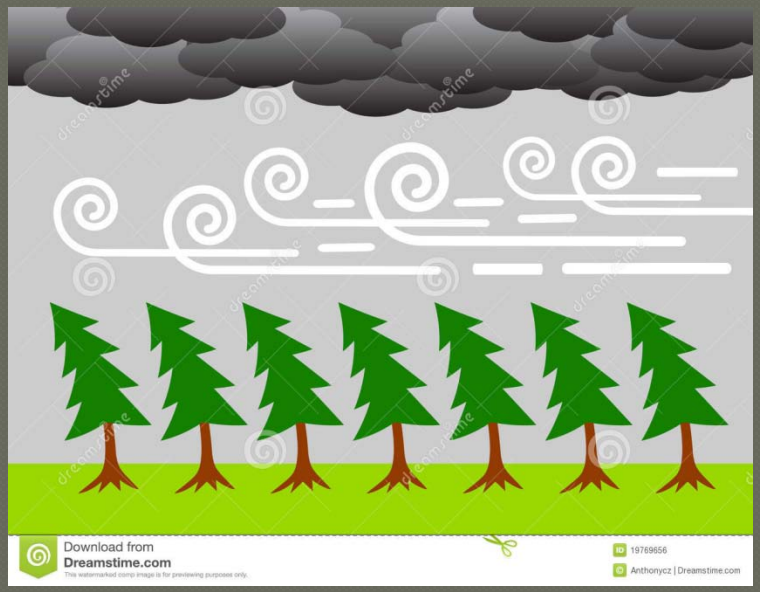
Herbicide Drift in Invasive Weed Control

Joel Trumbo
Senior Environmental Scientist
CA Dept of Fish & Wildlife
Lands Program
Sacramento CA

What is drift?

DPR defines pesticide drift as the pesticide that moves through the air and is not deposited on the target area at the time of application.



What is drift?

This definition DOES NOT include the following post-application pathways…

- surface water transport
- volatilization
- the transport of pesticide residues on windblown soil particles

Main Factors

- wind speed & direction
- spray droplet size
  - tank pressure
  - nozzle selection
- height above target
- application equipment

DPR Drift Regulations

§6614. Protection of Persons, Animals, and Property.

…no pesticide application shall be made or continued when there is a reasonable possibility of contamination of…

- people
- crops
- animals
- property

Significant Drift Damage

Crop Damage

Farmworker Illnesses

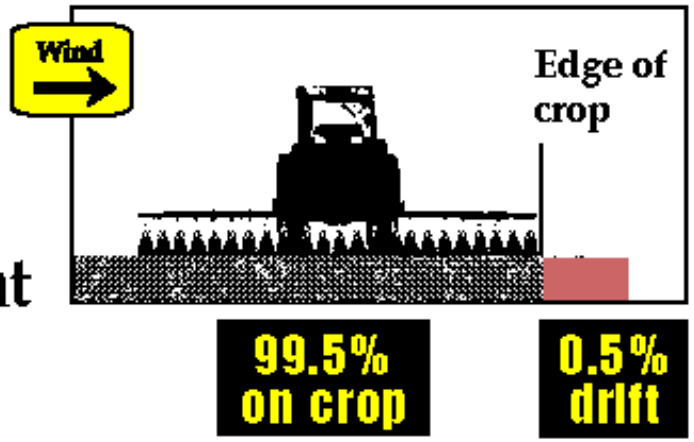
The Spray Drift Task Force

- In response to a directive from the U.S. EPA, a consortium of 38 chemical companies formed the Spray Drift Task Force (SDTF).
- Between 1992 and 1995, the SDTF conducted a series of field and laboratory studies that provides the basis for spray deposition and downwind drift predictions.

SDTF Study Results

Average SDTF Control Application
24 replicates

180 ft wide field
8004 nozzles
40 psi pressure
20 inch nozzle height
10 mph crosswind



SDTF Results

The results from the SDTF studies confirm conventional knowledge concerning the factors that affect spray drift.

- Droplet size was the most important factor affecting ground applications.
- Drift only occurs downwind. Waiting until the wind is blowing away from sensitive sites is an effective application practice.

SDTF Results

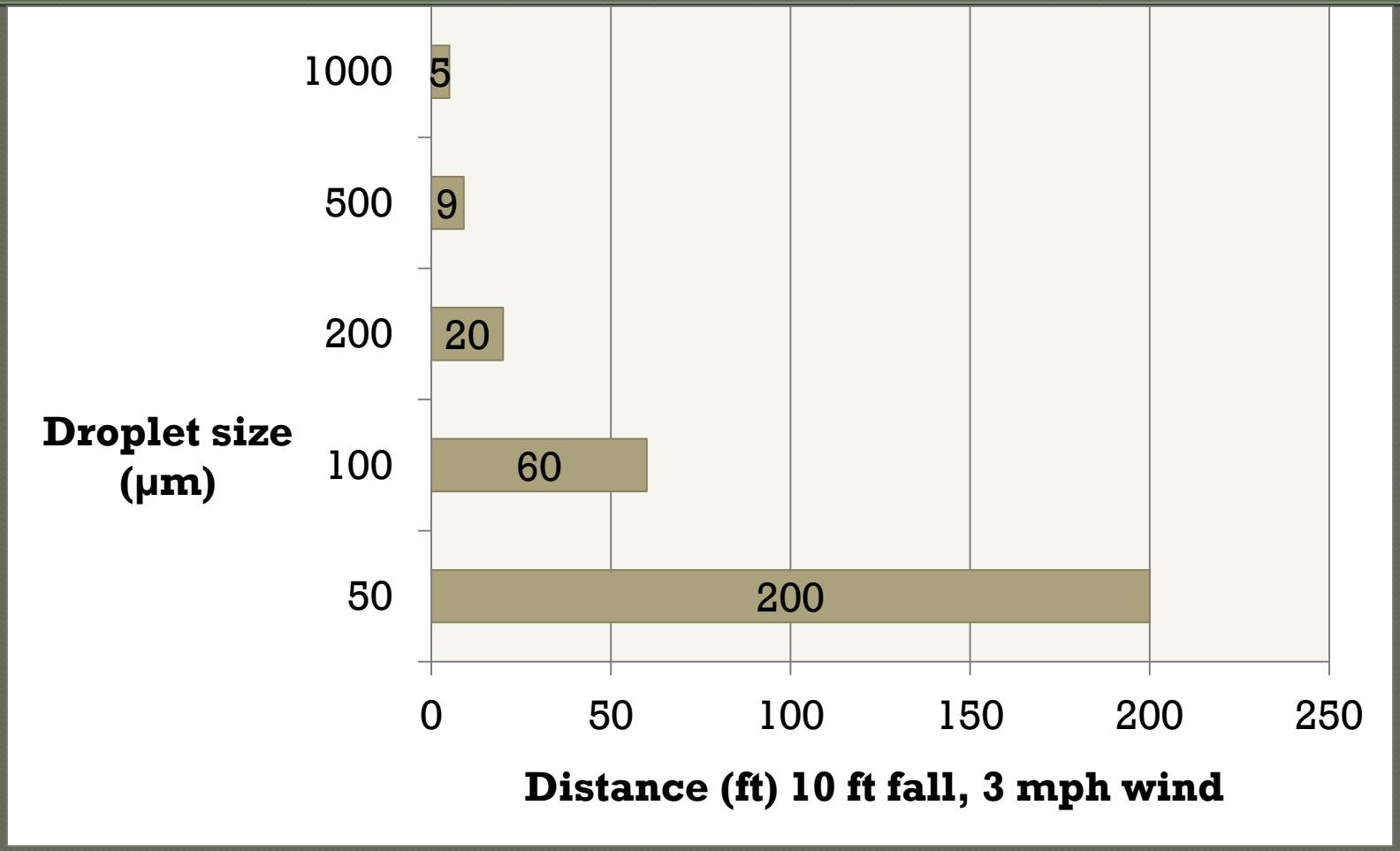
Drift levels can be minimized by…

- Applying the coarsest droplet size spectrum that provides sufficient coverage and pest control .
- Using the lowest nozzle height that provides uniform coverage.
- Applying pesticides when wind speeds are low and consistent in direction.

Droplet Size & Time to Fall

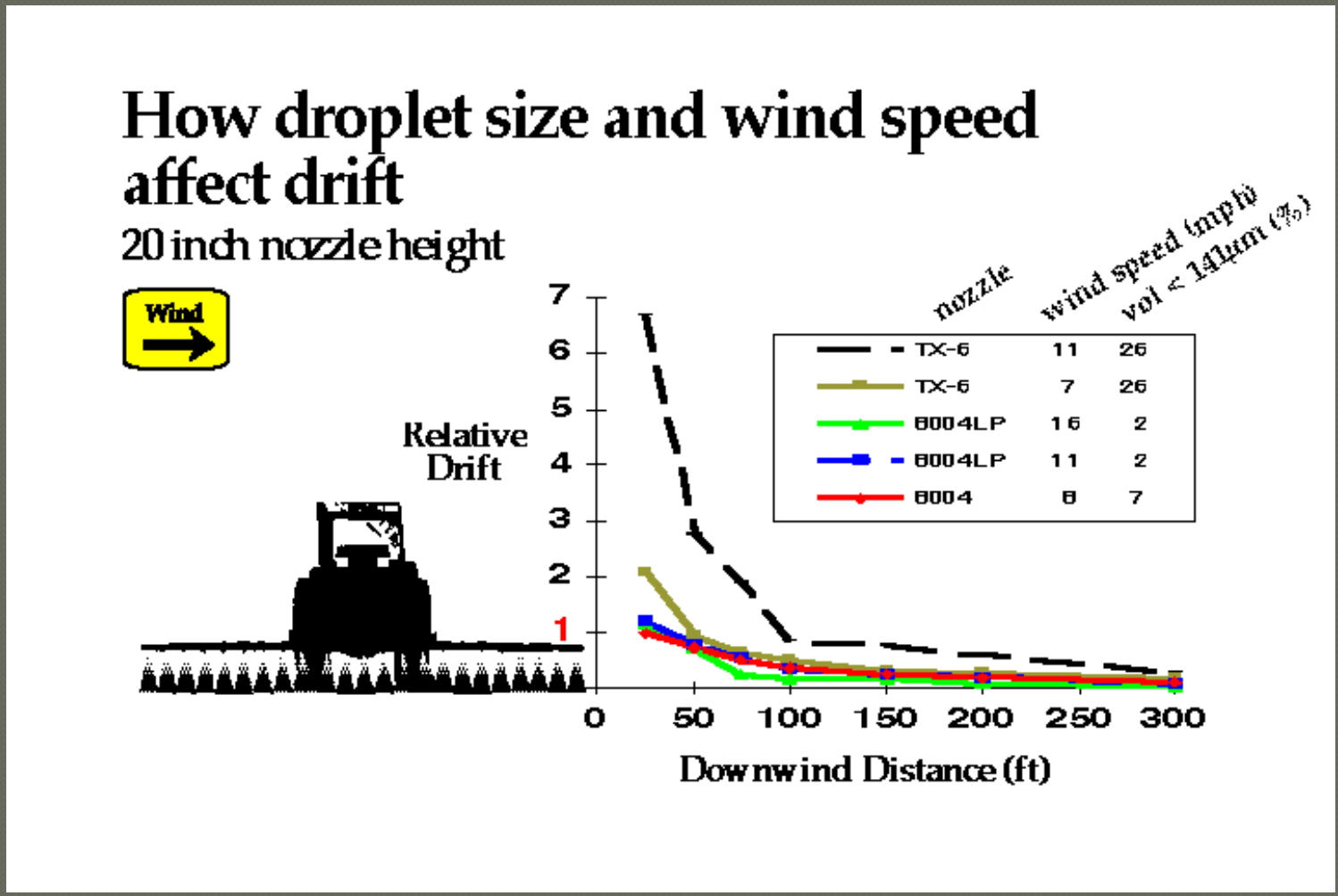
Diameter (µm)	Appearance	Time to Fall 10 Feet in Still Air
1	Fog	28 hrs
10	Fog	17 min
100	Mist	11 sec
200	Fine Spray	4 sec
400	Course Spray	2 sec
1,000	Course Spray	1 sec

Droplet Size & Drift Distance



Bode & Butler 1981

SDTF Study Results



Other Methods of Reducing Drift

- Maximum wind speeds
  - What should these be?
- Buffer zones
  - Based on what?

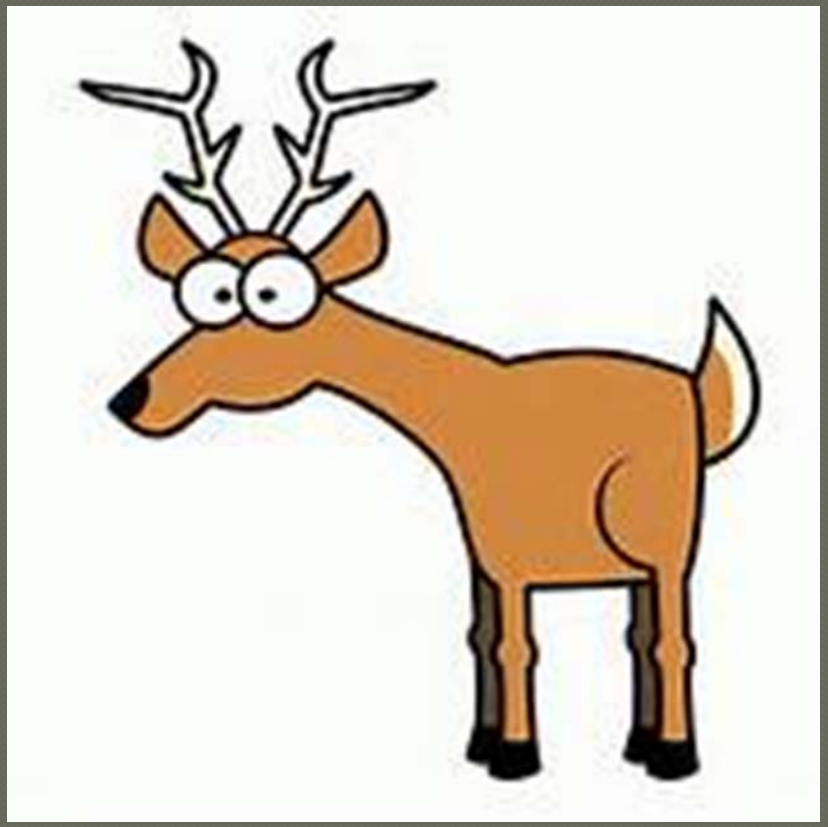
Arbitrary Buffer Distances

- CA Red-legged frog pesticide buffers are 60 ft by ground and 200 ft by air.

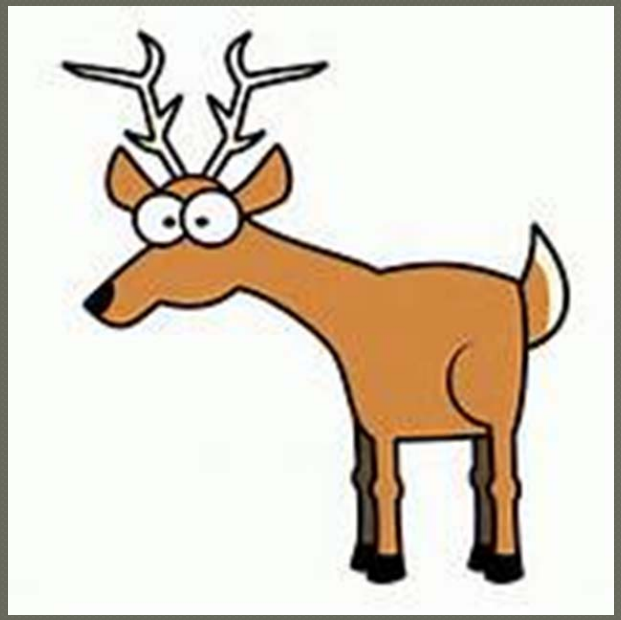
- Tox risk was obviously not considered b/c all 66 pesticides have the same buffer distances.

Hazard = exposure x toxicity

- You can't assess risk using exposure alone.
- You must also consider toxicity .

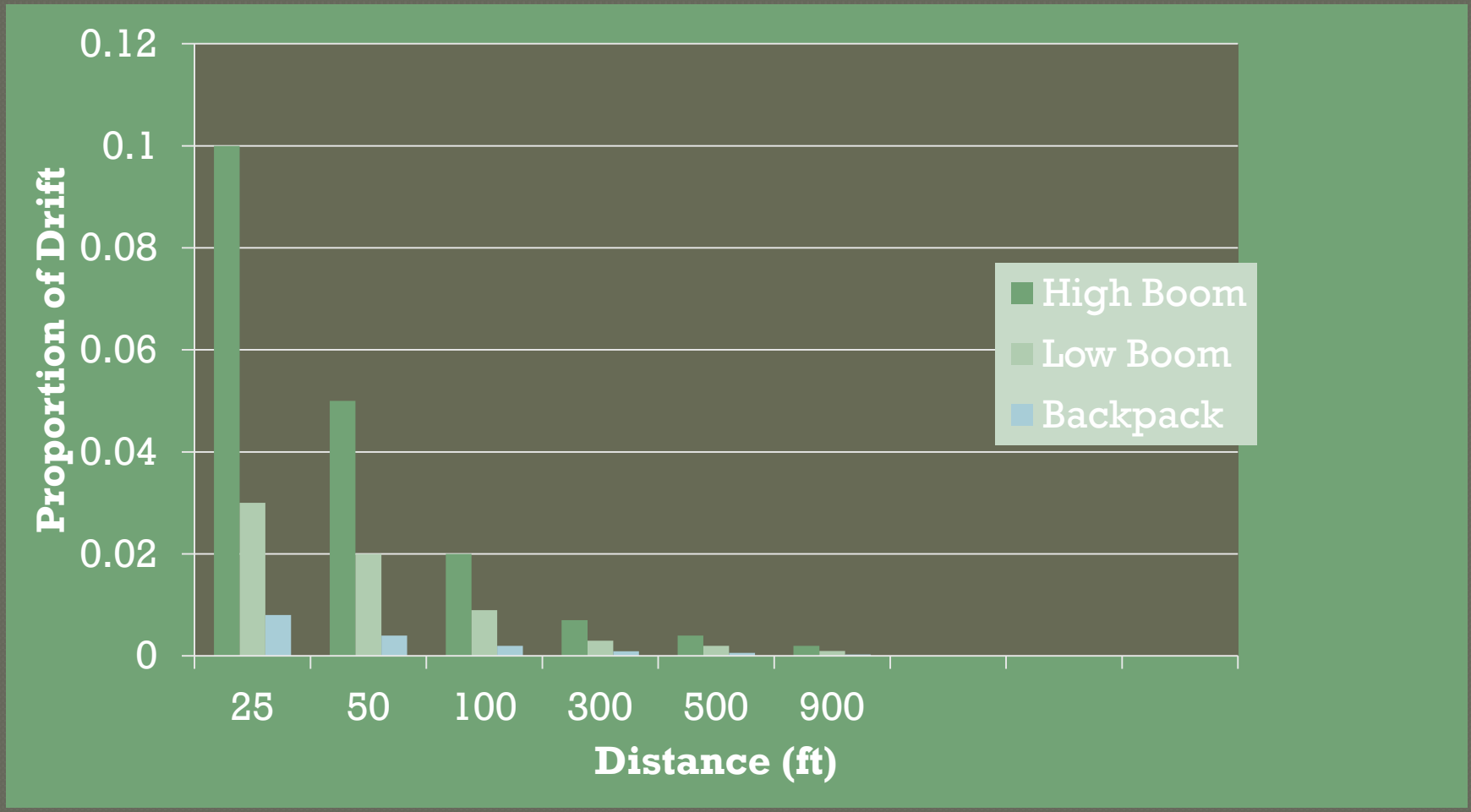


Hazard = exposure x toxicity



- HQ = exposure/toxicity
- HQ = EEC/NOEC
  - Label rate per acre
  - NOEC – vegetative vigor
  - SDTF proportion of drift values for ground-based applications, low boom

Proportion of Drift



HQ Values & Buffer Widths
HQ = Low Boom Proportion of drift/NOEC

	Lbs/acre	NOEC (lb/ac)	HQ @ 50 ft	HQ @ 900 ft
Chlorsulfuron Sensitive sp	0.056	8.8×10^{-6}	64	5
Chlorsulfuron Tolerant sp	0.056	0.14	4×10^{-3}	3×10^{-4}
Glyphosate	1.0	0.0013	14	0.8
Imazapyr	1.0	6.4×10^{-5}	277	17
Triclopyr TEA Sensitive sp	1.0	2.8×10^{-3}	6	0.4
Triclopyr TEA Tolerant Sp	1.0	2.0	9×10^{-3}	5×10^{-4}

HQ Values & Buffer Widths

	Lbs/acre	NOEC (lb/ac)	HQ @ 50 ft	HQ @ 900 ft
Chlorsulfuron Sensitive sp	0.056	8.8×10^{-6}	**RISK**	**RISK**
Chlorsulfuron Tolerant sp	0.056	0.14	**SAFE**	**SAFE**
Glyphosate	1.0	0.0013	**RISK**	**SAFE**
Imazapyr	1.0	6.4×10^{-5}	**RISK**	**RISK**
Triclopyr TEA Sensitive sp	1.0	2.8×10^{-3}	**RISK**	**SAFE**
Triclopyr TEA Tolerant Sp	1.0	2.0	**SAFE**	**SAFE**

Overestimations

- Invasive weed control in wildland settings is typically spot treatment and not broadcast treatment.
- Using broadcast application rates for spot spray overestimates exposure (proportion of drift) values.

Considerations

- NOEC values for plants are based on a few test species (onion, etc).
- Native plants may or may not have the same sensitivity.
- Selective herbicides may have far less impact. (higher NOEC values).

Final Thoughts

- If you're concerned about non-plant (wildlife) hazard, the HQ-derived buffer distances will be much reduced as compared to the plant protective buffers.
- This is because herbicides have generally very low toxicity values for aquatic and terrestrial wildlife.


QUESTIONS?