Department of **Agriculture and Fisheries**
Biosecurity Queensland

Invasive plant risk assessment

Chilean needle grass

Nassella neesiana

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Queensland Government

Contents

Identity and taxonomy

Taxa: *Nassella neesiana* (Trin. and Rupr.) Barkworth

Common names: Chilean needle grass, spear grass, Uruguayan tussock grass

Taxonomy and related species:

Prior to taxonomic revision, *N. neesiana* was known as *Stipa neesiana* Trin and Rupr. and many references use the outdated synonym. Several varieties of *N. neesiana* exist in South America (Torres 1993). *N. neesiana* subsp. *neesiana* has been recorded in Australia (Walsh & Entwistle 1994) but subspecies *N. neesiana* subsp. *gracillor* Bukart and *N. neesiana* subsp. *longiaristata* Arech. have not (Britt et al. 2002). The taxonomic history of *Nassella* was reviewed by Barkworth (1990). *N. neesiana* is in the Poaceae family. The genus contains 98 species, of which 90 can be found in South America (Torres 1997). Invasive congeners in Australia include *N. trichotoma* (serrated tussock) and *N. tenuissima* (Syn. *Stipa tenuissima*) (Mexican feather grass).

Description

Chilean needle grass, named for its sharp, pointed seeds, is an erect, perennial tussock-forming grass that grows in dense clumps. Without grazing, it can grow to 1 m tall. The inflorescence is a loose panicle, up to 40 cm long, with a distinctive purplish colour. Leaves are hairless or sparsely hairy, 10–30 cm long, 1–5 mm wide, flat and strongly ribbed on their upper surface, with leaf edges that are rough to touch. The seeds are pale brown when mature, mostly 8–10 mm long, with an awn 60–90 mm long.

Isolated, scattered specimens of Chilean needle grass are very difficult to detect among other grasses and can be easily confused with native spear grasses (*Austrostipa* species). They all have sharp seeds with a long, curved or bent awn and hairy tip, and may appear red before drying to a straw colour. The most distinctive feature of Chilean needle grass is the corona at the join of the seed body and the seed awn. Prior to flowering, Chilean needle grass can be mistaken for many other winter green species, especially *Austrodanthonia* and *Festuca*.

Phenology

In southern states, Chilean needle grass grows predominantly over the cooler months, producing flowers from September to December (timing can vary due to seasonal conditions). It has the ability to flower year-round if conditions are favourable. Isolated populations of Chilean needle grass found on the Darling Downs in southern Queensland, appear to die back during the winter dry season and grow quickly after storm rains in October–December. Flowering occurs in November–December, depending on the timing of rainfall.

Reproduction, seed production, longevity and dispersal

Chilean needle grass reproduces from seeds. In southern states, seeds are produced approximately one month after flowering and most seeds have fallen to the ground by February. Seeds have 90% viability and can remain viable for four years in the soil (Muyt 2001). Seeds germinate mainly in autumn and spring, but germination can occur at other times of the year given adequate moisture and suitable temperature. Seedlings grow quite slowly but have a high survival rate. They can flower and produce seeds in the first season. Seed production and germination have not been studied or described in Queensland.

Depending on the availability of moisture, Chilean needle grass can produce more than 20 000 seeds per square metre. As a result, up to 15 000 seeds per square metre can be found in the seed bank beneath infestations (Gardener 1998). The seed-bank can persist for many years, even if further seed production is prevented.

A curious feature of Chilean needle grass is that, in addition to seeds produced high on the flowering stems, it produces hidden seeds in the nodes and bases of the flowering stems. These 'stem seeds' (cleistogenes) are self-fertilised and can account for 25–50% of annual seed production. They are an adaptation that enables the plant to reproduce despite grazing, slashing or fire.

Seeds can be dispersed on clothing or livestock, on farm machinery, or as a contaminant of seeds and fodder. Slashers and earth-moving equipment have also been blamed for spreading seeds. Since Chilean needle grass can become abundant along watercourses subject to flooding, the seeds are readily dispersed by water (Liebert 1996).

History of introduction

The earliest known collection of Chilean needle grass in Australia was made in October 1934 at Northcote, an inner northern suburb of Melbourne. The mode of introduction into Australia is unknown. Chilean needle grass seems to have spread slowly in Victoria until the late 1970s and has only recently been acknowledged as a serious weed. In New South Wales, the earliest collection was made in 1944 at Glen Innes on the New England Tablelands. Chilean needle grass has also naturalised in South Australia where it was first recorded in 1988. It has not been recorded from Western Australia. The first record of Chilean needle grass in Queensland was a specimen collected by Richard Silcock (pasture scientist, DPI&F) near Felton on the Darling Downs in 1998.

Origin and distribution

Chilean needle grass is native to South America where it occurs in Argentina, Bolivia, Ecuador, Uruguay, southern Brazil and Chile (Rosengurrt et al. 1970). Along with serrated tussock, it is a common pasture component of the Argentine pampas in the central eastern part of Argentina. Unlike serrated tussock, which becomes less abundant in the drier west and south and northern wetter areas of Argentina, Chilean needle grass is less restricted in distribution. As well as the pampas, Chilean needle grass is also found between Tucuman province in northern Argentina and Chilean Patagonia. Large populations exist around the Sierra de Cordoba in central western Argentina.

In Australia, its range extends from the Northern Tablelands of New South Wales, along the Great Dividing Range and through Victoria to south-eastern South Australia. It is abundant over large areas of New South Wales, the Australian Capital Territory and Victoria (McLaren et al. 2002). Isolated populations have been found in South Australia and southern Tasmania.

In Queensland, the first (1998) detection site near Felton on the Darling Downs (GPS: S2787700, E15171939) was revisited in January 2005 (as part of this study) to review its status. Field staff from DPI&F and Clifton Shire Council also inspected the site and, after becoming familiar with the plant, began finding it in nearby areas. Large infestations were found at the Clifton Showgrounds, to the east of Felton, and along the banks of the Condamine River. Survey work is currently ongoing, as part of a major eradication campaign involving local governments and DPI&F.

Preferred habitat and climate

Chilean needle grass prefers temperate climates with annual rainfall of 500–800 mm. It can thrive in grassy woodlands and disturbed habitats, such as pastures and roadsides, on a wide range of soils. It tolerates periodic inundation, drought, fire and heavy grazing (Muyt 2001). Like many weeds, it is often symptomatic of prolonged grazing pressure, which tends to eliminate palatable plant species and allow unpalatable species to multiply without restriction.

In Victoria, Chilean needle grass occurs at sites that are subject to seasonal water-logging. Examples include Derrimut, the Laverton North grassland reserves and the Tarnagulla (160 km north-west of Melbourne) flora reserve (Liebert 1996, McLaren et al. 1998). Liebert (1996) commented that *N. neesiana* often establishes in damp depressions, such as drainage lines and roadsides, and then radiates out into drier grassland. Its drought tolerance and ability to tolerate seasonal waterlogging gives this species a wide ecological amplitude and potential to spread and overrun existing indigenous vegetation.

Impact in other states

Chilean needle grass is a Weed of National Significance (WoNS) due to its impact on pasture production and endangered native grasslands in south-east Australia. While providing some feed in winter, it is generally unpalatable in summer and reduces farm productivity by displacing more desirable pasture species. In Victoria, heavy infestations can reduce productivity by 50% in summer. It has dominated large areas of highly productive pastures on the Northern Tablelands of New South Wales and on the Volcanic Plain of Victoria (Gardener 1998). Its long, sharp seeds injure the skin and eyes of stock and downgrade the quality of wool. Within native grasslands, Chilean needle grass can reduce natural biodiversity by replacing native grass species. In Victoria, it has been described as potentially one of the worst environmental weeds of native grasslands (McLaren et al. 1998). Across Australia, Chilean needle grass is predicted to invade up to 41 million hectares, with substantial areas in New South Wales and Victoria (McLaren et al. 1998).

History as a weed overseas

Chilean needle grass is listed as a weed in Chile and New Zealand (Holm et al. 1979). It has been found in the past on ballast dumps in the United States, but there are no recent collections (Barkworth 1993).

Pest potential in Queensland

Based on climate modelling, it is reasonable to predict that Chilean needle grass could expand its range into subhumid cooler parts of south-east Queensland (Figure 1).

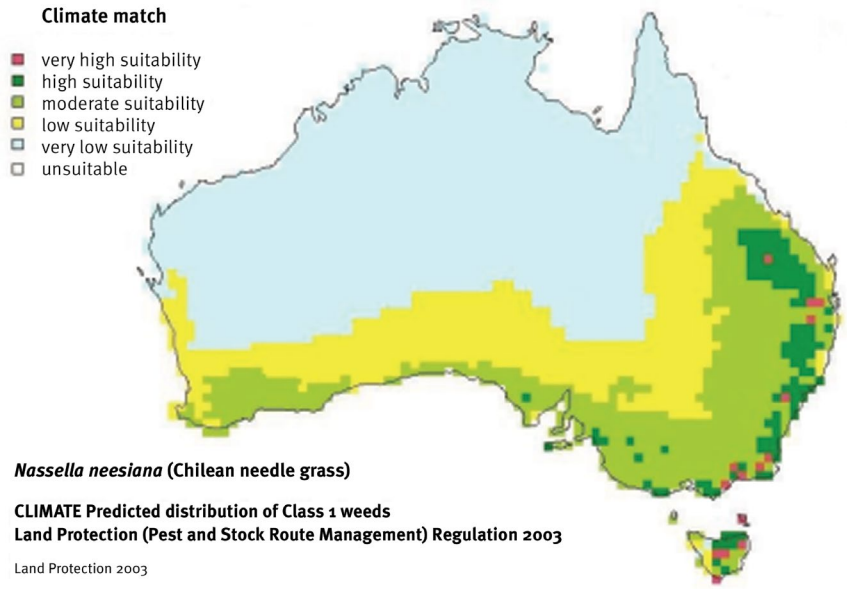

Figure 1. Potential distribution of *N. neesiana*, based on climate suitability.

The Darling Downs and 'granite belt' region around Warwick and Stanthorpe appear to be areas at particular risk. The plant is not expected to naturalise in tropical parts of the state. In areas where soil and climate are favourable, Chilean needle grass could invade grassy woodlands and become a significant weed of native pastures. Its impact could be comparable to other unpalatable grasses, such as weedy rat's tails grasses (*Sporobolus* spp.), which tend to dominate in paddocks where more palatable species are gradually eliminated by constant grazing. Extensive, pure stands of Chilean needle grass could render grazing paddocks useless, in much the same way as serrated tussock (Figure 2).

Figure 2. A pure stand of Chilean needle grass at the Clifton showgrounds, Darling Downs, Queensland, in 2005, prior to an eradication campaign.

The seeds of Chilean needle grass can contaminate produce (seeds, fodder and wool).

Chilean needle grass is closely related to serrated tussock and shares many of its key features. As such, its impacts could be comparable. Serrated tussock infests an estimated 700 000 ha in New South Wales and costs $12.5m annually in lost production (Parsons & Cuthbertson 1992). Field observations in Victoria suggest that Chilean needle grass can be more invasive than serrated tussock when growing as a component of kangaroo grass (*Themeda triandra*) dominated grasslands. In experimental plots, Chilean needle grass not only invaded areas of *T. triandra* but also replaced serrated tussock (Hunt 1996).

Control

There is a considerable amount of literature on the management of Chilean needle grass and the closely related serrated tussock. In 1998, a two-day workshop was held at Victoria University, St Albans, to bring together current knowledge about the biology and control of serrated tussock and related species, including Chilean needle grass, in Australia. The outcomes of the workshop were reported in a special edition of *Plant Protection Quarterly* (Volume 13(2)). A second workshop, held in 2002, was also documented in *Plant Protection Quarterly* (Volume 17(3)).

A survey of landholders in Victoria, New South Wales and the Australian Capital Territory estimated the average annual cost of controlling Chilean needle grass was between $60 and $120 per hectare, depending on whether the infestation was scattered or dense. These costs can be prohibitive on marginal grazing land, where the costs are difficult to recover. For this reason, a biological control program for Chilean needle grass (and serrated tussock) was initiated in 1998 (Briese et al. 1999). The Cooperative Research Centres (CRC) for Weed Management Systems, through CSIRO Entomology, established a research base in Bahia Blanca, Argentina, and a search for potential pathogens commenced in Sepetmber 1999 (Briese et al. 2000).

Fire is not considered to be an effective management option. The presence of cleistogenes hidden at the base of the tillers allows this species to reproduce after most of the plant itself has been destroyed by fire. In New Zealand, frequent burning of sites appears to facilitate the formation of pure stands of Chilean needle grass (McLaren et al. 1998).

Chilean needle grass is currently the target of a coordinated, national management program (ARMCANZ & ANZECCFM 2003).

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