Controlling Lantana – the Importance of Integrated Control

By
Dr Daniel Stock
What is the problem with Lantana?

World Wide context

- *Lantana camara* L.
- Weed in 60 countries
- Top 100 environmental weeds in the world (Holm et al. 1991)
- 650 hybrid varieties world wide (Howard 1969)
- A major problem in regions where agriculture is a major industry, such as
  - Australia, East Africa, Fiji, Hawaii, India, the Philippines, South Africa and Zambia (Holm et al. 1991)
Where did it come from?
What is the problem with Lantana?

Australian context

- Covers 4 million hectares (size of Switzerland)
- 3,500 km of east coast of Australia
  (Northern Queensland to southern New South Wales)
- Present in areas receiving 700 – 4,000 mm rainfall p.a.
- Present from sea level to 1100 m
- Infestations in Victoria, Northern Territory and South Australia
- Significant infestations also in Western Australia
Lantana camara distribution in Australia
What is the problem with Lantana?

Australian context

**Agricultural Costs**

- Costs Australian grazing industry >$100 million annually (2005/06 data)

**Environmental Impacts**

- Approximately 1200 plants, 100 animals and 57 ecological communities negatively affected by lantana (NSW DECC)
Inadequate Control Regimes

  - the majority of landholders either “do not control” or only use “single control” methods in an ad hoc manner.


- Integrated Trials Project (2005-2009)
  - produce best practice integrated options

- Economic Impacts Report (2007)
  - Control techniques appear to:
    - Reduce the area of medium and light infestations
    - Generally only expected to slow the rate of expansion, not reduce the area infested, in areas of heavy infestation
Integrated Trials Project
– Aims

- Develop best practice guidelines
- Investigate integration of controls
- Investigate alternative control methods
- Increase competitive advantage
- Develop decision support tool for landholders
- Develop best practices manual
- Increase adoption of best practices
Integrated Trials Project
– Investigating Integrated Techniques

• Identifying “control sequences” for integrated approach
  – adaptive management principles using logic
  – decision support for landholders

• Key variables
  – density, property size, land use, access and vegetation
  – lantana variety, climate

• Best economic methods in a variety of situations
  – Identify costs and benefits

• 11 control scenarios
  – Qld: Yarraman, Clairview, Ingham, Glen Ruth Station, Malanda
  – NSW: Grafton, Ballina, Border Ranges, Berry, Albion Park, Gloucester

• Demonstration sites and field days
Control Methods for Lantana

Planning for control

Manual control methods
- hand grubbing
- hand pulling
- hand cutting

Chemical control methods
- foliar spraying
- low-volume herbicide applications

Mechanical control methods
- slashing
- pushing or stick raking
- mechanical grubbing
- chain pulling
- ploughing

Trampling and grazing control

Biological control

Fire control

Follow-up, revegetation and monitoring

Biosecurity Queensland
Manual Methods

**Hand grubbing**
- using mattock or lever to remove whole plants including roots
- very good for small scale infestations

**Hand pulling**
- for seedlings only
- when soil is moist
- part of monitoring

**Hand cutting**
- usually to create access into larger thickets to carry out chemical controls
- no point just cutting back without either grubbing or herbicide applications
Chemical Methods

**Foliar spraying**
- only effective when plants are actively growing
- not cost effective for extensive infestations;
- best as follow up after fire or mechanical control
- hose and handgun; knapsack sprayers;
- for thickets up to 2m high

**Aerial spraying**
- from helicopter for harder to reach areas
- will require follow up control treatments
Chemical Methods

Low-volume applications

Cut-stump
~ effective for smaller infestations;
~ 15 second window between cut and paint

Basal bark
~ effective for larger infestations
~ must spray whole circumference to 30cms

Splatter gun
~ good for hard to access infestations
~ good for follow-up treatments
Mechanical Methods

• Mechanical control methods good for extensive or dense infestations

• Best as initial treatment to create access

• Decrease height, density and vigour or infestations

• Promote regrowth for easier and cheaper follow up.

• In smaller infestations, can be used to create a clean site for revegetation – topsoil!

• Disadvantages:
  – higher levels of disturbance to soil and desirable vegetation
  – higher risk of loss of topsoil
  – high likelihood of germination of weed seeds
**Mechanical Methods**

**Slashing** – regular slashing can contain large infestations; create regrowth for follow-up treatments

**Pushing or stickraking** – blade placement will determine level of disturbance; stick rake is better; immediate revegetation with pasture or natives is required

**Mechanical grubbing** – good for clumps and individual plants; grubbing implement; bobcat; excavator

**Chain pulling** – chain attached to tractor – good for clumps; scattered infestations over smaller areas

**Ploughing** – disc ploughing to cut and turn over stumps and roots – often after pushing; must re-establish pasture; follow up necessary
Trampling and Grazing

Trampling by cattle:
- Can create access tracks into thickets; can reduce height, density & vigour of thickets for easier follow-up
- Use of twining legumes or shade-tolerant pasture over-sown into lantana to encourage stock to trample

Grazing of lantana by stock (often goats)
- Not recommended – long term consumption terminal for goats
- Horses, cattle and sheep all susceptible to lantana poisoning

Good pasture management
- Manage stocking rates; prevent overgrazing; allow pastures to remain competitive; fertilise
Biological Control

- If present and effective, can reduce vigour and competitiveness of lantana
- Look for bugs or insects, or damage to plant
- Biocontrols are seasonal
- Biocontrols don’t completely kill the plants, and require integration with other control methods
- Follow up can be mechanical; manual; low-volume herbicide or fire if fuel is adequate
- Don’t need to keep a section of biocontrols if it is possible to treat and follow-up whole infestation
Fire

• Used as initial cost-effective treatment in extensive, broad scale infestations or where access is restricted

• Regular controlled burning will help to reduce height and density, create access, promote regrowth for easier follow up

• Won’t give 100% kill rate

• Must be followed-up; usually with foliar spraying or stickraking, then foliar spraying

• High number of variables:
  – Pastures: native or improved;
  – Natural ecosystems: vegetation type; frequency; extent; intensity; season
Putting them all together

• Integrated lantana control combines two or more methods,

• Targeting vulnerable aspects of the weed and different points in its life cycle or its environment in order to achieve more effective control.

• In most situations, lantana can only be controlled successfully through integrated control together with sustained follow-up and revegetation.
### Table A: Application method by land use

This is general information only. Always adhere to registered methods and rates on the product label.

<table>
<thead>
<tr>
<th>Land use</th>
<th>Density</th>
<th>Light</th>
<th>Medium</th>
<th>Heavy (reduce bio-mass before using herbicides)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pasture</td>
<td></td>
<td><strong>Handgun or knapsack.</strong></td>
<td><strong>Handgun or aerial spray.</strong> Follow up control of regrowth and seedlings and restore pastures by seeding and de-stocking.</td>
<td><strong>Mechanical, fire or aerial spray</strong> to reduce lantana bio-mass. Follow up control of regrowth and seedlings by spot spraying and restore pasture by seeding and de-stocking.</td>
</tr>
</tbody>
</table>
| Open eucalypt forest and other woodland |         | **Handgun, knapsack or splatter gun** (dependent on accessibility). | Follow up with the same technique until native grasses or vegetation is re-established. | Options:  
1. **Mechanical** or fire to reduce lantana bio-mass (vegetation clearing and fire permits may be required).  
2. **Splatter gun** in areas of difficult access.  
3. **Handgun or knapsack** in accessible areas. Follow up regrowth and seedlings with foliar spraying or splatter gun until native grass or vegetation is re-established. |
| Watercourses              |         | **Handgun or knapsack** using a non-residual herbicide registered for use near waterbodies.  
Low volume applications: basal bark, cut stump, or splatter gun to reduce off-target damage.  
Follow up control of regrowth and seedlings ensuring use of revegetation/regeneration techniques.  
Be cautious of over-spraying watercourses to prevent off-target damage and degradation of water quality.  
The addition of a surfactant will negate the environmental rating given to some some herbicides | | |
| Roadsides, easements, railways and fence lines |         | **Handgun.** Follow up control of regrowth and seedlings. | **Mechanical or handgun.** Follow up control of regrowth and seedlings. |
Decision Support Tool

- To successfully control lantana best practice methods are necessary.
- Adaptive management trials developed to target integration of control options.
- Results of these trials will used to produce a significant section of the updated *Lantana Control Manual* including the *Decision Support Tool*
- The tool will guide landholders through a series of questions that will provide them information on different sequences they can use to attack their lantana.
- The basic process of the *Decision Support Tool* was discussed at a workshop in February 2007 and key variables were determined.
1. The land manager will fill out a form with a series of questions concerning the key variables
   - access to infestation

<table>
<thead>
<tr>
<th>Easy Access</th>
<th>Moderate Access</th>
<th>Difficult Access</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Easy Access" /></td>
<td><img src="image2.png" alt="Moderate Access" /></td>
<td><img src="image3.png" alt="Difficult Access" /></td>
</tr>
</tbody>
</table>
1. The land manager will fill out a form with a series of questions concerning the key variables
   - density of infestation

<table>
<thead>
<tr>
<th>Light density</th>
<th>Medium density</th>
<th>High density</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Light density" /></td>
<td><img src="image2" alt="Medium density" /></td>
<td><img src="image3" alt="High density" /></td>
</tr>
</tbody>
</table>
1. The land manager will fill out a form with a series of questions concerning the key variables
   - size of infestation
1. The land manager will fill out a form with a series of questions concerning the key variables
   - access to infestation
   - density of infestation
   - size of infestation

2. The answers to these questions will then produce a handout (or similar) showing them several sequences available to them.

These sequences will show, broken up into each component:
   - the time required per area
   - the cost incurred per area
   - the overall timeline to achieve sequence
   - the efficacy of controls
   - limitations and suitability of the techniques used
Grazing Scenario

- **Glen Ruth Station – North Queensland** (scenario in heavy infestation)
- Control sequence:
  - Stick rake with bull dozer -> plough and seed -> spot spray regrowth
- Discussion:
  - Mechanical options allowed for cost effective reduction in weed bio-mass, followed by ploughing and pasture preparation.
  - Ongoing follow-up spot spraying will maintain the pasture.

<table>
<thead>
<tr>
<th>Before control</th>
<th>After bulldozer clearing</th>
<th>After ploughed and seeded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>December 2005</strong></td>
<td><strong>March 2006</strong></td>
<td><strong>August 2006</strong></td>
</tr>
<tr>
<td>Lantana density = 50%</td>
<td>Lantana density = 10%</td>
<td>Lantana density = 5%</td>
</tr>
<tr>
<td>Grass density = 30%</td>
<td>Grass density = 30%</td>
<td>Grass density = 70%</td>
</tr>
<tr>
<td>Other weed density = 20%</td>
<td>Other weed density = 60%</td>
<td>Other weed density = 15%</td>
</tr>
<tr>
<td>Bare ground = 20%</td>
<td>Bare ground = 10%</td>
<td>Bare ground = 10%</td>
</tr>
</tbody>
</table>
Conservation Scenario

- **Clairview – Central Queensland** (scenario in heavy infestation)
- Control sequence:
  - Hand pull -> spot spray -> hand pull seedlings
- Discussion:
  - A team hand-removed lantana from rainforest to allow natural regeneration to re-establish native species from existing seed bank.
  - Weed species that germinated were carefully spot sprayed to give native species an advantage. Regenerated native species will provide ongoing competition against lantana.
**Sequence example**

Sequence ~ Stick rake, slash and spot spray with Grazon

<table>
<thead>
<tr>
<th>Control Details</th>
<th>Stick rake</th>
<th>Slash</th>
<th>Spot spray ~ Grazon</th>
</tr>
</thead>
</table>
| Details of control:              | • Contractor-D4  
  • Nov-06                        | • Landholder  
  • Jan-06                        | • Contractor, 1 person  
  with 80CL Quilkspray  
  • Mar-06                        |
| Area of control (ha):            | 2.3ha      | 2.3ha | 2.3ha               |
| Cost of control ($)              | 9.2 hours @  
  $75/hour = $690               | 5.65 hours @ $65/hour  
  = $380                          | 4.75 hours @ 75/hour  
  = $356.25 = $155/ha            |
| Additional cost                  | N/A        | N/A   | Herbicide 7.7L@ $42/L  
  = $323 = $130/ha               |
| Cost/ha ($/ha):                  | $300/ha    | $185/ha | $285/ha              |
| Time/ha (hours/ha)               | 4          | 2.55  | 1.9                  |
| Strength of estimate             | High (actual) | Medium (estimate) | High (actual) |
| Vegetation details               | October 2006 | January 2006 | March 2006 |
| Lantana density:                 | ≃ 3750/ha   | ≃ 2400-2600/ha (min) | ≃ 1675-1875/ha (min) |
| Lantana height:                  | 170-180cm   | 30-40cm | 15cm                |
| Lantana regrowth (% of original density) | N/A       | 60-70% (post stick rake) | 45-50% (post slash) |
| Lantana seedlings                | N/A        | 10    | 0                   |
| Lantana cover %                  | 70         | 10    | 10                  |
| Native cover %                   | 5          | 0     | 0                   |
| Grass cover %                    | 0          | 15    | 20                  |
| Other cover weeds %              | 0          | 5     | 20                  |
| Bare ground cover %              | 25         | 70    | 50                  |
Further information

Dr Daniel Stock
Project Officer - Lantana Best Practice Management

Biosecurity QLD
Department of Primary Industries and Fisheries
Address: Locked Bag 40 Coorparoo QLD 4151
Phone: (07) 3406 2099 | Fax: (07) 3406 2578
Email: daniel.stock@dpi.qld.gov.au