Skeleton weed in Western Australia, pocket guide

State Skeleton Weed Committee
Department of Agriculture and Food, Western Australia
Agriculture Protection Board

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The Skeleton Weed Program is a coordinated approach to eradicating skeleton weed in Western Australia. It is run jointly by the State Skeleton Weed Committee, the Department of Agriculture and Food Western Australia and the Agriculture Protection Board. It is funded through the skeleton weed levy collected from grain growers each harvest, and pooled in the Skeleton Weed Eradication Trust Fund.

Skeleton weed is targeted as a declared plant as it can drastically reduce crop yields (more than 1 tonne/ha in cereals) by competing for moisture and nutrients, mainly nitrogen. Its wiry stems impede headers and the sticky latex within the stems can cause machinery to seize.
Objective: Assisting Western Australian landholders to eradicate skeleton weed and to prevent its further spread within the State

Strategies

- Improve landholders’ ability to find and eradicate skeleton weed.
- Increase landholders’ awareness of skeleton weed as a highly undesirable weed.
- Widely publicise descriptions and pictures of skeleton weed to help landholders identify infestations.
- Inform landholders about the techniques available for the management and eradication of skeleton weed.
- Encourage local grower groups (Local Action Groups) to participate in cooperative surveillance and reporting of infestations.

- Encourage Local Action Groups to assist in the management and eradication of skeleton weed in their local areas.
- Implement practical compliance regimes in affected areas.
- Provide landholders with incentives to report infestations.
- Provision of winter control treatments where landholders are compliant with program requirements.
Skeleton weed (*Chondrilla juncea* L.) is a perennial daisy like plant that develops from a rosette into a sparsely-leafed, erect plant of up to 1 m tall.

- Rosettes are often found in clusters due to the suckering nature of the plant.
- Leaves are hairless with deep barb-like lobes pointing back towards the centre of the rosette, and may be purplish when under stress.
- Stems, which are produced in early October, are generally erect with little or no foliage, progressively branched and untidy-looking.
- Short, downward-pointing bristles are present at the base of stems.
- Stems, leaves and roots ooze sticky white sap when broken.
- Bright yellow daisy-like flowers appear towards the ends of stems and branches.
- Seeds have fluffy white parachutes attached.

*Illustration: B.H. Hyde-Wyatt and D.I. Morris, Noxious and secondary weeds of Tasmania. Published by Department of Agriculture, Tasmania.*
**Rosette Leaves**

Leaves are 5 to 10 cm long, and hairless, with barb-like lobes pointing backwards towards the centre of the rosette. They exude a sticky white sap when broken.

A rosette can be sparsely or densely-leafed, depending on plant age, soil type and how extensive the root system has become. In late spring, stems form and the rosette usually dies off, though a healthy rosette with a well established root system may persist well into summer if there is adequate soil moisture.

Summer rain or high residual soil moisture will encourage old rosettes to re-emerge, even after chemical treatment.

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*WHAT DOES SKELETON WEED LOOK LIKE?*
Mature Plant
The mature plant is perennial (i.e. a plant can live for several years). The rooting system is extensive, as the tap root can reach a depth of over 2 m and the lateral roots can radiate up to 50 cm from the main tap root. Lateral root fragments as small as 5 to 10 mm can generate new plants. These root fragments are dragged from the original plant by farm machinery.

The above ground plant consists of one or more smooth, wiry branching stems, which grow to 1 m high and exude a sticky white sap when cut. Stems are hairless except for stiff, downward-pointing bristles at the base. Leaves are narrow and elongated, if present. (see image on page 35)

Stems die off in late summer once seeds are mature, though summer rain may cause regeneration and more seed production.
Flowers
Bright yellow and daisy-like with 10 ‘petals’. Individual flower heads are about 20 mm wide. Flowers appear on short stalks, in the angle between the plant stem or branch and a leaf or bract. They may occur singly or in clusters of two to five flowers.
Flowers are found along the full length of the branches and at the tip of the main stem, from December to May.

Seeds
Ten or eleven seeds per flower. A healthy, mature plant produces 10,000 to 20,000 seeds. Each seed is 5 mm long, with a white parachute attached to the top (to aid wind dispersal). Seeds are grooved, acting like ‘teeth’ to catch on wool. Seeds are fragile and susceptible to mould and bacteria (causing desiccation in unfavourable weather conditions), and predation by insects and birds.
If summer rainfall occurs, seeds germinate quickly, but usually die if there are no follow up rainfall events. If no rain falls during summer and the seed survives predation, it will germinate in the following autumn or winter. Seeds rarely survive more than 12 months under field conditions, so there is no long term seed bank.
SKELETON WEED IN DIFFERING LOCATIONS

Skeleton weed can be found growing in numerous environments, including road verges, railway lines, industrial sites, tree plantations and bush areas as well as crop paddocks.

*Mature plant growing in Austral Ships yard at Henderson*

Plants can have prominent leaves in good growing conditions
Plant with elongated leaves from herbicide or frost damage

Plant growing alongside rail line

SKELETON WEED IN DIFFERING LOCATIONS
Skeleton weed is declared in category P1 and P2 for the whole of Western Australia (except for the shires of Narembeen and Yilgarn, which are category P3).

The P3 declaration in the shires of Yilgarn and Narembeen is due to the widespread nature of the weed in these shires.

What do these categories mean and what are the implications for management?

P1 (prohibit movement) means that the movement of the plant and its seed is prohibited within the State. This includes movement by contaminated machinery, livestock and fodder.

P2 (eradication) means the plants need to be eradicated. Control treatments need to destroy plants and prevent propagation each year, until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.

P3 (control) means that the infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property on or in livestock, fodder, grain, vehicles and/or machinery.

What this means for the management of skeleton weed is that all landholders need to prevent the movement of seed and/or root fragments from their properties in produce (grain, seed and hay) and machinery and vehicles. In addition, all infested properties need to undertake searching for skeleton weed in summer and treat any plants to prevent seed set. Where skeleton weed is P2, control treatments are required in winter to eradicate any plants from the property. Where the weed is P3, this treatment is optional.
All weed control requires effective monitoring and surveillance of the weed species in the paddock. It is necessary to correctly identify the location and growth stage of the weed, so that the most cost effective treatment can be applied at the most suitable time.

The Department of Agriculture and Food has conducted a program of targeted surveillance since 2002, with the aim of finding (and controlling) infestations in areas considered a high risk of having skeleton weed. This program also has the advantage of raising awareness of the presence of skeleton weed on high risk properties.

Following a review of the Skeleton Weed Program in 2008, DAFWA will be increasing its surveillance effort to include areas outside of the known heavily infested areas, in an attempt to properly delimit the true extent of skeleton weed infestations across the WA Wheatbelt. This will include the southern grain growing areas in the area south of a line from Lake King to Wagin.

The surveillance program involves checking a minimum of three paddocks (preferably containing crop stubbles) on each selected property, such that around 300 hectares is searched per property.
Flatweed and Smooth Catsear (*Hypochaeris spp.*)

Flatweed is a short-lived perennial, smooth catsear an annual, but hybrids of these two species exist throughout the south of the State. All have a fleshy basal rosette with club-shaped leaves and a rounded apex. Short hairs cover upper, and sometimes lower, leaf surfaces. Bright yellow daisy-like flowers with multiple petals open in the morning and close at night, and appear singly at the tip of a simple, or slightly branched, semi-erect stem up to 30 cm tall. The seeds are similar to those of skeleton weed, as they have a parachute and are dispersed by wind.

A key difference with skeleton weed is that Hypochaeris species have many ‘petals’ on the flower, but skeleton weed has 10 ‘petals’.

Skeleton weed has 10-11 seeds per head. Hypochaeris species produce more than 10-11 seeds per head.
Wild Lettuce (*Lactuca serriola* L.)

Wild lettuce is biennial with a stiff, prickly stem up to 1.5 m tall. Leaves are stemless and deeply lobed or toothed. Lower leaves hug the stem and have spines along upper margins and along the lower midrib. Upper leaves are less divided and held upright in a north-south alignment. Flowers are pale yellow and are borne on florets that form a distinctive elevated flower stalk. The seed disperses by air, aided by a parachute. Seen in townsites, on road verges and in paddocks, often standing well above pastures and crops.

Key feature differing from skeleton weed is the deeply lobed leaves as skeleton weed leaves are small with smooth edges.
Prickly Lettuce (*Lactuca saligna* L.)

Prickly lettuce is a biennial herb similar to, and often confused with, wild lettuce. It does not grow as tall, and the upper leaves are more linear and are free of spines. Flowers are pale yellow. Seeds disperse by air, aided by a parachute. Common in townsites and around farm buildings.
Wild Turnip (*Brassica tournefortii* G.)

Wild turnip is an erect annual up to 60 cm tall. Plants have one or more stems, with soft, downward-pointing bristles starting at the base and becoming scattered up the length of the main stems. Basal rosette leaves have scattered hairs on the upper surface and dense, stiff hairs on the lower surface, particularly along the midrib and veins. Flowers are 10 to 20 mm in diameter, with four petals, pale yellow to cream, sometimes tinted violet at the base. Seed pods are elongated to 7 cm and segmented, splitting lengthwise when mature.

Wild turnip plants flower in spring much earlier than skeleton weed and skeleton weed plants do not have pods.
Wild Mustard, Indian Hedge Mustard (*Sisymbrium orientale* L.)

Wild mustard is an erect annual, sometimes biennial, up to 1 m tall with dense, dark foliage on one or more stems, but no lasting basal rosette. The arrow-shaped leaves are densely covered in imperceptible fine hairs, and grow on short stalks along the stems. Flowers are a deeper yellow than wild turnip and 10 to 20 mm in diameter with four petals. Seed pods are smooth and elongated to 11 cm, splitting lengthways when mature.

Like wild turnip the earlier flowering and presence of pods are key differences compared to skeleton weed.
Wild Radish (*Raphanus raphanistrum* L.)

Wild radish is an erect annual up to 1 m tall with hairy stems and a basal rosette with broadly lobed, hairy leaves that die off before maturity. Stem leaves are oblong and toothed or lobed. Flowers are pale orange or yellow to white, and sometimes lilac, 30 to 40 mm in diameter, with four dark-veined petals. Seed pods are up to 8 cm long. Pods are constricted around each seed, causing them to crumble into single-seeded segments at maturity.

Like wild turnip the earlier flowering and presence of pods are key differences compared to skeleton weed.
There is a lot of information available to landholders who find skeleton weed on their land, and a lot to remember, too. If you are unsure of what to do, there are several avenues for you to follow.

In the first instance, your local Department of Agriculture and Food Western Australia office can assist. You will be given reference material containing all the information you need to manage and eradicate skeleton weed from your property. Take the time to read it, and make a note of any additional questions that come to you later. Regular communication with your local office is essential to ensure you are aware of all your obligations, and what you can expect in return.

Visit the Department of Agriculture and Food Western Australia website: http://www.agric.wa.gov.au, and search for ‘Skeleton Weed’. Most of the information given to you by your local office is also available on the website, including this Pocket Guide and the ‘Skeleton Weed (Chondrilla juncea L). Best Practice Management Guidelines’.

If you live in an area where skeleton weed is prevalent, neighbours may be able to assist you. You may even find yourself in a position to share knowledge with those who have not yet encountered skeleton weed themselves.
Your district may have a well-established Skeleton Weed Local Action Group (LAG). A LAG is a network of local farmers in a district affected by skeleton weed who have a shared interest in helping other landholders around them cope with the issues skeleton weed presents. Each LAG is allocated a budget by the State Skeleton Weed Committee through the Skeleton Weed Eradication Trust Fund. They aim to promote awareness of the location of known skeleton weed infestations and management and eradication techniques. They liaise between landholders, the Department of Agriculture and Food Western Australia and the State Skeleton Weed Committee to provide input into management of local non-compliance issues and formulate local/regional strategies to deal with skeleton weed within the framework of the state-wide program. Some groups also appoint a LAG Coordinator to work with landholders and the Department of Agriculture and Food Western Australia to manage volunteer/contract searching and assist with records collation.

Local Action Groups are designed to provide you with additional support. Check with your local Department of Agriculture and Food office for the name of your nearest LAG representative.

Most importantly, when you find skeleton weed, it is not an indication of any failing on your part as a farmer. Skeleton weed is unpredictable and spreads over long distances due to wind dispersal, but once identified it can be managed effectively and eradicated. There is an extensive support network for you to call on to assist you in this process. Communication with your local Department of Agriculture and Food Western Australia office, neighbours and your Local Action Group is integral to achieving eradication.
Cereal areas

When skeleton weed is found on a property, it is referred to as an ‘infested property’. Each infested paddock is assigned a code that signifies a particular stage in the eradication process. These codes are described on Page 22.

A current infested paddock becomes a Code 1 paddock. Infestations are marked with a 20 m buffer and must not be worked through during the next seeding period. This allows winter application of Tordon® 75D, or equivalent, on undisturbed sites, while soil moisture levels are high.

The paddock remains Code 1 until the pegged infestation(s) has received both winter treatment AND a Full Search (see Page 28) by the landholder the following summer. If the paddock is found to be re-infested it remains Code 1 for the next year. If it receives a Clear Search, it progresses to Code 2. The entire paddock should then be cropped as usual (through old infestations) the following year.

A Code 2 paddock requires a Surveillance Search (see Page 28) post-harvest. If no plants are found it becomes Code 3. A clear Full Search the following year results in the paddock becoming Code 4, and being released from the ‘infested list’.

It takes a minimum of four years for an infested paddock to be released from the infested list. If the paddock is re-infested at any time during this period, it returns to Code 1 and the process starts over.
Grazing areas
The codes for the paddocks remain the same. However, because no cropping takes place, there should be a different approach for treatments (see table 3)

This mainly applies to areas west of Gingin and Moora. As there is no cropping, fragments of plants are unlikely to be moved and re-establish, so spread is only by seeds.

Landholder responsibilities (infested properties)
• All infestations are to be treated in summer and winter according to Table 3, Pages 50 & 51. Landholder must provide a full record of searching, plus summer and winter treatments when requested.
• Paddocks with two clean searches must be searched following the Full Search protocol to qualify for release from ‘infested’ status. The Full Search will be audited by the Department of Agriculture and Food. To qualify for release, at least two of the Clear Searches must have been done in a single crop year (winter and summer). If no cropping occurs then five (5) Clear Searches must be completed in sequence, at yearly intervals.

• All paddocks should be monitored throughout the summer and autumn, to increase the chance of detecting (and treating) plants that emerge or become more evident in the weeks following the Full Search.

Landholder responsibilities (non-infested properties)
• Ensure ability to identify skeleton weed plants at various stages of development.
• Maintain vigilance for skeleton weed plants during normal operations and particularly at harvest time.
• Mark the location of any suspected skeleton weed plants and report the finding to the nearest Department of Agriculture and Food office.
• Follow required search and treatment protocols once identification is confirmed by Departmental staff.
<table>
<thead>
<tr>
<th>CODE</th>
<th>Status</th>
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<td>New infested paddock/infested last search</td>
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<tr>
<td>CODE 2</td>
<td>First clear search of previously Code 1 paddock</td>
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<tr>
<td>CODE 3</td>
<td>Second consecutive clear search</td>
</tr>
<tr>
<td>CODE 4</td>
<td>Third consecutive clear search, possible release from ‘infested list’</td>
</tr>
<tr>
<td>CODE 5</td>
<td>Surveillance search of suspect paddock or adjacent paddocks, no plants found</td>
</tr>
</tbody>
</table>
• It is the responsibility of every landholder to prevent the active movement of seed and root fragments around and off the property, and to prevent seed set.

• If you find skeleton weed on a new paddock/property or a re-infestation, mark plant(s) with flagging tape, a steel post or drum. Mark a square around the find, allowing a 20 m buffer.

• Within 48 hours you need to:
  - treat the infestation(s) as per recommendations in Table 3 of this pocket guide.
  - notify your nearest Department of Agriculture and Food Western Australia office and fax a farm/paddock map indicating the site(s). You will be issued with an Infested Property Paddock Record book to record all searching and plant treatment activities. The program covers the cost of a Departmental officer to visit your property to confirm the infestation and discuss your obligations, when required.
  - notify all neighbours within five working days, inviting them to inspect the infestation.

• Complete a Full Search of each infested paddock within 14 days of finding skeleton weed and record details of all searching and plant treatments in the Paddock Record book.

• Complete a Surveillance Search of all paddocks adjacent to currently infested paddock(s) and record details in the Paddock Record book. If your infested paddock is on a boundary, your neighbour(s) are responsible for searching them and are also required to record their search activities.

• All surveillance searching of adjacent paddocks must be completed by 31 January, but regular monitoring of all paddocks and infestations should be ongoing.

• All paper records, including farm maps indicating paddocks searched and the location of all infested sites, must be submitted to your local Department of Agriculture and Food Western Australia office by 15 February. Audits will be undertaken on 100 per cent of all records.
• If you have paddocks already on the infested list you will be issued with an Infested Property Paddock Record book for each infested property and a farm map indicating which paddocks require Full or Surveillance searching. Additional guidelines need to be followed:
  − Full Search of all Code 1 paddocks.
  − Surveillance Search of all paddocks adjacent to Code 1 paddocks from last season.
  − Surveillance Search of all Code 2 and Code 3 paddocks.
  − Full Search of Code 3 paddocks followed by a search audit is required to progress to Code 4 and release from the infested list.
  − Remember to give adequate notice to your local Department of Agriculture and Food Western Australia office post-search, to allow an audit prior to stock being introduced.

• Any paddock found to have skeleton weed must be searched within 14 days.
• Search all current Code 1 paddocks by 31 December.
• Search Code 2 and 3 paddocks and paddocks adjacent to Code 1 paddocks from last season by 31 January and record details of all searching and plant treatments in the Paddock Record book. If paddocks adjacent to Code 1 paddocks from last season are on a neighbouring property, your neighbour(s) are responsible for searching them and also need to record their search activities.
• Regular monitoring of all paddocks, infested sites in particular, should be ongoing.
• All paper records, including farm maps indicating paddocks searched and the location of all infestations, must be submitted to your local Department of Agriculture and Food Western Australia office by 15 February. Audits will be undertaken on 100 per cent of all records.
**PROPERTY AND Paddock RECORD**

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<th>Year</th>
<th>2003/04</th>
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<td>Search date</td>
<td>Search code</td>
<td>Search method</td>
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<td>Pad code this season</td>
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**Search Method**  
Use F for Full paddock search and S for Surveillance search

1. Plants found  
2. First clear search  
3. Second clear search  
4. Third consecutive clear search (must be a Full Search to be released from Infested List)  
5. Surveillance search, no plants found

Completed forms and map to be faxed/mailed to the Department of Agriculture and Food.
Single Plant Find

- Mark the plant(s) using flagging tape, a star picket or a drum.
- Search thoroughly to ensure there are no other plants, and step out a 20 m buffer in all directions as shown. Where adjoining squares with single plants are within 50 m of each other, combine the squares into one large square (while keeping a 20 m distance between each individual plant and the edge of the square).
- Place star pickets or drums in each corner of the square.
- Mark the find on a farm map and submit with a Record Sheet from your Infested Property Paddock Record book to your local Department of Agriculture and Food Western Australia office by 15 February.
Multiple Plant Find

- Where the site contains multiple plants, search thoroughly to locate the extremity of the infestation using flagging tape, star pickets or drums. Step out a 20 m buffer from the outermost plants, as shown below.
- Place star pickets or drums in each corner of the square.
- Mark the find(s) on a farm map and submit a Record Sheet from your Infested Property Paddock Record book to your local Department of Agriculture and Food Western Australia office by February 15.
Full Search protocol

All Code 1 paddocks and Code 3 paddocks due for release from the infested list

1 person in a vehicle, maximum swath of 5m

2 people in a vehicle, maximum swath of 15m

3 people plus driver using search boom, maximum swath of 20m

Important things to remember before you start searching:

• Searching while harvesting or spraying does not constitute a skeleton weed search.

• All paddocks should be livestock-free at least six weeks before searching.

• Always be prepared to find skeleton weed. Ensure all vehicles used for searching are fully equipped with flagging tape, star pickets and a post driver or drums to mark finds.

• Take a farm/paddock map and pen with you to accurately mark finds as they are found.

• Search speed should range from 10 to 20 km/h, depending on stubble density or pasture density.

• Use only elevated cab, diesel-powered vehicles to reduce fire risk in paddocks.
Surveillance Search protocol
Code 2/3 and paddocks adjacent to Code 1 paddocks from last year

1 person in a vehicle, maximum swath of 20m
2 people in a vehicle, maximum swath of 30m
3 people plus driver using search boom, maximum swath of 40m

WHAT IS A SURVEILLANCE SEARCH?
### Determining the Appropriate Search Method

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<th>Adjacent to Code 1 last season</th>
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Winter treatment is the application of chemical on infested sites during the winter months. Its purpose is to eradicate plants, using Tordon® 75D or Commander® 75D or products containing triclopyr + picloram (there are many trade names). The active constituent picloram works best when soil moisture levels are high.

- Infested squares found during summer must not be worked through in the first twelve months, as cultivation may spread live root fragments. **Working through squares is allowable only where whole-paddock treatment applies.**
- All seeding equipment must be thoroughly cleaned down prior to exiting any infested paddock.
- It is the landholders’ responsibility to ensure infestations are adequately marked and maintained prior to the winter spray program.
- Winter spraying is completed by an accredited contractor or the Department of Agriculture and Food Western Australia at no direct cost to the landholder, except in P3 areas.
- The landholder, or a nominated representative, is required to accompany the operator during spraying of infested sites.
- Winter spray audits will be carried out on infested properties by the Department of Agriculture and Food Western Australia.

*What is Winter Treatment?*
Summer control is aimed at controlling the above-ground part of the plant in order to prevent viable seed set.

There are a number of options for controlling skeleton weed during the summer months:

- Spot spray with glyphosate (450 g/L) at a rate of 0.5 to 1.5 L/ha plus 0.5 L/ha 2,4-D ester (800 g/L) or 0.7 L/ha 2,4-D ester (600 g/L).
- Other formulations of glyphosate are available and if used the rates should be adjusted accordingly.
- The 2,4-D ester 800 g/L now requires a permit from the APVMA to use between 31st August and 1st May until 2009.
- For small infestations, the addition of either 1 – 1.5 L/ha of Tordon® 75D or Commander® 75D or one of the products containing triclopyr + picloram (e.g. Grazon) will improve control.
- Tordon® granules can be used for single plants and small infestations, at a rate of 5 to 10 g/m². Sprinkle granules over plants and over the ground in a 1 m buffer around each plant. Then cut or remove all stems to prevent seed production while the chemical takes effect.
- Boom spray dense infestations.
- Spray the whole paddock if infestations are widely scattered, to control possible missed plants.
- Where small numbers of plants are seeding, cut and bag stems before spraying. Burn all cuttings.
• Treat large areas of seeding plants (where cutting and bagging is impractical) with Spray.Seed® 250 at a rate of 1 to 2 L/ha (minimum recommendation). The addition of 2,4-D amine will improve control and lengthen the period between retreatment.
• Monitor infested sites regularly, approximately every two to three weeks throughout summer and autumn and after rain events.
• Be prepared to extend squares if plants emerge outside marked areas – the 20 m buffer must be maintained at all times.
• Notify the Department of Agriculture and Food Western Australia of any additional plants, extended squares and new squares found throughout summer and autumn, to assist with winter treatment.
ARE THERE OTHER OPTIONS FOR EROSION-PRONESOILS?

The use of Tordon® 75D over large areas may leave light sandy soils exposed to erosion. Use of the following recommendations must be done only after consultation with your local Department of Agriculture and Food Western Australia office.

Recommendation 1. Erosion-prone soils in cropping rotation:

• Non–crop phase. Treat the infested area/squares with herbicides such as clopyralid e.g. Lontrel + MCPA or 2,4-D amine or ester at the rates currently recommended for control in crops.

• For small infestations, cut and bag stems before spraying. Burn all cuttings. Apply Tordon® 75D/Commander® 75D or picloram + triclopyr products or Tordon® granules in a 1 m radius around where plants were located. A list of products with the various active ingredients recommended for treating skeleton weed is presented in a table 1.

• In-crop treatment using clopyralid + MCPA or 2,4-D and summer spraying will reduce the risk of plants producing seed, and may be used depending on the size of the infestation.

Recommendation 2. Preserving pasture in a non cropping situation:

• Manage grazing to allow rosettes to run up prior to inspection to make them easier to detect.

• Assess the extent of the infestation.

• If there is a low clover cover, treat the pasture with clopyralid + MCPA or 2,4-D amine. This treatment will leave the grasses and will reduce the potential for baring the soil and causing soil erosion. For areas west of Gingin to north of Moora, where there are permanent pastures and considerable amounts of tagasaste growing, the products containing picloram should be avoided. These produces will affect pasture and kill adjacent rows of tagasaste. Any spring treatments of clopyralid + MCPA or 2,4-D or spring/summer treatments of glyphosate + 2,4-D ester should be applied between the rows only, while avoiding any contact with the foliage of the tagasaste.
Where skeleton weed is growing amongst the rows, it maybe necessary to spot treat with one of the picloram products and accept that this will kill any adjacent plants. The same applies for small infestations of skeleton weed growing in amongst horticulture crops or forestry.

- Treat the main area of infestation with glyphosate and 2,4-D ester after annual pasture has seeded and dried off.
- For small infestations cut and bag stems before spraying. Burn all cuttings. Apply Tordon® 75D or Tordon® granules in a 1 m radius around plants.
- Repeat annual applications at or near flowering of skeleton weed, until infestation numbers are reduced sufficiently to allow all remaining plants to be treated using spot applications of the more residual products containing picloram e.g. Tordon® granules.
Occasionally infestations are so widespread that marking out squares and cropping around them is impractical. A different approach is used in these situations, but certain conditions must be met.

- A paddock, or a discrete worked area within a paddock marked by landforms or established paddock workings, must have greater than 10 per cent of the total area infested with skeleton weed to allow use of whole-paddock treatments.
- The decision to apply a whole-paddock treatment is made in conjunction with your local Department of Agriculture and Food Western Australia office and a State Skeleton Weed Committee member.
- Whole-paddock treatment is not paid for by the Skeleton Weed Eradication Trust Fund. All chemical is applied at the landholders’ expense.
- Sow the entire paddock or paddock section (whichever applies) with a cereal crop. The use of Sprayseed® as a knockdown treatment is preferred. Glyphosate has a retarding effect on skeleton weed growth, and a few plants recover sufficiently to be present when the important post-emergent applications of clopyralid + MCPA or 2,4-D are applied. In addition, the use of triasulfuron (Logran®) also retards skeleton weed growth, so the product chlorsulfuron is preferred.
- Ensuring that you clean seeding equipment prior to moving on to the next paddock or paddock section. This will reduce the risk of spreading live root fragments to a clean area.
- Treat the crop post-emergence with clopyralid – e.g. Lontrel™ (300 g/L) – and MCPA (500 g/L) at the minimum rate of 300 mL/ha and 1 L/ha respectively.
- Harvest the paddock early in December, before the skeleton weed has flowered, and search it no later than 31 December.
As the manager (person responsible for land infested with skeleton weed) you are obligated to search for, and eradicate, all skeleton weed found on your property.

- All skeleton weed must be reported to the Department of Agriculture and Food Western Australia and treated to prevent seed set within 48 hours.
- You must prevent the active movement of seed and root fragments from your property by ensuring that the risk of contaminated soil, produce and equipment moving off the property is minimised.
- You must prevent skeleton weed setting viable seeds in known infested locations.
- You need to provide a ‘Statutory Declaration’ declaring that search obligations and treatment, where necessary, have been met in the allocated time frame. This Declaration must be submitted to the nominated Department of Agriculture and Food Western Australia office by 1 April each calendar year until cleared of skeleton weed.

Skeleton weed can grow virtually anywhere, even on road verges.
Urban landholders/managers are required to meet search and treatment protocols similar to broad acre landholders. Specific guidelines for urban managers are outlined below. Ask for guidance if unsure of your obligations and always observe relevant safety precautions.

- Known infested areas must be searched using the Full Inspection Search protocol (see ‘Information for Landholders/Managers with Skeleton Weed in Urban Areas’). Pay attention to biosecurity on leaving infested areas – clean vehicles down thoroughly to reduce risk of seed spread.
- Adjoining ‘suspect’ areas should be searched where possible, including road verges 1 km either side of roadside infestations.
- Infestations must be marked using star pickets or drums and flagging tape at the exact location of isolated plants, or around the perimeter of large infestations at 10 m intervals.
- Record GPS coordinates where possible.
- Cut and bag flowering/seeding plants where appropriate.
- Treat single-plant or small infestations with 10 grams Tordon® granules per plant sprinkled over, and 1 m around, each plant.
• Treat larger infestations at a minimum rate of 1.0 L/ha of glyphosate (450 g/L) and 1 L/ha 2,4-D amine. Various formulations of glyphosate are available so rates should be adjusted if using other than the 450 g/L (see table 1).
• Check sites regularly throughout summer and autumn, as plants may emerge or become more evident post-search, or may regenerate after treatment.
• Record all search/treatment details on the Skeleton Weed Record Sheet issued to you when you first reported skeleton weed.
• A completed Record Sheet and business site plan indicating locations of infestations must be submitted to the Department of Agriculture by 1 April each year, along with your Statutory Declaration.

Random audit inspections will be undertaken by authorised Department of Agriculture and Food Western Australia staff.
Summer herbicide application prevents further growth of skeleton weed plants, and prevents seed set, but is unlikely to kill well-established, robust plants. Winter herbicide application is more likely to kill mature plants, as the rain and higher levels of soil moisture allow herbicides to permeate deep into the root zone of the weed.

The type of winter treatment used will be reliant on your specific circumstances. Infestations in or adjacent to sensitive areas like roads, public recreation spaces and market gardens, are given special consideration and decisions on treatment in these instances will be made in conjunction with the landholder/manager.

In general, the winter treatment protocol for urban infestations is as follows;

- Infested sites must not be disturbed, cultivated or worked through in any way.
- Where there are specific concerns regarding the application of Tordon® 75D, the Department of Agriculture and Food Western Australia may arrange for an accredited spray contractor to complete treatment, or may recommend use of Tordon® granules on squares or around individual plants.
- All winter treatments administered by landholders/managers must be recorded on the Skeleton Weed Record Sheet, and that record provided to the Department of Agriculture and Food Western Australia on request.
• All costs associated with winter treatment are covered by the Skeleton Weed Program.
• Where there is evidence of non-compliance with the protocols, all costs associated with winter treatment will be recovered from the landholder/manager.
It is important to follow the protocols for management of skeleton weed to ensure the success of the Skeleton Weed Program. Failure to comply with any of the protocols will result in regulatory management, and this applies to both broad acre and urban landholders.

Regulatory management involves the following:

• The issuing of a Direction Notice under Section 50 of the Agriculture and Related Resources Protection Act 1976. This Notice will require the landholder/manager to complete the nominated search/treatment work as directed and complete and submit fully compliant records to the Department of Agriculture and Food Western Australia within a specified time frame, usually seven days.

• Examples of non-compliance include failure to undertake searching, control seeding plants or keep required search/treatment records.

• Failure to comply with a Section 50 Notice will result in the work being carried out under Section 52 of the Act, with all associated costs being recovered from the landholder/manager. Prosecution will be considered in situations where there is clear evidence the landholder/manager has been aware of an infestation and their responsibilities, and has made no effort to comply.
Skeleton weed is not declared in South Australia and so is managed in crop using herbicides, to reduce its impact on crop yield.

The following images give some idea of its density in cropping situations and what could happen in Western Australia if it is not controlled.
Landholders failing to comply with the requirements listed below will be subject to regulatory management under the provisions of the *Agriculture and Related Resources Protection Act 1976*:

- Treat all skeleton weed plants, mark infested sites with a 20 m buffer and report them to the Department of Agriculture and Food Western Australia within 48 hours;
- Notify all neighbours of the discovery and location of all infestations within five working days;
- Complete a Full Search of all new infested paddocks within 14 days;
- Complete a Full Search of all Code 1 paddocks by 31 December;
- Complete a Surveillance Search of all Code 2, Code 3 (Full Search for release from infested list) and all paddocks adjacent to Code 1 paddocks from last season by 31 January;
- Keep the minimum required search and treatment records and submit with property maps to your local Department of Agriculture and Food Western Australia office by 15 February;
- Avoid cultivating through marked infestations during the first seeding period after discovery of skeleton weed; and
- Prevent active movement of skeleton weed by minimising the risk of contaminated produce and equipment moving around and off the property.
Regulatory management involves the following:
A Section 50 Notice will be issued requiring a non-compliant landholder to complete all searching and treatment as directed and submit fully compliant records to their local Department of Agriculture and Food Western Australia office within seven days of issue.
Failure to comply with a Section 50 Notice will result in searching, treatment and completion of written records being arranged by the Department of Agriculture and Food Western Australia, at full cost recovery from the landholder.

A contractor operated skeleton weed search rig
• Sow infested paddocks early and harvest before 10 December to avoid harvesting through seeding plants and remove all produce (e.g. hay) as soon as practicable before searching.
• Thoroughly clean down all equipment (including seeding and harvesting machinery) that has been driven/worked through any infested paddock prior to exiting the paddock, using water or air.
• Ensure all family members and staff on your property know how to identify skeleton weed.
• Remove stock a minimum of six weeks prior to searching paddocks and re-stock post-search (to prevent missed plants seeding) with (preferably) non-saleable stock – sheep grazed on infested paddocks during the summer must be sold bare-shorn.

• Grain from infested paddocks harvested after 10 December must not be kept or sold locally for seed.
• Carry flagging tape in all vehicles, including headers, to mark plants.
• Do not remove/dismiss plants you’re unsure of – treat any spindly green plant with suspicion.
• Adding 1.0 – 1.5 L/ha picloram + 2,4-D or picloram + triclopyr to the summer spray mix on sites less than 5 ha improves residual control.
• If you have an infestation on a property boundary, assist your neighbours with Surveillance Searching on adjacent paddocks within their boundary.
• Get into the habit of checking all paddocks prior to moving stock into them.
• Kangaroos and rabbits graze on skeleton weed, making it difficult to find even if stock have been removed.
• Remember to regularly monitor all infested sites throughout summer and autumn, particularly after rain, and be prepared to extend squares if plants emerge outside marked areas.
• Don’t forget to notify your local Department of Agriculture and Food Western Australia office if you find more plants before the winter spray – sites that are not officially recorded will not be eligible for winter treatment.
<table>
<thead>
<tr>
<th>TRADE NAME</th>
<th>ACTIVE INGREDIENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tordon® 75 D</td>
<td>Picloram (75g/L) + 2,4-D (300 g/L)</td>
</tr>
<tr>
<td>Commander® 75 D</td>
<td></td>
</tr>
<tr>
<td>Grazon® DS</td>
<td>Picloram (100 g/L) + triclopyr (300 g/L)</td>
</tr>
<tr>
<td>Grass-up®</td>
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<tr>
<td>Tri-Pick®</td>
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<td>Fightback®</td>
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<tr>
<td>Generex Trichloram®</td>
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<td>Triclozon®</td>
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<td>Ken-Zon®</td>
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<tr>
<td>Conqueror®</td>
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<td>Pickout®</td>
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<tr>
<td>Picker®</td>
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<tr>
<td>Lontrel®</td>
<td>Clopyralid (300 g/L)</td>
</tr>
<tr>
<td>Clock® 300</td>
<td></td>
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<tr>
<td>Victory®</td>
<td></td>
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<td>Ken-Trel® 300</td>
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<tr>
<td>Archer®</td>
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<td>Rally®</td>
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<td>Riddler®</td>
<td></td>
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<tr>
<td>Lontrel® 750 SG</td>
<td>Clopyralid (750 g/kg)</td>
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<tr>
<td>Lontrel® Forestry</td>
<td></td>
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<tr>
<td>Granosan®</td>
<td></td>
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<tr>
<td>Ken-Trel® 750</td>
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Table 2 Conversion Rates for different formulations of glyphosate based on the 360 formulation

<table>
<thead>
<tr>
<th>Active ingredient of glyphosate</th>
<th>Rate/ha</th>
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<tbody>
<tr>
<td></td>
<td>0.25 L</td>
</tr>
<tr>
<td>360</td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>0.2 L</td>
</tr>
<tr>
<td>490</td>
<td>0.18 L</td>
</tr>
<tr>
<td>500</td>
<td>0.18 L</td>
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<tr>
<td>540</td>
<td>0.17 L</td>
</tr>
<tr>
<td>680</td>
<td>0.13 kg</td>
</tr>
<tr>
<td>690</td>
<td>0.13 kg</td>
</tr>
<tr>
<td>700</td>
<td>0.13 kg</td>
</tr>
<tr>
<td>840</td>
<td>0.11 kg</td>
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</table>

CONVERSION RATES
<table>
<thead>
<tr>
<th>Crop</th>
<th>Pre-seeding</th>
<th>Preferred Herbicides</th>
<th>Rate per Hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wheat</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early post emergence (four leaf stage to early tillering)</td>
<td>clopyralid (300 g/L or 750 g/kg) + metsulfuron methyl (600 g/kg) + MCPA amine (500 g/L)</td>
<td>300 mL or 120 g (for 300 g/L or 750 g/kg) + 3 g + 500 mL</td>
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<tr>
<td></td>
<td>Late post emergence</td>
<td>clopyralid (300 g/L or 750 g/kg) + MCPA amine/ester (500 g/L)</td>
<td>500 mL or 200 g (for 300 g/L or 750 g/kg) + 1 L</td>
</tr>
<tr>
<td><strong>Barley</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early post emergence (four leaf stage to early tillering)</td>
<td>clopyralid (300 g/L or 750 g/kg) + metsulfuron methyl (600 g/kg) + MCPA amine (500 g/L)</td>
<td>300 mL or 120 g (for 300 g/L or 750 g/kg) + 3 g + 500 mL</td>
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<td></td>
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<td>clopyralid (300 g/L or 750 g/kg) + MCPA amine/ester (500 g/L)</td>
<td>500 mL or 200 g (for 300 g/L or 750 g/kg) + 1 L</td>
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<tr>
<td><strong>Oats</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Early post emergence (four leaf stage to early tillering)</td>
<td>clopyralid (300 g/L or 750 g/kg) + MCPA amine (500 g/L)</td>
<td>300 mL or 120 g (for 300 g/L or 750 g/kg) + 500 mL</td>
</tr>
<tr>
<td></td>
<td>Late post emergence</td>
<td>clopyralid (300 g/L or 750 g/kg) + MCPA amine/ester (500 g/L)</td>
<td>500 mL or 200 g (for 300 g/L or 750 g/kg) + 1 L</td>
</tr>
<tr>
<td>Canola</td>
<td>Pre-seeding</td>
<td>Tilt</td>
<td>In Crop</td>
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<td></td>
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<tr>
<td>Lupins</td>
<td>Pre-seeding</td>
<td>glyphosate (various formulations)</td>
<td>In Crop</td>
</tr>
<tr>
<td></td>
<td></td>
<td>or Spray.Seed® 250</td>
<td>(two to six leaves &amp; plants 4 to 10 cm high)</td>
</tr>
<tr>
<td>Pasture</td>
<td>Winter</td>
<td>Tigrex® or Giant® (420 g/L MCPA + 25 g/L diflufenican) or Brodal® (500 g/L diflufenican)</td>
<td>Late treatment</td>
</tr>
<tr>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td>Summer (for prevention of seed set in all crops &amp; pasture)</td>
<td>Spray.Seed® 250 or glyphosate (450 g/L) + 2,4-D ester (800 g/L or 600 g/L)</td>
<td></td>
</tr>
</tbody>
</table>
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ACKNOWLEDGEMENTS

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Fax: (08) 9041 1138
Mobile: 0429 083 786

Additional reading:
Farmnote No 51/98 – Skeleton Weed
Farmnote No 71/2002 – Farm Biosecurity
Skeleton Weed Look-a-Like Key
Information for Landholders/Managers with Skeleton Weed in Urban Areas
Website: http://www.agric.wa.gov.au
(Search for “Skeleton Weed”)

Written and revised by:
David Atkins, Terri Jasper and Kelly Manning
Report all unfamiliar or suspect plants to your district Department of Agriculture office listed below

- Albany
  Ph: 9892 8444
- Esperance
  Ph: 9083 1111
- Geraldton
  Ph: 9956 8555
- Katanning
  Ph: 9821 3333
- Lake Grace
  Ph: 9865 1205
- Merredin
  Ph: 9081 3111
- Narrogin
  Ph: 9881 0222
- Northam
  Ph: 9690 2000
- Moora
  Ph: 9651 0555
- Three Springs
  Ph: 9954 3333

or to your local Department of Agriculture office.

Metropolitan reports should be directed to the Pest and Disease Information Service at South Perth
Ph: 1800 084 881

www.agric.wa.gov.au (Search for “Skeleton Weed”)