NSW GOVERNMENT | Department of Primary Industries

# Industry insights- Weeds in NSW

## Supporting document

**NSW DPI Schools Program**

Answer guide

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DPI in SCHOOLS

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# Weeds in NSW

1. **Complete the passage using words from the NSW DPI Schools Program 'Weeds in NSW' poster.**

   Weeds impact agricultural production and pose a major threat to our unique natural environment. They threaten the survival of hundreds of native plants and animals in NSW alone. They also impact on the price of food, human health through allergies and asthma, recreational activities and the NSW economy.

   A general biosecurity duty applies to all plants in New South Wales. Many of the following weeds have both state and regional priority biosecurity duties.

   Early surveillance, detection and action offer the most strategic and cost-effective form of weed management. If you see a plant which you think is out of place and might be a weed, find out what it is.

**Go to Your role in Biosecurity the NSW DPI webpage to complete questions 2-3.**

2. **In your own words explain what biosecurity is and the role of every person in managing biosecurity.**
   Answers may vary.

   Example answer: Biosecurity is the protection of the economy, environment and community from the negative impacts of pests and diseases, weeds and contaminants.

   Biosecurity is a shared responsibility, this means that every person has a shared duty in weed, pests and disease; surveillance, detection and action. This allows us to protect our economy, environment and community from biosecurity threats.

3. **List the four steps in being biosecure.**
   - Take steps to prevent pests, diseases and weeds from entering NSW and spreading to new areas
   - Keep an eye out for pests, weeds and signs of disease
   - Report anything unusual to NSW DPI
   - Participate where you can when we are responding to incursions and biosecurity emergencies.

4. **In your own words make a definition for a weed and give an example.**
   Answers will vary.

   Example answer: A weed is any plant that is growing in the wrong place. For example, a rose bush growing in a wheat crop is a weed and vice versa, a wheat plant growing in a garden be would be termed as a weed.

## Integrated weed management

**Go to '[Integrated weed management']' the NSW DPI webpage to complete question 5.**

5. **Define Integrated weed management (IWM).**

   Integrated weed management is the coordinated use of a variety of control methods, reducing reliance on herbicides alone, and increasing the chances of successful control or eradication. Integrated weed management programs require long-term planning, knowledge of a weed's biology and ecology and appropriate weed control methods.

   **The following diagram illustrates how herbicide resistance in a weed population develops on a producer's paddock over time. Use the diagram to answer questions 6-7.**

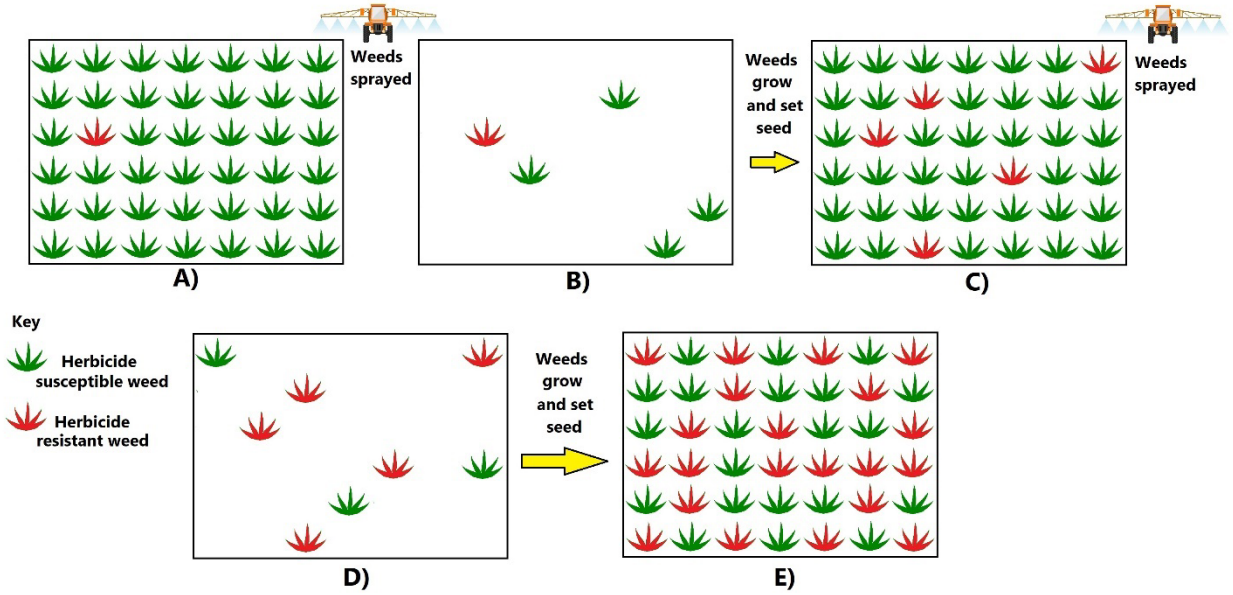


*Figure 1 Herbicide resistance*

6. **Describe what happened at labels A)-E) in the diagram.**

   Answers will vary. Example answer:

   A) A paddock has a weed population with one plant with herbicide resistance. The paddock is sprayed.
   B) Some weeds have survived which naturally occurs, due to a range of environmental factors which could include incorrect chemical dosage, missed application etc. The remaining weeds (both herbicide susceptible and the one herbicide resistant) grow and reproduce over time.
   C) The weed population has reached the point that the producer needs to spray again. The number of herbicide resistant weeds have increased to five. The paddock is sprayed.
   D) Some weeds have survived which naturally occurs. The five herbicide resistant weeds are still present, and three herbicide susceptible weeds. The remaining weeds (both herbicide susceptible and herbicide resistant) grow and reproduce over time.
   E) The weed population has reached the point that the producer needs to spray again. The number of herbicide resistant weeds have exploded and increased to twenty-one. The herbicide resistant population has now reached a point that the producer cannot solely rely on herbicide application for weed control. The producer will now have to look at a herbicide with a different mode of action or more correctly, should be using a range of IWM strategies to reduce the resistant population.

7. **What could the producer have done to prevent the herbicide resistant population scenario at part E) in Figure 1? Give examples.**

   Answers will vary. Example answer:

   The producer should have applied an integrated weed management approach much earlier in program rather than solely relying on chemical control. The producer could have used:

   - A biological control agent (fungi, insect, or bacteria) specific for the weeds

- Physical control strategies such as burning, grazing or cultivating the paddock
- Cultural control practices such as pasture and crop rotations in the paddock.

These strategies should have been used in conjunction over time with chemical control.

8. **Explain why it is important to not only use chemical control in pest control strategies.**
   Answers will vary. Example answer:
   It is crucial to not solely rely on chemicals as a control strategy, because chemical resistance occurs naturally and can develop within a population. Once resistance occurs to a certain type of herbicides mode of action, that herbicide type becomes unusable. As there are only a finite number of herbicide types (dependant on their mode of action) it is crucial to prevent plants developing resistance. Effective pest management requires an integrated approach using a range of biological, cultural, physical and chemical strategies specifically developed to treat the target pest. If chemicals must be used within the IPM or IWM strategy then correct dosage and application is crucial and herbicide types must be rotated.

9. **In an Integrated weed management program, should any one strategy (biological, cultural, physical and chemical) be used on its own to supress a weed? Why or why not?**
   Example answer:
   No, IWM is a multi-strategy approach that aims to reduce and supress weed populations using a range of strategies that are sustainable, cost efficient and environmentally sustainable. The whole purpose of using a range of control methods is to eradicate, supress or prevent a weed to a viable level which allows for cheapest treatment using a range of strategies. Any one strategy by itself is not effective or sustainable. For these reasons, an IWM program does not use only one control strategy.

10. **Use information from the NSW DPI 'Integrated weed management' webpage and your understanding of biological, cultural, physical and chemical control strategies in IWM, to complete the following table.**
    **Instructions: match the headings from the Integrated weed management' page (see below) to the four IWM control strategies. Then, give a description of the practice and points for when it is practical and effective. To assist, some examples have been given.**

- Inundate biological control
- Classical biological control
- Flaming
- Steaming
- Goats
- Contact herbicides
- Translocated herbicides
- Cultivation
- Slashing
- Mulching
- Fire
- Reafforestation
- Grazing and pasture management
- Crop management
- Weed hygiene

| Integrated Weed control strategy | Specific practice | Description of practice | When is it practical and effective? |
|---|---|---|---|
| **Biological control** | Inundate biological control | Involves use of mycoherbicides (plant pathogens such as rusts and fungi), applied as a treatment. These control agents act similarly to a species-specific natural herbicide, are not self-sustaining and have a short active period. | • Inaccessible areas such as timbered, rocky and steep locations<br>• Areas of low priority for control<br>• Situations where biocontrol is the only option, for example sensitive aquatic areas<br>• Situations where chemical control may be too expensive or not effective |
| | Classical biological control | Involves the release and establishment of control agents such as insects, rusts and mites into the target weed infestation. This creates a natural balance between the weed and its control agent, similarly to what occurs in the weed's native environment.<br>If an agent establishes in a population, control becomes self-perpetuating and self-regulating as the agent becomes part of the region's ecology. | • Inaccessible areas such as timbered, rocky and steep locations<br>• Areas of low priority for control<br>• Situations where biocontrol is the only option, for example sensitive aquatic areas<br>• Situations where chemical control may be too expensive or not effective |
| **Cultural control** | Reafforestation | Reafforestation is a long-term method of weed control, where a dense tree canopy is formed to restrict sunlight penetration to weeds on the forest floor. Reafforestation can be in the form of revegetation with native species or through establishment of plantation forests. A weed control program can involve agro-forestry principles, which include growing trees in conjunction with other agricultural enterprises such as cropping or domestic animals. | • Reafforestation is suitable over large areas where other forms of weed control are uneconomic or impractical. |
| | Grazing and pasture management | Involves using competitive, desirable pastures which out-compete weed species. Stocking rates must be managed to reduce overgrazing, as weeds will establish in overgrazed areas.<br>A vigorous pasture competes more effectively with weeds and has added benefits of increased production. Weeds can be controlled in a pasture situation by improving the existing pasture or replacing it with a more suitable or competitive species. Pastures can be improved by adding fertilisers and lime according to soil test results. | • Relevant to every grazing and pasture production system |
| | Crop | Crop rotations can minimise weed problems, help control diseases and | • Relevant to every cropping production system |

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| | management | insects, and improve soil fertility and structure as well as producing increased yields. Crop rotations can break the seed set and germination cycle of the weeds. | |
| | Weed hygiene | Weed hygiene includes sowing weed-free seed, cleaning machinery and vehicles, checking clothing and equipment for weed seeds or weed fragments, and removing sources of weed reinfestation around a control site.<br><br>New livestock being introduced to a property should be quarantined for several days so any potential weed seeds can pass through their systems into the new location. | • Relevant to every farming enterprise. |
| **Physical control** | Flaming | Liquefied petroleum gas or propane is used in flame weeders. The process does not require a weed to be burnt, but ruptures the plant's cell membranes by raising its water content to temperatures to above 100°C.<br><br>Small seedlings are generally more susceptible to flaming. Species with upright habits and thin leaves are more sensitive than species with a low stature and protected growth points. | • Weed control on organic farms<br>• Pre-emergent weed control in carrots and other slow-germinating row crops<br>• Selective post-emergent control in heat-tolerant crops<br>• General weed control on hard surfaces in urban areas. |
| | Steaming | Steaming involves applying hot water to a weed, which results in the loss of the plant's waxy coating, a reduction in moisture, dehydration and death.<br><br>The combination of heat and water pressure breaks down the cellular structure, causing discolouration and plant death within hours or over a few days. | • Trials are currently being conducted in Australia to determine effectiveness at a commercial scale.<br>Possible uses could include:<br>• General weed control on hard surfaces in urban areas.<br>• Weed control on organic farms |
| | Goats | Goats control weeds by selectively grazing their foliage, bark, stems and flowers. Goats eat a variety of weed species that sheep and cattle avoid, such as blackberry, sweet briar, scotch broom, thistles, Paterson's curse and horehound. | • In grazing situations, goats can be used to graze weed species sheep and cattle avoid.<br>• Goats should be only one aspect of an integrated weed control program and stocking rates, timing, weed palatability and farm management strategies need to be considered. |
| | Cultivation | Cultivation involves the use of implements that dig up and destroy weeds, ranging from large tractors with discs and ploughs to hand tools such as mattocks and chip hoes.<br><br>Shoots can be separated from their roots or buried deeply to prevent | • Particularly effective on young weeds.<br>• Some types of weeds can be controlled with repeated passes; however, eradication of perennial weeds can be difficult and depends on their root systems.<br>• Cultivation is more effective if weeds are cultivated before they flower |

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| | | regrowth, and roots can be dragged to the surface to dry out. | and under reasonably dry conditions.<br>• Manual cultivation is a viable means of weed control in small-scale situations or as a follow-up control measure. |
| | Slashing | Slashing can be done mechanically with a tractor and slasher or by using a hand-held brush-cutter. | • Slashing is cheaper than cultivation and preserves ground cover, reducing soil erosion and allowing access in wet weather.<br>• Slashing prevents tall weeds from flowering and seeding<br>• Slashing removes unpalatable or inedible weeds left after stock have selectively grazed a paddock.<br>• Slashing is affective at temporarily controlling weeds until they re-shoot.<br>• Slashing controls vegetation and weeds along roadsides. |
| | Mulching | Mulching involves the use of physical barriers such as black plastic or woven weed matting to exclude sunlight which disrupts photosynthesis and prevents weed establishment.<br>Natural mulches include sawdust, timber chips, straw, manures and grass clippings. These have other beneficial effects including adding organic matter and nutrients to the soil. | • Mulching is used for weed control in row crop production in horticulture such as strawberries, where machinery lays black plastic between rows.<br>• Woven weed matting is used along roadsides, steep banks and cuttings where areas need to be revegetated and where bank stabilisation is necessary. |
| | Fire | Fire is a major control method for woody weeds in western regions of NSW and can be a useful for controlling lantana and blackberry in certain situations. Fire is best used as part of an integrated weed management program.<br>Unlike wildfire, a controlled burn - where only the desired area is burned using firebreaks and back-burning techniques – is the best approach for woody weed control. | Direct costs are lower than alternative methods such as herbicide treatments or mechanical clearing. A controlled burn:<br>• Minimises damage to the environment.<br>• Avoids damage to property and livestock.<br>• Helps restore land to an open condition suitable for pasture.<br>• Creates access for further weed control.<br>• Very effective for woody weeds. |
| **Chemical control** | Contact herbicides | Contact herbicides kill the parts of the plants they are applied to - usually limited to leaves and stems of the plant. They are more effective on annual weeds or on seedlings of perennial weeds. Contact herbicides can be either selective (i.e. they only kill broadleaf plants) or non-selective (i.e. they kill all plants). | • Plants need to be actively growing when contact herbicides are applied, and good coverage is required to achieve effective results. Contact herbicides include paraquat and diquat. |
| | Translocated herbicides | Translocated herbicides must be moved around a plant's vascular system. They disrupt growth processes and interfere with biochemical reactions. | • Plants need to be actively growing. The herbicide needs to be applied on parts of the plant where growth tissue is dividing such as the bases of stems in grasses, and in growing tips or buds in broadleaf weeds. Translocated herbicides include glyphosate and metsulfuron-methyl. |

## Weeds investigation

**Instructions:**

- **Select two weeds which affect your local area, from the 'Weeds in NSW' poster to further investigate**
- **Do not research multiple species from the same weed category.**
- **For each species, use research to complete the following:**
    - **Common name**
    - **Scientific name**
    - **Description of the plant (including mature plant, flowers, seeds etc. Images can be used to assist the description).**
    - **Description of how it spreads.**
    - **Description of where it is found (a map could be used to assist this description).**
    - **Description of how it affects production, the environment or the economy.**
    - **Summary of your biosecurity duty regarding this weed, specific to your local area.**
    - **Make an Integrated Weed management calendar of operations for your chosen weed specifically for your local area. Your calendar must include:**
        - **A timeline for a minimum of one year (dependant on the weed).**
        - **Highlight when different control strategies are carried out to suppress the target weed.**
        - **Brief explanation as to why each control method is carried out at that time of year.**
        - **Include multiple control methods from each of the categories biological, cultural, physical and chemical.**
- **Compile your findings into a digital report, for example a brochure or weed fact sheet.**
- **Recommended website: NSW Weedwise, Department of Primary Industries**

Answers will vary.