

Oxalis

Three weeds of South African origin that many of you will be familiar with in your bushland are **soursob**, **fingerleaf** and **four o'clock** – all belong to the genus *Oxalis*, in the family Oxalidaceae. Of the 800 species in the genus, 14 occur in Western Australia and only one, *Oxalis perennans*, is native.

Bulbous perennial herbs, the foliage of these three weeds forms dense mats over the ground from autumn to spring, inhibiting the germination of native species and out competing native herbs for space, light and nutrients.

Soursob (*Oxalis pes-caprae*) is a small, succulent plant to 40cm high. The clover like leaves are bright green in colour, often with purplish brown speckles or markings on the upper surface. Bright yellow flowers occur in drooping clusters on top a single leafless stalk. The bulbs have a dark brown papery cover, many bulbils form above the bulb each year.

O. pes-caprae was introduced in 1839 as a garden ornamental. Associated with mediterranean climates, it also occurs in sub-tropical and semi-arid regions and is present in all states and territories. Commonly seen in disturbed areas, the weed occurs on a range of soil types, however it is most prolific on heavier, well drained, fertile soils.

Four o'clock (*Oxalis purpurea*) is a small low growing weed to 10cm high. The leaflets are almost circular, green to deep reddish green in colour. The leaves form a rosette above which the short stemmed flowers appear. Three colour forms occur, purple, mauve and white. All have a yellow throat. The shallow bulb is large – up to 2cm across, smooth, rounded and black/brown in colour.

O. purpurea is also thought to be a garden escapee. It prefers damp conditions and is widespread on heavier soils throughout the south-west of WA. Harder to kill than soursob, it has replaced this weed in agricultural areas.

Finger leaf (*Oxalis glabra*) is a small erect plant to 15cm high. One or two five petaled pinkish purple flowers with yellow throats are produced on thin upright stems. Short, narrow green to reddish leaves occur in clusters along the stem length. The small bulbs have a brown papery cover.

O. glabra is widespread in disturbed woodlands around the Perth metropolitan area. The weed is common on heavy soils from Perth to York and has a scattered distribution in the lower south west.

Biology and Life Cycle:

Oxalis pes-caprae, *O. purpurea* and *O. glabra* bulbs sprout with the fall of temperature in autumn. Leaf emergence is variable and may spread over several weeks. Flowering begins around June and may continue as late as October. In late spring rising temperatures kill the aerial growth and all three species are dormant over summer.

Below ground *O. pes-caprae* is a complex plant. An underground rhizomatous stem, joins the leaf crown to the deep seated parent bulb. Below the parent bulb the stem tapers to a fine thread then swells into a fleshy tuber. Initially acting as a food storage organ, in late spring the tuber shrinks as it loses moisture, contracting and pulling the new bulbs deeper into the ground. During the growing season it is common for two bulbs to develop inside the old bulb and one on the tuber. Many bulbils, often more than 20, develop on the rhizomatous stem above the bulb.

The large bulb of *O. purpurea* is found close to the soil surface, 2 – 5cm deep. After flower development, bulbils form just below the soil surface on the rhizomatous stem. Horizontal rhizomes can also develop roots and shoots, forming new plants. *O. purpurea* is not known to set fruit in Australia.

The small bulbs of *O. glabra* are located 5-10cm below the ground. Neither bulbils or fruit, are recorded in collections made in Western Australia. It is possible that underground stolons (horizontal stems) may produce roots and leaves at the nodes. At flowering the parent bulb is exhausted and can be squashed between your fingers without resistance.

How does it spread?

O. pes-caprae is predominantly spread through dispersal of the numerous bulbils. During vegetative growth, cut sections of the stem are also capable of forming new plants. Without disturbance, infestations spread by sending out the underground stem at an angle thereby allowing the contractile tuber to pull the new bulbils sideways. *O. purpurea* also spreads by dispersal of bulbils, supplemented by the production of new plants from horizontal rhizomes. *O. glabra* appears to spread by fine underground stolons, a bulbil forming at the tips and developing into a new plant.

Bulbs and/or bulbils of all three weeds are:

- Easily introduced to bushland in contaminated soils and garden refuse, or on earthmoving machinery and tools.
- Rapidly spread by soil disturbance or cultivation.
- Carried by water – both bulbs and bulbils float.
- Spread by birds – Oxalis patches have been recorded under roost sites.

Control and Management:

Understanding the distribution: Knowing the extent of an infestation is paramount to any good management program. Accurate distribution maps allow targeted control of infestations and provide evidence of where the program has been effective and where it has failed. As with all weeds it is important to control isolated patches within intact bushland before they spread. Working from intact bushland out towards the disturbed areas also limits spread – especially where the infestation cannot be removed in one concentrated effort. Updating maps regularly provides good feedback to workers on the effectiveness of their efforts.

Chemical control: Timing of chemical application is crucial. Spot spray infestations just prior to flowering – this is the point of maximum old bulb exhaustion, and minimum new bulb development. Bulbs are empty, plants are committed to flowering and the majority of leaves have emerged. Time of flowering will vary from year to year and between sites. As not all plants will be at the same stage further control will be required in the following years. *Oxalis* species are easily stressed by dry spells which reduces the effectiveness of systemic herbicides.

Care must be taken to avoid off target damage when using herbicides in bushland. It is important that training in the correct use of herbicides is undertaken. Always read the label and follow instructions.

Herbicide	metsulfuron methyl (minor use registration)
Active ingredient	600 g/kg metsulfuron methyl
Rates of dilution for spot spraying	1g in 100L
Knapsack amount of product per 10 litres water	0.1g
Rate of product per hectare	5g
Wetting agent dilution	1400
Time of application	winter
Remarks	useful as mixture with glyphosate for roadsides
Additional information	EWAN NB. Careful application of metsulfuron at these rates results in minimal off target damage. However, the herbicide is soil residual (from 2 months up to 2 years in dry calcareous soils) and may damage sensitive plants.

NOTE: Herbicide use is subject to registration. The onus is on the user to ascertain restrictions of use within their state.

Physical Control: Grubbing of plants is only practical for small infestations in very disturbed areas or on soil dumps.

Dig out the whole plant early in the season before bulbil formation, sifting soil to remove as many of the bulbils as possible. Due to the numerous small bulbils, this can be a very tedious task. Plant material should be taken from the site and disposed of carefully. Leave bulbs and plant material to rot in plastic bags placed in the sun. Soil disturbance resulting from the grubbing of plants will encourage other weeds to colonise the area and may spread the *Oxalis* species.

In heavily degraded areas heavy mulching **may** temporarily suppress oxalis. Cover area with weed matting or mulch over cardboard for the entire growing season. This method may be more successful on *O. purpurea* as research suggests that defoliation of this species reduces bulb development.

Management Guidelines:

- Mapping in mid winter is suggested - the bright flowers being highly visible.
- Decide where resources should be best spent - control isolated clumps in healthy bushland first.
- Timing of herbicide application is important spray just on flowering at time of maximum bulb exhaustion but before bulbils begin to develop. Spraying after flowering will not kill the bulbils so there is no point.
- If hand grubbing, soil must be sifted to get as many bulbils as possible (only recommended for small populations in very disturbed areas or soil dumps)
- Removal and careful disposal of all plant material is important - bulbils and pieces of rhizome can spread the weed! (it is important not to waste effort by removing plants ineffectively).
- Follow up control in following years - map each year to check progress of control efforts and/or spread.

NOTE: Cleaning mud containing bulbils from tools, boots and vehicles is important in restricting spread.

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Getting Involved - The Environmental Weeds Action Network:

The Environmental Weeds Action Network (EWAN) is a community initiative to tackle the problem of environmental weeds in bushland and waterways. It brings together community members in both urban and rural areas, bush regenerators, local government, weed scientists and ecologists to save our indigenous flora from the threat of weeds.

The aims of EWAN include:

- promoting an understanding of the threat of environmental weeds to our precious bushland
- providing useful information about weed control in native vegetation and elsewhere convincing governments at all levels of the need for appropriate legislation and funding for weed control
- researching methods of weed control
- encouraging community participation

Telephone (08) 9220 5311 or visit our web site at <http://members.iinet.net.au/~ewan/>

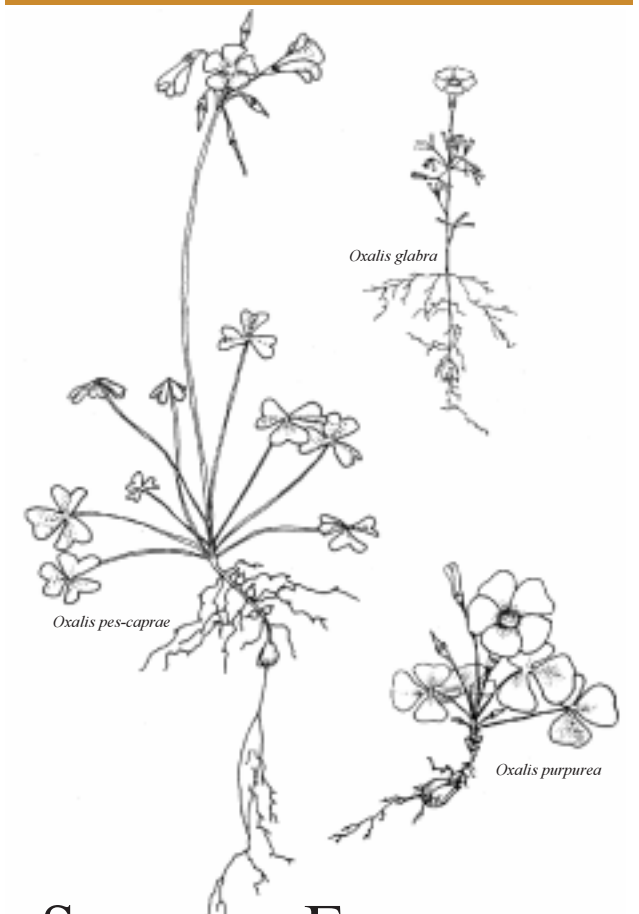
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SOURSOB, FINGERLEAF & FOUR O'CLOCK

Oxalis pes-caprae, *O. glabra* & *O. purpurea*
Oxalidaceae

