

Draft Revision (2009)

Flora and Fauna Guarantee Action Statement No. 22

Wedge Diuris *Diuris dendrobioides*

Description

Wedge Diuris (*Diuris dendrobioides* formerly *D. cuneata*, R.D. FitzG.) is a deciduous terrestrial orchid that annually produces one or usually two linear, grass-like folded leaves 100-250 mm long by 3-4 mm wide, from a subterranean storage organ (tuberoid). The single 200-400 mm tall flower stem bears, depending on the nutritional and climatic factors, one to nine moderately large flowers, 25-35 mm across. Flowers are pale lilac to mauve with a few darker spots and striations, and are sometimes fragrant. Distinguishing features include the petal stalk gradually expands into a blade and the labellum midlobe is fan-shaped, wrinkled and has a prominent marginal fold. Wedge Diuris is a relatively late flowering species, from late October to early December. A detailed description is contained in Jones (2006).

Distribution

Wedge Diuris is endemic to northern Victoria, the ACT, and central and south-coast NSW, where it is widespread but generally uncommon to common. It forms loose colonies in open forest and grassland in areas with well drained soils (Jones 2006).

In Victoria, Wedge Diuris was formerly present at Goornong, north-east of Bendigo (Allen 1986) and was widespread throughout north-eastern Victoria (Scarlett 1987). It is now restricted to two north-eastern Victorian localities, Boorhaman and Bonegilla Grassland Reserves (25 and 250 individuals respectively).

Habitat

In Victoria, the habitat of the Boorhaman Grassland Reserve is a herb-rich Northern Plains Grassland remnant, listed under the *Flora and Fauna Guarantee Act 1988*. The Bonegilla Grassland Reserve habitat is a species rich Grassy Box Gum Woodland remnant listed under the *Environment Protection and Biodiversity Conservation Act 1999* and is dominated by Kangaroo Grass (*Themeda triandra*), Hop Bitter-pea (*Daviesia latifolia*) and various eucalypt species.

Life history and ecology

The ecological requirements of Wedge Diuris and its associated grassland/grassy woodland communities are generally well understood. Wedge Diuris emerges from its underground summer dormant tuberoid state following the on-set of sufficient autumn rains. The extent of leaf emergence and growth, level of flowering or whether seed set or germination occurs is dependent on a number of factors including:

- Climate, site and soil factors such as rainfall, drought index, soil nutrient status and soil moisture.
- Grassy vegetation structure and condition including biomass levels and the level of inter-tussock space. Biomass is determined by cover abundance of dominant ground level vegetation, including perennial native grasses and the type, abundance and growth pattern of other native and weed species. Biomass levels are influenced by the intensity, frequency and season of burning or browsing/grazing regimes including whether it is being done by a native or exotic species, vertebrate or invertebrate. Grazing by Case Moth larvae (*Psychidae*) can defoliate plants and destroy flower spikes (G. Johnson *pers. obs.* 2009), and thereby reduce reproductive potential. Spittle Bug nymphs (*Cercopoidea*) have been observed on Diuris, but their effect is not known.
- Presence/absence of viable populations of native bees that pollinate Wedge Diuris.

Victorian management and research on Wedge Diuris is consistent with the findings of Stuwe & Parsons (1977) and McDougall (1989) that *Themeda* dominant grasslands require frequent biomass canopy removal to prevent smothering of smaller native herbs. It demonstrated that Wedge Diuris has the greatest capacity to flower, set seed and recruit new individuals into the population when critical inter-tussock spaces are maintained within a framework of dominant yet generally low, open native perennial grasses. These spaces also support a rich diversity of other similarly less competitive species such as orchids, lilies and other wildflowers.

Domestic stock grazing is generally not compatible with highly palatable orchid species such as Wedge Diuris. In Victoria, the small fragmented nature of Wedge Diuris remnants generally precludes native mammalian herbivore

presence. Accordingly, maintenance of important habitat structure such as inter-tussock spaces, and reduced annual exotic grass cover-abundance is achieved via implementation of frequent ecological burns. This maintains the ecologically diverse environment required by Wedge Diuris for long-term viability.

Wedge Diuris small linear remnants are susceptible to edge effects such as weed invasion and Victorian populations may be at the edge of the species' preferred geographical range, with abiotic factors, particularly climate and soils, being sub-optimal, thus reducing the species' ability to survive and reproduce.

However, natural pollination rates are acceptable with at least 25% of flowering plants producing one pod. Jones (2006) indicates that pollination is primarily achieved by small native bees. Wedge Diuris flowering generally occurs after the peak flowering period of most grassland wildflower species. Natural regeneration (recruitment) of new orchids into one Victorian populations has been clearly demonstrated with an increase from less than 20 in 1991 to 200 (excluding planted seedlings) in 2008. However the second population has recorded a decline from 70 to 25 over the last 10 years. The reasons for the decline are thought to be prolonged drought and possibly non target weed control effects.

Wedge Diuris has an extremely high potential reproductive ability. Propagation using modern flasking techniques has the potential to produce over 1000 plants from a single pod containing fertile seed. The mycorrhizal fungus associated with each Wedge Diuris population has been isolated and a propagation program with the Royal Botanic Gardens is underway. Planting of propagated orchids in 2005 has further increased overall numbers.

Conservation status

Victorian conservation status

Wedge Diuris (*Diuris dendrobioides*) has been listed as threatened under the *Flora and Fauna Guarantee Act 1988*.

Wedge Diuris (*Diuris dendrobioides*) is considered Endangered in Victoria according to the “Advisory List of Rare or Threatened Plants in Victoria – 2005” (DSE 2005).

Threats

At present the most serious threats to the Wedge Diuris are those that reduce recruitment of or out-compete Wedge Diuris. Environmental weeds, excessive dominance of some native grasses, shrubs and eucalypts and inappropriate fire regimes are major threats that can move its habitat away from a low, open native perennial grassland with inter-tussock spaces, its preferred habitat for recruitment. Environmental weeds can also directly displace Wedge Diuris while fire may destroy plants that are flowering or producing pods. The small population size and, its now, restricted and fragmented habitat can increase the susceptibility of Wedge Diuris to naturally occurring disturbances and anthropomorphic threats. Further, threats may also compound each other, for example, increased shading by eucalypts can lead to a better habitat for exotic weeds.

The threat(s) likely to be causing the decline in numbers include competition and invasion of environmental weeds, inappropriate fire regimes and loss of important habitat features.

<i>Standard threat</i>	<i>Source Of Threat</i>	<i>Explanation</i>
Competition	Invasion by environmental weeds	Environmental weeds can displace native grassland species including Wedge Diuris or influence habitat structure. Dominant native grasses, especially Kangaroo Grass and other native grassland species, are displaced by perennial grass weeds, particularly <i>Paspalum</i> sp.) and Canary Grass (<i>Phalaris</i> sp.), annual grass weeds including Wild Oat (<i>Avena fatua</i>) and Brome (<i>Bromus</i> sp.) and broad-leaf weeds including Paterson's Curse (<i>Echium plantagineum</i>), St. John's Wort (<i>Hypericum perforatum</i> subsp. <i>veronense</i>), Cat's ear (<i>Hypochoeris</i> sp.), Twiggy Mullein (<i>Verbascum virgatum</i>), Evening Primrose (<i>Oenothera stricta</i> subsp <i>veronense</i>) and Purple-top Verbena (<i>Verbena bonariensis</i>). Woody weeds, including Blackberry (<i>Rubus</i> sp.), Prunus (<i>Prunus</i> sp.), Briar (<i>Rosa</i> sp.) and other berry fruiting exotics, can out compete and shade natives.
Inappropriate fire regimes	Fire - frequency	Inappropriate fire regimes can change habitat structure and/or prevent flowering or pod production. Fires may be excessive or too frequent, for example, burning all patches annually. The impact of this can be exacerbated if timing precludes orchid flowering/pod production. Alternatively, if fires are too infrequent or absent, for example, lack of fire for more than three (and especially over five) years in any one grassland

		patch, excessive biomass accumulation may result, inter-tussock spaces may be reduced and smothering (leading to reduced flowering and pod production) of orchids and other inter-tussock space dependent species may occur.
Loss of important habitat features	Smothering by other native species	Smothering and competition from dominant native grasses, particularly Kangaroo Grass and shrubs including Hop Bitter-pea, can reduce the abundance of Wedge Diuris. Shading by dense eucalypt regeneration and existing tree canopies can adversely result in increased competition and cover abundance of annual and perennial exotics.

Important populations

<i>Location name</i>	<i>Land manager</i>	<i>Catchment</i>	<i>Bioregion</i>
Bonegilla Native Plant Reserve	Parks Victoria	North East	Northern Inland Slopes
Boorhaman Native Plant Reserve	Parks Victoria	North East	Victorian Riverina

Past management actions

<i>Action</i>	<i>Result explanation</i>
Maintain <i>ex situ</i> plant collections.	Royal Botanic Gardens Threatened Orchid Recovery Team maintains an <i>ex situ</i> conservation plant collection.
Develop policy.	The Victorian Wedge Diuris conservation status was revised from 'vulnerable' to 'endangered' in 1998 (Cameron <i>et al.</i> 1999) to reflect the small number of sites and low total population size.
Control introduced animals.	Low level and infrequent hare, rabbit and fox control has been undertaken at Bonegilla. Control on private land adjoining Boorhaman is periodically implemented. However, as introduced animal numbers are generally low and impacts to grassland flora minimal, this action is a low priority.
Conduct artificial pollination.	Very low levels of artificial pollination have been undertaken historically (early 1990s), however this activity is no longer required due to high levels of natural pollination.
Restock populations with seed or propagated plants.	Seed baiting trials to test for Wedge Diuris mycorrhizal fungus activity/presence was unsuccessfully undertaken at Bonegilla in 2004. Technical difficulties precluded this trial from working; however alternate means of artificially inoculating sites are now available. Over 100 cultivated tube-stock seedlings raised by the Royal Botanic Gardens Threatened Orchid Recovery Unit have been planted into Bonegilla with over 50% survival. Early monitoring of planted orchids has recorded vegetative reproduction (daughter orchid production) and flowering (demonstrating sexual reproduction potential).
Liaise with private landholders.	Active liaison with adjoining private landholders and community groups has been undertaken to convey grassland reserve management objectives, communicate key actions such as ecological burn and weed control activities, seek feedback and dialogue on any issues, and encourage participation in reserve monitoring and works and complimentary management of adjoining private land.
Undertake detailed population monitoring and collect demographic information.	All Wedge Diuris are individually marked in the field and accurate locations mapped. Annual monitoring consists of recording life history data e.g. dormancy, emergence, flowering and pod production states per plant.
Liaise with stakeholder groups.	Liaison with the following key stakeholders has occurred: local and state government agencies, for example, Wangaratta and Wodonga Councils and Vic Roads regarding relevant roadside management agreements and planning matters, Parks Victoria regarding implementation of ecological burn and environmental weed control programs, Parklands Albury Wodonga regarding Rail Trail

	management, and non government groups such as Trust For Nature and other conservation and Landcare groups on biodiversity conservation matters.
Map individuals.	Accurate ArcView Map projects delineating each individual orchid at both high priority locations have been maintained and updated annually.
Assess habitat characteristics and/or condition.	Small reptile and amphibian fauna of each reserve has been determined by surveys. No threatened species have been recorded, however a suite of open grassy woodland dependent species tolerant of ecological burn regimes have been identified. Surveys to determine floristic diversity and weed composition and abundance have been undertaken and are annually reviewed. Combined flora and fauna results have informed development of ecological burn and weed control programs.
Manage environmental weeds.	Strategic perennial grass, broad leaf and woody weed control programs have been annually implemented pre and post ecological burn regimes. The level of high threat environmental weeds has been reduced significantly resulting in an expansion of habitat suitable to native grassland dependent species. Ongoing works continue in this area.
Apply ecological burning.	Summer/early autumn mosaic pattern burns have been implemented almost annually in accordance with ecological burn plans. Individual burn units are generally 'burnt' on a 2-3 year cycle to maximise orchid flowering and potential pod development. The burn frequency is determined by assessment of dominant native grass/shrub biomass levels and degree of inter-tussock space. These variables are influenced by prevailing seasonal climate impacts on growth rates.
Restore habitat.	Natural regeneration has been the primary process of colonisation of degraded areas following environmental weed control. However, active restoration via tube stock planting of Kangaroo Grass and other native species has been regularly undertaken at more degraded sites at Bonegilla. Works in this area are ongoing to expand the area of habitat suitable to Wedge Diuris and other native grassland species.
Propagate seedlings and/or cuttings for reintroduction or reinforcement.	The Royal Botanic Gardens Threatened Orchid Recovery Unit has successfully propagated approximately 120 tube stock. Ongoing cultivation is being undertaken to facilitate further stocking. Approximately 55% survival (and some flowering) of planted tube stock has been recorded.
Collect reproductive material.	Approximately 20 pods have been collected to contribute to ex-situ conservation program priorities and research. This represents less than 5% of pods produced over the collection period.
Store reproductive material.	Royal Botanic Gardens Threatened Orchid Recovery Unit store collected pods to facilitate tube stock cultivation, research and store genetic material in secure repository.
Involve community groups and volunteers in recovery activities.	Annual TAFE Natural Area Management student working-bees are undertaken at Bonegilla. Biodiversity Month (September) Awareness and Community/Landcare field days have been successfully held at Boorhaman to increase community awareness and promote participation in monitoring and management of the reserve.

Conservation objectives

Long term objective

To ensure that the Wedge Diuris can survive, flourish and retain its potential for evolutionary development in the wild.

Objectives of this Action Statement

- To increase the number of populations or individuals
- To improve condition of habitat
- To increase the extent of habitat

- To secure populations or habitat from potentially incompatible land use or catastrophic loss
- To increase knowledge of biology, ecology or management requirements
- To increase community awareness and support

Intended management actions

The intended management actions listed below are further elaborated in DSE's Actions for Biodiversity Conservation (ABC) system. Detailed information about the actions and locations, including priorities, is held in this system and will be provided annually to land managers and other authorities.

<i>Standard objective</i>	<i>Targets</i>	
To increase the number of populations or individuals.	<ul style="list-style-type: none"> • Existing population levels increased to at least 400 and at least 100 at Bonegilla and Boorhaman, respectively, and at least two, preferably three new populations (of at least 50 individuals) of Bonegilla genetic origin established in nearby secure public land reserves by 2015. 	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Collect mycorrhizal fungi.	Collect limited Wedge Diuris tuberoid rootlets to facilitate isolation, cultivation, and long term storage of Wedge Diuris specific mycorrhizal fungi by the Royal Botanic Garden (RBG) Orchid Recovery Unit. Host specific fungi are critical for RBG seed germination, tube-stock cultivation and orchid translocation programs.	DSE Statewide Services - North East region
Collect reproductive material.	Collect ripe pods consistent with in- and ex-situ conservation program priorities and budget.	DSE Statewide Services - North East region
Establish and maintain a reintroduced / translocated population.	Establish at least two (preferably three) new populations of at least 50 individuals of Bonegilla Wedge Diuris genetic origin in nearby, secure public land reserves supporting suitable habitat within secure public land reserves.	Royal Botanic Gardens Melbourne, DSE Statewide Services - North East region
Maintain <i>ex situ</i> plant collections.	Maintain and store viable Wedge Diuris mycorrhizal fungi culture and <i>ex situ</i> plant collections to facilitate <i>in situ</i> fungal inoculations and future translocation programs.	DSE Biodiversity & Ecosystem Services, Royal Botanic Gardens Melbourne, DSE Statewide Services - North East region
Propagate seedlings and/or cuttings for reintroduction or reinforcement.	Facilitate asymbiotic or symbiotic seed cultivation for <i>in situ</i> orchid re-introductions or new population translocation programs.	DSE Biodiversity & Ecosystem Services, Royal Botanic Gardens Melbourne, DSE Statewide Services - North East region
Restock populations with seed or propagated plants	Plant cultivated seedlings to achieve viable population threshold (at least 400 individuals at Bonegilla and 100 individuals at Boorhaman) in accordance with reintroduction plan.	DSE Statewide Services - North East region
Store reproductive material	Store adequate seed to facilitate tube stock cultivation, research and ensure secure repository of genetic material.	Royal Botanic Gardens Melbourne, DSE Statewide Services - North East region

<i>Standard objective</i>	<i>Targets</i>
To improve condition of habitat.	<ul style="list-style-type: none"> • Strategic, priority environmental weed control programs implemented pre and post ecological burns and introduced hare and rabbit populations monitored and controlled. Habitat suitable for native grassland dependent species protected and

	enhanced and Wedge Diuris area of occurrence and abundance increased to a target population of at least 400 and 100 individuals at Bonegilla and Boorhaman respectively.	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Apply ecological burning.	Conduct frequent (generally annual) summer/early autumn mosaic pattern burns in accordance with ecological burn plan. Individual burn units generally 'burnt' on a 2 to 3 year cycle to maximise orchid flowering and potential pod development. Year to year burn frequency determined by assessment of dominant native grass/shrub biomass levels and degree of inter-tussock space. These variables will be influenced by prevailing seasonal weather and climate impacts on growth rates.	Parks Victoria, Parklands Albury Wodonga, DSE Statewide Services - North East region
Control introduced animals.	Monitor hare and/or rabbit numbers and implement control as required.	Parks Victoria
Manage environmental weeds.	Monitor and implement priority (high threat species) environmental weed control works. Integrate strategic perennial grass, broad leaf and woody weed control - pre and post ecological burns to mitigate threats.	Parks Victoria, Parklands Albury Wodonga, DSE Statewide Services - North East region

<i>Standard objective</i>	<i>Targets</i>	
To maintain or increase the extent of habitat.	<ul style="list-style-type: none"> Degraded areas rehabilitated following weed control works to restore and increase the extent of habitat suitable for Wedge Diuris and other native grassland dependent species. 	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Restore habitat.	Actively plant Kangaroo Grass, other dominant or key indicator native species in degraded areas following weed control works to restore habitat in areas where natural regeneration processes are limiting.	DSE Statewide Services - North East region

<i>Standard objective</i>	<i>Targets</i>	
To secure populations or habitat from potentially incompatible land use or catastrophic loss.	<ul style="list-style-type: none"> Wedge Diuris habitat in existing reserves permanently reserved and managed for conservation purposes. Effective liaison undertaken with adjoining private land holders and key government and non government stakeholders to raise awareness and seek cooperative participation in the development and implementation of conservation plans to secure populations. 	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Amend Crown land reservation.	<p>Permanently reserve under the <i>Crown Land (Reserves) Act 1978</i> for the purpose of 'preservation of an area of ecological significance', Wedge Diuris habitat in accordance with River Red Gum Forest Investigation Final Report Recommendations (D50 Bonegilla Nature Conservation Reserve, VEAC 2008).</p> <p>Permanently reserve as 'Nature Conservation Reserve' the Boorhaman Grassland Reserve section of H131 Boorhaman Bushland Area, Nature Features Reserve in the Box-Ironbark Forests and Woodlands Investigation Final Report (ECC 2001).</p>	Parklands Albury Wodonga, DSE Statewide Services - North East region
Liaise with private landholders.	Liaise annually or as appropriate with adjoining private landholders and community groups to convey grassland reserve management objectives, communicate key actions such as ecological burn and key weed control activities,	Parks Victoria, Parklands Albury Wodonga, DSE Statewide Services - North East region

	seek feedback and dialogue on relevant issues, and encourage participation in reserve monitoring and works and complimentary management of adjoining private land.	
Liaise with stakeholder groups.	Liaise with key stakeholders including local and state government agencies e.g. Wangaratta and Wodonga Councils and Vic Roads regarding relevant roadside management agreements and planning matters, Parks Victoria regarding implementation of ecological burn and environmental weed control programs, Parklands Albury Wodonga regarding Rail Trail management, and non government groups such as Trust For Nature and other conservation and Landcare groups on biodiversity conservation matters.	Wangaratta Rural City Council, Parks Victoria, Parklands Albury Wodonga, DSE Statewide Services - North East region

<i>Standard objective</i>	<i>Targets</i>	
To increase knowledge of biology, ecology or management requirements.	<ul style="list-style-type: none"> Habitat condition of each reserve monitored annually to inform annual ecological burn and weed control programs. Plants annually field marked and monitored, demographic information recorded and accurate GIS mapping maintained for all individuals (or specified subset/transects) in each population. 	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Assess habitat characteristics and/or condition.	Undertake surveys and monitoring to determine floristic diversity, weed composition and abundance, biomass and inter-tussock space levels, and small reptile and amphibian fauna of the reserves to facilitate informed implementation of ecological burn and weed control programs.	DSE Statewide Services - North East region
Map individuals.	Maintain accurate ArcView Map projects for all individuals within high priority populations.	DSE Statewide Services - North East region
Undertake detailed population monitoring and collect demographic information.	Field mark and map precise locations, and monitor and record annual life history data (dormancy, emergence, flowering and pod production states) of all individuals.	DSE Statewide Services - North East region

<i>Standard objective</i>	<i>Targets</i>	
To increase community awareness and support.	<ul style="list-style-type: none"> Community awareness, support and participation in conservation programs increased and participation in monitoring of the reserves promoted. 	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Involve community groups and volunteers in recovery activities.	Provide opportunities for increasing community awareness, such as field days during Biodiversity Month, and enable volunteer participation in monitoring and management works programs via Land care and tertiary institution field days and student assignments, for example, continue to support annual TAFE Natural Area Management student working bees at Bonegilla.	DSE Statewide Services - North East region

Personal Observations

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