

## Weed Control Using Goats

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Weeds in pasture greatly reduce the short and long term profitability of the pasture. The traditional methods of weed control in pastures are cultural, biological, chemical, mechanical or grazing. Not all are necessarily effective or desirable.

Preferential selection (palatability) of plants by animals is affected by plant and animal based factors.

Animal-based factors may be categorised into five classes:

- the senses
- species and breeds
- individual variation
- previous experience
- physiological condition

The actual ability of *goats* to utilise a variety of vegetation types is attributed to their dexterity, narrower mouth, mobile upper lip, prehensile tongue and a propensity to stretch upward on the hind legs to reach forage.

Plant-based factors include:

- species
- intra specific variation
- chemical composition
- morphology or physical traits
- succulence or maturation

All animals have dietary preferences. This can be observed in horse paddocks, or on adjacent sheep or cattle properties, where the weed problems are different to where goats are run. Goats eat a variety of undesirable plants and shrubs that sheep and cattle avoid, and often the nutritive value of these species is quite high.

Goats are efficient browsers and grazers of uncontrolled plants in rocky outcrops. They will also eat any weeds that germinated too early or too late to be affected by herbicides. Similarly, degraded non-arable country with woody and other weeds may be reclaimed by goat grazing.

The major control process is *ecological*, as the weed is placed at a comparative disadvantage in the presence of vigorous clover. This is because clover is not highly sought by goats.

In Australia we have both fibre and meat type goats that are suitable for weed control. In general the bush goat (derived from ferals), cashmeres (not off-shears), and boer X goats can be used.

The principle roll of the goat as a weed controller is to place the weed at a competitive disadvantage to the surrounding pasture. They preferentially graze the weed, preventing it from flowering and setting seed, reduce the plants stored energy reserves, and finally, ringbark and trample small bushes.

Advantages of using goats include the *savings* in the cost of chemicals, time, labour and machinery, also a sustained and efficient level of control. The *returns* from the "spin-off" profits make utilising goats plain common sense.

### Assessing Pasture and Weeds

Before you can devise a stocking strategy you need to assess pasture quality and quantity and the degree of weed infestation. This is best judged in the weed's late vegetative stage, before flowering. Simply estimate the percentage ground cover of the weed in a square (0.5m x 0.5m). Walk over the entire paddock and repeat the assessment in about 30 random positions.

For larger woody weeds (blackberry, broom, gorse) estimate the proportion of the paddock taken up by the weed.

From these assessments, and with the knowledge of weed palatability (see Table 1), you can devise a stocking strategy.

### Preparation

Any necessary improvements must be made before goats arrive on a property. These include fences, water points, and yards.

Goats test the lower portion of fences: any drains, low areas and diagonal stays etc. will need to be attended to, to ensure there are no escapees. Electric fencing is a reliable and inexpensive method of upgrading existing fences. As a general rule, any fence that will contain crossbred ewes will contain goats.

For localised woody weed infestations, it may be best to isolate the infestation with fencing. This has two benefits. It confines your goats to the infested area, so that fewer goats may be required for the job of controlling the weed; and it preserves the remaining pasture for your sheep or cattle.

In dense infestations of woody weeds such as blackberry, scotch broom or gorse, slash paths through the infestation to allow greater access for goats.

Goats will ringbark some mature trees, particularly over the late winter/spring period. Soft-barked gums are most at risk and so may require protection from goats. You may need to take protective action if your goats begin to chew the tree bark. Even within the same species, individual trees will have a different attractiveness to goats. A trace element salt lick is always useful and often negates the need to attack trees.

Wire mesh wrapped twice around the trunk to a height of 2 metres will prevent damage. Exposed roots may also need covering.

### **Control or Eradicate**

Control is achieved by stopping the annual replenishment of seed reserves in the soil, and eradication is achieved after the exhaustion or effective suppression of these seed reserves. Therefore, eradication of a weed depends on several years of continuous control.

Efficient control is achieved by goat grazing, even though the goats are consuming seedheads of weeds. Research has shown that very few of the seeds ingested by goats remain viable.

### **'Set' or 'Strategic' Stocking?**

Knowing how palatability varies at each stage of plant growth allows you the flexibility of either set stocking or strategic stocking.

Set stocking with goats can be an advantage in the first year of a weed control program. It allows you to 'quarantine' the new animals, a good management strategy in case the animals are affected by lice or other health problems. It also reduces the cost of upgrading fences, as only one paddock will require upgrading.

However, after the quarantine period, it is advisable to integrate other livestock. This ensures peak production from the herbage in the paddock.

The strategic grazing option requires goats to graze alongside other stock at the 'strategic' time - for example when the weeds are most palatable to the goats (as when thistles are flowering) so that competition with other livestock for feed is greatly reduced. Because strategic grazing, by definition, is only used at particular times there must be alternate grazing and holding areas for the goats. This means you will have to fence both the weedy paddock and the other holding paddocks.

### **Conclusion**

The integration of goats on a farm can be ecologically and economically significant. These comments on management are intended to be positive and allow sound management of the animals. The few hours per month involved in sound management are negligible to that involved in traditional weed control.



**Table 1. The potential toxicity, and palatability, of some Australian plants to goats.**

Botanical name – Common name	*	Botanical name – Common name	*
Acacia aneura - mulga	H	Carex spp - sedge	M F
Acacia escelsa - ironwood	M	Carthamus lanatus - saffron thistle	M F
Acacia farnesiana - mimosa bush	M	Carthamus leucocaulos - glaucous star thistle	M F
Acacia glaucescens - coastal myall, sally wattle	T	Cassia artemisioides - silver cassia	L
Acacia karoo - karoo thorn	L	Cassia eremophila - desert cassia	N
Acacia mearnsii - black wattle	H F	Cassia floribunda - arsenic bush, smooth cassia	M
Acacia nilotica - prickly acacia	M	Cassia obtusifolia - sickle pod	H
Acacia homalophylla - yarran	M	Cassinia arcuata - sifton bush	L
Acacia paradoxa - kangaroo thorn	M	Casuarina cristata - belah	H
Acaena ovina - sheeps burr	M	Cenchrus echinatus - mossman river grass	M R
Acetosa sagittata - turkey rhubarb	H	Cenchrus spp - spiny burrgrass	M R
Aconitum napellus - monkshood	T	Centaurea melitensis - cockspur	L
Acroptilon repens - creeping knapweed	M	Centaurea nigra - black knapweed	M
Aesculus - horse chestnut	M	Centaurea solstitialis - st barnabys thistle	M F
Agapanthus spp	L	Cestrum parqui - cestrum	T
Agave spp - century plant	L	Chamaecytisus proliferus - lucerne tree	H
Ageratina adenophora - crofton weed	M	Chenopodium album - fat hen	H
Ageratum houstonianum - blue billygoat weed	M	Chenopodium nitriarum - nitre goosefoot	H
Ageratum riparia - mistflower	M	Chloris spp - windmill grass	M R
Ailanthus altissima - tree of heavens	L	Chondrilla juncea - skeleton weed	M R
Alhagi pseudalhagi - camel thorn	M	Chrysanthemoides monilifera - bitou bush	H
Allium triquetrum - three corner garlic	L	Cichorium intybus - chicory	M
Allium vineale - wild garlic	L	Cineraria lyrata - cineraria	M
Alternanthera pungens - khaki weed	L	Cinnamomum camphora - camphor laurel	H
Amaranthus spp - boggabri	M	Cirsium arvense - perennial thistle	M F
Ambrosia artemisiifolia - annual ragweed	M	Cirsium vulgare - black thistle	M F
Ambrosia confertiflora - burr ragweed	M	Citrullus colocynthis - bitter apple	M
Ambrosia psilostachya - perennial ragweed	M	Citrullus lanatus - bitter melon	L
Ambrosia tenuifolia - lacy ragweed	M	Codonocarpus spp - horse radish tree	L
Ammi majus - bishops weed	M	Conium maculatum - hemlock	M
Amsinckia spp - amsinckia	N	Consolida ambigua - larkspur	T
Andropogon virginicus - whiskey grass	M R	Convallaria majalis - lily of the valley	T
Angophora spp - apple	M H	Convolvulus arvensis - bindweed	H
Anredera cordifolia - madeira vine	L	Conyza albidula - tall fleabane	H
Apophyllum anomalum - warrior bush	H	Coreopsis lanceolata - coreopsis	M
Araujia hortorum - mothplant	M	Cortaderia spp - pampas grass	H R
Arctotheca calendula - capeweed	H	Cotoneaster spp -	M
Argemone mexicana - mexican poppy	N	Cotula australis - carrot weed	M
Aristida spp - wire grass	M	Craspedia spp - round billy buttons	M F
Asclepias spp - redhead cotton bush	N	Crataegus spp - hawthorn	M
Asclepias curassavica - cotton bush	N	Cryptostegia grandiflora - rubber vine	L
Asphodelus fistulosus - onion weed	N	Cucumis myriocarpus - paddy melon	M
Atalaya hemiglaucula - whitewood	H	Cuscuta spp - dodder	H
Atriplex spp - saltbush	M	Cycas spp - zamia	L
Atropa belladonna - deadly nightshade	T	Cynara cardunculus - artichoke thistle	H F
Avena spp - wild oats	H	Cynodon dactylon - couch	M
Baccharis halimifolia - groundsel bush	H	Cyperus aromaticus - navua sedge	M F
Bambusa spp - bamboo	H R	Cyperus rotundus - nut grass	L F
Bidens pilosa - cobblers peg	H	Cytisus scoparius - broom	H
Brachychiton populneum - kurrajong	H	Danthonia spp - wallaby grass	H
Brassica tournefortii - wild turnip	H	Daphne odora	T
Bromus diandrus - great brome	H R	Datura stramonium - thorn apple, jimson weed	N
Brugmansia candida - angels trumpet	T	Delphinium spp	N
Bursaria spinosa - jimmy burn	H	Dieffenbachia spp - dumbcane	T
Buxus spp - box hedge	M	Digitalis purpurea - foxglove	T
Caesalpinia spp - mysore thorn	N	Diplotaxis tenuifolia - sand rocket	M F
Calicotome spinosa - spiny broom	M	Dittrichia graveolens - stinkwort	M R
Callitris columellaris - cyprus pine	H	Dodonaea attenuata - narrow leaf hop bush	H
Callitris endlicheri - black cyprus pine	N	Dodonaea viscosa - broad leaf hop bush	M F
Calotropis procera - rubber tree	H	Duboisia hopwoodii - pituri	N
Caninia quinquefaria	H	Duranta repens	T
Cannabis sativa - indian hemp	H	Ecballium elaterium - squirting cucumber	N
Capparis mitchellii - white orange	M	Echium plantagineum - patersons curse	M F
Capsella bursa-pastoris - shepherds purse	N	Echium vulgare - vipers bugloss	H F
Cardiospermum spp - balloon vine	M F	Emex australis - emex	M
Carduus nutans - nodding thistle	M F	Eragrostis australasica - cane grass	M
Carduus pycnocephalus - slender thistle	M F	Eragrostis curvula - african love grass	H R

Botanical name – Common name	*	Botanical name – Common name	*
Eremophila longifolia - emu bush	H	Lolium spp - rye grass	H
Eremophila mitchellii - budda	L	Lomandra longifolia - mat rush	L
Eremophila sturtii - turpentine bush	N	Lonicera japonica - honeysuckle	H
Erodium spp - crowfoot	M F	Lycium ferocissimum - african box-thorn	M
Erythrina spp - coral tree	H	Macfadyena unguis-cati - cats-claw creeper	N
Erythroxyllum coca - coco leaf	M	Macrozamia spp - burrawang	N
Eucalyptus albens - white box	M F	Maireana spp - blue bush	M
Eucalyptus cladocalyx - sugar gum	T	Malva parviflora - marshmallow	L
Eucalyptus melliodora - yellow box	M R	Malvella leprosa - ivy-leaf sida	M
Eucalyptus polyanthemus - red box	M F	Marrubium vulgare - horehound	H F
Eucalyptus populnea - bimbale box	L	Medicago falcata - yellow-flowered lucerne	H
Euphorbia helioscopia - spurge	N	Medicago sativa - lucerne	H
Euphorbia heterophylla - milkweed	N	Melia azedarach - white cedar	M
Euphorbia lathyris - caper spurge	N	Melianthus comosus - tufted honerflower	N
Euphorbia pulcherrima - poinsettia	T	Melilotus albus - bokhara clover	M
Euphorbia terracina - geraldton carnation	T	Muehlenbeckia cunninghamii - lignum	H
Foeniculum vulgare - fennel	M	Myagrum perfoliatum - mitre cress	H
Froelichia floridana - cottontails	M	Nassella neesiana - chilean needle gress	M
Galenia pubescens - galenia	M	Nassella trichotoma - serrated tussock	M R
Gastrolobium grandiflorum - desert poison bush	T	Nerium oleander - oleander	T
Gaura parviflora - clockweed	M	Nicandra physalodes - apple of peru	M F
Geijera parviflora - wilga	L	Nicotiana glauca - tree tobacco	M
Gelsemium sempervirens - yellow jasmine	T	Olea europaea - olive	M
Genista linifolia - flax-leaved broom	H	Olearia elliptica - australian daisy	M
Genista monspessulana - canary broom	H	Onopordum acanthium - scotch thistle	M
Gleditsia triacanthos - honey locust tree	H	Onopordum acaulon - stemless thistle	M F
Gloriosa superba - glory lily	T	Onopordum illyricum - illyrian thistle	M F
Gnaphalium spp - cudweed	L	Opuntia inermis - prickly pear	L
Gomphocarpus fruticosa - narrow-leaf cotton bush	N	Opuntia stricta - common prickly pear	L
Gomphocarpus physocarpus - balloon cotton bush	N	Owenia acidula - gruie	H
Gorteria personata	H	Oxalis latifolia - oxalis	L
Haloragis aspera	H	Oxalis pes-caprae - soursob	M
Heliotropium amplexicaule - blue heliotrope	T	Papaver somniferum - opium poppy	L
Heliotropium europaeum - common heliotrope	L	Parthenium hysterophorus - parthenium weed	M
Helleborus niger - christmas rose	T	Peganum harmala - african rue	N
Heterodendrum oleifolium - rosewood	H	Pennisetum macrourum - african feather grass	M R
Hibiscus trionum - bladder ketmia	M	Pennisetum villosum - long-style feather grass	M R
Hirschfeldia incana - buehan weed	M R	Pentzia suffruticosa - calomba daisy	L
Homeria spp - cape tulips	L	Persicaria spp - smart weed	M
Hordeum leporinum - barley grass	M	Phalaris minor - lesser canary grass	H
Hydrangea spp	L	Phragmites australis - common reed	M F
Hyparrhenia hirta - coolatai grass	H	Phyla canescens - lippia	L
Hypericum androsaemum - tutsan	L	Physalis virginiana - perennial ground cherry	L
Hypericum perforatum - st johns sort	L T	Physalis viscosa - prarie ground cherry	M F
Hypericum tetrapterum - st peters wort	M	Phytolacca octandra - inkweed	M
Hypericum triquetrifolium - tangled hypericum	M	Pimelea curviflora - pimelia, desert rice bush	N
Hypochaeris radicata - cats ear	F	Pinus radiata - radiata pine	H
Ibicella lutea - devils claw	N	Poa labillardieri - poa tussock	M
Ilex spp - holly	L	Polygonum aviculare - wire weed	M
Imperata cylindrica - blady grass	H R	Portulaca oleracea - purslane	L
Ipomoea lonchophylla - cow vine	M	Proboscidea louisianica - devils claw	L
Ipomoea plebeia - bell vine	M	Prosopis juliflora - mesquite	H
Ipomoea purpurea - morning glory	H	Prunus persica - peach, plum	H
Ipomoea spp - weir vine	M	Pteridium esculentum - bracken	L Pd
Iva axillaris - poverty weed	M	Pyracantha spp - indian hawthorn	H
Jatropha curcas - physic nut	T	Raphanus raphanistrum - wild radish	M t
Juncus acutus - spiny rush	F	Rapistrum rugosum - turnip weed	H
Juncus spp - rushes	M F	Rhododendron spp	L
Kalanchoe tubiflora - mother of millions	T	Ricinus communis - caster oil plant	M
Laburnum spp	L	Robinia pseudoacacia - black locust	M
Lactuca serriola - prickly lettuce	H	Romulea rosea - guildford grass	M
Lantana camara spp	H	Rosa canina - dog rose	H
Lathyrus odoratus - sweet pea	T	Rosa rubiginosa - sweet briar	H
Laurel spp	M	Rubus fruticosus - blackberry	H
Lavandula stoechas - lavender	M	Rumex acetosella - sorrel	M
Lepidium spp - peppergrass	M F	Rumex brownii - swamp dock	L
Leucanthemum vulgare - ox-eye daisy	M	Rumex conglomeratus - clustered dock	L
Ligustrum lucidum - broad-leaf privet	H	Rumex crispus - curled dock	M
Ligustrum sinense - small-leaf privet	H	Rumex obtusifolius - broad-leaf dock	L
Linaria dalmatica - dalmation toad-flax	T	Rhododendron spp	L



Botanical name – Common name	*	Botanical name – Common name	*
Ricinus communis - castor oil plant	M	Solanum nigrum - blackberry nightshade	N
Robinia pseudoacacia - black locust	M	Solanum rostratum - buffalo burr	N
Romulea rosea - guildford grass	M	Soliva pterosperma - jo-jo	L
Rosa canina - dog rose	H	Sonchus spp - milk thistle	H
Rosa rubiginosa - sweet briar	H	Sorghum halepense - johnson grass	H
Rubus fruticosus - blackberry	H	Sorghum spp - silk forage sorghum	H
Rumex acetosella - sorrel	M	Sorghum x almum - columbus grass	H R
Rumex brownii - swamp dock	L	Sporobolus caroli - fairy grass	M F
Rumex conglomeratus - clustered dock	L	Sporobolus indicus - giant parramatta grass	M R
Rumex crispus - curled dock	M	Sporobolus pyramidalis - giant rats tail grass	M R
Rumex obtusifolius - broad-leaf dock	L	Stachys arvensis - stagger weed	M
Rumex pulcher - fiddle dock	M R	Stevia eupatoria - stevia	L
Salsola kali - soft roly poly	M	Stipa caudata - espartillo	M R
Salvia reflexa - mint weed	M	Stipa spp - spear grass	M R
Schinus spp - pepper tree	H	Swainsona spp - darling pea	T
Sclerolaena birchii - galvanised burr	M	Tagetes minuta - stinking roger	M
Sclerolaena muricata - black roly poly	M R	Taxus baccata - english yew	T
Scolymus hispanicus - golden thistle	M F	Thevetia peruviana - yellow oleander	T
Senecio jacobaea - ragwort	L	Thunbergia grandiflora - blue trumpet vine	M
Senecio madagascariensis - fireweed	H F	Toxicodendron radicans - poison ivy	L
Senecio pterophorus - african daisy	L	Toxicodendron succedaneum - rhus tree	M
Senecio quadridentatus - cotton fireweed	H	Trema aspera - peach leaf poison bush	T
Senecio vulgaris - common groundsel	H	Tribulus terrestris - caltrop	M
Senna artemisioides - silver cassia	L	Trifolium spp - clovers	M F
Senna barclayana - pepper-leaved senna	M	Typha spp - cumbungi	M
Sida acuta - spiny-head sida	M R	Ulex europaeus - gorse	H
Sida cordifolia - flannel weed	M	Urochloa panicoides - liverseed grass	H
Sida rhombifolia - paddys lucerne	H	Urtica incisa - scrub nettle	L
Silene vulgaris - bladder campion	N	Urtica spp - stinging nettle	L
Silybum marianum - variegated thistle	H	Ventilago viminalis - supplejack	H
Sisymbrium officinale - hedge mustard	H F	Verbascum thapsus - aarons rod, great mullein	H F
Solanum carolinense - carolina horse nettle	L	Verbena spp - verbena	H F
Solanum cinereum - narra burr	N	Verbena tenuisecta - maynes pest	H
Solanum elaeagnifolium - silverleaf nightshade	M	Watsonia bulbifera - watsonia	M R
Solanum hermannii - apple of sodom	N	Xanthium occidentale - noogoora burr	T
Solanum laciniatum - kangaroo apple	N	Xanthium orientale - californian burr	T
Solanum marginatum - white-edge nightshade	N	Xanthium spinosum - bathurst burr	L
Solanum mauritianum - wild tobacco tree	M	Zantedeschia aethiopica - arum lily	N

\* palatability: where T = toxic; N = nil (not eaten); L = low palatability; M = moderate palatability; H = high palatability and F = eaten at flowering; R = recent growth, regrowth; Pd = physical damage caused by goats

Grazing impact is a result of plant selection (palatability or aversion) rather than plant availability so that Table 1 directly assists grazing management while the genera listing helps our understanding of palatability, toxicity, and the theory of aversion (Provenza, 1996).

These are indications of potential toxicity only, and not all of these are applicable to goats, who have a remarkable digestive system. Many plants are found as garden refuse, and fed to livestock as a "treat", while others are found naturally in grazing areas.

For further information see: "The Potential Palatability and Toxicity of Australian Weeds to Goats". Simmonds, Holst and Bourke. This also includes new information on palatability to goats of many more weeds.

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