Department of **Agriculture and Fisheries**
Biosecurity Queensland

Cotton-tails

Froelichia floridana and F. gracilis

Steve Csurhes and Dr Yuchan Zhoe

First published 2008
Updated 2016

Queensland Government

Cover image courtesy Wikimedia Commons

Contents

Summary	3
Identity and taxonomy	4
Description	5
Native range and worldwide distribution	6
Preferred climate	10
Ecology and preferred habitat	10
Reproduction and dispersal	10
History as a weed overseas	10
Current impact in Queensland	11
Potential impact in Queensland	11
Use	12
References	12

Summary

Froelichia floridana and *F. gracilis* (cotton-tails) are annual, or short-lived perennial, plants native to the semi-arid, inland prairies of North America. Within their native range, they are quick to colonise any open, disturbed habitats with dry, sandy soils.

Both *F. floridana* and *F. gracilis* are considered to be agricultural weeds in parts of North America, where their range has expanded as a result of human activity. In the United States, *F. floridana* has been classified as a weed in Nebraska and the Great Plains. *F. gracilis* is considered a weed in Connecticut. *F. gracilis* is invasive in Japan.

Both species exist in central Queensland and *F. floridana* is the more common and widespread of the two. *F. floridana* was probably introduced in the mid-1950s, most likely as a contaminant of imported pasture seeds. The species is now abundant in areas of deep, sandy soil around Injune, Mitchell, Roma, Chinchilla, Yandilla and Yalleroi.

Climate and habitat analysis suggests that both species are likely to become more widespread and abundant on sandy, disturbed sites across semi-arid, subtropical parts of central Queensland and northern New South Wales. Some authors suggest that within this area, dry land grazing and cropping are at risk (FAO 2006; Cunningham & Brown 2006; *Weeds in Australia*, nd). However, this study suggests that both species will be restricted to open, disturbed habitats (sandy soils only), such as roadsides, stockyards and any pastures that have been grazed heavily during drought. As such, the economic impacts of these species could be significant if at-risk habitat types are grazed bare during drought.

Landowners affected by these plants will need advice on ways to renovate their pastures. Landowners with suitable habitat for these species will also need to be warned not to over-graze their land.

Important note: Please send any additional information, or advice on errors, to the authors.

Identity and taxonomy

Species:	*Froelichia floridana* (Nutt.) Moq.	*Froelichia gracilis* (Hook.) Moq.
Common names:	Cottonweed, snakecotton, field snakecotton, large cottonweed, common cottonweed, snakeweed, snakecotton, plains snakecotton, Florida snakecotton, plains snakecotton, Florida snakecotton, cottontails, prairie froelichiam	small cottonweed, slender snakecotton, slender froelichia
Synonyms:	*Froelichia campestris* Small	*Froelichia braunii* Standl.; *Oplotheca gracilis* Hook
Family:	Amaranthaceae (sometimes also Chenopodiaceae).	

The Amaranthaceae is a family of annual or perennial herbs with small, crowded flowers. There are usually five sepals and no petals. Stamen filaments are often united into a short tube. The genus *Froelichia* has about 20 species, mainly in the warmer regions of America. They are annual, biennial or perennial herbs. Leaves are opposite; flowers white, flowers bisexual, arranged as a spike or raceme; covered with long, shiny, woolly hairs (PlantNET, nd).

Description

F. floridana is a hairy, annual, or short-lived perennial, herb up to 1 m tall (sometimes to 1.5 m). Stems are slightly hairy, swollen and often reddish at the leaf nodes. Leaves are opposite, 2–10 cm long and 1–4 cm wide; rounded at the apex; tapered gradually towards the base. The upper leaf surface is slightly hairy and rough to touch, while the lower surfaces are silky hairy. The base of the midrib and the leaf stalk are often tinged reddish. Flowering stems are up to 40 cm long; each with a dense, cylindrical, white, woolly spike of flowers from 1–10 cm long and about 1 cm wide. The mature fruit is flask-shaped, winged on each side and covered in long, curled, silky hairs. Each fruit contains a single seed. Seeds are up to 2 mm long and light brown (Stanley & Ross 1983; Parsons & Cuthbertson 1992).

F. floridana is a variable species, ranging from broad-leaved stout herbs taller than 1 m to much-branched plants forming bushes to 2 m in diameter and single-stemmed, erect herbs 10 cm tall. This variation probably reflects inherent genetic variability and wide environment-induced plasticity. Although specialists and taxonomists have implied the existence of well-delineated morphologic taxa with a strong geographic correspondence, this is not always true, and, in fact, one encounters typical specimens of any given variety sporadically throughout the range of the species.

Some variability is clearly attributable to geography, principally in terms of general morphologic trends. There is a cline toward long, narrow, almost linear leaves as one moves east along the Gulf Coast and into Florida. This would culminate in the little-known var. *pallescens* Moquin-Tandon, a linear-leaved form (leaf length more than eight times width) from peninsular Florida. Additional variation ascribable to geography is observed in plants traditionally included in *F. drummondii*—these being large, stout plants with broader leaves, more obtuse leaf apices, and more densely fulvous pubescence on the abaxial surfaces of leaves. Plants of this form are generally restricted south of the Brazos River and continue to the southern extent of the range in Kenedy County, Texas. Further work examining this variation using micromorphology or molecular markers may elucidate a reliable means to identify intraspecific taxa within *F. floridana* (*Flora of North America*, undated).

F. gracilis is very similar in appearance to *F. floridana*. Compared with *F. floridana*, *F. gracilis* is a smaller, erect to ascending herb to 25 cm tall, with narrower leaves (2–7 cm long, 8 mm wide), acute, pubescent to woolly on the undersurface. The plant has shorter flowering spikes; its bracts ovate, acute to obtuse, papery, sometimes dark-coloured (PlantNET, nd). Its flowers are also almost covered with woolly hairs and have no petals. The black-tipped, white bracts give the flower head a black-and-white appearance. The flower-head, or cluster, is sometimes attached directly to the stem, but more often grows on a flower stem 15–130 mm long (Wildflower Centre, nd).

Native range and worldwide distribution

Both species are native to North America.

According to the USDA (2008), the native range of *F. floridana* is:

Northern America

North-eastern US: Indiana, Michigan, Ohio

North-central US: Illinois, Iowa, Kansas, Minnesota, Missouri Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin

North-western US: Colorado

South-eastern US: Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland [e.], Mississippi, North Carolina, South Carolina

South-central US: New Mexico, Texas

Southern America

Caribbean: West Indies

Other

Naturalised in Australia.

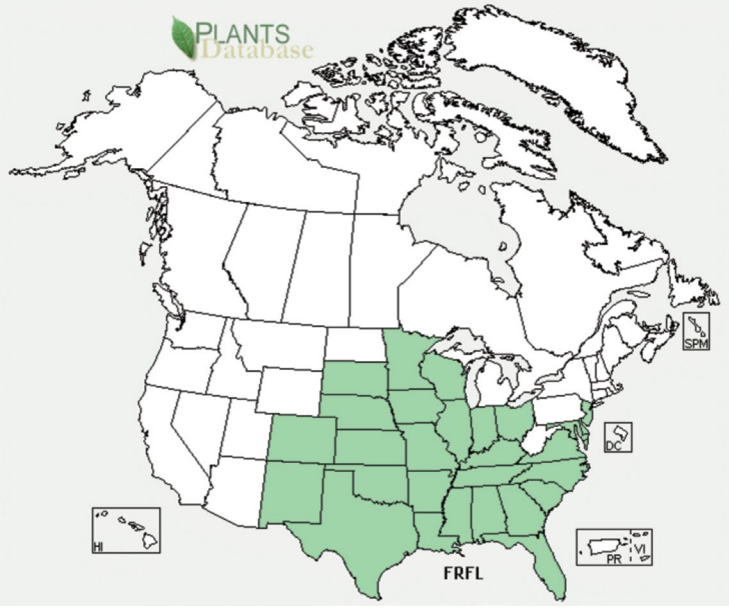

Figure 1. Distribution of *F. floridana* in the United States (USDA 2008).

The native range of *F. gracilis* is:

Northern America

North-central US: Iowa, Kansas, Missouri, Nebraska, Oklahoma

North-western US: Colorado

South-eastern US: Arkansas

South-central US: New Mexico, Texas

South-western US: Arizona, California

Northern Mexico: Chihuahua, Coahuila, Nuevo Leon, Tamaulipas

Other

Naturalised in Europe, Japan, West Indies and other eastern parts of North America.

In the United States, *F. floridana* sporadically inhabits disturbed sandy soils from the southern and central Great Plains through portions of the midwest and south-east, particularly western and central Florida. It is most common in the southern United States (McCauley & Ungar 2002).

Figure 2. Distribution of *F. gracilis* in the United States (USDA 2008).

Distribution maps for two varieties of *F. floridana* are provided in Figures 3 and 4.

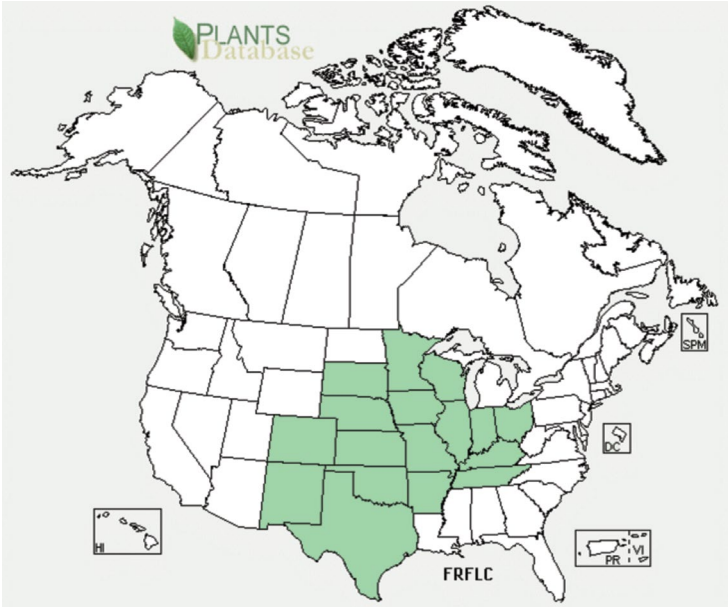

Figure 3. Distribution of *F. floridana* (Nutt.) Moq. var. *campestris* (Small) Fernald in the United States (USDA 2008).

F. floridana var. *campestris* is an endangered species in some parts of the United States (McCauley 1999).

Figure 4. Distribution of *Froelichia floridana* (Nutt.) Moq. var. *floridana* in the United States (USDA 2008).

According to Davidson (1965), *F. floridana* occurs in sandy soil from Florida, west to southern Tacas, north to near the Canadian border in the midwest, and to Delaware in the east. The plant is found along the eastern edge of Missouri and a few counties to the west (Missouri plants, nd). The range of *F. floridana* in North America has expanded, most likely due to direct or indirect human intervention (NatureServe, nd).

In Australia, both species are restricted to central Queensland (Figure 5). *F. floridana* was initially introduced at Yalleroi, Queensland. It is thought to have been introduced in buffel grass seeds from the United States. Soon after, buffel seeds harvested from the area were contaminated and, by 1970, the plant was found in several other areas. Currently, it exists over a substantial area around Injune, Mitchell, Roma, Chinchilla, Yandilla, Barcaldine and Yalleroi (Parsons & Cuthbertson 1992; Cunningham et al. 2003; AVH 2008) (Figure 5).

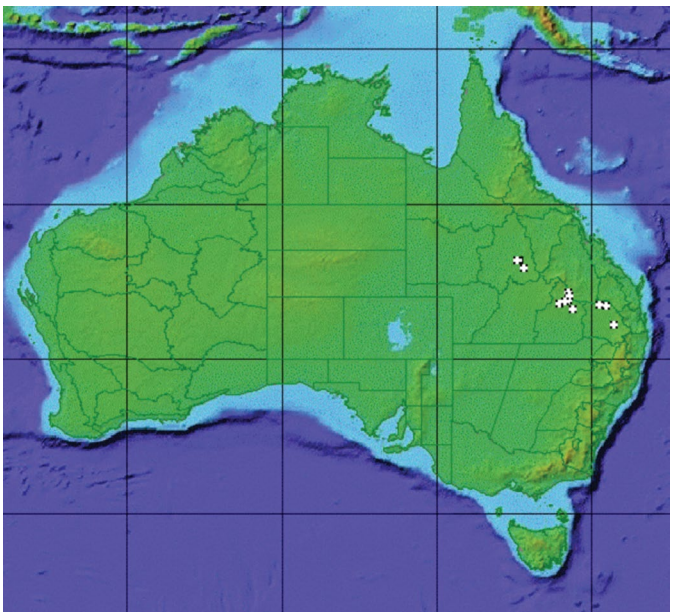

Figure 5. Distribution of *F. floridana* in Australia (AVH 2008).

F. gracilis is occasionally naturalised in a smaller area of central Queensland and the central coast region of New South Wales (Jacobs & Lapinpuro 2000) (Figure 6).

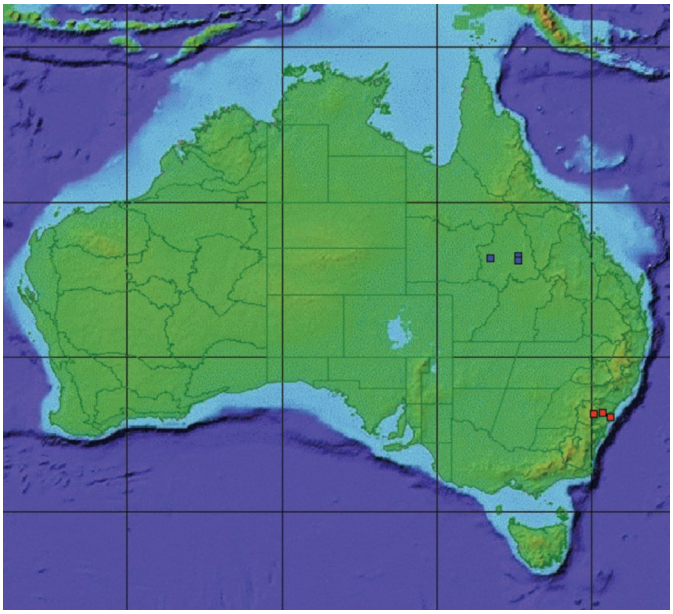

Figure 6. Distribution of *F. gracilis* in Australia (AVH 2008).

Preferred climate

F. floridana prefers a semi-arid, subtropical climate, with predominantly summer rainfall.

Ecology and preferred habitat

Both *F. floridana* and *F. gracilis* are opportunistic, 'pioneer' species that are adapted to quickly colonise disturbed, open sites with dry, sandy soils. They are not found on heavy clays. Both species can become agricultural pests within their native range, where they occasionally form large patches in fallow-fields or pastures (ZipcodeZoo, nd).

F. floridana prefers 'open sand prairies, edges of woodlands in sandy soils, road-sides, railroad 'rights-of-way' (*Flora of North America*, nd). Within its native range, it is best known as roadside weed as it thrives in periodically disturbed environments where there is little, if any, competition from other plants. It is also a common member of coastal pine plant communities, particularly along the Gulf Coast. Although common over a large geographical range, within the southern United States *F. floridana* is restricted to sand prairie or sandhill regions and sandy coastal areas (McCauley & Ungar 2002). Populations in Ohio can also be found on sand and gravel deposits associated with streams and rivers, along railroads, on agricultural land and waste ground (Burns & Cusick 1983).

In North America, *F. gracilis* has been described as 'a weed of waste-places' (Magee et al. 1999). It is found occasionally in dry, open, sandy soil, often around railroad tracks, vacant lots and sandy fields (Rhoads & Block 2007; Eastern Shore Plant, nd).

In Queensland, both species appear to prefer open, disturbed areas along roadsides, in degraded pastures and in stockyards (Parsons & Cuthbertson 1992).

Reproduction and dispersal

F. floridana reproduces from seeds and can also regrow from the crown and from root-fragments left in the soil after removal of the main plant (*Weeds in Australia*, nd). The plant's fluffy, winged fruit are readily dispersed by adhering to animals, clothing, as impurities in harvested pasture seeds, or by the wind (Parsons & Cuthbertson 1992; McCauley & Ungar 2002).

F. floridana seeds germinate quickly after rains, often in late winter and early spring (by the end of September), and the plant grows rapidly until flowering (Parsons & Cuthbertson 1992).

Seed longevity is unknown.

History as a weed overseas

F. floridana is a listed as a weed in the United States (Nebraska and the Great Plains) (Stubbendieck et al. 1994). *F. gracilis* is classed as potentially invasive and has been declared noxious in Connecticut. It is listed as an invasive alien species in Japan (Mito & Uesugi 2004).

Current impact in Queensland

Little information is available on the current impacts of *F. floridana* and *F. gracilis* in Queensland. While both species are currently expanding their range and abundance within suitable habitat types in central Queensland, they are generally restricted to highly disturbed, open, sandy sites, such as along roadsides, degraded pastures and in stockyards (Parsons & Cuthbertson 1992). There is anecdotal evidence that *F. floridana* has become much more common in recent years, perhaps in response to continued grazing and an associated loss of pasture cover during a prolonged drought.

Potential impact in Queensland

F. floridana has been identified as a potential weed of grazing land in Australia (Cunningham et al. 2003). Both *F. floridana* and *F. gracilis* are generally unpalatable and have little grazing value, despite being eaten when no other feed is available (Parsons & Cuthbertson 1992). In North America, *F. floridana* is poor forage for livestock but is consumed by deer (KWS, nd).

Climate and habitat analysis suggests that both species are likely to become more widespread and abundant on sandy, disturbed sites across semi-arid, subtropical parts of central Queensland and northern New South Wales. The predicted range of *F. floridana* is provided in Figure 7. Some authors suggest that within this area, dry land grazing and cropping are probably most at risk (FAO 2006; Cunningham & Brown 2006; *Weeds in Australia*, nd). However, this study suggests that both species will be restricted to open, disturbed habitats (sandy soils only), such as roadsides, stockyards and any pastures that have been grazed bare during drought. As such, while these species could affect a substantial area, they are likely to be symptomatic of overgrazing. Wise pasture management could prevent these species from having major impacts.

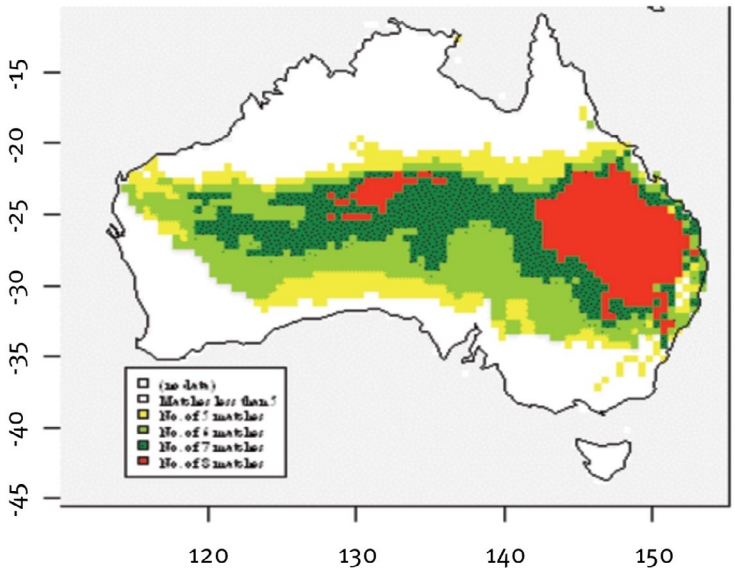

Figure 7. Potential range of *F. floridana* in Australia, as predicted by CLIMATE modelling software (red indicates areas where climate is suitable, green is marginal and yellow/white are unsuitable).

Use

The flowers of *Froelichia* are sometimes used in dried floral arrangements (KWS, nd).

References

AVH (2007), Australia's Virtual Herbarium. Council of Heads of Australian Herbaria (CHAH), www.anbg.gov.au/avh/

Burns, J and Cusick, A (1983). *Froelichia floridana*, Ohio Department of Natural Resource, Division of Natural Areas and Preserves. www.ohiodnr.com/dnap/Abstracts/E-F/froeflor.htm

Cunningham, D, Brown, L, Woldendorp, G and Bomford, M (2006). *Science for decision makers: Managing the menace of agricultural sleeper weeds*, Bureau of Rural Sciences, Canberra, http://affashop.gov.au/product.asp?prodid=13368

Cunningham, DC, Woldendorp, G, Burgess, M and Barry, SC (2003). *Prioritising sleeper weeds for eradication: Selection of species based on potential impacts on agriculture and feasibility of eradication*, Appendix E, Bureau of Rural Sciences, Canberra, http://affashop.gov.au/product.asp?prodid=12919

DAFF, Department of Agriculture, Fisheries and Forestry, Bureau of Rural Sciences, Australia Government, http://affashop.gov.au/PdfFiles/12919_appendix_e.pdf

Davidson, RA (1965). 'Photoperiodism in Froelichia Floridana (Nutt.) Moq. (Amaranthaceae)', *Ecology* 46: 520–524.

Davidson, RA (1965). 'Photoperiodism in Froelichia Floridana (Nutt.) Moq. (Amaranthaceae)', *Ecology* 46: 520–524.

Eastern Shore Plant. www.materry.com/froelichia%20gracilis%20home.htm

FAO, Food and Agricultural Organization of the United Nations (FAO), *Groups and Types of Climate*, http://ecocrop.fao.org/GPPIS.exe$Help?ID=2013

Flora of North America (undated). 5. *Froelichia floridana*, Vol. 4, pp. 442–7, www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=242415692

GCW, *Global Compendium of Weeds*, www.hear.org/gcw/

GRIN (2008) Germplasm Resources Information Network, www.ars-grin.gov/npgs/aboutgrin.html

Groves, RH, Hosking, JR, Batianoff, GN, Cooke, DA, Cowie, ID, Johnson, RW, Keighery, GJ, Lepschi, BJ, Mitchell, AA, Moerkerk, M, Randall, RP, Rozefelds, AC, Walsh NG and Waterhouse, BM (2003), *Weed categories for natural and agricultural ecosystem management,* Bureau of Rural Sciences, Canberra. http://affashop.gov.au/product.asp?prodid=12781

Jacobs, SWL and Lapinpuro, L (2000). *'Amaranthaceae'*, *Flora of New South Wales*, Volume 1, Second Edition, UNSW Press, Sydney. http://plantnet.rbgsyd.nsw.gov.au/cgibin/NSWfl.pl?page=nswfl&lvl=sp&name=Froelichia~gracilis

KWS, *Kansas Wildflowers and Grasses*, www.kswildflower.org/details.php?flowerID=108

Magee, DW, Ahles, HE and Rorer, A (1999), *Flora of the Northeast: A Manual of the Vascular Flora of New England*, University of Massachusetts Press.

McCauley, RA (1999). Population Dynamics and Conservation of Endangered *Froelichia floridana* (Nutt.) Moq. var. *campestris* (Small) Fern. in Washington County, Ohio, MS thesis, Ohio University.

McCauley, RA. and Ballard, HE Jr. (2002). 'Inferring nativity and biogeographic affinities of central and marginal populations of *Froelichia floridana* (Amaranthaceae) from inter-simple sequence repeat (ISSR) markers', *Journal of the Torrey Botanical Society,* 129(4): 311–325.

McCauley, RA and Ungar, IA (2002). 'Demographic analysis of a disjunct population of *Froelichia floridana* in the mid-Ohio River Valley', *Restoration Ecology* 10(2): 348–361.

Missouri plants, www.missouriplants.com/Others/Froelichia_floridana_page.html

Mito, T and Uesugi, T (2004). *Invasive alien species in Japan: The status quo and the new regulation for prevention of their adverse effects*, Global Environmental Research 8: 171–191.

NatureServe (undated), NatureServe Explorer Species Index: Froelichia: www.natureserve.org/explorer/speciesIndex/Genus_Froelichia_112234_1.htm

Parsons, WT and Cuthbertson, EG (1992). *Noxious Weeds of Australia*, Inkata Press, Melbourne.

PlantNet, New South Wales Flora Online (undated), http://plantnet.rbgsyd.nsw.gov.au/

Rhoads, AF and Block, TA (2007), *The Plants of Pennsylvania: An Illustrated Manual*, University of Pennsylvania Press.

Richardson, A (1995). *Plants of the Rio Grande Delta,* University of Texas Press,

Robert Freckmann Herbarium, University of Wisconsin-Stevens Point, http://wisplants.uwsp.edu/scripts/detail.asp?SpCode=FROGRA

Stanley, TD and Ross, EM (1983). *Flora of southeastern Queensland*, Volume 1, Department of Primary Industries, Brisbane.

Stubbendieck, J, Friisoe, GY and Bolick, MR (1994). *Weeds of Nebraska and the Great Plains*, Nebraska Department of Agriculture, Bureau of Plant Industry, Lincoln, Nebraska.

Tenaglia, D (2003). *Froelichia floridana*, *Photographs and descriptions of the flowering and non-flowering plants of Missouri*, USA. Brown Summit, NC, www.missouriplants.com/Others/Froelichia_floridana_page.html

UMass Extension: UMASS Extension Weed Herbarium, University of Massachusetts Amherst, www.umassgreeninfo.org/fact_sheets/weed_herbarium/pages/frogr.htm

USDA (2008). United States Department of Agriculture, Natural Resources Conservation Service, http://plants.usda.gov/index.html

Weeds in Australia (undated), Australian Government Department of the Environment, Water, Heritage and the Arts, www.weeds.gov.au/cgi-bin/weeddetails.pl?taxon_id=6976

Wildflower Center (undated). www.wildflower.org/plants/result.php?id_plant=FRGR3

Wisconsin State Herbarium (undated). University of Wisconsin-Madison Herbarium, www.botany.wisc.edu/wisflora/scripts/detail.asp?SpCode=FROGRA

ZipcodeZoo (undated). http://zipcodezoo.com/Key/Froelichia_Genus.asp