

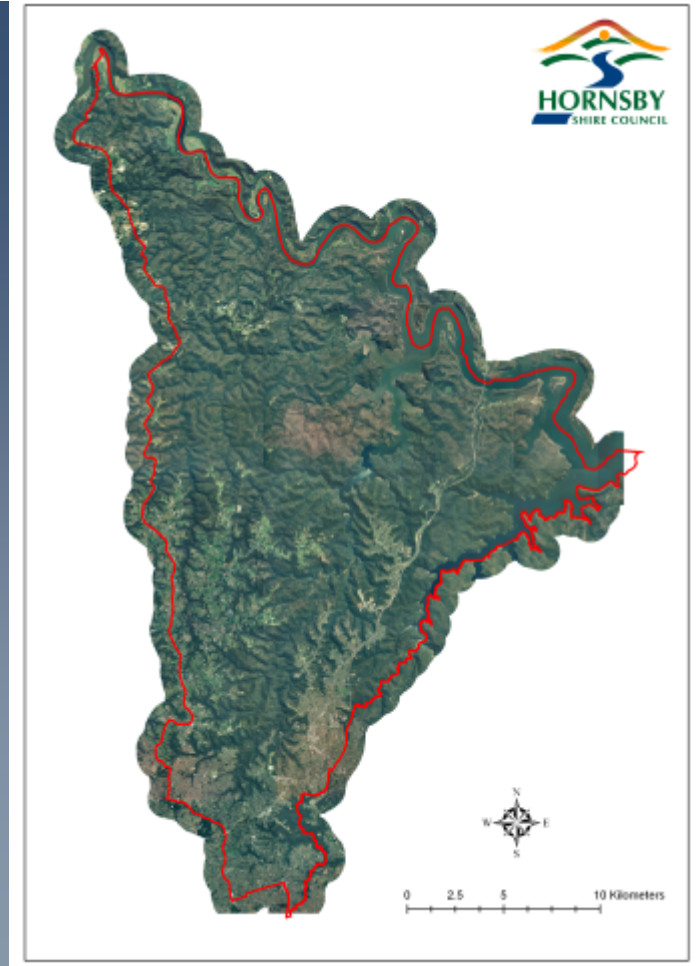
Controlling Weeds in Sensitive Environments



Diane Campbell
Manager Natural Resources

About Hornsby Shire

- At 51,000 ha one of the largest Shires in Sydney
- Features the Hawkesbury River in the north
- 67% is bushland
- Stretches from:
 - urban Epping in the south to
 - rural Galston and Glenorie,
 - large national parks
 - sand mines at Maroota and
 - river settlements from Wisemans Ferry in the north to Brooklyn in the east



Sensitive Environments in Hornsby Shire

- Public and private bushland
- Endangered Ecological Communities
- Threatened species habitat
- Estuaries and waterways
- 600 Council open space reserves



Public and private bushland

- Bushland
 - 18 660 ha in National Parks
 - 2 000 ha in 300 Council reserves
 - 29 000 in vacant Crown land and private ownership
- 34 native vegetation communities
- 1 000 plant species
- Vegetation is dominated by
 - Large areas of deeply dissected sandstone in national parks
 - Small patches of critically endangered vegetation on flatter shale ridges and
 - Small patches of endangered vegetation on alluvial Hawkesbury river flood plain



Endangered Ecological Communities

- 10 EECs
- 89% of EECs occur on private land
- < 5% of Turpentine-Ironbark Forest, Blue Gum High Forest remains
- Hornsby has
 - 1/4 remaining Turpentine-Ironbark Forest (295 of 1,183 ha)
 - 1/4 remaining Blue Gum High Forest (37 of 168 ha), and
 - all Blue Gum Diatreme Forest (14 ha)
- Some of the most endangered and poorly conserved have high levels of weed invasion



Blue Gum High Forest



Turpentine Ironbark Forest

Threatened Species

- Over 1000 native plants
- 26 threatened plants
- Over 340 vertebrate animals
- 27 threatened animals
- 3 endangered populations



Estuary and Waterways

- 4 catchments
 - Berowra Creek
 - Lane Cove River
 - Cowan Creek and
 - Hawkesbury River
- Creek reaches have a variety of forms
 - wide, sandy flat-based ponds,
 - sandstone with cobbles in the cracks at the base of the creek
 - rapids, riffles, rock chutes, waterfalls and potholes, yet, and
 - boulders with rock shelves, or sand and mud based streams
- Berowra Creek
 - a major tributary of the Hawkesbury River,
 - it enters the Hawkesbury 25 km from the ocean
 - a drowned river valley of steeply incised gorges with surrounding plateaus
 - at its source is less than 1m, deepens at Berowra Waters, to deep holes of 17m at Calabash Point, whilst the lower reaches shallow to 3m at the Hawkesbury bar and 2m at Marramarra Creek with ecologically productive environments at Big Bay.



Managing sensitive environments

- Natural Resources Branch manages 2,000 ha bushland in 300 reserves
- Parks Branch manages 300 parks
- Council is on the Berowra Valley National Park working group and manages programs with NPWS within the Park
- Weed management advice for over 29,000 ha privately owned bushland



Major Weeds

- Riparian colonizers - large and small-leaved privets, crofton weed and mistflower,
- aquatics such as *Ludwigia peruviana*
- woody weeds – lantana, ochna
- invasive vines such as balloon vine, honeysuckle, morning glory
- asparagus weeds including bridal creeper
- Grass weeds - tussock paspalum, Coolatai grass, pampas grass and boneseed



Council's Weed Control Programs

- **Contract Bush Regeneration**
 - Restoration of 120 ha of bushland pa
 - 12 companies work at 62 sites
 - Funding totalled \$570,000 in 2012/13
- **Hornsby Bushcare volunteers**
 - 766 volunteers work at 101 sites
 - Volunteers restore 68 ha of bushland
- **Catchment Remediation Rate**
 - 7 ha bushland restored near 450 CRR devices, nutrients and sediments removed
- **Noxious weed** - proactive and educational noxious weeds programs
- **Grant projects** - Roadside Restoration, Habitat Connectivity, Wetland Restoration.



Contract Bush Regeneration – Case Study

Carrs Bush Endangered Ecological Community

- Largest remnant of Turpentine Ironbark Forest in Hornsby Shire



Carrs Bush Site Plan

- Detailed site plan prepared
- Works, monitoring and performance targets defined
- Weeds in Zone B
 - *Watsonia* sp
 - *Zanteschia aethiopica*
 - *Lonicera japonica*
 - *Anredera cordifolia*
 - *Erharta erecta*



Herbicide Usage Report													Date	2012-13
Site Address			Carrs Bush											
Company Name			National Trust											

									Spray Use Only	Spray Use Only	Spray Use Only	Spray Use Only	Spray Use Only	Spray Use Only
Date	Zone	Supervisor	Trade Name	Active Constituent	Target Weed	Concentration (neat/1%)	Application Method	Vol Used (ml)	Time (24hr)	Wind (med/low/ni)	Wind dir'n	Temp (°C)	Rel Humid (%)	User
16.10.12	D	P Shirvington	Roundup	glyphosate 360g/L	<i>Ehrharta</i>	0.3	spray	15		nil	NA			P Shriv
30.10.12	D	P Shirvington	Roundup	glyphosate 360g/L	cape ivy	neat	paint	15						
8.1.13	B	P Shirvington	Roundup	glyphosate 360g/L	ochna	neat	scrape/paint	35						
			Roundup	glyphosate 360g/L	Narrow-leaf privet	neat	cut & paint	15						
			Roundup	glyphosate 360g/L	broad-leaf privet	neat	cut & paint	10						
			Roundup	glyphosate 360g/L	camphor laurel	neat	cut & paint	10						
21.1.13	B	P Shirvington	Roundup	glyphosate 360g/L	Ochna,	neat	scrape/paint	35						
			Roundup	glyphosate 360g/L	Broad-leaf privet	neat	cut & paint	25						
			Roundup	glyphosate 360g/L	Narrow-leaf privet	neat	cut & paint	25						
			Roundup	glyphosate 360g/L	Japanese honeysuckle	neat	scrape/paint	15						



Bushcare volunteer site – Carrs Bush

Work in Zone A 1 Behind toilet block

Description

- Resilience low to high, Probably past disturbance
- Acetosa and Ehrharta

Strategy

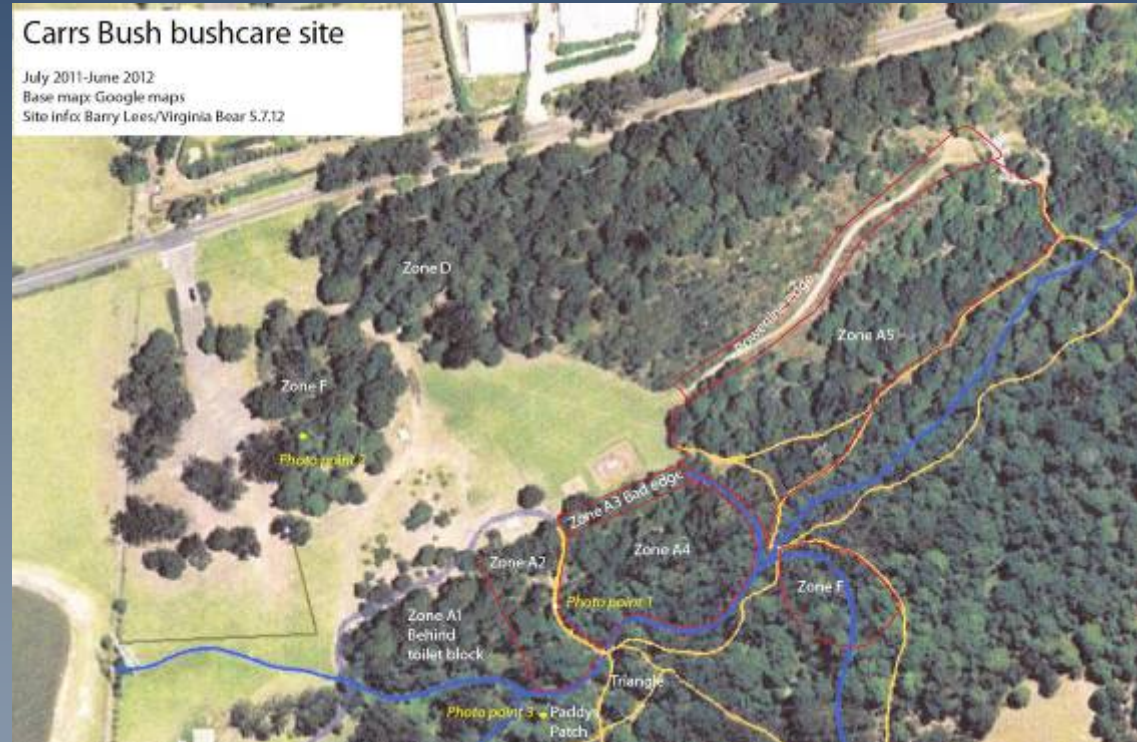
- Contain Ehrharta with silt fence to protect A2.
- Prevent Acetosa from seeding, eradicate Acetosa

Work completed

- Light infestations Acetosa, young plants: **Dug out**
- Previously treated Acetosa (**dug out, sprayed**): Removed seeds, cut Hypolepis - plan is to allow Acetosa to expand leaf area so it can be sprayed

Status

- Ehrharta successfully contained
- Minor Acetosa seeding - now contained
- Acetosa awaiting spraying in warmer weather



Noxious Weed Program

- 103 Noxious weed species
- Proactive program – 1200 property inspections
- Reactive program – 500 enquiries
- The interface between bushland and backyards extends for 50 km allowing for weed incursions



Grant Program – Roadside Restoration

- Restoration of 35 sites using a variety of techniques
 - Bush regeneration
 - Removal of weed trees – tree contractors
 - Spraying, jute matting and planting
- EECs – Turpentine Ironbark and Blue Gum High Forest, Swamp sclerophyll forest and Swamp Oak Woodland
- 75 signs installed
- 60 Council staff trained



Wetland Restoration – Biological Control

Bridal creeper rust fungus (*Puccinia myrsiphylli*)

- Target specific
- Non toxic near waterways
- Rust viable in damp environment
- No reapplication needed



Trackside Restoration Project – Fire

Flame weeding

- Removal of *Bidens*
- Killed seed
- Reduced biomass
- No green waste



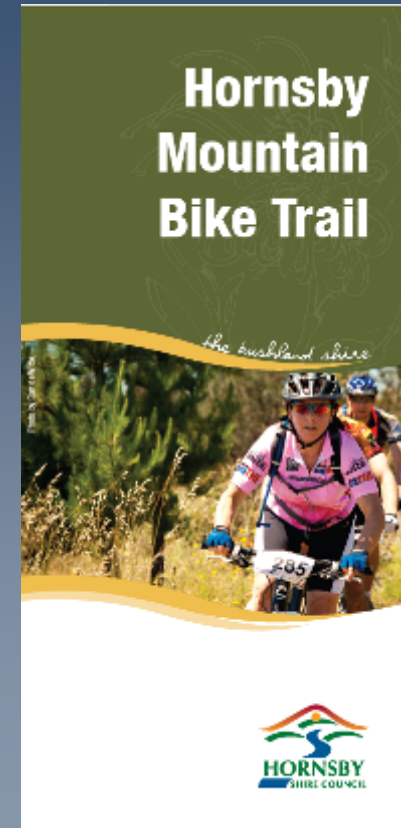
Catchment Remediation Program

- Biofiltration devices remove
 - gross pollutants
 - sediments
 - nutrients
- Mechanical weed removal
 - Sand media, dense plantings 6-8 per sq m, up to 5,000 plants per site
 - Interface can include sandstone Capping or jute matting
 - Bush regeneration as part of site maintenance
 - Long term conditions less suitable for weed growth



Herbicide use in Council

- Field staff
- Parks and recreation staff
- Contractors
- Bushcare volunteers
- Bushcare trainers
- Trailcare volunteers



What controls are put in place

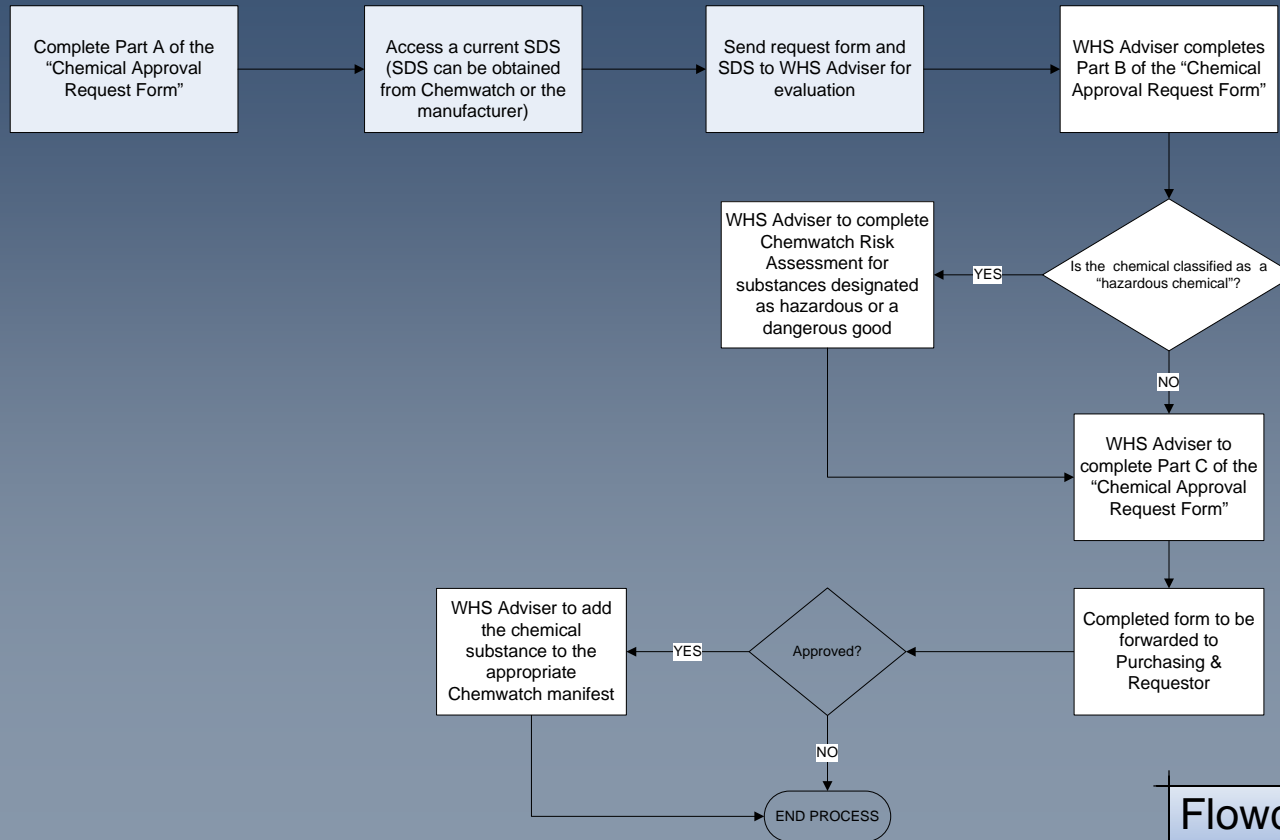
- Training
 - Works and Parks staff
 - Volunteers - Bushcode
- Chemical Management
 - Chemical Manifest
 - MSDS
 - Label
- Public Management
 - Herbicide Application Notice
 - Pesticide Application Form
- WHS
 - SWMS and PPE
 - Risk assessment and site induction
 - Safehold



Chemical management

WHS Adviser approval process

Purchasing a New Chemical Substance for the Workplace



Flowchart 2

Site management – Parks and Reserves

- Signs warn public
 - 24 hr advance notice
 - 48 hr notice to Childcare Centres – start 7 am, children kept inside, when dry on leaf can re-enter playground
- Drift control
 - Strict weather protocols - not in rain, wind, overcast, heat
- Herbicides used
 - Roundup Biactive
 - Jolt – selective herbicide for broadleaf weeds in turf; rotate seasonally with Broadleaf Weeder and Spearhead to prevent resistance
- Preventing herbicides going down drains/gutters/ creeks
- Differing application techniques
 - 30l tank used with 3 sprayers with 1.2 m boom – Parks
 - 400l Boom sprayer with 2 foldout arms – Ovals
 - Hand held spraying - Bushland



Pesticide Application Notice

Notice is hereby given that the following pesticide use will be undertaken by Council

DATE/S:

PESTICIDE PRODUCT NAME:

LOCATION:

APPLICATION METHOD:

PURPOSE OF APPLICATION:

OTHER INFORMATION / WARNINGS:

RE ENTRY DATE & TIME:

All pesticides are applied in a responsible manner as per manufacturer specifications. Pesticide use is subject to weather conditions. For further information contact Council's Parks Service Unit on 9547 4835 or visit Council's website at hornsby.nsw.gov.au

hornsby.nsw.gov.au/recreation

Legislation

- Workplace Health and Safety
 - Responsibilities for volunteers and contractors
- Pesticides Act and Regulation
- Noxious Weeds Act
- Australian Standards for storage and handling of agricultural and veterinary chemicals
- Protection of the Environment Operations Act
- Threatened Species Conservation Act
- EPBC Act
- Local Government Act



Training

- Chemcert III or IV Training
 - Bushland staff
 - Parks staff
- Volunteer Bushcode Training
 - Bushcode Training to become a member
 - Refresher every 5 years
 - Advanced training available
- Training Works and Parks staff

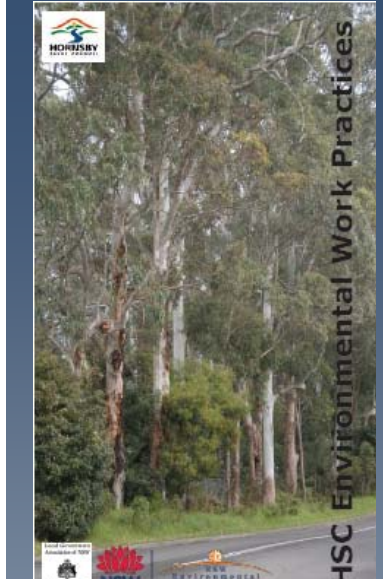


Works and Parks – Outdoor staff training

- Training manual covers
 - Threatened species
 - Endangered Ecological Communities
 - Common trees
 - Habitats
 - Weed id
 - Weed control techniques
 - Pathogens
- Tour of the Shire
- Weed control demonstration – cut & paint, crowning, vine skirting.

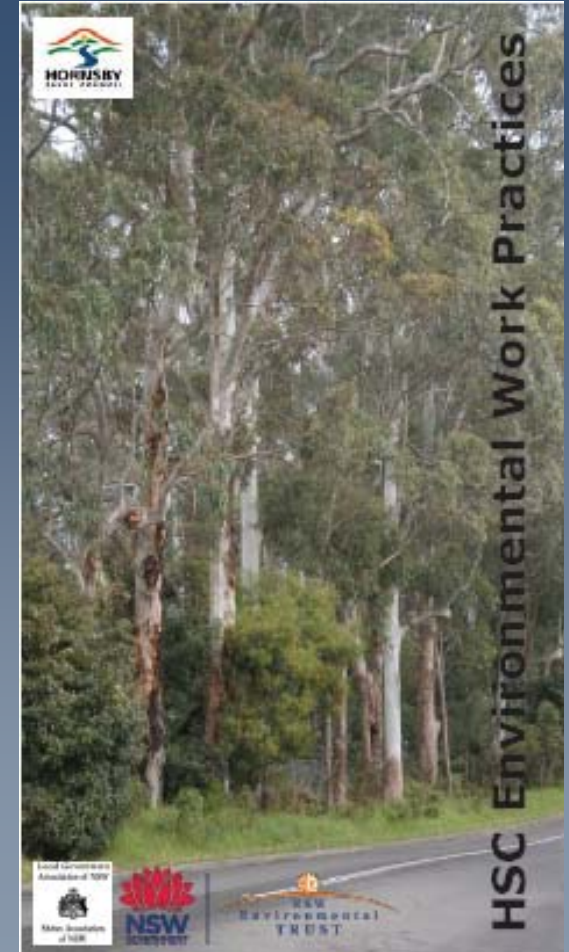
Site Visit Checklist

- Is there any obvious fauna that will be disturbed or affected by the proposed works?
- Is there any habitat for fauna on site?
- Is the site part of an EEC? (ask supervisor to check Dekho mapping)
- Is there a weed issue on the site?
- Which layer(s) are the weeds infesting? Ground/Shrub or Canopy layer?
- What is the best weed control technique?
- Will our team be able to commit to follow up weed control within the next few weeks?
- Is there likely to be native plants that will recruit to replace the weeds post weed control?
- Do we need to contact other council staff for further advice?
- If in doubt call the HSC Natural Resources Team 9847 6832



Program Review

- Review
 - how site plans are implemented
- Review Safe Work Practices
- Review the strategy
- Look to the future



Review

- how site plans are implemented

- Weather and seasons
- Weed flushes
- Changes in personnel – staff, volunteers, contractors
- Off site issues – budget, new weed incursions
- Working with new partners
- Review performance targets and monitoring
- Are outcomes being met



Review Safe Work Practices

Audit –

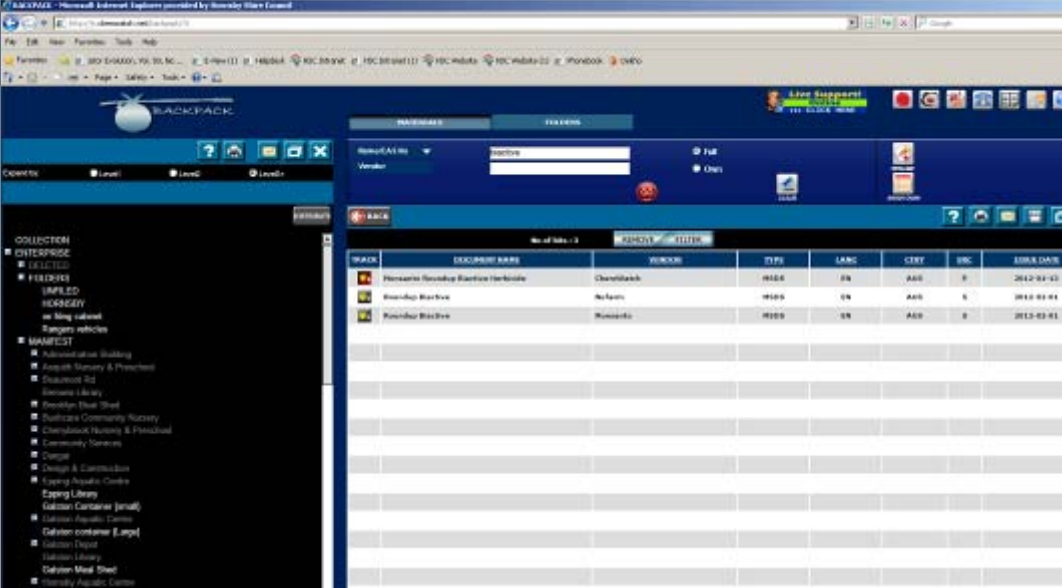
- Program compliance
- Volunteers
- Contractors

Review SWMS

Review PPE Matrix

Review SAFEHOLD

Review Chemwatch

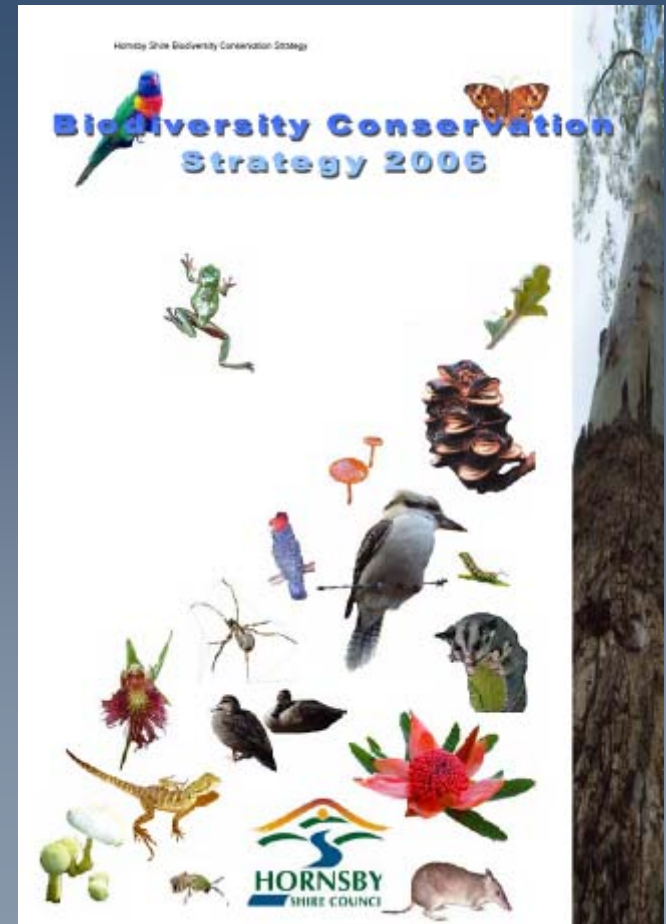


The screenshot shows a web-based interface for a software application named 'BACKPACK'. The interface includes a navigation menu on the left with categories like 'ENTREPRISE', 'COLLECTION', 'IMPLED', 'HEALTHY', 'MANIFEST', and 'EPPG'. The main area displays a table with columns for 'WORK', 'DESCRIPTION NAME', 'WORKID', 'TYPE', 'LABC', 'CITY', 'SEC', and 'ISSUE DATE'. The table contains three rows of data:

WORK	DESCRIPTION NAME	WORKID	TYPE	LABC	CITY	SEC	ISSUE DATE
1	Hornsby Shirewide Electric Vehicle	Cherrybank	MS04	EN	ADD	0	2012-01-13
2	Shirewide Machine	Belconn	MS05	EN	ADD	5	2012-01-13
3	Shirewide Machine	Hornsby	MS05	EN	ADD	0	2012-01-13

Review the strategy

- Measure and monitor – map bushland weed cover through the Shire and at a detailed site level, information is fed in to annual reports
- Review and evaluate plans – Biodiversity Conservation Strategy Action Plans are annually reviewed and updated, as are individual site restoration plans
- Implement – funding is sought and obtained through Council's Management Plan and works achieved are reported quarterly



Look to the future

- Environmental planning legislation reforms
- Local Land Services
- Funding issues
 - Reduced grant offset and other funding \$300,000
- Local government legislation reforms and mergers





HORNSBY

SHIRE COUNCIL

SHIRE COUNCIL
НОРНСБИ



Update from the EPA

Dave Thompson – Pesticide Specialist

NSW Environment Protection Authority

KEY REGULATORS

Safe and responsible pesticide use covered by:

- **APVMA assesses & approves; regulates until point-of-sale**
- **NSW EPA:**
 - **regulates use in NSW (ie after sale) – Pesticides Act 1999 & Regulation**
 - **pollution control laws –Protection of the Environment (Operations) Act 1997**
- **NSW WorkCover Authority - new national work health and safety legislation and codes**

FOLLOW LABEL INSTRUCTIONS

- **Assessment and registration ensures most risks have been anticipated**
- **Best way to avoid off-target harm**
- **Observe exclusion requirements – timing, signage, barriers**
- **Label complexity!**
- **Problems arise? *Adverse Experience* report to APVMA
http://www.apvma.gov.au/use_safely/adverse/agricultural.php**

Eg S7 Dangerous Poison herbicides

- **Paraquat**
- **Molinate – Ordram, Simion**
- **Acrolein – Magnacide**
- **DSMA – eg Trinoc, Paspalum killer**
- **MSMA – eg Daconate**

Things to reinforce:

- Ensure product is actually registered or allowed by a current permit (quiz reseller or use PUBCRIS or Permits search)

<http://www.apvma.gov.au/products/databases/index.php#pubcris>

- Eg. No approved sports turf situations for atrazine since APVMA review 1997

AVOID OFF TARGET HARM

- **Not always enough to only follow the label**
- **Assess risks, ensure no harm to people, plants, animals, property**
- **The “Due diligence” defence**
- **Polluting waters strict liability offences**
- **Failure to properly implement label instructions can risk wildlife – eg fenamiphos**

RECORDS

- **Pesticide records mandatory and always good practice:**
 - Date, start & finish times
 - Order of treatment
 - Crop or situation
 - Product
 - Rate of application
 - Total quantity
 - Equipment
 - Wind speed and direction
 - Applicator details
- **Other relevant records, eg, particular weather details, irrigation records for watering-in requirements, re-entry periods**

UNDERSTAND USER'S LEGAL RESPONSIBILITIES

- Be aware of shared liability provisions of pesticides legislation: manage pressure on workers
- Take all reasonable measures to prevent mishap - Due diligence defence

EPA Powers

- **Enforcement officers have wide-ranging powers:**
 - **Access, if necessary with Police company**
 - **requisition reseller records**
 - **take samples**
 - **direct answering of questions: underlings on bosses**
 - **Search (Warrants for dwellings)**
- **Provide accurate and truthful information**

- **Corporate manager's responsibilities: (due diligence)**
 - **Adopt Best Management Practices**
 - **Staff contracts- clauses to ensure knowledge of relevant law**
 - **Have a Pesticides Use Policy**
 - **Document procedures – Record keeping, purchasing, training, pesticides use, storage, disposal.**
 - **Induct staff - ongoing training (toolbox talks, new products/equipment)**
 - **Audit – internal, independent, unannounced**
 - **Boards of Management - awareness training**

HAVE APPROPRIATE AND CURRENT TRAINING

- **AQF Level 3 essential for unsupervised users**
- **NSW mandatory five year renewal requirement (level 2 acceptable – direct supervision)**
- **Level 4 - skills investment for program supervisors, assists due diligence/duty of care**

RECENT COMPLIANCE EXPERIENCE

- **Use of Notice Powers: sales info.**
- **Use of unregistered product without proper permit (eg ethephon)**
- **Off-label use without permit (eg atrazine, Vydate)**
- **Not following label instructions leading to off-target harm (fenamiphos - Namacur)**
- **Gaps or inaccuracies in record keeping**
- **Currency of training**

HELP USERS STAY UP TO DATE

- Resources
 - PUBCRIS (APVMA)
 - EPA pesticides website
www.epa.nsw.gov.au/pesticides
 - NSW Environment Line 131 555
- Stewardship programs of manufacturers, distributors and resellers
- Industry association programs

- Household use and disposal
- + Chemical management
- Pesticides**
- What are pesticides and how do they work?
- + Pesticides Act
- Managing pesticides in NSW
- Managing rinsate and spray drift
- + Using pesticides safely and legally
- Integrated pest management
- + Record keeping
- + Training
- + Notification of pesticide use
- + Pesticide control orders
- + For pest management technicians
- Pesticide links

What are pesticides?

A pesticide is any substance or mixture of substances used to destroy, suppress or alter the life cycle of a pest. A pesticide can be a naturally derived or synthetically produced substance. A pesticide can also be an organism.

Pesticides include herbicides, fungicides, insecticides, fumigants, bactericides, rodenticides, baits, lures and repellents. Products used on animals to control external parasites are also considered pesticides if they require dilution or mixing with water, unless they are listed as a low-risk veterinary chemical product in the [Regulation to the Stock Medicines Act 1989](#). Pesticides control pest organisms by physically, chemically or biologically interfering with their metabolism or normal behaviour.

For more detailed information, including the legal definition of pesticides under the [Pesticides Act 1999](#), see the Environment Protection Authority (EPA) webpage [What are pesticides and how do they work?](#)

Safe use of pesticides program and poster

A DVD and posters about safe pesticide use are available to help NSW market gardeners and horticultural workers from diverse backgrounds understand how to use pesticides safely and legally.



The poster is available in:

- English ([Englishpestposter06569.pdf](#), 275k)
- Arabic ([Arabicpestposter06576.pdf](#), 401kb)
- Chinese ([Chinesepostposter06577.pdf](#), 32k)
- Khmer ([Khmerpestposter06578.pdf](#), 1125k)
- Vietnamese ([Vietpestposter06579.pdf](#), 423k)

Copies of the DVD and A2 laminated poster, in English and a range of community languages, be requested from the EPA [Environment Line](#). For more details, see the information sheets in:

- English ([Englishpestinfo07384.pdf](#), 65kb)
- Arabic ([Arabicpestinfo06584.pdf](#), 587kb)
- Chinese ([Cantonesepestinfo06586.pdf](#), 10k)
- Khmer ([Khmerpestinfo06557.pdf](#), 3958kb),
- Vietnamese ([Vietpestinfo06588.pdf](#), 472kb)

These handy visual reminders complement information provided in [mandatory pesticide training courses](#). They will also be a useful resource for pesticide trainers and for agricultural, water catchment and environment advisory workers who work with growers in the Sydney Basin and across the state.

Web versions of the video are available in [Mandarin](#), [Cantonese](#), [Vietnamese](#), [Arabic](#) and [Khmer](#), along with other community language resources under [Using pesticides safely and legally](#).

Spray drift management

The EPA, in collaboration with the NSW Farmers Association, Australian Pesticides and Veterinary Medicines Authority (APVMA) and Cotton Australia, has prepared an education campaign to inform farmers on how to avoid spray drift and about the technical and regulatory requirements when using 2,4-D.

Download the [Spray Drift Management webpage and Factsheet](#)

AGREED CHANGES FROM NATIONAL HARMONISATION

- **NSW signed Inter-Gov'tal Agreement May 2013, 18 months to implement!**
- **Record keeping – similar to current Victorian and NSW requirements**
- **Training – minimum level 3 skill users of any Schedule 7s, other high risk products and Restricted Chemical Products (plus more for RCPs)**
- **'Access to chemicals' – minimum standards for varying from label instructions, including lower than label concentrations, and other pests/weeds/diseases**

<p>PER9907 (PDF) (DOC)</p>	<p>Glyphosate, Metsulfuron methyl & Fluroxypyr / Areas of native vegetation and non crop areas / A range of environmental and noxious weeds</p>	<p>31-Mar-20</p>
<p>PER10529 (PDF) (DOC)</p>	<p>Glyphosate / Hawkesbury - Nepean Catchment / Salvinia</p>	<p>30-Sep-13</p>
<p>PER10653 (PDF) (DOC)</p>	<p>Metsulfuron Methyl / Various Waterways / Aquatic Weeds</p>	<p>30-Jun-13</p>
<p>PER10698 (PDF) (DOC)</p>	<p>Glyphosate for control of aquatic weeds / Aquatic and terrestrial areas / Alligator weed, aquatic weeds generally, within 500 m of potable water intakes</p>	<p>30-Jun-13</p>
<p>PER11163 (PDF) (DOC)</p>	<p>Various herbicides (as specified) to be used in conjunction with Crop Optics Australia Pty Ltd WeedSeeker Technology</p>	<p>28-Feb-15</p>
<p>PER11208 (PDF) (DOC)</p>	<p>Garlon (triclopyr) / Bushland / Environmental weeds</p>	<p>31-Jan-14</p>
<p>PER11637 (PDF) (DOC)</p>	<p>Grazon DS Herbicide / Pastures & Non-crop Situations / Hawkweeds</p>	<p>30-Sep-14</p>
<p>PER11724 (PDF) (DOC)</p>	<p>Nufarm Weedmaster Duo / Aquatic areas / Arrowhead, Floating pond weed.</p>	<p>30-Sep-14</p>

<p>PER11916 (PDF) (DOC)</p>	<p>Glyphosate & Metsulfuron / Urban bushland, forests and coastal reserves / Various weeds</p>	<p>31-Mar-20</p>
<p>PER12363 (PDF) (DOC)</p>	<p>Glyphosate and Metsulfuron methyl / Areas of native vegetation / A range of environmental and noxious weeds</p>	<p>31-Dec-15</p>
<p>PER12367 (PDF) (DOC)</p>	<p>Picloram and triclopyr / herbaceous and wood weed control / bushland regeneration</p>	<p>03-Oct-15</p>
<p>PER12554 (PDF) (DOC)</p>	<p>Fusilade Forte 128 EC Herbicide / Bushland / Target Grass weeds: Couch Grass, Rye Grass, Barnyard Grass, Veldt Grass, Yorkshire Fog, Prairie Grass, Cocksfoot, Paspalum, Kikuyu, Bent Grass & Summer Grass</p>	<p>31-Aug-14</p>
<p>PER12665 (PDF) (DOC)</p>	<p>Starane Advanced/ Forestry plantations/ Woody and Herbaceous weeds</p>	<p>31-Jan-15</p>
<p>PER13019 (PDF) (DOC)</p>	<p>Glyphosate / Rights of way (aerial application) / Weeds as per label</p>	<p>31-Mar-15</p>
<p>PER13048 (PDF) (DOC)</p>	<p>Grazon DS and Grazon Extra / Bushland & Native Forest managed by OEH / Environmental weeds</p>	<p>30-Sep-13</p>
<p>PER14200 (PDF) (DOC)</p>	<p>Metsulfuron Methyl / Various Waterways / Aquatic Weeds</p>	<p>30-Jun-18</p>
<p>PER14201 (PDF) (DOC)</p>	<p>Glyphosate for control of aquatic weeds / Aquatic and terrestrial areas / Alligator weed, aquatic weeds generally, within 500 m of potable water intakes</p>	<p>30-Jun-18</p>

Q's

- **Dave Thompson**
NSW EPA
Metro Region
Parramatta

Ph. 9995 6859

Assessing weed control programs for environmental management

Controlling the off-site movement
of residual herbicides

What's driving the concern?

- Sydney Basin, where the issues are degradation of the Nepean-Hawkesbury system and contamination in drinking water catchments
- triazines and forestry herbicides in Tasmania, especially on the east coast, where a range of unfounded health concerns have arisen
- simazine in the Adelaide Hills, where the issue is run-off to potable water
- triazines in greater Perth, where groundwater is the main potable water source, the issue being urban encroachment on old forestry plantations with sandy soils
- run-off from sugar cane production and herbicides used for clearing trees in pasture along the Great Barrier Reef, thereby endangering the Reef
- APVMA's diuron review where the issue was not only Reef run-off but run-off to all water bodies

Who's driving the concern?

- regulators, e.g. Health, EPA, APVMA
- release of new potable water guidelines has caused Health to evaluate current monitoring
- many of the herbicides on APVMA's list to review are there for environmental risks (esp to aquatic life)
- new requirement for APVMA to review ALL pesticides on cyclical basis will invariably lead to restrictions on old pesticides registered to lesser standards than today's
- greenies, e.g. Greens political party, green lobby groups

State of play: potable water

- potable water quality an historical issue in Aus, in cities, well into 20th century
- still an issue in parts of Asia, Africa and Latin America
- yes, we should monitor for contaminants and strive for the lowest possible
- but we don't have 3rd world contamination or health effects

State of play: aquatic life

- yes, there are degraded environments
- mostly urban and consequence of industrial contamination and urban life itself
- non-urban mainly due to irrigation demands; water quality rather than contamination per se
- we don't have dead zone like off US in Gulf of Mexico, or scale of mining contamination like in E Europe, old Soviet bloc, Africa, Asia

Are the concerns real? Has anything changed?

NO

no excessive levels or significant effects on health or environment

Perth and Adelaide catchments not as protected as Sydney's

risk to Reef is sediment load, esp nitrates – pesticide residues inconsequential

anti-forestry sentiment in Tas strong

NGOs/green lobby groups always looking for something new – drift is off the boil so the time has come (the Walrus said) for the next big thing

regulation is self re-inforcing, viz if we have guidelines we'd better look to see if anything's there

Guideline values for potable water

- derive from same tox base used to set ADI and ARfD
- apply large uncertainty (so called 'safety') factors to NOEL: 10 for interspecies, 10 for intraspecies, ≤ 10 for study quality
- values NOT on dose response curve
- function of analytical chemistry – as chemistry improves, values drop
- set low because catchments well protected and we can detect at low levels
- 'health values' terminology misleading – not like 0.05 for alcohol or no Snow White effect

Potable water formula for health

$(\text{mg/kg/day} \times 70 \times 0.1) / 2 \times 100$

mg/kg/day = NOEL (no observed effect level) for rat

70 (kg) = human body weight (WHO standard)

0.1 = 10% of ADI for drinking

2 = 2 L/day adult water consumption

100 = 10 (interspecies) \times 10 (intraspecies)

Guideline values for aquatic life

- environmental values reflect most sensitive species endpoints, whether present or not
- theoretical, lab based, absolute – hazard based, not risk based; not real world or practical
- fails to take into account the ability of ecosystems to absorb and recover
- example, diuron and avian toxicity –
6% decline in fertility
probability of colony feeding on nothing but diuron treated crop for breeding cycle?
c/f dietary intake for residues in livestock
probability 6% decline in fertility will cause irreversible effects (IPM, selective herbicides, grazing crops)
obsolete models – IBS v PSPE

What are guideline values guides to?

- like MRL potable water and environmental guideline values are measures of or guides to GAP, **NOT** measures of adverse effect
- exceeding values will not result in acute or chronic harm
- set low because we can achieve low and measure low

Why should weedies bother?

- managing the perception of risk is often as important as managing the risk itself
- if people think there might be residues in water, no matter how unlikely, the onus falls on applicators to demonstrate there aren't

Managing the risk

Audit what you are currently using and ask:

- Are there non-chemical alternatives?
- Are there pesticides less hazardous to aquatic life?

Assessing the risk profile of the pesticide

- toxic to aquatic plants or animals
- half-life in soil (residual)
- mobility (leaching)
- solubility (half-life in water)
- adsorbed to sediment (hazardous to what grows there, e.g. sea grass, or lives there, e.g. aquatic invertebrates)

Where do you get the info?

- might have to go beyond label restraints and protection statements
- environmental info on MSDS/SDS poor (minimalist info, no explanation of LC_{50} s, K_{oc} s [oc = organic carbon, measure of adsorption] etc)
- access info on web – Exttoxnet, US EPA reviews, APVMA reviews, CDPR environmental assessments
- *Pesticide Manual*

Assessing the site specific risk

- application method (incorporation & band spraying v cover sprays, trunk injection or basal bark v cover spray)
- timing (avoid if >25 mm rain or storms predicted within 48 hours following application)
- capture surface
- soil and slope
- proximity of water bodies

How do you assess a site?

- walk it & talk it
- draw a map or annotate one
- take photos
- spray plan should make use of both map and photos

Managing the perception of risk

- If the public, lobby groups or regulators think there is a risk – even if there isn't – this perception of risk has to be managed.
- Monitoring against regulatory standards may be necessary to demonstrate your risk management is working.
- If the use pattern is on permit, monitoring may be mandated.

To monitor or not to monitor?

- monitoring provides feedback on whether or not the risk management practices adopted are working
- monitoring is also good for PR, esp for govt bodies which have to report on their activities
- monitoring should always target worst case scenarios – it is a waste of time and money to monitor everything

When to monitor

- day after application (greatest risk is storm immediately after application before pesticide translocated or incorporated)
- first heavy rain (>25 mm) within 3 months of application

Where to monitor

- surface water on site
- any surface water within 100 m of application site subject to drainage from site
- any potable water sources, irrigation draw points or aquatic ecosystems within 1 km downstream of application site

How to monitor/sample

- 2 samples at each site (one to despatch, another to retain in case retesting required)
- control or blank (check on laboratory standards)
- sterile jars
- procedures to avoid contamination
- lab advises details (also see guideline documents)

What to record

- who
- where, e.g. GPS, map co-ordinates, marked on map (golf course and surrounds)
- when
- when despatched

Analysis & results

- NATA accredited lab which can analyse for pesticides of concern
- check results against potable water guidelines (**Aust Drinking Water Guidelines**) and environmental guidelines (**Aust & NZ Guidelines for Fresh & Marine Water Quality**) – both on DSEWPaC website
- no guidelines for irrigation water or stock water

Trigger v threshold values

- with MRLs, traceback is initiated if residue in foodstuffs is half MRL or greater
- $\frac{1}{2}$ MRL = trigger value
- MRL = threshold/regulatory value
- investigate and remediate before not after residue is violative
- same principle applies to pesticide residues in water
- Forests NSW has set trigger values at half potable and environmental guideline values

Trigger v threshold values in ppb

Herbicide	Health value	Environment al value	Trigger value	LOQ
atrazine	20	13	7	0.1
simazine	20	3.2	1.6	0.01
hexazinone	400	75	40	0.01
glyphosate	1000	1200	500	10
metsulfuron	40	na	20	10

Herbicides to sample

- atrazine & simazine
- hexazinone
- metsulfuron
- glyphosate
- chlorophenoxy (2,4-D, MCPA, tricopyr, picloram)
- diquat
- diuron
- tebuthiuron (?)
- amitrole (?)

Responding to results

- trigger value exceeded: audit practices, identify what went wrong, rectify (usually requires retraining)
- threshold value exceeded: ditto but notify EPA and/or Health (depending on what guideline value exceeded) – keep them informed, ask their help to rectify problem if necessary

Educating Managers & Operators to Ensure Good Results



July 2013

Disclaimer

- The contents of this presentation is not intended for general public distribution.
- For those wanting to present contents of the presentation to others, permission must be granted from the author (Jonathan Pearson).

ChemCert Accreditation Competency Standards

New Units of Competency

As part of newly formed AHC10 training package

- ✓ **AHCCHM303A** Prepare & Apply Chemicals
- ✓ **AHCCHM304A** Transport, Handle & Store Chemicals
- ✓ **AHCPMG301A** Control Weeds (not required by EPA)

Old Units of Competency

- ✓ **RTC 2706A** Apply chemicals under supervision
- ✓ **RTC3704A** Prepare & apply chemicals
- ✓ **RTC 3705A** Transport, handle & store chemicals
- ✓ **RTC3401A** Control Weeds



AGVet Sales 2011/2012



<i>AGRICULTURAL PRODUCT Types</i>	<i>NO. OF PRODUCTS</i>	<i>TOTAL \$</i>
Adjuvants/surfactants	375	83,630,629
Fungicide	703	217,977,176
Herbicide	2420	1,301,904,633
Insecticide	1166	413,092,839
Household insecticide	545	131,584,261
Miticide	103	21,162,027
Molluscicide	50	16,655,588
Nematicide	19	3,497,287
Vertebrate poison	157	30,171,605
Total AG	7289 (others not shown)	2,474,160,881
<i>VETERINARY PRODUCTS</i>	<i>No. of Products</i>	<i>Total \$</i>
Antibiotics	387	65,367,519
Injectable vaccines	177	124,367,519
Nutrition & Metabolism	669	125,448,63
Parasiticides (internal/External)	1072	449,390,308
All Others	1077	304,019,586
Total Vet	3382	944,350,268
GRAND TOTAL AG & VET		3,418,511,149
	Source : APVMA	

Good Results – Holistic approach

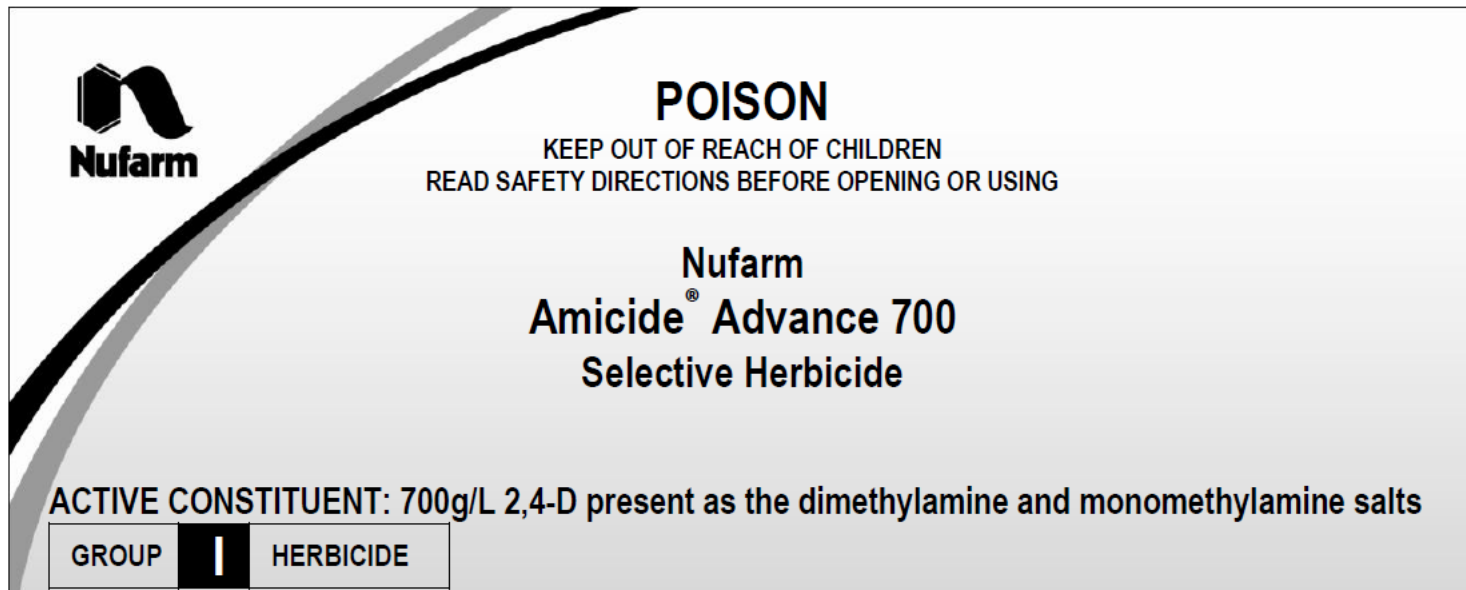
- Aspirational goal of 100 % control of target weeds prior to seed set in an integrated weed management approach
- Negligible damage to non-target organisms
- Zero harm to operator (both acute and chronic effects)
- BMP Industry Waste Management Practice
 - Drum washings (rinsate) into tank & onto target weeds
 - Empty containers (drums) to drumMuster
 - Unwanted/leftover pesticide disposed of through Chemclear
 - Spill procedures in place (small qty in sensitive areas)
- Within budget



Good Results –Chemical Control

- Risk Management – Re user, bystanders & environment
- Hierarchy of Controls
 - Substitution
 - S7 to S5, ester to amine, change in wind direction i.e SE to NW (forecasts)
 - Engineering
 - AI nozzles /Constant Flow valve/ splattergun vs. high volume handgun
 - Mixing of concentrates – closed caption drum to tank
 - Administration
 - Read the label/SDS for exposure controls/human toxicity/ecotoxicity
 - SWMS – Chemical mixing of concentrates – never above shoulders /ventilation
 - Operator training – ChemCert , Prestart inductions
 - PPE
 - According to label/SDS , mixing/application , situation (in cab vs. on foot with knapsack)

New label Restraints



Nufarm

POISON
KEEP OUT OF REACH OF CHILDREN
READ SAFETY DIRECTIONS BEFORE OPENING OR USING

Nufarm
Amicide[®] Advance 700
Selective Herbicide

ACTIVE CONSTITUENT: 700g/L 2,4-D present as the dimethylamine and monomethylamine salts

GROUP	I	HERBICIDE
-------	----------	-----------

DIRECTIONS FOR USE

RESTRAINTS

DO NOT spray if rain seems likely within 6 hours.

DO NOT apply if crop or weeds are stressed due to dry or excessively moist conditions.

SPRAY DRIFT RESTRAINTS

DO NOT apply with spray droplets smaller than a **COARSE** spray droplet size category according to "APVMA Compliance Instructions for Mandatory COARSE or Larger Droplet Size Categories" located under this title in the GENERAL INSTRUCTIONS section of this label.

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

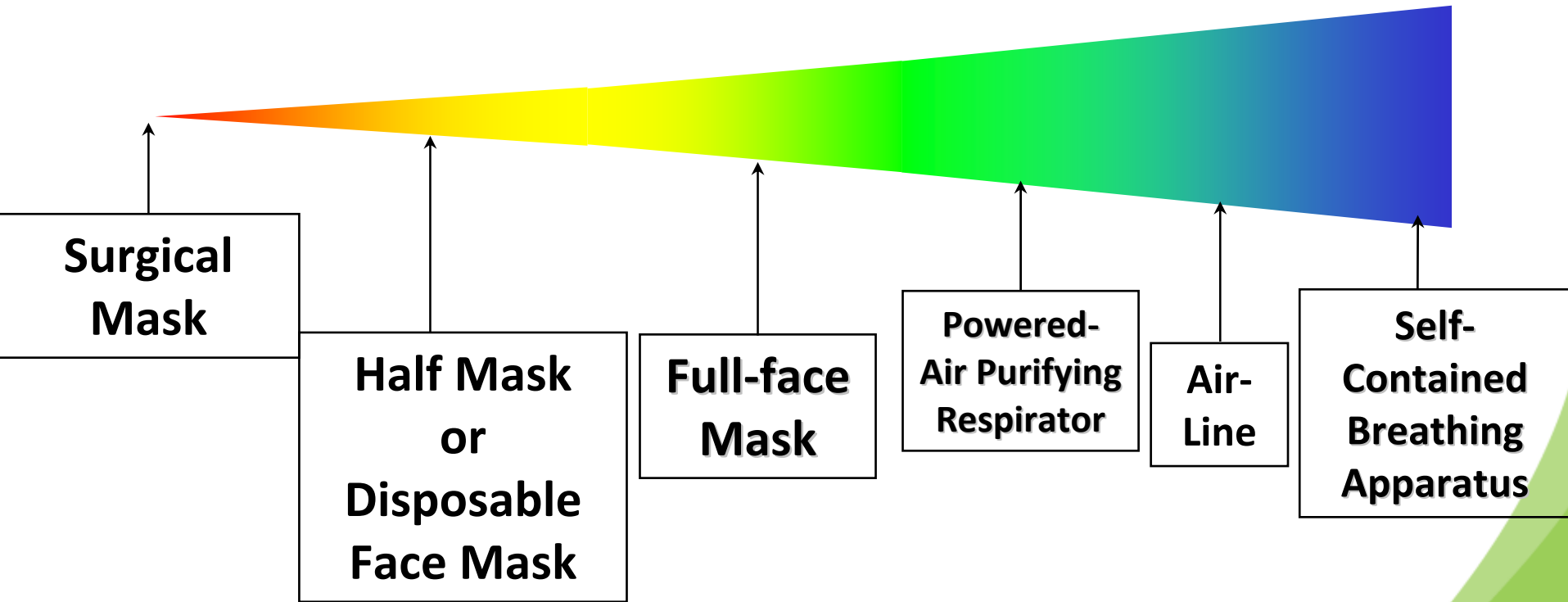
DO NOT apply when wind speed is less than 3 or more than 15 kilometres per hour (aerial application) as measured at the application site.

DO NOT apply during surface temperature inversion conditions at the application site.

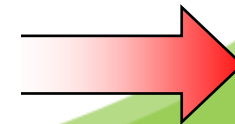
Users of this product **MUST make an accurate written record** of the details of each spray application within 24 hours following application and **KEEP** this record for a minimum of 2 years. The spray application details that must be recorded are: **1** date with start and finish times of application; **2** location address and paddock/s sprayed; **3** full name of this product; **4** amount of product used per hectare and number of hectares applied to; **5** crop/situation and weed/pest; **6** wind speed and direction during application; **7** air temperature and relative humidity during application; **8** nozzle brand, type, spray angle, nozzle capacity and spray system pressure measured during application; **9** name and address of person applying this product. (Additional record details may be required by the state or territory where this product is used.)







Respiratory Protective Equipment Spectrum



Increasing Protection



Types of Gas Filter

-  **A - Organic Vapour (tested against Cyclohexane)**
-  **B - Acid Gases (Cl_2 , H_2S , HCN)**
- E - SO_2**
-  **G - low vapour pressure organics**
-  **K - Ammonia**
- Hg - Mercury**
- MB - Methyl Bromide**
- Others**

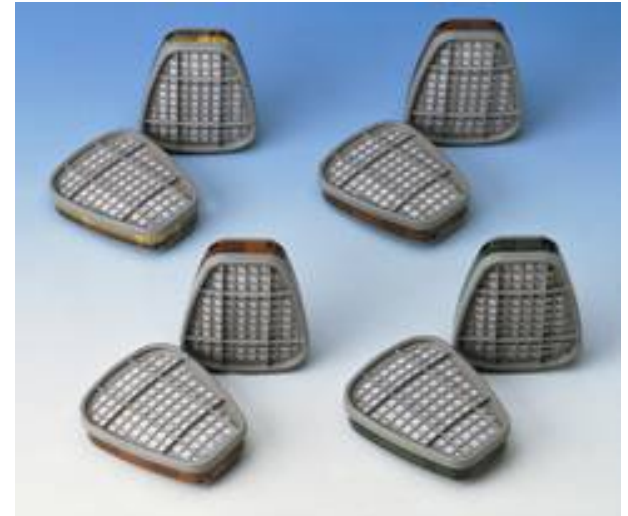
Gas Filter Classification

- **Capacity Rating**

- 3
- 2
- 1
- Aus



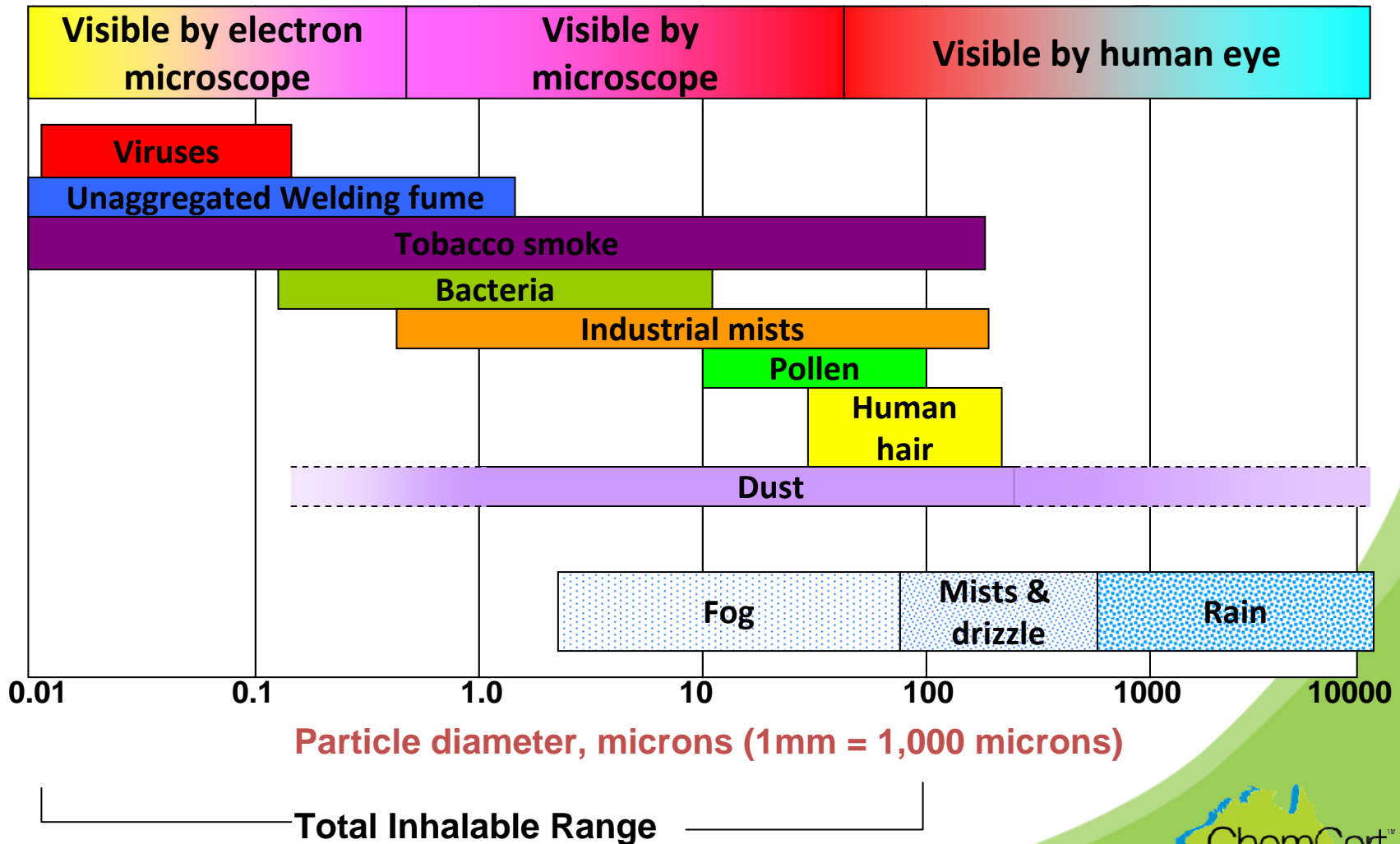
Decreasing capacity



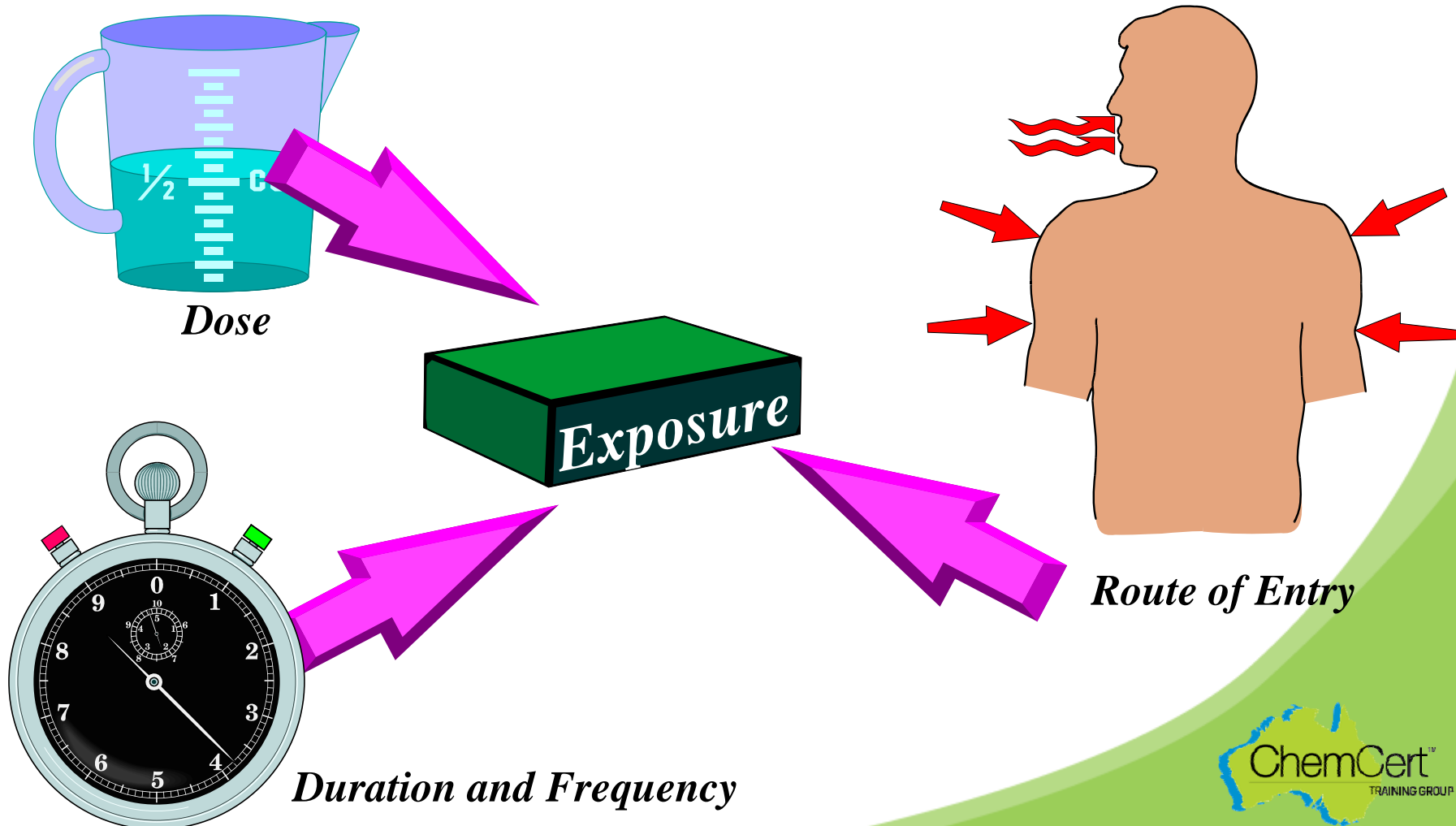
- The filter is rated by type and capacity to give suitable protection against different types and levels of contaminant.
- So there are filters like A1, B2 or multi gas filters like A1B1E1, A1B1E1K1 or combination gas/vapour/particle filters like A1P2 or A2B2E2K2P3.



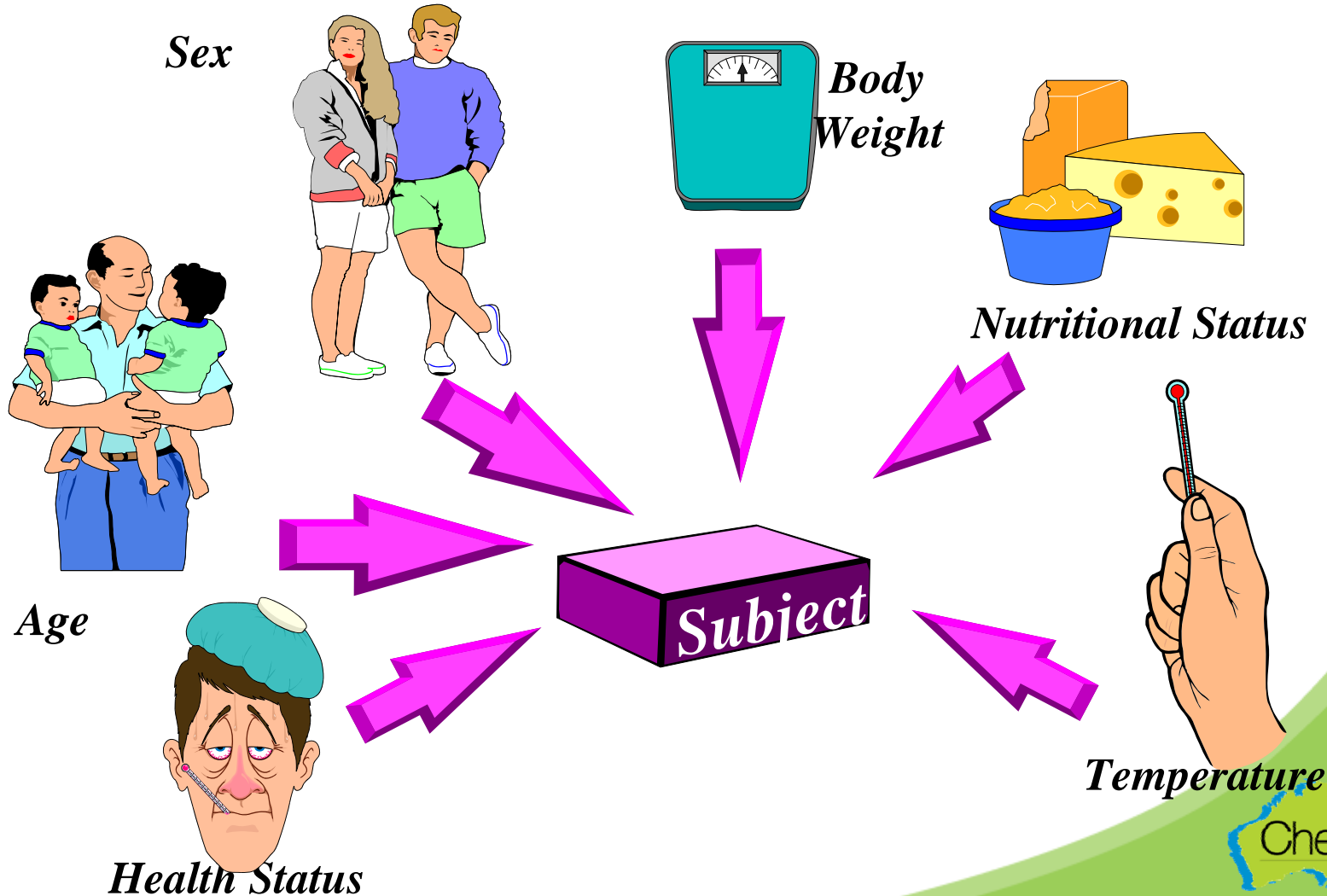
Sizes of selected particles



- FACTORS RELATED TO THE EXPOSURE



- FACTORS RELATED TO THE SUBJECT



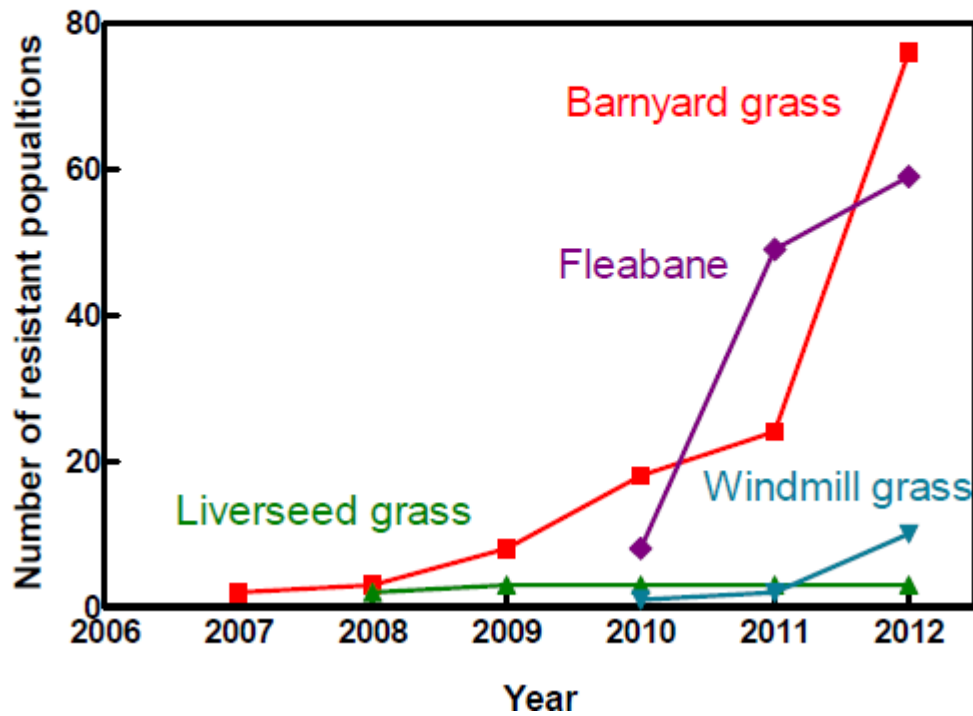
Overuse of Glyphosate

- Its cheap (\$5/ha)
- Roundup Ready Canola volunteers on roadside
- New/emerging weeds
 - Flax fleabane (pictured)
 - Stinging nettle
 - Marshmallow
 - Erodium
 - Barnyard, Liverseed and Windmill Grasses



Extrapolating forward doesn't look pretty

The increase in confirmed cases of glyphosate resistance in summer weeds between 2007 and 2012 is:



Source: glyphosateresistance.org.au

July 2013

Mode Of Action Rotation

S7	GROUP L	Inhibitors of photosynthesis at photosystem I (PSI inhibitors)
	<i>Bipyridyls:</i>	diquat (Reglone [®] , Spray Seed ^{®*}), paraquat (Alliance ^{®*} , Gramoxone [®] , Spray Seed ^{®*})
→	GROUP M	Inhibitors of EPSP synthase
	<i>Glycines:</i>	glyphosate (Arsenal Xpress ^{®*} , Broadway ^{®*} , Illico ^{®*} , Resolva ^{®*} , Roundup [®] , Trounce ^{®*})
→	GROUP N	Inhibitors of glutamine synthetase
S5	<i>Phosphinic acids:</i>	glufosinate (Basta [®] , Liberty [®])
	GROUP O	Inhibitors of cell wall (cellulose) synthesis
	<i>Nitriles:</i>	dichlobenil (Casoron [®])
	<i>Benzamides:</i>	isoxaben (Gallery [®] , X-Pand [®])
	GROUP P	Inhibitors of auxin transport
	<i>Phthalamates:</i>	naptalam (Alanap-L [®])
→	GROUP Q	Bleachers: Inhibitors of carotenoid biosynthesis unknown target
S5	<i>Triazoles:</i>	amitrole (Alliance ^{®*} , Amitrole [®] , Illico ^{®*})
	<i>Isoxazolidinones:</i>	clomazone (Command [®] , Viper ^{®*})
	GROUP R	Inhibitors of dihydropteroate synthase (DHP inhibitors)
	<i>Carbamates:</i>	asulam (Asulox [®])
	GROUP Z	Herbicides with unknown and probably diverse sites of action
	<i>Arylamino propionic acids:</i>	flamprop (Mataven L [®])
	<i>Dicarboxylic acids:</i>	endothal (Endothal [®])
	<i>Organoarsenicals:</i>	DSMA (disodium methylarsonate) (Methar [®]), MSMA (Daconate [®])

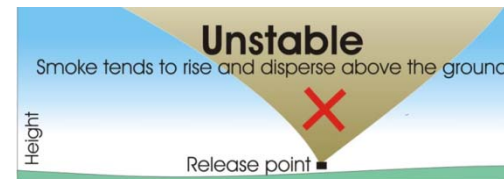
Aim of Efficient Application

- The Right Chemical – resistance status , generic versus branded , rain fastness, use of surfactants, registered use unless by permit
- In the Right Place – weather effects / spray quality - drift
- At The Right Dose – calibration/set up/robust rates
- At The Right Time – size of plant/time of year (woody weeds – full leaf and actively growing)
- With Safety to Operator and Environment
- Economical (high volume foliar spray versus cutstump/splattergun)



Suitable Spraying Conditions

- wind speeds between 3-15km/h (20 some labels)
- wind blowing away from sensitive areas
- Delta T between two and eight, 10 with AI nozzles
- temperature below 30°C
- no inversion layer present
- don't spray if the weather becomes unstable



- Refer BOM , Nufarm Spraywise and Syngenta Agricast forecasts by subscription

Why calibrate a knapsack?

- 100 operators tested resulted in 300% variation in water rates per hectare
- Using Roundup at e.g. 10ml/1litre water (1/100 Ratio) in 15 Litre Knapsack would add 150mls/Knapsack(10mlsx15)

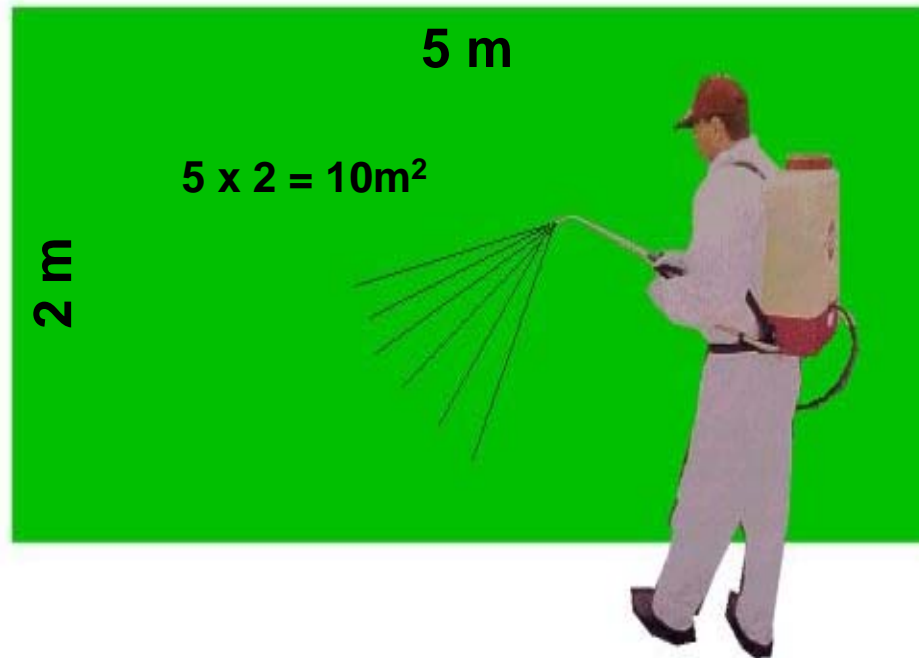
Importance of calibration ?

At 150ml Roundup/15Lt Knapsack

- Person A $1\text{L}/10\text{ m}^2 = 1000\text{lt water}/\text{Ha}$
Would apply **10Lts Roundup/Ha**
- Person B $0.8\text{L}/10\text{m}^2 = 800\text{Lt water}/\text{ha}$
Would be applying at **8Lts Roundup/Ha**
- Person C $0.4/\text{Lt}/10\text{m}^2 = 400\text{lts water}/\text{Ha}$
Would be applying at **4Lts Roundup/Ha**

Calibrating hand held equipment

1. Measure volume to spray 10m^2 L/ 10m^2
2. 10 Square metres is $1/1000$ Ha, $1\text{L} = 1000$ mls
3. Litres of spray applied/ha = L/ 10m^2 x 1000
4. Tank size (L).... x Chemical rate (L) \div L/Ha =
Chemical concentrate into sprayer (L)



Spray water into jug
for the same time
as you took to
spray area

=

Litres



If Target rate 6Lts/Ha

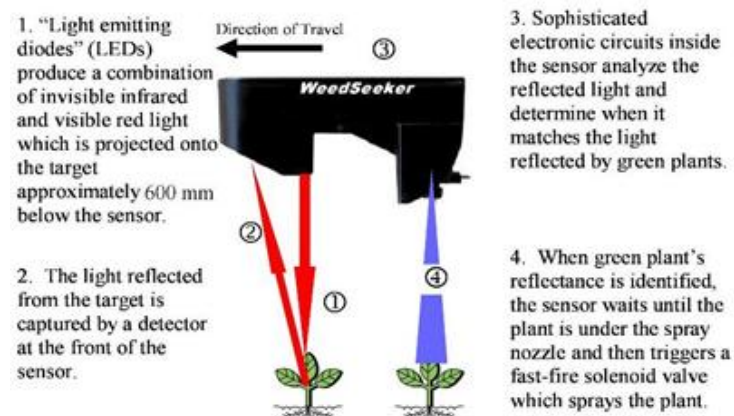
- Person A should add 90mls/15Lt Knapsack (6mls/Lt) **instead of 150mls (90=40% less)**
- Person B should add 113mls/15Lt Knapsack (7.5ml/Lt) **(113=25% less)**
- Person C should add 225ml/15Lt Knapsack (15ml/Lt) **(225=50% more)**

IWM Toolbox

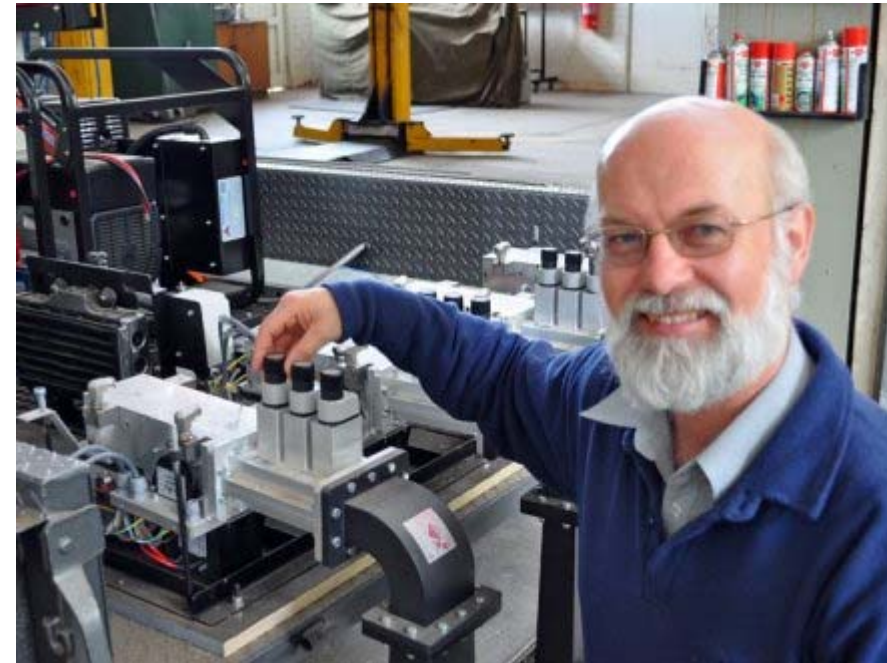
- Hygiene – Come Clean Go Clean, weed free mulch/compost
- Biological – Cactoblastis moth on Prickly Pear, Bitou bush seed fly, Cryptobageous salviniae weevil on salvinia, grazing
- Physical – hand pulling, chipping - if weeds reproductive must capture seed or do more harm than good.
- Mechanical – Slashing, mowing, cultivation
- Cultural – planting of natives (following fire)
- Strategic use of fire , not for the faint hearted, success is weed specific , good success with boneseed in Victoria
- Chemical – WeedSeeker

Wick wiper – sensitive areas

How a *WeedSeeker*[®] sensor works



Ag engineer Dr Graham Brodie has invented a working prototype machine that focuses microwave energy at ground level



The microwave treatment superheats the water that's inside the actual plant cells and that turns it to steam and the steam generates a lot of pressure, which eventually ruptures and destroys the cell structure which actually kills the plant.

SOME TOOLS/TECHNIQUES FOR WEED MANAGEMENT IN ENVIRONMENTALLY SENSITIVE AREAS

July 2013



Dow AgroSciences

Solutions for the Growing World

Things you don't want to see!



Dow AgroSciences

The other extreme!



- Japanese colleagues developed a picloram toothpick for controlling Kudzu vine.

Kudzu



What are we trying to achieve?



- Removal of undesirable plants
- Replacement with (more) desirable spp.
- Stopping seed set/propagule dispersion (eg. Maderia vine)
- Minimal exposure to end user if using chemical options
- Accurate placement on target spp.
- Minimal active ingredient into the environment
- No/minimal impact to off target plants or animals
- No run off into riparian zones
- No drift
- **RESULTING IN:** Restoration of either the native environment or improved pasture for grazing enterprises or rights of way free from interfering vegetation

Application methods and products



Techniques available to us



- High volume foliar spray with correctly calibrated equipment with coarse spray quality
- Cut stump
- Basal bark
- Granules
- Splatter gun
- Stem injection
- Paint/scrape
- Wet blade with equipment like EcoBlade®

High vol



CALIBRATION CHART FOR DOME-SHAPED WEEDS

Recommended volume for dome-shaped weeds such as blackberry and gorse.

Volume of spray per bush in L
Based on 3000–4000 L/ha

Bush diameter (metres)	Bush height (metres)		
	1.5	2.0	2.5
4.0	7.0	10.5	15.0
4.5	8.6	13.6	17.6
5.0	10.4	14.9	20.6
5.5	12.3	17.6	23.8
6.0	14.4	20.4	27.3

Source: Max McMillan

CALIBRATION CHART FOR CYLINDRICAL/CONE-SHAPED WEEDS

Recommended volume for cylindrical/cone-shaped weeds such as sweet briar, lantana, wattle and eucalypt regrowth.

Bush diameter (metres)	Bush height (metres)		
	1	2	3
1.0	160	240	310
2.0	630	940	1300
3.0	1400	2100	2800
4.0	2500	3800	5000
Water rate L/ha	2000	3000	4000

Source: Max McMillan



- Use t
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- > E.g
- Euc
- > Ho
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- areas
- Only

properly set up
g coarse spray

e
is the possibility of
John's wort under

sitive spp or riparian



Cut stump



Dow AgroSciences

Vigilant™ 11 Herbicide gel



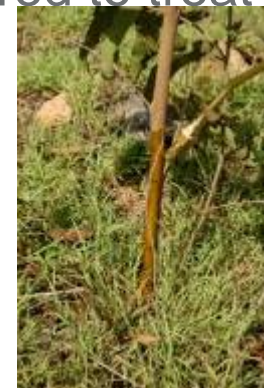
- **Vigilant II is a low toxicity herbicide gel which** provides a simple non-spray alternative for selectively controlling invasive weeds without the risk of
- **✓ Safe to the User** ✓ **No Spray Drift**
- **✓ No Mixing required** ✓ **Unique Gel Formation**
- **✓ Easy to Apply** ✓ **Ready to Use**
- **Vigilant II is applied directly to freshly cut/crushed stems or trunks of weed plants** and is suitable for use in sensitive areas including native bush, conservation areas, farms, lifestyle blocks, gullies, parks and reserves.



Basal bark technique



- **New ThinLine technique** to save time/labour and money
- **ThinLine Application** is an application technique using Access herbicide to treat saplings and regrowth less than 5 cm in basal diameter. The herbicide is applied mixed with diesel or Biosafe, a diesel replacement, to assist penetration through the bark
- The ThinLine application method, requires a mix of **Access with diesel or Biosafe** at a ratio of **1:9**.
- You treat the stem of the sapling from ground level up to 5 cm high. This technique uses less carrier and reduces the time required to treat each stem compared to standard basal bark application



Cut stump/basal bark-alternative to diesel available from GREEN N GOLD lubricants



- **Biosafe** is suitable for use as a diesel replacement in cut stump and basal bark applications as a low toxicity carrier for herbicides that are commonly used to prevent regrowth in forestry.
- Benefits include:
 - > Low toxicity means that it poses a low health and safety risk for users.
 - > Excellent solvency properties make it an effective replacement for diesel.
 - > Readily Biodegradable means that it will have a low environmental impact.
 - > **Dow AgroSciences has trialled with ACCESS™, GARLON™ and STARANE™ADVANCED and found them suitable. Not currently a label claim but supported.**

Granules



- Useful for ragwort-Tordon 2G
- Prickly acacia/Mimosa bush-Graslan pellets
- Need to be very aware of potential off target damage with tebuthiuron in particular. Not suited in urban or sensitive environments



Prickly acacia flowers



Prickly acacia

Splatter gun



Dow AgroSciences

Stem injection



- Used very successfully on weeds like privet/camphor laurel



Scrape and paint



- C
v
p



many
lant
que



Wet Blade



Wet Blade



New molecules in the woody weed noxious weed management space?



- Now costing \$250MM to bring to market
- Environmental data demands more stringent than ever before
- Looking at novel chemistry
- One new candidate identified
- Now need to characterise on key targets

Other news



- New woody weed app to be launched at Noxious weeds conference



- Application videos for most techniques discussed today are available on www.woodyweedspecialists.com.au

Questions?



Confidence in a drum



Dow AgroSciences

Solutions for the Growing World

APVMA Minor Use Permits Achieving Outcomes



Karl Adamson, APVMA



Australian Government
**Australian Pesticides and
Veterinary Medicines Authority**

Overview

- Drivers for minor use permits
- Preparing an application
- New Legislation

Drivers for minor use permits

Many and Varied

- User legal requirements
- Quality Assurance
- Market Access
- IPM & Resistance Management
- Crop rotation & New crops
- Manufacturer business case decisions
- Research and trials

Legal Requirements and QA

- **APVMA Legislation: Possession and Supply**

Permit means a permit, in respect of an active constituent for a proposed or existing chemical product, or in respect of a chemical product, to do or omit to do any thing stated in the permit the doing of which, or the omission to do which, would, apart from the permit, be:

- (a) an offence against section 74, 75, 76, 77, 78, 79, 79A, 79B, 80, 81, 84, 85, 87, 87A or 91; or
- (b) an offence against an eligible law of this jurisdiction.

- **State Legislation: Control of Use**

- **Quality Assurance and DECC Environmental Licencing Requirements**

Market Access, IPM

- **Quarantine and Market Access**

DQMAWG requirements, plant wash down and local requirements

- **Integrated Pest Management**

- Access to alternative chemical classes,
 - Different methods of application
 - Different regional issues
-

Other Issues

- Mixed Crop Rotation and New crops
 - Research and trials
 - **Manufacturer Business Case Decisions**
 - Patent and/or Data Protection
 - Regulatory cost versus potential profit
 - Liability (small but high value crops)
 - “Risk cup” (regulatory) considerations
 - Product stewardship
-

Why aren't these Uses Registered

The decision of what gets registered is not simple

IT IS

largely “PROFIT” driven determined by “marketers”

NOT

necessarily targeting agricultural needs or “gaps”
but “market opportunities”

“Weed Control and Minor Use”

THE KEY MESSAGE

Chemical companies drive
what uses are registered (“profitable”)

NOT

end users or the regulator

Environmental weeds are a high priority for registrants

Drivers to Registration

- Old Chemistry
 - Data requirements
 - Residues
 - Efficacy
 - Environment
 - Manufacturer Support
 - Supporting Data
 - Updating Labels
 - Registration Costs
 - Who generates the data?
-



MINOR USE

PERMIT APPLICATIONS

The Paperwork

3 Key Regulatory Requirements

To successfully gain a minor use permit the use must;

1. be a minor use,
2. meet the following criteria;
 - not pose unacceptable risks to;
 - people,
 - environment, and
 - target crop or animal
 - be effective, and
 - not adversely affect international trade.
3. be justified in presence of registered alternatives

Minor Use Status

APVMA Guideline

1. Automatic status – minor use by exclusion
2. Limited area of major crop (10% or 10,000 ha)
3. Economic analysis approach (rare)

Justification in presence of registered alternatives

Not acceptable:

- Cost
- Preference due to registration on other commodities
- “*Auditors are coming next week*” or “*I was issued a PIN*”
- Lower hazard

Additionally permits are:

- NOT a mechanism to ‘fast-track’ or by-pass registration
- NOT to solution to outdated labels (ie. changed practices, new technology or reduce WHP’s)

Justification in presence of registered alternatives

Sometimes acceptable:

- Product unavailability

Acceptable:

- Limited products, including purposes of Resistance mgt. & IPM suitability
- Lack of efficacy – resistance etc.
- Market access requirements (ie. quarantine related)

Supporting data and information

Key message - 'Assume nothing'

APVMA does not research supporting information

IT IS the applicants responsibility to gain information to support the proposed use

Not acceptable:

- *“I know it works and it’s safe”*
- Registration in other countries (without any information)

Supporting data and information

Often acceptable:

- Extrapolation from existing registrations
 - OH&S & Environment (similar to reg. use patterns)
 - Efficacy & crop safety (similar biologically/botanically)
 - Residues (similar botanically/morphologically)
- International / overseas data

Acceptable:

- Crop specific data (local or international)

Some typical extrapolations (major → minor)	Discipline		
	Efficacy	Crop Safety	Residues
Tomatoes ↔ Capsicums & Eggplant	S-C	S-C	C
Pome fruit ↔ Persimmons	S	S	C
Apples ↔ other Pome fruit	S-C	S-C	C
Onions ↔ other Allium vegetables	S-C	S-C	C
Oranges ↔ other citrus	S-C	S-C	C
Peaches ↔ other Stone fruit	S-C	S-C	S
Tropical fruit ↔ other tropical fruit	S-C	S	R
Oilseeds ↔ other oilseeds	S-C	S	C
Brassica veg. ↔ Asian leafy brassicas	C	C	R
Lettuce ↔ silverbeet & spinach	S-C	S	C
Carrots ↔ turnips, swedes, radish	S	S	C
Stone fruit ↔ Almonds	C	C	R

C = COMMON
S = SOMETIMES
R = RARELY

Finding supporting data and information

Look locally and internationally in same or similar commodities for;

- Existing registrations - databases
- MRLs (databases – MRL Database FAS)
- Industry R&D projects
- Other trial information
- Published papers
- Manufacturer support via data provision

New Legislation: New Business

1st July 2014

- Regulations still being written
 - Changes:
 - Data requirements
 - Interaction with Applicants
 - Powers of compliance
 - Cost
 - November 2013 deadline for external launch
-

Discussion



Justification

Toxicology and OH&S

Residues and Trade

Environment

Efficacy and Crop Safety



THANK YOU

Karl Adamson – Minor Use

Ph: 02 – 6210 4831

karl.adamson@apvma.gov.au

Recent Advances in Drift Management

Andrew Hewitt

July 17, 2013

Summary

- Balancing on-target spray coverage with drift avoidance
- Drift exposure with respect to toxicity and dose
- Overview of drift research – Spray Drift Task Force studies, Australian research (GRDC etc)
- Drift management – current approaches
- Drift management – new/ novel approaches and technologies
- Resources

Summary of Drift

- Spray drift exposure to a sensitive area can only occur if:
 1. WIND DIRECTION AND SPEED: The wind must blow sufficient mass of active ingredient in droplets/ particles towards the sensitive area(s)
 2. PARTICLE CAPTURE BY BARRIERS: The particles must not be caught by vegetation (trees, etc) or other structures in the area between the spray release and the sensitive areas
 3. PARTICLE DEPOSITION: The particles must deposit on the sensitive area (which may never occur for small particles as they remain airborne for long distance). Here, wind speed may be non-intuitive because at higher wind speeds, dispersion and dilution increase, so concentrations on the ground decrease

Pesticide Application: The Purpose is Efficacy

- Control of pests, weeds and diseases requires effective delivery of an optimised dose of chemical in a droplet size spectrum to achieve sufficient coverage on the crop with a formulation that will provide good sticking, spreading and uptake
- Smaller droplets provide greater coverage without increasing water volume rate, but can be a risk for off-target drift movement
- In some crops (especially tree and vine crops), the range of coverage can vary by 3 orders of magnitude and the way to improve that is not to simply increase application rates as 2×0.1 is only 0.2% Instead we need to better target the spray (I also don't agree with resistance management being via higher rates for the same reason)

Tank Mix Composition

Spray Material

Properties

Name:

Spray Material Evaporates

Spray Volume Rate:

Fractions

Active Fraction:

Nonvol. Fraction:

Tank Mix

Active Solution

% of Tank Mix:

Fraction of Active Solution that is nonvolatile:

Additive Solution(s)

% of Tank Mix:

Fraction of Additive Solution(s) that is nonvolatile:

Carrier

% of Tank Mix:

Total

% of Tank Mix:

Legend:

- Nonvolatile Active (18 %)
- Nonvolatile Additive(s) (7 %)
- Volatiles (75 %)

Calculation Control

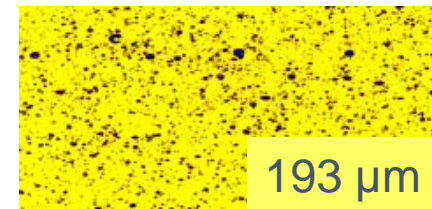
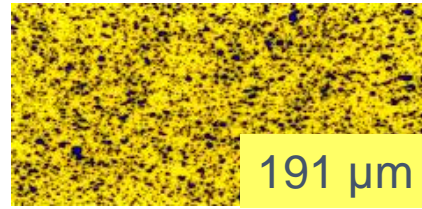
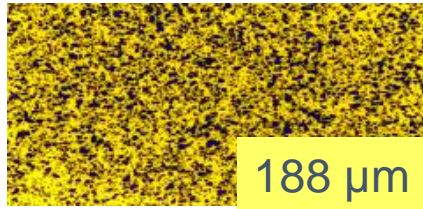
Enter Fractions Tank Mix

High Volume

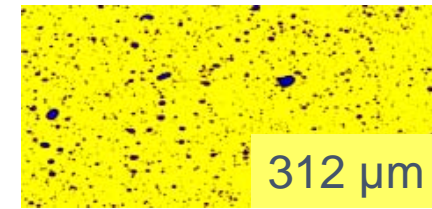
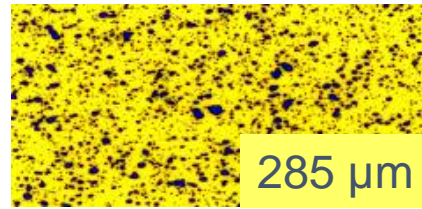
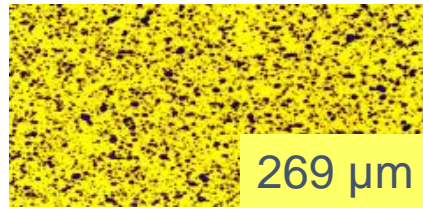
Medium Volume

Low Volume

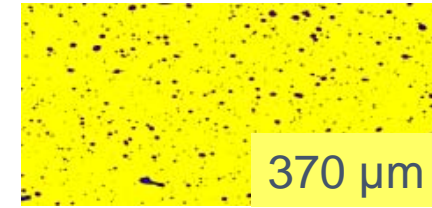
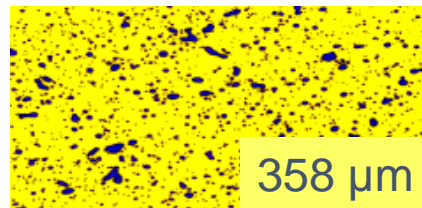
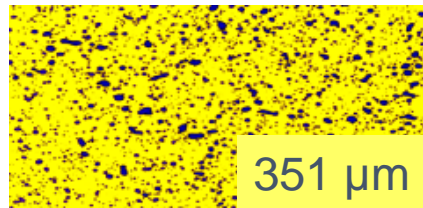
Fine/ Medium



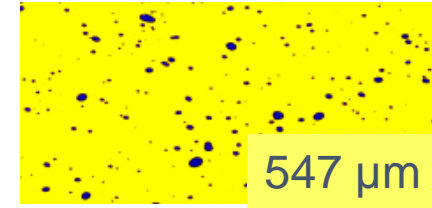
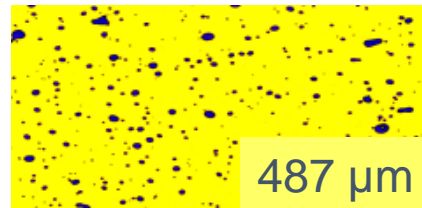
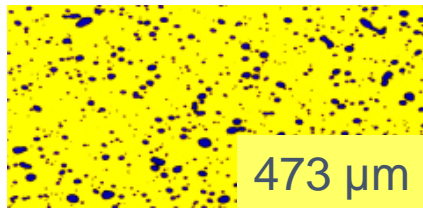
Medium/ Coarse



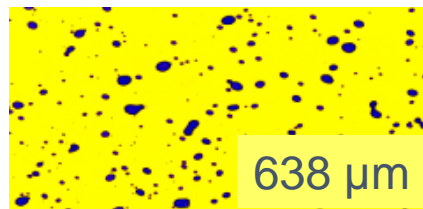
Coarse/ V. Coarse



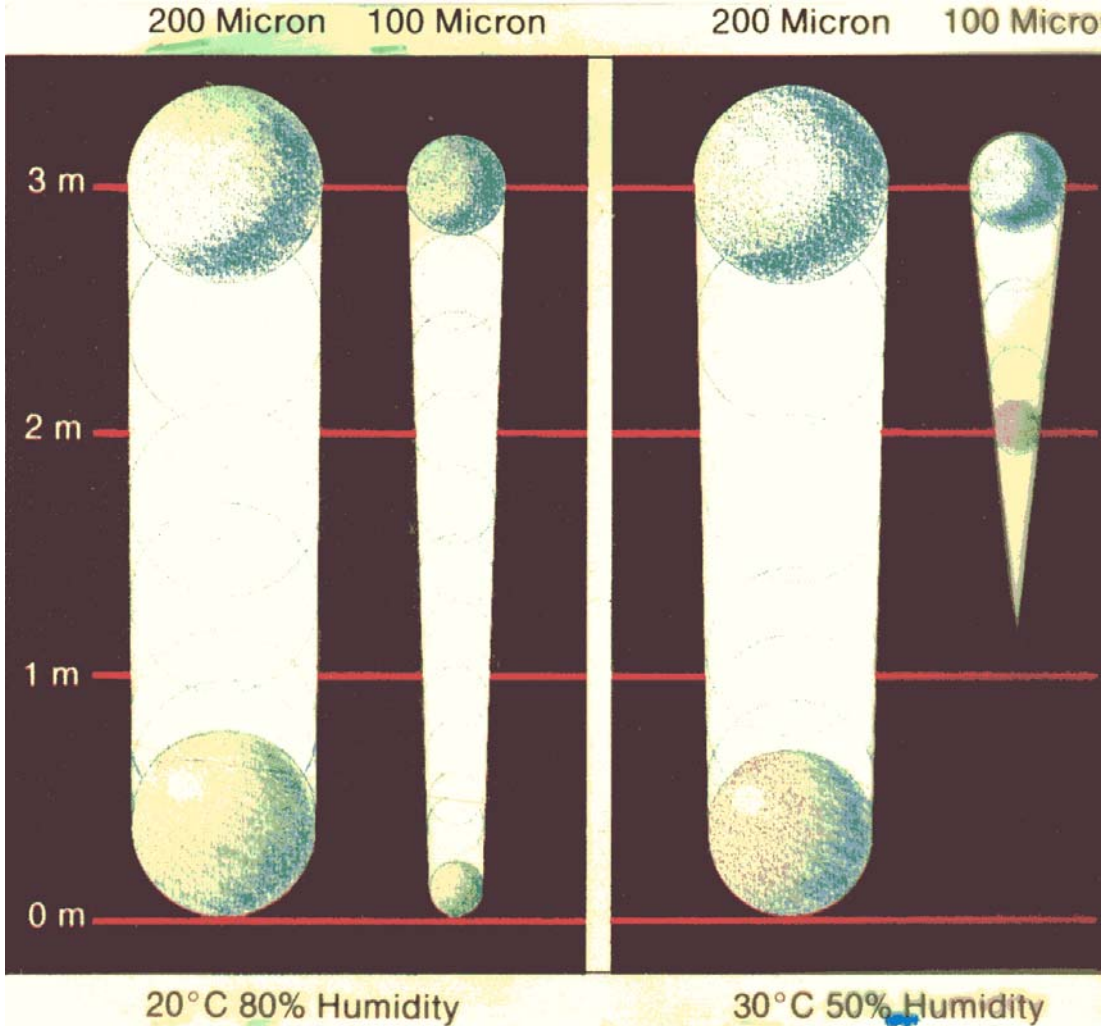
V. Coarse/ X. Coarse



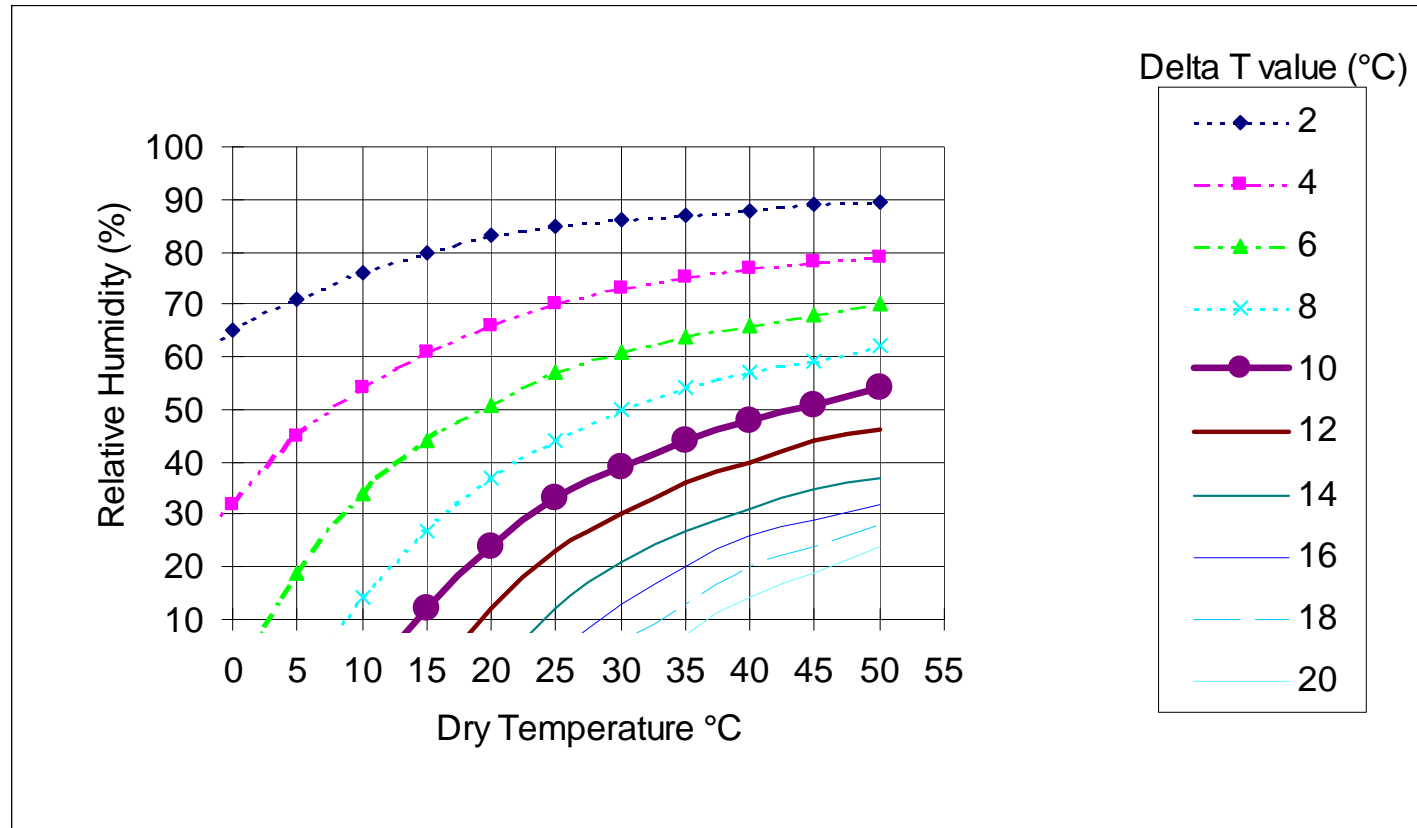
X. Coarse/ U. Coarse



Evaporation of Aqueous Sprays

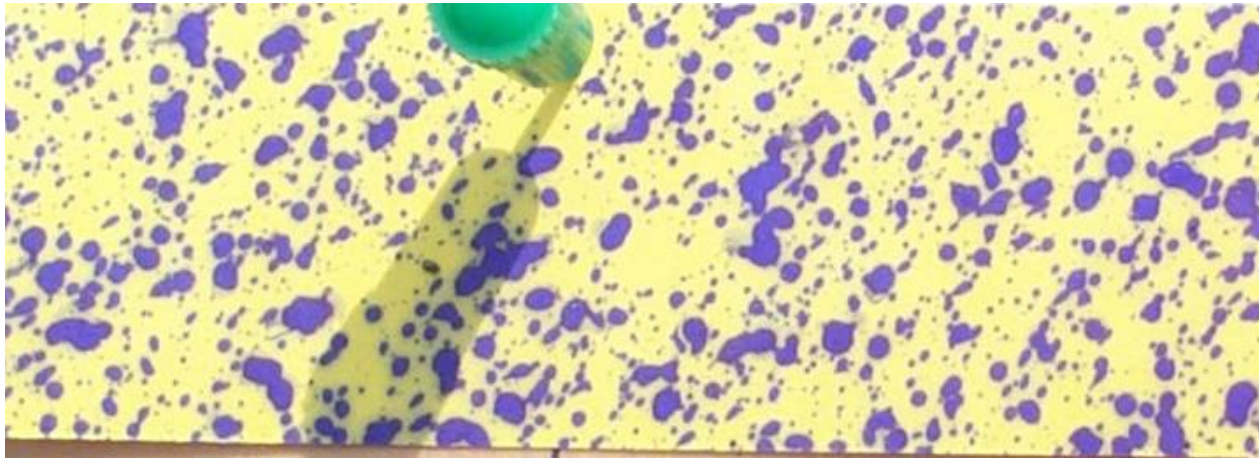


Relationship between dry temperature and relative humidity for various wet bulb depression or delta T values (whirling psychrometer)



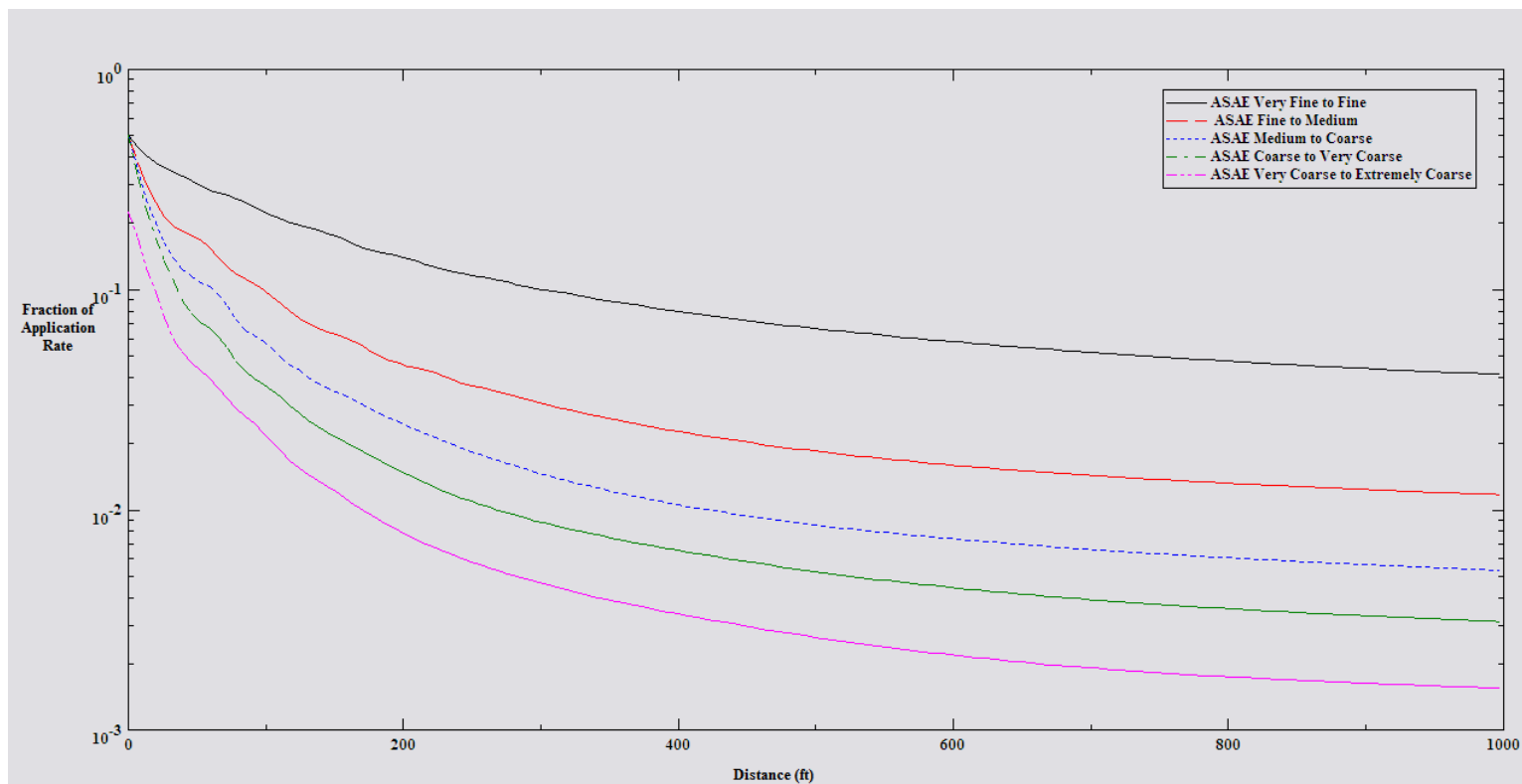
Advantages of Larger Droplets

- Retain momentum due to greater mass, tending to travel more rapidly toward the target, be less displaced by the wind and suffer less size reduction by evaporation



Advantages of Large Droplets

- Lower off-target drift potential



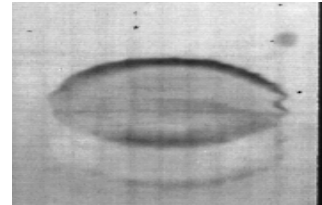
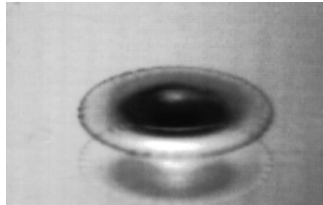
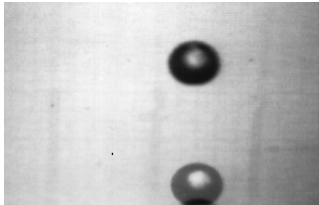
Advantages of Large Droplets

- Improved uptake of glyphosate (Feng et al, Weed Technology 14(1), 127-132) except at very high concentrations (Miller)

	Fine	Coarse
Retained:	47%	38%
Absorbed:	30%	49%
NET:	14%	19%

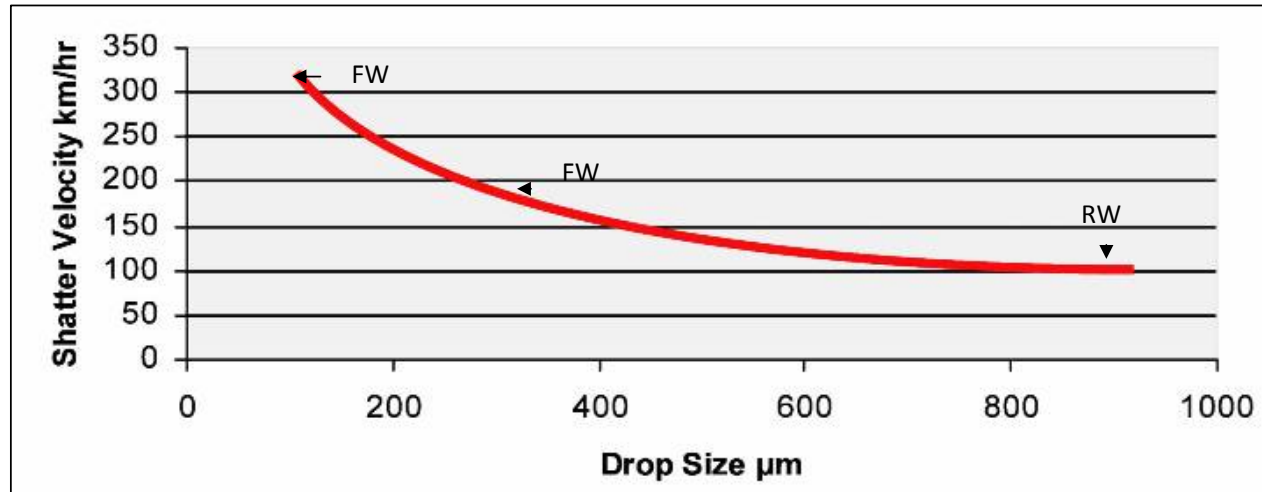
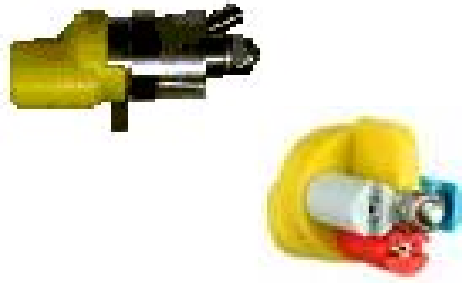
Advantages of Large Droplets

- Shatter on impact and spread to cover target surfaces (although total overall coverage may be lower than from smaller droplets if application volume rates are not high enough)

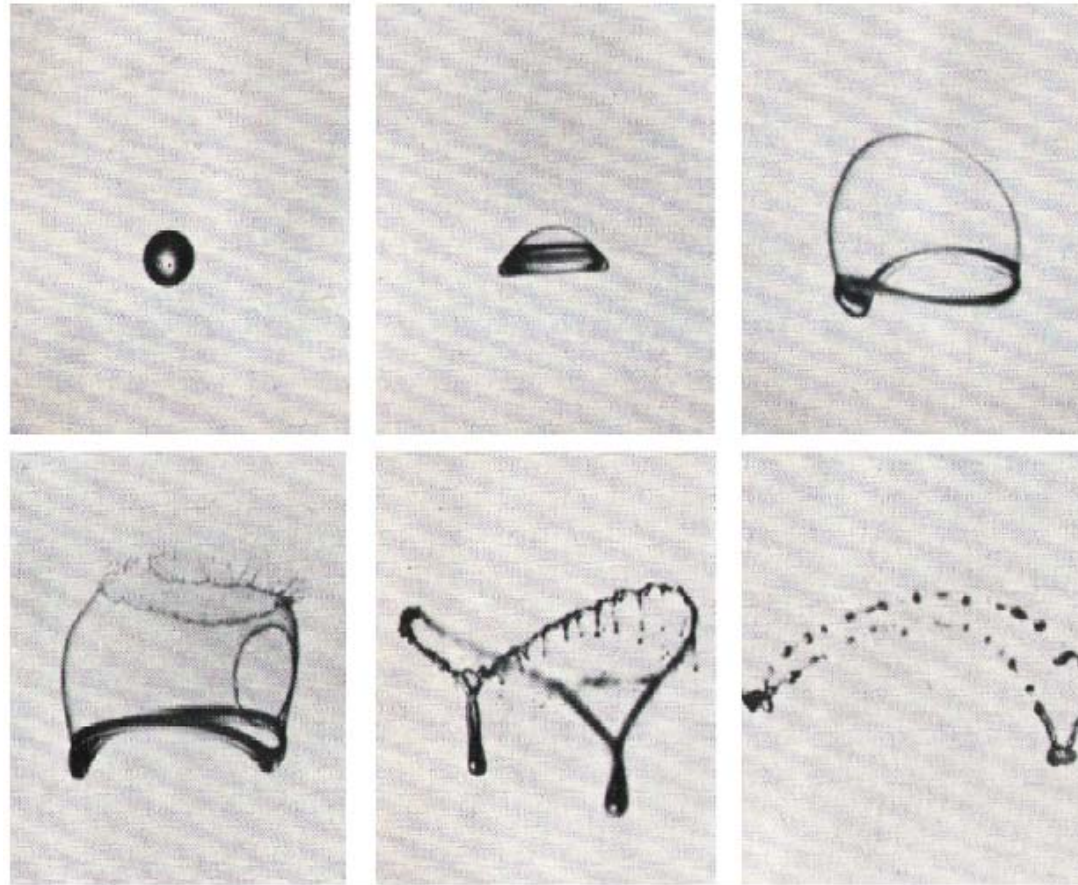


How to get Coarser Sprays

Aerial application: Accu-Flo, TVB, Narrow angle flat fan, solid stream at higher pressures, 0° angle



Secondary Breakup of Very Large Drops



Spray Drift Task Force Studies - \$23M (www.agdrift.com)

- Field Studies:
Aerial, Ground, Orchard Airblast, Chemigation
- Atomization Studies: ~70 nozzle types, different tank mixes, different application conditions
- Physical Property Studies: very wide range of viscosity, surface tension and density values, including some adjuvant effects
- Modeling: AgDRIFT® and DropKick®
- Effectively supplement decades of similar aerial studies in forestry spraying by the US Dept of Agriculture Forest Service





Testing Challenge

Changes in atmospheric
conditions between treatments

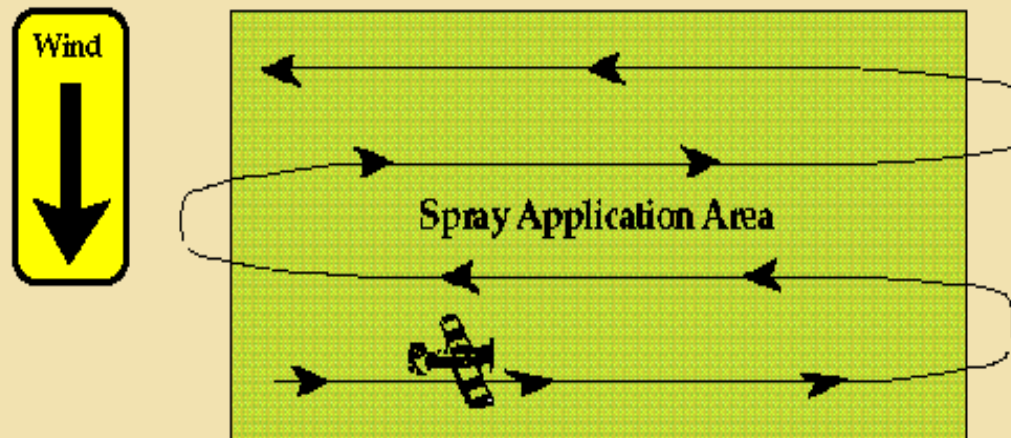
Solution

Apply a control treatment successively with each experimental treatment:

- Special aircraft equipped with dual application system
- Experimental treatment
- Control treatment
 - D6-46 nozzle
 - 45° orientation
 - 110 mph
 - 8 ft release height



Application Procedure



Successive Applications

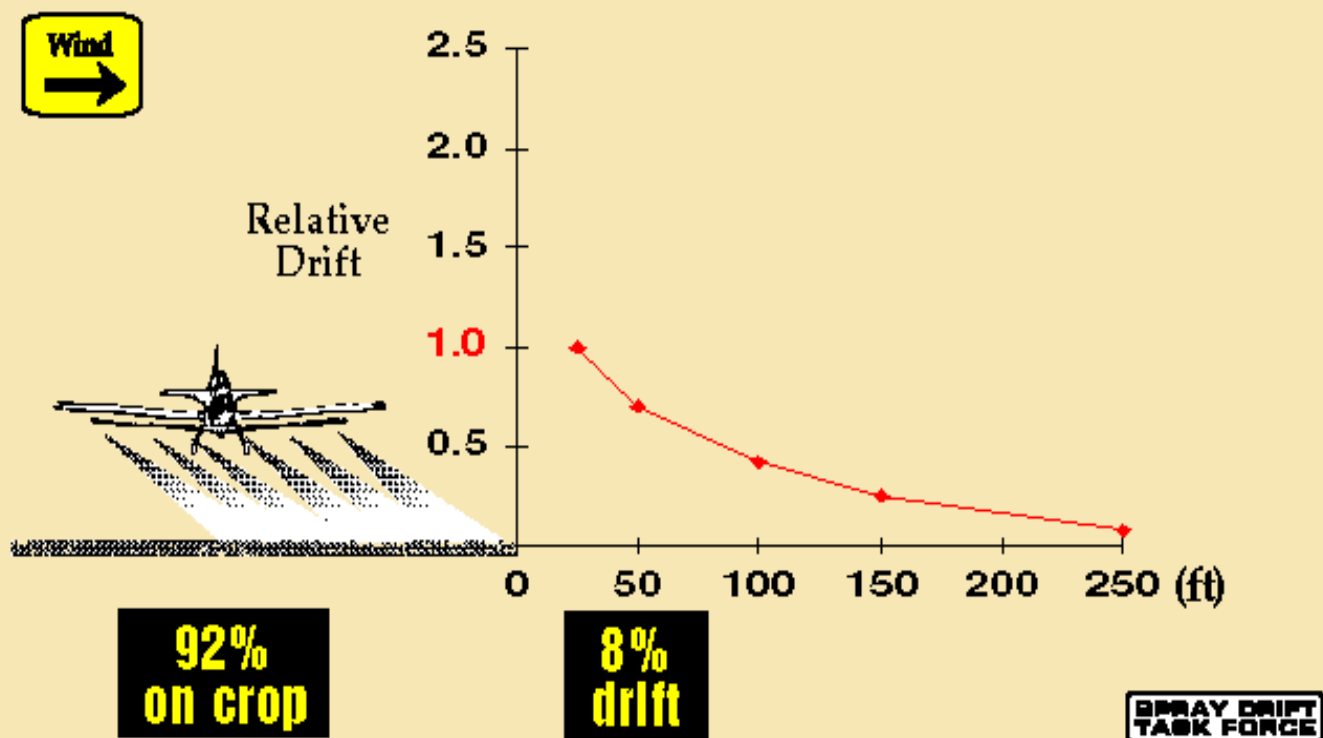
- **Experimental Treatment (4 swaths)**
- **Control Treatment (over same 4 swaths)**

Test Assumptions

- Differences between control treatments are due only to atmospheric conditions
- Differences between experimental treatments are due to atmospheric conditions and application procedures
- Differences between experimental and control treatments are due only to application procedures

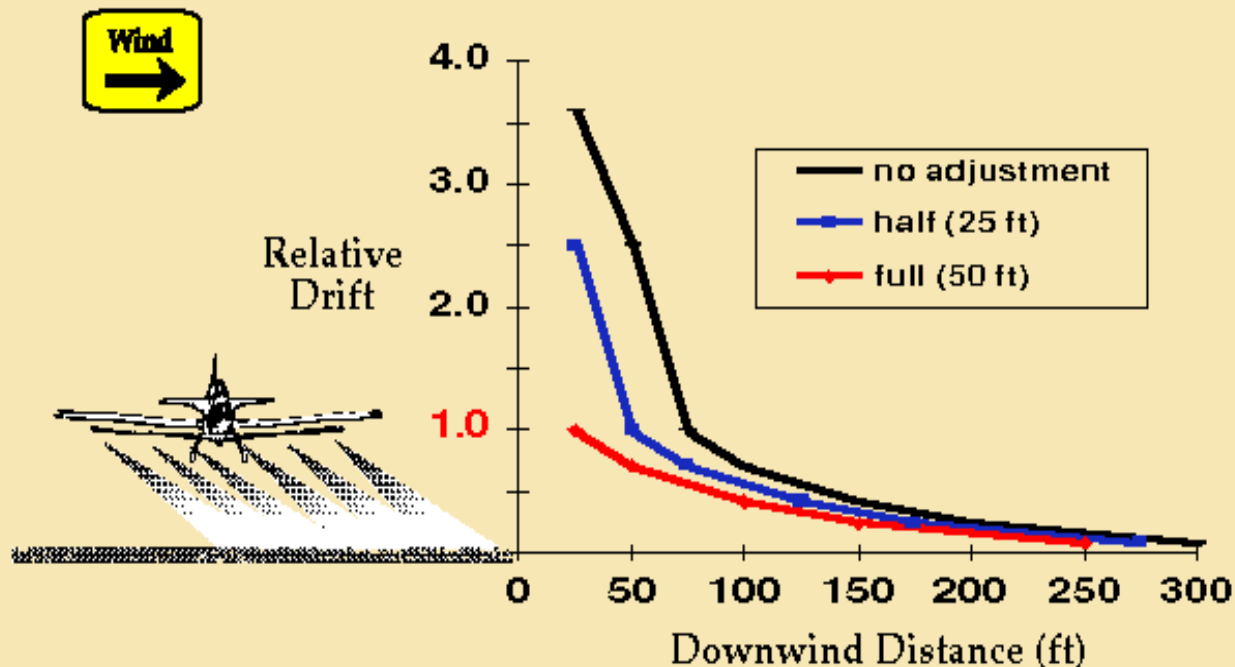
Drift from the SDTF Control Application

1.0 = 1.2 oz per acre

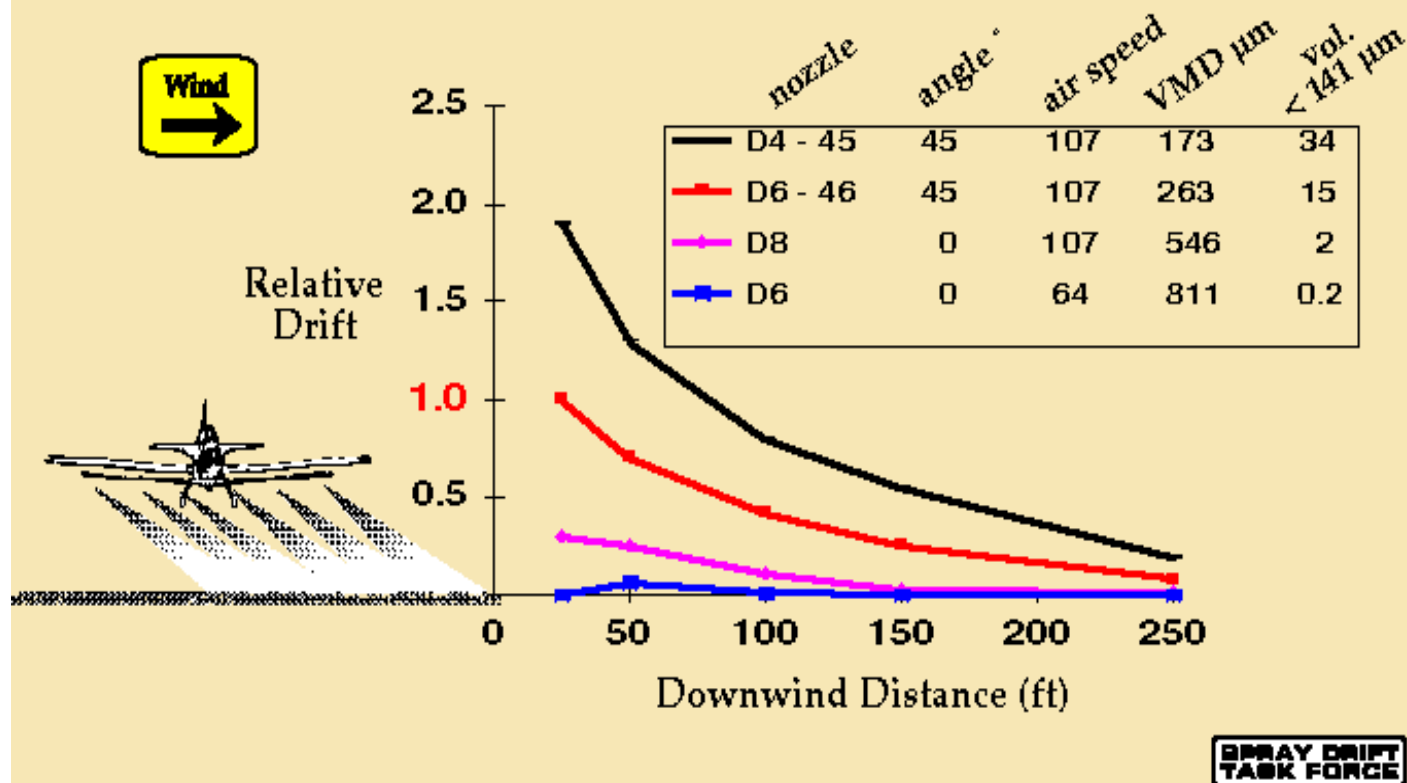


How swath adjustment affects drift

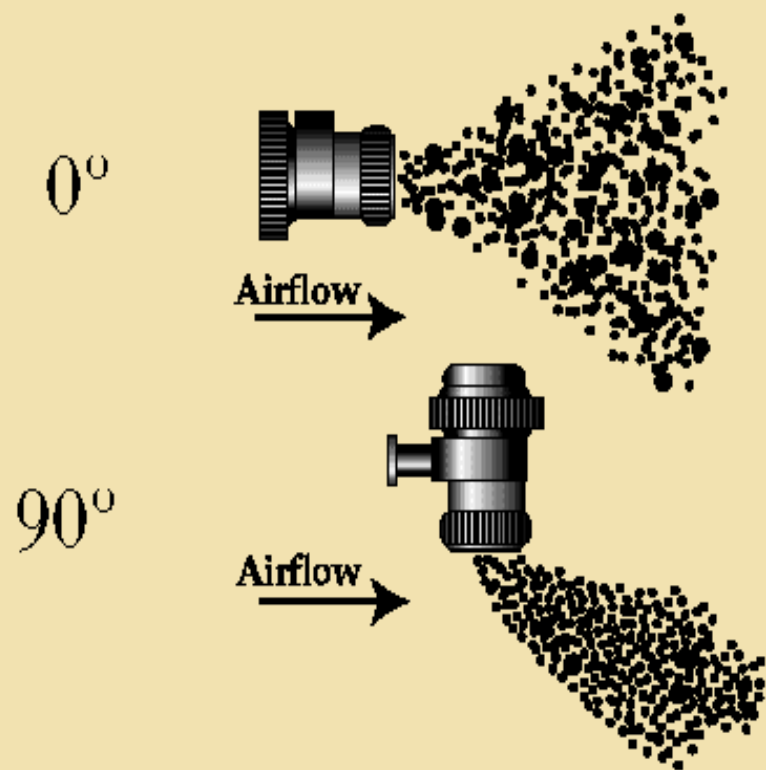
Control Application



How nozzle and droplet size affect drift



How air shear affects droplet size



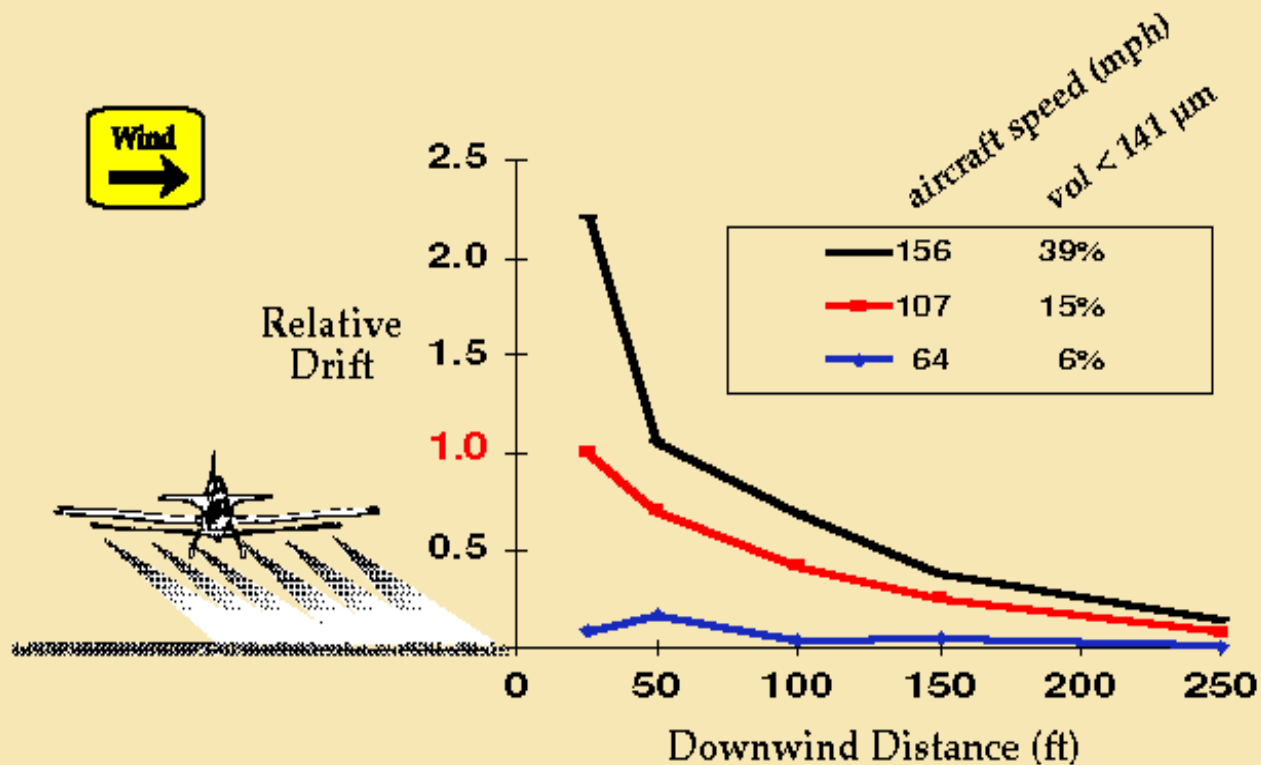
**DRAY DRIFT
TASK FORCE**







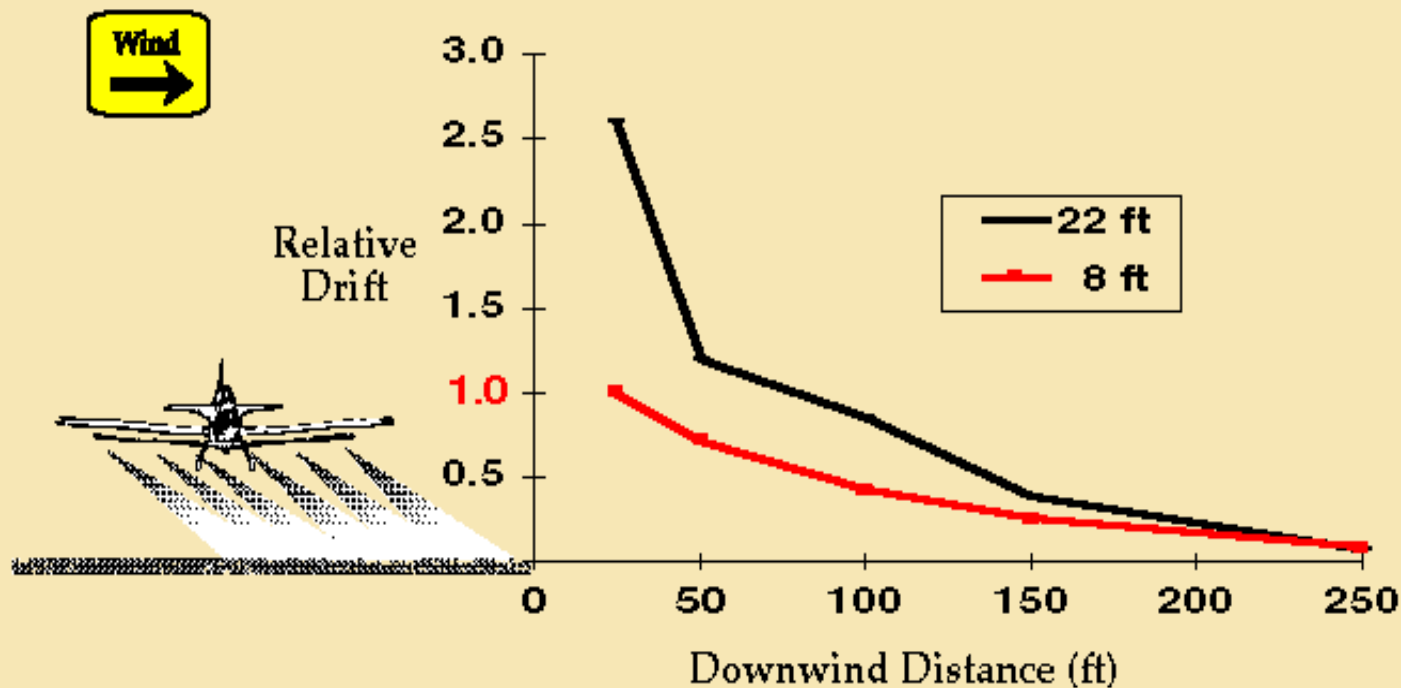
How air shear affects drift



SPRAY DRIFT
TASK FORCE

How nozzle height affects drift

Control Application



**SPRAY DRIFT
TASK FORCE**

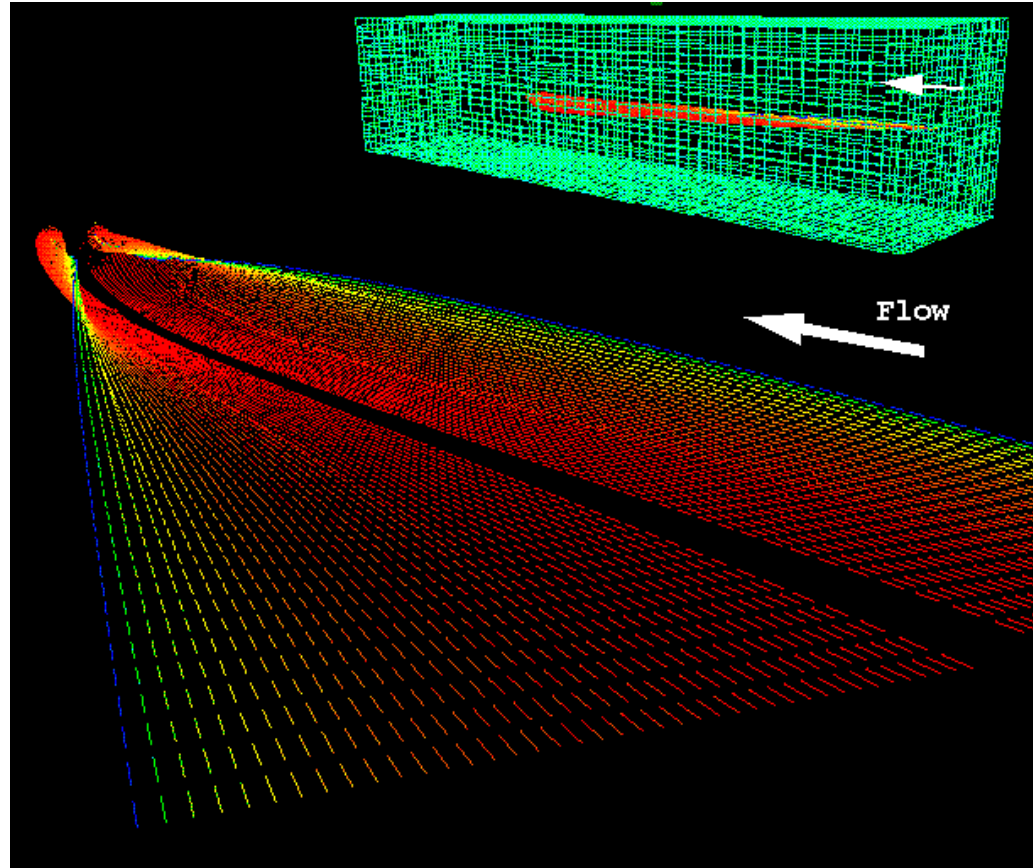
Long boom



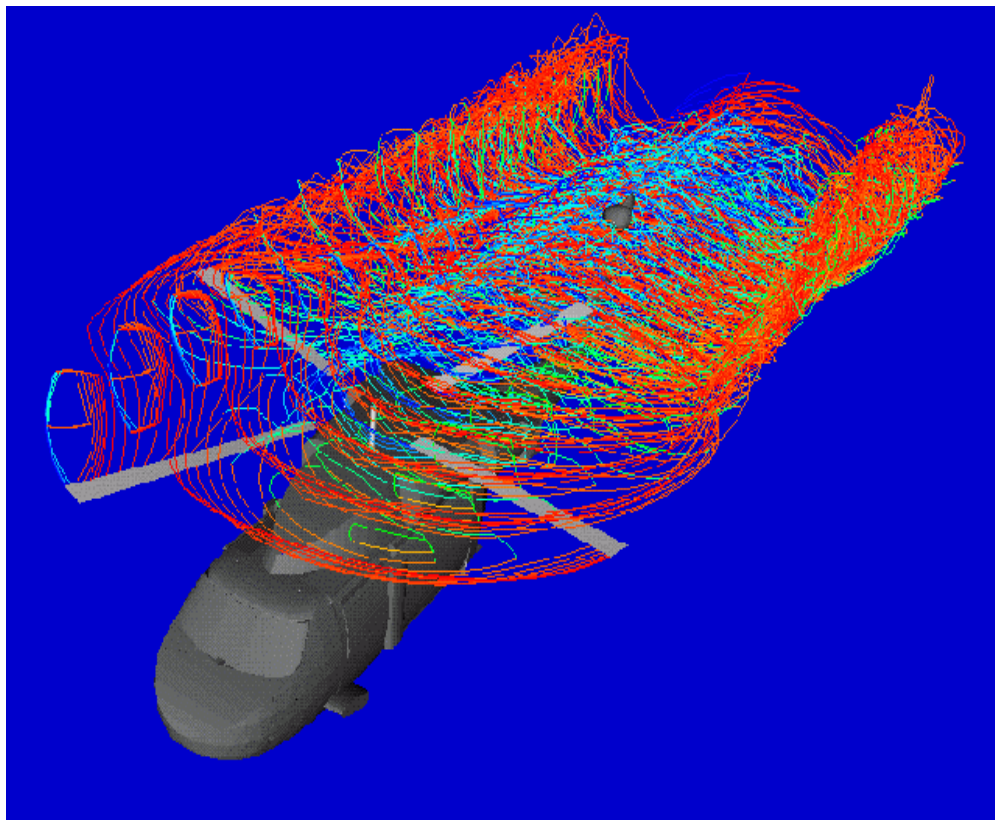
Shorter boom



Fixed-Wing Aircraft Wakes

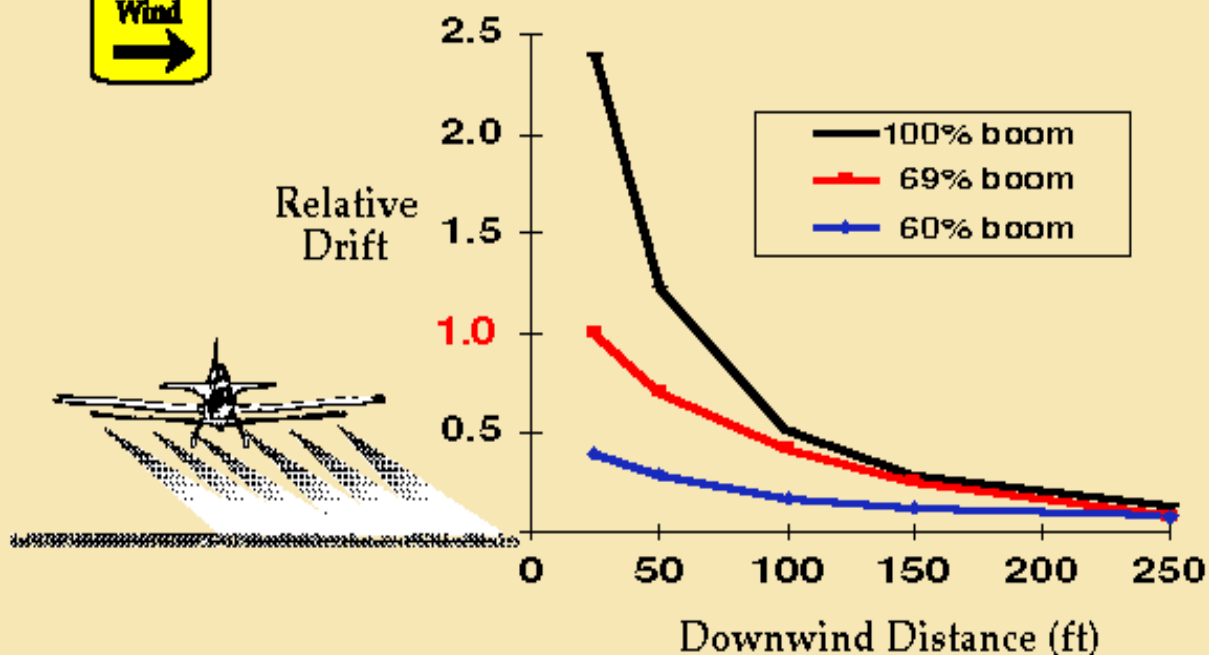


Helicopter Wakes



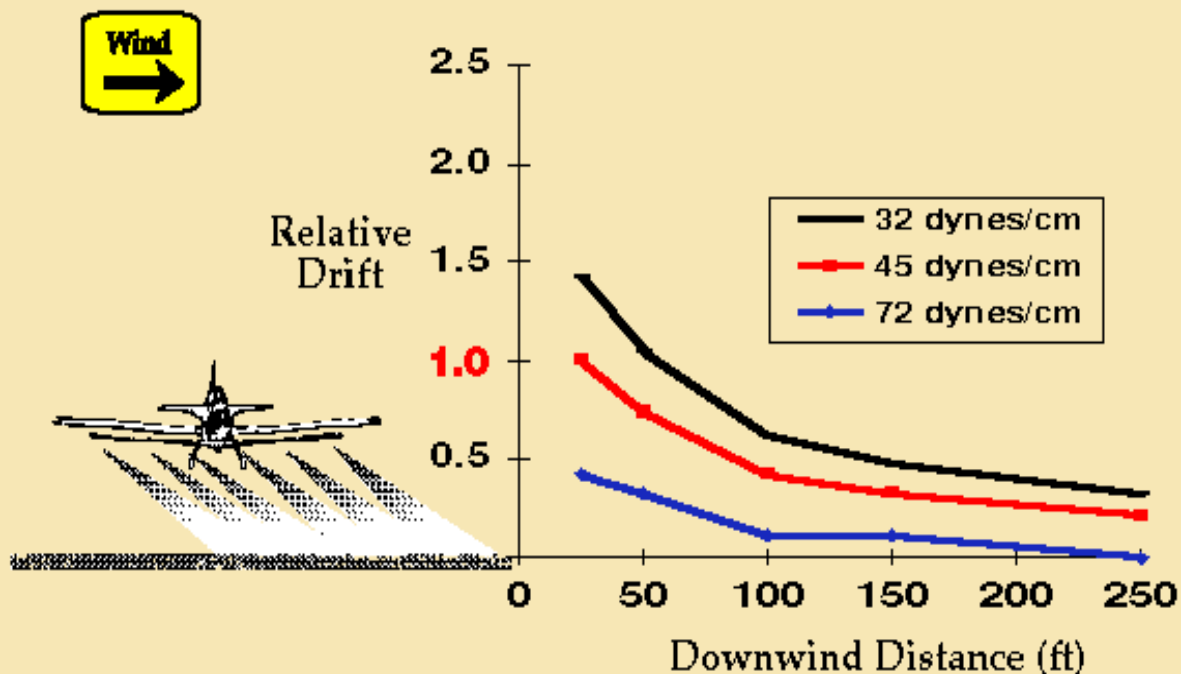
How boom length affects drift

Model-generated data for Control Application



How dynamic surface tension affects drift

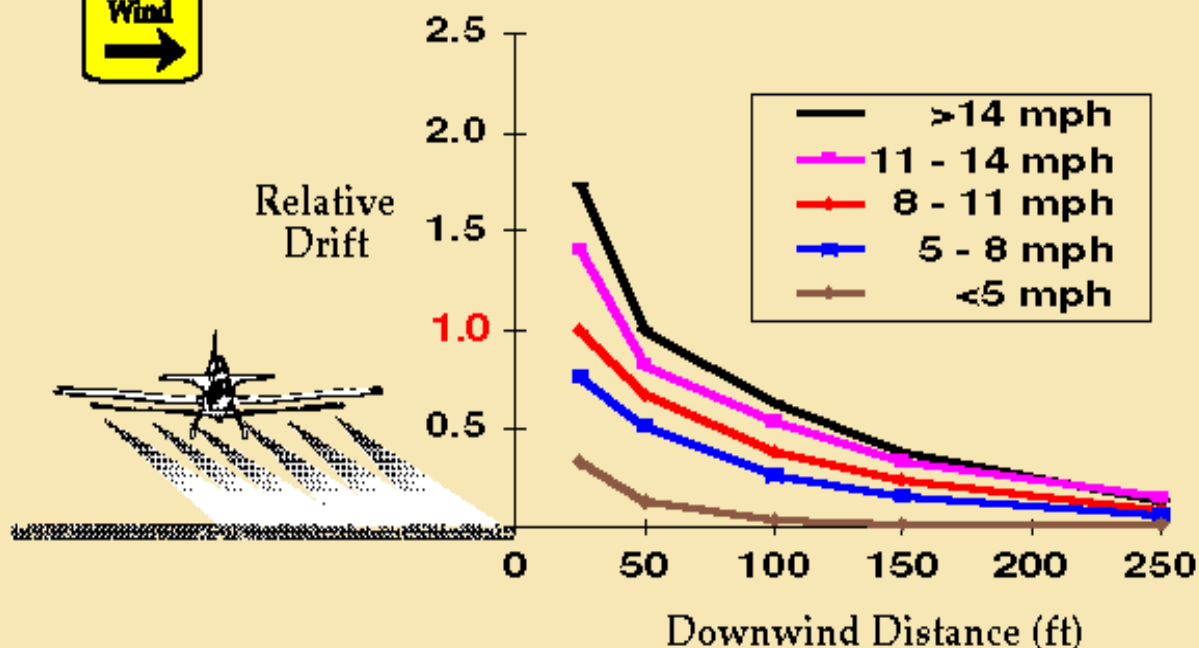
Model-generated data



SPRAY DRIFT
TASK FORCE

How wind speed affects drift

Control Application

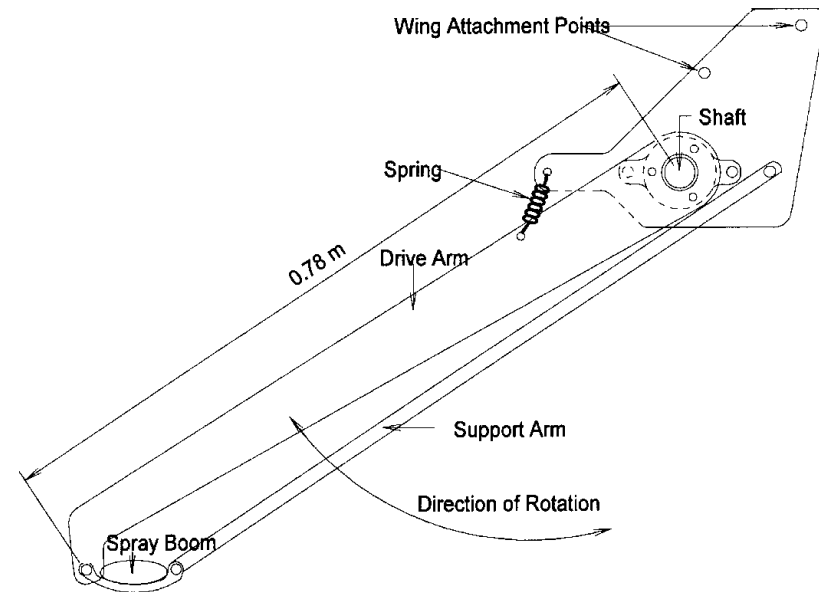


SPRAY DRIFT
TASK FORCE

Drift Reduction Technologies:

1. “Drop” (Lowered) Boom System

- Lower the aircraft boom after takeoff
- Studies show that drift can be greatly reduced

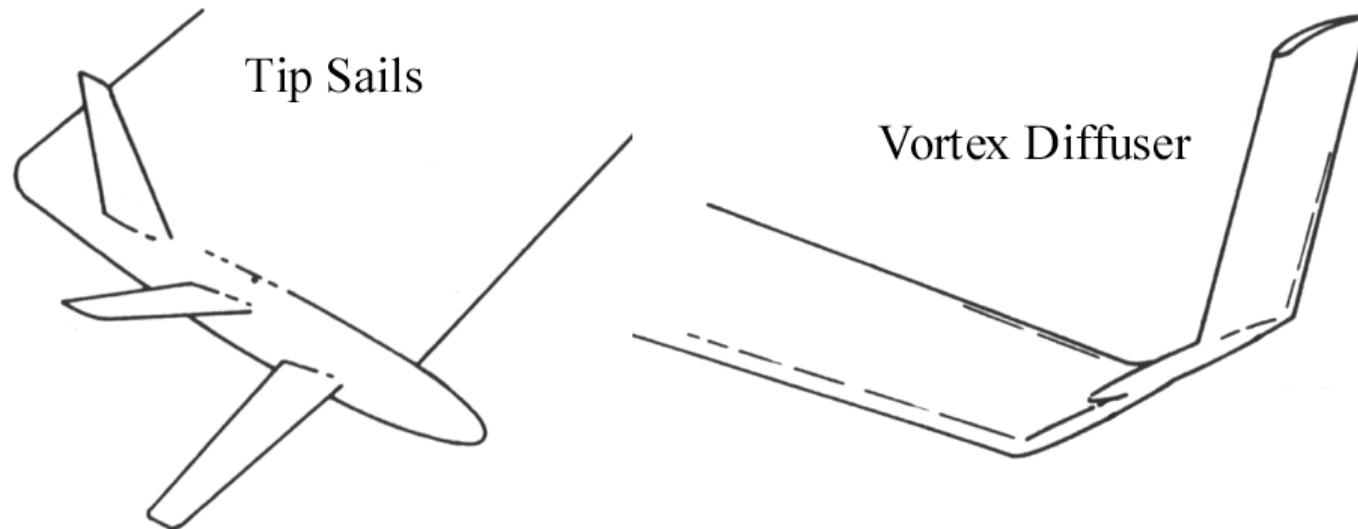


2. Vortex Mitigation Technologies



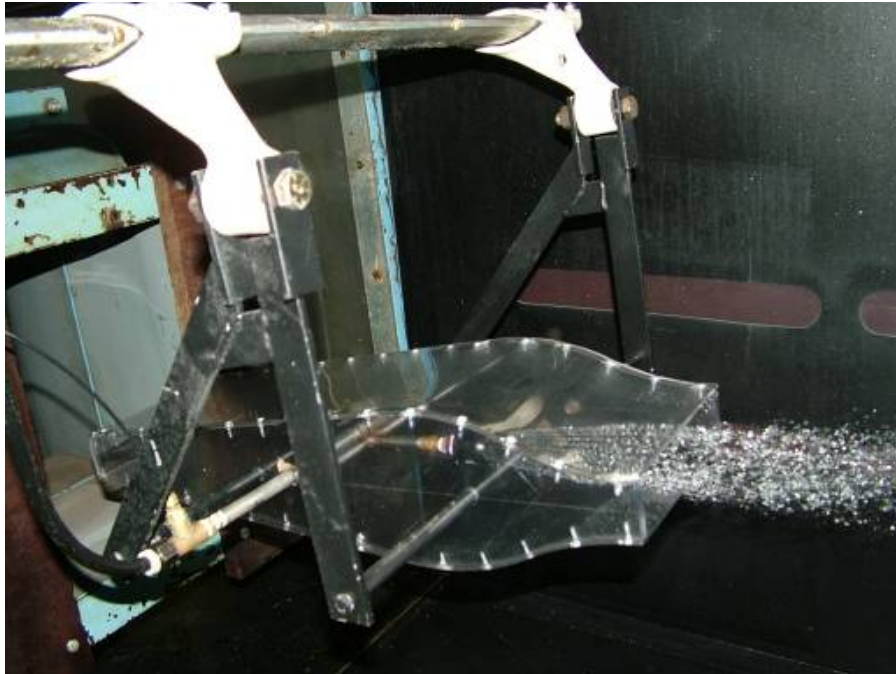
3. Wing Tip Modification Devices

- Modeling suggests drift may be reduced by 50 - 75% using wing tip sails
- Field studies needed for final verification



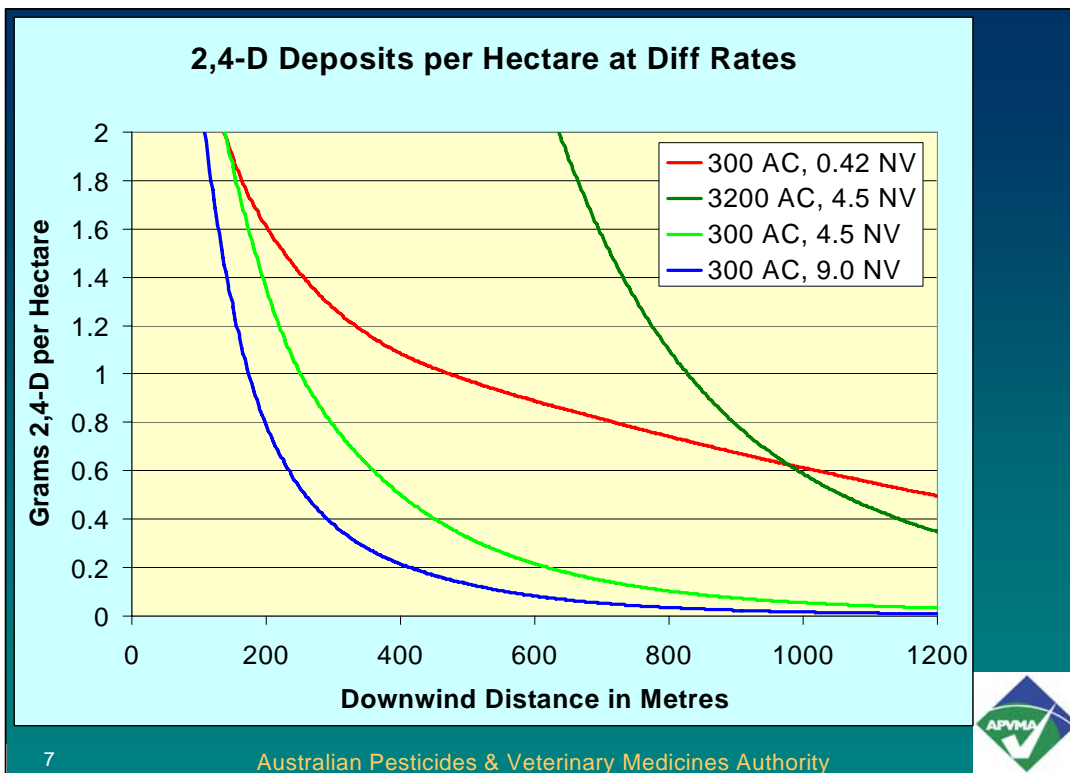
4. Reverse Venturi Chamber

- Reduces effective air velocity to \sim half aircraft speed, allowing coarser sprays at higher flight speeds



5. Tank Mix/ Adjuvant DRTs

- Non-volatile rate and evaporation reduction



6. Rotary Boom Assembly



Droplet Size Prediction Model for the Jones Air Rotating Boom Assembly



Input data

Air Speed (knots)	120
Nozzle Orifice size	4
Fan Angle (deg)	110
Nozzle Angle to Airstream (deg)	0

Predicted droplet size

D[v,0.1]	113
VMD	237
D[v,0.9]	387
Span	1.15



Results Based on Water at 3bar

Other Aerial Application Advancements for Drift Reduction

- On-board weather (e.g. AIMMS-20 weather system) to alert applicator to meteorological conditions – wind direction accurate within $\sim 14^\circ$, wind speed ~ 0.7 m/s, temp 0.1° , RH 2%. Cost \$30,000
- (Also on-board weather is now available for ground rigs)
- GPS guidance systems and GIS to correctly locate the target and sensitive areas. Sectional boom control etc

Droplet Size Calculators- USDA, UQ and Others



AAAA Nozzle Calculator



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

Input data

Air Speed (knots)	100
Product	Pasture Klean Extra 2.5%
Nozzle Type	TeeJet FF40
Pressure (bar)	2
Orifice Size	20
Nozzle Angle	0

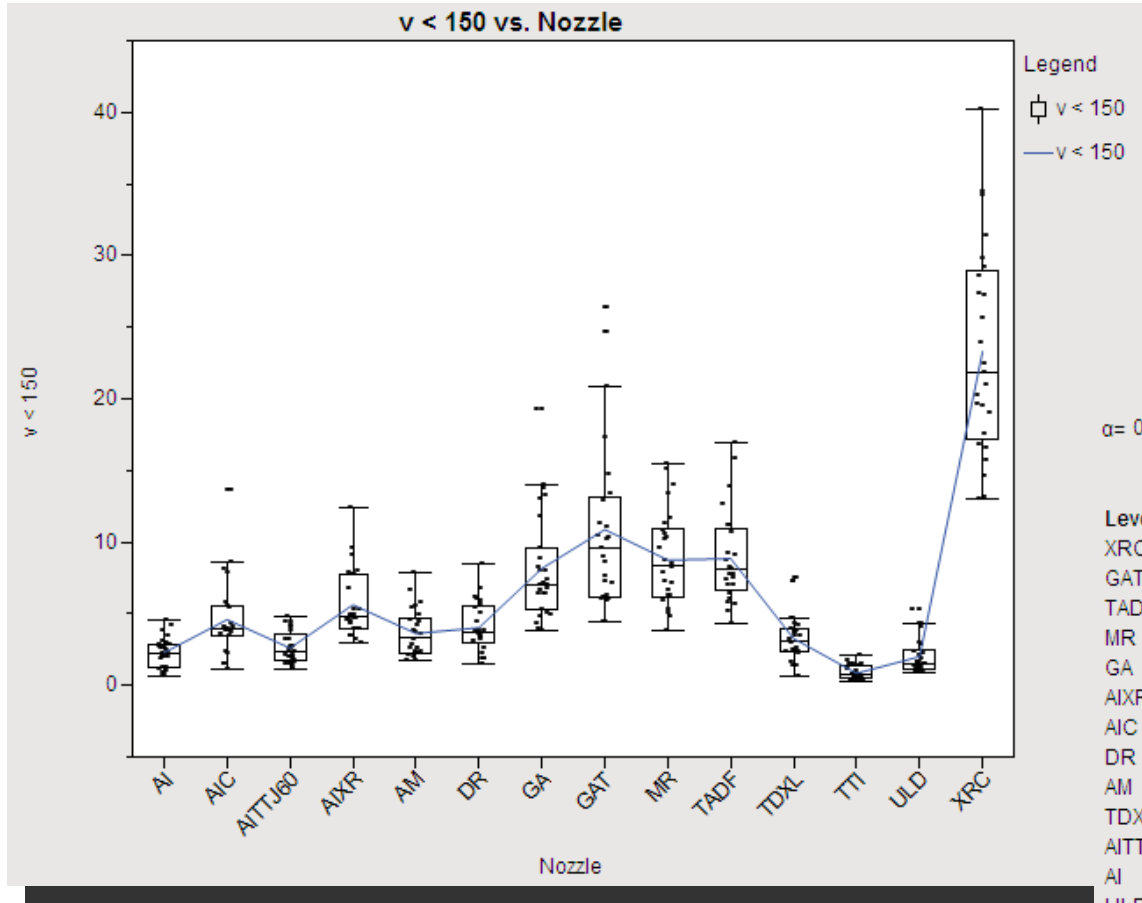
Nozzle Angle
Select an Angle
of Nozzle relative
to airstream from
the list

Predicted droplet size (μm)		Spray classification
D[v,0.1]	185	COARSE
VMD	409	COARSE
D[v,0.9]	760	COARSE

Aerial and Ground Application Test System



Effect of Nozzle on Percent Fines for Different Tank Mixes



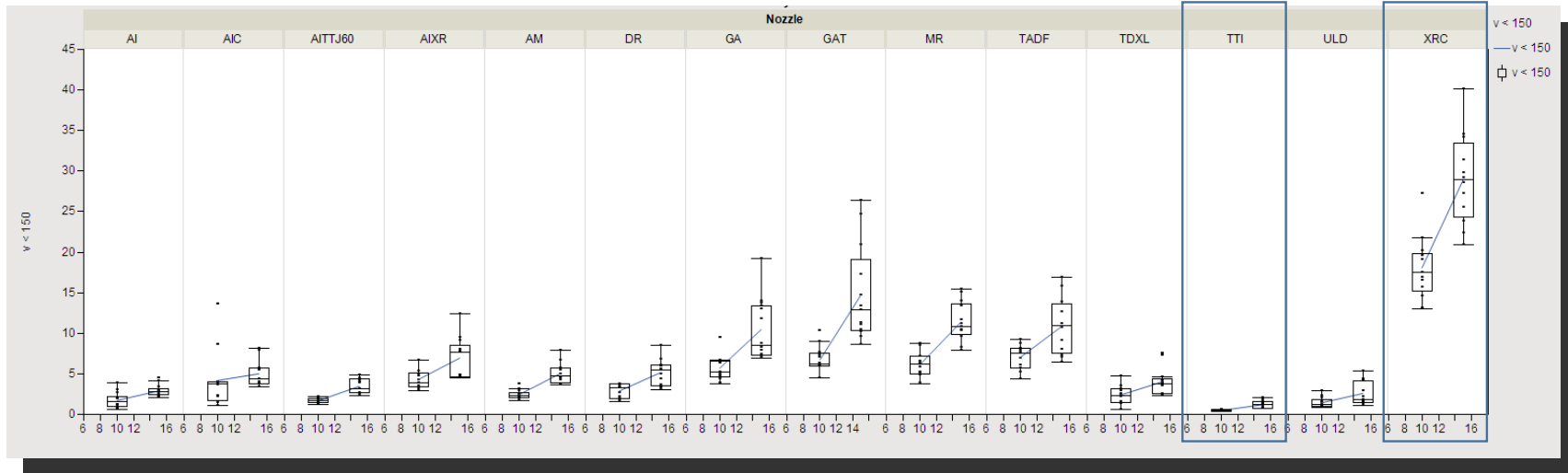
- Mean % fines ranged from <1% to >20% for test nozzles
- Nozzles that produce more fines are more sensitive to tank mix

$\alpha = 0.050$ $t = 1.97361$

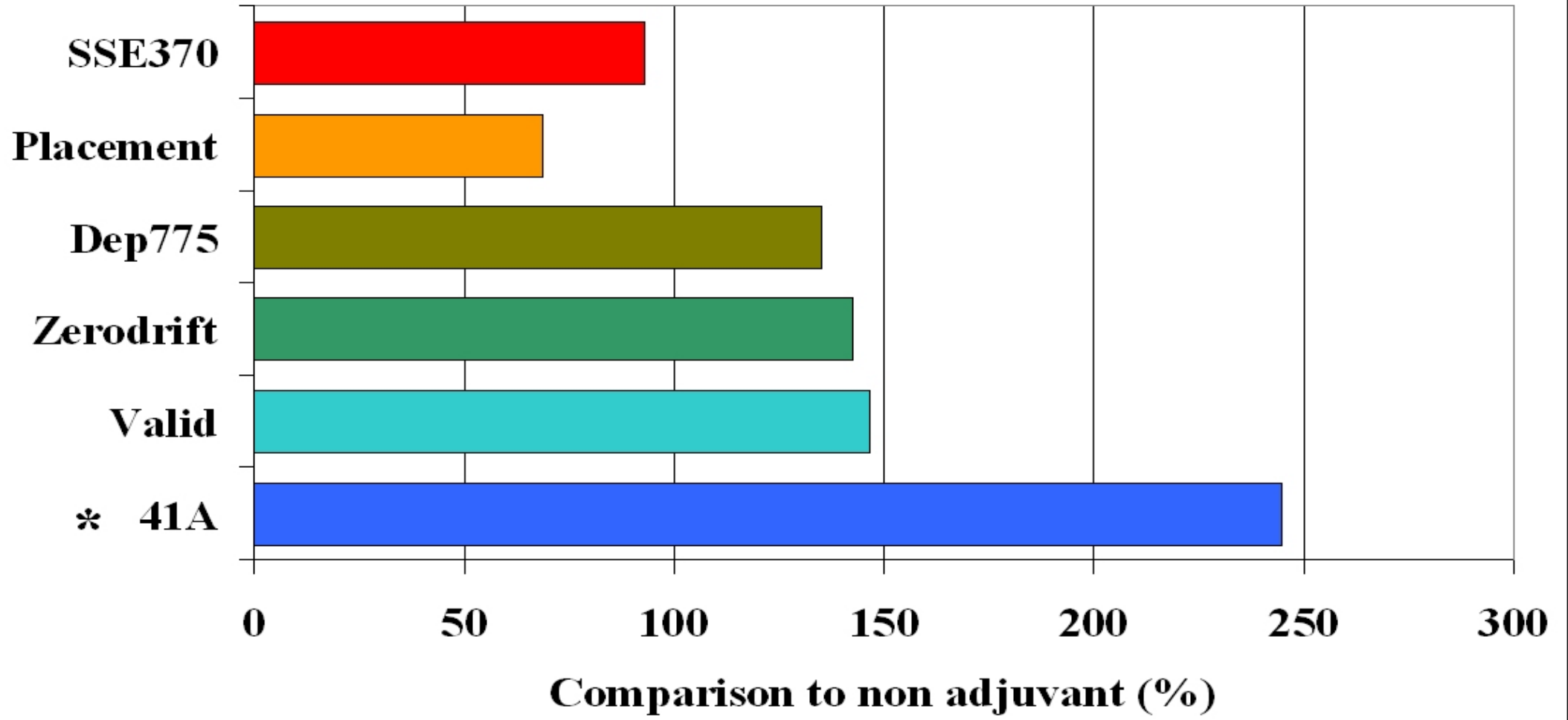
Level	Least Sq Mean
XRC	23.5
GAT	10.3
TADF	8.8
MR	8.5
GA	8.1
AIXR	5.4
AIC	4.5
DR	3.8
AM	3.6
TDXL	3.1
AITTJ60	2.5
AI	2.1
ULD	1.9
TTI	0.7

Levels not connected by same letter are significantly different.

Nozzle x Application Volume Interaction



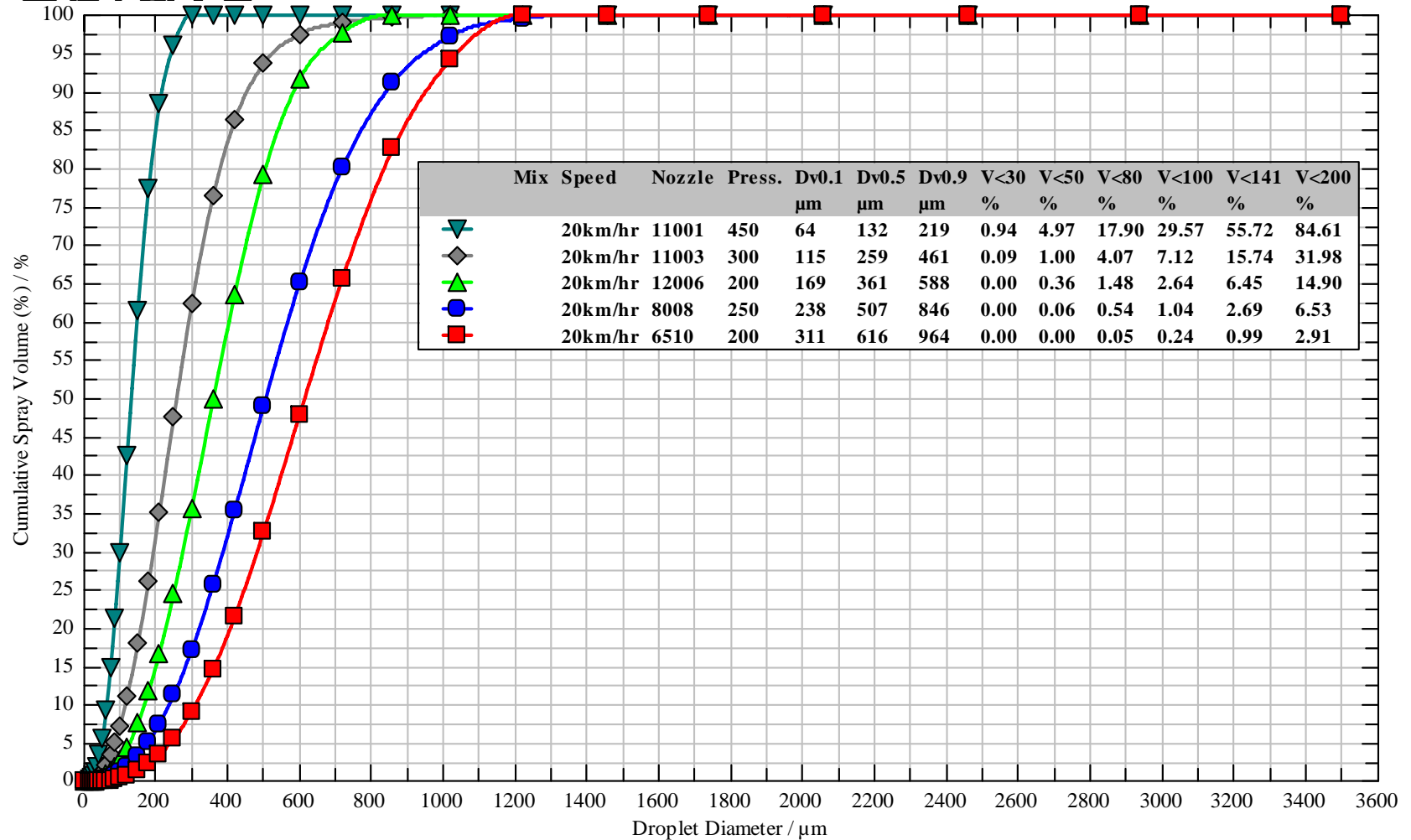
- Nozzles that produce more fines are more sensitive to pressure changes, so Pulsed Width Modulation may be of value for variable rate spraying in particular



Repeatability

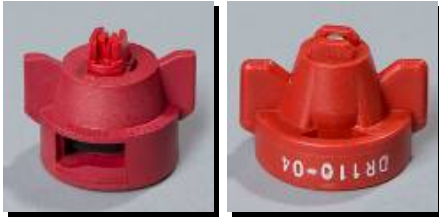
- How confident can we be that three replicate measurements of a single nozzle of any type provide representative data for droplet size?
- Repeatability for a single nozzle tip is typically 0.5-3%, but repeatability across tips of a given type ranged from 5-23%
- To be F, M, C, VC, XC, a spray needs a $D_{v0.1}$ of > 64, 115, 169, 238, 311 μm respectively with our standard sampling setup. Could some sprays cross the threshold and be differently classified depending on the actual tip within a nozzle type?

ASABE S-572 Categories for Water Sprays



Low Drift Nozzles and Repeatability

Very Coarse



AIXR - TeeJet
23%

DR - Wilger
13%



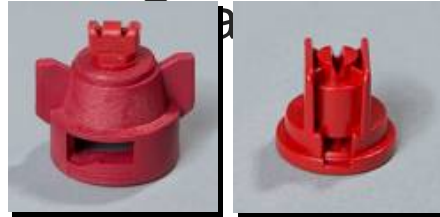
AirMix - Greenleaf
6%



TDXL -
Greenleaf
9%

AI/AIC (110°) -
TeeJet 11%

Extremely



AITTJ60-
TeeJet 7%

ULD - Hypro
7%



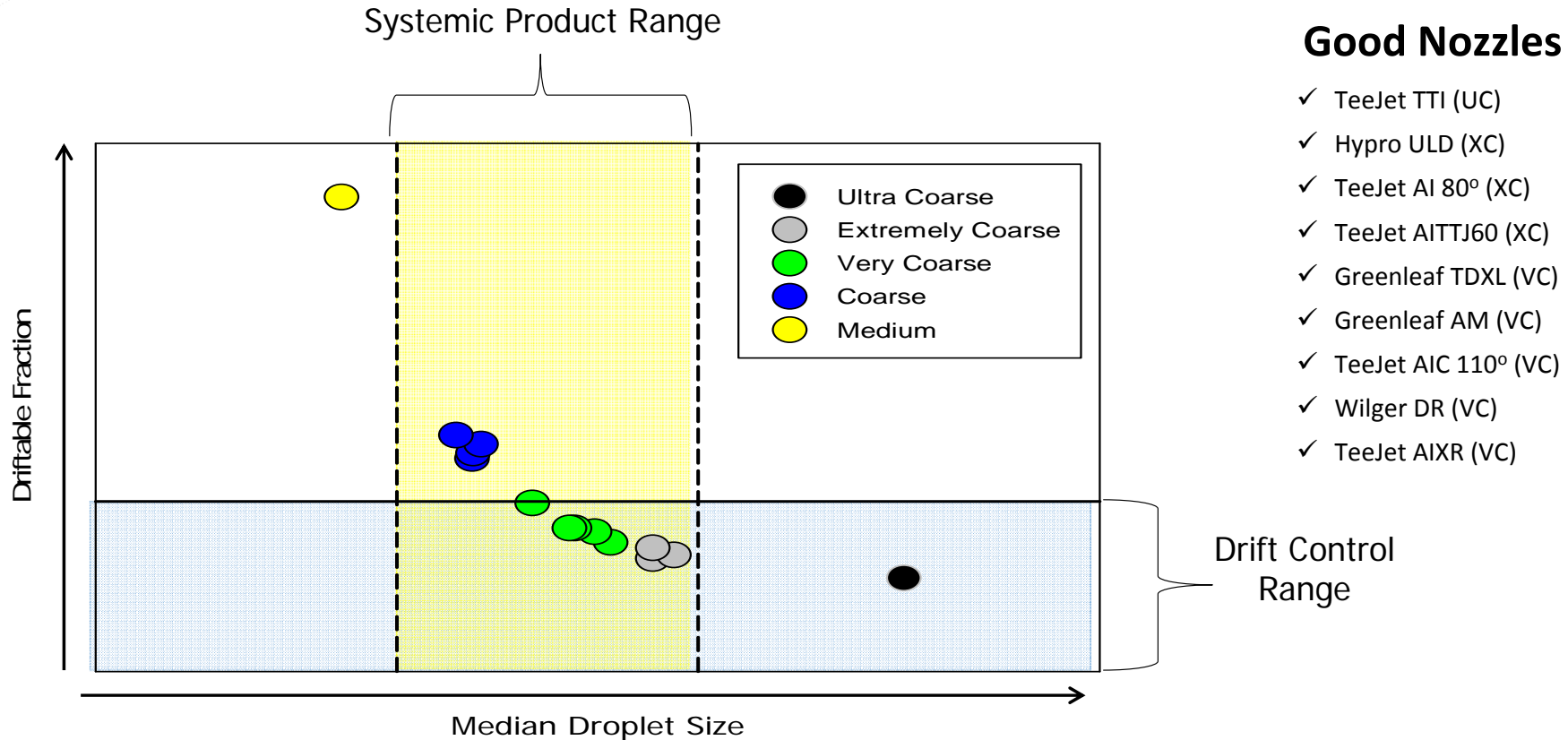
AI (80°) - TeeJet 5%

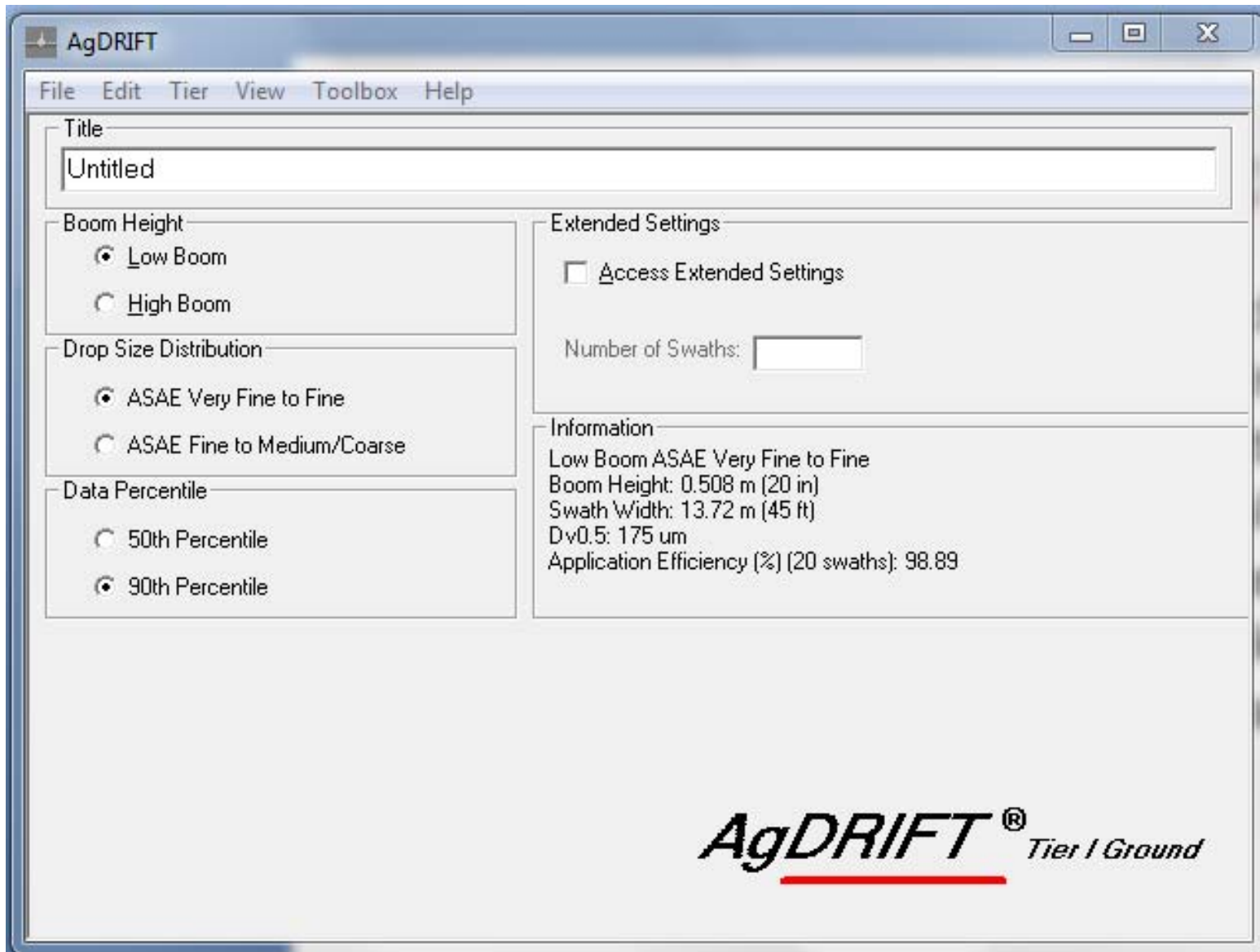
Ultra

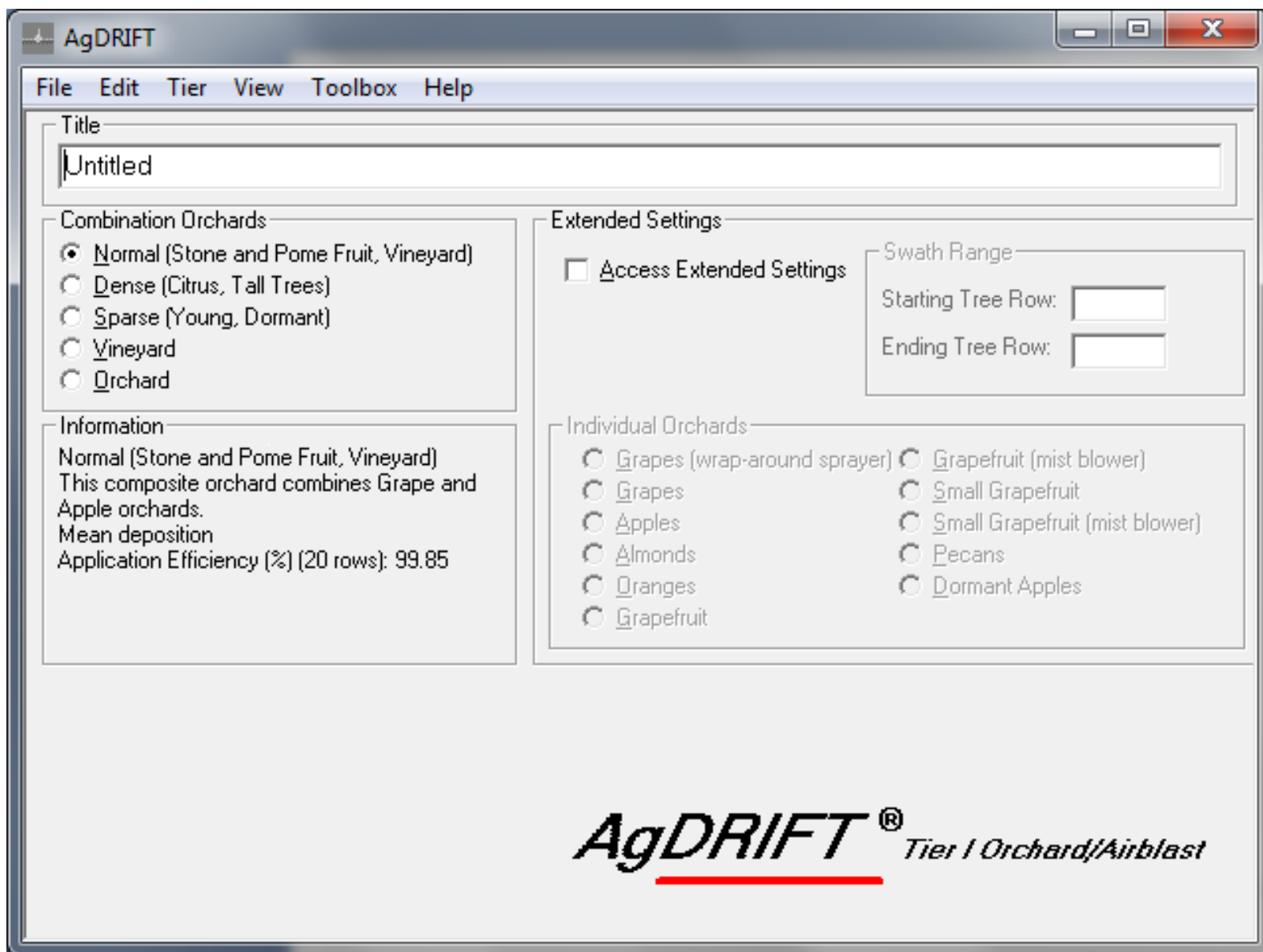


TTI - TeeJet
9%

Nozzle Selection







Choose AGDISP or empirical deposition equation by selecting appropriate tab below

AGDISP 8.26

Established Deposition Dataset

Custom Deposition Dataset

Use this form to select an established drift equation developed for specific nozzle and spray conditions.

Select Equation Set AAFC SDTF

Year:

Nozzle

Boom Height (in)

Sprayer Speed (mph)

Wind Speed (mph)

DV50 (micrometers) ASABE S-572.1 Spray Quality

Spray Area

Number of Swaths

Swath Width (ft)

Total Sprayed Width (ft)

Selected Equation

Enter Active Ingredient Application Rate

lb/acre

Run

Choose AGDISP or empirical deposition equation by selecting appropriate tab below

AGDISP 8.26

Established Deposition Dataset

Custom Deposition Dataset

The custom deposition dataset option requires that you have independently fit an equation to your own experimental data where the units of distances are in meters. Use this form to input your custom drift equation or select a previously defined equation.

Enter a New Empirical Equation

1. Select Equation Form Used to Fit Your Data

SDTF groundspray low boom model and orchard airblast model ▾

2. Review Equation Form and Description

[Fractional Deposition = $c / (1 + [a] \cdot \text{Distance}^b)$]: The user supplies coefficient shape parameters a, b, and c based on fractional deposition.

3. Enter Fitted Parameter Values

abc

****Parameters must be calculated with units of distance in METERS****

Save

Select a Saved Custom Empirical Equation

Equation Name	Equation
Low Boom VF 90th% >25ft	Fractional Deposition = $1.3322 / (1 + 0.5262 \cdot \text{Distance})^{1.5548}$
Linear Model Example	Fractional Deposition = $-1.2 \cdot \text{Distance} + 5$
testhighboom	Fractional Deposition = $1 / (1 + 1 \cdot \text{Distance})^1 \cdot (1 + 1 \cdot \exp(-1 \cdot \text{Distan} \dots)$

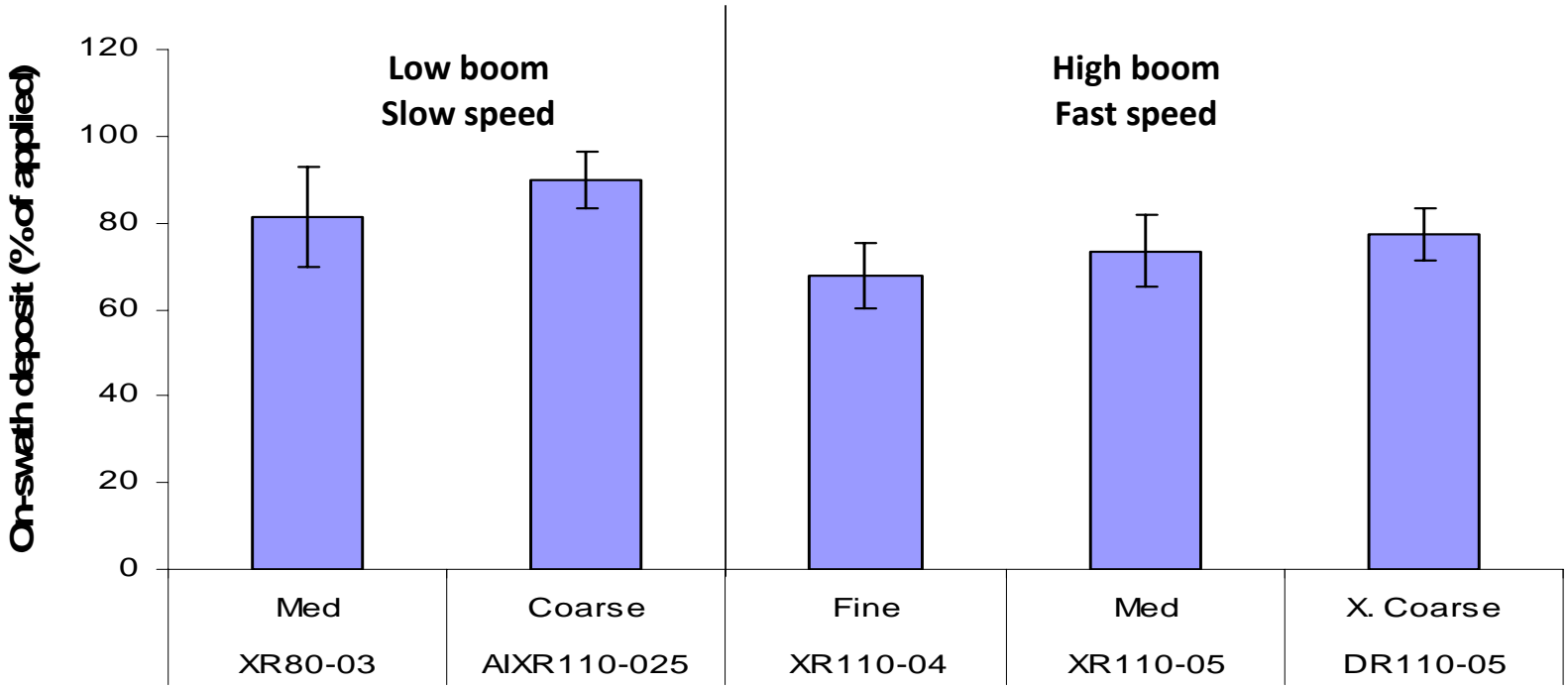
Active Ingredient Application Rate

lb/acre

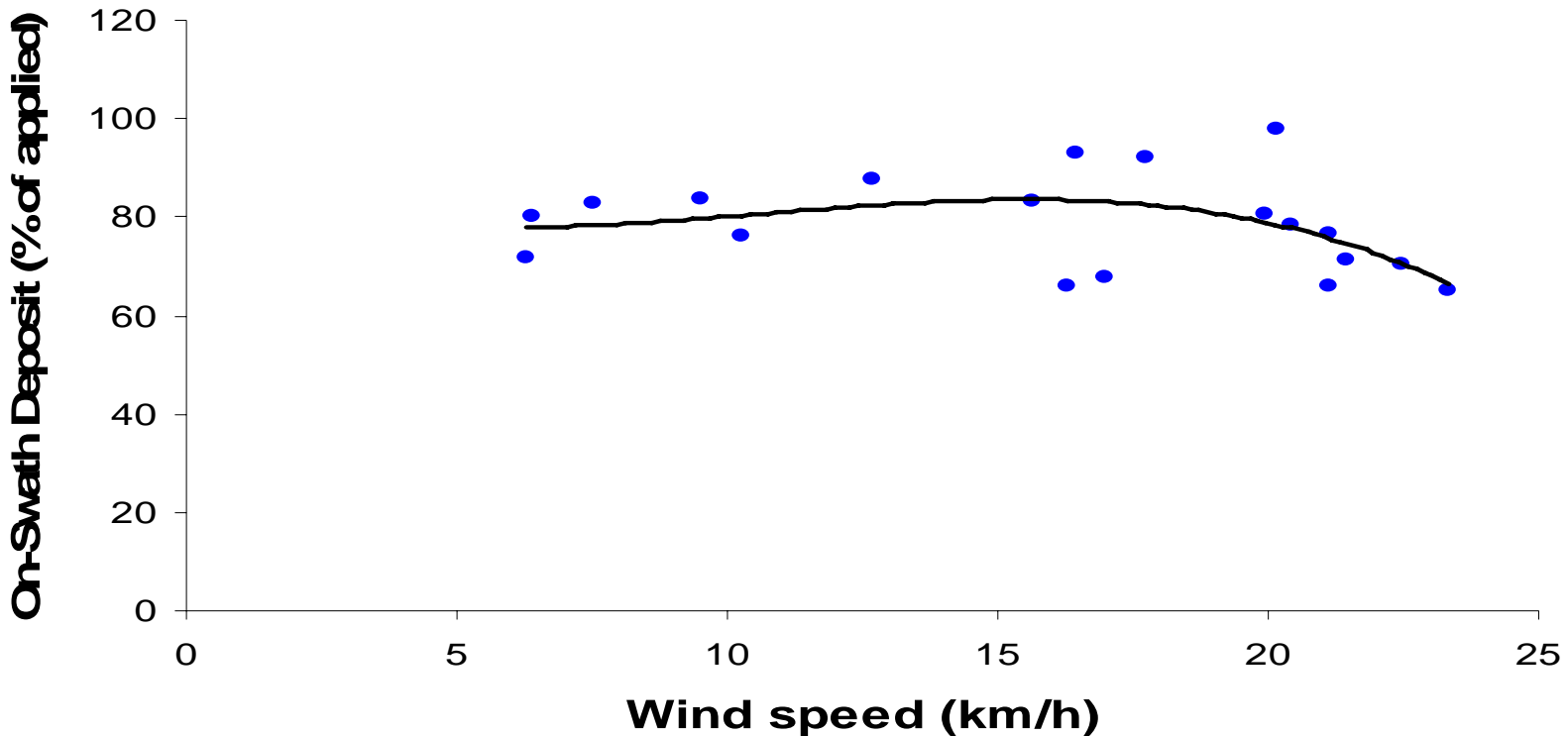
Equation Metadata:

Run

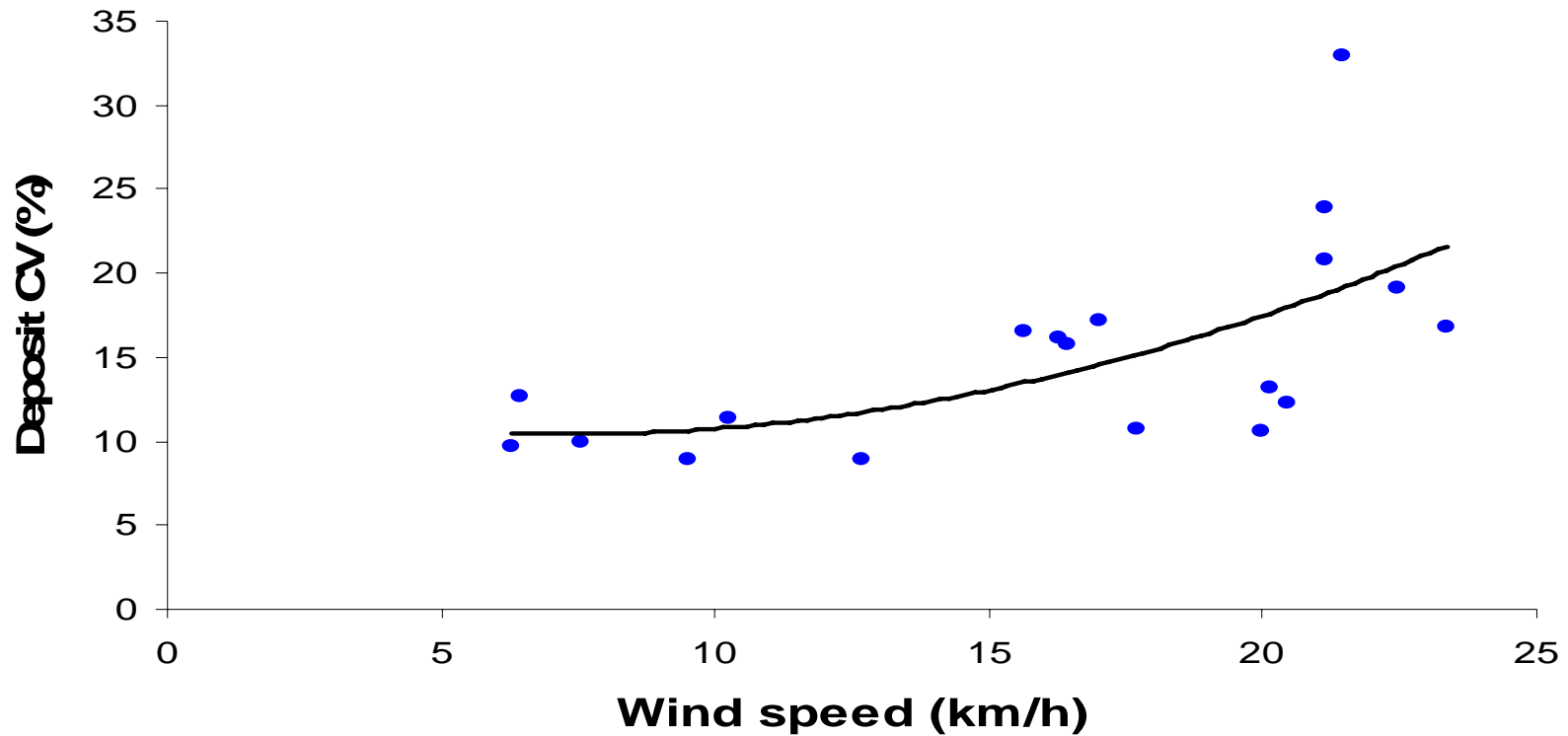
On-Swath Deposit



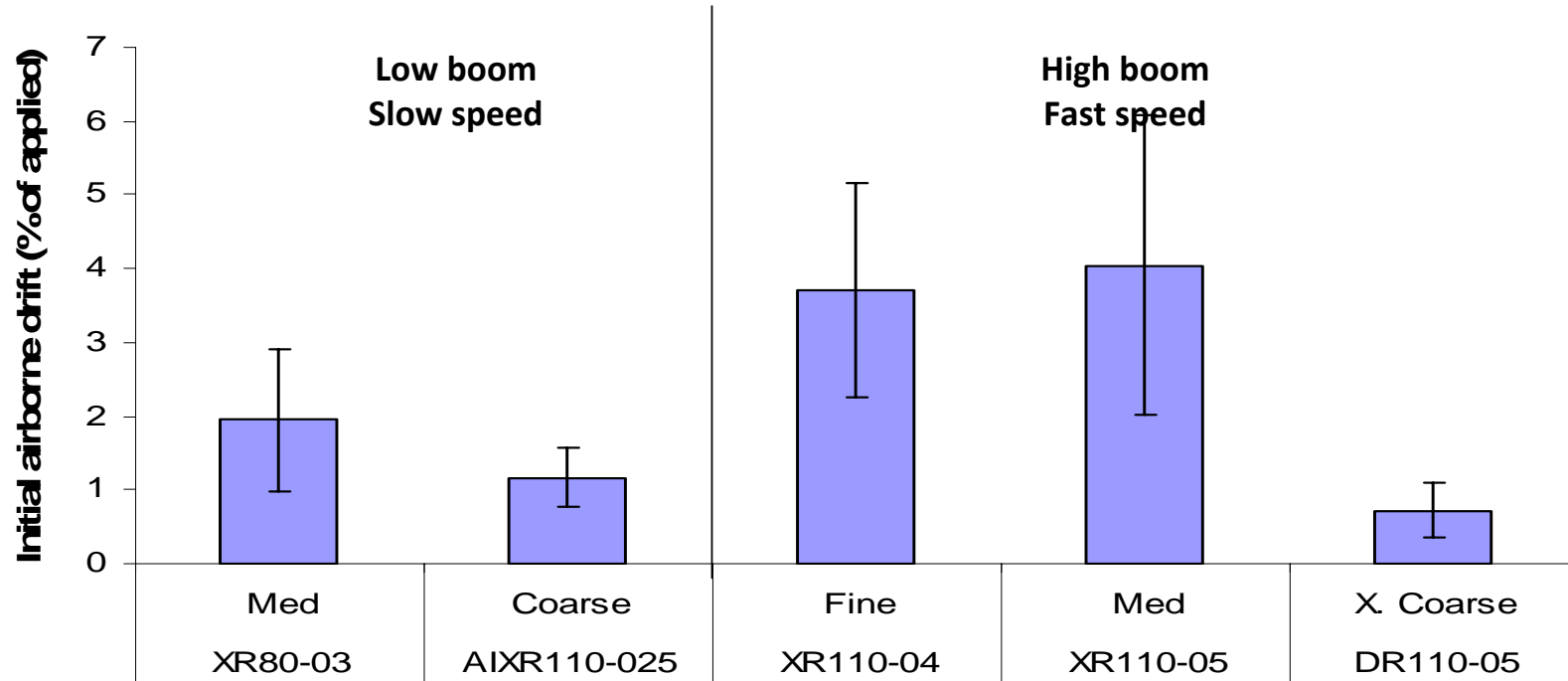
On-Swath Deposit



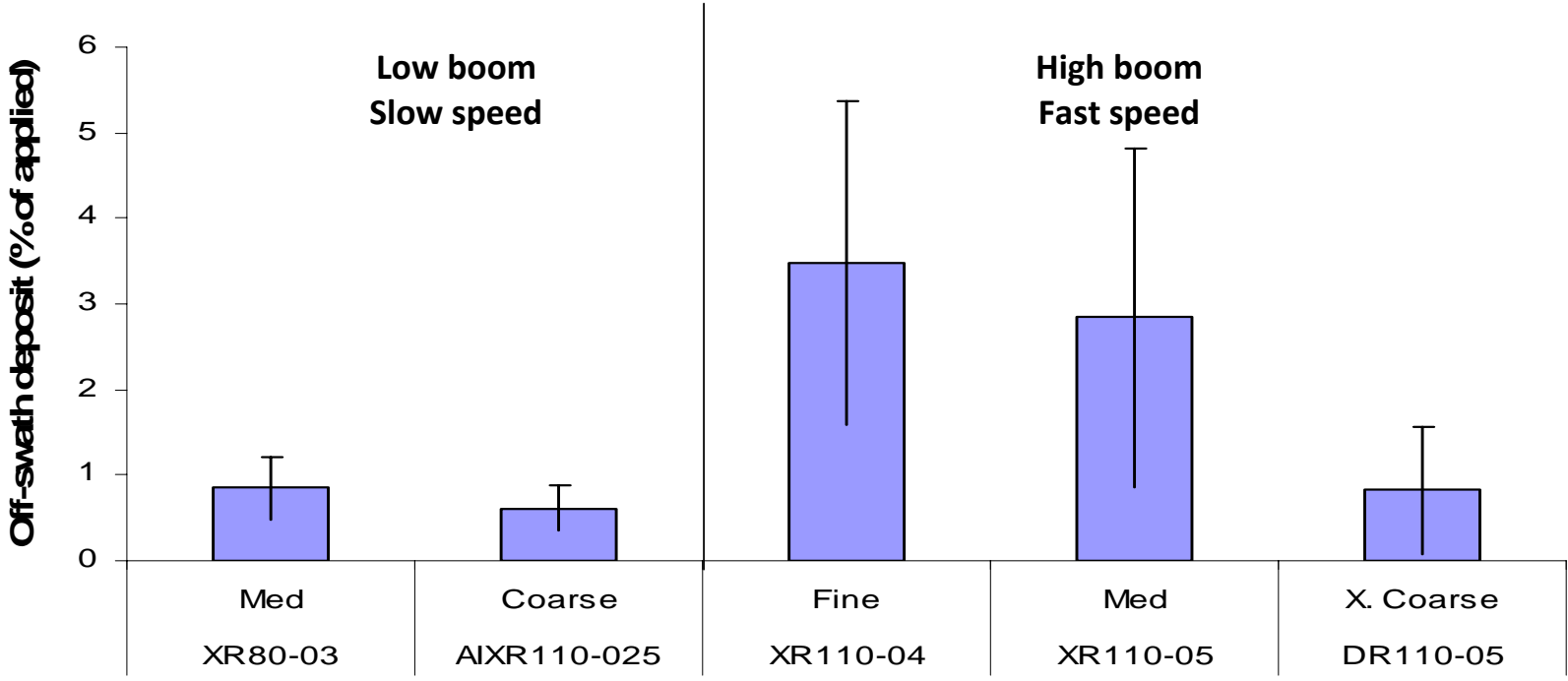
On-Swath Deposit Variability



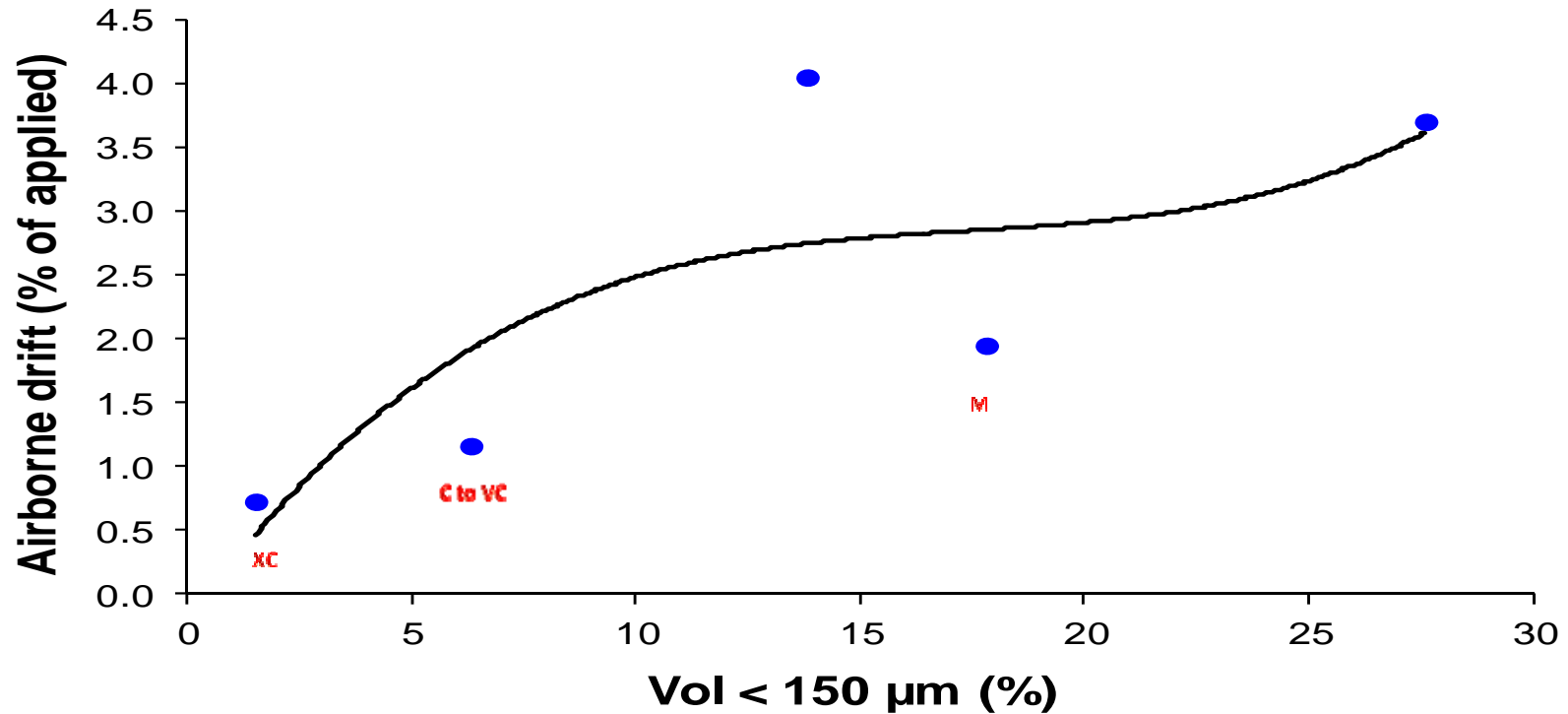
Initial Airborne Drift



Off-Swath Deposit



Droplet Size vs. Drift



Field Studies Summary

- High Boom, fast speed applications generated up to 2-3x more spray drift compared to low-boom sprays of similar quality
- Spray deposit uniformity decreases at wind speeds greater than 20 km/h.

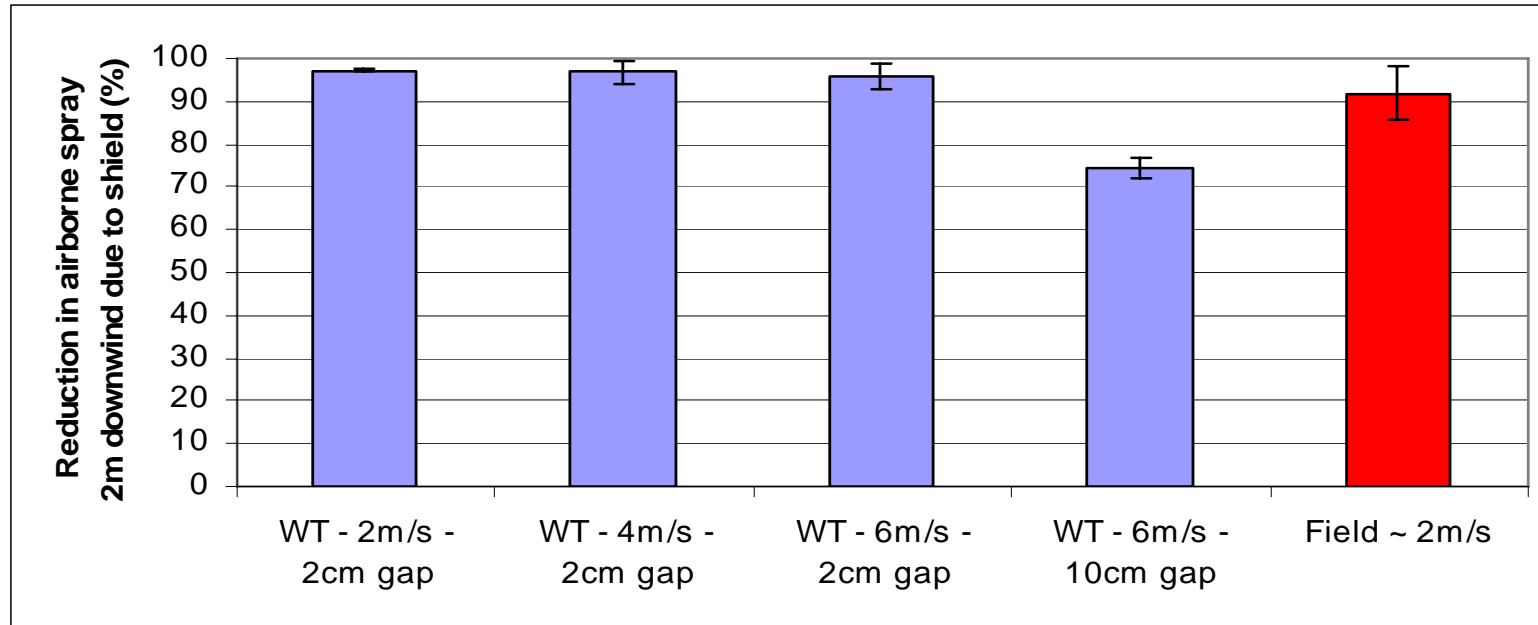
Hooded Sprayer as a DRT

- Hooded sprayer tested in wind tunnel and field studies with a range of droplet size spectra



Results

- >90% reduction in drift with hood and 2 cm gap to top of surface cover/ crop, decreasing to 75% reduction in drift with 10 cm gap



Conclusions

- Get the spray to the target and drift should be lower (as well as other losses such as runoff). In canopy spraying, targeting is the key
- For aerial and ground applications, reduce spray drift by avoiding fine droplets – select the best nozzle and avoid adjuvants that increase fines with that nozzle
- Wind direction is key – do not spray when sensitive areas are downwind
- Avoid spray release in high wind conditions (shorter booms, lower travel speeds, lower wind speed conditions but not stable air)
- Shields can prevent wind displacement of sprays – e.g. hoods, tunnels, shields etc typically reduce drift by >90%
- Precision agriculture can be a great way to reduce total environmental load, not only spray drift, while accurately targeting the pest or weed