

Taxon: <i>Medicago polymorpha</i> L.	Family: Fabaceae
Common Name(s): bur medic bur trefoil California bur-clover hairy medic rough medic toothed bur-clover toothed medic toothed medick trefoil-clover	Synonym(s): <i>Medicago denticulata</i> Willd. <i>Medicago hispida</i> Gaertn.

Assessor: Chuck Chimera	Status: Assessor Approved	End Date: 26 Jul 2021
WRA Score: 19.0	Designation: H(HPWRA)	Rating: High Risk

Keywords: Annual Herb, Disturbance Weed, Spiny Pods, Self-Seeds, Animal-Dispersed

Qsn #	Question	Answer Option	Answer
101	Is the species highly domesticated?	y=-3, n=0	n
102	Has the species become naturalized where grown?		
103	Does the species have weedy races?		
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
202	Quality of climate match data	(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)	y=1, n=0	y
204	Native or naturalized in regions with tropical or subtropical climates	y=1, n=0	y
205	Does the species have a history of repeated introductions outside its natural range?	y=-2, ?=-1, n=0	y
301	Naturalized beyond native range	y = 1*multiplier (see Appendix 2), n= question 205	y
302	Garden/amenity/disturbance weed	n=0, y = 1*multiplier (see Appendix 2)	y
303	Agricultural/forestry/horticultural weed		
304	Environmental weed		
305	Congeneric weed	n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs	y=1, n=0	y
402	Allelopathic		
403	Parasitic	y=1, n=0	n

Qsn #	Question	Answer Option	Answer
404	Unpalatable to grazing animals	y=1, n=-1	n
405	Toxic to animals		
406	Host for recognized pests and pathogens		
407	Causes allergies or is otherwise toxic to humans	y=1, n=0	n
408	Creates a fire hazard in natural ecosystems	y=1, n=0	n
409	Is a shade tolerant plant at some stage of its life cycle	y=1, n=0	y
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y=1, n=0	y
411	Climbing or smothering growth habit	y=1, n=0	n
412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally		
604	Self-compatible or apomictic	y=1, n=-1	y
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	1
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	y
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	y
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	y
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	y
801	Prolific seed production (>1000/m ²)		
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	y
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)		

Supporting Data:

Qsn #	Question	Answer
101	Is the species highly domesticated?	n
	Source(s)	Notes
	Prosperi, J. M., Auricht, G., Génier, G., & Johnson, R. (2001). <i>Medics (Medicago L.)</i> . In <i>Plant Genetic Resources of Legumes in the Mediterranean</i> (pp. 99-114). Springer, Dordrecht.	[Cultivars exist, but no evidence that any are highly domesticated] "Several cultivars of this species are commercially available. They are early maturing and relatively susceptible to cold conditions. New varieties with improved winter-hardiness are under selection (France, USA)."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Cultivated, but not domesticated] "Native to Europe and temperate Asia to China and Japan, also in northern India, widely cultivated as a fodder plant"

102	Has the species become naturalized where grown?	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	NA

103	Does the species have weedy races?	
	Source(s)	Notes
	WRA Specialist. (2021). Personal Communication	NA

201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"	High
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Europe and temperate Asia to China and Japan, also in northern India, widely cultivated as a fodder plant; in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0-1,220 m, on Kaua' i, O'ahu, Lana'i, Maui, and Hawai'i."

202	Quality of climate match data	High
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Europe and temperate Asia to China and Japan, also in northern India, widely cultivated as a fodder plant; in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0-1,220 m, on Kaua' i, O'ahu, Lana'i, Maui, and Hawai'i."

203	Broad climate suitability (environmental versatility)	y
	Source(s)	Notes

Qsn #	Question	Answer
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>M. polymorpha</i> occupies a very wide range of habitats and climatic zones and therefore associates with many other species of plants, some of which often have a similar Mediterranean origin. Environmental requirements: <i>M. polymorpha</i> is widely distributed around the Mediterranean and tolerates a wide variety of habitats. It is well adapted to neutral and slightly acid soils, to altitudes of 10 to 900 m or more, and to annual rainfall from 100 to 800 mm. (Hannachi et al., 1998). The species is also widespread where it has been introduced to other countries with similar climates – Australia, Chile, South Africa and the United States. As Graziano et al. (2010) say 'it is now found over a remarkable range of bioclimatic and soil conditions'."
	Hardiness.zone. (2021). <i>Medicago polymorpha</i> . https://hardiness.zone/plant/?sle=Medicago&art=polymorpha . [Accessed 20 Jul 2021]	" <i>Medicago polymorpha</i> is a annual in the Fabaceae family. It's registered as winter hardy at USDA zone 5 and higher. It typically grows around 20 cm tall. The origin of this species is Europe."
	Reedy, A. (2021). Center for Maunakea Stewardship. Pers. Comm. 20 July	[Collected at ca. 2800 meters elevation, Hawaii Island] "We recently found a live specimen of what appears to be <i>Medicago polymorpha</i> growing in our restoration area near the Visitor Information Station on Maunakea."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Occurs in regions with temperate to tropical climates, and over 1000 m elevation range in the Hawaiian Islands] "Native to Europe and temperate Asia to China and Japan, also in northern India, widely cultivated as a fodder plant; in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0-1,220 m, on Kaua' i, O'ahu, Lana'i, Maui, and Hawai'i."

204	Native or naturalized in regions with tropical or subtropical climates	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Europe and temperate Asia to China and Japan, also in northern India, widely cultivated as a fodder plant; in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0-1,220 m, on Kaua' i, O'ahu, Lana'i, Maui, and Hawai'i."

205	Does the species have a history of repeated introductions outside its natural range?	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Europe and temperate Asia to China and Japan, also in northern India, widely cultivated as a fodder plant; in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0-1,220 m, on Kaua' i, O'ahu, Lana'i, Maui, and Hawai'i."

301	Naturalized beyond native range	y
	Source(s)	Notes

Qsn #	Question	Answer
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0-1,220 m, on Kaua' i, O'ahu, Lana'i, Maui, and Hawai'i. First collected on O'ahu in 1909 (Forbes s.n., BISH). A collection was made 4 months later on Hawai'i (Rock 3199, BISH), which would indicate a probable introduction date earlier than 1909.-"
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 20 Jul 2021]	"Naturalized Africa MACARONESIA: Portugal [Azores] SOUTHERN AFRICA: South Africa Asia-Tropical INDIAN SUBCONTINENT: India, Pakistan INDO-CHINA: Vietnam Australasia AUSTRALIA: Australia Europe MIDDLE EUROPE: Czechoslovakia, Belgium, Switzerland, Hungary, Netherlands Northern America REGION: United States Southern America CENTRAL AMERICA: Costa Rica, Guatemala BRAZIL: Brazil (s.) WESTERN SOUTH AMERICA: Ecuador, Peru SOUTHERN SOUTH AMERICA: Argentina (e.-c.), Chile, Uruguay"
	Shannon, R. K. & Wagner, W. L. (1996). New records of Hawaiian flowering plants primarily from the United States National Herbarium. Bishop Museum Occasional Papers. 46: 13-15	[Molokai] "Medicago polymorpha L. New island record The following collection represents a new island record of this species for Moloka'i. It was previously known from Kaua'i, O'ahu, Lana'i, Maui, and Hawai'i (Wagner et al. 1990: 684). Material examined. MOLOKA'I: Ho'olehua, in waste field, not uncommon, 4 Apr 1928, Degener 3514 (US)."

302	Garden/amenity/disturbance weed	y
	Source(s)	Notes
	Brisbane City Council. (2021). Weed identification Tool - Burr Medic - <i>Medicago polymorpha</i> . https://weeds.brisbane.qld.gov.au/ . [Accessed 26 Jul 2021]	"A common weed of crops, pastures, riparian vegetation, revegetation areas, roadsides, disturbed sites, waste areas, parks, footpaths, gardens, lawns and other turfed areas."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0-1,220 m, on Kaua' i, O'ahu, Lana'i, Maui, and Hawai'i. First collected on O'ahu in 1909 (Forbes s.n., BISH)."

Qsn #	Question	Answer
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[A disturbance weed that may negatively affect agriculture or the natural environment] "Where <i>M. polymorpha</i> has been introduced, as in California, it occurs in a wide variety of 'disturbed' sites, including lawns and turf, roadsides, fields, grasslands, pastures, agricultural sites (UC IPM, 2013); Parker and Gilbert (2007) noted that it was invasive and one of the commonest legumes in coastal Californian prairies. In Hawaii it is 'naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides and vacant lots, 0-1220 m [altitude?]' (Wagner et al., 1999, cited in PIER, 2013). In Australia it is found in a wide variety of vegetation communities ranging from open grasslands to shrublands and woodlands, and grows on a wide range of soils, but does best in alkaline soils, growing most prolifically on heavy clays (Department of Primary Industries, Victoria, 2013). In Chile it is distributed over a remarkable range of bioclimatic and soil conditions throughout the Mediterranean-climate region of the country (Poza et al., 1989, quoted in Paredes et al., 2002)."
	WRA Specialist. (2021). Personal Communication	Although regarded as a weed of agriculture, it is also valued as a N-fixing fodder plant, and impacts to agriculture have generally not been quantifiably demonstrated. This plant is adapted to disturbance, and may be regarded as a nuisance in human-altered environments.

303	Agricultural/forestry/horticultural weed	
	Source(s)	Notes
	Brisbane City Council. (2021). Weed identification Tool - Burr Medic - <i>Medicago polymorpha</i> . https://weeds.brisbane.qld.gov.au/ . [Accessed 26 Jul 2021]	"A common weed of crops, pastures, riparian vegetation, revegetation areas, roadsides, disturbed sites, waste areas, parks, footpaths, gardens, lawns and other turfed areas."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Weed of: Cereals, Grapevines, Orchards & Plantations, Pastures, Pome Fruits, Potatoes, Vegetables"

Qsn #	Question	Answer
	<p>CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: <i>Invasive Species Compendium</i>. Wallingford, UK: CAB International. www.cabi.org/isc</p>	<p>[Both valued as a fodder, and potentially negatively impacting wool production, flax production and health of grazing livestock] "As mentioned in the 'Means of Movement and Dispersal' section, the burrs of <i>M. polymorpha</i> cause serious degradation of the Australian wool clip and reduce its value – they are difficult to remove, and if they are broken up during carding, their coils tend to unwind into thin 'eyebrow' shaped pieces which are even more difficult to remove and can persist into the finished product (Australian Wool Testing Authority, 2002). At the same time in Australia and elsewhere – Chile (Poza et al., 2002a,b), Sicily (Graziano et al., 2010), Tunisia (Hannachi et al., 1998), Syria (Ehrman and Cocks, 1990) – the species is seen as a valuable self-sustaining, nitrogen-fixing addition to pastures for grazing animals, and the search for better cultivars is continuing. In Australia at least three cultivars (Circle Valley, Serena and Santiago) have been commercially produced (Hannachi et al., 1998). However these cultivars have shown poor adaptability to real Mediterranean environments (Graziano et al., 2010). Chile has also produced its own cultivar of <i>M. polymorpha</i> suitable for the arid, semiarid and subhumid Mediterranean zones of Chile (Poza et al., 2001). In an article on the Russian Steppe, Boonman and Mikhalev (2005) say: 'Although it is well eaten, <i>M. polymorpha</i> can be a most harmful plant because the pods spoil the wool. It can be suppressed by hard and prolonged grazing. Herbicides are also effective.' In Egypt, <i>M. polymorpha</i> apparently 'causes great damage to flax production' (Hozayn et al., 2010). According to Howie et al. (2007) <i>M. polymorpha</i> can cause photosensitisation in horses, occasionally red gut in sheep, and bloat in cattle. Phytoestrogens/coumestrols can potentially have negative effects on the reproduction of grazing livestock but this is rarely reported (levels tend to be higher under conditions of phosphorus deficiency and <i>Phoma</i> infection)."</p>

304	Environmental weed	
	Source(s)	Notes
	<p>Queensland Government. (2021). Weeds of Australia. <i>Medicago polymorpha</i>. https://keyserver.lucidcentral.org/weeds. [Accessed 26 Jul 2021]</p>	<p>"Burr medic (<i>Medicago polymorpha</i>) is regarded as an environmental weed in Victoria, New South Wales and Western Australia" [Impacts not specified on this site]</p>
	<p>Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.</p>	<p>"in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0-1,220 m"</p>
	<p>Brisbane City Council. (2021). Weed identification Tool - Burr Medic - <i>Medicago polymorpha</i>. https://weeds.brisbane.qld.gov.au/. [Accessed 26 Jul 2021]</p>	<p>[Although categorized as an environmental weed, habitat and impacts appear to be most prevalent in human-disturbed and modified sites] "A common weed of crops, pastures, riparian vegetation, revegetation areas, roadsides, disturbed sites, waste areas, parks, footpaths, gardens, lawns and other turfed areas." ... "Burr medic (<i>Medicago polymorpha</i>) is regarded as an environmental weed in Victoria, New South Wales and Western Australia."</p>

Qsn #	Question	Answer
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Valued for fodder, but may be a nuisance in some locations or agricultural industries] " <i>Medicago polymorpha</i> is a herbaceous legume that is native to western and central Asia and countries around the Mediterranean, and has been introduced widely around the world. It is found in particular in regions with a Mediterranean climate, but is by no means confined to them. Introduction has been a result of accidental transport of the spiny seed pods and probably also of deliberate introduction as a fodder plant; the relative importance of these two means of spread cannot be determined. The species can be a useful pasture plant, in particular because of its nitrogen-fixing ability, but in other places it is considered to be an invasive weed; it can sometimes be toxic to livestock, and the seed pods can be a serious contaminant of wool."

305	Congeneric weed	y
	Source(s)	Notes
	Canadian Food Inspection Agency. (2012). The Biology of <i>Medicago sativa</i> L. (Alfalfa). Biology Document Bio2005-02. http://www.inspection.gc.ca . [Accessed 26 Jul 2021]	"While alfalfa is a highly adaptable plant species, <i>M. sativa</i> is not listed as a noxious weed in the Weed Seeds Order (1986). In managed ecosystems, alfalfa does not effectively compete with cultivated plants, nor is it recorded as being invasive of natural ecosystems. There is no evidence in Canada that <i>M. sativa</i> has weed or pest characteristics."
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	[<i>Medicago sativa</i>] "Weed of: Cereals, Grapevines, Orchards & Plantations, Pastures, Vegetables"

401	Produces spines, thorns or burrs	y
	Source(s)	Notes
	Prosperi, J. M., Auricht, G., Génier, G., & Johnson, R. (2001). Medics (<i>Medicago</i> L.). In Plant Genetic Resources of Legumes in the Mediterranean (pp. 99-114). Springer, Dordrecht.	[A spiny form occurs in Hawaii] "As its name implies, it is the most polymorphic of the medic species. Spineless forms occur. The spiny pods represent a significant problem to wool producers by way of vegetable faults in wool clips."
	Wagner, W.L., Herbst, D.R. & Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Unarmed plants. Pods with prickles] "Annual herbs; stems prostrate, up to 4 dm long, branched, subglabrous, with a few long hairs on petiolules, lower surface of leaflets, and calyx. Leaflets obovate-cuneate, 7-25 mm long, 5-23 mm wide, glabrate, margins dentate in upper half, apex rounded to truncate or emarginate, stipules narrowly elliptic to narrowly ovate, laciniate. Flowers (1-) 3-5 (-8) in racemes; corolla yellow, 3-4.5 mm long. Pods 4-8 (-10) mm in diameter, spirally twisted in (1.5-) 3-4 (-6) turns, glabrous or subglabrous, transverse veins prominent, anastomosing, groove between submarginal and marginal vein wide, with nearly straight prickles 2-3 mm long, arising from the submarginal and marginal veins. Seeds several" narrowly elliptic to narrowly ovate, laciniate.

402	Allelopathic	
	Source(s)	Notes

Qsn #	Question	Answer
	Mustafa, G., Ali, A., Ali, S., Barbanti, L., & Ahmad, M. (2019). Evaluation of dominant allelopathic weed through examining the allelopathic effects of four weeds on germination and seedling growth of six crops. <i>Pakistan Journal of Botany</i> , 51(1), 269-278	[Extracts exhibit allelopathic effects] "Present experiment demonstrated the allelopathic effects of <i>Melilotus indica</i> , <i>Medicago polymorpha</i> , <i>Elusine indica</i> and <i>Fumaria indica</i> on germination, radicle and hypocotyl growth of six crops, namely <i>Triticum aestivum</i> , <i>Hordeum vulgare</i> , <i>Medicago sativa</i> , <i>Trifolium</i> spp., <i>Raphanus sativus</i> and <i>Trigonella foenum-graecum</i> . All examined parameters showed pronounced poor growth under leaf aqueous extracts of different donor species, whereas <i>Melilotus indica</i> proved a stronger allelopathic weed species as its plant parts can also be used directly in assessing the allelopathic activity in weed control system. In present investigation, selected donor plants, especially <i>M. indica</i> , showed a promising future in terms of their allelopathic potential, which must be further studied for their selective behavior on particular crops for the development of bio-herbicides in weed management program."

403	Parasitic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual herbs; stems prostrate, up to 4 dm long, branched, subglabrous, with a few long hairs on petiolules, lower surface of leaflets, and calyx." [Not parasitic]

404	Unpalatable to grazing animals	n
	Source(s)	Notes
	DiTomaso, J. (2007). <i>Weeds of California and Other Western States</i> . 2 Volumes. UCANR Publications, Oakland, CA	"Both species are good livestock forage and are sometimes cultivated for pasture or as a cover crop. However, the prickly fruits of California burclover can entangle the wool of sheep and lower its value."
	Abbasi, A. M., Shah, M. H., & Khan, M. A. (2015). <i>Wild edible vegetables of lesser Himalayas</i> . Ethnobotanical and Nutraceutical Aspects, Volume 1. Springer International Publishing, Cham, Switzerland	"Ethnobotanical uses: Young leaves cooked in water as vegetable. Aerial parts are also used as fodder. Medicinal uses: Fresh leaves are cooked in water and taken orally against constipation and indigestion."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Europe and temperate Asia to China and Japan, also in northern India, widely cultivated as a fodder plant"

405	Toxic to animals	
	Source(s)	Notes
	Western Australian Herbarium (1998–2021). <i>FloraBase—the Western Australian Flora</i> . Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 26 Jul 2021]	"Toxicity. Occasionally toxic to livestock."

Qsn #	Question	Answer
	McKenzie, R. (2020). Australia's Poisonous Plants, Fungi and Cyanobacteria: A Guide to Species of Medical and Veterinary Importance. CSIRO Publishing, Clayton South, VIC	[Medicago genus implicated in photosensitisation] "Toxin: An unidentified toxin causing photosensitisation Toxic parts of the plant: Leaves and stems Animals affected: Sheep are the usual victims of photosensitisation, but cases have happened in pigs, cattle and horses. Ruminants may bloat. Conditions of poisoning: 'Trefoil dermatitis' or 'aphis disease' (photosensitisation of uncertain type) occur occasionally when animals graze large amounts of lush plants in spring, but these plants are usually non-poisonous valuable pasture species. In some, but not all, cases the plants involved have been heavily infested by aphids (sap-sucking insects), and there is some evidence that the aphids themselves can produce the photosensitisation when eaten. Bloat may occur in ruminants grazing lush plants. Toxic dose: Not measured, but it is presumed that large intakes are needed."
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Potential phytosensitization] "According to Howie et al. (2007)M. polymorpha can cause photosensitisation in horses, occasionally red gut in sheep, and bloat in cattle. Phytoestrogens/coumestrols can potentially have negative effects on the reproduction of grazing livestock but this is rarely reported (levels tend to be higher under conditions of phosphorus deficiency and Phoma infection)."

406	Host for recognized pests and pathogens	
	Source(s)	Notes
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"Major pests of M. polymorpha in Australia listed by Howie et al. (2007) are: redlegged earth mite (<i>Halotydeus destructor</i>), lucerne flea (<i>Sminthurus viridis</i>), bluegreen aphid (<i>Acyrtosiphon kondoi</i>), cowpea aphid (<i>Aphis craccivora</i>), spotted alfalfa aphid (<i>Therioaphis trifolii</i>), sitona weevil (<i>Sitonadiscoideus</i>) and the root lesion nematode <i>Pratylenchus neglectus</i> . Major diseases are phoma black-stem (<i>Phoma medicaginis</i>), rhizoctonia bare-patch (<i>Rhizoctonia solani</i> [<i>Thanatephorus cucumeris</i>]) and powdery mildew (<i>Erysiphe trifolii</i>). <i>Uromyces ciceris-arietini</i> (chickpea rust) (Stuteville et al., 2013), <i>U. pisi-sativi</i> (Storey, 2013), and <i>U. anthyllidis</i> (Landcare Research, 2013) have also been recorded as infesting M. polymorpha."

407	Causes allergies or is otherwise toxic to humans	n
	Source(s)	Notes
	McKenzie, R. (2020). Australia's Poisonous Plants, Fungi and Cyanobacteria: A Guide to Species of Medical and Veterinary Importance. CSIRO Publishing, Clayton South, VIC	[Potentially to animals, but risk to humans would be minimal or non-existent] "Animals affected: Sheep are the usual victims of photosensitisation, but cases have happened in pigs, cattle and horses. Ruminants may bloat."

408	Creates a fire hazard in natural ecosystems	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[No evidence. Annual, prostrate herb unlikely to contribute to fuel load or increase fire risk] "Annual herbs; stems prostrate, up to 4 dm long, branched, subglabrous, with a few long hairs on petiolules, lower surface of leaflets, and calyx."

Qsn #	Question	Answer
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	Not listed among potential risks or impacts

409	Is a shade tolerant plant at some stage of its life cycle	y
	Source(s)	Notes
	Clark, S. (2014). Plant guide for bur clover (<i>Medicago polymorpha</i> L.) USDA-Natural Resources Conservation Service, Big Flats Plant Materials Center, Corning, New York	"Bur clover is most adapted to heavy loams but will survive in a wide range of soil types. It inhabits all exposures and grows well under light conditions varying from full sunlight to heavy shade (Graziano et al., 2010). It is a common volunteer in the understory's of California orchards, including walnut, which are heavily shaded from April to November (SAREP, 2013)."

410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)	y
	Source(s)	Notes
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" As Graziano et al. (2010) say 'it is now found over a remarkable range of bioclimatic and soil conditions'."
	Pastures Australia. (2007). <i>Medicago polymorpha</i> var. <i>brevispina</i> . https://keys.lucidcentral.org/keys/v3/pastures/Html/Spinless_burr_medicago.htm . [Accessed 23 Jul 2021]	"Adapted to a range of soil types from sandy loams to clays of moderate fertility. Prefers mildly acid to alkaline soils (pHwater > 5.6, pHCa > 4.8). Tolerant of transient waterlogging and/or moderate salinity (ECe up to 8 dS/m)."

411	Climbing or smothering growth habit	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual herbs; stems prostrate, up to 4 dm long, branched, subglabrous, with a few long hairs on petiolules, lower surface of leaflets, and calyx."

412	Forms dense thickets	n
	Source(s)	Notes
	Wagner, L., & Spira, T. (1994). Germination, Recruitment and Survival in the Weedy Annual <i>Medicago polymorpha</i> in Successive Wet and Dry Years. <i>The American Midland Naturalist</i> , 131(1), 98-108	"in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0-1,220 m" [No evidence]
	Clark, S. (2014). Plant guide for bur clover (<i>Medicago polymorpha</i> L.) USDA-Natural Resources Conservation Service, Big Flats Plant Materials Center, Corning, New York	"It is very prostrate, but if in dense stands may become erect." [Cultivated in dense stands]

Qsn #	Question	Answer
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[No evidence] " <i>Medicago polymorpha</i> is a herbaceous legume that is native to western and central Asia and countries around the Mediterranean, and has been introduced widely around the world. It is found in particular in regions with a Mediterranean climate, but is by no means confined to them. Introduction has been a result of accidental transport of the spiny seed pods and probably also of deliberate introduction as a fodder plant; the relative importance of these two means of spread cannot be determined. The species can be a useful pasture plant, in particular because of its nitrogen-fixing ability, but in other places it is considered to be an invasive weed; it can sometimes be toxic to livestock, and the seed pods can be a serious contaminant of wool."

501	Aquatic	n
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	[Terrestrial] "in Hawai'i naturalized in open, dry to occasionally mesic, disturbed areas such as pastures, roadsides, and vacant lots, 0 -1,220 m"

502	Grass	n
	Source(s)	Notes
	USDA, Agricultural Research Service, National Plant Germplasm System. (2021). Germplasm Resources Information Network (GRIN-Taxonomy). National Germplasm Resources Laboratory, Beltsville, Maryland. https://npgsweb.ars-grin.gov/ . [Accessed 20 Jul 2021]	Family: Fabaceae (alt. Leguminosae) Subfamily: Faboideae Tribe: Trifolieae

503	Nitrogen fixing woody plant	n
	Source(s)	Notes
	DiTomaso, J. (2007). Weeds of California and Other Western States. 2 Volumes. UCANR Publications, Oakland, CA	[Nitrogen-fixing herb] "Roots and Underground Structures: Taproots slender, usually with many fine laterals that form a dense mat. Roots associate with nitrogen-fixing bacteria."

504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	n
	Source(s)	Notes
	DiTomaso, J. (2007). Weeds of California and Other Western States. 2 Volumes. UCANR Publications, Oakland, CA	"Roots and Underground Structures: Taproots slender, usually with many fine laterals that form a dense mat. Roots associate with nitrogen-fixing bacteria."

601	Evidence of substantial reproductive failure in native habitat	n
	Source(s)	Notes

Qsn #	Question	Answer
	Prosperi, J. M., Auricht, G., Génier, G., & Johnson, R. (2001). <i>Medics (Medicago L.)</i> . In <i>Plant Genetic Resources of Legumes in the Mediterranean</i> (pp. 99-114). Springer, Dordrecht.	[No evidence] "Species with a wide distribution and frequently occurring, for example <i>M. polymorpha</i> , <i>M. truncatula</i> , <i>M. orbicularis</i> , <i>M. minima</i> and <i>M. lupulina</i> . These species can be qualified as colonisers. They have all been introduced unintentionally to Australia (Cocks et al. 1980), are widely adapted and represent an important source of variability and genetic diversity."

602	Produces viable seed	Y
	Source(s)	Notes
	Wagner, L., & Spira, T. (1994). Germination, Recruitment and Survival in the Weedy Annual <i>Medicago polymorpha</i> in Successive Wet and Dry Years. <i>The American Midland Naturalist</i> , 131(1), 98-108	"Germination, establishment and survival in <i>Medicago polymorpha</i> , a weedy winter annual, were studied during 2 successive seasons in California. Seeds were dormant when produced in spring and remained largely dormant following exposure to summer conditions. Approximately 40% of viable seeds in the seed bank were carried over from year to year. Consequently, autumn recruitment of seedlings is due in large part to germination of seeds produced in previous years. Seedling emergence was mostly simultaneous following the first substantial autumn rains. Survival to reproduction differed between years; few individuals produced seeds prior to senescence in the dry year, whereas in the wet year most overwintering individuals successfully produced fruits."
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). <i>Manual of the flowering plants of Hawaii</i> . Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Pods 4-8(-10) mm in diameter, spirally twisted in (1.5-)3-4(-6) turns, glabrous or subglabrous, transverse veins prominent, anastomosing, groove between submarginal and marginal vein wide, with nearly straight prickles 2-3 mm long, arising from the submarginal and marginal veins. Seeds several."
	DiTomaso, J. (2007). <i>Weeds of California and Other Western States</i> . 2 Volumes. UCANR Publications, Oakland, CA	"Reproduce by seed. Flowers and fruits develop continuously throughout the growing season. Fruits disperse with water, soil movement, animals, and human activities. Seeds also disperse as commercial seed contaminants. Seeds are hard-coated and can survive many years under field conditions."

603	Hybridizes naturally	
	Source(s)	Notes

Qsn #	Question	Answer
	Hosseini, M. N. (2000). Regeneration and interspecific hybridization in annual <i>Medicago</i> species. Iranian Journal of Rangelands and Forests Plant Breeding and Genetic Research 3: 33-62	[Unknown. Artificial hybrids created] "When and at which stage in Medics' flowers, pollen grains may grow and fertilize the pistil? How the fragile flowers of medics may be emasculated for inter and intra-specific hybridization, with high percentage of success? This study was carried out to answer these questions. To find the exact time of pollen maturation and their fertility, the flowers of two species of medics, <i>Medicago polymorpha</i> and <i>M. rigidula</i> were visited at various sizes. And stages Pollen sacs were removed and cultured on agar based media. The best size of the flowers for emasculation before self fertilization was recognized for the two species. This size was about the stage before the tip of the standard petal past its calyx teeth. To emasculate the flowers on the mentioned stage, various density of ethilic alcohol, suction pump, surgical blade and fine/ needle were used. The best method to emasculate the flowers was opening the flowers through standard petal by surgical blade and removing the pollen sacs by suction pump or fine needle. After hybridization, to cover the fragile emasculated flowers to keep them fresh and moist, a glass tube was used, instead of paper bag, for 15 days at 25 degree of centigrade. "

604	Self-compatible or apomictic	y
	Source(s)	Notes
	Prosperi, J. M., Auricht, G., Génier, G., & Johnson, R. (2001). Medics (<i>Medicago</i> L.). In Plant Genetic Resources of Legumes in the Mediterranean (pp. 99-114). Springer, Dordrecht.	"Table 5.1. Different species of annual <i>Medicago</i> ." [<i>M. polymorpha</i> - Breeding System = Selfing]

605	Requires specialist pollinators	n
	Source(s)	Notes
	Lesins, K. A., & Lesins, I. (1979). Genus <i>Medicago</i> (Leguminosae): A Taxogenetic Study. Kluwer Boston, Inc.	"About two-thirds of <i>Medicago</i> species are annuals. They have the same tripping mechanism devised for cross-pollination by insects as their older, perennial relatives, but it is superfluous since they have all become self-pollinators."
	Small, E. (2011). Alfalfa and Relatives: Evolution and Classification of <i>Medicago</i> . NRC Research Press, Ottawa, Canada	"Small (1988) noted that the small flowers and pollen to ovule ratio (281) are consistent with <i>M. polymorpha</i> being largely self-pollinated and basically an inbreeder."

606	Reproduction by vegetative fragmentation	n
	Source(s)	Notes
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	" <i>M. polymorpha</i> is an annual or sometimes a biennial plant, reproducing entirely by seed."
	DiTomaso, J. (2007). Weeds of California and Other Western States. 2 Volumes. UCANR Publications, Oakland, CA	"Reproduce by seed. Flowers and fruits develop continuously throughout the growing season."

607	Minimum generative time (years)	1
-----	---------------------------------	---

Qsn #	Question	Answer
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Annual herbs; stems prostrate, up to 4 dm long, branched, subglabrous, with a few long hairs on petiolules, lower surface of leaflets, and calyx."
	Wu, Z. Y., P. H. Raven & D. Y. Hong, eds. (2010). Flora of China. Vol. 10 (Fabaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis	"Annual or biennial herbs, 20-90 cm."

701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y
	Source(s)	Notes
	Randall, R.P. (2017). A Global Compendium of Weeds. 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Animals, Cattle, Donkey, Horse, Livestock, Sheep, Vehicles, Water, Escapee"
	DiTomaso, J. (2007). Weeds of California and Other Western States. 2 Volumes. UCANR Publications, Oakland, CA	"Fruits disperse with water, soil movement, animals, and human activities. Seeds also disperse as commercial seed contaminants. Seeds are hard-coated and can survive many years under field conditions."

702	Propagules dispersed intentionally by people	y
	Source(s)	Notes
	Wagner, W.L., Herbst, D.R.& Sohmer, S.H. (1999). Manual of the flowering plants of Hawaii. Revised edition. University of Hawai'i Press and Bishop Museum Press, Honolulu, HI.	"Native to Europe and temperate Asia to China and Japan, also in northern India, widely cultivated as a fodder plant"

Qsn #	Question	Answer
703	Propagules likely to disperse as a produce contaminant	y
	Source(s)	Notes
	DiTomaso, J. (2007). Weeds of California and Other Western States. 2 Volumes. UCANR Publications, Oakland, CA	"Fruits disperse with water, soil movement, animals, and human activities. Seeds also disperse as commercial seed contaminants. Seeds are hard-coated and can survive many years under field conditions."
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"The hooked spines commonly, but not always, found on the fruits allow the entire burrs to adhere firmly to the wool of sheep or the hair of horses, American bison (<i>Bison bison</i> L.) (Constible et al., 2005) and other animals, and to the hair and clothes of humans. Their occurrence in sheep's wool in Australia is described by the Australian Wool Testing Authority (2002) as follows: 'Burr Medic is very common in Australian wools and is one of the most troublesome types to processors. Not only do its protruding spines catch in the wool, making them difficult to remove, but also, if broken up during carding, its coils tend to unwind into thin 'eyebrow' shaped pieces which are even more difficult to remove and can persist into the finished product'."
	Prosperi, J. M., Auricht, G., Génier, G., & Johnson, R. (2001). <i>Medics (Medicago L.)</i> . In <i>Plant Genetic Resources of Legumes in the Mediterranean</i> (pp. 99-114). Springer, Dordrecht.	[A contaminant of raw wool products] "As its name implies, it is the most polymorphic of the medic species. Spineless forms occur. The spiny pods represent a significant problem to wool producers by way of vegetable faults in wool clips."

704	Propagules adapted to wind dispersal	n
	Source(s)	Notes
	Randall, R.P. (2017). <i>A Global Compendium of Weeds</i> . 3rd Edition. Perth, Western Australia. R.P. Randall	"Dispersed by: Humans, Animals, Cattle, Donkey, Horse, Livestock, Sheep, Vehicles, Water, Escapee"
	DiTomaso, J. (2007). Weeds of California and Other Western States. 2 Volumes. UCANR Publications, Oakland, CA	"Fruits disperse with water, soil movement, animals, and human activities. Seeds also disperse as commercial seed contaminants. Seeds are hard-coated and can survive many years under field conditions."

705	Propagules water dispersed	y
	Source(s)	Notes
	DiTomaso, J. (2007). Weeds of California and Other Western States. 2 Volumes. UCANR Publications, Oakland, CA	"Fruits disperse with water, soil movement, animals, and human activities. Seeds also disperse as commercial seed contaminants. Seeds are hard-coated and can survive many years under field conditions."
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"The non-dehiscent fruits are relatively large and are unlikely to move far from the parent plant, except perhaps in flood waters."

706	Propagules bird dispersed	y
	Source(s)	Notes

Qsn #	Question	Answer
	Reynolds, C., Miranda, N., & Cumming, G. (2015). The role of waterbirds in the dispersal of aquatic alien and invasive species. <i>Diversity and Distributions</i> , 21(7/8), 744-754	"Field and laboratory feeding studies indicate that the propagules of alien plants and invertebrates remain viable after passage through the guts of waterbirds. Green et al. (2008) showed that three alien invasive plant species could survive gut passage and germinate: celery-leaved buttercup <i>Ranunculus sceleratus</i> ; bur clover <i>Medicago polymorpha</i> ; and oval-leaf knotweed <i>Polygonum arenstrum</i> . All three of these species are widespread and range expanding in Australia and are considered invasive in the United States of America."

707	Propagules dispersed by other animals (externally)	y
	Source(s)	Notes
	DiTomaso, J. (2007). <i>Weeds of California and Other Western States</i> . 2 Volumes. UCANR Publications, Oakland, CA	"Both species are good livestock forage and are sometimes cultivated for pasture or as a cover crop. However, the prickly fruits of California burclover can entangle the wool of sheep and lower its value."
	Prosperi, J. M., Auricht, G., Génier, G., & Johnson, R. (2001). <i>Medics (Medicago L.)</i> . In <i>Plant Genetic Resources of Legumes in the Mediterranean</i> (pp. 99-114). Springer, Dordrecht.	"The spiny pods represent a significant problem to wool producers by way of vegetable faults in wool clips."

708	Propagules survive passage through the gut	y
	Source(s)	Notes
	Reynolds, C., Miranda, N., & Cumming, G. (2015). The role of waterbirds in the dispersal of aquatic alien and invasive species. <i>Diversity and Distributions</i> , 21(7/8), 744-754	"Field and laboratory feeding studies indicate that the propagules of alien plants and invertebrates remain viable after passage through the guts of waterbirds. Green et al. (2008) showed that three alien invasive plant species could survive gut passage and germinate: celery-leaved buttercup <i>Ranunculus sceleratus</i> ; bur clover <i>Medicago polymorpha</i> ; and oval-leaf knotweed <i>Polygonum arenstrum</i> ."
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	"Green et al. (2008) found an apparently intact seed of <i>M. polymorpha</i> in the faeces of a black swan (<i>Cygnus atratus</i>). Seeds have also been found in cattle dung in Argentina (Vignolio and Fernández, 2010); they easily survive passage through horses (St John-Sweeting and Morris, 1990), and some pass unharmed through the guts of sheep, both in South Africa (Kotzéac et al., 1995) and in Australia (Edward et al., 1998)."

801	Prolific seed production (>1000/m2)	
	Source(s)	Notes
	Walsh, M. J., Groose, R. W., Obour, A. K., Claypool, D. A., Delaney, R. H., & Krall, J. M. (2013). Seed Persistence in Soil of Five Medic Cultivars in Southeastern Wyoming. <i>Crop Science</i> , 53(2), 674-678	[Certain cultivars may produce high seed densities in cultivation] "Our previous studies showed that the Australian cultivar Santiago and Laramie growing at the experimental site in Archer, WY, produced greater than 20,000 and 6000 viable seeds m ⁻² yr ⁻¹ , respectively (Walsh et al., 2001). With 60% of Laramie seed remaining viable after 3-yr of burial, this cultivar has the potential to regenerate sufficient plant densities required for productive medic pasture phase if used in a 2 to 3 yr rotation with a cereal crop."

Qsn #	Question	Answer
	Clark, S. (2014). Plant guide for bur clover (<i>Medicago polymorpha</i> L.) USDA-Natural Resources Conservation Service, Big Flats Plant Materials Center, Corning, New York	[High seed densities produced in cultivation] "Seeds are produced in round, coiled burs surrounded by spiny hooks, which can cling to animal coats, assisting seed distribution. There can be 3-11 seeds per bur and are separated by partitions. The seeds are 2-4 mm long and oval. The average seed yield in California is 300-500 lb/acre of hulled seeds (USDA Farmers Bulletin 693, 1915). The seed weight of 1 bushel of clean dry burs weighs 6-13 lbs and contains 2-4 lb of seed (USDA Farmers Bulletin 693, 1915). Depending on the cultivar being used, these characteristics can be variable."

802	Evidence that a persistent propagule bank is formed (>1 yr)	y
	Source(s)	Notes
	Wagner, L., & Spira, T. (1994). Germination, Recruitment and Survival in the Weedy Annual <i>Medicago polymorpha</i> in Successive Wet and Dry Years. <i>The American Midland Naturalist</i> , 131(1), 98-108	"A substantial dormant viable seed bank is carried over from year to year in <i>Medicago</i> , in which approximately 15-50% of seeds become germinable and germinate each year (Tables 2 and 3). Detailed analysis at the time of germination in 1982 showed that over half of the estimated viable seed pool germinated and became established, with just over 40% of viable seeds remaining dormant. Fewer than 5% of seeds produced in late spring were germinable by the following autumn, indicating that seedlings are frequently derived from seeds produced in previous seasons. Similar germination data have been reported for <i>Medicago polymorpha</i> in a Sierra foothill site (Young et al., 1981)."
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: <i>Invasive Species Compendium</i> . Wallingford, UK: CAB International. www.cabi.org/isc	"Although the plants of <i>M. polymorpha</i> themselves are short lived, 200 year-old viable seeds have been found on the surface of adobe bricks in Northern Mexico (Spira and Wagner, 1983). As these authors point out, the longevity of these seeds may have been favoured by the dry stable environment of adobe bricks, and reduced temperature fluctuation and microbial activity may also have played a part."
	Western Australian Herbarium (1998–2021). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 26 Jul 2021]	"Seedbank persistence. 5+ years."
	DiTomaso, J. (2007). <i>Weeds of California and Other Western States</i> . 2 Volumes. UCANR Publications, Oakland, CA	"Seeds are hard-coated and can survive many years under field conditions."

803	Well controlled by herbicides	y
	Source(s)	Notes

Qsn #	Question	Answer
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	"It is suggested in Florabase (Western Australian Herbarium, 2013) that as <i>M. polymorpha</i> in the Swan River area of Western Australia is relatively tolerant to glyphosate, instead clopyralid, metsulfuron or triasulfuron can be used as herbicides to give reasonably selective control, but their use must be repeated annually for several years. In California, isoxaben is suggested for the control of clovers in general (Smith et al., 2013). Boonman and Mikhalev (2005) indicate that herbicides are effective in the Russian steppes."
	Western Australian Herbarium (1998–2021). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 26 Jul 2021]	"Suggested method of management and control. Relatively tolerant to glyphosate, grazing and mowing. Hand pull isolated plants in winter before flowering. Lontrel® at 10 ml/10 L + wetting agent provides effective control in early winter. Otherwise metsulfuron methyl 0.1 g/10 L + wetting agent or 1 g/10 L of Logran® applied in early winter provides reasonably selective control. Repeat annually for several years. Read the manufacturers' labels and material safety data sheets before using herbicides. For further information consult the Australian Pesticides and Veterinary Medicines Authority to determine the status of permits for your situation or state."
	DiTomaso, J. M., Kyser, G. B., Oneto, et al. (2013). Weed Control in Natural Areas in the Western United States. Weed Research and Information Center, University of California, Davis, CA	The following herbicides have been classified in category E = Excellent control, generally better than 95%: Aminocyclopyrachlor + chlorsulfuron, Aminopyralid, Chlorsulfuron, Clopyralid, Dicamba, Sulfometuron, and Triclopyr.

804	Tolerates, or benefits from, mutilation, cultivation, or fire	y
	Source(s)	Notes
	Western Australian Herbarium (1998–2021). FloraBase—the Western Australian Flora. Department of Parks and Wildlife. https://florabase.dpaw.wa.gov.au/ . [Accessed 26 Jul 2021]	"Relatively tolerant to glyphosate, grazing and mowing. Hand pull isolated plants in winter before flowering."

805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	
	Source(s)	Notes
	CABI. (2021). <i>Medicago polymorpha</i> (bur clover). In: Invasive Species Compendium. Wallingford, UK: CAB International. www.cabi.org/isc	[Unknown, but unlikely] "Biological control of <i>M. polymorpha</i> has never been considered because the species is seen as a useful component of pastures in several parts of the world. However, a number of insects, nematodes and fungi are known to attack it"

Summary of Risk Traits:

High Risk / Undesirable Traits

- Broad climate suitability, and elevation range exceeds 1000 m, demonstrating environmental versatility
- Naturalized in regions with tropical climates
- Naturalized on Kauai, Oahu, Lanai, Maui, and Hawaii (Hawaiian Islands) and widely naturalized elsewhere
- Often regarded as an escaped, weedy plant of crops and disturbed natural areas, but often considered innocuous or a desirable fodder plant
- Other *Medicago* species are invasive
- Spiny pods on plants in Hawaii, but spineless cultivars exist
- Possibly allelopathic
- May cause photosensitisation in horses, occasionally red gut in sheep, and bloat in cattle, but generally a desired, palatable plant
- Tolerates shade, although most often occurs in high light environments
- Tolerates many soil types (not limited by substrate)
- N-fixing, and may modify soil chemistry
- Reproduces by seeds
- Self-fertile
- Able to reach maturity in one growing season
- Seeds dispersed by external attachment of pods to animals, internally by livestock and waterfowl, as a crop and wool contaminant, by water and both intentionally and accidentally by people
- Seeds long lived (5+ years), and can form a persistent seed bank
- Tolerates mowing and grazing

Low Risk Traits

- Despite reports of weediness, also regarded as a desirable pasture plant
- Provides fodder for livestock
- Sensitive to herbicides, which may provide effective control if removal is desired