

A weed by any other name: problems with defining weeds in tropical Queensland

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‘Weed’ is a pejorative term for plants. The most common definition is ‘a plant out of place’ or ‘a plant growing where it is not wanted’.¹ Unfortunately this can apply equally to modest herbs of little impact, and uncontrollable vegetable monsters that swallow whole landscapes. For most land managers in Australia, a weed is usually an introduced plant which is invasive to the point that it has a negative effect on people or the environment. An example from the Australian National Weeds Strategy is typical: ‘a weed is considered pragmatically as a plant that requires some form of action to reduce its harmful effects on the economy, the environment, human health and amenity’.² One more clearly anthropomorphically centred is: ‘Weed: A plant that is in some way deleterious to human activities’.³ Put into a historical context, the definition will vary according to time, place, and whoever is doing the defining. This study looks at issues in defining weeds, and in particular the difficulties in defining weeds up to the 1970s in the Australian state of Queensland, with an emphasis on the northern tropical regions of that state.

Biological invasions have inspired a massive literature, including debates over what makes a plant into a ‘weed’. However, comprehensive summaries of these arguments in their historical context are not commonly applied to the tropics. This article considers some of the issues discussed in that literature in the context of a tropical environment in northern Australia. Tropical Queensland is a large region, 901,837 square kilometres, covering a range of vegetation types and climates. Most of the area is monsoonal, with a pronounced ‘wet season’ in summer. Wet tropical rainforest and monsoonal forest (termed ‘jungle’ outside Australia) on parts of the coast and coastal ranges give way to eucalypt forest, savannah, and semi-arid grasslands further inland. To the south, near the Tropic of Capricorn, the climate begins to change, taking on some of the characteristics of southern Australia’s Mediterranean climate such that rain can happen in both summer and winter – or not at all in one of Australia’s fearsome droughts. The region therefore offers a range of habitats to introduced plants and though summer heat usually precludes European weeds, some can establish on the cooler wet tablelands on the coastal ranges. Most of the case studies examined will, therefore, be tropical weeds. Urban settlement has always been thin, with ports of varying size servicing small agricultural and mining towns in their hinterlands; the only towns with more than 20,000 inhabitants in the period under consideration were the ports of Mackay, Townsville and Cairns, and the mining towns of Charters Towers and Mt Isa. All are dependent on primary industries and secondary industry is negligible, so this study will concentrate on weeds in rural environments.

What is a weed?

¹ Eg. Nicholas Smith, *Not from here: plant invasions on Aboriginal lands of the Top End* (Darwin: Tropical Savannas CRC), p.12; Elisa Arcioni, “What’s in a name? The changing definition of weeds in Australia”, *Environmental and Planning Law Journal* 21 (2004): 450. For a history of such definitions in Europe and earlier colonies, see Neil Clayton, ‘Weeds, people and contested places’ in Sarah Johnson (ed.), *Bioinvaders* (Cambridge: White Horse Press, 2010), pp. 95-104.

² Natural Resource Management Ministerial Council, *The Australian Weeds Strategy: A national strategy for weeds management in Australia* (Canberra: Australian Government Department of the Environment and Water Resources, 2006).

³ R.H. Groves, *Recent incursions of weeds to Australia, 1971 – 1995* (Weed CRC Technical Series 3, 1998), p. 7.

Most definitions of ‘weed’ include some reference to their harmful effects. Some affect human health by inducing allergies, such as Parthenium (*Parthenium hysterophorus*), or cause mechanical harm such as thorny bushes like Chinese apple (*Zizyphus mauritiana*). Gardeners spend considerable effort and money eliminating unwanted plants. In crops, gardens and pastures, weeds take resources such as nutrients, water and sunlight from desired plants, or harbour pests and diseases. Many have allelopathic qualities, producing chemicals or like Siam weed (*Chromolaena odorata*), concentrating soil pathogens, both of which discourage the growth of other plants.⁴ For animal raising, some weeds are poisonous or even if edible, taint meat, milk and eggs. Very dense weeds can impede stock movement or hide and entangle animals. Some grasses are considered weeds because they are less productive, nutritious or palatable to stock, though still edible. A recent trend in Australia is to consider annual grasses as ‘weeds’ with a preference for perennials, which retain their food value longer. One example is Rhodes grass (*Chloris gayana*), introduced in the very early 20th century.⁵ For decades it was considered highly desirable but is valued less now it has been proved to act as an annual in northern Queensland.⁶ A more recent category is ‘environmental weeds’ which out-compete native plants and reduce biodiversity, or threaten endangered species. An implied distinction is sometimes made between harmful introduced plants, called ‘weeds’ or ‘invasive plants’, and those which seem harmless, described merely as ‘naturalised’.⁷ Groves draws less of a distinction:

Naturalised plant: An invasive species that has become established and has reproduced in the wild. Introduced plant: A plant known to be native to a region outside Australia and not native to Australia. Environmental weed: A weed that is in some way deleterious to the environment.⁸

Which weeds will be considered serious threats changes over time and varies according to dominant industries. In southern Queensland in the early stages of the colony (1820s-1860s), agricultural weeds – those accompanying crops from Europe – were present but apart from European dodder (*Cuscuta europaea*) in lucerne (*Medicago sativa*), not seen as major problems, as cultivation methods such as harrowing had been developed to deal with them in the ‘old’ country. A weedy farm was a reflection on the farmer’s character, not the nature of the weeds or their behaviour in a new area. However, for newer tropical and sub-tropical crops being planted further north after the 1860s, like cotton and pineapples, managing weeds such as Cobbler’s Pegs (*Bidens pilosa*) and Couch grass (*Cynodon dactylon*) was more problematic. European experience of these crops in earlier tropical colonies was gained with the benefit of cheap coloured labour to handle the weeding, and while this option was briefly used in the 19th century in north Queensland, the ideal of White Australia meant it

⁴ Inderjit, Inderjit Lab http://www.inderjit-ecology.com/inderjit/Research_Findings.html
Accessed 1 February 2015.

⁵ Annual Report of the Department of Agriculture and Stock for 1904-5, *Votes and Proceedings of the Queensland Legislative Assembly* (hereafter *QV&P*) 1905 vol. 2, p. 525.

⁶ *Queensland Agricultural Journal*, 29 (November 1912): 391; Joe Rolie, Tristin Golding, Don Cowan, *Is Your Pasture Past It?* Department of Primary Industries, Queensland, 1997, p. G-22; Joe Miller, Ken Gostelow, Debbie Gostelow, *Pasture Grasses of Cape York Peninsula* (Landcare Cape York Peninsula, 2008), entry for Rhodes grasses. It acts as a perennial in central Queensland but the northern dry season tends to kill it off. Bob Shepherd, Senior Extension Officer, Queensland Department of Agriculture, Forestry and Fisheries, pers comm. August 2015.

⁷ For example, Richard Groves, Robert Boden and Mark Lonsdale, *Jumping the Garden Fence: Invasive Garden Plants in Australia and their environmental and agricultural impact* (Sydney: CSIRO report prepared for WWF-Australia, 2005), p. 12.

⁸ Groves, *Recent incursions*, 7. Woods and Moriarty disagree, preferring to use the word for species which are becoming integrated with their new environments rather than dominating them. Mark Woods and P.V. Moriarty, ‘Strangers in a strange land’, in Johnson (ed.), *Bioinvaders*, p. 13.

disappeared after the 1890s. The problem was not solved until chemical herbicides came into use after World War II.

Even more serious were the weeds of pasture, particularly burrs. Queensland's first major industry was wool, expanding in the 1840s into the inland grasslands created by Aboriginal firestick farming. Overstocking reduced the fine pastures found by the early pastoralists, and let in unprofitable weeds such as thistles. Stock also carried in burrs, the first being Bathurst burr (*Xanthium spinosum*) spreading from the neighbouring colony of New South Wales, soon followed by Noogoora burr (*Xanthium strumarium*⁹) introduced in American cotton seed in the 1870s to the prime sheep pastures of the Darling Downs in southern Queensland.¹⁰ Noogoora spread rapidly along the roads and rivers, and by the 1930s was in most regions of the state. Burrs were a particular problem because they stuck in the wool and lowered the value of the fleece. In the 20th century a new problem occurred as thorny plants previously imported as hedges, such as prickly pear (*Opuntia* spp) and Parkinsonia (*Parkinsonia aculeata*), or as fodder such as Prickly Acacia (*Acacia nilotica*) and Mesquite (*Prosopis* spp), began to spread aggressively and crowd out grasses.

Queensland's ideal of closer settlement through agriculture from the 1880s meant that farmers moved into the wetter forests, often to set up dairy farms. Dairying in cleared rainforest was another area of concern because the mild wet climate was hospitable to weeds, including the milk taints such as Fat Hen (*Chenopodium album*) and Shepherd's Purse (*Capsella bursa-pastoris*), poisonous plants such as *Passiflora suberosa*, and aggressive bushes like Crofton weed (*Ageratina adenopfera*) that covered pastures.

Apart from some poisonous native plants such as Heart-leaf Poison Bush (*Gastrolobium grandiflorum*), also described as weeds, the beef industry of tropical Queensland had few weed problems from its inception in the 1850s until the 20th century. Thereafter, they rapidly multiplied. The worst were those weeds such as Noogoora and rubber vine (*Cryptostegia grandiflora*) which monopolised the better soils along the rivers; for most of its history cattle raising in this region has been done on the open range system and during the dry season, grazing normally contracts to these grassy alluvial flats and the permanent waterholes in the river beds. Many of the weeds taking over these refuges are poisonous, creating yet more problems. Some of these riverine weeds have spread out across the paddocks, further reducing dry season grazing near the rivers: for example, Lantana (*Lantana camara*), Calotrope (*Calotropis procera*) and Bellyache Bush (*Jatropha gossypifolia*). The most formidable weed in the southern part of the region was a relative late-comer, Parthenium, which dominated overgrazed pastures in the 1970s and was responsible for the introduction of vehicle washing facilities to try to stop its spread.

Legal definitions

As threats to the economy, weeds soon figured in legislation, but legal definitions are not helpful for Queensland. As Arcioni notes, statutes dealing with weeds have created the category of 'noxious' plants but do not define what brings a plant into that category.¹¹ The authorities chose which plants they declared as coming under the terms of the legislation. Some Acts actually named some of the worst weeds, such as the many acts dealing with

⁹ Noogoora burr owns many synonyms and I have used the name accepted by the Atlas of Living Australia http://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:apni:taxon:610766#tab_names .

¹⁰ Report of the Chief Inspector of Stock for 1879, *QV&P* 1880 vol. 2, p. 1318.

¹¹ Elisa Arcioni, 'What's in a name? The changing definition of weeds in Australia', *EJPL* 21 (2004): 458.

Prickly Pear,¹² though the 1875 Bathurst Burr and Scotch Thistle Bill failed to pass partly because the members of parliament could not agree which species of thistle was being referred to.¹³ The first practicable Act for controlling weeds in Queensland was passed to set up rural local governments, the Divisional Board Act of 1879, so that the list of declared weeds would vary from place to place.

Ironically, the very naming system employed for plants can cause problems for weed management. Plant names often change thanks to the botanical convention of discarding established names when an earlier name has been found, or when plants are reclassified into different genera. Sandy Lloyd, while commenting on the ‘black list’ system of preventing weed imports, notes:

[A] weakness is synonymy – when a plant is incorrectly named or is known by several names. This is perhaps best illustrated by the legal importation of Mexican feather grass (*Nassella tenuissima*) into Australia. While all *Nassella* species were prohibited, Australian Quarantine and Inspection Service (AQIS) permitted all *Stipa* species at the time and *S. tenuissima* is a synonym for *N. tenuissima*.¹⁴

In Queensland, the same plant could appear under different names on a number of local authority lists of declared weeds, causing problems for its management across the state.¹⁵ Some naturalised drug plants such as Opium Poppy and Coca, once promising new crops but now prohibited, have been classified as ‘noxious plants’ because it was easier to deal with them under weed legislation.¹⁶

Defining a weed by its origin

Most north Australian weeds are species introduced from tropical and sub-tropical regions overseas, benefiting from leaving natural enemies behind. Of course, it is widely acknowledged that Australian native plants can also become ‘weedy’, taking advantage of changes to their environment brought about by settlement.¹⁷ *Sida retusa* (*Sida rhombifolia*) spread with settlement, becoming such a nuisance that Queensland legislators considered including it in a Bill to deal with weeds in 1880.¹⁸ From the 1930s, Currant Bush (*Carissa ovata* and *C. lanceolata*) took advantage first of the biological control of Prickly Pear and then the clearing of native Brigalow forests, springing up in the newly-opened areas and competing with pasture.¹⁹ Australian plants deliberately spread from one region to another as garden specimens have become invasive, such as Umbrella Tree (*Schefflera actinophylla*) which is a north Queensland native but from around the 1960s has become a southern

¹² E.g. *Prickly Pear Destruction Act* of 1912.

¹³ *Local Authority (Grazing Districts Improvement) Transfer of Powers Act of 1933* (24 Geo V, No. 29) Part 3 s.1.(h); debates on the Bathurst Burr and Scotch Thistle Bill, *QPD*, vol. 18, 1875, p. 643 and vol. 29, 1878, p. 760.

¹⁴ Sandy Lloyd, ‘The grey areas of the black list section’, *Weedwatch* 2 (March 2003): 1, http://pandora.nla.gov.au/pan/64168/20070119-0000/www.weeds.crc.org.au/documents/awm_030403_n_letter_ed2.pdf accessed 10 December 2014.

¹⁵ Minutes of the Noxious Plant Consultant Sub-Committee of the Co-ordinating Board, 15 Nov. 1949, Alan Fletcher Research Files, ID305265, QSA.

¹⁶ See for example the list of noxious weeds in the Stock Routes Board Report for 1954-5, *Parliamentary Papers of the Queensland Legislative Assembly* (hereafter *QPP*) 1955 vol. 2, p. 13.

¹⁷ See for example Groves, Boden and Lonsdale, *Jumping the Garden Fence*, 49-60.

¹⁸ *Queensland Parliamentary Debates*, Legislative Assembly, vol. 33, 30 September 1880, pp. 873-4.

¹⁹ Weed File for *Carissa ovata*, reports June 1947 and October 1949, Alan Fletcher Research Files ID305230 Queensland State Archives (hereafter QSA); Queensland Department of Primary Industries, *The Condition of River Catchments in Queensland* (Brisbane: DPI, 1993), p. 67. Brigalow is *Acacia harpophylla*, which occurs in almost pure stands over large areas of inland central Queensland.

Queensland weed.²⁰ As noted earlier, native plants found to be poisonous to stock have also been defined as ‘weeds’, such as the cycads (*Cycas* spp., *Bowenia* spp. and *Macrozamia* spp., historically lumped under the term ‘Zamia’).

Generally, plants considered to be native are less likely to be termed ‘weeds’ unless, like the cases above, they become particularly invasive or continuously poison stock. However, there is considerable debate over the definition of some weeds as ‘introduced’ or ‘native’. One species which is mentioned as introduced for the perfume industry in early Queensland records, and is considered native to tropical America, is *Vachellia farnesiana* (syn. *Acacia farnesiana*).²¹ However, it is recorded in Ludwig Leichhardt’s expedition of 1844-5 as growing at the head of the Gulf of Carpentaria, well in advance of European settlement, and is also thought to be indigenous in the Northern Territory and therefore an Australian native, though this has been disputed.²² The distinction depends very much on how one defines the ‘native environment’. Normally in Australia, the tag ‘native’ refers to plants present before European settlement, though others believe any human-assisted movement of plants defines them as ‘introduced’.²³ To the north of Australia is one of the busiest historic maritime trade routes in the world, one established for centuries on the basis of Indonesian spices and China’s manufactures and demand for luxury goods, and involving three continents. The Macassan visitors to coastal northern Australia who gathered sea slugs for trade with China before European colonisation were known to have imported plants, and there has been speculation about African visitors to northwest Australia.²⁴ Trade across the Torres Strait with New Guinea also occurred, and the Spanish were bringing American weeds to nearby Pacific islands in the seventeenth century.²⁵ Recorded European contact with northern Australia started with the Dutch in 1606, well before the advent of British explorers with their botanists recording plants in the region. Even early British shipping predates the first major survey of northern flora, Robert Brown’s collections when he accompanied Matthew Flinders in his circumnavigation of Australia in 1802-3.

It would not be surprising if there were more visitors accidentally introducing plants before colonial settlement than we have records for, or that the Macassans might have brought in plants originating beyond South Sulawesi to northern Queensland and the Northern Territory. Bean suggests that any plant tending to be invasive, without pests or diseases, a considerable distance from other occurrences outside Australia, and lacking genetic diversity or close relatives, was probably introduced by humans, even if recorded here by the earliest European botanists. His model suggests that *Vachellia farnesiana* is, in fact, a pre-European introduction.²⁶

²⁰ Tim Low, *Feral Future: the untold story of Australia’s exotic invaders* (Camberwell, Vic.: Penguin, 2001), pp. 172-3; Brian Walters, ‘The Queensland Umbrella Tree’, *Australian Plants* June 1967 reproduced in *Wildland Weeds* vol.1, no.2 (Spring 1998) http://www.se-eppc.org/wildlandweeds/pdf/sp98-walters-p_4-5.pdf accessed 22 February 2016.

²¹ The Brisbane Botanic Gardens was distributing ‘*Acacia farnesiana*’ plants for public beautification in 1890-91. Report of the Colonial Botanist for 1890, *QV&P*1891 vol. 4, p. 645.

²² Ludwig Leichhardt, *Journal of an overland expedition in Australia, from Moreton Bay to Port Essington, a distance of upwards of 3000 miles, during the years 1844–1845* (Adelaide: University of Adelaide e-book), entry for 31 July 1845; Smith, *Not from here*, 18; Kull and Rangan, ‘Acacia exchanges’, *Geoforum* 39 (2008): 1262.

²³ For example, A.R. Bean, ‘A new system for determining which plant species are indigenous in Australia’, *Australian Systematic Biology* 20, 1 (2007): 1.

²⁴ Kull and Rangan, ‘Acacia exchanges’, 1262.

²⁵ Bean, ‘A new system’, 8.

²⁶ Bean, ‘A new system’, 12-13, 27.

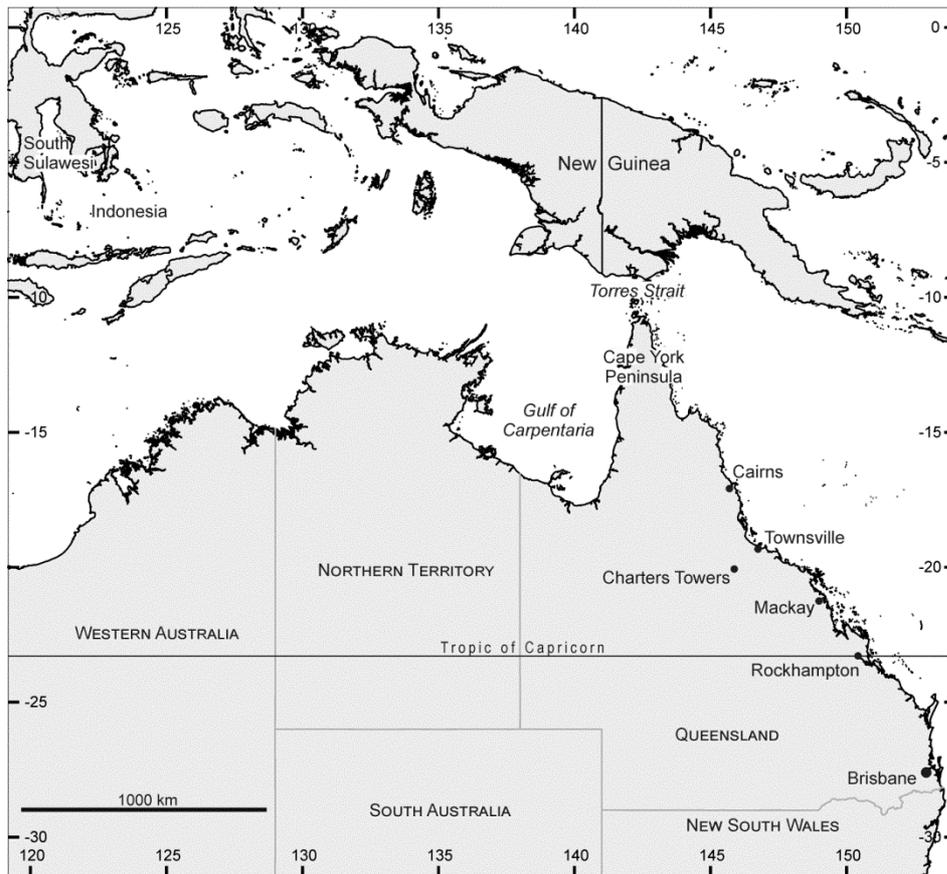


Figure 1: Map of northern Australia and areas from which pre-European settlement contact occurred. (Cartography: Adella Edwards)

Even early European eyewitnesses a long way from the north Australian coast were uncertain of the status of particular plants. *Sida Retusa* was first noticed as a weed in Brisbane in the 1840s. One report noted that Chinese servants from Amoy knew it from their homeland.²⁷ It appeared to spread north along the coast, following settlement, and became one of the worst weeds in disturbed areas of the tropics around the turn of the twentieth century.²⁸ However, even in the nineteenth century there was a lively argument in the press about its status as introduced or native.²⁹ Couch grass was first noticed in 1834 in Sydney, New South Wales as an accidental introduction, said to have come in horse fodder imported from India. However, Brown recorded it from northern Australia as a native; another colonial author refused to accept this, suggesting it had been brought in earlier by a ship coming from India.³⁰ Government botanist Frederick Bailey, who published the first compendium of Queensland weeds in 1906 and tried to identify their origins, simply described some plants as ‘pan-tropical’³¹

²⁷ *Brisbane Courier*, 5 June 1886, 3 (TROVE, National Library of Australia digital newspaper collection, hereafter ‘Trove’). Amoy is now Xiamen, in Fujian province.

²⁸ See eg. *Rockhampton Morning Bulletin*, 4 Aug. 1903, 5 (Trove), reporting on severe infestations in Townsville, and *Maitland Mercury* 19 April 1879, 14S (Trove) noting the same for Cooktown; *Queensland Agricultural Journal*, 10 (May 1902): 60.

²⁹ See eg. *Sydney Morning Herald*, 23 June 1864, 2 (Trove), which suggests it was introduced from Mauritius and *Brisbane Courier*, 5 June 1886, 3 (Trove) arguing it was native.

³⁰ Archibald Meston, *Geographic History of Queensland* (Brisbane: Government Printer, 1895).

³¹ F.M. Bailey, *The weeds and suspected poisonous plants of Queensland* (Brisbane: Queensland Government, 1906).

During the environmental movements of the 1930s and 1970s, the distinction between introduced and native plants has hardened even further with introduced plants seen as biological contaminants of native ecosystems. Clayton traces this to the realisation in the mid 20th century that introduced weeds were a consequence of environmental disruption by European colonists.³² Several authors however are critical of this division of plants into ‘native’, which are acceptable, and ‘introduced weed’, which are not. Ken Thompson among others argues that species mobility over long periods of time makes a nonsense of such definitions and that human-aided dispersal across borders is little different to natural means of plant spread. Organisms may have existed in a place, gone extinct there, and then been re-introduced: are they ‘native’?³³ He also suggests that while some introduced species are destructive, others have been blamed for environmental damage which in fact is caused by humans. The introduced plants simply fill the gaps, and do not reduce biodiversity. In other words, they should not be considered ‘weeds’.³⁴ Others have taken the argument further, noting that environments are constantly changing and the idea of a stable, balanced ecology that weeds will disrupt is a myth.³⁵ Groves, Boden and Lonsdale admit that European settlement and land use is the main problem endangering some indigenous plant species, but point to the characteristics of certain introduced weeds as making the situation much worse.³⁶ Larson comments further that species identified as ‘invasive’ are considered to be in competition with native species, but that those which become ‘allies’ of native species are less likely to receive attention.³⁷ Kull and Rangan believe that former British colonies like Queensland tend to be ‘parochial’ about plants and value environmental ‘purity’, while Trigger et al. note that Aboriginal society is much more accepting of introductions.³⁸ Others point to nationalism as adding an unhelpful layer to definitions of ‘weediness’ given that many alien plants are not strongly invasive and some native plants are.³⁹ Yet another aspect is offered by those introduced plants which hybridise and therefore are unique to their newer environments, the tamarisk of southwest USA being a famous example. Woods and Moriarty, among others, argue that this makes it native to the area, while not contesting its ‘weediness’.⁴⁰ Lantana, considered the worst weed in the wet tropics of Queensland,⁴¹ is a

³² Clayton, ‘Weeds, people and contested places’, in Johnson (ed.) *Bioinvaders*, pp. 111-2, 113.

³³ Hettinger counters this argument by taking it to its logical conclusion: so, then, are dinosaurs should they be revived and re-introduced. Ned Hettinger, ‘Exotic species’, in Johnson (ed.) *Bioinvaders*, p. 43.

³⁴ Ken Thompson, *Where Do Camels Belong?: the story and science of invasive species* (London: Profile Books, 2014), *passim*. See also Inderjit, M.W. Cadotte, and R.I. Colautti, ‘The ecology of biological invasions: past present and future’ in Inderjit (ed.), *Invasive Plants: ecological and agricultural aspects*, (Basel: Birkhauser Verlag, 2005), p. 37; and Ned Hettinger, ‘Exotic species’.

³⁵ Woods and Moriarty, ‘Strangers’, p. 9; J.H. Peretti, ‘Nativism and Nature’, in Johnson (ed.) *Bioinvaders*, pp. 30-32.

³⁶ Groves, Boden and Lonsdale, *Jumping the Garden Fence*, 33.

³⁷ Quoting Matthew Chew and Manfred D. Laubichler, “Natural enemies: metaphor or misconception?” *Science* 301 (2003): 52–53, in Brendon Larson, “Entangled biological, cultural and linguistic origins of the war on invasive species”, in R. M. Frank, R. Driven, T. Ziemke and E. Bernardez (eds.), *Body, Language, and Mind*, Vol 2: *Sociocultural Situatedness*. Cognitive Linguistics Research 35.2, (New York: Mouton de Gruyter), p. 172.

³⁸ Kull and Rangan, ‘Acacia exchanges’, 1270; David Trigger, Jane Mulcock, Andrea Gaynor and Yann Toussaint, ‘Ecological restoration, cultural preferences and the negotiation of ‘nativeness’ in Australia’, *Geoforum* 39,3 (May 2008). See also Libby Robin and Tom Griffiths, ‘Environmental History in Australasia’, *Environment and History* 10 (2004): 445-6.

³⁹ Lesley Head and Pat Muir, ‘Nativeness, Invasiveness, and Nation in Australian Plants’, *Geographical Review* 94, 2 (April 2004): 199; Yvonne Baskin, *A Plague of Rats and Rubber Vines* (Washington: Shearwater Books, 2002), pp. 12-13; M.E. Lien and A. Davison, ‘Roots, rupture and remembrance: the Tasmanian lives of the Monterey Pine’, *Journal of Material Culture* 15,2 (2010): 235–238.

⁴⁰ Woods and Moriarty, ‘Strangers in a strange land’, p. 3.

similar case; hybridisation has occurred to the point where biological control agents from its original home of South America will not work. As yet, no Australian author has made a similar case for considering it a 'native'.

Weed as moral label

Some authors acknowledge that classifying a plant as a 'weed' or 'introduced' is a moral judgement.⁴² Apart from the nationalist bias noted above, there is a tendency to see weeds as the enemy in an unending war; even the language of scientists abounds with terms such as 'green death'⁴³, and 'invasion' rather than more neutral terms like 'transfer'.⁴⁴ Beinart and Middleton note that even 'colonise' is a loaded term.⁴⁵ Larson suggests this militaristic language is an inevitable result of viewing exotic weeds as 'invaders' in 'competition' with native plants, fitting well with a cultural tendency to use the metaphor of warfare in 'challenging situations'.⁴⁶ Few writers use positive terminology. In one exception, Crosby calls weeds the 'Red Cross of the plant world' for their role in quickly colonising disturbed areas ('ecological disasters'), preventing erosion, providing food for animals and rebuilding an ecosystem suitable for permanent plants. He suggests they are not noxious, but rather opportunistic.⁴⁷ However, he also uses Sir Joseph Dalton Hooker's description of them as 'tramps'.⁴⁸ Historical language was less restrained, as one might expect from a European community trying to establish its version of agriculture in a strange land and in the face of many disadvantages. Prickly Pear, which took over 25 million acres of Queensland, inspired language like 'menace' which was 'stealthily stealing through the scrubs'⁴⁹, 'evil'⁵⁰, 'Queensland's worst enemy',⁵¹ and 'one of the most frightful curses on the face of the earth'.⁵²

Defining a weed by context

The status of a plant as 'weed' depends very much on the perspective of the individual describing it. In other words, weeds can be 'situational'. This occurs most clearly in clashes between economic and environmental values, or between different industries. One large group of introduced plants in northern Australia is pasture plants. Tropical Australia has a

⁴¹ Peter Stanton pers comm., 12 Feb 2016. Peter Stanton surveyed vegetation all over Queensland for the then National Parks and Wildlife Service.

⁴² Neil Clayton has traced this through history to the ancient Greeks: Clayton, 'Weeds, people and contested places', *Environment and History* 9 (2003): 301-31. He also notes the moral judgements against those who allowed weeds to flourish on their land.

⁴³ Peter Martin, *Killing Us Softly: Australia's Green Stalkers*, (Co-operative Research Centre for Weed Management 2003), title of Chapter 1, 'A Green Death Stalks Australia'.

⁴⁴ For example Anna Eskridge and Derek Alderman, 'Alien Invaders, Plant Thugs and the Southern Curse', *Southeastern Geographer*, 50(1), 2010, which discusses the language used to demonise Kudzu vine in Missouri.

⁴⁵ William Beinart and Karen Middleton, 'Plant transfers in historical perspective: a review article', *Environment and History* 10 (2004): 16.

⁴⁶ Larson, "Entangled biological, cultural and linguistic origins of the war on invasive species", p. 172. Larson attributes this to biological scientists, but the terminology of warfare and disease has long been used about weeds.

⁴⁷ Alfred Crosby, *Ecological Imperialism: the biological expansion of Europe, 900-1900* (Cambridge: Cambridge University Press, 1993), pp. 28, 169, 288.

⁴⁸ Crosby, *Ecological Imperialism*, 164.

⁴⁹ Bell, MLA for Dalby, Second reading of the Prickly Pear Selections Bill, *Queensland Parliamentary Debates* (hereafter *QPD*), vol. 87, 11 October 1901, p. 1231.

⁵⁰ *Queensland Agricultural Journal* 1 (January 1897), p. 84.

⁵¹ Premier Denham, debate on Prickly Pear Destruction Bill, Legislative Assembly, *QPD* vol. 109, 11 October 1911, p. 2364.

⁵² A.H. Barlow, MLC, Second reading of the Prickly Pear Destruction Bill, Legislative Council, *QPD* vol. 113, 6 November 1912, p. 2204. 25 million acres is approximately 10 million hectares.

very long history of importing exotic grasses and legumes which have become pests in crops and gardens, and sometimes even in pastures. Graziers and Government scientists recognised early that northern pastures suffered from a number of disadvantages for raising sheep and beef cattle. Australian native pasture plants in the north are well adapted for the strongly defined monsoonal weather pattern of cool dry winters and hot wet summers. After a growing season of four to five months during the ‘wet’, annuals die and perennials die back, so that the pastures lose nutrition during the ‘dry’ and there is an annual setback to animal growth and fattening. Soils are heavily leached during the ‘wet’ and except in certain favoured areas such as river flats, are poor and infertile. The holy grail of pasture scientists was to find and establish grasses which would retain a good level of nutrition during the ‘dry’, and legumes that would raise soil fertility through their ability to fix nitrogen in the soil. The legumes would therefore increase pasture productivity, as well as providing more protein in animal diets. Even Queensland’s best native grass – Mitchell grass – was recognised as being rich in carbohydrates, but poor in protein.⁵³ The overall deterioration of native pastures under sheep and cattle was also recognised, with desirable grasses and herbs being eaten out and coarser, less palatable grasses and herbs predominating.⁵⁴ There was a need for tough, palatable, productive species that could stand heavy grazing. From the early spread of Guinea grass (*Megathyrsus maximus var maximus*), Paspalum (*Paspalum dilatatum*) and Prairie grass (*Bromus catharticus*) by the Brisbane Botanic Gardens in the 1870s⁵⁵, hundreds of pasture plants have been introduced to the tropics by the Queensland Department of Agriculture and Stock, joined by the Council for Scientific and Industrial Research (later CSIRO, the Commonwealth Scientific and Industrial Research Organisation) in the 1930s.⁵⁶ In the wet tropics another suite of grasses was needed where rainforest was cleared for pasture, usually for dairying. There was never any assessment of the impact on cropping. In 1899 Paspalum was introduced to the Mackay district to help establish a small dairying industry, despite its known record as a crop weed.⁵⁷ Unfortunately this area was Queensland’s premier sugar cane growing region. Within a short time the grass had become a weed in cane farms. Grice, Clarkson and Spafford call these types of plants ‘commercial weeds’, ie. commercially useful for some industries while weeds for others.⁵⁸ Beekeepers, for example, have been the only people with a good word for the toxic Mexican Poppy (*Argemone mexicana* and *A. ochroleuca*), the milk taint Turnip Weed (*Rapistrum rugosum*) and the ubiquitous Flatweed (*Hypochoeris radicata*), all important sources of pollen.⁵⁹

The newest definition: environmental weeds

Since concern for the environment has increased from the 1960s, the impact of introduced forage plants has led to their further redefinition as environmental weeds. They are blamed for decreasing biodiversity, displacing native plants and animals, and changing entire ecosystems. Moisture loving grasses like Para (*Urochloa mutica*) and Olive Hymenachne (*Hymenachne amplexicaulis*) invade and dominate wetlands. Others like Guinea, Buffel (*Cenchrus ciliaris*) and Gamba grass (*Andropogon gayanus*) not only displace native grasses but build up a much larger fuel load than normal, causing hotter fires which kill trees. This

⁵³ A.F. Bell, ‘The land and water resources of Queensland’, *Queensland Agricultural Journal* 72 (April 1951): 194.

⁵⁴ For example, *Queensland Agricultural Journal*, 13 (August 1903): 170.

⁵⁵ Report of the Brisbane Botanic Gardens, *QV&P* 1872, pp. 1316, 1319; 1875 vol. 2 p. 1202.

⁵⁶ See for example Plant Introduction Inventories, 1931-33, National Archives of Australia: A9778, B1/3/45.

⁵⁷ Report of the Department of Agriculture for 1899-1900, *QV&P* 1900 vol. 2 p. 755.

⁵⁸ A.C. Grice, J. Clarkson and H. Spafford, ‘Commercial weeds: roles, responsibilities and innovations’, *Plant Protection Quarterly* 23, 2 (2008): 58-59.

⁵⁹ S.T. Blake and C. Roff, ‘The Honey Flora of Southeast Queensland’, *Queensland Agricultural Journal*, 78 (September 1954): 154; 78 (October 1954): 224; 82 (May 1956): 308.

trend is encouraged by the legumes, which build soil fertility and therefore productivity, and themselves add to the fuel load. Larger legumes like Leucaena (*Leucaena leucocephala*) form dense thickets while vines such as Centro (*Centrosema molle*) cover native trees. The pastoralists resent attempts to define introduced pasture plants as ‘weeds’, and the controls and prohibitions that come with such a redefinition. Gamba grass (*Andropogon gayanus*) in particular has become a point of contention. Introduced by CSIRO in the 1930s, it is a very tall and productive grass, establishes readily, but causes fires 25 per cent hotter than native grasses. It also reduces soil nitrogen and moisture, one study finding that all of these impacts result in the destruction of 50 per cent of trees in affected savannah over 12 years.⁶⁰ Since 2012 it has attained the status of a Weed of National Significance, which means it is one of the 20 least wanted weeds in Australia. Despite this, pastoralists in the tropics still consider it a desirable grass; one noted wryly that he had tried to establish it on his property in the past, but the cattle ate it out too quickly.⁶¹

With exceptions, such as the various naturalists’ clubs, it has taken European Australians two centuries to learn to appreciate the native ‘bush’ in its many forms. The environmental movement now teaches that ‘wilderness’ is under threat, and that introduced weeds damage the integrity of these areas. While there is no such thing as ‘untouched wilderness’, there are areas of undoubted ecological value which weeds can harm. Of all the environmental threats, weeds offend the sense of the bush aesthetic most because of their visibility; they shade out native ‘wildflowers’, while feral vines convert trees to fungoid shapes before killing them. Many ornamentals were grown deliberately because they looked so different to native plants and this difference now stands out in glaring contrast where they have invaded ‘bushland’.⁶² However, even as threats to the environment, weeds have an ambivalent status. There are numerous cases of weeds which have a detrimental effect on some species, but help others. Small birds and marsupials are assisted by dense thickets of thorny shrubs such as lantana which provide shelter and often, food.⁶³ The very reason why some plants become weeds – because their fruits are eaten by birds and other animals, which spread the seed widely – indicates that they have become a part of the food supply for those animals. Insects have also adapted to some weeds; for example, the small tropical weed *Emilia sonchifolia* has become a host plant for the caterpillar of the Magpie Moth (*Nyctemera baulus* syn *secundiana*).

Useful or not?: the ambiguous status of weeds

This ambivalent status for weeds strikes at the heart of their definition as weeds: that they are harmful to people or the environment. Many weeds began as plants that were wanted. Australia’s alien and largely unknown flora impressed few European colonists, leading to a massive effort to import almost anything that might have some use – crop plants, fodder plants, ornamentals, hedge plants, medicinal plants. The colonists wanted to create European

⁶⁰ ‘Evidence in on the impact of gamba grass’, Savanna Explorer website http://www.savanna.org.au/dk/gamba_invader.html accessed 27 November 2014.

⁶¹ Australian Weeds Committee, *Weeds of National Significance Gamba Grass (Andropogon gayanus) Strategic Plan* (Canberra: Australian Weeds Committee), pp. 2, 26, http://www.weeds.org.au/WoNS/gambagrass/docs/National_Gamba_Grass_Strategic_Plan_FINAL-June2013.pdf accessed 10 December 2014; interview with John Ahlers, Maitland Downs Station (Cape York Peninsula), 8 Oct. 2014.

⁶² Jan Wegner, ‘Why garden? Gardening on mining fields in the dry tropics of Queensland, 1860 to 1960’, *Journal of Australian Studies*, 34, 3 (2010): 354.

⁶³ Commonwealth and National Weeds Strategy Executive Committee, *Weeds of National Significance: Lantana Strategic Plan* (2001), p. 2. This is a common problem for weed control: for U.S. examples see Woods and Moriarty, ‘Strangers’, p. 8

towns and gardens and a European economy in Australia, but recognised that the tropics would be different and were much more willing to experiment in the north, particularly for crop plants. For example, Rubber Vine (*Cryptostegia grandiflora* and *C. madagascariensis*), Castor Oil (*Ricinus communis*) and Sisal (*Agave sisalana*) were imported and trialled as sources of rubber, oil and fibre respectively in the 19th century.⁶⁴ All became weeds, with Rubber Vine attaining the status of a Weed of National Significance. Interestingly, they all were adopted as garden plants once they proved to be tough enough to cope with the dry tropics, and it was this newer use as ‘plants’ that gave them the opportunity to spread further and become invasive.

Even once a plant becomes considered a weed, it does not necessarily remain so. Rubber Vine, for example, was already causing alarm among land managers in the Gulf country and Cape York in the 1910s as it spread down rivers from the mining towns, covering the only green forage available in the dry season on the alluvial flats, entangling cattle, hindering mustering and blocking stock movement to waterholes in the rivers.⁶⁵ However, when Australia lost access to its sources of rubber in Malaya during World War Two, the vine’s destruction was prohibited and the Commonwealth Government established an experimental plantation of it near Charters Towers.⁶⁶ Despite producing good quality rubber, the experiment was not commercially successful, and the vine reverted to weed status after the war.

A similar story can be told for the legume Sensitive Weed (*Mimosa pudica*). Its delicate foliage, which folds up at a touch, and pretty pink flowers made it a darling of nineteenth century gardeners. Introduced to Queensland’s sugar-cane growing districts as a pot plant and garden border in the 1870s to 1890s, it promptly escaped and became a weed in the sugar cane.⁶⁷ By the 1920s cane cutters were demanding more money to harvest Sensitive Weed-infested cane because of its thorny stems.⁶⁸ In the 1930s, though, it reverted to plant status when a Mackay cane farmer discovered it increased the productivity of his farm by six times when used as a ‘green manure’ ie. planting it on fallow land and ploughing it in before planting the crop. It also proved to be an excellent source of protein for cattle.⁶⁹ However, there were less troublesome green manures available for cane growing and several new legumes becoming established for cattle in the wet tropics; by the 1950s Sensitive Weed was again an undesirable plant.⁷⁰ In cooler areas of Australia, where it does not naturalise, it is still sold as a pot plant.

It is well known that some weeds become useful sources of fodder during droughts. One of *Sida Retusa*’s common names is ‘Paddy’s Lucerne’, combining an insult to the Irish with

⁶⁴ *Queensland Agricultural Journal*, 1 (Nov. 1897): 382; 11 (July 1902): 63; Note, ID 903153, Agricultural Batch Files 1902-7, QSA.

⁶⁵ J.F. Simpson, Land Ranger to Land Commissioner, Georgetown District, Cairns, 4 March 1954; Haseler, Alan Fletcher Research Station to Secretary, Land Administration Commission 15 Sept. 1971; report forms for Burlington, Webster’s Peak and Black Downs Stations, 1971, Nychum Station 1970, Chinese Apple and Rubber Vine Survey File, ID174665, QSA.

⁶⁶ D.G. Johnstone, Land Commissioner Townsville to Land Administration Board, 25 March 1949, Alan Fletcher Research Files, ID 305265, QSA; *Canberra Times*, 5 Nov. 1942, 3 (Trove).

⁶⁷ *Cairns Post*, 21 Feb. 1940, 12; *Rockhampton Morning Bulletin*, 9 Jul. 1938, 13 (Trove).

⁶⁸ *Cairns Post*, 14 Dec. 1925, 5 (Trove).

⁶⁹ *Brisbane Courier-Mail*, 1 Aug. 1938, 3; *Rockhampton Morning Bulletin*, 9 Jul. 1938, 13 (Trove). Its usefulness had been discovered earlier by the Bureau of Sugar Experiment Stations in its 1912 report, but the report recommended against growing it. *QPP* vol.2 1913, p. 613.

⁷⁰ For example, *Cairns Post*, 6 Nov. 1954, 6 (Trove).

acknowledgement that the weed is a poor forage, but usable if necessary. Normally it is too fibrous to be attractive to grazing animals. Even the devastating Prickly Pear regularly retrieved its plant status as emergency fodder, particularly during the long Federation drought which blighted the turn of the twentieth century in Australia and the equally devastating 1914-1917 drought.⁷¹ Thistles, Yellow Waterlily and Water Hyacinth, all troublesome weeds, were also fed to animals during these droughts. As late as 1965 the Government Botanist asked that Prickly Acacia (*Acacia nilotica* subsp *indica*), rapidly becoming a major weed in the dry tropics, should not be destroyed in all areas ‘because of its high protein content and drought resistance, it is a valuable fodder’ – the reason it was first introduced.⁷² This ambiguous status led to trouble with weed management, as stockowners and the legislators representing them argued against control measures, particularly biological control.⁷³

Lantana is generally accepted as being a disaster for the environment and for pastoralists. However, it enjoyed a reputation as a ‘farmer’s friend’ on the exhausted soils of banana farms, as banana plants quickly deplete soil of nutrients. Lantana replenished the soil with potash-rich humus, shaded out other weeds, and was easily removed when the fields were brought back into cultivation. Advertisements selling agricultural land made its presence a point in favour.⁷⁴ Peter Ryle says that an acquaintance used to scatter pieces of mushroom around Lantana plants because the rejuvenated soil was so good, it grew more mushrooms.⁷⁵

Even the potential uses of a weed can give it a kind of shadow ‘plant’ status. Ralph Waldo Emerson’s definition of a weed as ‘a plant whose virtues have not yet been discovered’⁷⁶ resonates here. In the nineteenth and early twentieth centuries, resources were scarcer and Queensland colonisers were more likely to look for ways to use plants that were out of control as a means of managing them. There were many organisations, private and Government, experimenting with uses for Prickly Pear or looking to overseas uses before its effective control through biological agents was achieved in the 1930s. These uses included sugar, alcohol, wood pulp, paper, ensilage, oil, rubber, potash, whitewash, oxalic acid, and food colouring, though without commercial success in Queensland.⁷⁷

Cultural groups also have different attitudes to weeds. The poor and children are traditionally much more likely to use the resources offered by weeds, because they are free and readily available. Those in areas remote from food suppliers also use them. The small orange fruit of

⁷¹ See for example Report of the Department of Agriculture 1901-2, *QPP* 1901 vol.4 p. 142; Reports of the Land Commissioners for Taroom, Goondiwindi and St George, Annual Report of the Department of Lands for 1915, *QPP* 1916-7 vol. 2 pp. 549-551.

⁷² Acting Superintendent of Stock Routes to General Secretary, Queensland Dairymen’s State Council, 6 Oct. 1965, Blady Grass File, TR1844/ PRV14798, QSA.

⁷³ For example, graziers protesting imports of Cochineal insects to control prickly pear. *Queensland Agricultural Journal*, 4 (December 1915): 323.

⁷⁴ See for example *Brisbane Courier-Mail*, 13 Jan. 1934, 20; 24 Feb. 1934, 22 (Trove).

⁷⁵ Peter Ryle pers comm., 3 April 2015.

⁷⁶ Ralph Waldo Emerson, ‘The Fortune of the Republic’, in *The Complete Works*, Vol. XI (New York and Boston: Houghton, Mifflin, 1904), Bartleby.com, 2013, <http://www.bartleby.com/90/1130.html> accessed 2 June 2015.

⁷⁷ Report of the Queensland Agricultural College, *QPP* 1909 vol. 2 p. 310; Report of the Board of Advice on Prickly Pear Destruction, *QPP* 1911 vol. 2 p. 759; *Queensland Agricultural Journal*, 26 (April 1911): 222; 28 (May 1912): 366; 31 (August 1913): 125; 14 (November 1920): 239; Report of Officer in Charge of Prickly Pear Experimental Station, Dulacca, 30 April 1914, p. 389 and Report of the Travelling Commission for Prickly Pear Destruction, pp. 438-443, *QPP* 1914 vol. 2. Iqbal believes that this belief in potential uses of water hyacinth in Bengal weakened and delayed control efforts. Iftexhar Iqbal, ‘Fighting with a weed’, in Johnson (ed.), *Bioinvaders*, p. 204.

Stinking Passionfruit (*Passiflora foetida*) and berries of Chinese Apple or Jujube (*Zizyphus mauritiana*) have been standard children's fare throughout the north up to the present. Nightshade (*Solanum americanum* and *S. nigrum*) berries were made into jam, baked in pies as 'blackberries', and eaten raw by children.⁷⁸ A number of weeds have been used as greens, including Purslane or Pigweed (*Portulaca oleracea*) and Green Amaranth (*Amaranthus viridis*). 'Wild amaranth' was recommended by the Queensland government as a spinach substitute when World War Two put pressure on food supplies.⁷⁹ More recently, multiculturalism has meant that migrants recognise weeds as food and medicinal plants from their homelands; a surprising number of north Queensland suburban weeds have been tested in their originating countries in Asia, Africa and tropical America, and found to contain useful properties as medicines and insecticides. Clashes can occur when cultural groups want plants which have been declared as noxious weeds. Italians in particular had to be persuaded not to include Prickly Pear, cultivated for fruit, in their gardens.⁸⁰

Queensland's tropics have seen many accidental introductions which were always considered weeds, but a few made the transition permanently to 'plant' status when they proved useful. Townsville Lucerne, now Townsville Stylo (*Stylosanthes humilis*), appeared around that city around 1912 after hitching a ride in a load of hay shipped from Argentina. Its rapid spread caused some alarm until local graziers realised their cattle were getting rolling fat on it.⁸¹ The plant earned its name as the tropical legume that filled the same role as Lucerne (*Medicago sativa*) in southern Queensland, and Subterranean Clover, *Trifolium subterraneum* (also an accidental introduction) in southern Australia.⁸² It spread throughout the tropical savannah of northern Australia, in bush hay or by stock, and was grown as part of improved pastures or broadcast-sown by pastoralists when travelling.⁸³ It also gave wildlife a new food source; flocks of galahs pecking at apparently bare ground are actually picking up Stylo seeds.⁸⁴ Agricultural scientists became interested and investigated it, leading to the introduction of more *Stylosanthes* species, including the current forage legumes Seca and Verano (varieties of *S. scabra* and *S. hamata* respectively), all of which were then exported into Africa from Australia.⁸⁵ Another accidentally introduced weed which may be rehabilitated into a plant is Indian mustard, *Brassica juncea*, considered a pest in cultivation despite occasional use as a salad plant and a source of mustard.⁸⁶ Bred into new cultivars, it is now considered to be a useful oilseed in hotter areas.⁸⁷

The biological basis for 'weeds'

⁷⁸ For example, *Queenslander*, 10 Jan. 1920, 5 (Trove).

⁷⁹ See for example *Cloncurry Advocate*, 6 Feb. 1942, 6 (Trove).

⁸⁰ For example, Hinchinbrook Shire Council asking the railway station master at Ingham not to deliver a case of prickly pear to an Italian there. Council minutes, 8 Feb. 1927, Hinchinbrook Shire Council collection.

⁸¹ Report of the Agricultural Chemist for 1913-14, *QPP* 1914 vol. 2 pp. 692-3.

⁸² Neil Barr and John Cary, *Greening the Brown Land* (Melbourne: Macmillan, 1992), p. 32.

⁸³ For its spread in the Northern Territory, see L.E. Woods, 'A survey of Townsville Stylo (Townsville Lucerne) pastures established in the Northern Territory up to 1969', *Tropical Grasslands* 3, 2 (October 1969): 98.

⁸⁴ Finches also eat the seeds. J.M. Foreshaw and Mark Shephard, *Grass Finches in Australia* (Collingwood, Vic.: CSIRO, 2012), p. 180.

⁸⁵ J.T. Amodu, 'Stylosanthes: a promising legume for Africa' in S. Chakraborty (ed.), *Anthracnose resistant Stylosanthes for agricultural systems* (Australian Centre for International Agricultural Research, 2004), p. 226.

⁸⁶ *Queenslander*, 30 May 1929, 59

⁸⁷ Wayne Burton, Phil Salisbury and David Potts, 'The potential of canola quality *Brassica juncea* as an oilseed crop for Australia', 13th Australian Research Assembly on Brassicas – Conference Proceedings (2003),

http://www.australianoilseeds.com/_data/assets/pdf_file/0019/4573/The_potential_of_canola_quality_Brassica_juncea.pdf

Botanists concerned with predicting which plants may become weeds in the future will tend to define ‘weeds’ as those plants possessing certain biological characteristics, as well as their harmful impacts, and judge their potential for weediness by their behaviour outside Australia.⁸⁸ They also warn, however, against oversimplification. Larger flowers might assist a plant to become weedy by increasing the likelihood of fertilisation, for example, but might be more important as a reason for widespread introduction as a garden plant, giving it greater opportunities for escape into favourable environments. In fact frequent introductions in large numbers seem more important than any biological advantage.⁸⁹ Ability to take advantage of human activity, particularly disturbance, is also noted.⁹⁰ Disturbance can include drainage, pollution, fire, and overstocking with its consequent erosion, as well as clearing vegetation and breaking or compacting soil; even the changes brought about by introduced weeds count as disturbance, creating ecosystems more favourable for those and other weeds. Another helpful human activity is movement of crop seed around the world, advantaging those weeds which are closely associated with agriculture. Williamson believes there are no typical characteristics of invasiveness in plants, and that characteristics of the new habitat are more important, particularly absence of predators.⁹¹ However, experience of weeds in tropical Queensland shows that certain biological characteristics can help their establishment and spread within that environment. Early germination and fast growth in the monsoonal wet season, before the lush grass growth following rain or before crops can sprout, are two. Large seed production and long-lived seeds, creating a ‘seed bank’ in the soil, are others. Deep rooted plants and succulents are more likely to be drought resistant, important in the uncertain rainfall regime of Australia or for surviving the northern dry season. Deep tap roots can also access minerals below the leached topsoils caused by heavy wet season rainfall. More than one means of reproduction is useful – tubers and rhizomes, vegetative, seed – and particularly those seeds and plant fragments suited to dispersal by wind, water, vehicles and animals, especially birds. Vines can take advantage of shaded forest soils, more likely to retain moisture and humus, while able to reach sunlight by climbing. Given that the dominant industry in tropical Queensland is stock raising, species unpalatable to stock, poisonous, or which can withstand heavy grazing are more likely to establish and spread.⁹² However, the savannah that supports the grazing industry is not the only ecosystem in northern Queensland, even if it is the largest, and what makes a successful weed there will not characterise weeds of rainforests and monsoon forests, which favour weeds whose seeds are spread by birds, wind and water to clearings where they can germinate.

Sleepers and faders

These factors seem less important for those plants defined as ‘sleeper weeds’, which have a long period (suggested by Groves as at least 50 years) between first naturalisation and invasiveness. However, certain biological characteristics have been identified for these as well, such as genetic variability which allows hybridisation and adaption to a range of environments. Even this class of weeds can be partly explained by human activity, such as

⁸⁸ For example, Jeff Burton and Peter Dowling, *Pasture Management for Weed Control* (NSW Agriculture and CRC for Australian Weed Management, 2004), p. 10.

⁸⁹ R.I. Colautti, ‘In search of an operational lexicon for biological invasions’, in Inderjit (ed.), *Invasive Plants*, 9, 11.

⁹⁰ Inderjit, M.W. Cadotte, and R.I. Colautti, ‘The ecology of biological invasions: past, present and future’, in Inderjit (ed.), *Invasive Plants*, 25.

⁹¹ In Beinart and Middleton, ‘Plant Transfers’, 9.

⁹² For more complete lists and analyses of biological advantages, see Jack Dekker, ‘Biology and anthropology of plant invasions’ in Inderjit (ed.), *Invasive Plants*, 239-241 and M-X Ren and Q-G Zhang, ‘The relative generality of plant invasion mechanisms and predicting future invasive plants’, *Weed Research* 49 (2009): 450.

further accidental introduction into a new and different ecosystem more suited to them.⁹³ The opposite category attracts less attention: those which were once dominant but are now less so, even without biological controls being evident. Madagascar Periwinkle (*Catharanthus roseus*) still occurs along the sandy soils behind beaches on Queensland's north-east coast, but no longer dominates them as it did around the turn of the twentieth century. Around the same time Chinese burr was described as forming six foot high walls, almost impenetrable, on either side of roads in the Cairns district.⁹⁴ It is still plentiful in that area, but no longer dominant. Neither suffer from obvious predators. Like crop plants, highly invasive weeds seem to decline over time, perhaps because of diseases adapting to them, new diseases being introduced, or because of competition from newer introduced weeds.⁹⁵ One Charters Towers observer said in 1911 that smaller weeds 'eat themselves out', pointing to the decrease of bindi-eye (*Alternanthera repens*) after its vigorous start in Townsville.⁹⁶ Some authors discuss the integration of introduced species with their new environments through a process of adaption, gradually establishing relationships of dependence and control with other species. However, these authors appear to consider the concepts of 'invasiveness' and 'adapting' to be opposed, not consequential.⁹⁷ More historical studies need to be done to evaluate the process of adaption for initially aggressive invaders.



Figure 2: Madagascar Periwinkle dominates the Cairns beachfront in 1883, six years after the town was founded. (Photo: Cairns Historical Society)

Conclusion

It seems clear that “weed” is a cultural construct, the product of complex interactions between plants, their environment and human society. That environment is not a natural one;

⁹³ R.H. Groves, 'Are some weeds sleeping? Some concepts and reasons', *Euphytica*, 148 (2006): 114-6.

⁹⁴ Report of the Kamerunga State Nursery, 1904-5, *QPP* 1905 vol.2 p.355.

⁹⁵ Botanist Louise Hucks suggests competition by new weeds as a major factor. Pers comm., 27 August 2012. Clayton briefly notes a reference to this occurring in New Zealand but does not elaborate. Clayton, 'Weeds, people and contested places', in Johnson (ed.) *Bioinvaders*, p. 108.

⁹⁶ Meeting of the Dalrymple Shire Council, Charters Towers *Evening Telegraph* 15 March 1911, 4 (Trove).

⁹⁷ Woods and Moriarty, 'Strangers', pp. 11-13, 15- 16; Ned Hettinger, 'Exotic species', pp. 44, 52.

plants have constantly been introduced, whether deliberately or not, into landscapes that have undergone continuous change, and those very plant introductions themselves furthered this process of change. In turn, the 'weeds' were often those plants which adapted well to change, particularly those introduced plants which left behind natural enemies such as predators and diseases. Whether or not they were viewed as nuisances or assets depended on place, time, and the cultural and economic background of the observer. Tropical Queensland is no different from other areas colonised by Europeans; cleared or damaged forests and deteriorating pastures have provided opportunities for a tide of introduced (and some native) plants to spread into places where they were unwelcome and therefore defined as 'weeds'. By the 1910s there were enough aggressive weeds in the landscape to be noticeable, creating concern among naturalists for the environment and among land managers for grazing industries in particular, including dairying. By the 1920s, the rapid and apparently unstoppable spread of Prickly Pear and Noogoora Burr were increasing awareness of the potential for economic damage by weeds. An upsurge in Australian nationalism in the 1970s coincided with rising consciousness of environmental damage, such that the term 'weed' became more likely to be applied to introduced plants. Possibly tropical Queensland took longer than most regions colonised by Europeans to understand that deliberately introduced pasture plants were potentially just as weedy as those which arrived accidentally or in gardens and naturalised by themselves, simply because pasture improvement in the unfamiliar conditions of a monsoonal tropical climate proved to be so difficult and has therefore continued so long. Tropical pasture species in particular have therefore had an ambiguous status, becoming 'weeds' in crops, gardens and in the environment. There has always been some latitude in defining a 'weed', given that many plants so labelled are useful for something, even if unwanted in some or most circumstances. However, land managers and their advisers have less ambiguous understandings of the concept, one that comes closer to the usual definition of a plant that is harmful to human activities, needing costly control measures which may or may not work. To them, weeds are indeed enemies.