The IUCN Red List of Ecosystems
Scope: Sub-global / National
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Georgina gidgee woodlands, Central Australia, Australia

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Overall risk category VU

NOT EVALUATED	DATA DEFICIENT	LEAST CONCERN	NEAR THREATENED	VULNERABLE	ENDANGERED	CRITICALLY ENDANGERED	COLLAPSED
NE	DD	LC	NT	VU	EN	CR	CO

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Acacia, Biodiversity, Desert, Desert dunes, Ecosystem risk assessment, Fire, Grass cenchrus-ciliaris, Habitat, IUCN Red List, Native vegetation, Queensland, Rainfall, Species distributions, Woodland

Ecosystem Description

Georgina gidgee woodlands are strongly associated with arid to semiarid climates in Central Australia where summer rainfall is dominant and usually less than 350 mm a year, and often but not exclusively with clay soils. Georgina gidgee woodlands canopy is dominated by Acacia georginae F. M. Bailey (Fabaceae). Although A. georginae is the single dominant tree species in this ecosystem, it occurs with varying associated understory and ground plants, a soil microbial community and invertebrate and vertebrate fauna, some of which, such as birds or mammals, may be transiently present. Georgina gidgee, or gidyea woodlands include species across several trophic levels that depend on the existence of Acacia tree-dominated habitats. These woodlands occur over large areas in the longitudinal dune fields and fringing areas of arid central Australia, but at the local scale are distributed patchily in clay swales between dunes (Purdie 1984; Dickman et al. 2011; Frank et al. 2014) or elsewhere on calcareous and alluvial soils (Beadle 1981). The ecosystem is impacted currently by firewood removal and by trampling, browsing and inputs of nutrients from livestock and feral camels (Frank et al. 2013, 2014).

Classification

IUCN Habitats Classification Scheme

- 8. Desert
  - 8.1. Desert - Hot

IUCN Global Typology

- Terrestrial
  - T5. Deserts and semi-deserts
    - T5.3 Sclerophyll hot deserts and semi-deserts

Distribution

Gidgee woodlands are strongly associated with arid to semiarid climates in Central Australia. These woodlands occur over large areas in the longitudinal dune fields and fringing areas of arid central Australia, but at the local scale are distributed patchily in clay swales between dunes (Purdie

1984; Dickman et al. 2011; Frank et al. 2014) or elsewhere on calcareous and alluvial soils (Beadle1981).

System

Terrestrial

Biogeographic Realm

Australasian

Countries

Australia

Geographic Region

Central Australia

Characteristic Native Biota

Georgina gidgee woodlands canopy is dominated by Acacia georginae F. M. Bailey (Fabaceae). Georgina gidgee trees exhibit a gnarled and spreading habit with variable canopy height (3-8.5 m), resulting in low woodlands or low open woodlands with adult tree densities as high as 200 trees ha−1 but more typically 60-70 trees ha−1. Georgina gidgee woodlands vary in the structural and floristic composition of the understory. Typically, chenopods, a subfamily now within Amaranthaceae are common, as are grasses and forbs (Frank et al. 2014). In some patches, taller shrub layers may be present, giving a multi-layered structure. Grasses mainly occur after rain, as do forbs. There is typically an abrupt boundary between adjoining spinifex grassland and gidgee woodland, visually obvious by the change in structure and floristics despite many species occurring in both habitats, including spinifex itself (Wardle 2010; Frank et al. 2014). Georgina gidgee woodlands are important refuge sites for some native rodents, dasyurid marsupials, red kangaroos and bats that have varying levels of reliance on woodland. The trees, leaf litter and fallen woody debris in A. georginae woodlands provide habitat for many species of reptiles (Pianka 1989; McElhinny et al. 2006). Amphibians appear to use A. georginae woodlands for foraging and, when the clay pans contain water for several weeks after rain, for reproduction, too (Predavec and Dickman 1993). Georgina gidgee woodlands provide permanent or temporary habitat for at least 81 species of birds. While some core species utilize gidgee as preferred habitat -some exclusively- most birds use the scattered distribution, variable-sized patches and structural attributes of stands as ‘stepping-stones’ through other land systems (Tischler 2012). These patterns are especially evident when episodic rainfalls trigger different floristic responses across disjunct woodlands, resulting in isolated productivity cascades and pockets of resource-rich habitat. Overall, insectivores are the dominant avian functional group in gidgee (Tischler et al. 2013), and this ecosystem is preferred habitat for small desert specialists. During resource pulses, Georgina gidgee woodlands provide forage (e.g. seeding grasses, flowering perennial shrubs, invertebrate hatches) and free-standing water in claypans for nomadic granivores. Invertebrates are a diverse but relatively poorly known component of the Georgina gidgee woodland ecosystem. Invertebrate orders are similar in number to those in adjoining spinifex habitat, but nearly threefold more numerous in gidgee than spinifex. In the understory, chenopod shrubs provide preferred forage plants for Lepidoptera (Edwards and Glover 2009). Other groups of note include desert-dwelling cicadas (Hemiptera) (Ewart 2009), semiaquatic Coleoptera in flooded claypans (Lemann and Weir 2009) and many soil invertebrates involved in nutrient cycling (Greenslade 2009).

Taxa

Acacia calcicola, Acacia cambagei, Acacia georginae, Acacia peuce, Acacia pickardii, Acacia pruinocarpa, Amphibolurus longirostris, Aphelocephala nigricincta, Aristida contorta, Atriplex spp., Ctenotus regius, Cyclorana spp., Dactyloctenium radulans, Eragrostis spp., Eremophila freelingii, Eremophila macdonnellii, Eremophila obovata, Falco berigora, Geopelia cuneata, Halosarcia spp., Lichenostomus virescens, Litoria rubella, Melanodryas cucullata, Melopsittacus undulatus, Neobatrachus centralis, Notaden nichollsi, Ocyphaps lophotes, Planigale gilesi, Planigale tenuirostris, Pseudomys hermannsburgensis, Sclerolaena spp., Senna artemisioides, Strophurus ciliaris, Taenopygia guttata, Tragus australianus, Triodia basedowii, Varanus gilleni, Yakirra australiensis

Abiotic Features

Gidgee woodlands are strongly associated with arid to semiarid climates in Central Australia where summer rainfall is dominant and usually less than 350 mm a year, and often but not exclusively with clay soils. Mean annual daily maximum and minimum temperatures range from 27°C to 30°C and 12°C to 15°C, respectively (Australian Bureau of Meteorology 2014). However, during summer, daily temperatures usually exceed 40°C and minima in winter fall below 5°C (Dickman et al. 2010).

Biotic Processes

Mature trees are relatively long-lived (more than 200 years) and recruitment appears to be episodic, rather than annual or seasonal, and recovery from adverse conditions is slow. Although there are no data on regeneration of A. georginae, recent studies on the more widespread but closely related Acacia cambagei show that seedling establishment occurs after a series of wet years and may lead to dense stands of young trees (Fensham and Fairfax 2005). Adult A. cambagei will generally survive fire, but fire affects recruitment in contrasting ways: juveniles in woody thickets are killed by fire, but in the absence of fire the natural self-thinning process that leads to mature trees, may take a century (Fensham and Fairfax 2005).

Conceptual Model

Conceptual diagram showing the relationship between the key threatening processes (climate change, fire, weeds, feral predators, overgrazing and hydrology) and the geographic distribution and the biodiversity and ecosystem function components of Georgina gidgee woodlands. The main threats to the Georgina gidgee woodland ecosystem are shown in red boxes with large open red arrows.The relationships among the threats are shown in thin red arrows. Key components of the biodiversity mentioned in the text are labelled in the inner circle, but these are not comprehensive. Spinifex hummock grasslands surround most patches of gidgee woodland and, therefore, this close association with another ecosystem is indicated by an open khaki arrow in the top right of the figure.

Threatening Processes

Six main processes threaten Georgina gidgee woodlands: overgrazing, weeds, feral predators, altered fire regimes, changed hydrological regimes and altered climates. The threatening processes can be viewed collectively as a circle of interacting threats that affect the distribution, biodiversity and ecosystem function of the woodland. Importantly, given their close proximity, gidgee woodland patches are also functionally connected to the adjoining spinifex grassland.

Collapse

For assessment of the geographic distribution in terms of reduction in area or restricted extent, collapse of the Georgina gidgee woodland ecosystem was assumed when the mapped distribution declined to less than 10% of its suitable bioclimatic range, with remaining stands exhibiting poor condition and no recruitment. Poor condition is defined as less than 10% canopy cover and no new growth. Moreover, collapse would likely result from any of the following processes, or combinations thereof: changed hydrological conditions due to altered precipitation and/or increased evapo-transpiration, extraction of ground water, adverse fire regimes, overstocking of livestock or clearing.

Ecosystem Risk Assessment

Assessment Protocol	IUCN Red List of Ecosystems Category and Criteria	Last Assessed
IUCN RLE v2.0	Vulnerable C2b+D1+D2a	2015

Justification

For the Georgina gidgee woodlands ecosystem, there has been little change in the geographic distribution of Georgina gidgee woodlands in the past 50 years and historically. Also, there has been an inadequate fine-scale spatial mapping of the distribution limits assessment in a 50-year period. Currently, 73% of the extent of Georgina gidgee woodlands is not reserved, and available data suggests that 62% decline in plant species composition was related to cattle grazing, and also, fauna abundance declined between 30% and 40%. Although historical decline in fauna and flora due to grazing pressure appears to be negligible, future estimates indicate that the unprotected areas of the ecosystem will still be pressured and declining. Therefore, the ecosystem is classified as Vulnerable under subcriteria C2b, D1 and D2a.

Criterion A LC

Summary

Georgina gidgee woodland was used extensively for fence posts and early buildings, thus thinning woodland stands, but the current distribution is likely to have been in stasis for many decades. Moreover, use of Central Australia was limited after European settlement and cattle grazing did not start until the late 19th century (Nolan 2003). There is inadequate fine-scale spatial mapping; therefore, no reliable information is available to assess the decline of the geographic distribution in the next 50 years nor any 50-year period. Thus, there has been little change in the geographic distribution of Georgina gidgee woodlands in the past 50 years and historically; therefore, the ecosystem is classified as Least Concern under criterion A.

Risk Category LC

Subcriterion	Category	Justification
A1	LC	The geographic distribution declined less than 30% in the past 50 years. This is below the minimum threshold to assign a risk category; therefore, the ecosystem is classified as Least Concern under subcriterion A1. **Key Indicators in detail** Evidence of Continuing Decline: Stable or Increasing Evidence of Threatening Processes: No **Indicator Variable:** Change in distribution Extent (%): less than 30 Mapped distribution
A2a	DD	No reliable information is available to assess the decline of the geographic distribution of the ecosystem in the next 50 years; thus, it is classified as Data Deficient under subcriterion A2a. **Key Indicators in detail** Evidence of Continuing Decline: Unknown Evidence of Threatening Processes: Unknown
A2b	DD	No reliable information is available to assess the decline of the geographic distribution of the ecosystem in a 50-year period; thus, it is classified as Data Deficient under subcriterion A2b. **Key Indicators in detail** Evidence of Continuing Decline: Unknown Evidence of Threatening Processes: Unknown
A3	LC	The geographic distribution declined less than 50% historically. This is below the minimum threshold to assign a risk category; thus, the ecosystem is classified as Least Concern under subcriterion A3. **Key Indicators in detail** Evidence of Continuing Decline: Unknown Evidence of Threatening Processes: Unknown **Indicator Variable:** Change in distribution Extent (%): less than 50 Mapped distribution

Criterion B LC

Summary

A minimum convex polygon enclosing all mapped occurrences of A. georginae has an area of 646,562 km2; a total of 269 of the 10 × 10 km grid cells within the extent of occurrence are occupied by A. georginae and the number of threat defined locations is more than 5. Therefore, there is a spatial and functional decline and threatening processes that affects the ecosystem; therefore, the ecosystem is classified as Least Concern under criterion B.

Risk Category LC

Subcriterion	Category	Justification
B1	LC	The EOO is 646,562 km2, there is an observed and inferred spatial and functional continuing decline, threatening processes likely to cause ecosystem declines in the next 20 years and the number of threat-defined locations is more than 5. Thus, the ecosystem is classified as Least Concern under subcriterion B1.

Key Indicators in detail

Number of Threat-defined Locations: more than 5
Evidence of Continuing Decline: Unknown
Evidence of Threatening Processes: Unknown

Indicator Variable: EOO

Mapped distribution
Year: 2015
Mapped distribution (km2): 656,562

B2 LC

The AOO is 269 10x10 km grid cells, there is an observed and inferred spatial and functional continuing decline, threatening processes likely to cause ecosystem declines in the next 20 years and the number of threat-defined locations is more than 5. therefore, the ecosystem is classified as Least Concern under subcriterion B2.

Key Indicators in detail

Number of Threat-defined Locations: more than 5
Evidence of Continuing Decline: Unknown
Evidence of Threatening Processes: Unknown

Indicator Variable: AOO

Mapped distribution
Year: 2015
Mapped distribution (10x10 km): 269

B3 LC

The number of threat-defined locations is not very small (more than 5); therefore, the ecosystem is classified as Least Concern for subcriterion B3.

Key Indicators in detail

Number of Threat-defined Locations: more than 5
Evidence of Continuing Decline: Unknown
Evidence of Threatening Processes: Unknown

Criterion C VU

Summary

For the Georgina gidgee woodlands ecosystem, trends in climate for Central Australia show that extreme temperatures have increased within the last 50 years, as have the magnitude and frequency of large rainfall events (Greenville et al. 2012); however, the emission scenario used for predictions is conservative and, without a global approach to reducing emissions, it may underestimate the trends in extreme weather events and mean climate, and there is no reliable information available to assess environmental degradation in the next 50 years nor historically. Temporal trends in total suitable habitat and in high-quality habitat were assessed under nine future climate scenarios to give a total of 18 estimates for the next 50 years. Of these, eight indicate a decline in suitable habitat of less than 30%, one is close to 30%, six predict the decline to be between 30% and 50%, two predict 50-80% and one predicts more than 80%. Given the uncertainty surrounding the projections, the best estimate of the status of the ecosystem is Vulnerable under subcriterion C2b.

Risk Category VU

Subcriterion	Category	Justification
C1	LC	Trends in climate for central Australia show that extreme temperatures (maxima and minima) have increased within the last 50 years, as have the magnitude and frequency of large rainfall events (Greenville et al. 2012). Bioclimatic distribution modelling from 2000 using temperature and rainfall variables suggests that the area of suitable habitat may have increased in the short term for this ecosystem. However, the emission scenario used for predictions is conservative

and, without a global approach to reducing emissions, it may underestimate the trends in extreme weather events and mean climate. therefore, the ecosystem is classified as Least Concern under subcriterion C1.

Key Indicators in detail

Indicator Variable: Climatic suitability

Extent (%): 100
Relative Severity (%): less than 30

estimated
Year: 2015

C2a DD

No reliable information is available to assess the environmental degradation of the ecosystem in the next 50 years; therefore, the ecosystem is classified as Data Deficient under subcriterion C2a.

Key Indicators in detail

C2b VU

Temporal trends in total suitable habitat and in high-quality habitat were assessed under nine future climate scenarios to give a total of 18 estimates for the period 2000 to 2050 (a 50-year period). Of these, eight indicated a decline in suitable habitat of less than 30%, one is close to 30%, six predict the decline to be between 30% and 50%, two predict 50-80% and one predicted more than 80%. Given the uncertainty surrounding the projections, the best estimate of the status of the ecosystem is Vulnerable under subcriterion C2b.

Key Indicators in detail

Indicator Variable: Climatic suitability

Extent (%): 100
Relative Severity (%): 30-50

projected
Year: 2050

C3 DD

No reliable information is available to assess the environmental degradation of the ecosystem historically; therefore, the ecosystem is classified as Data Deficient under subcriterion C3.

Key Indicators in detail

Criterion D VU

Summary

Currently, 73% of the extent of Georgina gidgee woodlands is not reserved, and available data suggests that 62% decline in plant species composition was related to cattle grazing and Fauna abundance declined between 30% and 40%. Future estimates indicate that the unprotected areas of the ecosystem will still be pressured and declining and will be unable to regenerate and recover from grazing impacts. Historical decline in fauna and flora due to grazing pressure appears to be negligible. Therefore, the ecosystem is classified as Vulnerable under subcriteria D1 and D2a.

Risk Category VU

Subcriterion	Category	Justification
D1	VU	Currently, 73% of the extent of Georgina gidgee woodlands is not reserved, and hence is potentially exposed to commercial cattle grazing. Within three years of cattle removal and one above-average rainfall event, a 62% decline in plant species composition under grazing was evident, and plant reproduction declined by 98% (Frank et al. 2014). Moreover, mammal abundance declined by 40%, reptiles by 30% and invertebrates by 35% in continuously grazed gidgee compared to cattle-removed gidgee (Frank et al. 2014). Based on these data, the relative severity of decline in biotic

processes is 30-40% for fauna and 62-98% for flora, and these projected declines in biotic processes occur over 73% of the distribution based on the extent of grazing. Then, it is declines of at least 30% severity across at least 80% of the distribution. Therefore, the ecosystem is classified as Vulnerable under subcriterion D1.

Key Indicators in detail

Indicator Variable: Woodlands extent

Extent (%): at least 80
Relative Severity (%): at least 30

estimated
Year: 2015

D2a VU

The risk to Acacia georginae woodland areas is that without further protection from grazing through installation of exclusion fences and careful management of stocking rates, water points and total grazing pressure (including camels, rabbits and kangaroos) throughout the rangelands, the ecosystem will still be pressured and declining and unable to regenerate and recover from grazing impacts, resulting in a risk status of Vulnerable under subcriterion D2a.

Key Indicators in detail

Indicator Variable: Woodlands extent

Extent (%): more than 30
Relative Severity (%): more than 30

projected

D2b DD

No reliable information is available to assess the disruption of biotic processes or interactions in the ecosystem in a 50-year period; therefore, the ecosystem is classified as Data Deficient under subcriterion D2b.

Key Indicators in detail

D3 LC

The ecosystem has undergone a disruption of biotic processes of less than 50% severity over 100% of its extent historically. This is below the minimum threshold to assign a risk category; therefore, the ecosystem is classified as Least Concern under subcriterion D3.

Key Indicators in detail

Indicator Variable:

Criterion E DD

Rationale

No reliable information is available to assess the ecosystem decline; therefore, the ecosystem is classified as Data Deficient for criterion E.

Risk Category DD

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