



Cat's claw creeper (*Dolichandra unguis-cati*)



Cat's claw creeper (standard form). Photo: Sheldon Navie.

Key points

- Cat's claw creeper is a woody vine that invades warm, moist native forests and riparian zones, killing native trees and understorey plants.
- It spreads readily from seed, carried by water or wind.
- Regrowth can occur from persistent underground tubers.
- Mature plants are usually controlled by cutting off the vines and treating lower stems and foliage with herbicide; or by foliar spray where off-target damage can be minimised. Follow up 2-3 times a year is essential.

The problem

Cat's claw creeper (*Dolichandra unguis-cati*; until recently classified as *Macfadyena unguis-cati*) is a vigorous, perennial vine with an east coast distribution that extends from Cooktown to south of Sydney. Infestations are most concentrated in south-east Queensland and north-east New South Wales, where it poses a significant risk to biodiversity in riparian and rainforest communities. It is also a pest of forestry, urban areas and infrastructure corridors.

The vine is a transformer species, described as such because of its capacity to completely alter native ecosystems. Cat's claw creeper smothers and kills mature trees, opening up the canopy for light-loving weeds. In areas where there are no standing structures, it forms dense above-ground mats that prevent growth and germination of desirable understorey vegetation.

The weed

Cat's claw creeper is native to Central and South America and the West Indies where it has a distribution that covers several climatic zones, including wet tropics, temperate and tropical savannah.

It was introduced to Australia as a garden plant and was first reported as being naturalised in the 1950s.

Seedlings have the capacity to tolerate competition for light, moisture and nutrients and while the plants grow best in open, sunny situations, it can invade intact communities.

Seeds germinate readily in moist leaf litter and rapidly develop subterranean tubers.

The weed's climbing woody stems (lianas) cling to tree trunks using aerial roots, enabling it to grow into the forest canopy (Figure 1).

How to identify cat's claw creeper

Cat's claw creeper is a perennial woody vine with numerous stems, generally up to 15 cm thick. The leaves are opposite and compound, with a 1-2 cm long stalk (petiole). Each leaf has a pair of lance-shaped leaflets 2-7 cm long x 1-3 cm wide (Figure 2a). The plant's name (cat's claw) refers to a modification to the third leaflet, forming a three-pronged tendril with stiff tips that form hooks (visible in Figure 2a). Tendrils are 10-35 mm long and aid in climbing.

Hairy or long-pod cat's claw creeper (a less common form found in south-east Queensland) has larger and broader leaflets (Figure 2b), often with toothed margins and a fine covering of hair on the stems, leaf stalks and leaf undersides.

The standard form of cat's claw creeper has large yellow trumpet flowers (Figure 2c). The flowers of the hairy form are usually pale orange to pale orange-yellow. The flowers of both forms are borne in the leaf axils in clusters or as single flowers. They are 4-8 cm long with lobes to 2 cm long.

Cat's claw creeper fruit develops as a long narrow capsule, 30-60 cm long and 8-12 mm wide in the standard form (Figure 2e) and 60-100 cm long in the hairy form. Capsules contain numerous two-winged seeds that are 2-4 cm long (Figure 2d).

Cat's claw creeper has an extensive root system which produces a tuber at approximately 50 cm intervals along the lateral roots. Each tuber can be up to 40 cm long and develops climbing runners that either colonise the surrounding vegetation or grow as ground cover. Entwined roots and tubers form a dense underground mat in mature infestations.

Under low-light conditions, cat's claw creeper vines can be difficult to differentiate from native species, however cat's claw creeper stems tend to 'hug' the host tree or fence. When they are mature and woody, the bark becomes fissured and flaky, and tends to be covered in adventitious roots.

Similar species

Cat's claw creeper is a member of the Bignoniaceae family. Two other introduced vines in this family have become naturalised in eastern Australia, but are localised:

- Flame vine or golden shower (*Pyrostegia venusta*) has ribbed branchlets, three-pronged tendrils, and orange flowers.
- White trumpet vine or monkey's comb (*Pithecoctenium cynanchoides*)

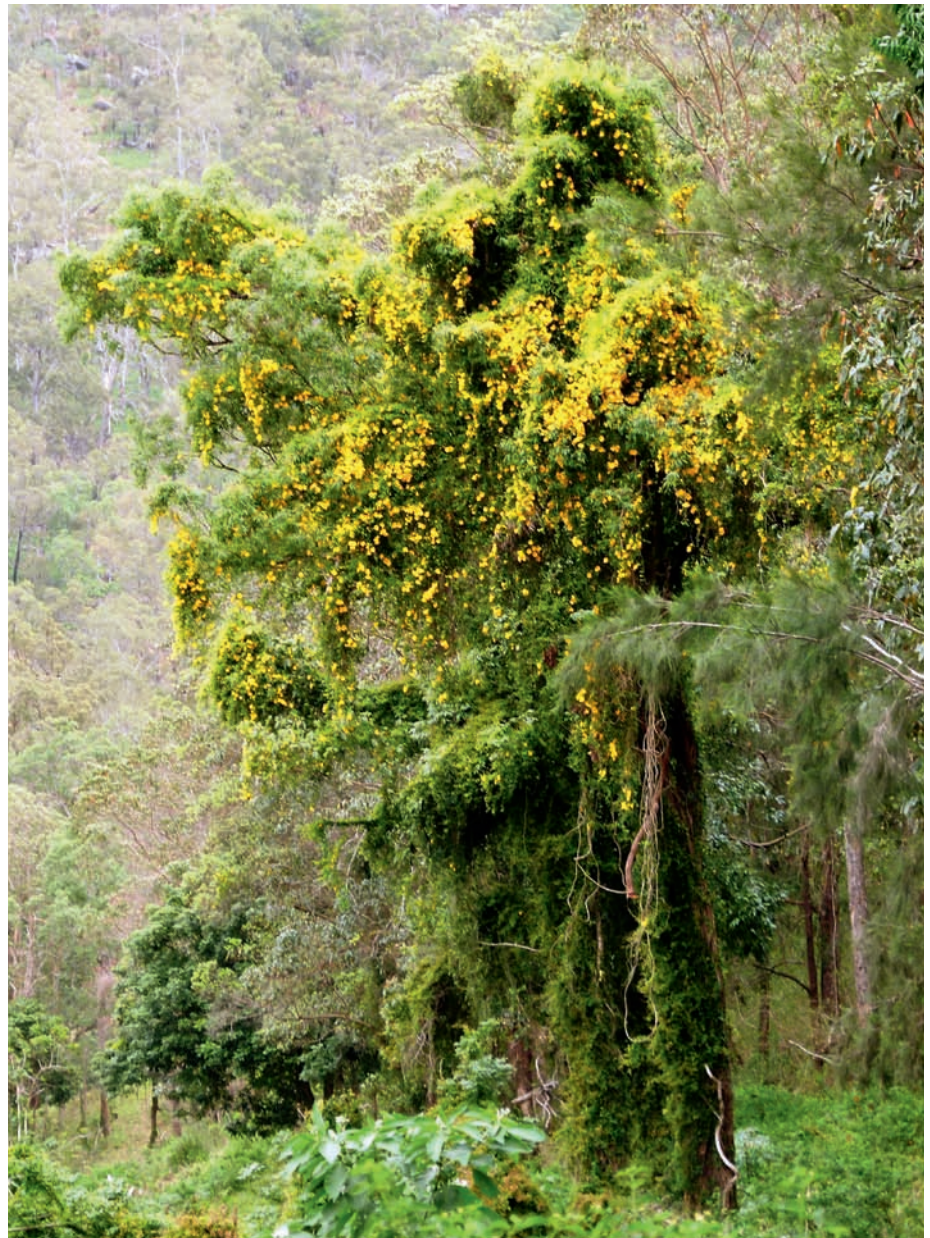


Figure 1. Cat's claw creeper smothering mature trees, Clarence River, New South Wales. Photo: Liza Smith, Wollongong University.

has ribbed branches, tendrils, heart-shaped leaflets and yellow flowers that are paler inside.

Native vines are common in the habitats invaded by cat's claw creeper, but do not have the distinctive three-pronged tendrils. Native species that can be confused with cat's claw creeper, particularly in the seedling stage, include Australian teak (*Flindersia australis*), pastel flower (*Pseuderanthemum variable*) and the endangered isoglossa (*Isoglossa eranthemoides*).

Growth calendar

Cat's claw creeper has a well defined growing season, extending from spring through to autumn. Seedlings start to develop small tubers (1.5-2 cm in diameter) at the two-leaf stage; however, plants are usually well established before they start to flower. Flowering occurs in spring, and seed capsules mature in late summer to autumn, approximately 6-10 months after flowering. Seed begins to drop in late May, with peaks in July and August. The fruits of hairy cat's claw creeper mature in late winter to early spring.



Figure 2. (a) Lance-shaped leaflets and cat claw-like tendrils of the standard cat's claw creeper; (b) larger, broader leaflets of hairy cat's claw creeper; (c) yellow trumpet flowers (standard form); (d) winged seeds; (e) fruit. Photos: Sheldon Navie.

How it spreads

Cat's claw creeper produces numerous seeds with membranous wings that aid dispersal, particularly by water and wind. Seed persistence is thought to be low as emergence ceased after 300 days in experimental trials; however, survival rates may be extended in inland regions. Cooler weather and reduced rainfall patterns are likely to reduce germination events and anecdotal evidence indicates germination may continue for up to three years. Established plants can reproduce vegetatively from tubers and creeping stems, and detached tubers and cuttings may re-sprout in moist conditions. It is the subterranean tuber bank which allows populations to persist.

Cat's claw creeper also spreads from gardens as a result of human propagation and rubbish dumping.

Where it grows

In Australia, populations of cat's claw creeper are most highly concentrated in south-east Queensland and northern NSW, but its coastal distribution stretches from as far north as Cooktown in Queensland to Sydney in NSW.

Cat's claw creeper grows in a range of soil types, but does not tolerate poorly drained soils. Plants are capable of surviving heavy frost, but germination is reduced at low temperatures and its general distribution seems to be limited by cold and dry stress.

The plant communities in Australia most commonly invaded by cat's claw creeper are those in riparian zones and subtropical and tropical rainforests. These include littoral rainforest and river-flat eucalypt forest on coastal floodplains, listed as endangered ecological communities in New South Wales. Most surviving remnants of these communities are small and particularly prone to weed invasion and degradation.

Hairy cat's claw creeper appears to tolerate drier conditions and has invaded open and closed forests away from waterways. It has been found growing around estuarine wetlands, suggesting a higher tolerance for salt than the common form.

Potential distribution

Climatic tolerance modelling of cat's claw creeper's potential distribution indicates that highly suitable habitat occurs in the coastal regions from southern New South Wales north, to include the tropical rainforests in Far North Queensland and large areas of Cape York. Coastal zones of Western Australia and small areas of the Northern Territory and South Australia are also suitable. Cold and dry inland conditions limit cat's claw creeper distribution, but riparian microclimates that provide increased soil moisture and protection from frost are likely to enable inland invasion along waterways. There is also potential for cat's claw creeper to become significantly more abundant within its current range. See Figure 3.

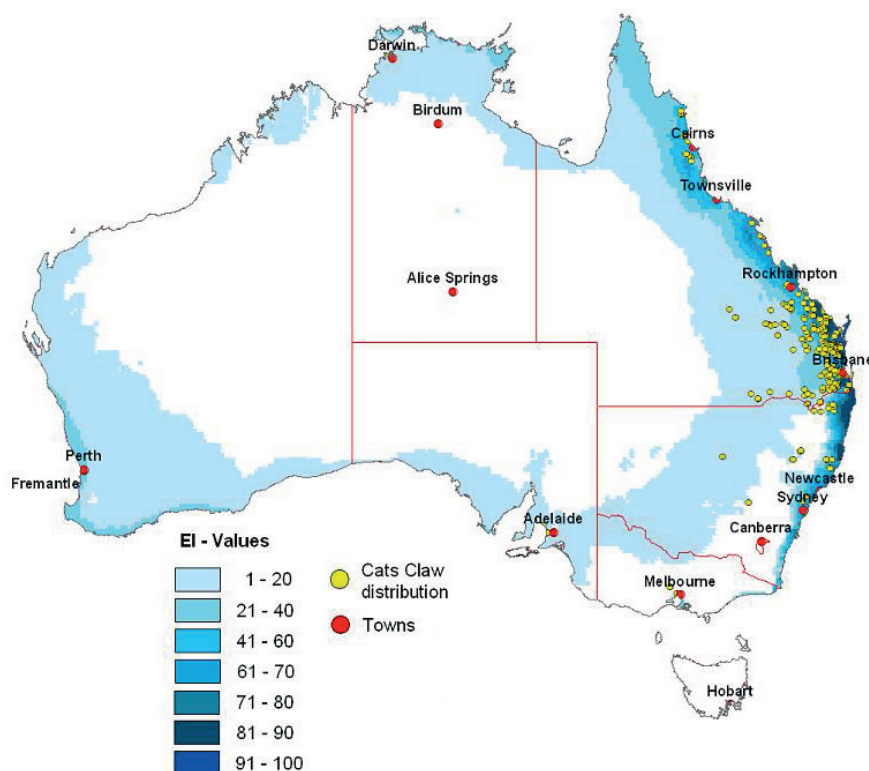


Figure 3. Current and potential distribution of cat's claw creeper. Potential distribution - CLIMEX model based on native distributions from south and central America (Biosecurity Queensland).

What to do about cat's claw creeper

In regions where cat's claw creeper is widespread, sites with the greatest biodiversity significance should be given the highest priority for weed removal. Liberating mature native trees from vine weeds to enable recovery of the canopy is a key first step in restoring ecosystems. Coordinated control programs at the catchment and sub-catchment scale can reduce spread and maximise the effectiveness of management work.

1. Prevent cat's claw creeper spread:

- Identify locations where cat's claw creeper occurs as isolated plants or sparse populations. Remove seedlings and treat isolated plants or clumps first. Cat's claw creeper can spread along rivers, particularly from seeds dispersed by floodwaters. Where possible, keep uninfested areas free of cat's claw creeper.

2. Reduce established infestations:

- Develop and implement a long-term weed management plan for each site. It is important to identify all plant species (weeds and natives) and map their distribution and density so that you can establish the most strategic management approach to the site.

- Mature infestations of cat's claw creeper are most readily identified during flowering season (spring). Where possible, infestations should be managed prior to seeding (late summer–autumn) to reduce the incidence of spread.
- Weed strategically, protecting the better quality native vegetation first (treat cat's claw creeper infesting trees that are still living) and, where possible, control infestations which threaten to spread downstream.
- The size of the area targeted at each stage should be manageable enough to enable thorough follow-up control 2-3 times a year, usually in late spring/early summer, late summer/early autumn and just before winter. Regrowth should be treated before it reaches the foliage of the host tree.
- Follow-up work in the first year is particularly delicate as care must be taken to treat the cat's claw creeper seedlings amongst native seedlings.
- Ensure that activities do not spread the seed and tubers, or disturb ground cover.

3. Monitor and evaluate outcomes and adapt the plan accordingly:

- Include monitoring of native plant regeneration, as well as weed response. In weed management programs there is often a tendency to focus on the removal of weeds as a goal, but at the site level the ultimate goal is restoration of native vegetation.

Control methods

Dense infestations of cat's claw creeper are very difficult to control due to numerous lianas, abundant seed and its ability to resprout from the tubers, sometimes for years. In selecting the most suitable control techniques it is essential to minimise adverse impacts on native vegetation and to encourage its subsequent recovery.

Biological control

Several biological control agents have been identified and are at various stages of testing and introduction. Australian releases of the leaf-sucking lace bug (*Carvalhotingis visenda*) and leaf-tying pyralid moth (*Hypocossia pyrochroma*) were approved in 2007 and a new agent, the leaf-mining buprestid beetle (*Hylaeogena jurecki*) is due for release in 2012-13.

If successful, these agents should reduce the rate of shoot growth to limit cat's claw creeper's ability to smother native plants; and through suppression of photosynthetic processes, reduce the tuber biomass.

Physical weed removal

The physical removal of large numbers of tubers cannot be achieved without excessive soil disturbance. However, some practitioners recommend grubbing out larger tubers where repeated herbicide treatments have failed to prevent reshooting. Tubers must be composted on-site or double bagged and disposed of in landfill waste, as they will regrow in moist conditions in contact with soil.

It may be impractical and dangerous to attempt to pull lianas out of the tree canopy, and the upper vines are generally cut and left to die *in situ*.

Chemical control

Herbicides can be effective, providing they are carefully chosen and selectively applied when plants are actively growing. The main herbicide application methods for cat's claw creeper are described below. Also see Table 1. Stem injection and basal bark application are less commonly used. Remember to always follow label and permit directions when using herbicides.

Cut stump and cut, scrape and paint application

Suitable for all basal stem sizes

Cut all climbing stems well above the ground (1-2 m high) and leave the aerial parts to die. Peel the stems back from the trunk of the host plant (leaving a clear area that can be monitored for regrowth) and cut all the basal stems again horizontally approximately 20 cm from the ground (Figure 4). Treat the cut surface immediately (within 15 seconds) with concentrated herbicide, using a handheld spray bottle or a brush. To increase the likelihood of herbicide penetration into the root and tuber system, it may also be beneficial to scrape the bark from one side of the remaining stem and the surface of any visible tubers, and treat the exposed area with herbicide. For large plants, a team of two or more people need to work together to treat each stem as it is cut.

Foliar spray

Stems of cat's claw creeper are strongly attached to the trunk of the host, so *in situ* foliar spray can cause off-target damage. However, handheld equipment (handgun and hose or knapsack) can be used to spot spray prostate stems, seedlings and regrowth less than 2 m tall. Pull any regrowth off the native vegetation, coil or tie it into a knot and spray the vines at ground level to minimise spray drift and off-target damage. The leaves and stems must be sprayed to the point of run-off. The best time for foliar spray is when new growth is present.

Some managers find it most cost effective to cut the stems (allowing aerial sections to die) and foliar spray any regrowth, without dedicating time to cut, scrape and paint application of herbicides.



Figure 4. Cut stump treatment - clear stems from the host tree so regrowth is easily detectable. (Photo: Maggie Scattini).

Table 1. Cat's claw creeper management summary.

| Growth form | Most effective treatment approach |
|------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Seedlings and ground runners | Foliar application of herbicide [†] . |
| Small to medium sized vines that have begun to attach/climb host | Pull juvenile vines away from host if possible and spray with herbicide [†] . If vine can't be removed from host, scrape and paint with concentrated herbicide (more time consuming). |
| Well established vines growing into canopy | Cut stump herbicide application; or cut and foliar spray regrowth if detrimental affects to host tree can be avoided. |

[†] Some residual herbicides may not be suitable where there is the potential for run-off into waterways or where there could be a long-term impact on native species recruitment. Non-residual and waterway compatible herbicides are available.

Herbicides for cat's claw creeper management

The most commonly used herbicides are described here. However, further research is needed to determine the comparative effectiveness and off-target impacts of many of these herbicides, and care must be taken to ensure conditions are suitable for their use.

The only herbicide that has Australia-wide registration for cat's claw creeper (under the definition of 'rhizomatous plant') is picloram gel (45 g/kg). However, a number of minor use permits are also current for Queensland and New South Wales for herbicides including glyphosate, dicamba, fluroxypyr and triclopyr + picloram (+/- aminopyralid). Permits are also available for metsulfuron-methyl, but trials indicate that cat's claw creeper is particularly resistant to this herbicide. These permits are either issued specifically for cat's claw creeper or under the definition of environmental weeds. For more details on the current status of pesticide permits go to www.apvma.gov.au.

For cut stump or cut, scrape and paint techniques, glyphosate (360 g/L) is generally applied at a ratio of 1:1.5 mixed with water. Alternatively, picloram gel (e.g. Vigilant®) can be applied 'neat' to the cut surface. The latter is more expensive, but some research indicates it may have more impact on the subterranean tubers.

A range of selective, non-selective, residual and non-residual herbicides are available for spot spraying cat's claw regrowth and seedlings. There are pros and cons associated with each of these (described below) that must be considered on a site by site basis.

For spot spraying of regrowth and seedlings, glyphosate (360 g/L) mixed with water at a ratio of 1:100 is commonly used. However, as glyphosate is non-residual, it will not provide ongoing control of tuber and seed germination. A site may therefore require additional follow-up herbicide applications (compared to residual herbicides) to exhaust the

soil tuber bank. Glyphosate is a non-selective herbicide and indiscriminate spraying will open up bare ground for opportunistic weed invasion. Therefore extreme care must be taken to avoid contact with desirable species.

Most selective and residual herbicides achieve good control of regrowth, juveniles and tubers but can remain active in the soil for long periods of time. The favoured treatment is triclopyr (300 g/L) + picloram (100 g/L) at mix rates of 200-400 mL/100 L of water because it works relatively rapidly and provides the lowest levels of immediate off-target damage to competitive native species. At these rates grasses, ferns, rushes and sedges should be unaffected; however, this herbicide will have an impact on other woody plants and vines, particularly in the immature stages. Therefore, until further trials can be conducted to assess the long-term impacts on the germination of native species, the use of these residual herbicides should be avoided in more sensitive sites. In degraded and heavily infested sites, where recolonisation of native species from adjacent areas or active revegetation will be required regardless, these selective and residual herbicides may provide a better control option.

Dicamba (500 g/L) applied as a foliar spray at a mix rate of 4 mL/1 L of water is also recommended by some groups as an effective control for cat's claw creeper where the vine is growing over the ground or up to 1 m into small trees and shrubs. Dicamba is a selective broadleaf herbicide with a half life of about 14 days. For this reason it won't provide the same long-term residual tuber control that triclopyr + picloram herbicides provide; however, it may be more suitable in environments where native seedling regeneration is critical. Despite this, care should still be taken, particularly where it is used around shallow-rooted native plants and in sandy soils where there is a risk of soil leaching.

Application of both selective and non-selective herbicides must be done with extreme care, following label or permit instructions and by an experienced operator. The use of a dye is recommended to enable managers to identify which areas have been treated. Off-target spraying has the potential to affect desirable species and significantly deplete the native seed bank, jeopardising the long-term recovery of a site.



Destruction of riparian habitat, Clarence River, New South Wales. Photo: Liza Smith.



Treatment of cat's claw creeper vines by volunteers at Cabbage Tree Creek, Brisbane. Photo: Maggie Scattini.

Case study: Controlling cat's claw creeper on Cabbage Tree Creek

The Brisbane City Council WipeOut Weeds program has funded control of a cat's claw creeper infestation in Cabbage Tree Creek since 2004.

The vegetation at this site is a narrow fringing riparian community of forest red gum (*Eucalyptus tereticornis*) with lilly pilly (*Acmena smithii*), brush cherry (*Syzygium australe*), sandpaper fig (*Ficus coronata*) and native laurels (*Cryptocarya* spp.). When work started, the infestation of cat's claw creeper was well established, covering nine hectares. The vines had reached the tree canopy, affecting an estimated 50% of the trees, and were also carpeting the ground.

Seed of cat's claw creeper is short-lived. Each seedling forms a tuber soon after it germinates and these rapidly multiply, with each tuber forming a new plant. Spray treatments need to be repeated until all these tubers are dead and contractors have found it important to respray within about three months of the original treatment.

In the long term, successful rehabilitation will depend on protecting native plants in the infested area during the control program. Careful spraying is required to prevent off-target herbicide damage and trampling, and native seedlings are to be located (and marked if necessary) before treatment commences.

Priorities for controlling cat's claw creeper on this site include:

- treating flowering vines before seed set, by cutting vines at ground level and painting with glyphosate;
- treating all other cat's claw creeper stems that are climbing trees, by cutting at ground level and painting;
- spraying the vine where it forms a carpet on the ground (the preferred herbicide is glyphosate, but where native grasses are present a broadleaf selective herbicide is used); and
- follow-up spraying of regrowth; some patches have been treated three or four times.

Work commenced in 2004 and has continued each year. There has been good natural regeneration of native species, accelerated by the removal of the cat's claw creeper. Removal of this infestation is a major task requiring persistence and resources over the long term.

Weed control contacts

Contact the weed control authority in your state for up to date information on pesticides and legislation.

| State / Territory | Department | Phone | Email | Website |
|-------------------|-----------------------------------------------------------------|--------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------|
| National | Australian Pesticides and Veterinary Medicines Authority | 02 6210 4701 | contact@apvma.gov.au | www.apvma.gov.au |
| ACT | Department of the Environment, Climate Change, Energy and Water | 13 22 81 | environment@act.gov.au | www.environment.act.gov.au/environment |
| NSW | Department of Primary Industries | 1800 680 244 | weeds@dpi.nsw.gov.au | www.dpi.nsw.gov.au/agriculture/pests-weeds/weeds |
| NT | Department of Land Resource Management | 08 8999 4567 | weedinfo@nt.gov.au | www.lrm.nt.gov.au/weeds |
| Qld | Department of Agriculture, Fisheries and Forestry | 13 25 23 | callweb@daff.qld.gov.au | www.daff.qld.gov.au |
| SA | Biosecurity SA, Dept of Primary Industries and Regions SA | 08 8303 9620 | nrmbiosecurity@sa.gov.au | www.pir.sa.gov.au/biosecuritysa/nrm_biosecurity/weeds |
| Tas | Department of Primary Industries, Parks, Water and Environment | 1300 368 550 | See contacts at www.dpipwe.tas.gov.au/weeds | www.dpipwe.tas.gov.au/weeds |
| Vic | Department of Environment and Primary Industries | 13 61 86 | customer.service@dpi.vic.gov.au | www.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds |
| WA | Department of Agriculture and Food | 08 9368 3333 | enquiries@agric.wa.gov.au | www.agric.wa.gov.au |

Legislation

Cat's claw creeper is prohibited entry to Western Australia, and is a declared Class 3 weed in Queensland and a Class 4 noxious weed in selected local control areas of New South Wales. Sale and trade is illegal in these states. In Queensland landholders may be required to control cat's claw creeper if their land is adjacent to an environmentally significant area. In New South Wales the plant must be managed to reduce numbers, spread and incidence within the relevant local control area. (Refer to the contacts table above to obtain current details relevant to your location).

Invasion and establishment of exotic vines and scramblers has been listed as a key threatening process under the New South Wales *Threatened Species Conservation Act 1995*, with cat's claw creeper being a species of special concern.

Acknowledgements

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Map: Data provided by state and territory weed management agencies. Map created by Biosecurity Queensland; potential distribution mapped using CLIMEX modelling.

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