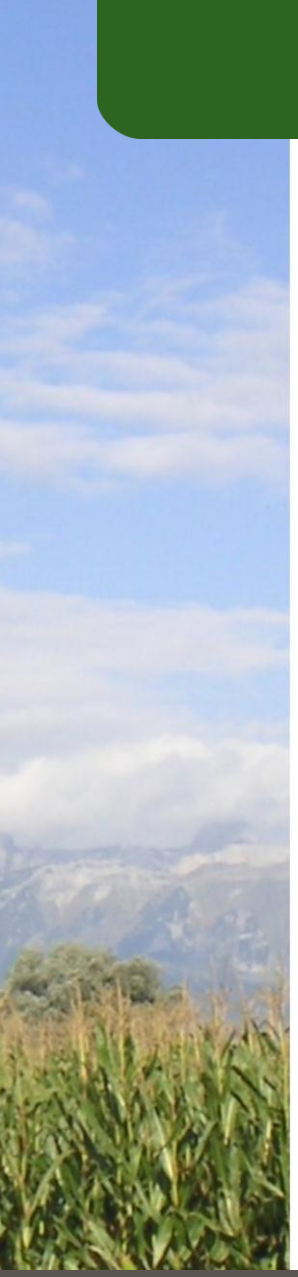


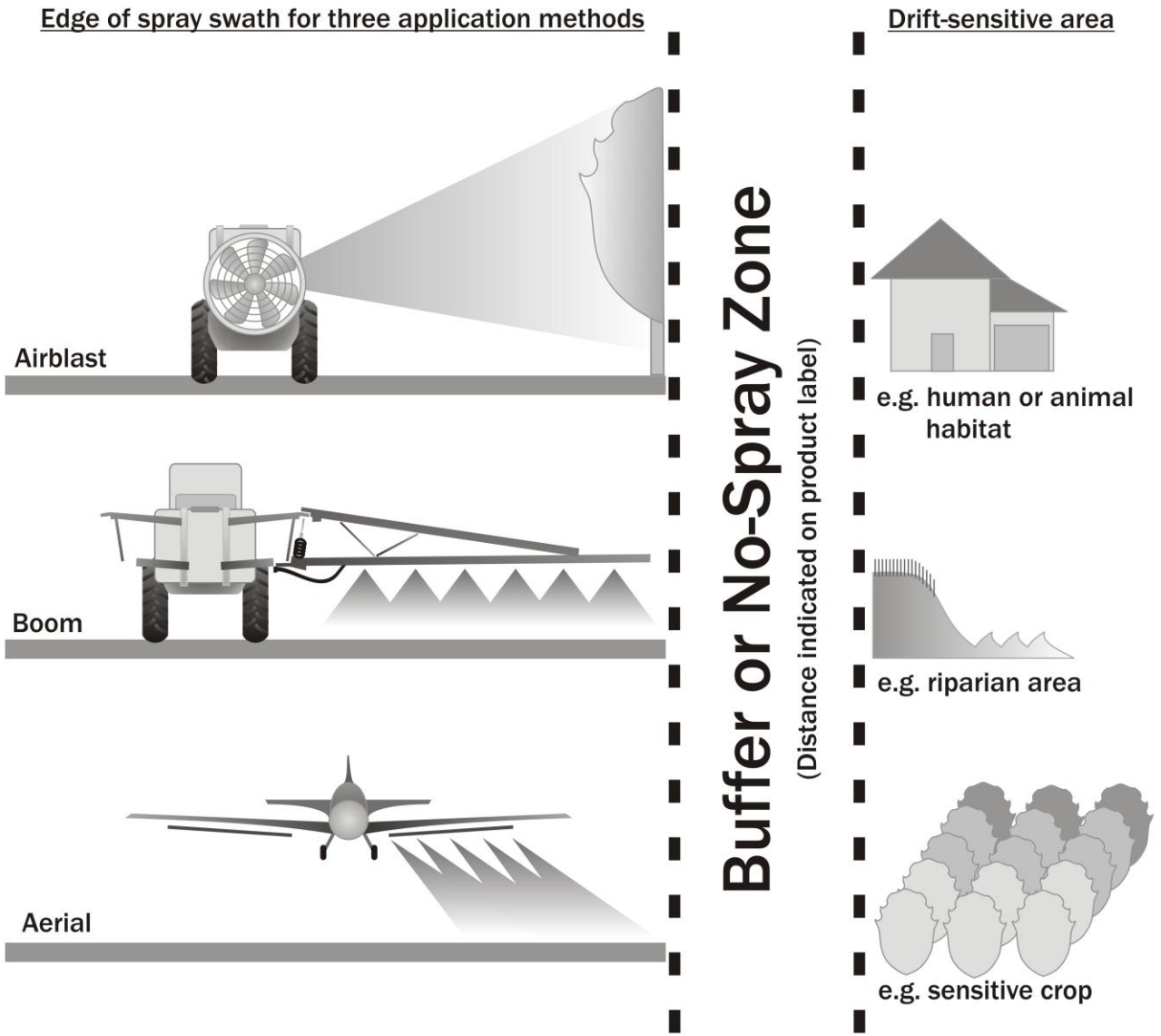
Buffer Zones

Then and Now

Jason Deveau
Application Technology Specialist, OMAFRA

Includes slides/information from
Mike Cowbrough
Weed Management Lead, OMAFRA

Ted Kuchnicki
Environmental Assessment Directorate, PMRA



- **Buffer zones for terrestrial and aquatic sensitive areas are measured downwind from the end of the spray swath to the area in question.**

Long ago…

- Prior to 1995, federal buffer zones for field and aerial applications were **15 metres** and **100 metres**, respectively.
- These distances were **arbitrary** – they didn't reflect the different toxicities of various pesticides to non-target organisms.

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

Not so long ago…

- **Since 1995, Health Canada's PMRA has calculated pesticide buffer zones based on "risk".**
  - ***The more toxic the pesticide to a sensitive non-target organism, the larger the buffer zone.***

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

How is Risk Determined?

- First, each product has a risk assessment (review of environmental fate, toxicity and exposure information) to determine if a buffer zone is needed.
- Toxicity is determined by examining the effects on fish, algae and terrestrial plants at the Expected Environmental Concentration (EEC).
- The EEC is basically the expected level of exposure for based on the maximum labelled rate.

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

How is Risk Determined?

- Then, models are used to determine how far pesticide is likely to move from of the point of application.
- If the amount of pesticide is exceeds the concentration likely to cause toxicity in a target organism, the buffer zone increases until an acceptable concentration is reached.

So Remember…

- This only describes particle drift, which is the movement of pesticide droplets or solid particles outside the area being treated.
- Buffer zones for terrestrial and aquatic sensitive areas are measured downwind from the end of the spray swath to the area in question.
- As risk increases, % allowable deposit decreases.
- Size of buffer zone reflects the toxicity.

Not so long ago…

- But, there were questions…
- What models do you use to calculate pesticide drift?
- Why doesn't this model reflect the variability between sensitive areas, application practices, or application technology?

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

Not so long ago…

- As a result, the PMRA formed the **Buffer Zone Working Group** in 1999 to address the need to refine the calculation of buffer zones.
- The group commissioned a **review** of how other countries were calculating buffer zones and specifically, what data they used to determine how large they should be.

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

What Others Do

United Kingdom

- **Local Environmental Risk Assessment for Pesticides (LERAP) was introduced in 1999 and is explained in a 17-page booklet. 5 metre minimum, pesticide and sensitive-area dependant.**

- **Drift potential is assessed for nozzles and/or sprayers through a government protocol (paid for by the sprayer manufacturer)**
  - ***a reference sprayer (no drift reduction),***
  - ***a one star rating (25% drift reduction),***
  - ***two star rating (50% drift reduction), and***
  - ***three star rating (75% drift reduction).***

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

What Others Do

Netherlands

- **Standard buffer zone of 14 metres for all applications and rewards the use of low-drift nozzles or air assist sprayers with a reduced buffer zone of 1.5 metres.**

- **The use of both technologies combined results in a buffer zone of 1 metre.**

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

What Others Do

Sweden

- There is a **matrix of distances** in a huge buffer zone table for each combination of temperature (10, 15 and 20°C) and wind speed (1.5, 3 and 4.5 m/s) on the day of application
- This is applied for either a "non-sensitive" (cropped) or "sensitive" (aquatic or ecologically important areas) area.
- THEN you look up three tables based on a ¼, ½ or full dose.
- FINALLY you get the required buffer zone based on the spray quality used (fine, medium and coarse) and the boom height (15, 40 and 60 cm).

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

What Others Do

Germany

- **Be glad you don't live in Germany. There's not enough room in this presentation to describe their methods...**
- **Interesting to note that compliance is policed, and fines up to $40 000 are authorized for violations.**

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

What Others Do

USA

- **They employ pesticide hazard and usage information along with drift deposition estimates from available drift models and studies to make its decision for each pesticide.**

- **They focus on the most influential factors:**
  - ***wind speed,***
  - ***placement of nozzles,***
  - ***spray quality (droplet size) and***
  - ***application height.***

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

Not so long ago…

- **After reviewing available options, the Group proposed refinements using numeric multipliers based on:**
  - ***the nature of the sensitive area,***
  - ***the application equipment, and***
  - ***the meteorological characteristics at the time of application.***

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

Very Recently…

- **By then, the PMRA was using three data sets to develop their drift models:**

  -Field sprayer application [Wolf and Caldwell (2001)]

  -Air-blast application [Ganzelmeier et al. (1995)]

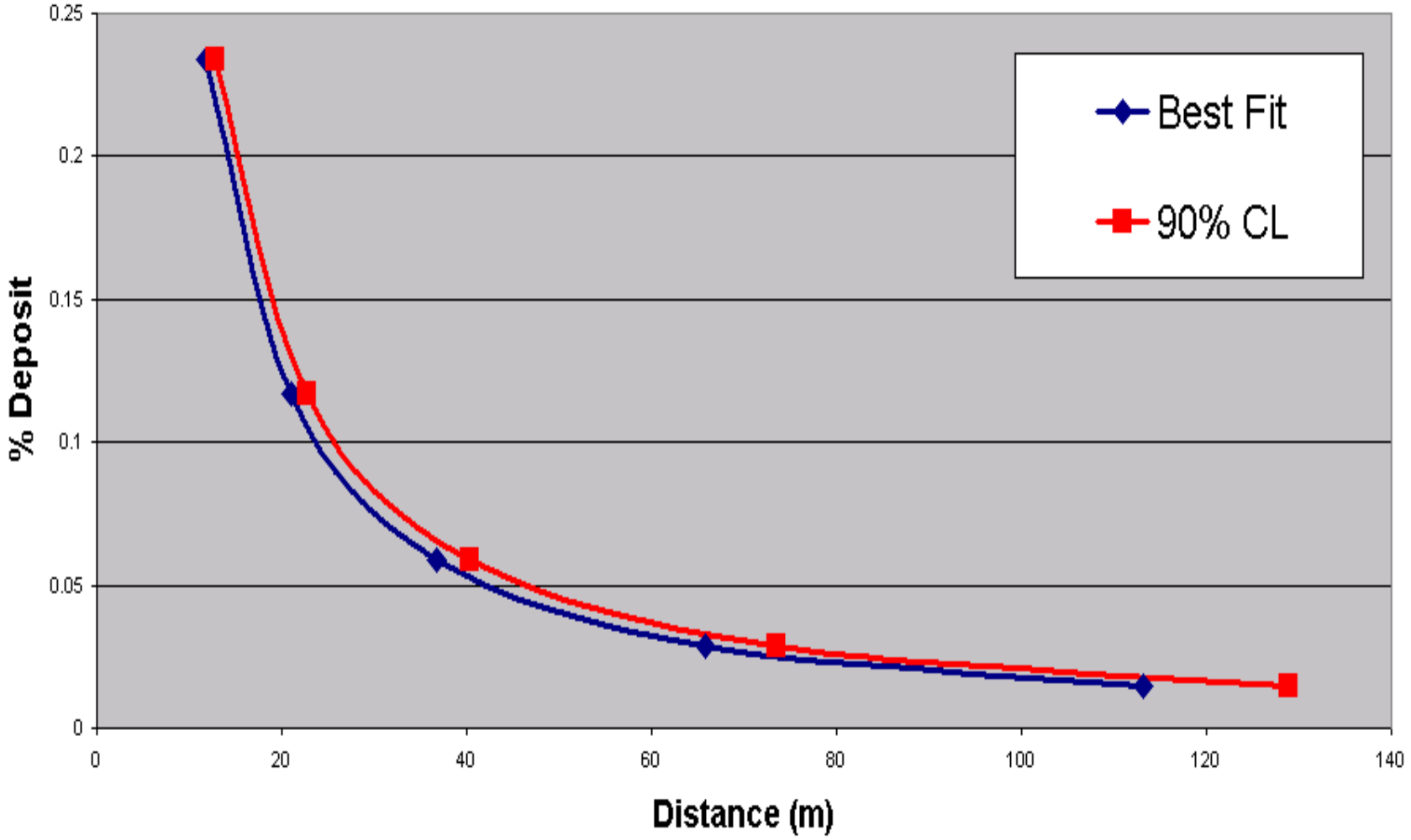
  -Aerial application [AgDISP (version 8.15)]

http://www.hc-sc.gc.ca/cps-spc/pest/part/consultations/_pro2005-06/index-eng.php

The Wolf/Caldwell Dataset

- The Wolf/Caldwell field trials were conducted near Saskatoon.
- They compared different nozzles to a standard flat-fan XR8003 Nozzle (ASA[B]E medium drops) at variable wind speeds.
- The PMRA fit a regression curve to the results.

The Wolf/Caldwell Dataset



Today

- Just after the review, the Buffer Zone Working Group became the **Federal/Provincial/ Territorial Pesticide Drift and Non-Target Exposure Working group** (FPT PDNTEW) and I joined up because I love acronyms.

- In my time with the group, I've been fortunate to see a lot of long-term endeavours come to completion.

- The one we're really here to talk about is the PMRA's Site-Specific Buffer Zone Modification model... aka the online buffer zone calculator.

- The model assumes that if the application rate remains unchanged, a reduction in drift can be achieved by the following factors:

Today

- **Wind Speed**

The model reflects the linear nature of the wind speed effect for field sprayers. For all application methods, wind speeds were divided into the following three categories:

1-8 km/h, 9-16 km/h, and 17-25 km/h for field sprayers and chemigation applications; and

1-5 km/h, 6-10 km/h, and 11-16 km/h for aerial and airblast applications.

Today

- **Air Temperature and Relative Humidity**

For field sprayers, where discharge heights rarely exceed 1 m, temperature and relative humidity are not considered important enough to be included (Goering and Butler 1975).

An intermediate temperature and relative humidity condition is used for modelling aerial applications: 25°C and 50% relative humidity.

Today

- **Spray Quality**

Nozzle manufacturers typically report the BCPC or ASABE spray quality of their nozzles for each flow rating and pressure, and this information is available to applicators.

Spray quality categories in this scheme are: fine, medium and coarse (aerial application) and fine, medium, coarse and very coarse (field sprayers).

Drift potential varies by about a factor of three between adjacent quality classes. Spray quality is considered as a variable for field sprayer and aerial application only. Spray quality adjustments are not common in orchard airblast and chemigation applications.

Today

- **Boom Height and Length**

The scheme assumes that drift potential is increased by a factor of two when the sprayer boom is raised from 0.6 m to 1.2 m for field sprayers (Goering and Butler 1975, Nordby and Skuterud 1975).

Although boom height is a very important parameter in aerial applications, it is not considered because flight height decisions are dependent on aircraft size, air speed, terrain and pilot judgement.

For chemigation, credit is given for lower boom heights and drop tubes.

Today

- **Shrouds and Cones**

The scheme allows an additional 30% drift reduction for cones and 70% for shrouds when used at travel speeds <12 km/h and boom heights <60 cm (Edwards and Ripper 1953, Maybank et al. 1991, Wolf et al. 1993).

- **Atmospheric Stability**

The model does not incorporate inversion conditions into drift prediction; instead, spraying during a temperature inversion is not recommended (Goering and Butler 1975, Maybank and Yoshida 1969, Yates et al. 1974).

Today

- Carrier Volume, Travel Speed and Crop Stage

No credit is given for increased carrier volume. In cases where a higher volume is applied with a coarser sprays, this effect is captured by the spray quality component.

In light of the counteracting effects that occur with increasing travel speed, this model assumes **no net change in drift potential with travel speed.**

Due to the variable nature of foliation between crops, species and seasons, **no adjustment is made for crop growth stage.**

Today

- For field sprayer application, buffer zones can be reduced with the use of drift reducing spray shields. When using a spray boom fitted with a full shield (shroud, curtain) that extends to the crop canopy or ground, the labelled buffer zone can be reduced by up to 70%.

- When using a spray boom where individual nozzles are fitted with cone-shaped shields that are no more than 30 cm above the crop canopy or ground, the labelled buffer zone can be reduced by up to 30%."

Field Sprayer Modifiers

Labelled Spray Advisory - Fine			
Wind Speed (km/h)	Spray Quality		
	Fine	Medium	Coarse
1-8	0.5	0.1	0.1
9-16	0.7	0.4	0.2
17-25	1.0	0.6	0.4
Labelled Spray Advisory - Medium			
Wind Speed (km/h)	Spray Quality		
	Fine	Medium	Coarse
1-8	0.8	0.2	0.1
9-16		0.6	0.3
17-25		1.0	0.6
Labelled Spray Advisory - Coarse			
Wind Speed (km/h)	Spray Quality		
	Fine	Medium	Coarse
1-8		0.4	0.2
9-16		0.9	0.6
17-25			1.0

Aerial Sprayer Modifiers

Labelled Spray Quality – Fine			
Wind Speed (km/h)	Spray Quality		
	Fine	Medium	Coarse
1-5	0.4	0.1	0.1
6-10	0.7	0.2	0.1
11-16	1.0	0.2	0.1
Labelled Spray Quality – Medium			
Wind Speed (km/h)	Spray Quality		
	Fine	Medium	Coarse
1-5		0.3	0.1
6-10		0.8	0.1
11-16		1.0	0.2
Labelled Spray Quality – Coarse			
Wind Speed (km/h)	Spray Quality		
	Fine	Medium	Coarse
1-5			0.2
6-10			0.6
11-16			1.0

Let's Try it

- **Retain BZ modification record for at least one year from the time of application.**

Changes are being made

- So, it's not perfect right now.
- I have lots of emails regarding situations where it's ambiguous.
- E.G. Airblast in QC – Provincial minimum is 20 m, no matter what federal policy or labels say.
- E.G. What about labels where no droplet size is referenced?
- E.G. What about labels that already give modified buffer zones based on equipment?

The Future

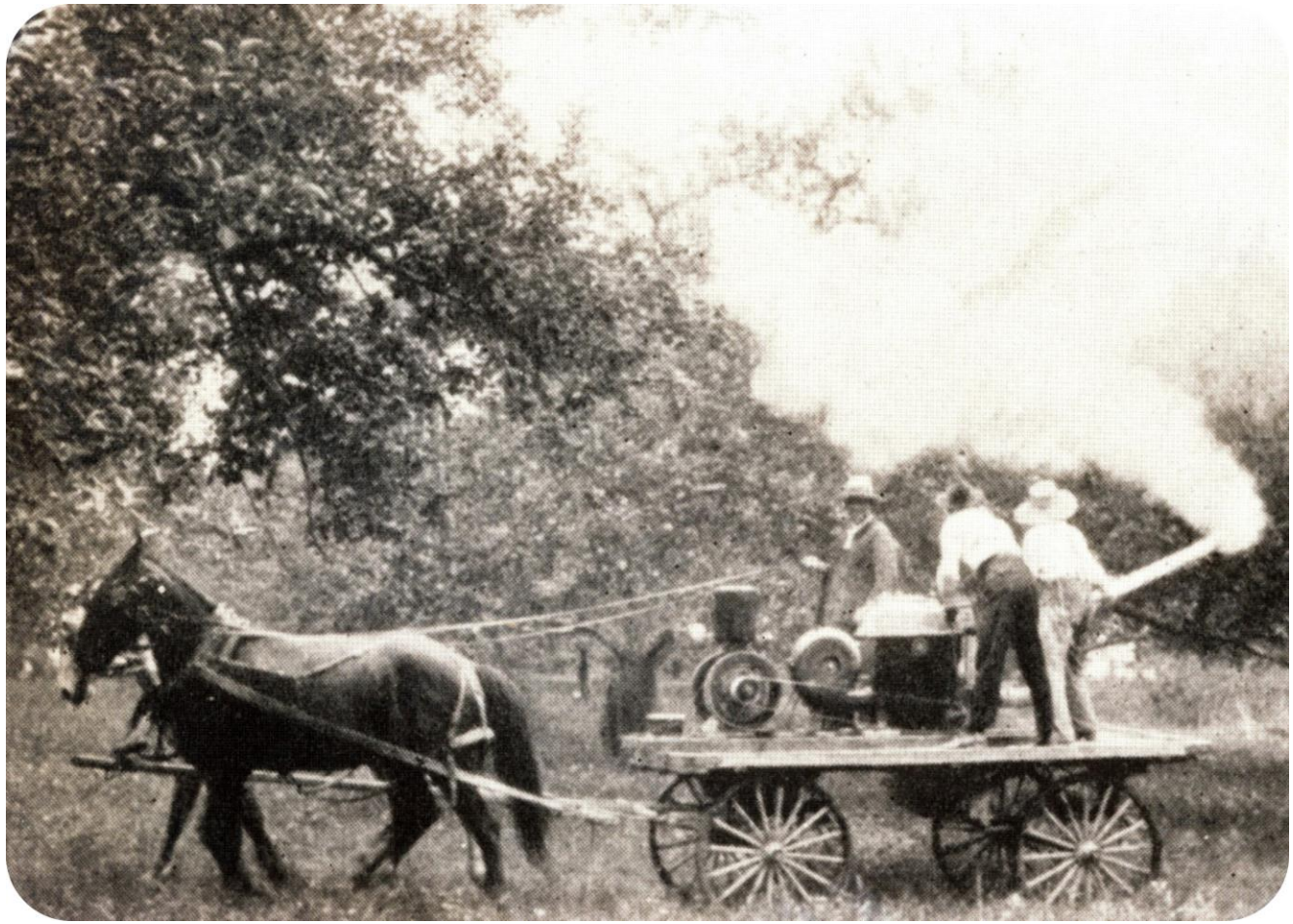
- Dr. Andrew Hewitt (New Zealand) is leading an international collaboration to develop drift reduction scheme. We're involved.
- Australia has incorporated Canada's models and we're all working to incorporate LERAP's nozzle data. It requires nozzle manufacturer's to give us access to their data and so far we're getting that support.
- PMRA is working to remove manmade shelterbelts from the environmental protection strategy.
- This summer we anticipate a the PMRA will launch their new Best Practices Manual on drift and drift mitigation.

Air Induction In Action

- **When set up properly, less drift means more product on-target. As an additional perk, A.I. spray is harder to see, which helps when the public is watching.**

Which side has air induction and which is conventional disc-core?

Evolve your Practices to Minimize the Impact of Drift!



THANK YOU!