

**NATIONAL RECOVERY PLAN FOR THE
DESERT SAND-SKIPPER**

Croitana aestiva



Female desert sand-skipper. Photo: © C.M. Palmer



Australian Government



Northern Territory Government

Title: National Recovery Plan for the Desert Sand-skipper *Croitana aestiva*

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This recovery plan sets out the actions necessary to stop the decline of, and support the recovery of, the listed threatened species or ecological community. The Australian Government is committed to acting in accordance with the plan and to implementing the plan as it applies to Commonwealth areas.

The plan has been developed with the involvement and cooperation of a broad range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

This plan should be cited as follows: Palmer C. M. (2010). National Recovery Plan for the Desert Sand-skipper *Croitana aestiva*. Department of Natural Resources, Environment, The Arts and Sport, Northern Territory.

Copies of the plan are available at:

<http://www.environment.gov.au/biodiversity/threatened/recovery-list-common.html>

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Abbreviations

CLC	Central Land Council, a statutory authority representing Aboriginal people in the southern Northern Territory under the <i>Aboriginal Land Rights (Northern Territory) Act 1976</i> . It also has functions under the <i>Native Title Act 1993</i> and the <i>Pastoral Land Act 1992</i>
CSIRO	The Commonwealth Scientific and Industrial Research Organisation. It is Australia's national science agency.
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> , Commonwealth Government Legislation
IBRA	Interim Biogeographic Region of Australia. The Interim Biogeographic Regionalisation of Australia is the National Reserve System's planning framework.
MAGNT	The Museum and Art Gallery of the Northern Territory
NRETAS	Department of Natural Resources, Environment, The Arts & Sport (formerly Department of Infrastructure, Planning and Environment) of the Northern Territory; includes the Biodiversity Unit and the Parks and Wildlife Division
NT	Northern Territory

SUMMARY

The Desert Sand-skipper *Croitana aestiva* (family Hesperidae) is a small, brown butterfly with distinct, pale yellow markings. It is one of only two butterflies endemic to central Australia. This species is classified as 'Endangered' both under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and in the Northern Territory under the *Territory Parks and Wildlife Conservation Act 2000*.

This species is restricted to the MacDonnell Ranges IBRA region up to about 80 km west of Alice Springs, in the southern arid region of the Northern Territory. Much of the known distribution is contained within the West MacDonnell National Park. Its persistence in central Australia is linked to the sheltered, relatively protected habitat in the Chewings Range in which it is now known. Research has revealed seven relatively closely spaced extant populations and two possibly extinct historical populations. The phenology of this species is driven by rainfall.

The desert sand-skipper faces a range of current and potential threats such as: climate change, invasion by exotic weeds, exposure to fire, impacts of feral animals, tourism impacts and illegal collection. This plan outlines these threats and the actions required to help maintain or improve the conservation status of this species.

SPECIES INFORMATION

Taxonomy

The genus *Croitana* (family Hesperiidae) is endemic to Australia and comprises three described species. The Desert Sand-skipper *Croitana aestiva* and Inland Sand-skipper *C. arenaria* are restricted to the arid and/or semi-arid zones, and both occur in central Australia (Edwards, 1979). The third species, *C. croites*, does not occur in the Northern Territory and is restricted to south western and central western parts of Western Australia (Braby 2000).

Morphology and identification

The Desert Sand-skipper is a small butterfly with a wingspan of approximately 2.5cm in both sexes. It is distinguished from most other butterflies by having its antennal club bent before the middle, with a long, blunt apiculus (apical portion of the club), and by being predominantly dark brown on the upper surface, with three or four distinct, pale yellow spots towards the wing apex. Larger, confluent pale yellow spots occur in the centre of the upper surface of the forewing.

This species is not easily identified in the field, as it looks very similar to the Inland Sand-skipper, which is also of a very similar size. However, the Desert Sand-skipper is distinguishable from the other species of *Croitana* upon close examination, which reveals that the central, pale yellow patch on the upper surface of the hindwing is smaller and divided by brown veins compared with other members of the genus, in which the veins are pale yellow.

Distribution

The Desert Sand-skipper is endemic to the southern Northern Territory, where it is restricted to the MacDonnell Ranges Bioregion. The species was first collected from two locations in 1966: along a roadside 25 km west of Alice Springs and at Standley Chasm, 41 km west of Alice Springs (Fig. 1) (Edwards 1979). It was next collected in 1972 at Ellery Creek Big Hole, approximately 75 km west of Alice Springs (Braby 2000).

Surveys from February 2007 to February 2009 yielded six new localities, all within the Chewings Range (Fig. 1). Targeted surveys over this period at two of the three historical localities were unsuccessful, and the badly degraded habitat at one of these localities suggest that at least one population may have been lost over the last forty years.

The known latitudinal distributional range is approximately 60 km, and the longitudinal range approximately 11 km. The extent of known occurrence is approximately 660 km²; however, the butterfly is most likely patchily distributed

within this area based on the occurrence of suitable habitat. The area occupied by the butterfly is therefore likely to be small.

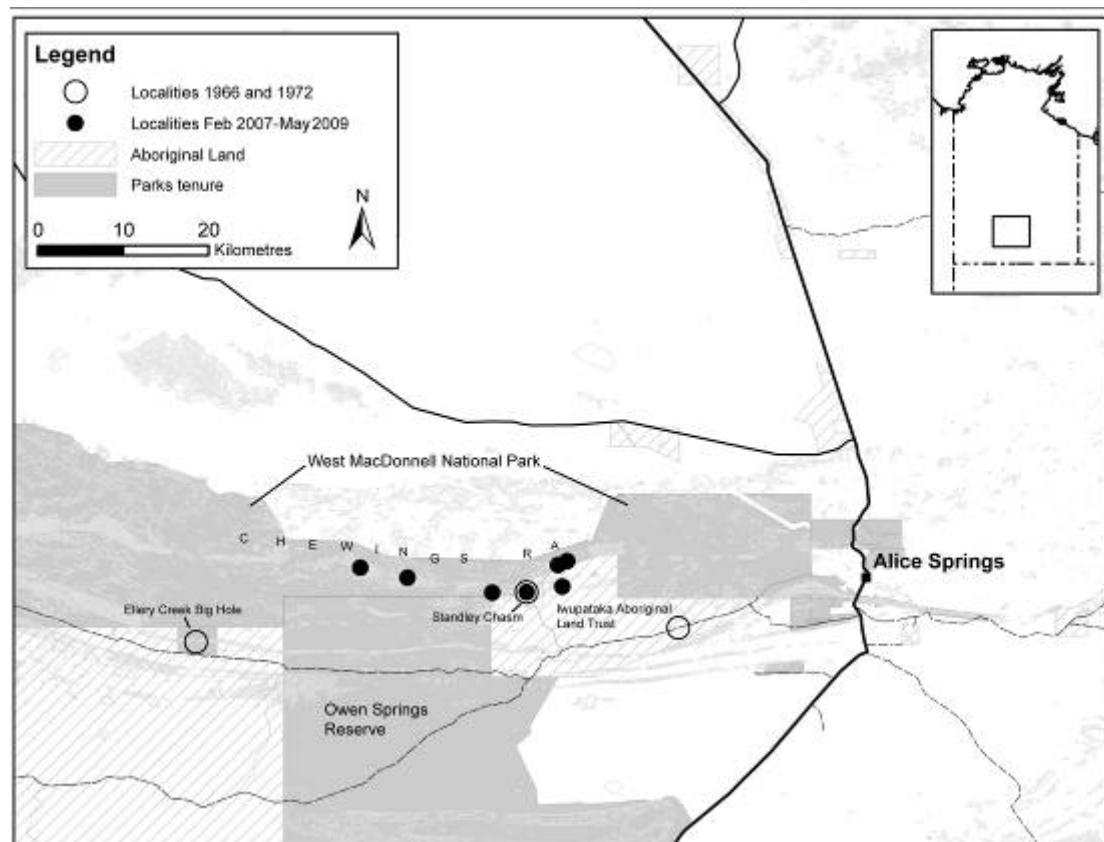


Figure 1: Recorded distribution of the desert sand-skipper *Croitana aestiva*.

Most of the current distribution (five populations) is contained within the West MacDonnell National Park. There are also two current localities in the adjoining Iwupataka Aboriginal Land Trust.

Biology

The climate of central Australia is characterised by extreme diurnal and seasonal temperature differences, although temperature trends are predictable throughout the year. The low average rainfall of 279.3mm (Bureau of Meteorology 2009) is temporally and spatially variable and unpredictable (Stafford-Smith and Morton 1990). Most precipitation is derived from a few concentrated falls, usually in the warmer months (Bureau of Meteorology 2009). A corollary of the lack of rain is the occurrence of long dry periods of irregular length, which can vary from months without any rain at all to consecutive years with low falls (Stafford-Smith and Morton 1990).

Fieldwork has shown that adult emergence and abundance are entirely dependent on rainfall, such that adults will not emerge without adequate rain, and larger numbers of adults are seen following wetter periods. The presence of adults is therefore highly

unpredictable. There is a prolonged flight period following sufficient rain, indicating an adaptation to these sporadic events. Upon emergence adult males and females feed opportunistically on many species of nectar-producing plants, representing several families, such as the Asteraceae, Amaranthaceae and Nyctaginaceae. Mating and oviposition have not been observed, although males have been observed exhibiting territorial behaviour leading to fighting with other males and interacting with females. The life history of this species is unknown.

Larvae of other species of *Croitana* feed on native grasses such as *Enteropogon* and *Austrostipa* (Poaceae) (Braby 2000), but the food plant of the immature stages of the Desert Sand-skipper was unknown. However, an aestivating larva belonging to *Croitana* was recently found on a native grass, and life history studies are ongoing to confirm its identity.

Populations

As adults are present only after sufficient rainfall, all population counts have followed wet weather. There are seven known extant populations of the Desert Sand-skipper, but due to the challenges of locating small, mobile individuals in rugged terrain, counts for six of these populations are low, with between one and twelve adults seen at each site. Although these data demonstrate the presence of this species, the counts probably underestimate the population size at these six sites.

More systematic and comprehensive counts of adults following good rain have occurred at Standley Chasm: 29 individuals were counted at this site in March 2007, and 37 individuals counted in December 2008. Because Standley Chasm is easily accessible by road and walking track it is an excellent site for ongoing monitoring of population numbers.

As a result of the very limited known distribution and low number of populations, all populations of this species are considered necessary for its long-term survival and recovery.

Habitat critical to survival

As the immature stages of butterflies typically exhibit strong preferences for certain species as food plants, habitats most critical to survival will be those containing these larval food plants. However, other factors such as climate and topography as well as presence of plants providing nectar for adults and general vegetation cover are also very important determinants of critical habitat.

Habitat in the type locality 25 km west of Alice Springs is low open woodland, dominated by mulga (*Acacia aneura*). However, this collecting locality is now heavily disturbed, with an understorey dominated by the introduced pasture plant buffel grass (*Cenchrus ciliaris*) and subject to extensive grazing by horses as well as native vertebrates. Blackened trunks and dead trees and shrubs throughout the area demonstrate the presence in recent years of large fires, and there is also a considerable

amount of human rubbish and evidence of camp fires. Targeted surveys in this site from 2007-2009 did not yield adults. When taken together this information indicates that the Desert Sand-skipper is unlikely to be still present here.

Extant populations of the Desert Sand-skipper are typically found on the steep slopes of gorges and along creek lines of the Chewings Range (Figures 2 and 3). The present range of this species is characterised by sheltered habitats with protection from naturally occurring fires and extremes in temperature. All sites are well vegetated, with a large variety of native trees, shrubs and herbs. The steep topography of the Chewings Range has reduced the incursion of introduced weeds, although these are sometimes seen. Although all sites are critical to the survival of this species, the Chewings Range localities are the ones most likely to provide suitable habitat in the long term.



Figure 2: Steep gorges in the Chewings Range inhabited by the Desert Sand-skipper.
Photo: © C.M. Palmer

THREATS

Climate change

The 'best estimate' of climate change for the distributional area occupied by *C. aestiva* is that by 2030 annual rainfall will decrease by between 2 and 10%, with a general decrease in rainfall across all seasons, and that temperature will increase by

between 0.6 and 1.5°C (CSIRO 2007). The best estimate projections for 2050 and 2070 are for even drier and hotter conditions (CSIRO 2007).



Figure 3: Example of a sheltered, well vegetated creek line in the Chewings Range inhabited by the Desert Sand-skipper. Photo: © C.M. Palmer

Although *C. aestiva* has persisted in areas already subject to significant rainfall variability and temperature extremes, it is likely that both rainfall variability and unpredictability will increase further with climate change, leading to larger rainfall events but longer dry periods between these events (Pickup 1998). The effect of such changes on a rainfall-dependent species such as *C. aestiva* will likely be negative. It is unknown how long the aestivating immature stage of this species can survive without rain.

Invasion by exotic weeds

Buffel grass (*Cenchrus ciliaris* L.) (Poaceae) is a perennial pasture plant native to parts of Africa, southern parts of Asia and India (Lazarides *et al.* 1997). It was deliberately sown in northern parts of the Northern Territory in the 1950s and 1960s (Cameron *et al.* 1984), and the first recorded presence of buffel grass in central Australia was of a specimen identified from Alice Springs (White 1930). Following trials, plantings were conducted in this area throughout the 1960s and 1970s for pasture improvement, prevention of soil erosion and dust control (Keetch 1981, Allan 1997). Experimental manipulation has led to this species being self sowing, and so buffel grass has spread widely from these introduction points, now occurring across all land tenures in central Australia (Puckey and Albrecht 2004). With this expansion

there has been a concomitant reduction in biodiversity and alteration of fire regimes. Buffel grass typically out-competes other herbs for resources in central Australia (Clarke *et al.* 2005), and the putative larval food plant, also a grass, will be subject to such competition.

Relatively large areas of buffel grass now occur particularly on alluvial soils throughout central Australia and also on rocky hill slopes of the MacDonnell Ranges west of Alice Springs. The type locality 25 km west of Alice Springs and large areas at Ellery Creek Big Hole are infested with buffel grass, and this species is also occasionally present at other desert sand-skipper localities in the Chewings Range such as Hugh Gorge, east of Standley Chasm and at Standley Chasm itself; however, the grass is periodically removed at Standley Chasm by Aboriginal trainee rangers linked to the Iwupataka Aboriginal Land Trust. As buffel grass is able to grow on some rocky hills and slopes, it seems likely that all known localities for the Desert Sand-skipper are suitable habitats for the grass and could potentially be invaded on a large scale.

Buffel grass also promotes and significantly increases the effects of bushfires, as discussed in more detail below.

Fire

Fire has been an important part of the ecology of central Australian ecosystems for thousands of years. Historically, Aboriginal people burned patches of land at different times, leading to a mosaic of plant communities in different stages of recovery after burning (Latz 1995). This was done primarily to ensure production of long-term supplies of food. Because different stages of regrowth and hence a 'staggered' build up of fuel result from this practice, it had the benefit of preventing large, widespread fires. However, land use patterns have changed dramatically over the last 130 years, concomitant with changes to land tenure and movement of populations, and fire regimes and fire management practices have also changed. As the practice of mosaic burning diminished, fuel loads have steadily increased, so that current fire regimes in central Australia are characterised by large pulses of intense, uncontrolled fires (Edwards *et al.* 2008). For example, widespread fires occurred throughout central Australia in 1974-77 and in 2000-02, and increased but more localised fire activity also occurred in 1984-85, 1989-90, and 1994-95 (Edwards *et al.* 2008).

One of the main explanations for the widespread planting of buffel grass in pastures was because of its very quick response to even low rainfall and its fire tolerance. Any infestation of buffel grass therefore provides a large amount of plant biomass which, when dry, represents a significant increase in fuel load, increasing the frequency of fires and causing more extensive and intensive fires compared with those carried by native grasses (Low 1997). Miller (2003) found that buffel grass invasion in central Australia was significantly correlated with increased fuel load and burn severity. These fires destroy seeds and seedlings of other species, and kill less tolerant plant species while facilitating growth of fire tolerant species, encouraging still further the growth and spread of buffel grass.

The site 25 km west of Alice Springs was severely burned during the 2000-02 bushfires, and this probably explains at least partly why buffel grass is now the dominant species of the herb layer at that site. It is highly likely that this site will be burned again.

During winter 2005 part of the Standley Chasm site was burned by a fire, which was started accidentally. Although the fire was not large, covering approximately 500 m², it burned an area that is used by adult males in territorial behaviour and for feeding by males and females when flowers are present. The effect of this fire on the Desert Sand-skipper, nectar-giving plants and the putative larval food plant is unknown. Although localities for this species in the Chewings Range are probably protected to some extent from large bushfires, this example demonstrates that accidental fires can occur at any time, emphasising the continued need for reduced fuel loads in all areas, particularly when such loads are comprised of weeds.

Impacts of feral animals

Based on the presence of many aged and recent scats in the area, the roadside site 25 km west of Alice Springs is continually and heavily grazed by horses and/or donkeys. More scats and even a dead horse were also seen at another Desert Sand-skipper locality in December 2008, approximately 4.5 km east of Standley Chasm on the Iwupataka Aboriginal Land Trust (C.M. Palmer pers. obs.).

Tourism impacts

Thousands of people visit Standley Chasm every year. The main walking track from the car park to the Chasm is through habitat that supports large numbers of nectar-producing flowering plants that are heavily utilised by adults. Visitors are periodically seen leaving the walking track and ascending Desert Sand-skipper habitat despite a sign at the beginning of the walk stating that they are not allowed to do so. This disturbs the adult butterflies and potentially damages flowers.

An estimated 70,000 people visit Ellery Creek Big Hole every year, and important habitat may be exposed to visitor impacts such as trampling, rubbish and the spread of weeds. However, because the exact site from which butterflies were collected in 1972 is no longer known, the proximity of Desert Sand-skipper habitat to the main areas visited by tourists is unknown.

Several sites are accessible by the Larapinta Trail, a 223 km walking track passing through the West MacDonnell Ranges. Approximately 1000 people walk the Larapinta Trail every year, but such a low number of visitors is unlikely to directly impact on Desert Sand-skipper habitats. Possible indirect effects include the spread of weeds.

Illegal collection

Butterflies are the most popular, charismatic and best known group of insects. Consequently, the re-discovery of the Desert Sand-skipper in February 2007 attracted widespread media interest, as well as interest by amateur butterfly enthusiasts who are keen on adding specimens of a species previously thought to be extinct to their own private collections, regardless of its nationally protected status. These collectors also engage in non-commercial trading of such species. The population at Standley Chasm is most at risk of illegal collection, with a sealed road providing easy access. There has also been published information on this locality for 30 years (Edwards 1979). The population at Ellery Creek Big Hole (if still present there) is also easily accessible.

RECOVERY INFORMATION

Overall objective

To maintain or improve the conservation status of the Desert Sand-skipper, currently listed as endangered.

Specific objectives

- Determine the current distribution of this species.
- Develop and implement fire and weed management at regional and local scales, to maintain or enhance habitat quality and extent.
- Find out critical aspects of its biology, such as life history, confirming the larval food plant, and the climatic factors that influence its life cycle.
- To continue engagement with Indigenous people enabling incorporation of traditional ecological knowledge and management practice into recovery plans.
- To inform and involve stakeholders and the wider community in the recovery planning process.

Performance criteria

- The distribution limits and number of populations of the Desert Sand-skipper are understood.
- Habitat quality and extent is maintained or increased.
- Knowledge of the biology, population dynamics and distribution are increased and used to inform management of this species.

- Indigenous knowledge relating to the biology and cultural significance of the Desert Sand-skipper is incorporated into recovery programs.
- Stakeholders and members of the wider community are informed, and networks are maintained and enhanced.
- A systematic and robust monitoring program is implemented and used to measure recovery success.

Performance of the plan will be evaluated by an independent consultant within five years from adoption as a national recovery plan.

Table 1: Relationships between specific objectives, performance criteria and actions.

Specific objectives		Performance criteria		Actions
Determine the current distribution of this species.	↔	The distribution limits and number of populations are understood.	↔	1. Carry out targeted surveys for additional populations within the known distributional area and in new areas.
Develop and implement fire and weed management at regional and local scales, to maintain or enhance habitat quality and extent.	↔	Habitat quality and extent is maintained or increased.	↔	2. Negotiate conservation agreements to secure significant populations on land trust properties. 3. Carry out population and habitat monitoring at selected sites. 4. Implement management strategies for key threatening processes as required.
Find out critical aspects of its biology, such as life history, confirming the larval food plant, and the climatic factors that influence its life cycle.	↔	Knowledge of the biology and population dynamics is increased and used to inform management of this species.	↔	5. Undertake research to determine life history. 6. Undertake research to confirm the larval food plant.
To continue engagement with Indigenous people enabling incorporation of traditional ecological knowledge and management practice into recovery plans.	↔	Management of the Desert Sand-skipper is informed by any traditional ecological knowledge.	↔	7. Continue to engage traditional ecologists to provide advice on any biological aspects, threatening processes and the cultural and economic significance of this species.
To inform and involve stakeholders and the wider community in the recovery planning process.	↔	Stakeholders and members of the wider community are informed, and networks are maintained and enhanced.	↔	8. Provide education and information in appropriate formats to all stakeholders and interested members of the community.

Actions

Action 1

To search for additional populations of the Desert Sand-skipper and determine its distributional range. Further sampling within the core habitat area between the most easterly and westerly historical records, especially at new sites in the Chewings Range, will allow for more informed assessment of the total number of populations and of each population size, as well as yielding further data on threatening processes. Also critically important is continued re-sampling of the two historical collecting localities to determine if populations are still present at those sites. If populations are found there extra surveys can further extend the known range. Surveys will need to be conducted over 2-4 years to take into account the limitations to sampling after sufficient rain, and because there may be little or no rain for prolonged periods. Additional surveys will be carried out or led by an experienced field entomologist, and use of a helicopter will be required to access certain areas.

Action 2

Negotiate conservation agreements to secure significant populations on land trust properties. Two populations of the Desert Sand-skipper are on unreserved land, and these are priorities for off-park conservation actions. Avenues for effective protection (e.g. removal of weeds, preventing illegal collection of butterflies) should continue to be pursued by NRETAS with the assistance of relevant non-government agencies (especially the Central Land Council). Stakeholders include NRETAS (Parks and Wildlife, the Biodiversity Conservation Unit), Iwupataka Land Trustees and the CLC.

Action 3

Develop a monitoring program that ensures important populations of the Desert Sand-skipper and critical habitats are checked regularly, to detect any declines in population size or changes in habitat quality. Some sites will be more easily monitored than others, but Standley Chasm is probably the most important, because all the phenology data as well as the most comprehensive population counts have thus far been collected there. These data can be used to guide future management practice at all sites. Potential stakeholders include: NRETAS (the Biodiversity Unit), Ingkerreke Rangers, the CLC and Traditional Owners, Iwupataka Land Trustees and interested amateur naturalists. Monitoring of populations can only occur after good rain and should include counts of adults in relation to precipitation. Important habitats should be checked every six months for:

- density, abundance and condition of larval food plants (once they are known);
- diversity, density, abundance and condition of nectar-giving plants;
- habitat condition especially of breeding areas and especially in relation to weed abundance and other existing threats; and
- presence of new or potential threats.

Monitoring of habitat and threats could be achieved with six-monthly or annual photographs at several key locations. Such activities should be conducted over many years to assess potential impacts of climate change.

Action 4

Implement management strategies for key threatening processes as required. Actions 5 and 6 (discussed below) have been developed to provide information on the ecology of the Desert Sand-skipper to address some of the threats to this species. Until such information is available, it is important to carry out adequate monitoring and to develop the capacity to respond to changes to existing conditions. Further management strategies will be developed and implemented following the outcomes of Actions 5 and 6. Stakeholders include the NRETAS Biodiversity Unit, the CLC and Iwupataka Land Trustees.

Developing strategic, prioritised, regional and local fire and weed management activities are the major focus of this action and would provide the most effective solution for these threats. The aims of fire management on conservation and Aboriginal lands include protecting physical assets by limiting the spread of wildfires onto fire-sensitive vegetation and associated fauna, and maintaining cultural and natural resources (Edwards *et al.* 2008). Following the recommendations of Edwards *et al.* (2008), such a fire management strategy needs to be coordinated across all land tenures in central Australia, and could include (1) establishing an improved monitoring system for fuel loads using GIS data; (2) creating smaller-scale fire breaks using a combination of slashing, herbicides, burning, raking and grading; (3) broader, landscape-level strategic burning (e.g. patch burning) of certain areas to minimise any potential adverse effects; and (4) transfer of knowledge of optimal fire management practices between all stakeholders, such as senior Aboriginal people, fire ecologists, senior rangers and pastoralists, ensuring that the knowledge is used to train inexperienced managers of fire. Patch burning of areas of fire tolerant spinifex may be useful to prevent incursion into fire sensitive vegetation, which are the usual habitat of the desert sand-skipper. The putative larval foodplant is also probably highly sensitive to fire.

As part of a larger management program for invasive weeds involving physical removal, slashing and spraying, a combination of burning and use of herbicides is effective for small areas of buffel grass, which grows vigorously after fire and is susceptible to herbicides at this point (Edwards *et al.* 2008).

To assist with controlling illegal collection of the Desert Sand-skipper the Australian Federal Police as well as staff from the Wildlife Management Unit of the Northern Territory Government Parks and Wildlife Division and park rangers are aware of this threat, and staff have been provided with information on how to recognise the species. Park rangers regularly patrol national parks and conservation reserves, and Wildlife Management staff enforce the *Territory Parks and Wildlife Conservation Act 2006* regarding protected wildlife.

Action 5

Undertake research on the biology and ecology of adults to assist in the recovery of this species. Stakeholders may include NRETAS (Biodiversity Unit), relevant Australian universities and amateur naturalists. The main recommended areas of investigation are:

- the relationship of adult emergence and abundance with level of precipitation;
- field observations of pre-mating, mating and oviposition behaviour to determine breeding areas;
- maintaining captive adults to rear immature stages and find out life history; and
- field observations to determine life cycle.

Action 6

The likely larva of the Desert Sand-skipper has recently been discovered, but fieldwork and experiments should continue to confirm the identity of this caterpillar. Finding out the identity and distribution of the larval food plant(s) are essential before adequate management strategies can be developed and implemented. The distribution of *C. aestiva* will be largely determined by the distribution of the larval food plant. Stakeholders may include NRETAS (Biodiversity Unit), MAGNT, and experienced amateur naturalists. Research should focus on:

- searches of potential larval food plants for immature stages;
- mapping the distribution of larval food plant(s) based on herbarium records. This will help determine the distributional range of the Desert Sand-skipper, and locate potential survey areas for adults;
- experiments to determine larval food plant preferences and numbers of species used as food plants by larvae; and
- mapping the extent of breeding areas.

Action 7

Continuing to engage traditional ecologists to provide advice on biological aspects, threatening processes and the cultural and economic significance of this species. Although individual butterfly species are not normally of great significance in central Australia, any knowledge about this species that they have will aid the recovery process. However, investigations so far have not yielded any such information.

Action 8

Improve the profile of the Desert Sand-skipper within the community and ensure that all stakeholders are informed of recovery actions and the results of ongoing research and monitoring. The coordinator of threatened species projects in the Northern Territory (based in the NRETAS Biodiversity Unit) will ensure that information on

research and management is disseminated to stakeholders. Information may be disseminated through oral presentations, printed material and displays.

Costs

Estimated costs of recovery (in \$'000s)

Actions	Year 1	Year 2	Year 3	Year 4	Year 5	TOTAL
1	10	10	10	5		35
2				5	5	10
3	15	15	15	15	5	65
4				20	20	40
5	10	10	10	5		35
6	5	5	5			15
7			20			20
8	2	1	1	1	1	6
Total	42	41	61	51	31	226

Management practices

Most populations of *C. aestiva* are reserved in the West MacDonnell National Park, which is managed by NRETAS. Management practices necessary to avoid a significant impact on populations of this butterfly include:

- a reduction in weed cover in infested areas;
- fire management programs at affected and potentially affected sites that aim to reduce fire frequency, avoiding habitat critical to *C. aestiva*; and
- strongly discouraging illegal collection of butterflies from wild populations, and application of appropriate penalties for those involved in such activities.

Biodiversity benefits

The MacDonnell Ranges have long been recognised as refugia for flora and fauna since the onset of aridity in central Australia (e.g. Keast 1959). The ranges currently support a very diverse and unique assemblage of terrestrial and aquatic animals and plants, many of which are rare and unique to the area. The perennial waterholes and rocky gorges are of particular ecological significance, supporting such species as the MacDonnell Ranges cycad (*Macrozamia macdonnellii*) and the dragonfly

Hemicordulia flava, both endemic to central Australia (Keast 1959, Watson *et al.* 1991). The MacDonnell Ranges cycad is listed as ‘Vulnerable’ under the EPBC Act. Recovery actions may therefore also benefit a variety of endemic, rare, and/or threatened plant and animal species that are unrelated to the activities of the desert sand-skipper but occupy the same habitat.

The implementation of recovery actions described in this plan will help ensure the continued presence of the Desert Sand-skipper in central Australia. Implementation may also ensure the continuation of interactions between *C. aestiva* and other species. It is highly unlikely that negative effects on other native species and ecological communities would arise from the implementation of this plan.

Affected interests

The Desert Sand-skipper is known from a conservation reserve jointly managed by the Northern Territory Government and Aboriginal Traditional Owners, as well as an Aboriginal Land Trust. All affected interests will be involved in the implementation of this plan. Identified affected interests include:

- Northern Territory Government (particularly Parks and Wildlife and the Biodiversity Unit within NRETAS);
- Traditional Owners of the area designated as the West MacDonnell National Park;
- Ingkerreke Rangers;
- Trustees of Iwupataka Aboriginal Land;
- Managers of the Standley Chasm Kiosk; and
- Central Land Council

Social and economic impacts

Implementation of this recovery plan is unlikely to have any adverse social or economic impacts. All proposed actions are on a small scale and will not significantly alter existing land uses. Some positive social and economic impacts are likely to arise from implementation: on-ground recovery actions involve Aboriginal people in the recovery process, including the employment and training of the Ingkerreke Rangers.

International obligations

This species is not listed under any international agreement and the recovery plan is consistent with Australia’s international obligations.

Indigenous consultation

The following indigenous stakeholders were consulted: (1) Central Land Council; (2) local Arrernte elders; (3) Ingkerreke Outstation Resource Services; and (4) Ingkerreke Rangers. The Central Land Council is the lead organisation for indigenous land

management issues in the southern half of the Northern Territory. One of its strategies is to enable Aboriginal people to use and manage their land in accordance with their customs, laws and aspirations and promote cultural and environmental sustainability, in accord with relevant legislation. One approach that the CLC takes to achieve this goal is by the formation of indigenous ranger groups, the members of which undergo practical training in ways that best manage the land.

The Ingkerreke Rangers are responsible for on-ground, community based natural resource management of the Iwupataka Aboriginal Land west of Alice Springs, and have just completed the Certificate III in Land Management at Batchelor College. The rangers helped locating an additional population of the desert sand-skipper on their land. This additional, collaborative training in field survey complemented their formal studies.

Discussions with the Ingkerreke Rangers and with a respected local Arrernte elder who has published widely on Arrernte ecological and cultural knowledge and language showed that all were unfamiliar with this species.

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