



WEEDS OF NATIONAL SIGNIFICANCE

# SERRATED TUSSOCK



How to recognise, manage and prevent serrated tussock herbicide resistance

# SERRATED TUSOCK CONTROL

## INTRODUCTION

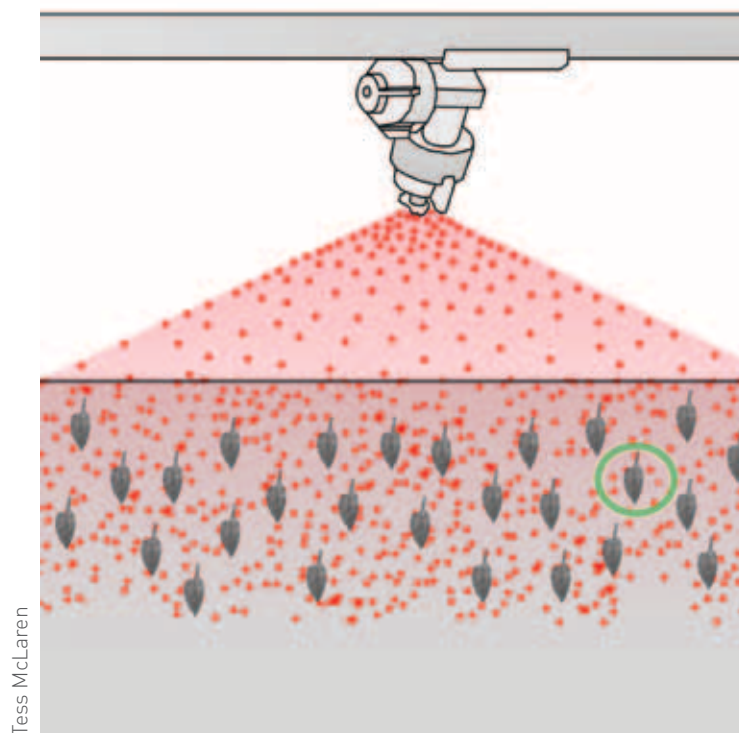
Serrated tussock (*Nassella trichotoma*) is a Weed of National Significance causing huge agricultural and environmental impacts to Australia. The only registered herbicides for control of serrated tussock in pastures are flupropanate, glyphosate and 2,2-DPA. Flupropanate is widely regarded as the most selective and effective herbicide for serrated tussock control. Flupropanate is a residual soil active herbicide (until it receives 100ml of leaching rain) that can prevent serrated tussock from regrowing for two to five years in some situations.

Serrated tussock resistant to flupropanate was first identified on a Victorian property in 2002 and has since been confirmed in several locations from Armidale and Goulburn in New South Wales to Diggers Rest and the Rowsley Valley in Victoria. This Agriculture Note provides information to help land managers identify serrated tussock resistant to flupropanate and how they can manage it if they find it. It also provides important information on how to prevent herbicide resistance.

## What is herbicide resistance?

Herbicide resistance is the ability of a plant to survive and reproduce following exposure to a dose of herbicide that would normally be lethal. In a plant, resistance usually occurs through natural selection resulting from random and infrequent genetic mutations. Through selection, susceptible plants are killed while herbicide resistant plants survive to reproduce without the competition from susceptible plants. If the herbicide treatment is repeated, resistant plants successfully reproduce and become dominant in the population. The appearance of herbicide resistance in a plant population is an example of rapid weed evolution and typically develops when a weed species has been exposed to 10-14 years of continual application from a particular herbicide group or type. Large weed populations increase the likelihood of developing resistance.

Flupropanate – one application provides soil residual control of germinating serrated tussock seedlings until its effectiveness dissipates with rainfall (100mm of leaching rain and will vary with soil type). Dry conditions and heavy soils may result in two or more years control of serrated tussock seedlings.



**Figure 1.**

Millions of serrated tussock seeds in the soil may get exposed to flupropanate. Herbicides that have long soil residual and season-long control of germinating weeds such as flupropanate characteristically increase selection pressure and the likelihood of resistance developing.

 = Resistant seed



## What is serrated tussock resistance to flupropanate?

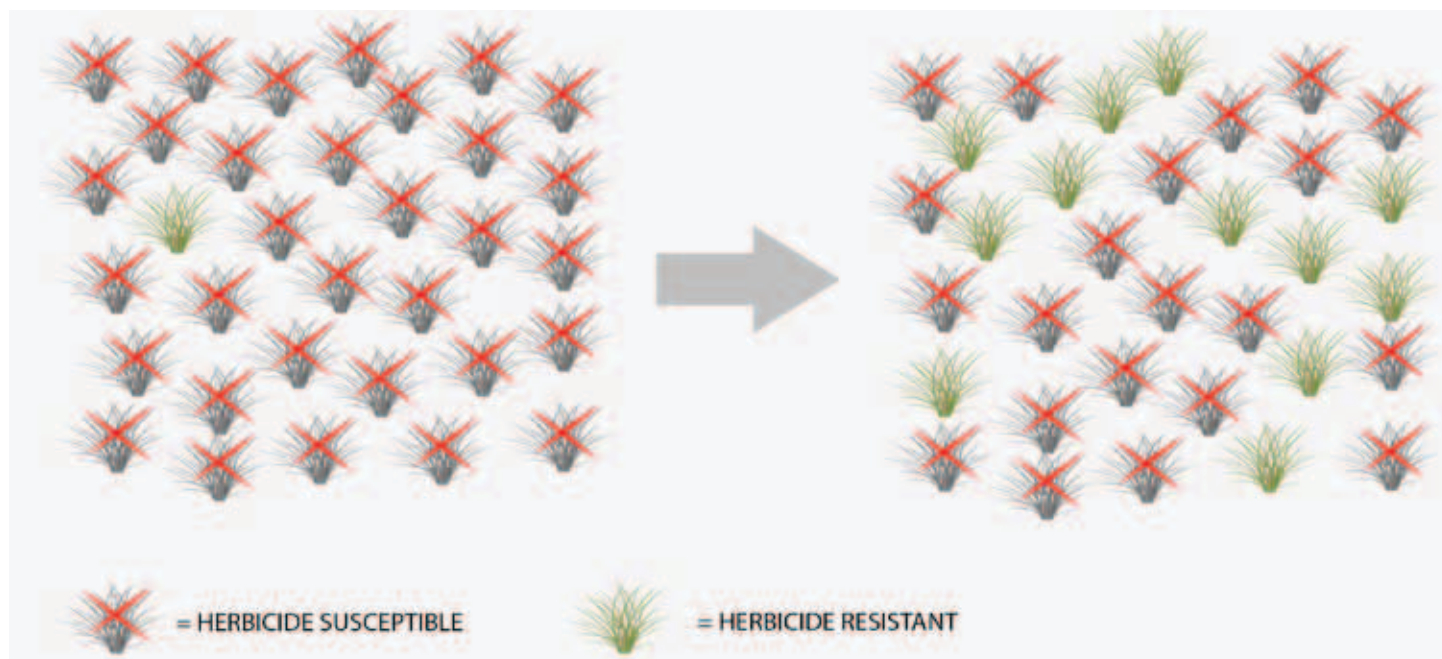
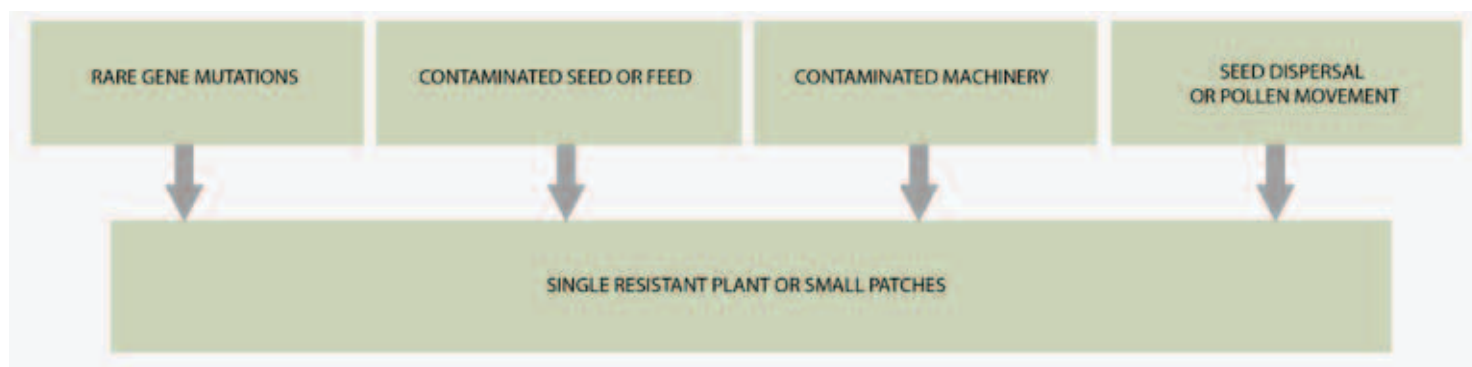
Being a residual herbicide, four or five successive applications of flupropanate applied over a 10-14 year period to a parcel of land with low rainfall will be the equivalent of continual applications of a non-residual herbicide.

The serrated tussock seed bank may consist of millions of seeds of which many will attempt to germinate each year depending on environmental cues (Figure 1). Like a lotto draw, eventually a serrated tussock seed will have the genetic code to resist the effects of flupropanate and will survive to reproduce and spread the resistance (**Figure 2**).

## Management implications of serrated tussock resistance to flupropanate.

- Increased dominance of serrated tussock as a weed and reduced grazing opportunities for animals
- Increased costs to land managers
- More herbicide usage and increased time spent by land managers controlling serrated tussock
- Higher environmental pollution and damage to the environment as a consequence

## FACTORS INFLUENCING THE INITIAL INTRODUCTION OF HERBICIDE RESISTANT PLANTS



**Figure 2.** Serrated tussock resistance to flupropanate becoming a problem in a paddock when using high risk management options.

## How do I know if the serrated tussock on the land I manage has resistance?

Flupropanate is a slow acting herbicide that requires rainfall for its activation and may take as long as 12 months in some situations to kill mature serrated tussock plants. This can be confusing for land managers as they can forget when treatments have been undertaken.

Make sure you take careful records of where the serrated tussock has been treated. Look out for live serrated tussock plants amongst dead serrated tussock in paddocks that have been broad acre sprayed with flupropanate (**Figure 3**). Another indicator of serrated tussock resistance to flupropanate is when you see live serrated tussock seedlings growing in an area recently treated (within last 12 months and before 100 ml of leaching rain) with label rate flupropanate (**Figure 4**).

## Ways to avoid herbicide resistance

Most importantly – do not rely solely of the use of chemicals for control. Use immediate acting or short residual herbicides whenever possible. Use long term residual herbicides (like flupropanate) wisely and not continuously on the same parcel of land. Avoid continual use of the one herbicide type on large populations of serrated tussock.

Integrate herbicide use with other control strategies (practice integrated weed management) including chipping, cultivation, mulching, cropping, pasture rehabilitation, fire, grazing management, forestry/native re-vegetation, strategic fencing, use of shelter belts/windbreaks, slashing, strategic stock management, vehicle/machinery hygiene where appropriate (see Serrated Tussock National Best Practice Management Manual).

Always apply herbicides according to label directions. Regularly rotate the herbicide types used with different modes of action. For example, Group J (Flupropanate and 2,2-DPA) or Group M (Glyphosate). Keep good spray records for every paddock. Always monitor and follow up control (chip out) any re-growing serrated tussock plants. **Report suspected weed resistance to your local weeds officer.** Practice good sanitation practices to reduce movement of weed seed. Do not let any serrated tussock plant set seed.



**Figure 3.** Alive and dead serrated tussock after flupropanate application.

Report suspected weed resistance to your local weeds officer or agronomist.



**Figure 4.** Serrated tussock seedlings surviving in an area recently (within 12 months and without 100mm of leaching rain) sprayed with label rate flupropanate is an indicator of resistance.



# SERRATED TUSSOCK CONTROL



Spot spraying using glyphosate with spray wand. Ensure every tussock leaf is sprayed.

## Integrated Weed Management to Prevent Herbicide Resistance



Cropping to out-compete serrated tussock.



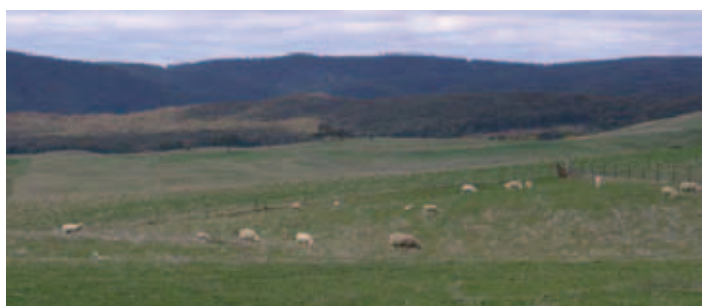
Use rabbit fencing for grazing management and to reduce serrated tussock seed spread.



Agroforestry to shade and outcompete serrated tussock in non arable locations.



Chipping or hoeing serrated tussock.



Strategic grazing (rotational) is important to maintain good competition to out-compete serrated tussock.



Burning serrated tussock to prevent seeding.



Slashing to reduce serrated tussock seeding.



**Windbreaks to reduce serrated tussock seed spread.**

Identify and monitor surviving weed populations and check for resistant weeds on your farm. Keep good records of weed populations.



**Strategic use of mulch to smother serrated tussock seedlings around rocky outcrops.**

Attend IWM training schools and ChemCert® courses.



**Pasture re-sowing. Healthy competitive pastures will prevent serrated tussock establishment.**

## Further Information

Further information on biology, management and identification can be found in the Serrated Tussock - Best Practice Management Manual available from: [www.weeds.org.au/WoNS/serratedtussock](http://www.weeds.org.au/WoNS/serratedtussock) or [www.serratedtussock.com](http://www.serratedtussock.com) or by contacting the VIC DEPI Customer Centre -- ph: 136 186.

## Acknowledgments

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This project was funded under an Australian Government Initiative and by the Victorian Department of Primary Industries. Figure 2 was adapted from a GRDC "Herbicide Resistance Fact Sheet".

ISSN 1329-8062

Published and Authorised by Department of Environment and Primary Industries.

1 Spring Street, Melbourne Victoria

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