern to OECD countries. The Seminars are intended to provide an opportunity for OECD governments to discuss these issues together with non-governmental stakeholders and to develop recommendations for further follow-up OECD activities. The OECD Pesticides Programme has made great accomplishments toward helping national governments coordinate the efficiency and effectiveness of pesticide risk reduction work, in part because of Seminars such as the one held in San Francisco.

4. Past OECD Risk Reduction Seminars are listed below:

Title of Seminar [references of publication]	Date	Place
Compliance and Risk Reduction <i>ENV/JM/MONO(2004)6</i> (Series on Pesticides No. 24)	10 March 2003	Paris, France
Minor Uses and Pesticide Risk Reduction <i>ENV/JM/MONO(2005)4</i> (Series on Pesticides No. 26)	4 Nov. 2003	Canberra, Australia
Pesticide Risk Reduction through Good Container Management <i>ENV/JM/MONO(2005)12</i> (Series on Pesticides No. 28)	22 June 2004	Bonn, Germany
Risk Reduction through Good Pesticide Labelling <i>ENV/JM/MONO(2006)13</i> (Series on Pesticides No. 29)	1 March 2005	Paris, France
Pesticide Risk Reduction through Better Application Technology <i>ENV/JM/MONO(2007)3</i> (Series on Pesticides No. 35)	30 Nov. 2005	Wellington, New Zealand
Joint OECD/EC Seminar on Harmonised Environmental Indicators For Pesticide Risk (HAIR) <i>ENV/JM/MONO(2007)27</i> (Series on Pesticides No. 40)	13 Nov. 2006	Bonn, Germany
Risk Reduction through Better Worker Safety and Training <i>ENV/JM/MONO(2008)9</i> (Series on Pesticides No. 42)	21 March 2007	Brno, Czech Republic
Risk Reduction through Education / Training the Trainers <i>ENV/JM/MONO(2009)35</i> (Series on Pesticides No. 45)	15 Nov. 2007	Mexico City, Mexico
Risk Reduction through Spray Drift Reduction Strategies as Part of National Risk Management <i>ENV/JM/MONO(2009)36</i> (Series on Pesticides No. 46)	12 June 2008	Paris, France

The reports from these Seminars are available on the OECD public web site at: <http://www.oecd.org/env/pesticides>, under the section “Risk Reduction.”

5. Members of the RRSB selected “aerial application” as the topic of this Seminar considering its significance for pesticide risk reduction in the fields of human health and the environment. The importance of adopting risk management strategies for aerial application was noted during earlier OECD Seminars and surveys:

- The Seminar on Better Application Technology discussed opportunities for risk reduction through better pesticide application technologies and methods. It considered a variety of technology approaches for aerial and other methods of pesticide applications, benefits of those options, and how pesticide applicators and regulatory authorities depended on those approaches for risk reduction. It also reviewed regulatory (e.g., policies, laws, and equipment inspections) and voluntary (e.g., spray drift management guidelines) mechanisms that exist, which address the issue.
- The Seminar on Spray Drift considered several approaches to reduce risks associated with drift, including that arising from aerial application. Strategies included inter alia setting buffer zones or adopting drift reduction technologies.
- The importance of reducing aerial spray drift was also highlighted in the Second Risk Reduction Survey conducted in 2004-2005 (ENV/JM/MONO(2006)14).

PARTICIPANTS

6. People attending the OECD Seminar included:

- Representatives of the pesticide regulatory authorities of OECD countries (Australia, Canada, Germany, Japan, the Netherlands, New Zealand and US)
- Representatives from industry, including CropLife International (the international association of pesticide manufacturers), BIAC (Business and Industry Advisory Committee to the OECD) and IBMA (International Biocontrol Manufacturers Association)
- Officials from international organisations, such as the European and Mediterranean Plant Protection Organization (EPPO)
- International experts engaged in programmes dealing with aerial application from other key stakeholder groups such as environment non-governmental organisations (Pesticide Action Network North America) and national aerial applicator organisations (National Agricultural Aviation Association (US)).

7. A participant list is provided in Annex 2.

PURPOSE AND SCOPE OF THE SEMINAR

8. The main objectives of the Seminar included:

- to identify key issues and challenges of pesticide risk reduction from aerial applications, especially spray drift management
- to provide updates of national and international legislative and non-legislative activities and initiatives for requiring or promoting the adoption of aerial application drift reduction technologies by farmers and other pesticide users to reduce risks from using agricultural pesticides
- to exchange information on OECD countries' current activities in the area of aerial application risk reduction
- to suggest and discuss options of further steps for OECD countries and key stakeholders in OECD and non-OECD countries to address the identified issues
- to recommend possible further steps for OECD.

9. In particular the following issues were presented during the Seminar:

- Training and certification programs on aerial spraying
- National regulations and schemes for risk reduction for aerial spraying
- Special requirements for aerial spraying equipment and pesticides used
- New application technologies and approaches for managing drift from aerial application
- Protecting workers, communities and sensitive sites
- Recommendations for improving aerial drift management.

STRUCTURE OF THE SEMINAR

10. The first part of the Seminar in the morning was devoted to informative presentations from governments and other stakeholders. The second part in the afternoon consisted of roundtable discussions that built on issues that arose from morning presentations, and recommendations for the OECD. The Seminar Programme is provided in [Annex 1](#).

GOVERNMENT AND STAKEHOLDER EXPERIENCE & PERSPECTIVES WITH AERIAL APPLICATION

11. Following an initial presentation on training and certification of aerial applicators in the US, government representatives of Australia, Germany, New Zealand and the European Commission presented their experiences and recent initiatives with aerial application in their own countries/regions. Then representatives of the industry (pesticide manufacturers) and NGOs presented their perspectives, actions and concerns related to aerial spraying.

12. Below are listed the main topics covered in the presentations. More detailed information can be found in the slides of presentations that are grouped in [Annex 3](#).

- *Reasons for treating by air* (e.g., treat large surfaces quickly, reach difficult terrains with impossible access by ground, prevent soil compaction, prevent damage to crops by not disrupting foliage, deal with wet soil conditions, respond to urgency situations, reduce cost)
- *Importance of education and training of aerial applicators* (development of specific educational programmes focusing on safety, maintenance/security and drift mitigation approaches leading to reduced number of aviation accidents and drift incidents associated with aerial application)
- New technologies to improve aerial spraying and to make applications more precise and efficacious, thus reducing pesticide risks (such as GPS-assisted aircrafts, use of smokers, electrostatic nozzles, air-induction nozzles replacing hollow cone nozzles that present a higher drift potential)
- *Recent developments in pesticide and environmental legislations* (in the European Union, the new “Framework directive on the sustainable use of pesticides” will generally ban aerial spraying from 2012 onwards. Derogations will however be possible in certain limited cases where clear advantages or no viable alternatives exist and under certain conditions - pesticides approved for aerial spraying; operator holding a certificate; sprayed area not in close proximity to residential areas; aircraft equipped with best available technology; emergency situations. Spraying steep vineyards – with helicopters - and forests were presented as possible derogation cases)
- *Aerial spray drift trials and modelling*, (importance of generating aerial drift trials, of deriving basic drift values and scenarios specific for aerial application – those for ground applications not being valid, of developing by-stander exposure models; use of spray drift reduction software such as AgDRIFT to estimate drift deposition)
- *Need for international collaboration in research* (on aerial drift modelling, droplet size modelling, application technology)
- *Product label restrictions* (statements to impose no-spray/buffer zones, to forbid application under certain wind conditions, to recommend spray drift reduction techniques, to use largest spray droplet size compatible with efficacy)

- *Communication and information aspects* (notification messages to residents and bystanders, community concerns with aerial spraying over/near homes and public sites)
- *Compliance and enforcement issues* (illegal applications, problematic “legal” applications, weak enforcement, loss of organic farming certification due to aerial drift, double standard for developed and developing countries).

ROUNDTABLE DISCUSSION

13. Following the presentations reviewing the existing programmes in OECD countries and among various stakeholders, the floor was opened to all Seminar participants for a roundtable discussion. The following points guided the discussion:

- Key issues and challenges of pesticide risk reduction from aerial applications
- Barriers to and solutions for the development of aerial spray drift reduction technologies
- Regulatory requirements that exist in different countries, and existing guidance and other voluntary measures concerning aerial spray drift reduction
- Good practices and innovative approaches
- Opportunities for further development for all stakeholders

14. All participants made knowledgeable interventions which contributed to a better understanding of the issues associated with aerial application and helped the group reach recommendation on follow-up steps for OECD on this topic.

SEMINAR RECOMMENDATIONS AND FINDINGS

Risks associated with aerial spraying

15. First, it was recognised that aerial application may be seen as potentially riskier than other forms of applications. Spraying is quicker and therefore whenever there are mistakes they are happening on a larger scale. Also, the pilot may have more difficulties to see the residents around the sprayed fields.

16. On the one hand, some risks were said to be *specific* to this type of application. Risks arising from aerial application are more difficult to control for by-standing communities (information to them is key) and for aquatic/terrestrial environments. Also, spraying over neighbouring crops, whether because of aerial drift or because of wrong/inaccurate applications, could generate problems (e.g. withdrawal of organic farming accreditation). In these cases, the answers are also specific: specific training/guidance for aerial application, specific modelling research on drift/deposition and droplet size, specific regulations (e.g. general ban in the European Union with possible derogations) including labels.

17. On the other hand, some risks associated with aerial application were *not* considered *specific*. For example, pesticide mix loading/cleaning procedures do not differ significantly from other types of application. In general, similar issues dealing with pollution from with point sources are encountered.

18. Some participants stressed that it was important not to damn one method of application compared to others. Each method presents inherent advantages and disadvantages and regulatory agencies regulate each at its optimal risk management level, using label restrictions, modelling and data information, etc.

Finally, it was recognized that there are some possibilities of shifting risks from one method to another. For example, when condemning/banning aerial application, this would imply, in certain situations, more incidents if ground application were used instead (e.g. for worker safety).

Benefits of aerial spraying

19. Aerial application demonstrates clear advantages in certain situations. It enables quicker applications (e.g. on large surfaces such as forests, cotton, soybean or in case of emergency/outbreaks) that lead to immediate cost savings. Also areas that are difficult to reach by ground can be accessed and treated by air (e.g. trees, bananas, palms).

Technical developments

20. A number of risk reduction technologies were reviewed and encouraged:

- **Air-induction nozzles** to reduce spray drift
- **GPS techniques** to guide aircraft pilots on the tracks
- **Electrostatic nozzles.** Such devices induce the chemical droplets with either a positive or negative charge before their release over the target. Charged aerial sprays are attracted to targeted objects such as crops, trees and other plants. Electrostatic nozzles can be very beneficial in aerial application because less drift seem to happen, less pesticide mix is used per sprayed area, hence larger areas are treated per load, meaning less fuel used. But some concerns were expressed with this technique: in some case, product penetration on the leaves could be reduced.
- **Innovative approaches** such as reverse venture devices, lower speed aircrafts (to limit turbulence and vortex effects), drone/remote control aircrafts (to reduce risks for the pilot/operator), laser/camera controlled systems.

Communication and information

21. Communication was seen as a key factor for risk reduction. Good exchange of information should take place between residents and growers, in an open and transparent way (right-to-know issue). Education and training (primarily for applicators and ideally also for the neighbouring communities on a voluntary basis) specific to aerial application is essential.

IPM (Integrated Pest Management)

22. Wherever possible, IPM good practices were again encouraged as a way to reduce pesticide risk reduction.

Specific regulations

23. As mentioned above (paragraphs 16 and 18), specific regulations are needed to cover aerial application and its specific risk profile(s).

Recommendations for possible further OECD work

24. The main recommendation concerning OECD's potential role was two-fold:

- **to promote information exchange on aerial application**
- **to develop a code of best/good practices for aerial application.**

25. The recently-established OECD Network of Experts on Spray Drift (NESD) was seen as the right body to promote and facilitate information exchange on aerial application, in particular as it relates to spray drift management. In a first phase, the NESD would collect existing documents from regulatory authorities on aerial application (on spray drift reduction aspects, but also on e.g. current research, methodologies, up-to-date practices, guide books). Information collected would be posted on the NESD website that is expected to be ready in the first half of 2010.

26. The development of a code of best/good management practices for aerial application could take place in a second phase, if deemed useful by the RRSB, depending on the information collected during the initial phase. NESD members could draft a short document of the generic or basic important elements for a best management plan (BMP) for spray drift management for aerial applications. These elements would be based on existing countries' BMPs that would have been collected during the first phase. The use of the basic OECD BMP would be for countries that may not have their own BMPs and wish to develop their own.

ANNEX 1

**OECD SEMINAR ON PESTICIDE RISK REDUCTION THROUGH BETTER
NATIONAL RISK MANAGEMENT STRATEGIES FOR AERIAL APPLICATION**

24 February 2009, San Francisco, US

SEMINAR PROGRAMME

Chair: Wolfgang Zornbach, Germany

9.00 a.m.	<p>Introduction</p> <ul style="list-style-type: none"> • Opening remarks – EPA Region 9: <i>Kathy Taylor, Associate Director of the Communities and Ecosystems Division</i> • Welcoming remarks – US-EPA: <i>Jay Ellenberger, Associate Director Field and External Affairs Division, Office of Pesticide Programs</i> • Purpose and structure of the seminar - Chair • Tour de table to introduce participants
	<p>Training & Certification of Aerial Applicators on Drift Management</p> <ul style="list-style-type: none"> • USA: <i>Education/Training Program of Aerial Applicators</i> (Randy Hale, National Agricultural Aviation Association (US)) • Other countries are invited to make presentations and share experiences
	<p>Government Regulatory Initiatives, Experience and Perspectives</p> <ul style="list-style-type: none"> • European Commission: <i>Framework Directive</i> (Wolfgang Zornbach, Germany, on behalf of the EC) • Australia: <i>Spray Drift Risk Assessment and Regulation at the APVMA</i> (David Loschke, Australian Pesticides and Veterinary Medicines Authority) • Other countries are invited to make presentations on their experiences

	<p>Aerial Application Equipment and Other Technologies for Drift Management</p> <ul style="list-style-type: none"> • Australia/New Zealand: <i>Modelling Drift and Droplet Size for Aerial Application</i> (Andrew Hewitt / Warren Hughes) • Germany: <i>Helicopter Drift Trials in Germany</i> (Dirk Rautmann, Institute for Application Techniques in Plant Protection) • CropLife International: <i>Why aerial spraying? - the reasonable case for this type of application</i> (Keith Jones, Director of Stewardship of CropLife International)
	<p>Perspectives from the Public on Aerial Applications</p> <ul style="list-style-type: none"> • PAN: <i>Drift from Aerial Spraying: The View from the Other Side of the Fence</i> (Susan Kegley, Pesticide Action Network North America)
	<p>Round-table Discussion</p> <ul style="list-style-type: none"> • Regulatory requirements that exist in different countries, and existing guidance and other voluntary measures concerning aerial spray drift reduction • Economic aspects related to innovation and adoption of aerial spray drift reduction technologies • Good practices and innovative approaches • Barriers to and solutions for the development of aerial spray drift reduction technologies • Opportunities for further development for all stakeholders
	<p>Summary of the Discussion, Ideas for Follow-up, Recommendations for possible further OECD work</p>
5.00 p.m.	End of the Seminar

ANNEX 2

**OECD SEMINAR ON PESTICIDE RISK REDUCTION THROUGH BETTER
NATIONAL RISK MANAGEMENT STRATEGIES FOR AERIAL APPLICATION**

24 February 2009, San Francisco, US

LIST OF PARTICIPANTS

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David LOSCHKE
Principal Scientist
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TOPPS

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ANNEX 3

**OECD SEMINAR ON PESTICIDE RISK REDUCTION THROUGH BETTER
NATIONAL RISK MANAGEMENT STRATEGIES FOR AERIAL APPLICATION**

24 February 2009, San Francisco, US

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**Presentation 1
US National Agricultural Aviation Association
Randy Hale**



**OECD Seminar on Aerial
Application**

San Francisco, California

February 24, 2009

Randy Hale, NAAREF President

Presentation Outline

- NAAA & Aerial Application Industry Overview

- Drift Mitigation Efforts
 - PAASS Program
 - Operation S.A.F.E.





- NAAA operator and pilot members are licensed as commercial applicators that use aircraft to enhance food, fiber and biofuel production, protect forestry, and control health-threatening pests.
- NAAA has 1,500 members in 46 states throughout the United States.
- According to USDA's Ag Research Service, aerial application account for almost 25% of crop protection applications and nearly 100% of forest protection applications.

Aerial Application Industry Statistics & NAAA Goals*

No. of Aircraft per business:	2.2
Percent of industry airplanes:	88%
Percent of industry helicopter:	12%
Percent of aircraft closed-cockpit	97%
Percent of industry that use GPS	92%**

* From 2004 NAAA Survey

** An NAAA 1998 survey indicated that 60% of agricultural airplanes were equipped with GPS as compared to 25% in 1994.



Aerial Application Industry Overview

Why treat crops by air?

- Wet soil conditions
- Quickly treat large acreages (3 to 4 times as fast as other forms of application)
- Prevent soil compaction
- Prevents damage to crops by not disrupting foliage.



Aerial Application Industry Statistics & NAAA Focus

NAAA Environmental Focus

- Increase the application efficacy of crop protection products (use less; cover more);
- Deliver spray materials onto their intended target (mitigate drift);
- Address these points through education and the development of new technologies



Education



NAAREF & PAASS



NAAA's sister organization - the National Agricultural Aviation Research and Education Foundation (NAAREF) - developed the Professional Aerial Applicators Support System (PAASS) - in 1998. PAASS is a comprehensive educational program for aerial applicators focusing on safety, security and drift mitigation.



Professional Aerial Applicators Support System (PAASS)

- Offered at approximately 22 of the state and regional ag aviation association conventions each year.
- Many SLA's offer CEU's for PAASS attendance.
- PAASS has received funding from EPA and FAA.
- Many Insurance companies offer discounts and or additional coverage to pilots for attending PAASS.
- PAASS attended by approximately 1,800 ag pilots and aerial application operators each year.
- PAASS goals: reduce the number of aviation accidents and drift incidents associated with aerial application and enhance security through education.





Program Development & Presentation



- Educational content designed by distinguished program content committee (University PhD's, crop protection product manufacturers, insurance company reps, aircraft & spray equipment engineers).
- Presented by experienced pilots, operators and other allied industry personnel professionally trained that speak the audience's language.
- At each session the participants of PAASS are requested to evaluate the program and presenters.
- This immediate feedback allows program to be constantly strengthened and remain pertinent to current industry environment.


Drift Mitigation Examples in PAASS Program

- PAASS Program teaches applicators how to:
 - Use droplet spectrum software models for drift mitigation
 - Conduct spray system maintenance to avoid misapplications



Drift Mitigation Examples in PAASS Program

- Spray drift reduction software models

-  Nozzle Atomization Model
- Spray Drift Task Force (SDTF) AgDrift[®] spray model
 - Models allow user to input and select specific operational parameters such as aircraft, nozzle type and nozzle size, wind velocity, airspeed, and pressure.
 - Output: model results will then be related quantitatively to spray drift and various drift mitigation options (i.e. droplet size, and amount of product moving off-target.)



USDA Aerial Nozzle Atomization Models

CP-03 NOZZLE
FOR USE ON FIXED-WING AIRCRAFT
 AERIAL APPLICATORS SPRAY NOZZLE HANDBOOK
 USDA ARS AGRICULTURAL HANDBOOK NO. XXX
 I. W. Kirk, Agricultural Engineer, Area-wide Pest Management Research Unit,
 Southern Plains Agricultural Research Center, Agricultural Research Service, U. S. Department of Agriculture, 2771F&B Road, College Station, TX 77845-4966, USA.

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Directions: Enter CP-03 nozzle settings, pressure, and airspeed in the cells highlighted below.
 (Atomization parameters are valid only with nozzle and operational settings specified in the Acceptable Range.)

	Orifice Size, inches Acceptable Range: .061 to .171 <input style="width: 100%; height: 20px;" type="text" value="0.125"/>	Deflector Angle, degrees Acceptable Range: 30 to 90 <input style="width: 100%; height: 20px;" type="text" value="30"/>	Pressure, psi Acceptable Range: 20 to 60 <input style="width: 100%; height: 20px;" type="text" value="60"/>	Airspeed, mph Acceptable Range: 100 to 160 <input style="width: 100%; height: 20px;" type="text" value="130"/>
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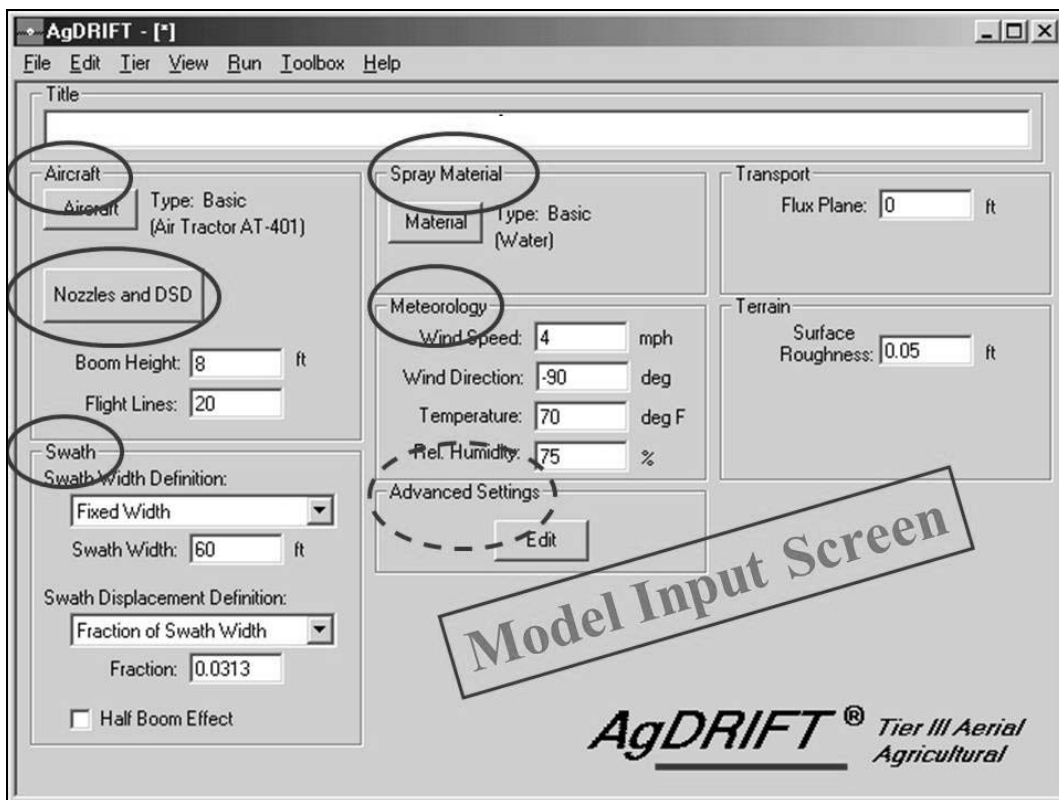
Atomization parameters are displayed in the box below.

CAUTION: Do not enter or clear data in this box!

D_{v0.5} =	301 μm	= Volume median diameter
RS =	1.01	= Relative Span
%V<100μm =	6.62 %	= Percentage of spray volume in droplets smaller than 100 μm diameter.
%V<200μm =	17.51 %	= Percentage of spray volume in droplets smaller than 200 μm diameter.
DSC =	MEDIUM	= ASAE S572 AUG99 Droplet Spectra Classification

Values and classifications reported here are least-squares best-estimate predictions from experimental data collected in a wind tunnel. Values reported from other laboratories may not yield the exact same values, but similar trends would be expected. The ASAE droplet spectra classification category is based on droplet sizes in the mid-80% of the spectrum and not a single data point.

Trade names are mentioned solely for the purpose of providing specific information. Mention of a trade name does not constitute a guarantee or warranty of the product by the U. S. Department of Agriculture, and does not imply endorsement of the product over other products not mentioned.



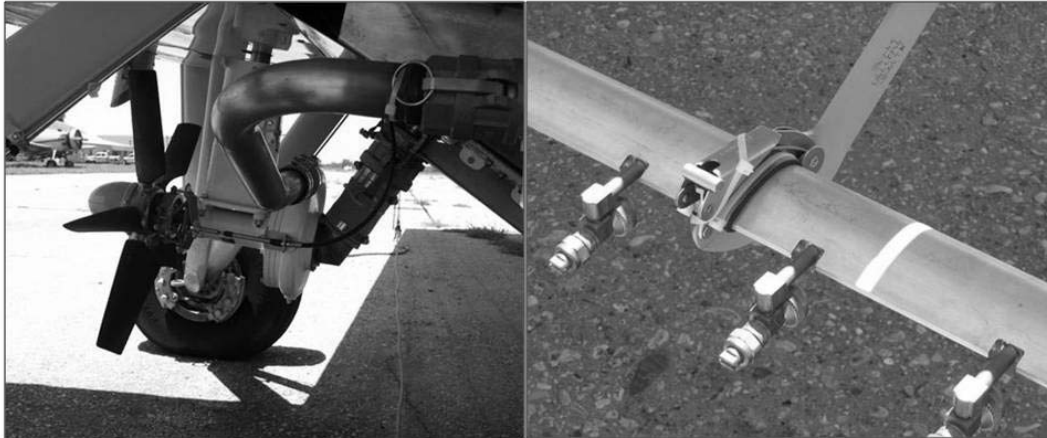
Drift Mitigation Examples in PAASS Program

The PAASS Program educates applicators about conducting proper maintenance of their spray systems.



Drift Mitigation Examples in PAASS Program

The PAASS Program educates applicators about conducting proper maintenance of their spray systems.




Education: NAAREF & Operation S.A.F.E




Operation S.A.F.E. Fly-Ins provide spray pattern testing clinics allowing the ag pilot the opportunity to work with a trained analyst to test and calibrate his ag aircraft application equipment.





NAAREF & Operation S.A.F.E



2007 Statistics



Number of Total S.A.F.E. Clinics: →→ 35

Number of Total Participating Aircraft: → 253

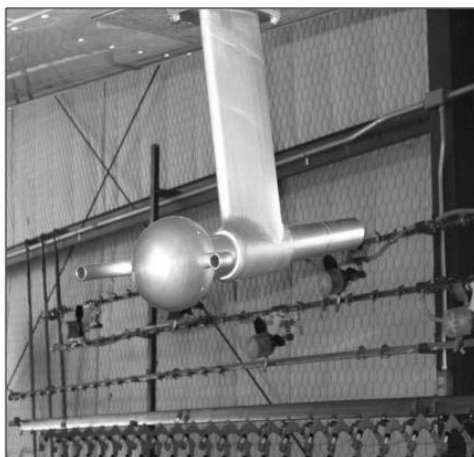
Number of Total Passes Analyzed: →→ 1,704

NAAA Efforts to Enhance Aerial Technology

- ARS Efforts
 - Sought and Obtained Increased funding for ARS Aerial Application Research Technology Program by \$4 million over 7 years.
 - Facility designs and tests many of the new technologies coming to market
 - Variable Rate
 - Using GIS and flow control to use crop protection products only where needed at the exact rate needed
 - Using meteorological technology to provide real time nozzle adjustments and flow of chemical to mitigate drift
- Use PAASS Programs, Operation S.A.F.E. clinics, magazine and annual convention to keep industry abreast of new technologies



NAAA Efforts to Enhance Aerial Technology



Aircraft - Integrated Meteorological Measurement System (AIMMS) measures site specific atmospheric turbulence data to support aerial application, including wind speed, direction, altitude, humidity and temperature.



NAAA Efforts to Enhance Aerial Technology

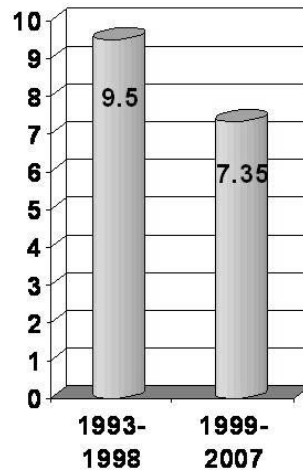


Electrostatic Nozzles— developed by ARS—induces the chemical droplets with either a positive or negative charge before their release over the target. Charged aerial sprays are attracted to targeted objects such as crops, trees and other plants. Electrostatic nozzles can be very beneficial in the aerial application industry because you can use less carrier per acre with the active ingredient; hence you can apply more acres per load. This means less fuel used.



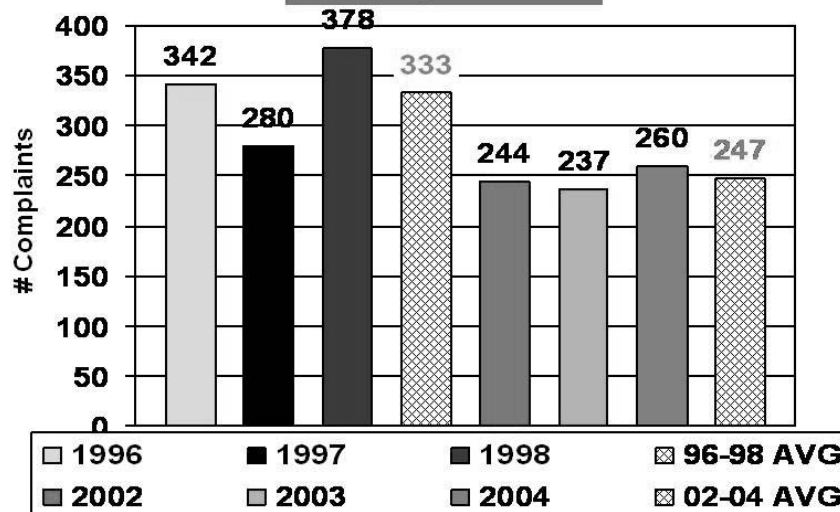
Ag Aircraft Accident Rates Before & After PAASS Began

- Agricultural Aircraft accidents are down.
- Avg. accident rate pre-PAASS (1993-1998) - **9.5** accidents per 100,000 ag hours flown
- Avg. accident rate after PAASS began (1999-2007) - **7.35** accidents per 100,000 ag hours flown



■ Accidents per 100,000 hours

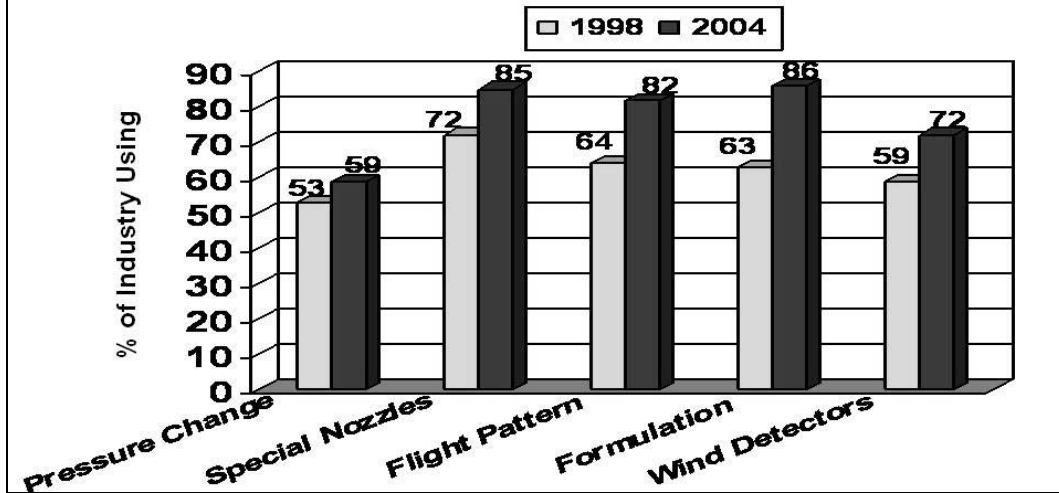
AAPCO Confirmed Aerial Drift Complaints



- This is out of an estimated 200 - 250 million acres treated by air per year
- Drop in drift complaints by 26% when comparing 3 year periods

Drift Mitigation Advancements

The PAASS program has influenced Aerial Applicators to increase their adoption of drift reduction techniques and technologies.



Pilots View of Global Positioning Satellite (GPS) System

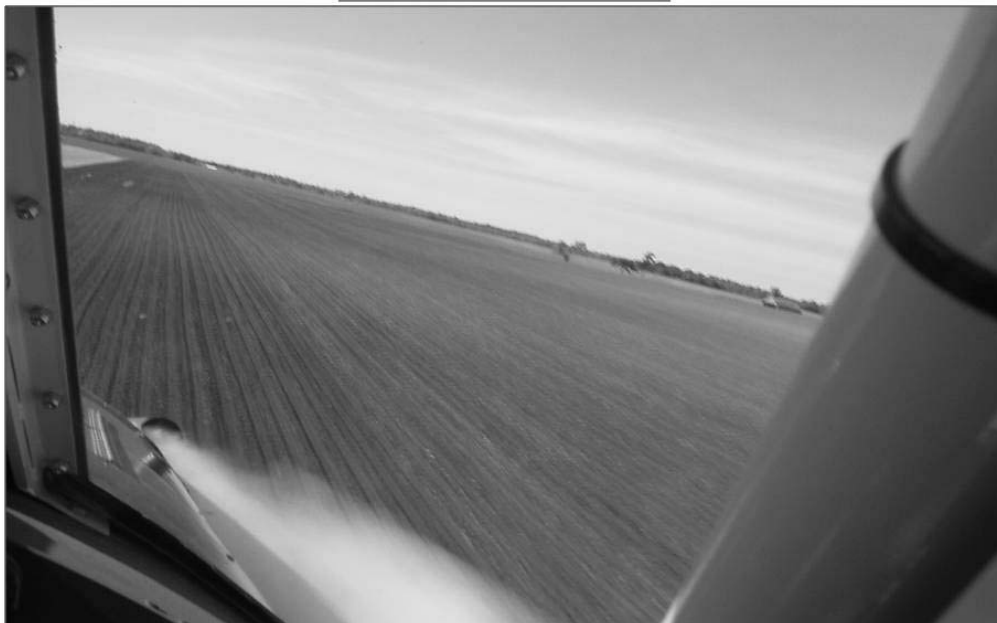




Drift Mitigation Equipment

- Drift indicators (Smokers) are extremely useful tools for predicting the direction of product movement before release.
 - A Smoker releases a small cloud of smoke from aircraft; direction smoke moves indicates direction released product will move.
 - This is a great help in reducing adverse affects of crop protection products.
 - Use of Smokers increased from 59% in 1998 to 85% in 2004.

Aircraft Activating Smoker to Determine Wind Direction



Smoke Movement (right-center of picture)
helps to determine product movement



Conclusion

- Through the PAASS & Operation S.A.F.E. educational programs, the professionalism of the aerial application industry is augmented and the stewardship of the environment is promoted.
- Technological developments through USDA and private research enable equipment and educational content material for aerial application to be more environmentally friendly, precise and efficacious.





Thank You to the OECD!

Randy Hale, NAAREF President

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Website: www.agaviation.org

**Presentation 2
European Commission
Wolfgang Zornbach on behalf of the EC**



FRAMEWORK DIRECTIVE ON THE SUSTAINABLE USE OF PESTICIDES

-
The final content

**European Commission
DG Environment
Unit B.3 (Biotechnology, Pesticides & Health)**

RRSG Seminar on Aerial Applications – San Francisco, 24 February 2009

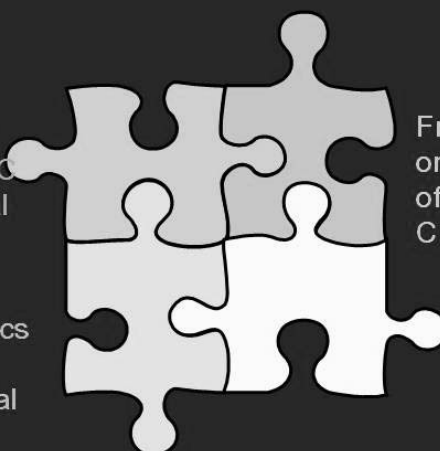
Slide 1



Legislative proposals of the Pesticide Package

Regulation revising
Directive 91/414/EEC
COM(2006) 388 final

Regulation on the
collection on statistics
on PPP
COM(2006) 778 final



Framework Directive
on the sustainable use
of Pesticides
COM(2006) 373 final

Directive on the
placing on the market
of pesticide application
equipment
COM(2008) 535 final

RRSG Seminar on Aerial Applications – San Francisco, 24 February 2009

Slide 2



Overall objective

- **Achieve a more sustainable use of pesticides by reducing the risks and impacts of pesticide use on human health and the environment and promoting the use of IPM and of alternative approaches such as non chemical alternatives**
 - **Fill the EU legislative gap regarding the use-phase of pesticides**
-



Aerial spraying 1/2

- **Prohibition of aerial spraying with derogation possibility where:**
 - clear advantages or no viable alternatives
 - pesticides approved for aerial spraying
 - operator holds a certificate
 - enterprise doing aerial spraying certified
 - sprayed area not in close proximity to residential areas
 - aircraft equipped with best available technology as from 2013
 - **Competent authorities examine requests and specify how to warn residents and bystanders and protect the environment**
-



Aerial spraying 2/2

- **Two-tier approach for standard requests:**
 - Submission of an application plan (with general information) to be approved
 - Specific requests (more detailed) in accordance with approved plan; implicit consent possible
- **Single requests with accelerated procedure possible for emergency situations**
- **Record keeping of requests and approvals**
- **Relevant information (day and time of spraying, type of pesticide used) available to the public**
- **Appropriate compliance monitoring to be carried out**

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Slide 5



Additional measures

- **National Action Plans with risk and use reduction targets**
- **Access to training for professional users, advisers, distributors (See Annex I) -> certificate of sufficient knowledge**
- **Regular inspection of application equipment in professional use to check compliance with requirements (see Annex II) -> certification**
- **Protection of the aquatic environment and drinking water**
- **Prohibition or minimisation of pesticide use in specific areas**
- **Handling, storage and waste of pesticides, remnants, packaging**
- **Use of risk indicators to monitor progress made**

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Slide 6



Implementation phase

- **Second-reading agreement found – EP vote at second reading on 13 January 2009**
- **Publication in OJCE and entry into force in the Spring?**
- **Two years for transposition (some delays for establishing certain provisions)**
- **Regulation on marketing will enter into force at the same date as the directive**
- **Discussions still ongoing on the last two proposals**

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Slide 7



All the documents are available at:

<http://ec.europa.eu/environment/ppps/home.htm>

Thank you for your attention !

RRSG Seminar on Aerial Applications – San Francisco, 24 February 2009

Slide 8

Presentation 3
Australia
David Loschke

Spray Drift Risk Assessment and Regulation at the APVMA



**OECD RRSRG Seminar
Spray Drift Regulation**

24 Feb 2009

Presenter: David Loschke



Australian Government
Australian Pesticides and
Veterinary Medicines Authority

**The Australian Pesticides and Veterinary Medicines
Authority is Australia's national regulator of pesticides**

The APVMA is responsible for 3 main risk
areas of pesticide use

It must –

- Protect human health
- Protect the health of the environment
- Protect Australia's international trade

Spray drift can affect all three risk areas



APVMA and Spray Drift

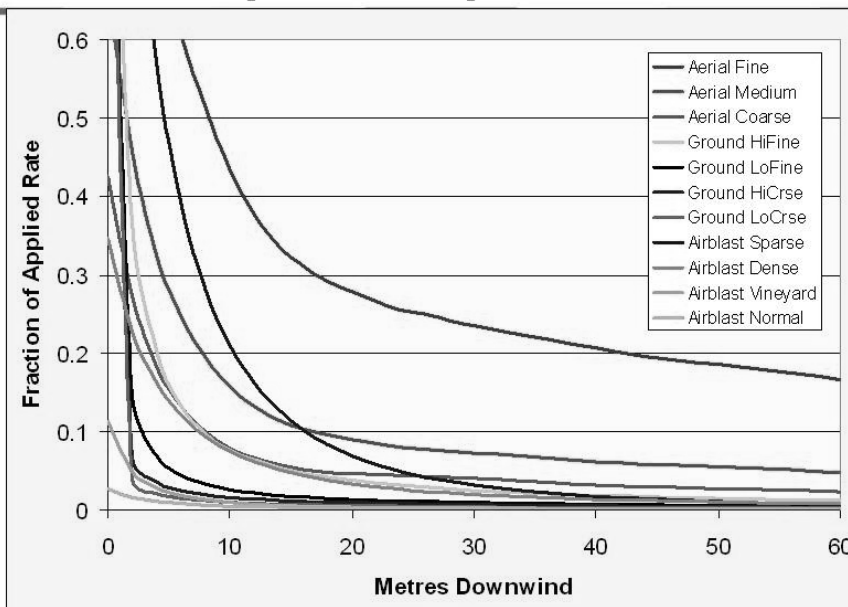
- On 15 July 2008, the APVMA published on its website a policy overview paper entitled –
APVMA OPERATING PRINCIPLES IN
RELATION TO SPRAY DRIFT RISK
- The website also contains information about how protective no-spray zones are set and about how the APVMA estimates potential drift by using standard application scenarios

APVMA Spray Drift Risk Assessment

- The APVMA uses both computer modelling and field data sets to estimate drift deposition
- Currently, 19 standard spray drift risk assessment scenarios are available on the APVMA website
- Spray drift risk is assessed near the upper estimate of risk for equipment and methods typical of Australian industry

Australian Pesticides and Veterinary Medicines Authority

Examples of typical drift deposition profiles



Australian Pesticides and Veterinary Medicines Authority

Risk Management Approach

- Risk is managed by means of instructions and restrictions placed on product labels
- State and Territory authorities enforce mandatory label instructions as law
- If a method of application (for example aerial) has not been assessed for risk, that method is forbidden on the label

Australian Pesticides and Veterinary Medicines Authority

Principal Label Restrictions

Mandatory label statements include:

- Required use of largest spray droplet size compatible with efficacy – specified as a standard spectrum – currently within ASAE S572
- Limits on wind speed during spraying
- Imposition of protective downwind no-spray zones (buffer zones) when necessary

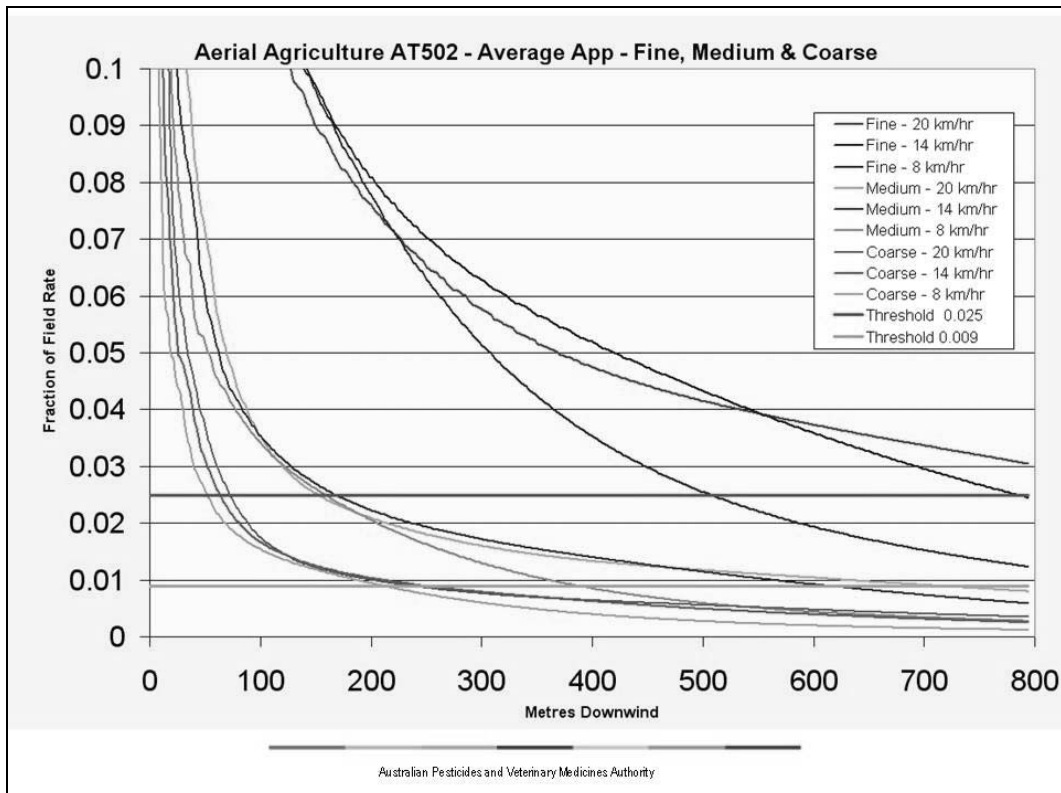
Australian Pesticides and Veterinary Medicines Authority

Mandatory No-Spray Zones

Mandatory no-spray zones (buffer zones) exist only in the downwind direction at the time of spray application

- Labels might have a different no-spray zone for each of the three major risk categories
- The size of a no-spray zone is based on estimated spray drift deposition linked to an acceptable risk-threshold based on scientific studies

Australian Pesticides and Veterinary Medicines Authority



Beyond Label Restrictions

Label restrictions based on current typical practice will form a relatively stable reference point over time.

- As industry practices improve with new drift reducing technologies (DRT), those who take up aspects of DRT can be rewarded through a special mechanism
- The mechanism will be based on methods used in Europe and Canada

Australian Pesticides and Veterinary Medicines Authority

Beyond Label Restrictions

Label mandatory no-spray zones can be reduced by factors tied to the measured benefit of particular DRTs

- An easily updated reference document referred to on each label will explain the reduction factor for each type of DRT
- Australia will use existing data for these factors as much as possible

Australian Pesticides and Veterinary Medicines Authority

Systematic Label Reviews

Targeted label revisions of older products for spray drift risk have recently begun

- A large number of old products need to be reviewed – perhaps more than 2,000
- This massive task is expected to require four to five years

Australian Pesticides and Veterinary Medicines Authority

Example Wind Speed Restriction Statement

DO NOT apply when wind speed is less than 3 or more than 20 kilometres per hour at the application site.

Australian Pesticides and Veterinary Medicines Authority

Example Droplet Size Restriction Statement

DO NOT apply with smaller than **COARSE** spray droplets according to ASAE S572 definition for standard nozzles.

Australian Pesticides and Veterinary Medicines Authority

Example Human Health No-Spray Zone Restriction Statement

DO NOT apply when there are people, structures that people occupy or parks and recreation areas within XXX metres downwind from the application area.

Australian Pesticides and Veterinary Medicines Authority

Bystander Spray Drift Exposure Model

To determine the size of a human health no-spray zone as in the previous slide, the APVMA uses an exposure model that considers a small unclothed child playing on drift affected turf

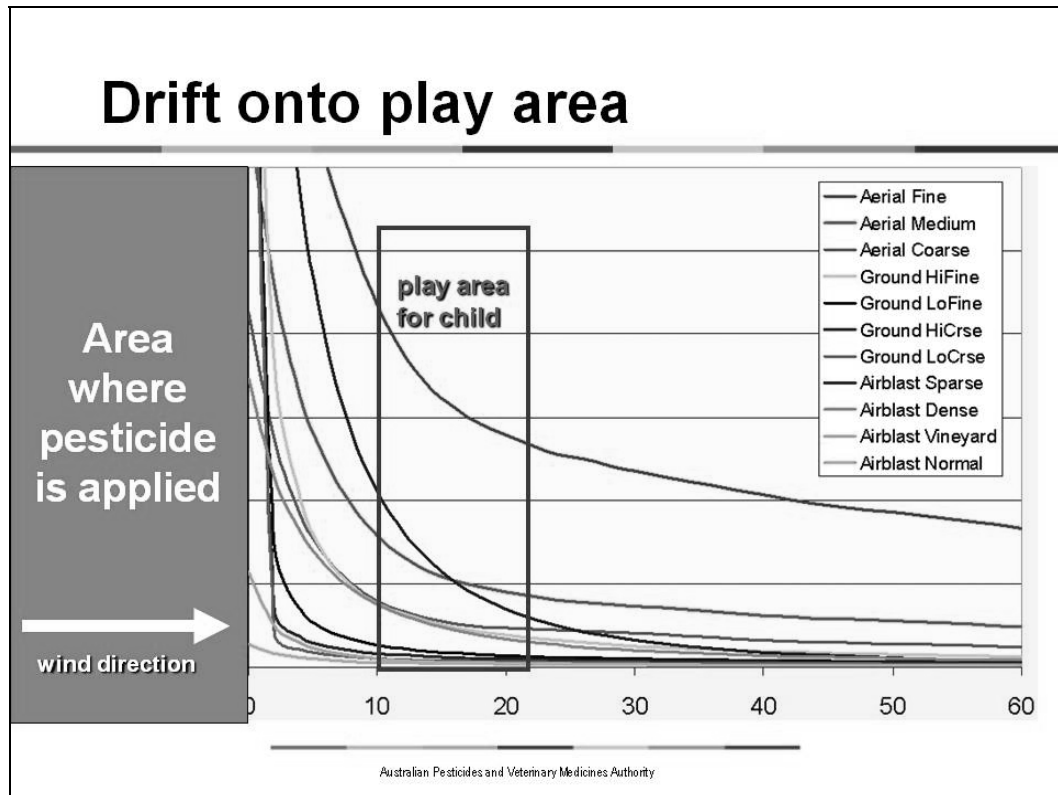
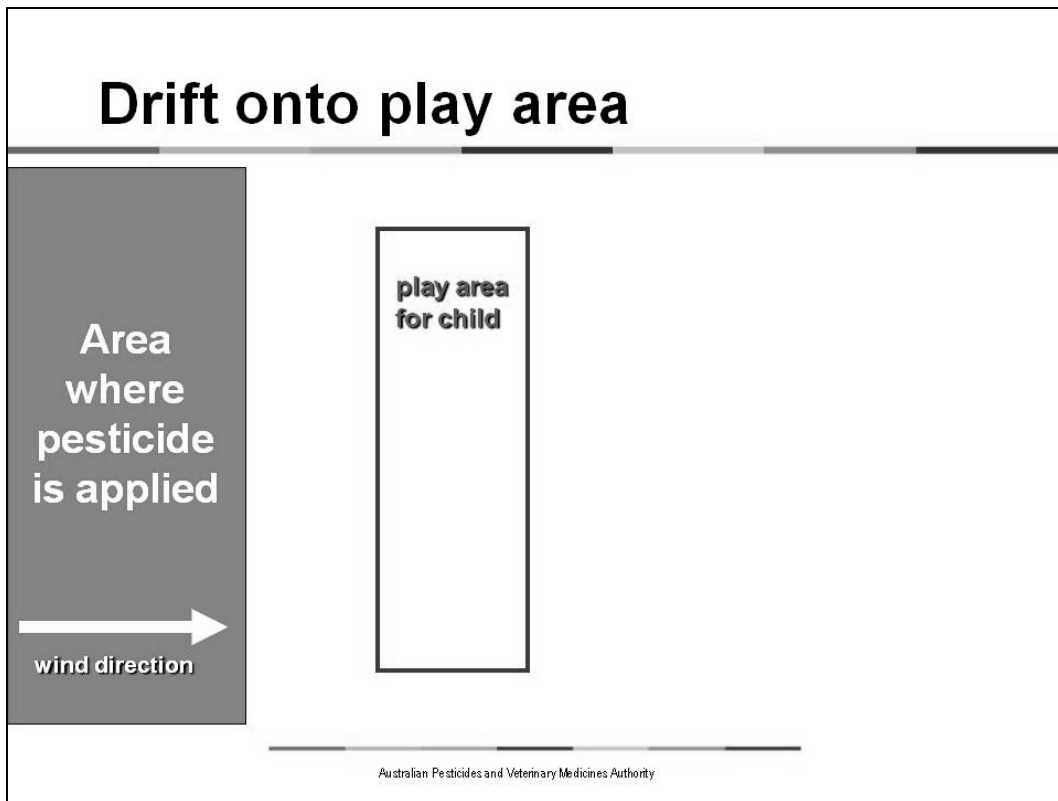
- The model combines standard drift scenarios with a toddler turf exposure model developed by the US EPA
- The model delivers total dose in mg/kg/day for both oral and dermal exposure as well as the sum of the two
- The size of the play area, its distance from the application area and other features can be set as input parameters

Australian Pesticides and Veterinary Medicines Authority

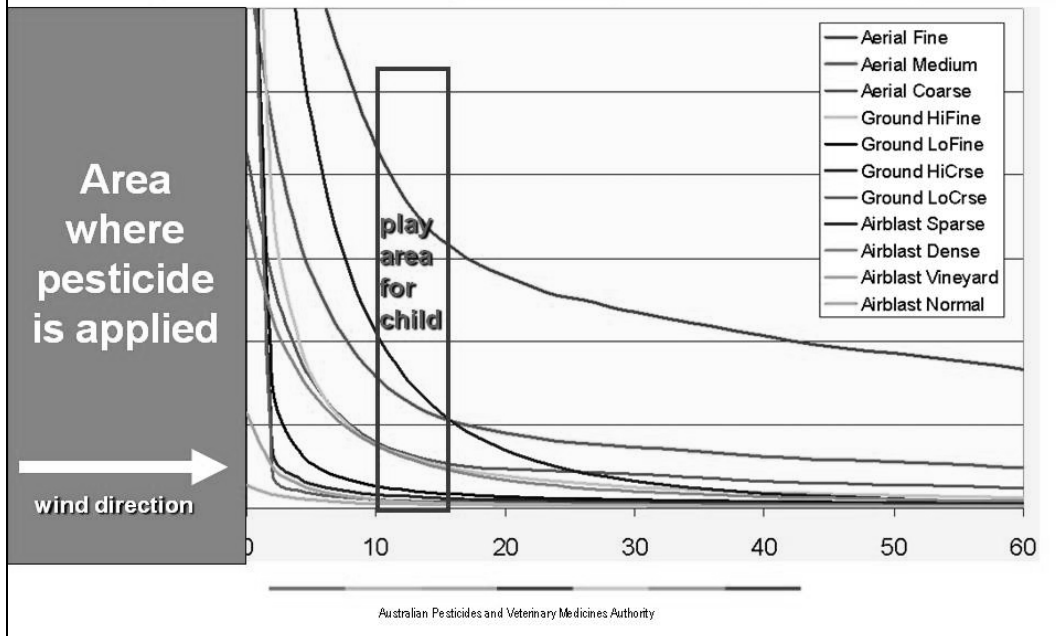
Bystander Spray Drift Exposure Model

- **The model integrates each deposition curve across the play area**
- **The width of the play area and its distance from the application area can be varied**
- **Input of the environmental half-life of the pesticide on foliage and time intervals between applications allow repeat applications to be taken into account**

Australian Pesticides and Veterinary Medicines Authority



Drift onto play area



A Question to Consider - Which Health Standard Should be Used as a Threshold?

- ARfD ?
- ADI ?
- Tailored standard based on appropriate short-term repeat dose study NOEL ?

Australian Pesticides and Veterinary Medicines Authority

thank you

Australian Pesticides and Veterinary Medicines Authority

Presentation 4
New Zealand
Andrew Hewitt / Warren Hughes

*Modelling Drift and Droplet Size for Aerial
Application*

Dr Andrew Hewitt

Lincoln Ventures, Lincoln University, New Zealand
University of Queensland, Australia

Summary

- Current models: drift and droplet size
Predictive models versus curve-fits for
field data
- Gaps and ongoing modelling work

Aerial Drift Models

- More effort has probably gone into modelling aerial spraying than any other application platform
- Several decades of work, millions of dollars by USDA Forest Service, NASA, US Army, Spray Drift Task Force, EPA and others – mostly focussed on a single platform, AGDISP

AGDISP

- Lagrangian modelling – higher level of complexity than simpler Gaussian approaches
- Tracks every droplet released from every nozzle on an aircraft through emission to transport to deposition within or beyond the target crop or forest
- Validated with thousands of field studies for diverse applications
- Extensively published

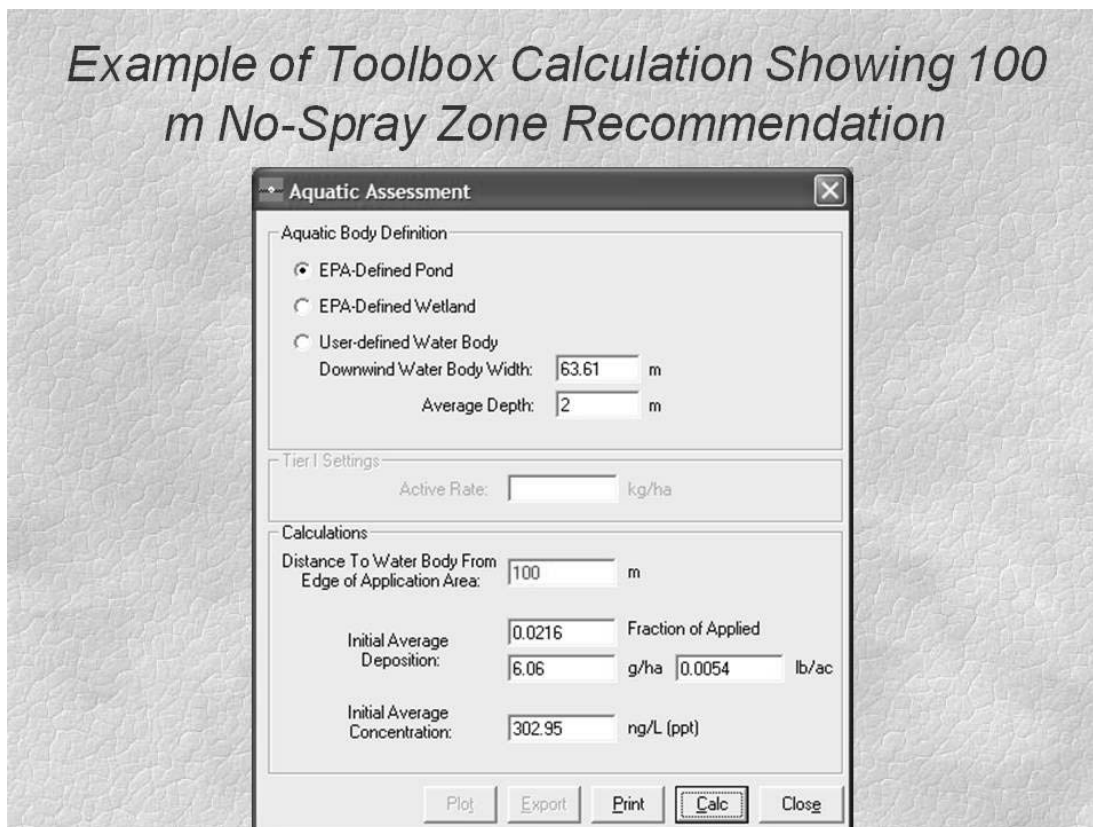
AgDRIFT

- The AGDISP code has found a home in many subsequent models, perhaps the most famous of which is AgDRIFT
- AgDRIFT is a regulatory-focussed model with three tiers for spray drift exposure risk assessment of pesticide application based on SDTF field study validation of AGDISP. Developed jointly by SDTF, EPA and USDA – download from www.agrdift.com

AgDRIFT

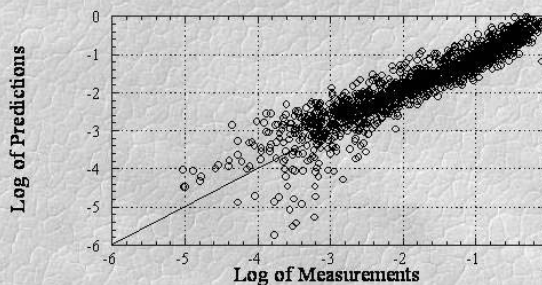
- Most users will input reasonable worst-case application conditions and use the toolboxes to assess spray drift mitigation options such as droplet size (e.g. “Coarse spray”), wind speed and perhaps boom length to manage drift
- Includes aquatic and terrestrial “no spray” buffer zone toolboxes as well as more specialised features such as stream assessments, multiple application assessments, etc.

Example of Toolbox Calculation Showing 100 m No-Spray Zone Recommendation



Future Work in NZ and N. America

- Improvements to the accountancy for spray within the canopy
- Alternative far-field drift calculations to reduce the 4 X difference between SDTF field studies and model data at such larger distances (e.g. using CALPUFF modelling) and variability/ uncertainty analysis for meteorological conditions. The current steady-state modelling approach wrongly assumes constant wind speed and direction in the field
- CFD Modelling considerations



Droplet Size Data Needs

- Important for product performance, drift management and spray efficacy
- Primary input for drift and application modeling, e.g. using AGDISP/ AgDRIFT
- Specified on increasing number of pesticide labels

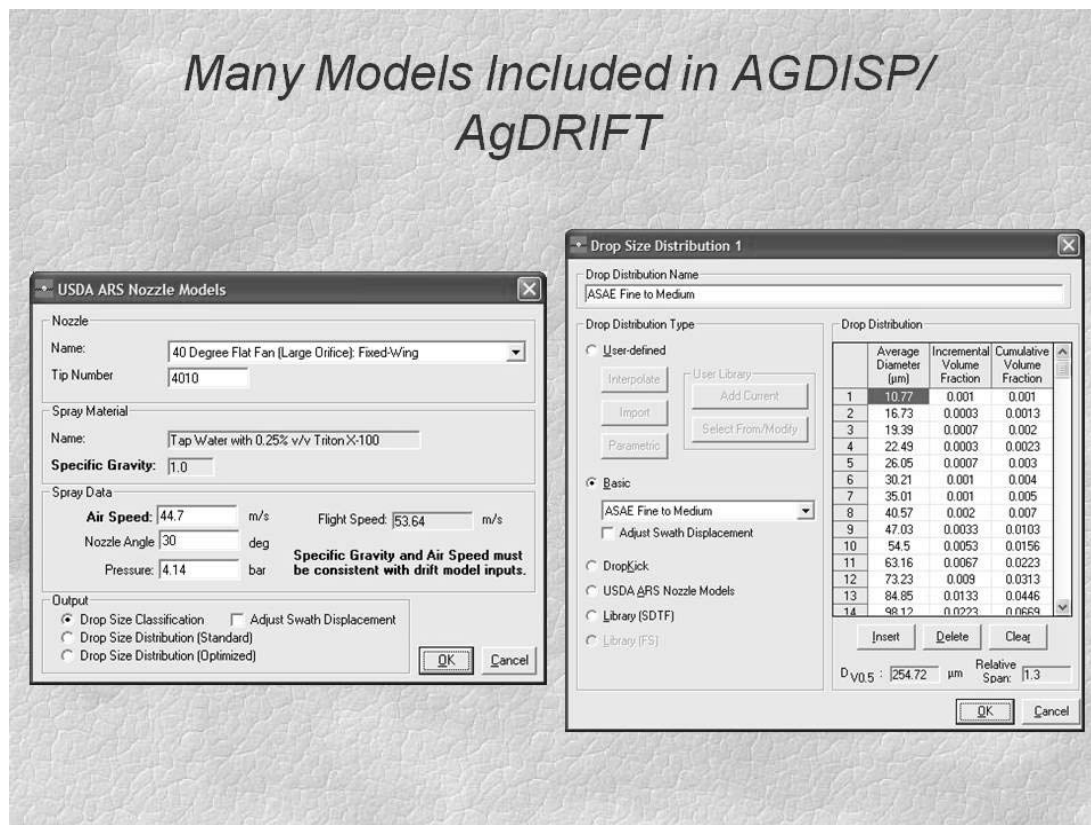
Aerial Droplet Size Modelling

- Nozzle catalogue ground droplet size data are not applicable to aerial scenarios due to air shear effects
- Aerial sprays tend to be more concentrated than ground sprays due to their lower water volume rates. This produces further changes in droplet size relative to ground conditions

Droplet Size Models

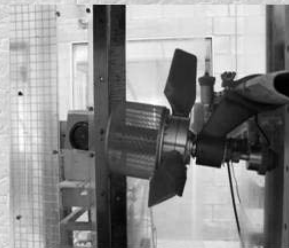
- USDA ARS – aerial models for water+surfactant - <http://apmru.usda.gov>
- SDTF – “DropKick” model within AgDRIFT
- Jones Air Australian nozzle angle model – in “JARBA” system
- Rotary atomiser models (ASC, Micronair, Unimiser)

Many Models Included in AGDISP/ AgDRIFT




Atomization Models


- Wind tunnel data being used to develop range of atomization models compatible with other droplet size data from SDTF already in AgDRIFT
- Extensive rotary atomizer and active tank mix/ adjuvant modeling




Example of Droplet Size Calculator



Nozzle Calculator for 2,4-D



The Centre for
Pesticide Application and Safety
"...for a safer environment"




Input data		Predicted droplet size		
Air Speed (knots)	120	D[v,0.1]	192	Coarse
Product	Water	VMD	425	Coarse
Nozzle Type	40° Flat Fan	D[v,0.9]	737	Coarse
Orifice Size	10	Fines (<150µm)	7.4	%
Pressure (bar)	4	Spray Quality		Coarse
Nozzle Angle	0			

Micronair AU5000

MICRONAIR

AU5000 ATOMISER

Droplet Size Prediction Model



Calculate flow per atomiser?

Application rate L/ha

Number of atomisers

Track spacing metres

Calculated flow per atomiser L/min

Formulation


Air speed Knots

Is RPM transducer fitted?

Blade angle degrees

Blade type

Atomiser rotational speed (spraying) RPM



The Centre for Pesticide Application and Safety
...for a safer environment™

PREDICTED DROPLET SIZE (µm)

D[v,0.1]	85
VMD	257
D[v,0.9]	481
Rel. Span	1.54

Click on yellow cells to select options

Enter data in grey cells

Ongoing Droplet Size Modelling

- Need to develop additional models for many application, adjuvant and tank mix types
- Increasingly important to facilitate compliance with pesticide label droplet size requirements

International Collaborations

- Modelling collaborations between researchers in several countries, e.g. current joint work by LVL (NZ), ILVO and CUL (Belgium), TAG Silsoe (UK), UQ (Australia), AAFC (Canada), USDA (US) and others
- We would like to collaborate with others as well on important drift and application technology research

For Further Information

- A.hewitt@uq.edu.au
- Andrew.hewitt@lvl.co.nz

**Presentation 5
Germany
Dirk Rautmann**



Helicopter Drift Trials in Germany

Dirk Rautmann
Institute for Application Techniques in
Plant Protection
Julius Kühn-Institut, Braunschweig

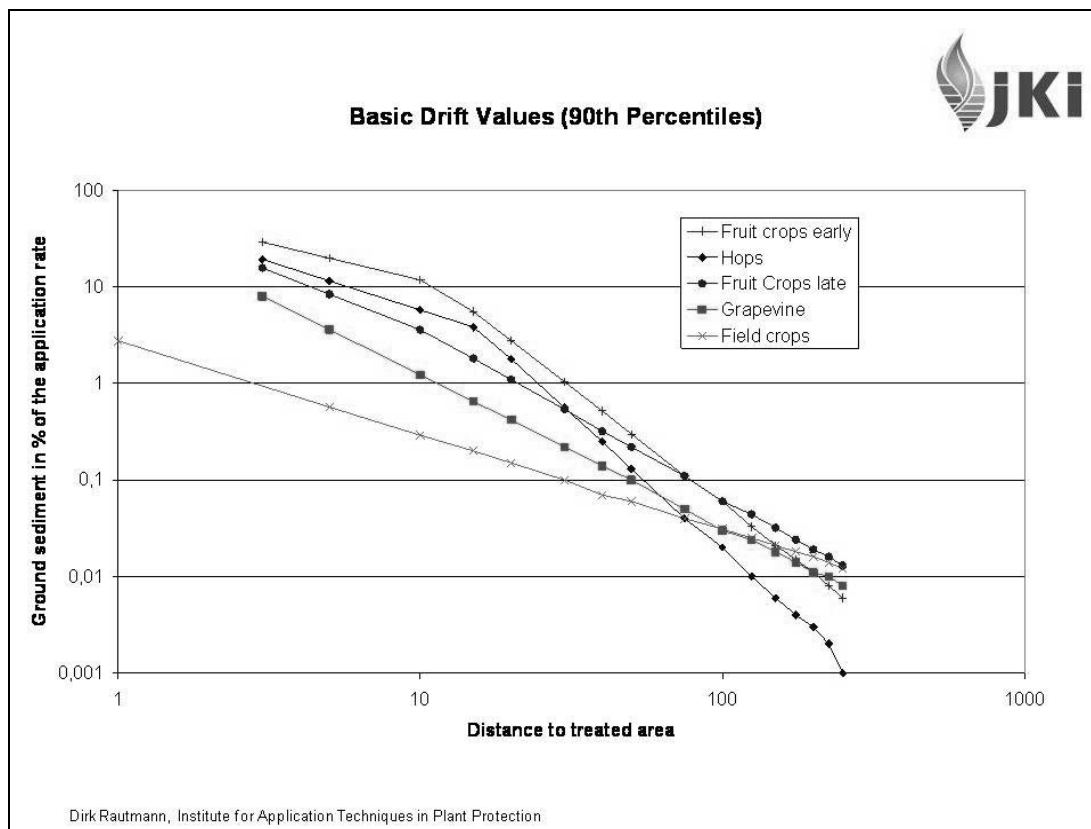
Dirk Rautmann, Institute for Application Techniques in Plant Protection


Introduction



- Exposure assessment in the authorization procedure for plant protection products is based in the first instance on the maximum application rate and the German drift values
- Basic Drift Values are available for
 - field crops
 - fruit crops
 - grapevine
 - hops
 - ornamental plants
- Basic Drift Values are valid for ground application but not for aerial application

Dirk Rautmann, Institute for Application Techniques in Plant Protection





Drift Values for Aerial Application

- In Germany aerial application is used in vineyards with steep slopes and in forests
- Aerial application techniques have changed in the last years (air induction nozzles)
- No Basic Drift Values are available
- Drift trials are necessary to develop Basic Drift Values

Dirk Rautmann, Institute for Application Techniques in Plant Protection

Aerial spraying in Vineyards in steep slopes



Dirk Rautmann, Institute for Application Techniques in Plant Protection

Application Techniques changed



Hollow cone nozzles until
2001



Low Drift Air Induction
Nozzles since 2002

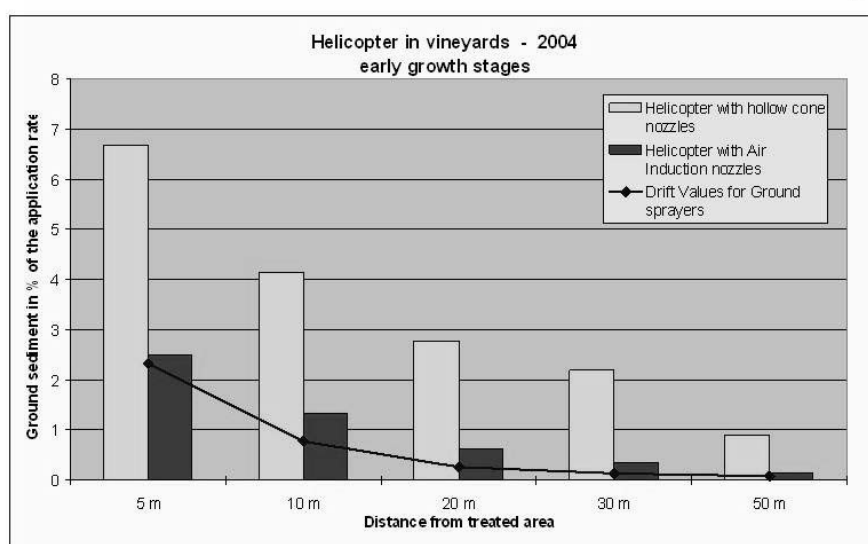
Dirk Rautmann, Institute for Application Techniques in Plant Protection

Drift trials in vineyards

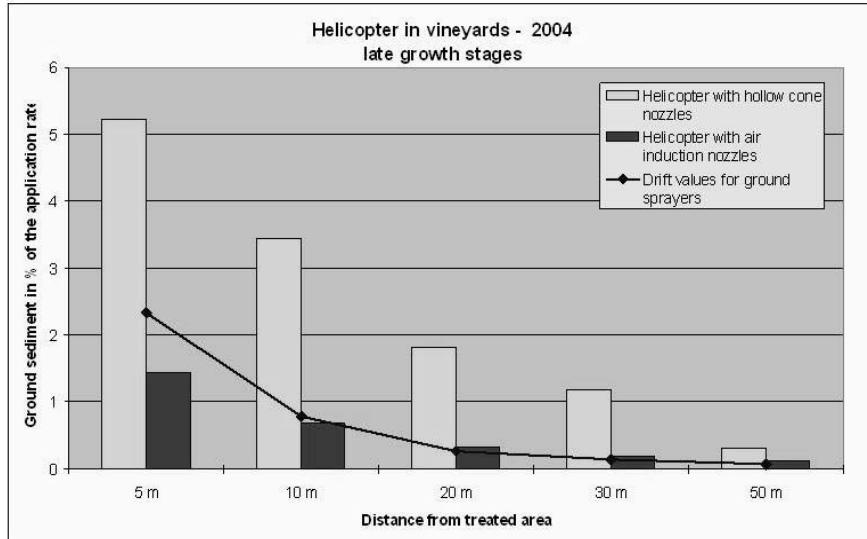


- 10 Trials in early growth stages (no leaves)
- 8 Trials in late growth stages
- Wind speeds between 2 m/s and 5 m/s
- Hollow cone nozzles (ATR) and air induction nozzles (AirMix)

Dirk Rautmann, Institute for Application Techniques in Plant Protection



Dirk Rautmann, Institute for Application Techniques in Plant Protection



Dirk Rautmann, Institute for Application Techniques in Plant Protection



Drift trials in forests

- Due to the costs trials have to be conducted in combination with real applications
- Applications are not done every year
- It is difficult to find suitable sites for the trials
- Wind speed and wind directions must fit during the application

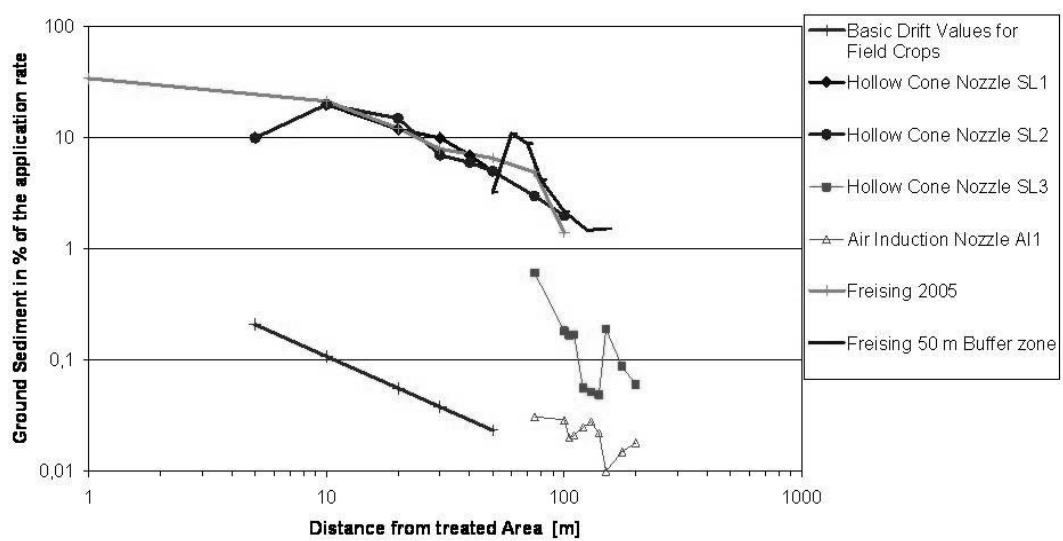
Dirk Rautmann, Institute for Application Techniques in Plant Protection

Aerial spraying in Forests



Dirk Rautmann, Institute for Application Techniques in Plant Protection

Results of Drift Trials in Forests with Helicopters 1994 - 2004



Dirk Rautmann, Institute for Application Techniques in Plant Protection

Drift results so far



Drift trials in 1994 and 2004 by different institutions showed a high drift potential, when spraying with hollow cone nozzles.

Buffer zones and air induction nozzles resulted in a significant drift reduction

More trials are necessary to get reliable data

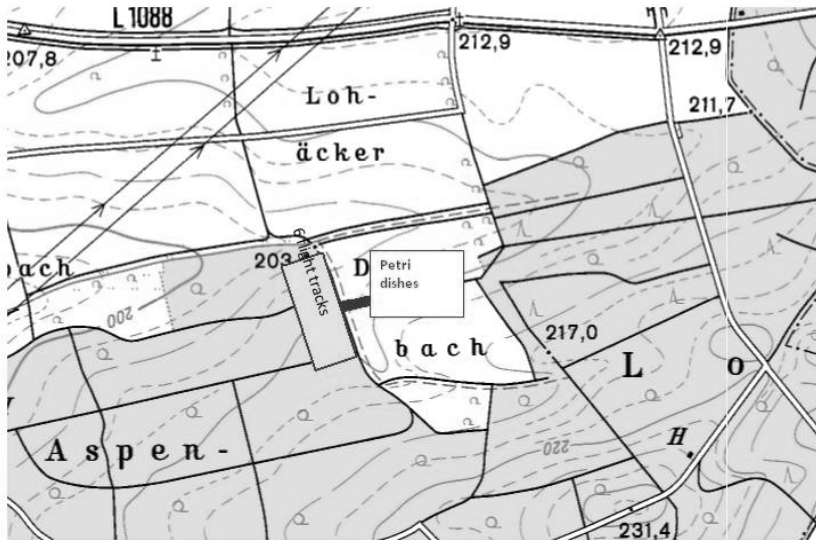
Drift results so far



Dirk Rautmann, Institute for Application Techniques in Plant Protection



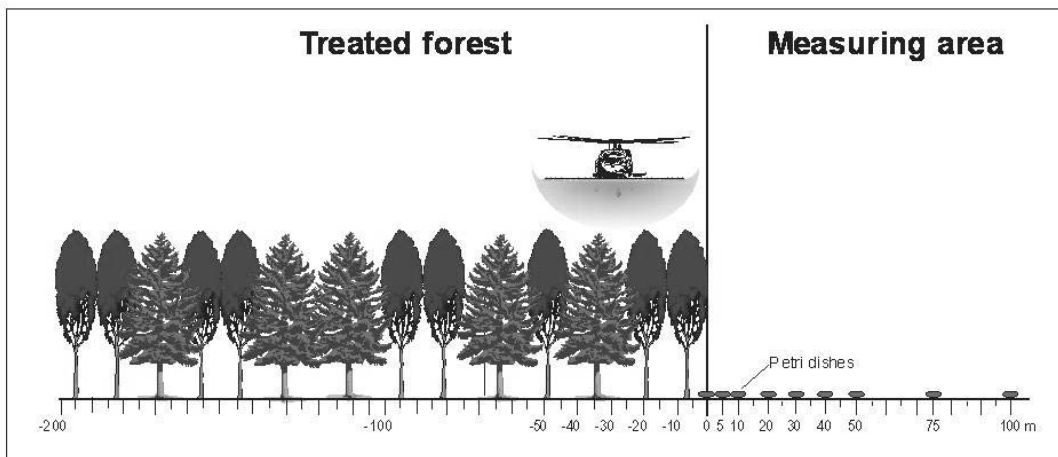
Drift trials in forests 2008 – Layout plan



Dirk Rautmann, Institute for Application Techniques in Plant Protection



Trial arrangement for drift measurements in forests



Layout following ISO 22866 – Equipment for crop protection – Methods for field Measurements of spray drift

Dirk Rautmann, Institute for Application Techniques in Plant Protection



Drift trials in 2008

Forest sprayed to the edge

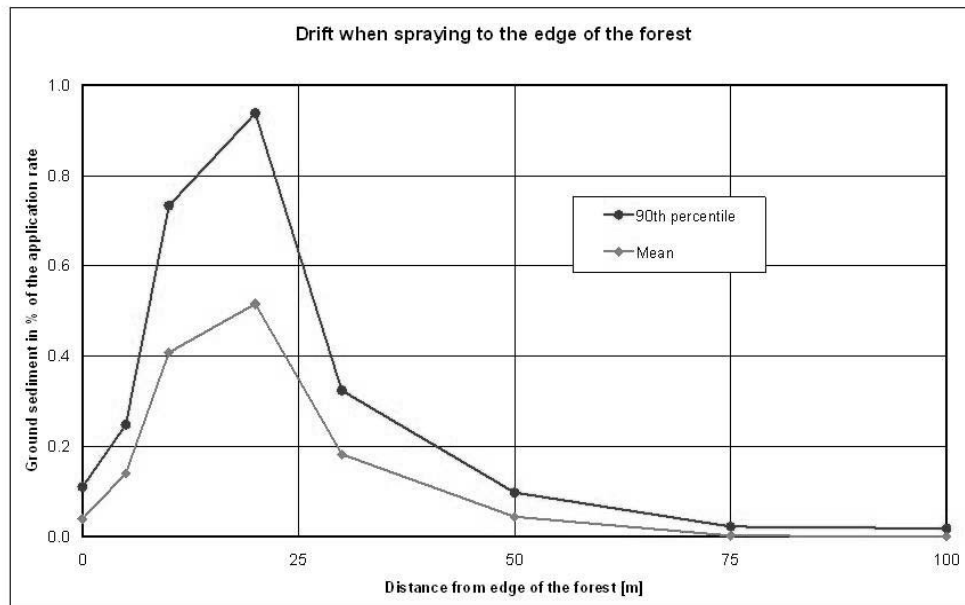
6 trials

Nozzles: AirMix 110 05
 Spray pressure: 2.5 bar
 Speed: 70 km/h
 Swath width: 15 m
 Width of treated area: 90 m

Results

Drift reduction of more than 90 % compared to applications with hollow cone nozzles

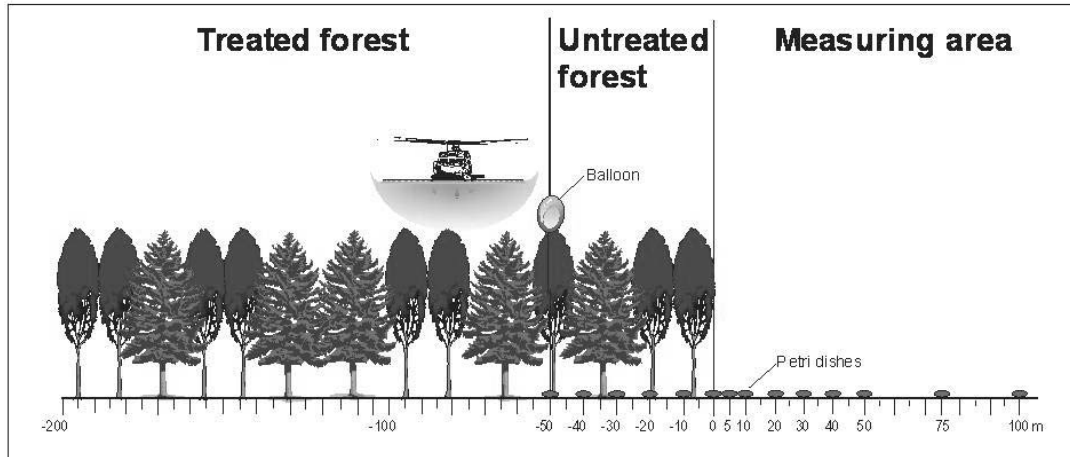
Dirk Rautmann, Institute for Application Techniques in Plant Protection



Dirk Rautmann, Institute for Application Techniques in Plant Protection



Trial arrangement for drift measurements in forests



Layout following ISO 22866 – Equipment for crop protection – Methods for field Measurements of spray drift

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Drift trials in 2008



Trials with a 50 m buffer zone

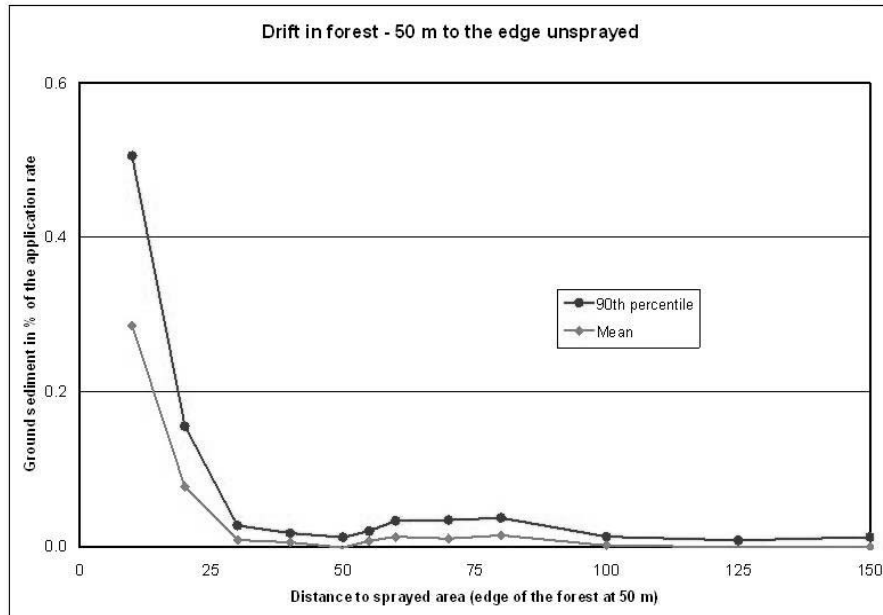
3 trials

Nozzles:	AirMix 110 05
Spray pressure:	2.5 bar
Speed:	70 km/h
Swath width:	15 m
Width of treated area:	90 m

Results

Drift reduction of more than 99 % compared to applications with hollow cone nozzles without a buffer zone.

Druck: 6,000 x 4,000 mm, 120 g/m², 100% (100% = 100%)



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Conclusion




- With low drift nozzles it is possible to reduce spray drift significantly.
- The drift level can be reduced to the drift level of ground equipment.

Dirk Rautmann, Institute for Application Techniques in Plant Protection



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Presentation 6
CropLife International
Keith Jones

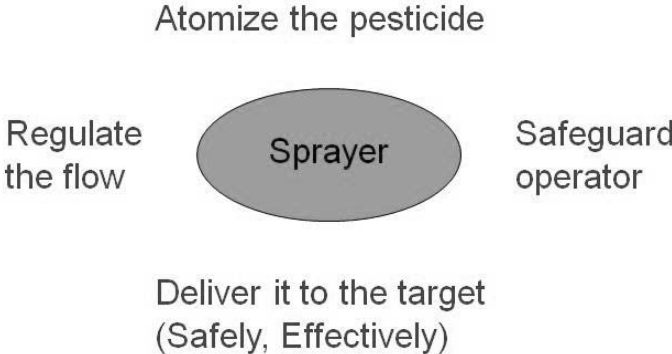


Why Aerial Spraying?

Keith A. Jones
RRSG Seminar, San Francisco, February 2009



What is a Sprayer for?




Atomize the pesticide

Regulate the flow

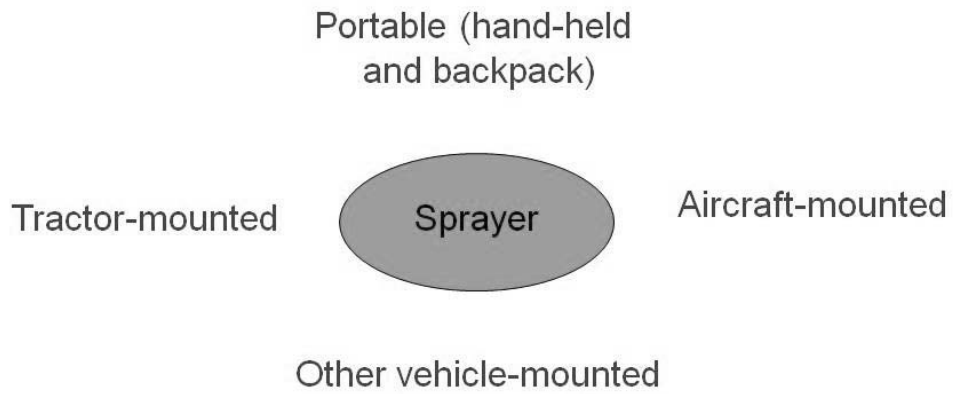
Sprayer

Safeguard operator

Deliver it to the target
(Safely, Effectively)



Spraying Platforms



Why Aerial?

- Scale
- Urgency
- Access
- Cost



Scale

- Large Areas
 - Soybean
 - Cotton
 - Forests, Trees
 - Sugar Cane
 -



Scale



Scale



Scale



Scale



Urgency

- Prevent total crop destruction
 - Locust Outbreak
- Disease Outbreak
 - Malaria Control



Urgency



Urgency



Accessibility

- Vector Control
- Locust Control
- Forests
- Sugar Cane
- Difficult Terrain
 - Bananas
 - Palm
 -



Accessibility



Accessibility



Accessibility



Accessibility



Cost

All of the Above!



Safety

All of the Above!



Minimising Risk

Track navigation – the old way

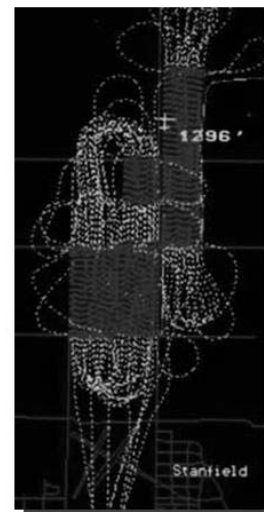


Track navigation the new way – Global Positioning Systems

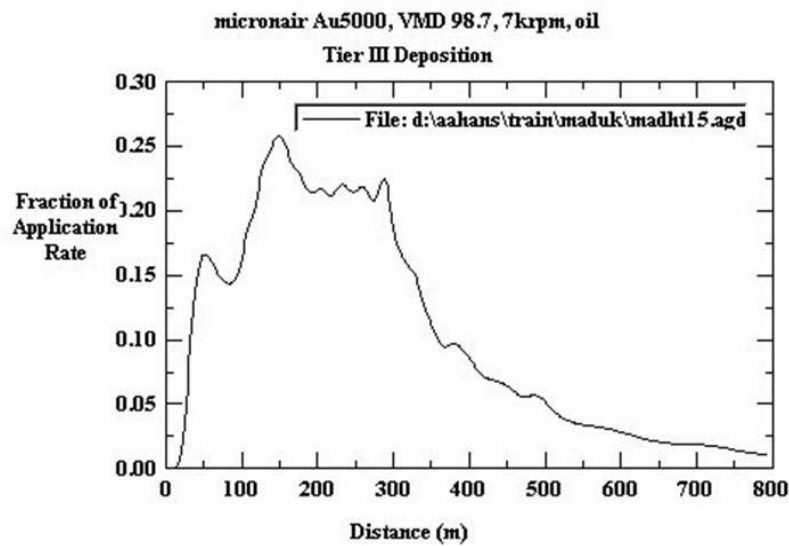


GPS can...

- lay out accurate spray tracks on a display
- show position of aircraft
- guide the pilot along the tracks



Modelling the deposit with Agdrift



Summary

- Aerial Spraying is only viable option in specific circumstances
 - Scale
 - Urgency
 - Access
 - Cost
- Safest option under these circumstances
- Technological developments reduces risk



Presentation 7
PANNA
Susan Kegley

Drift from Aerial Spraying: The View from the Other Side of the Fence

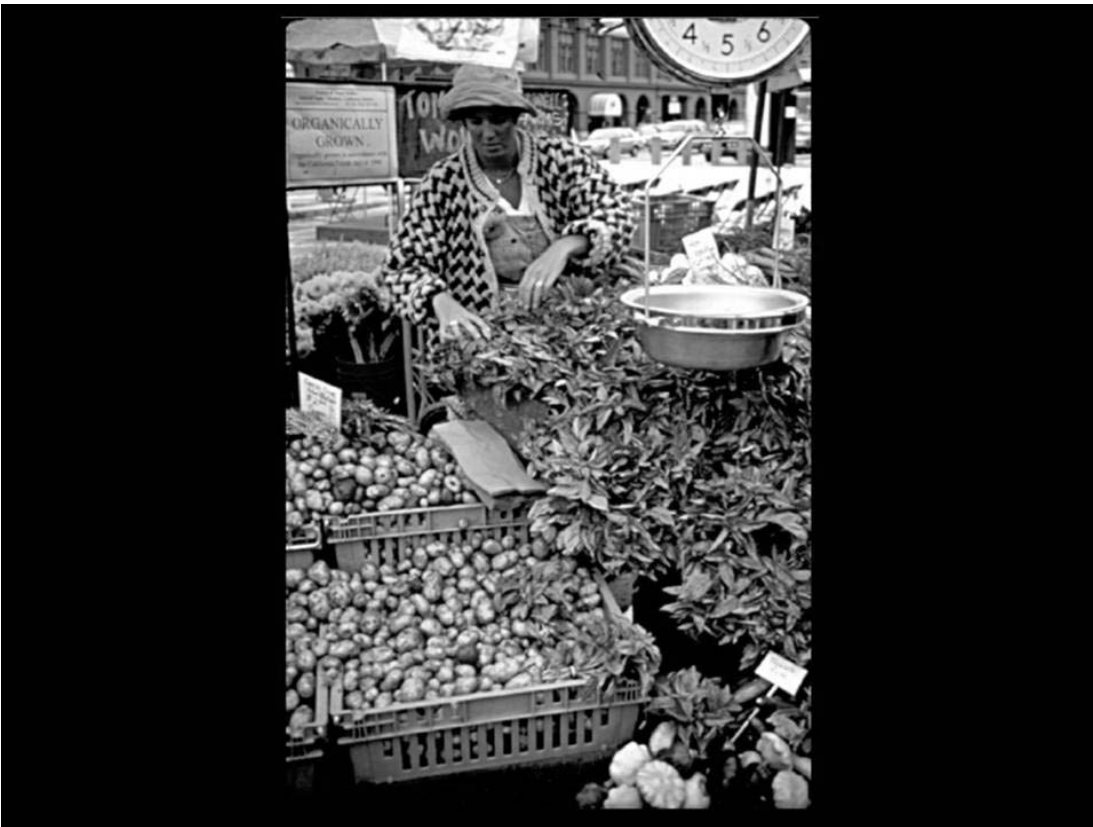


Susan E. Kegley
For Pesticide Action Network North America
skegley@pesticideresearch.com

Community Problems with Drift

- Illegal applications
- Malicious “applications” to private property
- Legal applications that still make people sick
- Weak or no enforcement
- Double standard for developed and developing countries







Illegal Applications

“Because of my access to a computerized weather station I have frequently monitored spraying events with winds in excess of 20-25 mph.”

Minnesota resident

“An applicator making an application of spinosad and febutatin-oxide to a prune orchard drifted pesticides onto a bus while it was stopped at an intersection. At least 2 of the windows on the bus were open. Four children on the bus were exposed to the drift and developed symptoms of systemic poisoning, as well as eye irritation. One child who had experienced seizures before suffered a seizure while at a firehouse a short time after the pesticide drifted on the bus.”

CA DPR poisoning incident report

Aerial Treatments of Olive Groves in Spain

On 28 July 2004, a plane spraying olive trees in the district of Orgiva near Granada, flew over one of the organic farms in this district, in which the farmer, Mr H who grows vegetables within his olive grove, was picking tomatoes for sale. The dimethoate spray drenched him as well as contaminating his land and falling on his house nearby. Mr H rapidly developed poisoning symptoms and had to be rushed to the emergency unit with skin irritation and breathing difficulties. Three months later, Mr H has been suffering from kidney pain and general poor health.



Pesticides News No. 66, PAN-UK, December 2004, pp. 18-19

Aerial Spraying Damages Organic Farms

Spraying is prohibited over organic farms, which is why Mr H's property was marked with red flags to avoid this happening. Spray planes also went outside the area they had originally indicated in a map deposited at the Orgiva Town Hall. Ironically, two days before the incident, Mr H had met with the technical person in charge of local olive fruit fly control operations, who had assured him that his zone was excluded and that in any case, red warning flags would be respected.

. . . the organic certification body will be obliged to withdraw his certificate for at least two years, preventing him from selling any of his farm produce as organic.

Pesticides News No. 66, PAN-UK, December 2004, pp. 18-19

Malicious “Applications”

“Complaints [about drift] to the Dept. of Ag brought about no changes. Then began the routine spraying of my house during the day while I was at work which I could see from where I worked that the spraying was happening but was unable to prove it until a young lady who came to stay with us went outside because she heard the plane and looked out the window in time to see it turn. She stepped outside just in time to be sprayed along with our home.”

A Minnesota resident who complained about drift

Problematic “Legal” Applications

Aerial Spraying on Banana Plantations in Ecuador

- Extensive mancozeb use to control black sigatoka fungus in bananas
- Houses and schools adjacent to banana plantations are being sprayed routinely



http://www.youtube.com/watch?v=xKgf4vn1_H8&feature=channel_page
http://www.youtube.com/watch?v=vLPVIJxYf8E&feature=channel_page


Adverse Effects of Mancozeb Spraying

- People sprayed directly develop rashes and difficulty breathing
- Birth defects observed that appear to be related to *in utero* mancozeb exposure
- High rates of thyroid cancer
- Pilots also seem to be affected—more accidents with increasing use of



Double Standard on Restrictions

- In the U.S., after re-registration of mancozeb (2005)
 - EPA required label language on drift:
 - “Do not apply this product in a way that will contact workers or other persons, either directly or through drift”
 - No more than 10 applications per year
- In Ecuador
 - No restrictions on spray drift
 - No restrictions on spraying over homes and schools
 - 15, 22, even 38 applications per year reported



[CDC Home](#) | [Search](#) | [Health Topics A-Z](#)

MMWR™

Weekly

January 4, 2008 / 56(51);1343-1345

Acute Pesticide Poisoning Associated with Pyraclostrobin Fungicide --- Iowa, 2007

Pyraclostrobin is an agricultural pesticide product used to kill fungi (e.g., blights, mildews, molds, and rusts). Hazards to humans from pyraclostrobin exposure include eye injury and skin irritation (*1*). In July 2007, the Iowa Department of Public Health (IDPH) received reports of five events involving pyraclostrobin that sickened 33 persons, including 27 migrant workers who were exposed in a single incident during aerial application (i.e., crop dusting). This report describes those five events and provides recommendations for preventing additional illnesses associated with exposure to pyraclostrobin.

Event A. On July 23, 2007, IDPH received media reports that migrant workers in a field had been inadvertently exposed to pyraclostrobin fungicide by a crop-duster plane on July 22. An IDPH investigation identified 27 cases of acute illness among the potentially exposed workers; all illnesses were associated with off-target drift of the pyraclostrobin to an adjacent field, owned by a different grower, where workers were detasseling field corn. IDPH learned that the pilot had seen the nearby workers yet proceeded to apply the fungicide. Some workers reported feeling wet droplets on their skin and seeing mist coming from the aircraft.

The Light Brown Apple Moth



Female Male
 (Photo courtesy of SARDI, Greg Baker)
 Photo from California Dept. of Food and Agriculture

- Quarantine leafroller pest originally from Australia
- Found in coastal California in 2006
- Massive aerial sprays of pheromones over urban areas proposed as a control strategy
- An agricultural “emergency” declared
- Prompted an uprising of the people to be sprayed

The People Rebel



- Not an “emergency” —not a primary pest
- LBAM prefers coastal habitat, so no threat to Central Valley crops
- Little or no documented crop damage
- Aerial spraying canceled
- New strategy implemented: Sterile male moth release

Some Lessons to be Learned from the California LBAM Issue

- People do not like to be sprayed directly, no matter how benign the pesticide is
- Government agencies have lost credibility on issues of toxicity, the ability of a pest to cause damage, and the judgment of a “need” for emergency action
- People with political power can and will stop these incursions

Regulatory Gaps in Managing Drift in the U.S.

- **The label regulates spray drift (sometimes)**
 - Label language is inconsistent and drift language is not included for all pesticides
 - EPA is considering changes across the board to make labels consistent
- **EPA is only beginning to regulate volatilization drift**
 - EPA’s definition of drift excludes volatilized pesticides
 - EPA does not assess inhalation exposure for bystanders, except for fumigants and mosquito fogging agents
 - A Scientific Advisory Panel meeting on volatilization drift is scheduled for December 2009

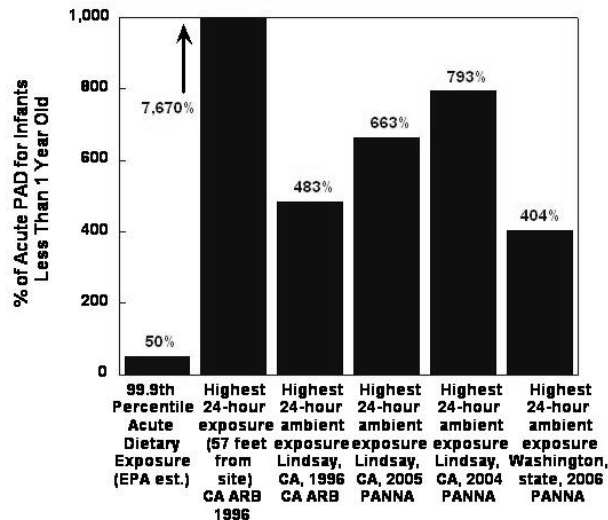
Volatilization During Aerial Spraying

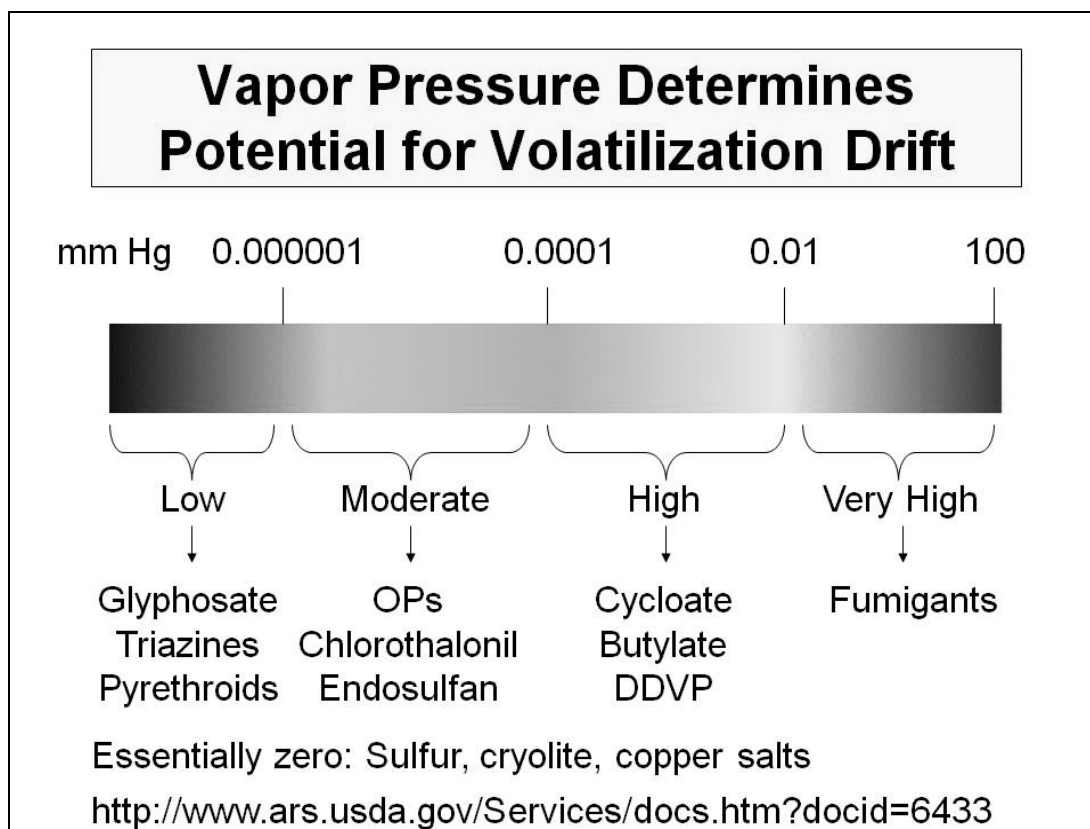
Three field workers developed symptoms while harvesting lettuce in a field adjacent to an aerial insecticide application to a lettuce field. Residue samples failed to indicate substantial drift. However, an odor was noted by the workers.

CA DPR poisoning incident reports

Comparison of Inhalation Exposure to Dietary Exposure

Chlorpyrifos from Different Exposure Sources as a Percent of the Acute Population Adjusted Dose (PAD) for Infants Less than One Year Old





Regulatory Gaps in Managing Drift in the U.S.

- **Enforcement is lacking**
 - EPA delegates enforcement to states
 - No consistency in enforcement capacity across states
 - Few or no penalties for violations
 - No recourse for bystanders affected by drift

Weak or No Enforcement

- There is often no serious response to a drift complaint. Ag departments often give the benefit of the doubt to the applicator, wait too long to sample for residues, or label the neighbor as “crazy” and do nothing
- Complaints are minimized as “just an odor problem, not enough to hurt you”
- In some states, it is not even clear who is in charge of enforcement
- In states with good enforcement infrastructure and good intentions to prosecute drift incidents, the pesticide label often is so ambiguous that it is difficult to bring an enforcement action.

Preferred Approach

- Default for all products: No aerial applications
- Possible allowance for applications of low-toxicity pesticides in unpopulated areas to accommodate critical IPM needs
- No aerial applications within a quarter mile of homes, schools, workplaces, parks
- Provide incentives for growers to manage pests without toxic pesticides

At Least

- No aerial spraying of the most toxic pesticides
 - High acute toxicity, carcinogens, neurotoxicants, developmental toxicants
- No aerial applications within a mile of homes, schools, workplaces, parks
 - Propanil drift from rice fields damages prune trees up to 10 miles away. CA now prohibits applications within 4 miles of a prune orchard.
 - National Marine Fisheries Service Biological Opinion will require 1,000 foot buffer zones between aerial applications of OP insecticides and salmon streams
- Neighbor notification of when aerial applications are to occur
- Criminal prosecution of those who use pesticides as a weapon to harass others
- Enforcement of existing pesticide regulations
- Allow citizen action suits to circumvent the problem of lack of

The home page welcomes new users and provides a log-in option for experienced users. "About" through "Log in" are general support links repeated on most pages. A brief guided tour will be available for viewing without registration and will include links to more detailed tutorials.

About Contact Privacy Donate Help Log On

Measure and Reduce your Pest Management Footprint

Evaluate pesticide options and risk

On your farm:
Evaluate your pest management options using science-based tools.

In your program:
Track performance of multiple growers in your IPM program.

Choose the best option to protect health & environment and control pests effectively.

Get Started Guided Tour

User clicks "Get Started."

28

Measure and Reduce your

Pest Management Footprint

About Contact Privacy Donate Help Log Off

Links:
Crop Profiles
North Central IPM
Local Extension

Account:
User Account
Customize
Workspace

Workspace > Management Unit Profile

Management Unit Profile

User Name	State	County	Site Name	Management Unit	Year/Crop
McIntosh	Wisconsin	Dane	McOrchard	Upper Orchard	2007-Apples Add New

Landscape Features

Enter a scenario name. * In order to save your data, you must enter a scenario name.

Tasks

Evaluate a Pesticide
Compare Pesticides
Evaluate a Pest Management Program
Compare Program to Baseline

Pesticide Selection

Use Pattern

Risk Summary

Display All

Endosulfan 3EC

High Risk	2/17	
Moderate Risk	0/17	
Low Risk	9/17	

Additional Mitigation: Highly Recommended

Aza-Direct

High Risk	0/17	
Moderate Risk	0/17	
Low Risk	17/17	

Additional Mitigation: Not necessary

Indices

- Avian acute
- reproductive
- Aquatic fish
- algae
- invertebrates
- Earthworm
- Mammalian
- Bee
- Beneficials
- Resistance
- Leaching
- Human Dietary acute
- chronic
- oncogenic
- Worker acute
- chronic
- oncogenic

Risk Rating

What should I be most concerned about?

The tool displays a risk summary in two graphic formats.

The display on the left shows the proportion of indices that fall into each risk category (low/moderate/high). This display gives the user a quick comparison of the products and is our alternative to a composite score.

For a more detailed comparison, the display on the right shows the level of risk for each resource concern.

29

Measure and Reduce your

Pest Management Footprint

About Contact Privacy Donate Help Log Off

Links:
Crop Profiles
North Central IPM
Local Extension

Account:
User Account
Customize
Workspace

Workspace > Management Unit Profile

Management Unit Profile

User Name	State	County	Site Name	Management Unit	Year/Crop
McIntosh	Wisconsin	Dane	McOrchard	Upper Orchard	2007-Apples Add New

Landscape Features

Enter a scenario name. * In order to save your data, you must enter a scenario name.

Tasks

Evaluate a Pesticide
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High Risk	2/17	
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Additional Mitigation: Highly Recommended

Aza-Direct

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Additional Mitigation: Not necessary

Indices

- Avian acute
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- Earthworm
- Mammalian
- Bee
- Beneficials
- Resistance
- Leaching
- Human Dietary acute
- chronic
- oncogenic
- Worker acute
- chronic
- oncogenic

Risk Rating

What should I be most concerned about?

Endosulfan 3EC (4/28/07)

A description of the risk drivers is initially collapsed.

By clicking "What should I be most concerned about?" the user expands the display showing the resources that are at risk and the exposure pathways causing the risk.

30

Account: Enter a scenario name. * In order to save your data, you must enter a scenario name.

User Account
Customize
Workspace

Tasks
[Evaluate a Pesticide](#) | [Compare Pesticides](#) | [Evaluate a Pest Management Program](#) | [Compare Program to Baseline](#)

Pesticide Selection

Use Pattern

Risk Summary

Display All

Endosulfan 3EC
 High Risk 2/17
 Moderate Risk 0/17
 Low Risk 9/17
 Additional Mitigation: Highly Recommended

Aza-Direct
 High Risk 0/17
 Moderate Risk 0/17
 Low Risk 17/17
 Additional Mitigation: Not necessary

Indices Risk Rating

What should I be most concerned about?
 Endosulfan 3EC (4/28/07)

Resource at risk	Risk Level	How is the pesticide getting there?
Aquatic	High	80% spray drift, 20% runoff
Avian	Moderate	spray drift
Earthworm	Moderate	leaching
Mammalian	Moderate	spray drift, direct contact
Bee	Moderate	spray drift, direct contact
Beneficials	Moderate	spray drift, direct contact

Additional Mitigation Strategies

When a product is rated at moderate or high risk in one or more indices, the tool will suggest "Additional Mitigation Strategies" based on exposure pathways (e.g. runoff, leaching, spray drift).

31

Resource at risk	Risk Level	How is the pesticide getting there?
Aquatic	High	80% spray drift, 20% runoff
Avian	Moderate	spray drift
Earthworm	Moderate	leaching
Mammalian	Moderate	spray drift, direct contact
Bee	Moderate	spray drift, direct contact
Beneficials	Moderate	spray drift, direct contact

Additional Mitigation Strategies

- **General IPM:** Pest Identification, Scouting, Thresholds, Non-chemical methods - [information](#)

- **Management Practices**

- Use Alternate Pesticide - [return to pesticide selection - information](#)
- Reduce Application Rate: -banded, perimeter or spot application?

- **Reduce Runoff**

	width	height	Located between spray zone and ...	efficacy
<input type="checkbox"/> Riparian Forest Buffer	<input type="text"/>	<input type="text"/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Riparian Herbaceous Cover	<input type="text"/>	<input type="text"/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Contour Buffer Strips	--	--	--	+
<input type="checkbox"/> Contour farm/orchard	--	--	--	+

- **Reduce Spray Drift**

	width	height	Located between spray zone and ...	efficacy
<input checked="" type="checkbox"/> High-Pressure Air Induced Nozzle	--	--	--	+++
<input type="checkbox"/> Low-Pressure Air Induced Nozzle	--	--	--	++
<input type="checkbox"/> Pre-Orifice Nozzle	--	--	--	+
<input type="checkbox"/> Riparian Forest Buffer	<input type="text"/>	<input type="text"/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Wind Break	<input type="text"/>	<input type="text"/>	<input type="text" value="select sensitive site"/>	

- **Reduce Leaching**

	width	height	Located between spray zone and ...	efficacy
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text" value="select sensitive site"/>	

Apply hypothetical mitigation to which application?

Endosulfan 3EC
 Aza-Direct

The user selects hypothetical mitigation options to compare.

32

Aquatic	High	80% spray drift, 20% runoff
Avian	Moderate	spray drift
Earthworm	Moderate	leaching
Mammalian	Moderate	spray drift, direct contact
Bee	Moderate	spray drift, direct contact
Beneficials	Moderate	spray drift, direct contact

Additional Mitigation Strategies

- **General IPM:** Pest Identification, Scouting, Thresholds, Non-chemical methods - [information](#)

- **Management Practices**

- Use Alternate Pesticide - [return to pesticide selection - information](#)
- Reduce Application Rate: qt/ac -banded, perimeter or spot application?

- **Reduce Runoff**

	width	height	Located between spray zone and ...	efficacy
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Riparian Herbaceous Cover	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Contour Buffer Strips	--	--	--	+
<input type="checkbox"/> Contour farm/orchard	--	--	--	+

- **Reduce Spray Drift**

	width	height	Located between spray zone and ...	efficacy
<input checked="" type="checkbox"/> High-Pressure Air Induced Nozzle	--	--	--	+++
<input type="checkbox"/> Low-Pressure Air Induced Nozzle	--	--	--	++
<input type="checkbox"/> Pre-Orifice Nozzle	--	--	--	+
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input checked="" type="checkbox"/> Wind Break	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	

- **Reduce Leaching**

	width	height	Located between spray zone and ...	efficacy

Apply hypothetical mitigation to which application?

Endosufan 3EC
 Aza-Direct

33

Aquatic	High	80% spray drift, 20% runoff
Avian	Moderate	spray drift
Earthworm	Moderate	leaching
Mammalian	Moderate	spray drift, direct contact
Bee	Moderate	spray drift, direct contact
Beneficials	Moderate	spray drift, direct contact

Additional Mitigation Strategies

- **General IPM:** Pest Identification, Scouting, Thresholds, Non-chemical methods - [information](#)

- **Management Practices**

- Use Alternate Pesticide - [return to pesticide selection - information](#)
- Reduce Application Rate: qt/ac -banded, perimeter or spot application?

- **Reduce Runoff**

	width	height	Located between spray zone and ...	efficacy
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Riparian Herbaceous Cover	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Contour Buffer Strips	--	--	--	+
<input type="checkbox"/> Contour farm/orchard	--	--	--	+

- **Reduce Spray Drift**

	width	height	Located between spray zone and ...	efficacy
<input checked="" type="checkbox"/> High-Pressure Air Induced Nozzle	--	--	--	+++
<input type="checkbox"/> Low-Pressure Air Induced Nozzle	--	--	--	++
<input type="checkbox"/> Pre-Orifice Nozzle	--	--	--	+
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input checked="" type="checkbox"/> Wind Break	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	

- **Reduce Leaching**

	width	height	Located between spray zone and ...	efficacy
		<input type="text" value="20-30 ft"/>		
		<input type="text" value="30-40 ft"/>		
		<input type="text" value=">40 ft"/>		

Apply hypothetical mitigation to which application?

Endosufan 3EC
 Aza-Direct

User specifies attributes of the hypothetical windbreak, including width...

34

Aquatic	High	80% spray drift, 20% runoff
Avian	Moderate	spray drift
Earthworm	Moderate	leaching
Mammalian	Moderate	spray drift, direct contact
Bee	Moderate	spray drift, direct contact
Beneficials	Moderate	spray drift, direct contact

Additional Mitigation Strategies

- **General IPM:** Pest Identification, Scouting, Thresholds, Non-chemical methods - [information](#)

- **Management Practices**

- Use Alternate Pesticide - [return to pesticide selection - information](#)

Reduce Application Rate: qt/ac -banded, perimeter or spot application?

- **Reduce Runoff**

	width	height	Located between spray zone and ...	efficacy
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Riparian Herbaceous Cover	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Contour Buffer Strips	--	--	--	+
<input type="checkbox"/> Contour farm/orchard	--	--	--	+

- **Reduce Spray Drift**

	width	height	Located between spray zone and ...	efficacy
<input checked="" type="checkbox"/> High-Pressure Air Induced Nozzle	--	--	--	+++
<input type="checkbox"/> Low-Pressure Air Induced Nozzle	--	--	--	++
<input type="checkbox"/> Pre-Orifice Nozzle	--	--	--	+
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input checked="" type="checkbox"/> Wind Break	<20 ft	<input type="text" value="5-10 ft"/>	<input type="text" value="select sensitive site"/>	

- **Reduce Leaching**

	width	height	Located between spray zone and ...	efficacy
<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	

Apply hypothetical mitigation to which application?

Endosufan 3EC

Aza-Direct

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... height...

Aquatic	High	80% spray drift, 20% runoff
Avian	Moderate	spray drift
Earthworm	Moderate	leaching
Mammalian	Moderate	spray drift, direct contact
Bee	Moderate	spray drift, direct contact
Beneficials	Moderate	spray drift, direct contact

Additional Mitigation Strategies

- **General IPM:** Pest Identification, Scouting, Thresholds, Non-chemical methods - [information](#)

- **Management Practices**

- Use Alternate Pesticide - [return to pesticide selection - information](#)

Reduce Application Rate: qt/ac -banded, perimeter or spot application?

- **Reduce Runoff**

	width	height	Located between spray zone and ...	efficacy
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Riparian Herbaceous Cover	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Contour Buffer Strips	--	--	--	+
<input type="checkbox"/> Contour farm/orchard	--	--	--	+

- **Reduce Spray Drift**

	width	height	Located between spray zone and ...	efficacy
<input checked="" type="checkbox"/> High-Pressure Air Induced Nozzle	--	--	--	+++
<input type="checkbox"/> Low-Pressure Air Induced Nozzle	--	--	--	++
<input type="checkbox"/> Pre-Orifice Nozzle	--	--	--	+
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input checked="" type="checkbox"/> Wind Break	<20 ft	5-10 ft	<input type="text" value="select sensitive site"/>	

- **Reduce Leaching**

	width	height	Located between spray zone and ...	efficacy
<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value=""/>	

Apply hypothetical mitigation to which application?

Endosufan 3EC

Aza-Direct

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... and location.

Aquatic	High	80% spray drift, 20% runoff
Avian	Moderate	spray drift
Earthworm	Moderate	leaching
Mammalian	Moderate	spray drift, direct contact
Bee	Moderate	spray drift, direct contact
Beneficials	Moderate	spray drift, direct contact

Additional Mitigation Strategies

- **General IPM:** Pest Identification, Scouting, Thresholds, Non-chemical methods - [information](#)
- **Management Practices**
 - Use Alternate Pesticide - [return to pesticide selection - information](#)
 - Reduce Application Rate: qt/ac -banded, perimeter or spot application?
- **Reduce Runoff**

	width	height	Located between spray zone and ...	efficacy
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Riparian Herbaceous Cover	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Contour Buffer Strips	--	--	--	+
<input type="checkbox"/> Contour farm/orchard	--	--	--	+
- **Reduce Spray Drift**

	width	height	Located between spray zone and ...	efficacy
<input checked="" type="checkbox"/> High-Pressure Air Induced Nozzle	--	--	--	+++
<input type="checkbox"/> Low-Pressure Air Induced Nozzle	--	--	--	++
<input type="checkbox"/> Pre-Orifice Nozzle	--	--	--	+
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input checked="" type="checkbox"/> Wind Break	<20 ft	5-10 ft	Stream	++
- **Reduce Leaching**

	width	height	Located between spray zone and ...	efficacy

Apply hypothetical mitigation to which application?

Endosufan 3EC
 Aza-Direct

Once attributes are selected, the tool displays the efficacy.

User selects an application to which to apply the hypothetical mitigation...

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Aquatic	High	80% spray drift, 20% runoff
Avian	Moderate	spray drift
Earthworm	Moderate	leaching
Mammalian	Moderate	spray drift, direct contact
Bee	Moderate	spray drift, direct contact
Beneficials	Moderate	spray drift, direct contact

Additional Mitigation Strategies

- **General IPM:** Pest Identification, Scouting, Thresholds, Non-chemical methods - [information](#)
- **Management Practices**
 - Use Alternate Pesticide - [return to pesticide selection - information](#)
 - Reduce Application Rate: qt/ac -banded, perimeter or spot application?
- **Reduce Runoff**

	width	height	Located between spray zone and ...	efficacy
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Riparian Herbaceous Cover	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input type="checkbox"/> Contour Buffer Strips	--	--	--	+
<input type="checkbox"/> Contour farm/orchard	--	--	--	+
- **Reduce Spray Drift**

	width	height	Located between spray zone and ...	efficacy
<input checked="" type="checkbox"/> High-Pressure Air Induced Nozzle	--	--	--	+++
<input type="checkbox"/> Low-Pressure Air Induced Nozzle	--	--	--	++
<input type="checkbox"/> Pre-Orifice Nozzle	--	--	--	+
<input type="checkbox"/> Riparian Forest Buffer	<input type="text" value=""/>	<input type="text" value=""/>	<input type="text" value="select sensitive site"/>	
<input checked="" type="checkbox"/> Wind Break	<20 ft	5-10 ft	Stream	++
- **Reduce Leaching**

	width	height	Located between spray zone and ...	efficacy

Apply hypothetical mitigation to which application?

Endosufan 3EC
 Aza-Direct

...and clicks "Evaluate."

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Measure and Reduce your **Pest Management Footprint**
About Contact Privacy Donate Help Log Off

Links:

Crop Profiles

North Central IPM

Local Extension

Account:

User Account

Customize

Workspace

Workspace > Management Unit Profile

Management Unit Profile

User Name	State	County	Site Name	Management Unit	Year/Crop
McIntosh	Wisconsin	Dane	McOrchard	Upper Orchard	2007-Apples

[Add New](#)

Landscape Features

Enter a scenario name. * In order to save your data, you must enter a scenario name.

Tasks

[Evaluate a Pesticide](#) |
 [Compare Pesticides](#) |
 [Evaluate a Pest Management Program](#) |
 [Compare Program to Baseline](#)

Pesticide Selection

Use Pattern

Risk Summary

Display All

Endosulfan 3EC

High Risk	2/17	
Moderate Risk	0/17	
Low Risk	0/17	

Additional Mitigation: **Highly Recommended**

Endosulfan 3EC (with windbreak)

High Risk	0/17	
Moderate Risk	8/17	
Low Risk	9/17	

Additional Mitigation: **Recommended**

Endosulfan 3EC (with high-pressure a.i. nozzle)

High Risk	0/17	
Moderate Risk	7/17	
Low Risk	10/17	

Additional Mitigation: **Recommended**

Aza-Direct

High Risk	0/17	
Moderate Risk	0/17	
Low Risk	17/17	

Additional Mitigation: **Not necessary**

What should I be most concerned about?

Indices	Risk Rating
Avian acute	[Bar]
reproductive	[Bar]
Aquatic fish	[Bar]
algae	[Bar]
invertebrates	[Bar]
Earthworm	[Bar]
Mammalian	[Bar]
Bee	[Bar]
Beneficials	[Bar]
Resistance	[Bar]
Leaching	[Bar]
Human Dietary acute	[Bar]
chronic	[Bar]
oncogenic	[Bar]
Worker acute	[Bar]
chronic	[Bar]
oncogenic	[Bar]

Low Risk
Moderate Risk
High Risk

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In addition to the two original products, the tool now displays the selected application with hypothetical mitigation measures applied.