

**Local Recovery Plan
for the
Yellowish Sedge-Skipper and
Thatching Grass**



Peri Coleman and Faith Coleman



Local Recovery Plan for the Yellowish Sedge-Skipper and Thatching Grass

**Produced and written for
South Australian Urban Forest Biodiversity Program**

by

Peri Coleman and Faith Coleman

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CONSULTING

Acknowledgments

Developing plans to restore habitat and attempting to secure the future of vulnerable species are not tasks for the faint-hearted. The project outlined in this recovery plan has required the co-operation of two Local Government Councils, the Penrice Dry Creek Saltfields, the Defence Estate Organisation and the South Australian Urban Forest Biodiversity Program. Delta Environmental Consulting would like to thank the following people:

Roger Grund for sharing his wealth of knowledge of the skippers of South Australia and for permission to use his photographs of the butterfly.

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The Urban Forest Biodiversity Program for funding the development of this plan.

Executive Summary

Introduction

The Yellowish Sedge-skipper Butterfly, *Hesperilla flavescens flavia* Waterhouse, was described in 1941. At that time it was collected from Henley and West Beach, as well as north of Adelaide where it was found in the swampy coastal areas west of Bolivar and Virginia. A small yellow and brown butterfly, the Yellowish Sedge-skipper Butterfly is restricted to stands of the rare Thatching Grass, *Gahnia filum*.

There are no currently known populations of the Yellowish Sedge-skipper Butterfly in its historic range, although there is a population of *Hesperilla flavescens* on the Yorke Peninsula, and populations of the closely related *Hesperilla flavescens flavescens* occur at Altona in Victoria. The Yorke Peninsula skipper is a distinct form of *flavescens*, close to but different to nominotypical *Hesperilla flavescens flavia* from the Adelaide Plains. No specimens of the local population of the Yellowish Sedge-skipper Butterfly have been caught or seen on the Northern Adelaide Plains for over 6 years but it is possible that individuals of this butterfly may exist within the few stands of *Gahnia filum* left in the region.

The main stand of *Gahnia filum* remaining in the Northern Adelaide Plains region is located on the Penrice Dry Creek Saltfields. Small numbers of isolated plants have been located in road reserves in the area.

Legislative context

No invertebrates are listed under Schedules 7, 8 & 9 National Parks and Wildlife Act 1972 (those specifying vulnerable, endangered and rare species of plants and animals). While all native animals are protected from being 'taken' or 'killed' under the Act, this does not include death by habitat destruction.

Gahnia filum, the larval food plant, while listed as rare in the Southern Lofty region (Kraehenbuehl, 1996) is considered to be common in the State as a whole, and so is not protected in Schedules 7, 8 & 9 of the National Parks and Wildlife Act 1972. *Gahnia filum* is protected under the Native Vegetation Act 1991 where it is growing within the City of Munno Para, however one site with existing plants is located in the City of Salisbury and so not afforded coverage under the Act. Further, a large area that previously supported *Gahnia filum* is owned by the Defence Estate Organisation and is therefore under Federal control (the DSTO lands at St Kilda). As these latter two areas are excluded from the operation of the Act, protection may require entering into a Heritage Agreement with the Minister.

Conservation status

The Yellowish Sedge-skipper is known to be under extreme habitat pressure, and is considered endangered by the Conservation Council of South Australia, who have released a fact sheet titled *SA's Endangered Wildlife No 4 – Yellowish Skipper Butterfly* (see Appendix 2). However the butterfly does not have any official conservation status in the State.



The larval food plant, *Gahnia filum*, does not have a conservation status at State level, however it is recognised as being rare in the Southern Lofty region.

Preparation of plan

This Recovery Plan has been prepared by Delta Environmental Consulting for the South Australian Urban Forest Biodiversity Program. The information in this Recovery Plan represents current scientific understandings in the field of butterfly conservation and habitat restoration, to the best of Delta's knowledge.

The Recovery Plan was developed using the following process:

- Site assessment to determine the habitat values present at sites currently supporting *Gahnia filum*, and the threatening processes present.
- Identification of key management issues, identification of additional stakeholders and development of Draft Recovery Plan
- Consultation with land managers and stakeholders, which includes a two-week feedback period for the Draft Recovery Plan
- Production of final Recovery Plan incorporating any required changes identified during the consultation process

Implementation of plan

The Penrice Dry Creek Saltfields, Cities of Salisbury and Playford, and the Defence Estate Organisation have agreed to implement the actions described in this report, in conjunction with the Urban Forest Biodiversity Program.

Overall recovery objective

The overall objective of this recovery plan is to prevent, if possible, the extinction of the Yellowish Sedge-skipper Butterfly by protecting potential habitat areas from degradation and other threats. Recovery relates specifically to the protection of possible Yellowish Sedge-skipper populations by the provision of larger, connected patches of habitat, and/or the possible reintroduction of the butterflies using the Yorke Peninsula population as donor.

Overall recovery performance criteria

The overall performance criterion of the recovery plan is that the risk of extinction of potential populations of the Yellowish Sedge-skipper Butterfly be decreased through the protection and extension of known potential habitats.

Species ability to recover

The species ability to recover is limited by its small population size and by the limited available habitat. The Yellowish Sedge-skipper Butterfly's small size and possibly low dispersal capacity may also limit its ability to recover. Only by actively managing any identified populations and addressing the habitat degradation can the extinction of the species statewide be controlled. Grund (1997) felt that the Skipper butterflies would be the easiest to re-establish and conserve because of the relative simplicity of their habitat requirements.



Recovery actions

The recovery plan includes twenty-two (22) recovery actions that aim to meet the overall objective.

These actions are based on the following aims:

- to identify and prevent the continuation of processes such as habitat destruction and degradation, weed incursion, and over-collection that threaten the Yellowish Sedge-skipper Butterfly,
- to maintain existing potential habitat and increase the potential habitat available by planting Yellow Sedge-skipper Butterfly larval host and nectar plants around and between existing potential habitat areas where conditions are suitable,
- to inform, and educate the community of the significance of the species through the distribution of information sheets and to actively involve the community in the conservation effort for the Yellowish Sedge-skipper Butterfly; and
- to gain a thorough understanding of the distribution, abundance and ecology of the Yellowish Sedge-skipper Butterfly through encouragement of further research into Skipper ecology, as well as the assessment of potential and known sites.

Cost Summary Table

A cost summary table is included in the Appendices of this Recovery Plan. It itemises the uses being made of the following funds: UFBP \$6000, Penrice Soda Products \$5540, the Cities of Salisbury and Playford \$7220. In addition to these funds, the DEO are contributing the costs of fencing an area of their land for revegetation, earthworks (contour bank to retain winter runoff) and a team for planting.

Biodiversity Benefits

Community appreciation and support for butterfly conservation has meant that they have become a flagship for other endangered insect conservation efforts, and even the less showy specimens such as the Yellowish Sedge-skipper are usually appreciated by the public. The butterfly is essentially a sedentary species, and restricted to one larval food plant that is suffering from human induced decline. Sedgelands generally, and *Gahnia* habitat in particular, have been drained across the region for horticultural and industrial purposes. *Gahnia* sedgelands provide habitat for a variety of significant birds and mammals. This project has considerable flow-on biodiversity benefits to be gained by the expansion of this significant habitat type and its associated species.

Faith & Peri Coleman
Delta Environmental Consulting



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Grass***

Produced and written for

SA Urban Forest Biodiversity Program

by

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March 2000



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1. Introduction

The yellowish sedge-skipper (*Hesperilla flavescens flavia*) is one of South Australia's rarest butterfly species, and within the State has only been found in a few sites near Adelaide and on the Yorke Peninsula. This species relies on a sedge, the Thatching Grass, *Gahnia filum*, as both a food source and for materials used by the larvae to construct their shelters (Herbison-Evans & Crossley, 1999). The population of the Yellowish Sedge-Skipper Butterfly has been declining over the past few years and the species may even be extinct in the Adelaide region. No butterflies have been seen for more than six years.

Gahnia filum, like many sedge species, is struggling to survive with urban expansion and clearing of land for grazing and horticulture. It is considered endangered in the Southern Lofty region (Kraehenbuehl, 1996). Like many of the *Gahnia* species, *Gahnia filum* is reportedly hard to propagate (Ralph, 1993 & 1994). However, despite this reputation, several local nurseries have had success in growing *Gahnia filum* using bog propagation methods.

Another subspecies of *Hesperilla flavescens*, the Altona Skipper Butterfly, *H. flavescens flavescens*, can be found between Altona and Ararat in Victoria. The Altona Secondary College, in co-operation with the local community are planting *Gahnia filum* and other native plants in an area known as the Cheetham Wetlands, home of the remaining Victorian population of *Hesperilla flavescens flavescens* (Goss, S., 22/6/99). The attempt to expand the habitat of the Altona Yellowish Sedge-skipper has required a considerable effort in formalising propagation methods for *Gahnia filum*. These have been successful and the school's commercial nursery is growing *Gahnia filum* from seed, and is encouraging its use in home gardens as a replacement for plants such as Pandanus.

This Recovery Plan describes our current understanding of the Yellowish Sedge-Skipper Butterfly in the Northern Adelaide Plains, documents the research and management actions undertaken to date, and identifies the parties responsible for the actions required by the plan.



2. Legislative context

2.1 Legal status

Under South Australian legislation (National Parks and Wildlife Act, 1972) all native animals are ‘protected animals’ unless specifically excluded from protection by Schedule 10 of the Act. Under the Act ‘protection’ relates to the taking and/or killing of animals and their eggs. Incidental destruction of animals by habitat modification is not included in this protection. The Act contains a further three Schedules (7, 8 & 9) that respectively itemize endangered, vulnerable and rare animals and plants. These species are afforded further protection under the Act. However no invertebrates are included in these Schedules, and invertebrates are excluded from the definition of ‘animal’ provided in the Act.

Gahnia filum, the larval food plant, while listed as rare in the Southern Lofty region (Kraehenbuehl, 1996) is considered to be common in the State as a whole, and so is not protected in any of the Schedules of the National Parks and Wildlife Act.

However, *Gahnia filum* is protected under the Native Vegetation Act 1991. This Act provides for the protection of all native vegetation (including regrowth that is over five years old) from ‘clearance’. Clearance is defined as killing, removing, severing parts, burning, draining and flooding, and other ‘substantial damage.’

Exceptions are provided for:

- native plants that have been intentionally sown or planted (unless such sowing or planting was a condition imposed by the Native Vegetation Council),
- isolated plants, and
- plants growing within the Metropolitan Adelaide planning area, unless they are growing in the Hills Face Zone, or the Cities of Happy Valley, Mitcham, Munno Para (now amalgamated with the City of Elizabeth to form the City of Playford) and Noarlunga, or the Councils of East Torrens, Stirling and Willunga.

While most of the *Gahnia filum* sites are within the boundaries of the City of Playford, a few sites with existing plants are located in the City of Salisbury. Further, a large area that previously supported *Gahnia filum* is owned by the Defence Estate Organisation and is therefore under Federal control (the DSTO lands at St Kilda). These latter two areas are excluded from the operation of the Act, as it pertains to clearance.

Additional protection for the sites may be available (regardless of the land’s ownership or location) in the form of a Heritage Agreement under the Native Vegetation Act 1991 between the landowner and the Minister. Such agreements are registered with the Native Vegetation Council and may incorporate some assistance for the landowner to establish further native vegetation on the land or to undertake research that leads to the enhancement of management of the native vegetation and associated animals.

Further protective options include creating private sanctuaries under the National Parks and Wildlife Act 1972, or the establishment of “Land for Wildlife” agreements.



2.2 Recovery plan preparation and implementation

This recovery plan is being prepared with financial support from the Urban Forest Biodiversity Program. While neither the butterfly nor its host plant are afforded specific protection under South Australian legislation, the Cities of Salisbury and Playford, Penrice Soda Products Dry Creek Saltfields and the Defence Estate Organisation have agreed to implement the plan.

The existing *Gahnia* habitat area present on the Dry Creek Saltfields has been zoned 'Conservation' in the land usage maps of the Saltfields Environmental Management Plan (SFM2-014) and tasks relating to the Recovery Plan have been incorporated into the Saltfields Enrichment EIP (Environmental Improvement Plan).

Areas of roadside vegetation containing *Gahnia filum* are to remain the responsibility of the respective Councils.

Support shall be provided to councils in the Northern Adelaide Plains area who wish to establish *Gahnia filum* habitat in any constructed stormwater treatment wetlands they operate.

The management of the area to be revegetated with *Gahnia filum* on the Defence Estate Organisation's lands at St Kilda shall be incorporated in that organisation's Environmental Management Plan (under development).

2.3 Environmental assessment

Under Section 4.4.5 of the Planning Strategy, conserving biodiversity is listed as a specific strategy in the use of the State's natural resources. This allows for consideration of biodiversity values in the development assessment process of any new development. Where a planning application for a new development is received, the relevant authorities (usually the Councils in the first instance) are required to collect information from the following sources when decisions on development consent are made:

- public notification and consultation,
- voluntary consultation with appropriate State bodies that have specific expertise (eg Coast Protection Board, EPA), and
- consultation with State bodies may be required under Regulation 29 and Schedule 8.

The latter only covers very specific types of development, and almost all agricultural uses (except intensive uses such as piggeries) are exempt. Heritage agreements for habitat areas that occur on private lands may afford more statutory protection.



3. Conservation Status

3.1 *Yellowish sedge-skipper butterfly*

Waterhouse first described the Yellowish Sedge-skipper Butterfly in 1941. Since discovery the populations of this species have been decreasing, due to decreased host plant habitat availability. The Yellowish Sedge-skipper is known to be under extreme habitat pressure, and is considered endangered by the Conservation Council of South Australia. They have released a fact sheet titled ‘SA’s *Endangered Wildlife No 4 – Yellowish Skipper Butterfly*’ (see *Appendix 1*). However the butterfly does not have any official conservation status in the State, even though it has not been reported from the Adelaide region for over six years.

A population the Yellowish Sedge-skipper Butterfly, *Hesperilla flavescens flavia*, occurs on the Yorke Peninsula, South Australia. It is a distinct form of *flavescens*, close to but different to nominotypical *Hesperilla flavescens flavia* from the Adelaide Plains.

3.2 *Thatching Grass*

The larval food plant, *Gahnia filum*, does not have a conservation status at State level, however it is recognized as being rare in the Southern Lofty region and uncommon in the Yorke Peninsula region (Kraehenbuehl, 1993,1996). In South Australia sedges have often been considered nuisance plants. They grow in mildly saline coastal areas that are subject to occasional inundation. The Defence Science and Technology Organisation site at St Kilda formed the ‘core’ butterfly breeding area for the region. As such, the site helped maintain and supply breeding females for all the other nearby smaller areas (Grund, pers.com.1999¹). This site was cleared by a tenant farmer only a few years ago, in the hope of “improving” the land for grazing purposes. The sites that remain are all less than one hectare in extent.

¹ Grund, R. Museum of South Australia



4. Description

4.1 Yellowish Sedge-skipper (*Hesperilla flavescens flavia*)

The caterpillar of this species hatches from a pale green hemi-ellipsoid egg that has 40 vertical ribs. The larva is smooth and green, with a dark dorsal line. The head is brownish with a black “V” mark (Grund, 1998). It feeds principally on Thatching Grass, *Gahnia filum*, however a number of species including *Gahnia deusa* have also been recorded as food plants for the Southern Yorke Peninsula population (Grund, 1998a). The larvae of this species of butterfly is known to construct their shelters out of blades of *Gahnia filum* joined together with silk (Jones, 1999, Herbison-Evans & Crossley, 1999).

The adults of the species have yellow patches on each wing. The background colour of the wings is dark brown strongly suffused with yellow, see Figure 1 (Grund, 1998a). There is an arc of outlined spots under each hind wing, see Figure 2. The wing span is around 30-40 mm (Herbison-Evans & Crossley, 1999). Colour photographs of the larvae of this species are available on the web at:

<http://www.mov.vic.gov.au/bioinformatics/butter/images/en1030.html>, and

<http://www.adelaide.net.au/~reid>



Figure 1 – Yellowish Sedge-skipper at rest
(photograph: R. Grund, 1998a)



Figure 2 – Underwing pattern of Yellowish Sedge-skipper (photograph: R Grund, 1998a)

4.2 Thatching Grass (*Gahnia filum*)

Gahnia filum is a member of the sedge family (Cyperaceae). Members of the genus *Gahnia* are commonly called cutting grasses, as they can inflict deep cuts if carelessly handled. These sedges have a wealth of common names, with *Gahnia filum* being referred to as thatching grass, chaffy saw-sedge and salt cutting grass.

Gahnia filum is a tussock-type sedge and grows up to 1.5 metres tall in mildly saline areas subject to occasional freshwater inundation. The plants are perennials with woody rhizomes and form dense tussocks that may be up to a metre across. The leaves are quite dark green and hard, with the ability to cut if mishandled. The flowering heads rise above the tussock and



are a dark reddish-brown. The flowering and seed heads are distinctive in late spring and early summer.

Similar tussock-grasses found in the region that could be confused with *Gahnia filum* include the introduced tall wheatgrass (*Elymus elongatus*, sometimes reported as *Thinopyrum elongatus* or *Agropyron elongatus*), which is frequently planted in saline areas. The wheatgrass can be distinguished by its more bluish leaf coloration and by its flowering and seed heads, which resemble a long head of wheat. These are not present in late spring and early summer, and when they are present they have a light yellow-grey coloration.



Figure 3 - *Gahnia filum*



5. Distribution and habitat

5.1 Current distribution

The current distribution of the Adelaide sub-species of the Yellowish Sedge-skipper is unknown. A population of the Yellowish Sedge-skipper Butterfly is located on the Yorke Peninsula.

There are a number of possible Yellowish Sedge-skipper butterfly habitats both in the Northern Adelaide Plains and further south in the Henley and Grange areas where the butterfly was historically found.

Existing habitat areas in the Northern Adelaide Plains include some medium-sized remnant patches of *Gahnia filum* close to the last known habitat of the Yellowish Sedge-skipper Butterfly, see Figure 4. The Yellowish Sedge-skipper Butterfly may be present at these sites, in some of the smaller sites or in some of the habitat areas created by the recent building of stormwater treatment wetlands in the Gillman to Bolivar coastal zone.

5.2 Historical distribution

The Yellowish Sedge-skipper Butterfly was described in 1941. In the earlier years specimens were recorded near West Beach and Henley Beach (wherever *Gahnia filum* occurred) as well as in the Northern Adelaide Plains near St Kilda.

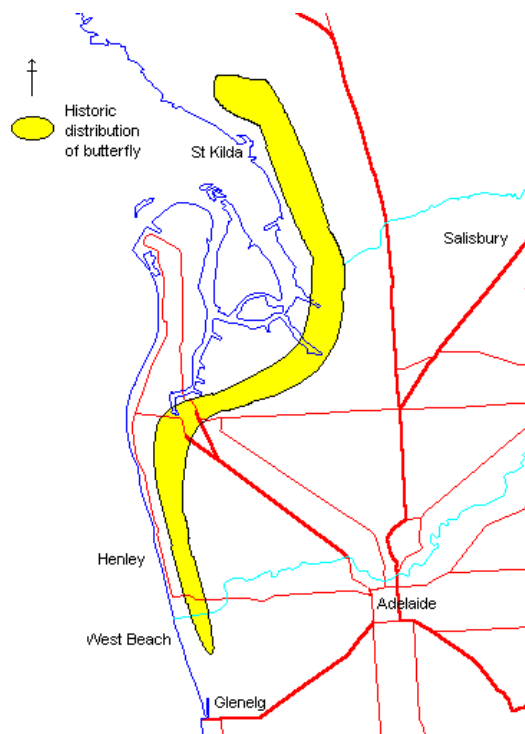


Figure 4 – Historic distribution of the butterfly in South Australia



The Yellowish Sedge-skipper's host plant *Gahnia filum*, is a coastal saw-sedge often called Thatching Grass. *Gahnia filum* is unfortunately limited, in the Adelaide Plains, to the low-lying mildly saline supratidal areas. With the drainage, clearing and "improving" of the land in the Northern Adelaide Plains for horticulture many thick stands of *Gahnia filum* have disappeared, including those that were known to contain populations of the Yellowish Sedge-skipper Butterfly.

The known *Gahnia filum* stands remaining in the St Kilda region of the Northern Adelaide Plains each occupy less than one hectare

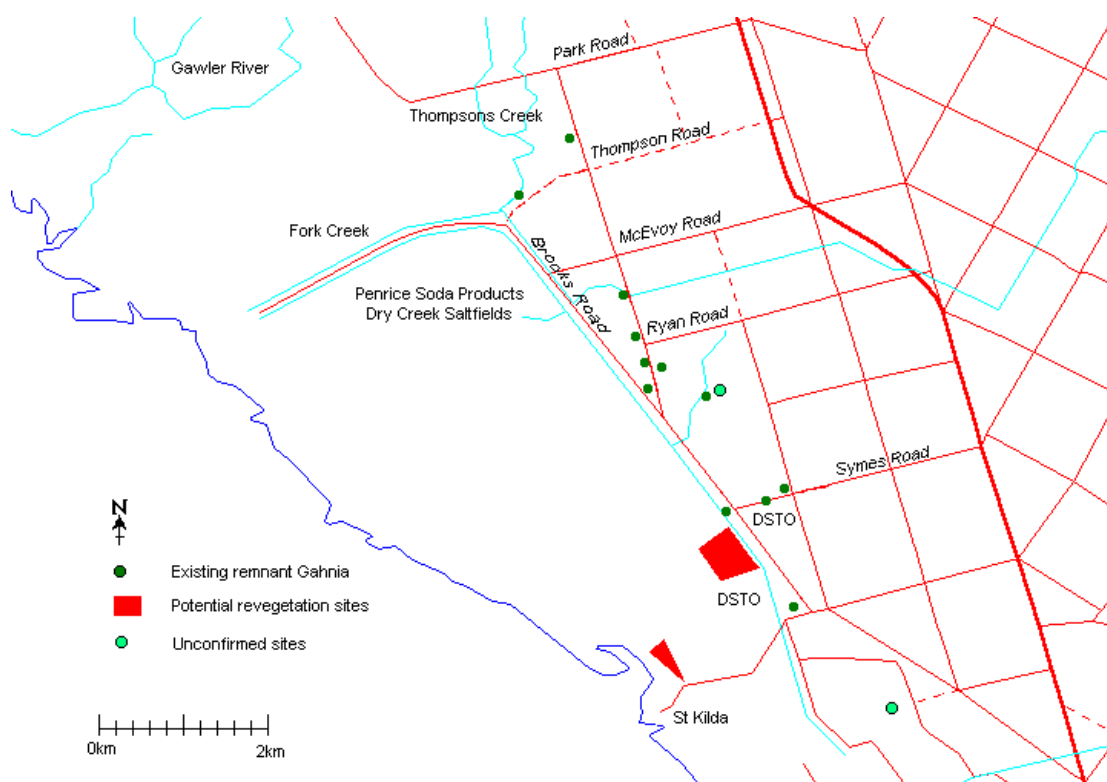


Figure 5 - *Gahnia filum* locations in the St Kilda area

5.3 Tenure

Of the known *Gahnia filum* sites in the Northern Adelaide Region many occur within council controlled road reserves or creeklines. Most of the roadside sites contain less than five tussocks of *Gahnia*.

Several larger stands are present on private land. The largest known existing stand of *Gahnia filum* is on the Penrice Soda Products' Dry Creek Saltfields. The site contains an area of 7500m² *Gahnia filum* (approximately 3000 plants) growing on part of Allotment 11 of DP1671. The land is owned freehold (Certificate of Title Folio5404 Volume 395) and is part of Private Mine 199. The company has zoned the area "Conservation" on its land usage plan.

The stands along Thompsons Creek number up to forty (40) individual plants. This land (Allotment 6 of FP 16853) is freehold, held under title CT5447/585, owned by Morgold Pty



Ltd. Similar numbers of plants are found on the Constellation Model Aeroplane Club's flying field at Allotment 7 DP18569 (CT5450/311).

The block east of the flying field (Allotment 12 FP 106266) appears to have a large number of very young plants growing on it. The land is freehold (CT 5706/158) and until the owner is contacted it is not possible to confirm the identity of the plants.

Significant numbers of plants have been reported from the land occupied by the Bolivar Sewage Works, however the current status of these plants cannot be confirmed.

Land to the south of the Penrice site is controlled by the Defence Estate Organisation under certificates of title CT5309/707 and CT 5309/706. This land previously supported considerable stands of *Gahnia filum*, and was the location of the last sightings of the Yellowish Sedge-skipper butterfly. Remnant clumps of *Gahnia* still exist along the northern and southern road reserves, entwined in the fences of land held under CT 5309/707. The DEO is providing an area of approximately five hectares of CT 5309/706 for revegetation purposes as part of this recovery plan, as part of the development of an environmental land management plan for their entire landholdings in the Northern Adelaide Plains.

5.4 Climate

The Northern Adelaide Plains experience a Mediterranean climate characterized by hot summers and cool winters. Peak rainfall is experienced during winter with some autumn and spring rainfall. Monthly averages are illustrated in Figure 5. The weather station at the Parafield Airport was chosen over the Adelaide office of the BOM as it more accurately represents climate across the historical range of the Yellowish Sedge-skipper Butterfly.

Summer average maximum temperatures range from 27-36°C, see Figure 6, and winter average maximum temperatures range from 14-16°C. The hottest month is February and the coldest month is July. Light frosts can occur in some areas during June and July but rarely last more than a few hours.

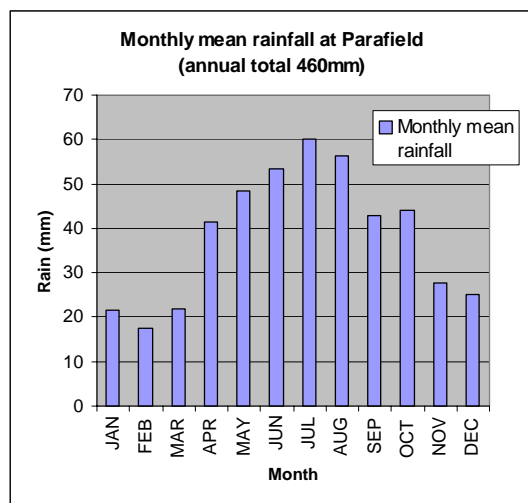


Figure 6 - Rainfall summary

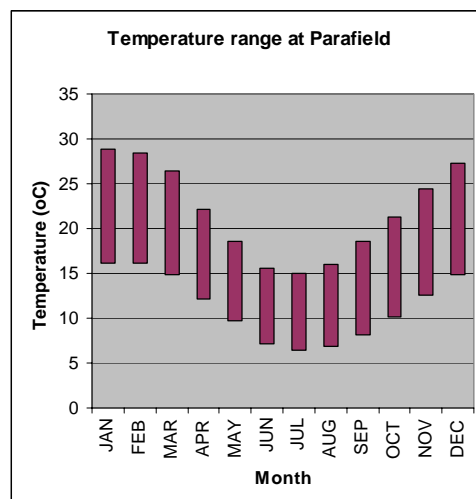


Figure 7 - Temperature summary



Records from the Museum of Victoria show that the closely related Altona Skipper has been found in areas with a rainfall varying from approximately 350mm per annum to nearly 650 mm per annum (Museum Victoria, 1999). The rainfall for the Northern Adelaide Plains fits inside these limits.

5.5 Landscape and topography

All known historical Yellow Sedge-skipper Butterfly populations on the Northern Adelaide Plains have been on *Gahnia filum* sedgelands, located on land below nine meters above sea level. However, Museum of Victoria records indicate that the Altona Skipper can be found at altitudes of up to 300m above sea-level (Museum Victoria, 1999).

In the Northern Adelaide Plains sedges are characteristically found on flat supratidal floodplains. The soil derives from sediment deposited by the sea during the last (Flandrian) transgression and also from floods of the Gawler and Little Para Rivers. The remnant sites of *Gahnia filum* are located on a geological complex known as the St. Kilda formation.

5.6 Vegetation and zoogeography

The vegetation across the range of the Yellow Sedge-skipper Butterfly is generally low-growing supratidal saltmarsh, freshwater tidal wetlands and saltbush communities. Common plant associations are open grasslands (*Stipa drummondii/Vittadinia*), assorted saltbush (*Atriplex* species), coastal *Acacia* species and chenopod halophytes. The host plant, *Gahnia filum*, occurs throughout coastal fresh and brackish swamps, often in association with *Melaleuca halimifolium* and *Melaleuca brevifolia*. In sandier areas it occurs in association with *Callitris preissii* and *Eucalyptus diversifolia* (Kraehenbuehl, 1993).

The butterfly typically occurs in the warm temperate Bassian zoogeographic region, where the precipitation:evaporation ratio is greater than 1:3 for at least 5 months of the year, and where the temperature range remains between –5°C and 32°C.



6. Ecology

6.1 Life history

Skippers are named thus because of the way that they “skip” short distances from flower to flower (Herbison-Evans & Crossley, 1999). The skippers are notable because they do not hold their wings upright when at rest as other groups of butterflies do.

There are two distinct broods laid each year, with peak emergence occurring in Spring and Autumn. Adult populations do not normally overlap, although the larvae may do so. However, there may be a few adults emerging right through summer, allowing some mixing of the two populations (Conservation Council of SA, undated). The female butterfly lays her eggs singly on the underside of a *Gahnia filum* leaf, close to the ground. A fortnight later the larvae hatch and construct shelters out of *Gahnia filum* blades joined by silk. The larvae will take nearly a year to mature, pupate and emerge (Common and Waterhouse, 1981).

6.2 Host plant

The larval food plant of the butterfly is the Thatching Grass, *Gahnia filum*. The plant is not a grass, despite its common name. It is a sedge, and large clumps of the tough, fibrous, dark green blades rise up to 1.2 m on supratidal sedgeland. These are also the dominant food plant for other Hesperillini skippers.

Commonly suggested methods for propagating *Gahnia* are to subdivide clumps, use mature seed stored for 12 months, use fresh seed and treat with sulfuric acid or smoke water, or to thoroughly scarify very fresh seed (Ralph, 1994 and Southern Native Plant Nursery, pers.com. 1999²). There is some doubt as to the survival rate of subdivided clumps (Grund, pers.com. 1999¹). The City of Salisbury’s nursery has been successfully propagating *Gahnia filum* from seed for several years, using bog propagation methods (Ormsby, pers.com 1999³). The seedlings have been used to establish *Gahnia* sedgeland zones within the Council’s constructed stormwater treatment wetlands.

The use of smoke water for propagation, and the fact that *Gahnia* species are a high fire risk, suggests that research into fire management of the species, to encourage new growth and propagation, could be beneficial (The Australian Plants Society - Tasmania Inc, 1999).

Gahnia filum sedgelands occur where fresh to brackish water stands over winter. The soils may dry out completely over summer, although the plants exhibit better growth if there is some fresh water available over the hotter months. The plants appear to tolerate extremely shallow saline water tables, providing the winter surface water is relatively fresh. For example, the uppermost Quaternary aquifer of the St Kilda formation underlying the coastal edges of the Northern Adelaide Plains has a watertable between 0.5m and 3m below the surface. The water in the aquifer has a total dissolved salts concentration of 64,000 mg/L, or nearly twice that of seawater (Pavelic and Dillon, 1993). This formation underlies the areas where *Gahnia filum* was historically found.

² Southern Native Plant Nursery PL, Chalk Hill Rd, McLaren Vale, SA 5171

³ Ormsby, B. Barrie Ormsby Landscape Architect, 17 Twenty-Fifth Street, Gawler, SA 5118



7. Previous management actions

7.1 Yellowish Sedge-skipper / *Gahnia filum* Recovery Team

The recovery team was formed mid-1999 to coordinate recovery efforts and manage remnant stands of *Gahnia filum* in the Northern Adelaide Plains region. The team comprises stakeholder representatives including Penrice Soda Products, the Cities of Salisbury and Playford, and the Urban Forest Biodiversity Program. Approaches have been made to the Defence Estate Organisation, who have indicated a willingness to join the project. Neighbours living opposite the main (Penrice) *Gahnia filum* site and the owners of the Thompson Creek site and the Constellation Model Aeroplane Club site have also been approached, to explain the project and its aims.

The Butterfly Recovery Team shall meet twice yearly, in April and October to review the progress of actions provided in this plan. The meetings shall include representatives from the councils, Penrice Soda Products and the Urban Forest Biodiversity Program. Landholders, neighbours and interested members of the public are welcome.

Meeting location: The Boardroom, Penrice Soda Products Dry Creek Saltfield, Magazine Road, Dry Creek, SA 5094

Contact details for members of the Butterfly Recovery Team:

Corporation of the City of Salisbury: Mark Adams and Valdis Zvaigne, City of Salisbury, PO Box 8, Salisbury SA 5108

Corporation of the City of Playford: Lynda Tout-Smith and Bill Doyle, City of Playford, Warooka Drive, Smithfield SA 5114

Penrice Soda Products: Peri Coleman, Magazine Road, Dry Creek SA 5094 ph: 8262 2405

UFBP: Fiona Chambers, PO Box 8, Salisbury SA 5108. ph: 8406 8506

Neighbours and landowners:

Defence Estate Organisation: Lawrie Bruggemann, PO Box 1500, Salisbury SA 5108

Mr and Mrs Robinson, PO Box 188, Virginia SA 5120

Mr Zane Pitt, Morgold Pty Ltd, 9 Madeline Crescent, Fulham Gardens SA 5024

Mr Brian Horrocks, Constellation Model Aeroplane Club, Brooks Road, Virginia SA 5120

7.2 Weed control

The medium to large site of *Gahnia* on Penrice land has had very little weed control in the past as it is difficult to reach from Penrice embankments and is hard to see. It was drawn to the company's attention that African Boxthorn (*Lycium ferrocissimum*) was infesting the area.



Penrice undertook low impact “cut and swab” weed control during November 1999. The occurrences of *G. filum* on council maintained road verges are small and vulnerable to road verge slashing. In some cases the plants have so often been slashed that they only grow entwined in the roadside fencing. However the slashing has also minimized the amount of weeds in these areas. The *G. filum* occurring along Thompson Creek is growing in a dense freshwater tidal saltmarsh community in the riparian zone of the creek. Any weed control in this area would need to be conducted using Glyphosate Bioactive.

7.3 Research

Very little published work is available on the Yellowish Sedge-skipper Butterfly. Much that is known is contained in personal notes and observations. Some work is available on the Victorian sub-species, the Altona Skipper Butterfly, however it is still not comprehensive.

7.4 Endangered wildlife leaflet

The Conservation Council of South Australia published a leaflet in their “South Australia’s Endangered Wildlife” series in 1991. A copy of this is included in *Appendix 1*.

7.5 Site descriptions

Each site where *Gahnia filum* has been reported has been visited to confirm or deny the presence of the host plant. Positive locations have been checked for weeds and checked for Yellowish Sedge-skipper Butterflies or larvae. *Appendix 2 - Site Descriptions* contains details of all sites in the Northern Adelaide Plains where *Gahnia filum* has been found.

7.6 Habitat creation projects

Constructed stormwater treatment wetlands built in the Northern Adelaide Plains area may contain areas suitable for the establishment of stands of *Gahnia filum*. Wetlands have been built in areas where the sedge historically occurred. The sites contain quite varied topography, including lowlying, flatter areas that may support substantial numbers of sedges. The advantages of using these constructed wetlands include the abundant water supply, security of tenure and consistent management (Ormsby *pers com*, 1999³).

The Paddocks Wetland (City of Salisbury) is the most easterly of the wetlands where trial plantings of *Gahnia filum* have been undertaken. The plants are now established tussocks and there is sufficient area for further plantings, however the site may be too distant from the rest of the patches for it to provide habitat for the butterflies.

At Burton, the Kaurna Park Wetlands (City of Salisbury) have large areas of shallow overland flow that would provide suitable growing conditions for *Gahnia filum*. In 1999 over 1000 plants of *Gahnia filum* were planted out into the wetlands, with plans to plant similar numbers in the year 2000. The site is being planted with a range of indigenous wetland species that will complement the sedgeland.

Greenfields Wetlands (City of Salisbury) are very large (112ha) and there are many shallow areas in the more southerly sections (Connector Wetlands). These wetlands link to the Barker Inlet Wetlands (City of Port Adelaide-Enfield) and to the Mawson Lakes Wetlands (Land Management Corporation). Between them, these wetlands could provide a most significant



augmentation to the area available for *Gahnia filum*. The wetland officers managing the Barker Inlet have been contacted, and have undertaken to plant several hundred plants (provided by Penrice Soda Products) in the winter of 2000. Project managers for the Mawson Lakes development have been contacted and provided with information about the recovery plan.

Further suitable areas for creating habitat include the proposed Whiting Street Reserve at St Kilda and the complex of constructed wetlands (Little Para, Whites Road, Swan Alley) and private lands along the Little Para estuary in the City of Salisbury. Recently proposed remediation works in the outfall area of the estuary may recreate ephemeral wetlands on land owned by Penrice Soda Products adjacent to the river.

The Defence Estate Organisation lands at St Kilda have considerable areas that supported *Gahnia filum* until recently. A revegetation project has been discussed with the DEO, who have undertaken to fence an area, undertake some earthworks to improve the quantity of water retained on the site, and provide a planting team.

Some areas of the Constellation Model Aeroplane Club could support many more *Gahnia filum* plants if a small amount of water were diverted from the Council stormwater drain that runs through the property. The Club has been contacted and a presentation has been arranged to explain the Recovery Plan to the club members.

Areas considered suitable for the creation or re-creation of *Gahnia filum* habitat are described in *Appendix 2 – Site Descriptions*.



8. Management issues

Recovery programs for threatened species need to address the biological and ecological aspects of the species, the social, political and organisational parameters that may affect the success or otherwise of the program, and the economic factors which may influence the program's implementation.

This section identifies the management issues affecting the Yellowish Sedge-skipper Butterfly including the limits of our current knowledge of the butterfly's ecology, the known threats and reasons for decline in the population, and any social and economic factors which may influence operation of the recovery plan.

As the *Gahnia filum* sites are generally small and vulnerable and the Yellowish Sedge-skipper Butterfly populations are tiny (if present), and as there are a number of threats acting on the sites, further effects are likely. The 'leave it alone' approach has resulted in the accidental clearing of *Gahnia* on the DSTO lands at St Kilda, and recent requests for a car parking facility at the neighbouring model aeroplane club could have easily resulted in major damage to the Penrice *Gahnia* sedgeland. The destruction of sensitive habitat more frequently occurs from lack of knowledge or understanding than from any desire to destroy *per se*.

On-site actions should therefore occur to at least formalise the protection of the more vulnerable sites. This would include placing some identifying signage to prevent accidental slashing or eradication of plants in the road verge areas.

8.1 Level of understanding

The Yellowish Sedge-skipper Butterfly was a relatively recently identified sub-species before it disappeared and knowledge of its ecology is far from complete. Our level of understanding is very low.

Continued monitoring of *Gahnia filum* sites for the Yellowish Sedge-skipper Butterfly is required to assess the effectiveness of the recovery actions and to provide a data source for the review of the Recovery Plan and recovery actions.

The Yorke Peninsula population of *Hesperilla flavescens* also requires detailed monitoring as they could provide an alternative data source on the ecology of the Adelaide *Hesperilla flavescens flavia* as well as stock for any future translocation program.

8.2 Threatening processes

8.2.1 Habitat loss

Since settlement the native vegetation of the Northern Adelaide Plains has been predominantly cleared for grazing, and more recently for horticulture. Remnant native vegetation is generally restricted to road verges, small crown reserves, riparian zones, mining leases and areas of tidal inundation.

Many landholders consider *Gahnia filum* and other sedges to be 'rubbish' as they are tough and relatively unpalatable to stock. Where *Gahnia* is found growing on grazing land it is often slashed, burnt or over-grazed to remove it. Most remaining *Gahnia filum* is either on road verges or on "unimproved" land.



Few landholders are aware of the butterfly and some still regard *Gahnia* as a weed. Sites within or adjacent to road verges are at risk from road maintenance, upgrading, weed spraying and clearing for road works, power lines and other utilities, and stockpiling of roadbase materials.

8.2.2 Habitat modification and disturbance

A range of factors is directly or indirectly influencing the quality and extent of habitat available to the Yellowish Sedge Skipper Butterfly. These factors are discussed below.

8.2.2.1 Weeds

Weed invasion has been identified as a problem at all of the potential Yellowish Sedge-skipper Butterfly sites found so far. Woody weeds including Boxthorn compete with the host *Gahnia filum*, which is necessary for the butterfly's survival. Many introduced grasses may also grow very densely around the base of the sedges, making it difficult for the female butterfly to deposit her eggs (New, 1997).

The *G. filum* occurring along Thompson Creek is growing in a dense freshwater tidal saltmarsh community in the riparian zone of the creek. Any weed control in this area would need to be conducted using herbicides approved for use in riparian zones.

Some nectar-producing weeds may provide food for the adult butterfly during its period of flowering, however it should be possible to reintroduce those indigenous nectar-producing plants that once occurred in the sedgeland, during any revegetation projects undertaken to expand the areas of *Gahnia filum*.

8.2.2.2 Vehicular access and recreational vehicle use

Gahnia filum usually inhabits areas that become only temporarily boggy. Such areas frequently have intense Off-Road Vehicle use. The saving grace for the sedges may be their sharp leaves. The cuts inflicted by the blades can be quite deep.

The larger areas of sedge are fenced, however the sites along road verges are not expanding because of vehicle use and slashing. Fencing off some of the more important of these areas may allow the plant populations to expand, and would also provide 'safe' areas for revegetation efforts.

8.2.2.3 Dust

It has been claimed that dust from roadways affects the larvae of other butterflies (such as the Bathurst Copper Butterfly) by making the leaves inedible or at least unpalatable to the larvae (NSW NPWS, 1999). Dust from roadways could be high at the currently known potential habitats due to unsealed road surfaces. Land planing (conducted as part of local horticultural operations) can also contribute significantly to the dust load when it is conducted on windy days.

8.2.2.4 Fire

The effects of fire on populations of Yellowish Sedge-skipper Butterfly have not been studied. It would be safe to assume that large fires that removed the entire *Gahnia* habitat in an area could be disastrous for the butterfly, as it is a species with an apparently low



dispersibility. Small fires may allow regeneration of fresh *Gahnia* plants, and younger growth is preferred by the butterflies (New, 1997).

Gahnia species are considered a high fire risk due to the large amount of organic build-up below them (The Australian Plants Society - Tasmania Inc, 1999). The plants themselves may also become very dry over summer, particularly so in regions where the surface-water dries out completely. The use of extensive agricultural surface drains in the Northern Adelaide Plains has resulted in very dry summer growing conditions for many of the remnant sedge populations. Where the plants are growing in more marshy conditions the plants remain green and are not a hazard.

8.2.2.5 Grazing and clearing

Gahnia species are generally tough and inedible to many large creatures, and are often the last thing to be eaten in a paddock. However *Gahnia filum* is more palatable than most, particularly the younger plants (Grund, *pers.com.* 1999¹). As these are also the plants most favoured by the butterfly, stands of young *Gahnia* should be considered vulnerable. Grazing around mature stands may clear away encroaching grasses, allowing the female butterfly to access the base of the plants for egg-laying. However, the sharp edges of hard hooves may damage the plants' fibrous root systems and the grazing may reduce the recruitment rate of new *Gahnia* plants.

Where grazing or horticulture are proposed, *Gahnia* is frequently cleared to 'improve' the pasture or make way for the crop.

8.2.2.6 Impacts of feral animals

The major feral animals with potential to impact on Yellow Sedge-skipper Butterfly habitat sites are rabbits and hares. Their impacts are concentrated on the butterfly's host and feeding plants. Rabbits and hares impact the butterfly's host and feed plants by uprooting small plants, eating young plants and shoots and burrowing under mature stands. The impact of these feral animals in the Northern Adelaide Plains has considerably reduced in the past two years due to the combined impact of the rabbit calicivirus, myxomatosis and regular baiting / shooting.

8.2.2.7 Isolation of habitat

The widespread clearing of native vegetation has not only reduced the amount of *Gahnia filum* available for the butterfly, but it has also fragmented the habitat into isolated remnants. The Yellowish Sedge-skipper Butterfly has been recorded as flying only 3km in one generation, so the isolation and fragmentation of the any remaining stands of plants is a significant threat to the butterfly (Grund, *pers.com.* 1999¹). The smaller the population, the more vulnerable it is to various threats that operate against it.

Where small populations are connected (through dispersal) over a network of occupied and unoccupied habitat patches the entire network of populations is called a metapopulation (Mace *et al.* 1998). Individual populations may become extinct, however the metapopulation will survive as long as recolonisation from nearby habitat patches exceeds the extinction rate. The small size of the available habitat patches and the distances between them limit the dispersal ability of the Yellowish Sedge-skipper Butterfly. The planting of small islands or 'stepping stones' of *Gahnia filum* between the larger sites could alleviate this threat.



At present it is unknown what density of *Gahnia filum* patches is required to support a metapopulation of Yellowish Sedge-skipper. The butterflies are in such small numbers Australia-wide that the necessary research has not been possible. Hence the questions of how big a patch is required to support breeding, and how far apart patches of habitat can be in order to support a metapopulation, are unanswered. This is the type of data that needs collecting for almost all of Australia's vulnerable butterflies if we are going to be able to model habitat reconstruction needs in the future, rather than working blindly and 'hoping for the best' (Thomas, 1995).

8.2.2.8 Seed and grass collection

The populations of *Gahnia filum* on the Northern Adelaide Plains are small. *Gahnia* seed-heads and leaves are currently in great demand for dried flower arrangements, and were, in the past, used for thatching houses and sheds. The latter use is no longer common.

8.2.2.9 Direct and indirect spraying effects

The *Gahnia* sedgeland habitats of the Northern Adelaide Plains are subject to direct spraying to control weeds, to accidental drift from aerial mosquito control operations, and 'overspray' from neighbouring agricultural operations. Chemicals used range from herbicides that impact on the *Gahnia filum*, to insecticides that can eradicate both adult and larval butterflies.

8.2.2.10 Sea-level change and land drainage

Gahnia sedgelands in the St Kilda area are all located on land that may be affected by relative changes in sea-level. These changes may be the result of any of the following (acting singly or in concert) – greenhouse warming sea-level rise, land settlement in areas overlying the St Kilda formation (breakdown of peaty sea-grass deposits), land settlement or raising due to fault slippage (several faults run through the area) and land building due to sediment deposition.

Swamps are, by their nature, a temporary stage of affairs at a geological timescale. Moss (1988) discussed the birth, development and passing of lakes, but the same processes occur in all parts of the fluvial system – water banks up behind something impermeable and makes a lake. Then after many years sedimentation may be so marked that the lake fills in and becomes a swamp with a river running through it, and a new lake may form further downstream. The swamps may remain swampy, or levees may build up on the river banks, isolating some swamp areas and reducing their flood frequency.

It is unknown whether the *Gahnia* sedgelands on the Northern Adelaide Plains were expanding or contracting prior to human intervention. The remaining stands do not receive a very regular flooding, but this is probably a result of extensive drainage works that have been undertaken. What is certain is that all the coastal wetland habitats are in a state of flux, and those (such as saltmarsh, freshwater tidal wetlands and sedgelands) that have been isolated by man-made levees or drainage systems, are unable to respond to environmental changes by colonising more suitable zones. These habitats are steadily shrinking. Therefore it is important to include 'future accretion zones' in any long term planning of the management of sedges.

The Climate Impact Group of CSIRO has developed a model that predicts habitat effects of climate change. Their BIOCLIM model has been used to evaluate the likely response to greenhouse change of several Australian native species, including the Altona Skipper butterfly (Brereton *et al*, 1994). While the skipper showed a small increase in range with a



one-degree rise in temperature, its core habitat area was reduced. With a two-degree rise in temperature both the core habitat and range contracted by more than 90% leading to extinction of the butterfly.

8.2.3 Collection

Little is known of the extent, origin, location or value of Yellowish Sedge-skipper Butterfly specimens held in collections. The butterfly larvae are easily collected from their shelters, and this has frequently been a method of collecting in the past, to ensure a 'perfect' specimen was obtained. While most data on the distribution of Australian insects has come from collectors, over-collecting is a distinct possibility with a sedentary species that makes easily observed shelters.

Publishing of site details of proven populations should be kept to a minimum to prevent over-collection. However, the reporting of **regional populations** and identification of **habitats** should be encouraged, to prevent further accidental destruction of habitat.

The larger habitat sites reported in this plan are located on freehold land, and it would be hoped that responsible lepidopterists would contact the landowner prior to visiting any site. Landowners who have invested time and effort to preserve the butterflies' habitat have a personal interest in ensuring that collection is conducted only for scientific purposes and in a conservative manner. Involving the local community in recovery efforts has proven to be an effective tool interstate in the control of collecting. The open nature of sedgeland makes it unlikely that collectors would go unobserved by neighbours.

Australia is a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora, and consideration should be given (at the Federal level) to assessing Australia's vulnerable invertebrates, for inclusion in Schedule 3 of the Convention.

8.3 Community education and awareness

The informed assistance of the local community is necessary for the effective recovery of the Yellowish Sedge-skipper Butterfly and its host plant.

Support from the community is essential in the success of any threatened species recovery plan. The community as a whole should have the opportunity to be fully informed of the activities associated with the recovery of the Yellowish Sedge-skipper Butterfly and the opportunity to become involved in the project. The community has a number of essential roles, including the identification of potential habitat and populations, reducing the impact of farming and insect collection on areas of potential habitat and helping with the propagation and replanting of butterfly host and food plants.

This project has as its focus the recovery of the butterfly and its habitat on the Northern Adelaide Plains. However, further areas of potential habitat exist outside the Northern Adelaide Plains region. A significant *G. filum* colony is still present at Kooyonga Golf Course, and potential habitat areas with existing plants occur at the Adelaide airport, the reserves to the west of Adelaide airport, and various wetlands along the old reed-belt from West Beach to Port Adelaide (Grund, pers.com. 1999¹). A strong educational outreach may provide local community environment groups in the southern areas with the tools they require to undertake a similar program.



8.4 Translocation

Translocation is a controversial topic. Translocation is defined as the deliberate reintroduction of species into an area where it once occurred or introduction to an area where it never occurred. Translocation is usually only considered when the native population is known to be extinct (New, 1997). Captive breeding may be a component of a translocation program.

Translocation programs are usually devised to assist in the conservation of a threatened species, within the context of a broader recovery strategy. That is, translocation takes third place, after the strategies of 'maintaining existing habitat connectivity, and restoring connectivity by management which provides new habitat stepping stones' (Thomas, 1995). Translocation programs can provide a measure of security for critically endangered populations in the event of catastrophes such as the impacts of fire or disease.

The translocation of the Yellowish Sedge-skipper Butterfly from the Yorke Peninsula population may be investigated should the Adelaide population be definitely considered extinct at some time in the future. However this strategy could have negative impacts on the Yorke Peninsula population, if that group were to be seriously depleted by a translocation program.

Before a translocation program can proceed a number of things need to be considered. Translocation programs are expensive, are often unsuccessful and could possibly mean introducing another subspecies by mistake. Things that need consideration are:

- Are the Adelaide Yellowish Sedge-skipper Butterflies confirmed as extinct? If not, is there any chance of reviving them without a translocation program, which could disturb the genetics of the population or introduce more habitat competition?
- Has sufficient habitat, in a network of larger patches with appropriately spaced 'stepping stones' been established in the receptor area? New (1997) considered that opportunities to restore networks of metapopulations are more likely to be successful than single-site reintroductions.
- The maximum distance Yellowish Sedge-skipper Butterflies commute is not known. The Yorke Peninsula butterflies could be at the other end of a species cline or possibly another subspecies. Has everything been done to determine if either of these is the case? Are the Yorke Peninsula butterflies adapted to a different microclimate?
- The York Peninsula butterflies may be a vulnerable population. Could we do something for them now, to ensure they will be able to support a translocation program in the future? Translocation should not be considered if it would harm the donor population.
- Have captive breeding programs been examined for the Yorke Peninsula Yellowish Sedge-skippers and/or the Altona Skippers?
- If translocation is undertaken, sufficient numbers of butterflies should be used to ensure a sustainable gene pool is present.
- Any such program needs to be well documented, with appropriate permissions from the agencies responsible, and the translocated population should be monitored for at least five years to establish the success or otherwise of the program.



8.5 Consideration of social and economic consequences

8.5.1 Social considerations

Those landholders with *Gahnia filum* growing on their property will bear the main social consequences of this plan. The major landowners and the local Councils for those identified areas of sedgelands have accepted changes in management practices. Future finds on private property may be the result of increased awareness of the butterfly conservation effort. Educating the community about changes in land management practices to prevent impacts on potential Yellowish Sedge-skipper Butterfly habitat should result in a modification of weed control and grazing activities, as well as the identification of illegal collection activities of any populations of the butterfly.

Negative social impacts may include public dissatisfaction with recovery plan actions, which encourage sensitive management of Yellowish Sedge-skipper Butterfly habitat. This could provoke vandalism of the potential habitat sites and signs. Ensuring the local community is involved in all stages of the development and implementation of the Yellowish Sedge-skipper Butterfly recovery plan is the main avenue for reducing the likelihood of these impacts.

8.5.2 Economic considerations

The economic consequences of this recovery plan relate to implementation costs and possible development restrictions.

Implementation costs include population monitoring, habitat management and expansion, and community liaison. Management costs are either minor, such as fencing, signposting, fire management and weeding, or are covered by a biodiversity grant. Ongoing management research is not covered by this plan, however the joint parties may consider encouraging local universities to direct their postgraduates towards butterfly management research.

The consideration of the Yellow Sedge-skipper Butterfly in any environmental impact assessment for proposed developments on adjoining properties could produce an economic impact. However, development restrictions would not exceed those provided under the Native Vegetation Act 1991 for developments within the City of Playford. Consideration of the butterfly's requirements would be an addition to current development requirements in the City of Salisbury (which is exempt from the operation of the Native Vegetation Act) but would result in minimal economic consequences as the areas involved are very small.

8.6 Biodiversity benefits

Kraehenbuehl (1993) reported *Gahnia filum* sedgelands as important for wildlife conservation, with the habitat providing nesting and permanent shelter areas for birds such as the Southern Emu-Wren (*Stipiturus malachurus**) and the Golden-headed Cisticola (*Cisticola exilis*). Seasonal users of *Gahnia filum* habitat include the Painted Snipe (*Rostratula benghalensis**), Buff Banded Rail (*Gallirallus philippensis*), Stubble Quail (*Coturnix novaezealandiae*), Black-tailed Native Hen (*Gallinula ventralis*), Musk Duck (*Biziura lobata**) and Blue-billed Duck (*Oxyura australis*). Those species above marked with an asterisk are endangered, rare or vulnerable species listed in Schedules 7-9 of the *National Parks and Wildlife Act 1972*.

Additionally, *Gahnia* sedgelands provide habitat for the Swamp Rat (*Rattus lutreolus*). This rat has been described as a rat of swamp, grass and sedge (Lunney, 1995). It is a very cryptic



rat, making tunnels through the sedges around its nest and seldom venturing out of them. The sedges form the main component of the rat's diet. Each rat uses a home range of at least 0.2 hectares, while females have an expanded home range of 0.5ha during the breeding season. The female rats fail to breed if their entire home range is burnt, even though the fresh growth may support many individual males. The recovery potential of the Swamp Rat is considered to be high, making the animal a useful one to measure success of habitat restoration projects (Lunney, 1995).

The more significant areas of potential habitat identified in this recovery plan have previously been identified as areas of significant conservation value (Grund 1997) based on the plant associations found on them. In particular, the Penrice Soda Products site on Brooks Road hosts several plants listed by Kraehenbuehl (1996) as uncommon, rare or vulnerable in the Southern Lofty region (*Eutaxia microphylla microphylla* and *Pittosporum phylliraeoides microcarpa* as well as *Gahnia filum*). The *Eutaxia* has an 'uncommon' rating for the entire state. Additionally the silky wilsonia, *Wilsonia humilis*, has been reported from the site (unconfirmed during the current survey).

An immediate benefit of the Yellowish Sedge-skipper Butterfly recovery program is an increase in local invertebrate and floral biodiversity as a result of the restoration project. In the longer term the program has the potential to herald a change in South Australian philosophy regarding the conservation of our biodiversity.

Butterflies have been described as the insect equivalents of the Blue Whale, Giant Panda, Rhinoceros and the Californian Condor (New, 1997). They have aesthetic appeal, they are easily visible and they are excellent indicators of habitat health. Hence it is easy to see how butterflies may become the flagship for invertebrate conservation efforts.

8.7 Ability to recover

The Yellowish Sedge-skipper Butterfly's ability to recover is limited by the available habitat and the current population size. It may be possible to rehabilitate areas that were once sedgeland between the currently known potential habitat sites. Given the Yellowish Sedge-skipper's low dispersivity and many butterflies' preference for edge habitats, a thick "corridor" may not be the best method of linking the current sites or creating new potential habitat (Fry & Main, 1993). Fry and Main's study showed that butterflies in general do not like to fly through dense belts or boundaries and that they preferred to fly through and around open clumps of grasses and herbs. An open but close-set pattern of *Gahnia filum* "stepping stones" or "islands" across fields and along fences with no more than 60% total could encourage the recovery of the Yellowish Sedge-skipper Butterfly while not hindering the movements of other species of invertebrates between habitats cover (Fry & Main, 1993). This planting belt should also include a number of nectar-producing native plants that flower during times of peak butterfly activity, as well as other plants commonly found in association with *Gahnia*.



9. Overall objectives and criteria

9.1 Overall objective

The overall objective of this recovery plan is to prevent, if possible, the extinction of the Yellowish Sedge-skipper butterfly by protecting and expanding habitat plant sites in the Northern Adelaide Plains area. Recovery relates specifically to the protection of possible Yellowish Sedge-skipper Butterfly populations from human induced decline.

9.2 Performance criteria

The overall performance criteria of the recovery plan is that potential habitat for the Yellowish Sedge-skipper Butterfly is preserved and expanded to increase protection and the possibility of recovery for any remnant butterfly populations.



10. Threat abatement

10.1 Objectives

The objectives of the threat abatement program are:

1. Assessment of threats operating on freehold and Commonwealth land,
2. Prevention of clearing and habitat fragmentation, and impact assessment of future developments,
3. Habitat augmentation,
4. Management of weeds,
5. Prevention of collection of the Yellowish Sedge-skipper Butterfly in the Northern Adelaide Plains,
6. Management of vehicular access and recreational vehicle use,
7. Management of road surfaces / embankments and maintenance activities,
8. Management of fire prevention activities and planning,
9. Management of grazing activities,
10. Management of impacts associated with feral animals,
11. Management of seed and grass collection, and
12. Management of direct and indirect spraying effects.

Deleterious factors for the survival of Yellowish Sedge-skipper Butterfly populations or their habitat are listed for each site in the Site Descriptions (*Appendix 2*).

10.2 Criteria

The success criterion is the reduction of factors detrimentally affecting potential Yellowish Sedge-skipper Butterfly populations or their habitat to a level where their effect is not significant. This reduction is expected to result in the stabilisation or increase in possible populations of the Yellowish Sedge-skipper Butterfly.

10.3 Recovery actions

10.3.1 Assessment of threats operating on freehold and Commonwealth land

The Butterfly Recovery Team will undertake a site assessment (*Appendix 2*) of all current *Gahnia filum* stands on freehold and public land in the Northern Adelaide Plains area as well as identifying locations where *Gahnia filum* grew in the recent past. The Butterfly Recovery Team will liaise with nearby landholders, including the Defence Estate Organisation, to provide advice about the ecology of the Yellowish Sedge-skipper Butterfly and threatening processes and instigate ameliorative actions, including replanting of *Gahnia filum* dominated associations.



10.3.2 Prevention of clearing and habitat fragmentation, and impact assessment of future developments

- Where potential Yellowish Sedge-skipper Butterfly habitat could be affected by a development activity or proposal, determination and consent authorities under the Development Act 1993, including the Corporations of the Cities of Salisbury and Playford, are requested to have due regard for the environmental impacts of the proposal.
- The Penrice Saltfields, the Corporations of the Cities of Salisbury and Playford and any other relevant land managers should ensure that the contents of this recovery plan are considered during implementation of their internal environmental planning processes.
- Where Yellowish Sedge-skipper Butterfly sites are under the management of either the Corporations of the Cities of Salisbury and Playford, or Penrice Saltfields, they will manage their adjacent operations (eg road verge maintenance) to prevent impacts on potential habitat areas.
- All corporate members of the Butterfly Recovery Team shall provide signage at habitat sites, to ensure no accidental clearance.

10.3.3 Habitat augmentation

- All corporate members of the Butterfly Recovery Team shall provide materials and organise volunteers to rehabilitate areas of Yellowish Sedge-skipper Butterfly habitat, as specified in this plan in Section 14, Table 1 (Implementation schedule). Plantings shall include *Gahnia filum* and other endemic saltmarsh/sedgeland plants (*Appendix 8 – Species List*). Sites nominated in *Appendix 2 - Site Descriptions* shall be enlarged with restorative plantings to create a network of larger areas connected by smaller patches. Additional areas of land that have previously supported *Gahnia filum* may also be revegetated at the request of the landholder.
- The Cities of Salisbury and Port Adelaide-Enfield have constructed stormwater treatment wetlands that contain large areas suitable for the establishment of *Gahnia filum* sedgelands. The wetland managers of these facilities should be supported to expand any existing areas of *Gahnia* and undertake plantings in appropriate areas as part of their maintenance planting activities.

10.3.4 Management of weeds

- For Yellowish Sedge-skipper Butterfly habitat under their management, the Penrice Saltfields and the Corporations of the Cities of Salisbury and Playford shall ensure that weed control in their respective areas is carried out in accordance with the guidelines outlined in *Appendix 3*.
- Penrice Saltfields shall undertake weed control of areas of Boxthorn and other weeds adjacent to the potential habitat identified on their land. They shall co-ordinate the planting of weed-free areas with further potential habitat species. These shall include *Gahnia filum*, and other species listed in *Appendix 8 – Species List*. The plants shall be provided by the Corporation of the City of Salisbury, or grown by local community members.



10.3.5 Prevention of collection of the Yellowish Sedge-skipper Butterfly in the Northern Adelaide Plains

- The Butterfly Recovery Team shall arrange for annual visits of potential habitat sites to check for the presence of the Yellowish Sedge-skipper Butterfly. At this stage the collection of Yellowish Sedge-skipper specimens in the Northern Adelaide Plains area is not considered an option, as no butterflies have been seen for some years.
- The Butterfly Recovery Team shall inform local residents and landholders of the biological value of the species and encourage them to report people trespassing on private land to the landowner.
- The Butterfly Recovery Team shall install fencing and signage to discourage people from trespassing on potential habitat sites or collecting specimens. The signage shall include a contact telephone number (to be determined by the team).

10.3.6 Management of vehicular access and recreational vehicle use

- Where potential Yellowish Sedge-skipper Butterfly sites are under the control of either the Corporations of the Cities of Salisbury and Playford, or the Penrice Saltfields, unauthorised vehicular access to the sites shall be prevented through the installation of appropriate fencing around sites.
- The Butterfly Recovery Team shall install signage to discourage people from trespassing or driving vehicles across or within potential habitat sites.

10.3.7 Management of road surfaces / embankments and maintenance activities

- Adjacent to all potential Yellowish Sedge-skipper Butterfly sites, Penrice Saltfields and the Corporations of the Cities of Salisbury and Playford shall ensure that road surfaces and embankments under their control are maintained in a manner that reduces possible dust impact on the adjacent habitat. This may require the sealing of high volume roadways to reduce dust or applying speed limits to unsealed roads. Any road verge maintenance that utilises slashing should be conducted so as not to destroy any *Gahnia filum* present.
- All employees and contractors who carry out work on behalf of Penrice Saltfields and the Corporations of the Cities of Salisbury and Playford shall be informed of any potential habitat sites and their significance. Work procedures shall be provided that help reduce any impacts on the site.

10.3.8 Management of fire prevention activities and planning

- For Yellowish Sedge-skipper Butterfly habitat sites under their control, Penrice Saltfields and the Corporations of the Cities of Salisbury and Playford shall ensure that fire management of the sites is planned that recognises the best possible scientific knowledge of Yellow Sedge-skipper Butterfly ecological requirements. Fire management should be effected in accordance with the guidelines for fire management outlined in *Appendix 4*.

10.3.9 Management of grazing activities

- For potential Yellowish Sedge-skipper Butterfly sites under their management, Penrice Saltfields and the Corporations of the Cities of Salisbury and Playford should generally



exclude grazing by domestic stock, unless otherwise advised by the Butterfly Recovery Team.

- If significant potential habitat sites are found on current grazing land the Butterfly Recovery Team shall inform the landholder of the significance of the site and cooperate in preparing guidelines to encourage responsible management of grazing at that particular site as described in *Appendix 6 – Agriculture Operations Guidelines*.

10.3.10 Management of impacts associated with feral animals

- Members of the Butterfly Recovery Team shall observe known sites for evidence of impacts from feral animals.
- If a significant impact is observed from feral animal activity members of the Recovery Team are to encourage the landholder of the site to run a feral animal control program.

10.3.11 Management of seed and grass collection

- The Butterfly Recovery Team will regularly visit the potential habitat sites to monitor the health of the Yellowish Sedge-skipper butterfly's host plant and to deter collection of seeds (except for propagation programs aimed at extending the habitat) or plants of *Gahnia filum* from the site. Respective councils should inform applicants for the collection of native seeds within their council area that no *Gahnia filum* seed is to be taken except for propagation programs aimed at extending the habitat.
- The Butterfly Recovery Team shall inform local residents and landholders of the biological value of the species and encourage them to report people trespassing, or collecting seeds or plants, to the team coordinator.
- Seed heads should only be collected from the Penrice site, and only for use in revegetation trials and projects within the Northern Adelaide Plains region.
- Collection of seeds should be undertaken in late summer (usually during January and February (Ralph,1993)) and only with the approval of the Butterfly Recovery Team and Penrice Saltfield personnel.
- Approved seed collectors should follow the instructions in Ralph (1993) *Seed Collection of Australian Native Plants*.
- Under no circumstances should more than 20% of available seed be collected at the site in one year.
- Local residents should be informed when seed collection by the Butterfly Recovery Team will occur at a particular site.
- The Butterfly Recovery Team shall install fencing and signage to discourage people trespassing on potential habitat sites, or collecting seeds and grass, without prior approval.



10.3.12 Management of direct and indirect spraying effects

- Weed control on habitat sites, undertaken by contractors or employees for the Councils or for the Penrice Saltfield, shall be undertaken with due regard for the health of the *Gahnia filum* plants. Where possible ‘cut and swab’ techniques shall be used.
- Mosquito control conducted by the Councils or their contractors in *Gahnia* sedgelands shall be restricted to the hand application of larvicide to mosquito larvae infested pools of water. Aerial spraying of bacterial or chemical larvicide, or fogging with insecticide is inappropriate in butterfly habitat areas.
- The Torrens Island Mosquito Control Committee shall be provided with the locations of all *Gahnia filum* sedge habitats, so that they can plan their mosquito control program to avoid impacts on the butterflies or their larvae.
- Neighbouring horticultural operations shall be provided with information about the butterfly and the need to prevent drift of farm sprays over the sites.



11. Community education and awareness

11.1 Objectives

The objectives of the community education and awareness program are:

1. to increase knowledge within the local community about the significance and issues associated with the recovery of the Yellowish Sedge-skipper Butterfly,
2. to assist local landholders by the provision of information about land management options that assist with the conservation of the Yellowish Sedge-skipper Butterfly,
3. to ensure that local and State government agencies make informed decisions on matters affecting the conservation of the Yellowish Sedge-skipper Butterfly.

11.2 Criteria

The success criterion is an increase in community awareness regarding the conservation of the Yellowish Sedge-skipper Butterfly, which is reflected by behavioural change in the management of its habitat.

Local landholders and government agencies become aware of, and understand the issues relating to the recovery of, the Yellowish Sedge-skipper Butterfly. This awareness will result in the following actions:

- implementation of land management practices that are sensitive to the recovery of the Yellowish Sedge-skipper Butterfly's sedgeland habitat,
- incorporation of appropriate environmental assessment in governmental planning processes,
- community propagation and utilisation of *Gahnia filum* in place of exotic sedges and grasses, and
- community identification of illegal collection activities.

11.3 Recovery actions

11.3.1 To increase knowledge within the local community about the significance and issues associated with the recovery of the Yellowish Sedge-skipper Butterfly

- Copies of the South Australian Conservation Society leaflet on the Yellowish Sedge-skipper Butterfly (*Appendix 1*) shall be provided to local landholders, and shall be available at the offices of the Corporations of the Cities of Salisbury and Playford and the Penrice Dry Creek Saltfields.
- The Butterfly Recovery Team shall produce or obtain an information brochure about the identification and significance of *Gahnia filum*. The information brochure shall be made available at the offices of the Corporations of the Cities of Salisbury and Playford and the Penrice Dry Creek Saltfields.



- Members of the Butterfly Recovery Team shall distribute the leaflet as required to plant operators, weed spraying contractors, developers, owners and managers of habitat within the Northern Adelaide Plains.
- Members of the Butterfly Recovery Team shall prepare and disseminate media releases on the Yellowish Sedge-skipper Butterfly and associated recovery efforts.
- Members of the Butterfly Recovery Team shall hold a field day in September 2000, to inform the community about the Butterfly recovery program and outline its progress.
- Members of the Butterfly Recovery Team shall visit local community groups including schools, to encourage community involvement in the project. Involvement may take the form of attending open days, propagating *Gahnia filum* or using it in place of exotic sedges and grasses in ornamental plantings.
- The Butterfly Recovery Team shall install signage at all currently known potential habitat sites along road verges and other publicly accessible areas.
- The Butterfly Recovery Team shall notify local and regional lepidopterist groups of the project and encourage members to submit potential or actual habitat site details for the Yellowish Sedge-skipper Butterfly to the project coordinator (Urban Forest Biodiversity Program – Fiona Chambers).

11.3.2 To assist local landholders by the provision of information about land management options that assist with the conservation of the Yellowish Sedge-skipper Butterfly

- The Butterfly Recovery Team shall notify landholders whose land contains areas of *Gahnia filum* and invite them to participate in the program. The landowners shall be informed about current recovery actions and issues via visits and any other available communication means.
- The Butterfly Recovery Team shall liaise with affected landholders through an annual assessment of potential sites as described in *Appendix 5*.
- The Butterfly Recovery Team shall provide the affected landholders with details of the assessment and discuss the implications for the ongoing management of the sites.

11.3.3 To ensure that local and state government agencies make informed decisions on matters affecting the conservation of the Yellowish Sedge-skipper Butterfly

- The Butterfly Recovery Team shall keep affected local and state government agencies up to date with Yellowish Sedge-skipper Butterfly recovery actions and issues.
- The Butterfly Recovery Team shall make species information sheets for the Yellowish Sedge-skipper Butterfly available to the local and state government agencies responsible for assessing developments that may impact upon the butterfly or its habitat.
- The Butterfly Recovery Team shall provide a description of the known potential habitat sites to local and state government agencies.



12. Monitoring and research

12.1 Objectives

While the Butterfly Recovery Team does not have the resources to commit to a comprehensive research program, it shall undertake ongoing monitoring of the sites being managed in this plan, and attempt to interest appropriate research bodies in undertaking research. The objectives of the monitoring and research component are to:

1. invite universities and museums undertake research in areas identified as ‘knowledge gaps’ in the ecology of the Yellowish Sedge-skipper Butterfly,
2. identify and assess all potential Yellowish Sedge-skipper Butterfly habitat,
3. undertake annual assessments of butterfly presence,
4. in the event of butterflies being recorded, monitor their population dynamics, and
5. in the event of a translocation program being undertaken, document the program comprehensively and monitor butterfly populations at both the recipient and donor sites for at least five years.

12.2 Criteria

The success criteria are that:

- both potential habitat sites (areas supporting *Gahnia filum*) and confirmed butterfly habitats (areas where butterflies have been sighted in the past five years) are recorded as they are discovered, and this information is conveyed to relevant State and local government agencies, and
- research is performed, the results of which will increase knowledge of the Yellowish Sedge-skipper Butterfly’s ecology and assist in confirming the applicability of recovery actions or identifying more effective recovery actions.

12.3 Recovery actions

12.3.1 Invite universities and museums undertake research in the following areas identified as ‘knowledge gaps’ in the ecology of the Yellowish Sedge-skipper Butterfly

- A population and vegetation survey at the Yorke Peninsula *Hesperilla flavescens* sites to discover more about the species’ ecology.
- Studies into the ecology of the host plant, *Gahnia filum* and its distribution.
- Research into the Yorke Peninsula *Hesperilla flavescens* to determine the vulnerability status of that metapopulation.
- Studies relating to the butterfly’s dispersibility, to enable the development of a model that determines appropriately sized and spaced habitat patches.



- Research on the response of the host plant and butterfly to fire, as long as a population of *Hesperilla flavescens* or *Gahnia filum* is not jeopardised in the process.

12.3.2 Identify and assess all potential and actual Yellowish Sedge-skipper Butterfly habitat

- If a population of the Yellowish Sedge-skipper Butterfly is discovered, the Butterfly Recovery Team is to record the extent of the population on that site in accordance with the style identified in *Appendix 2*.
- For sites under their management, Penrice Saltfields and Corporations of the Cities of Salisbury and Playford should maintain detailed records of their sites.
- The Butterfly Recovery Team shall examine new *Gahnia filum* sites reported by members of the local community within the Northern Adelaide Plains and verify their significance as potential Yellowish Sedge-skipper habitat.

12.3.3 Undertake annual assessments of butterfly presence

- The Butterfly Recovery Team shall undertake an annual assessment of Yellowish Sedge-skipper Butterfly potential habitat sites in accordance with the guidelines specified in *Appendix 5*, or arrange for it to be undertaken by an external party.
- Monitor the habitat condition at each site to determine improvements.

12.3.4 In the event of butterflies being recorded, monitor their population dynamics

- If possible, the extent of the Yorke Peninsula populations of *Hesperilla flavescens* should be determined and recorded in accordance with the style identified in *Appendix 2*.

12.3.5 In the event of a translocation program being undertaken, document the program comprehensively and monitor butterfly populations at both the recipient and donor sites for at least five years

- Any translocation program should only be developed after careful consideration of the factors outlined in Section 8.4



13. Protection of the butterfly and its habitat

13.1 Objectives

The objectives of the protection program are to:

1. have the conservation status of the butterfly (under the National Parks and Wildlife Act 1972) reviewed at a State level
2. increase the security of freehold sites supporting potential Yellowish Sedge-skipper Butterfly habitat.

13.2 Criteria

Success will be recognised by:

- Some level of legislative protection being provided for the butterfly.
- Privately owned potential Yellowish Sedge-skipper Butterfly habitat sites increasingly become protected from clearance under the Native Vegetation Act, managed under a voluntary Heritage Agreement, or managed under a recognised environmental management plan (for example, a plan subject to auditing under ISO 14000).

13.3 Recovery actions

13.3.1 Have the conservation status of the butterfly (under the National Parks and Wildlife Act 1972 of SA and the Endangered Species Protection Act 1992) reviewed at a State and Federal level

- The Butterfly Recovery Team is to discuss the conservation status of the butterfly with the Department of Environment, Heritage and Aboriginal Affairs, and provide a copy of the Recovery Plan to Drs New, Sand and Clarke who are hosting the Federal government's Butterfly Action Plan workshops.

13.3.2 Increase the security of freehold sites supporting potential Yellowish Sedge-skipper Butterfly habitat.

- The Butterfly Recovery Team shall discuss with affected landowners what long-term protection mechanisms are available. The team shall provide advice to those landowners who wish to enter voluntary Heritage Agreements (under the Native Vegetation Act 1991), private sanctuary agreements (under the National Parks and Wildlife Act 1972), or develop property management plans or environmental management plans.



14. Implementation

Tables 1-4 allocate responsibilities for the implementation of recovery actions specified in this plan. The plan covers the period 1999 to 2003.

Appendix 7 provides implementation costs and sources of funding for the project.

Table 1 - Implementation of Threat Abatement Actions

Action	Description	Responsibility for implementation	Time frame	Priority
10	Threat Abatement			
10.3.1	Assessment of threats operating on freehold and Commonwealth land	BRT	Initial: Nov 99, then ongoing	1
10.3.2	Prevention of clearing and habitat fragmentation, and impact assessment of future developments	LC, PSP	Planning controls: Sept 99-onwards	1
10.3.3	Habitat augmentation – sites specified in <i>Appendix 2 – Site descriptions</i>	LC, PSP, DEO	Planting: Jul-Aug 2000	
10.3.4	Management of weeds	LC, PSP, DEO	Sept 99 - ongoing	2
10.3.5	Prevention of collection of the Yellowish Sedge-skipper Butterfly in Northern Adelaide Plains	BRT	Sept 99-onwards	2
10.3.6	Management of vehicular access and recreational vehicle use	LC, PSP, DEO BRT	Fencing: Feb 2000 Signage: Feb 2000	2
10.3.7	Management of road surfaces / embankments and maintenance activities – including “Conservation Area” signage	LC, PSP	Sept 99-onwards	2
10.3.8	Management of fire prevention activities and planning	LC, PSP	Sept 99-onwards	2
10.3.9	Management of grazing activities	BRT, DEO	Sept 99-onwards	3
10.3.10	Management of impacts associated with feral animals	BRT, PSP	Sept 99-onwards	3
10.3.11	Management of seed and grass collection	BRT, LC, PSP	Control: Sept 99 – onwards Collection: Jan/Feb 2000	2
10.3.12	Management of direct & indirect spraying effects	PSP, LC	Sept 99-onwards	1



Table 2 - Implementation of Community Awareness Actions

Action	Description	Responsibility for implementation	Time frame	Priority
11	Community education and awareness			
11.3.1	Increase knowledge within the local community about the significance and issues associated with the recovery of the Yellowish Sedge-skipper Butterfly	BRT	Field trip: Sept 2000 Signage: Feb 2000 Ongoing distribution of leaflets, talks to groups etc.	1
11.3.2	Assist local landholders by the provision of information about land management options that assist with the conservation of the Yellowish Sedge-skipper Butterfly	BRT	Nov 99, then ongoing	1
11.3.3	Ensure that local and State government agencies make informed decisions on matters affecting the conservation of the Yellowish Sedge-skipper Butterfly	BRT	Dec 99, then ongoing	1



Table 3 - Implementation of Monitoring and Research Actions

Action	Description	Responsibility for implementation	Time frame	Priority
12	Monitoring and research			
12.3.1	Invite universities and museums undertake research in areas identified as 'knowledge gaps' in the ecology of the Yellowish Sedge-skipper Butterfly	BRT to provide summary of "knowledge gaps" to appropriate institutions	Dec 99 – Jan 2000	1
12.3.2	Identify and assess all potential Yellowish Sedge-skipper Butterfly habitat	BRT	Nov 99 initially, then ongoing	1
12.3.3	Undertake annual assessments of butterfly presence and habitat quality	BRT	Spring annually	1
12.3.4	In the event of butterflies being recorded, monitor their population dynamics	BRT to request from Museum?	Jan 2000	1
12.3.5	In the event of a translocation program being undertaken, document the program comprehensively	BRT	Unknown	2



Table 4 - Implementation of Species Protection Actions

Action	Description	Responsibility for implementation	Time frame	Priority
13	Protection of the butterfly and its habitat			
13.3.1	Have the conservation status of the butterfly reviewed at a State and Federal level	BRT	Jan-Mar 2000	1
13.3.2	Increase the security of freehold sites supporting potential Yellowish Sedge-skipper Butterfly habitat	BRT	Nov 99, then ongoing	1

PSP Penrice Soda Products, Dry Creek Saltfields to fund and organise the action

LC Local Councils, the Corporations of the Cities of Salisbury and Playford, to fund and implement action

BRT Butterfly Recovery Team as a whole with UFBP funding

DEO Defence Estate Organisation



15. Preparation details

This Recovery Plan was prepared by Faith Coleman, Technical Officer, Delta Environmental Consulting and Peri Coleman, Consultant, Delta Environmental Consulting.

15.1 Date of last amendment

This document is the final version of the recovery plan for the Yellowish Sedge-skipper Butterfly. No amendments have been made.

15.2 Review date

This Recovery Plan will be reviewed 2 years after the date of publication.



16. References

Animals and Birds Protection Act 1919-1934 of South Australia.

Barker S (1979) *Letter to MA McCarthy - ICI*, departmental document 1041/72, Department of the Environment, Adelaide.

Burgman MA and DB Lindenmayer (1998) *Conservation Biology for the Australian Environment*, Surrey Beatty & Sons, Norton.

Brereton R, Bennett S and I Mansergh (1995) "Enhanced greenhouse climate change and its potential effect on selected fauna of south-eastern Australia: a trend analysis" in *Biological Conservation* **72** (1995) 339-354

Buchanan RA (1989) *Bush Regeneration – Recovering Australian Landscapes*, TAFE NSW, Sydney.

Clark T, Reading R, and A Clarke (1993) *Endangered Species Recovery: Finding the Lessons, Improving the Progress*, Island Press, Washington.

Common IFB and DF Waterhouse (1981) *Butterflies of Australia*, revised edition, Angus and Robertson, Melbourne.

Conservation Council of SA (undated) *South Australia's Endangered Wildlife 4 - Yellowish Skipper Butterfly*, a leaflet published by the Conservation Council of SA Inc, Adelaide.

Fauna Conservation Act 1964-1965 of South Australia

Fisher RH (1978) *Butterflies of South Australia*. 272pp. Government Printer, Adelaide.

Fisheries Act 1917-1956 of South Australia.

Fry G & AR Main (1993) "Restoring seemingly natural communities on agricultural land" in Saunders, Hobbs & Ehrlich eds. (1993), *Nature Conservation 3 : The Reconstruction of Fragmented Ecosystems*, Surrey Beatty & Sons Pty. Ltd, NSW, Australia

Government Gazette (30 July 1959, 24 September 1959, 1 September 1966), Government Printer, Adelaide.

Grund R (1997) *Thematic Identification of Remnant Bushland and Tussock Lands in Coastal South Australia*, National Estate Grants Program, 800pp.

Grund R (1998) "The identification of *Gahnia* Forst. & Forst. F. (Cyperaceae) eating Hesperidae (Lepidoptera) using immature stages" in *Victorian Entomologist* **28**(2): 20-32.

Grund R (1998) *South Australian Butterflies*, <http://www.adelaide.net.au/~reid>, (a website for South Australian butterflies with images by Fisher, R., Grund, R., and Hunt, L.)

Goss S (1999) "They're planting a forest in Altona" in *The Age*, 23/6/1999, <http://www.theage.com.au/daily/990623/education/vce7.html>

Herbison-Evans D & SA Crossley (1999) *Hesperidae of Australia*, <http://linus.socs.uts.edu.au/~don/larvae/hesp/hesperidae.html>, <http://linus.socs.uts.edu.au/~don/larvae/hesp/flave.html>



Hobart District Group of The Australian Plants Society - Tasmania Inc (1999) *The Unique Flora of Tasmania*, online at <http://www.trump.net.au/~joroco/sgaptas-index.htm>

Jessop JP and HR Toelken, eds (1986) *Flora of South Australia Vols 1-4*, SA Government Printer, Adelaide

Kraehenbuehl DN (1993) "A natural history of the genus *Gahnia*, Family Cyperaceae" in *South Australian Naturalist* **67**(3,4):44-62.

Kraehenbuehl DN (1996) *Pre-European vegetation of Adelaide – A survey from the Gawler River to Hallett Cove*, Nature Conservation Society of South Australia, Adelaide.

Lunney D (1995) "Swamp Rat – *Rattus Lutreolus*" in Strahan R (ed) (1995) *The Mammals of Australia*, Reed Books, Chatswood.

Mace GM, Balmford A and JR Ginsberg (1998) "The challenges to conservation in a changing world: putting processes on the map" in Mace GM, Balmford A and JR Ginsberg eds (1998) *Conservation in a Changing World*, Cambridge University Press, Cambridge.

McCarthy GJ, Tolhurst KG and K Chatto (1998) *Overall Fuel Hazard Guide*. Research Report 47, Natural Resources and Environment, Victoria, Melbourne.

Moss BM (1988) *Ecology of Fresh Waters*, Blackwell Scientific Publications, London

Museum of Victoria (1999) *Bioinformatics Database*,
<http://www.mov.vic.gov.au/bioinformatics/butter/images/en1030.html>

National Parks and Wildlife Act 1972 of South Australia.

Native Vegetation Act 1991 of South Australia.

New South Wales National Parks and Wildlife Service (1999) "Site Assessment Guidelines" in *Draft Recovery Plan – Bathurst Copper Butterfly (Paralucia spinifera)*, NPWS, Sydney

New TR (1997) *Butterfly Conservation*, Oxford University Press, Melbourne

Pavelic P and PJ Dillon (1993) *Gillman - Dry Creek Groundwater Study*, Report 54, Centre for Groundwater Studies, CSIRO, Glen Osmond.

Ralph M (1993) *Seed Collection of Australian Native Plants*, Imprenta, Melbourne, Australia

Ralph M (1994) *Germination of Local Native Seed*, Murray Ralph, Fitzroy, Victoria, Australia

Saunders DA, Hobbs RJ and PR Erhlich eds (1993) *The Reconstruction of Fragmented Ecosystems*, Surrey Beatty & Sons, Norton.

Thomas CD (1995) 'Ecology and conservation of butterfly metapopulations in the fragmented British landscape' in Pullin AS ed. (1995) *Ecology and Conservation of Butterflies*, Chapman and Hall, London.

Van Praagh BD (1996) *Adult and larval counts of the Eltham Copper Butterfly, Paralucia pyrodiscus lucida Crosby, 1993-1995*. Flora and Fauna Technical Report No. 144, Dept of Natural Resources and Environment, Victoria

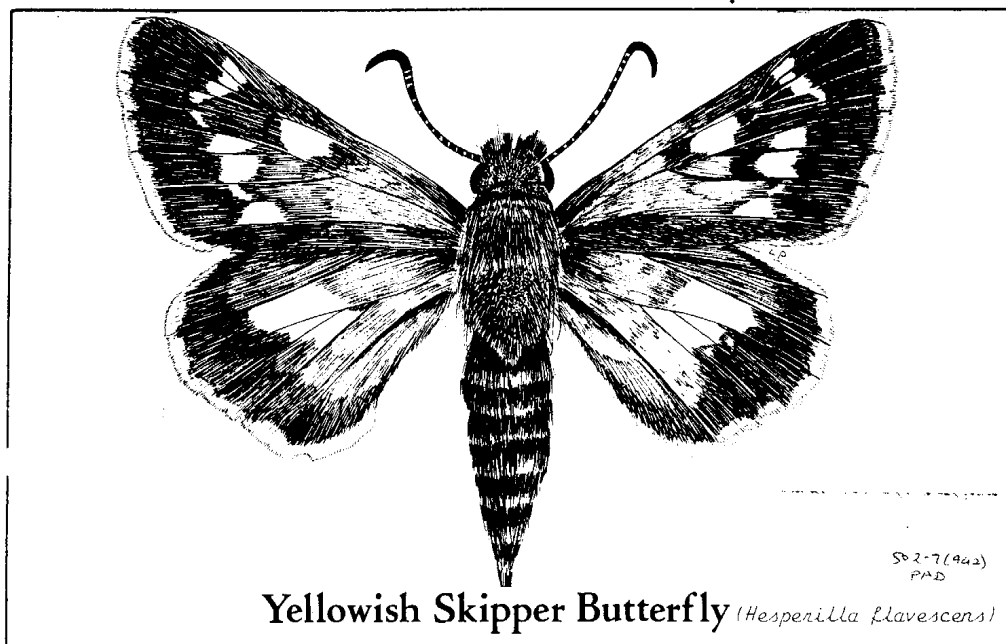


17. Appendices



Appendix 1 - Information Sheet

SOUTH AUSTRALIA'S ENDANGERED WILDLIFE 4



history and distribution

Before the metropolitan coastline became heavily urbanised, the yellowish skipper butterfly was collected from Henley Beach and West Beach. Today, this species is restricted to a small coastal area north of Adelaide where its larval plant food, thatching grass (*Gahnia vilum*), survives. Occasional specimens of what is thought to be *H. flavescens* – the yellowish skipper – have been collected from Eyre and Yorke Peninsulas, the River Murray Mouth and the Coorong, but more collections over a longer time must be made before their identity can be confirmed. A subspecies, *Hesperilla flavescens flavescens*, occurs in western Victoria.

habitat and ecology

The life cycle of the yellowish skipper is about twelve months, with two overlapping generations occurring each year in the spring and autumn. Some adults do emerge in summer ensuring that some breeding occurs between the two populations. The butterfly's flight path is fast and erratic with frequent feeds at flowers and rest stops in the sun.

After mating has occurred the female's flight is slower, closer to the ground and interrupted by characteristic fluttering. Eventually she alights on a thatching grass leaf close to the ground where she rests, then extends her abdomen over the edge to deposit a single egg on the underside of the leaf. This is repeated a number of times. The butterfly probably only lives for about a week as there are many predators.

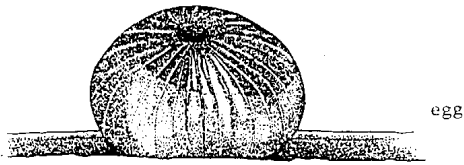
Within two weeks the young larva hatches and builds its first shelter by curling a leaf. At night it emerges to feed on thatching grass.

A large cylindrical, silk-lined shelter is constructed by the more mature larva. After about ten months, pupation occurs within the larval shelter and two to six weeks later the adult butterfly emerges about a year after the eggs were laid.

description

The egg of the yellowish skipper butterfly is pale cream with fine vertical lines and a darker band developing in the upper zone after a few days. The young larva's body is yellow green with brown

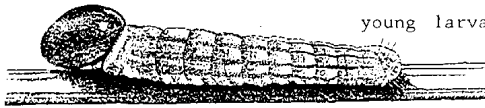




egg

lines. Its head is shiny and black. The mature larva is apple green tinged bluish at junctions of segments with a dull, dark green dorsal line and a pale brown head. The cylindrical pupa is pale green but gradually darkens to brown or black.

Adult butterflies are brown with yellow markings on the wing. The female is slightly larger than the male.



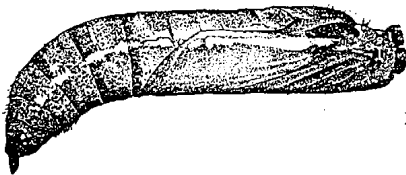
young larva

conservation

The greatest risk to the only known colonies of this endangered butterfly near St. Kilda, lies in the destruction of the remaining thatching grass stands, which could occur as a result of fire or by grazing. There is evidence that some immature stages of the butterfly would survive a fire, as other species of skipper actually survived the Ash Wednesday fire of 1983.

The area where the thatching grass occurs is owned by the Department of Defence but is currently let out on contract for grazing. Sheep and cattle will eat the plant including any eggs, larvae and pupae on it. While thatching grass may survive grazing, the butterfly would not.

Plans by the Defence Department to allow the bulk of the thatching grass stands to survive without grazing will help the yellowish skipper to survive but it is feared that the butterfly population is already too small to survive for long and that it will eventually succumb to the genetic pressures brought about by inbreeding.



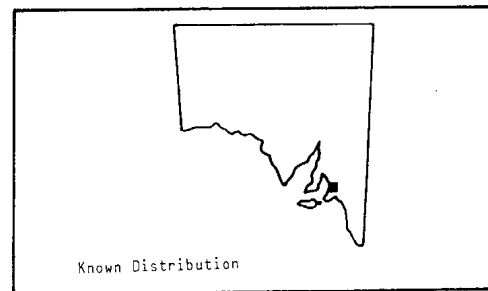
pupa

words

Pupation: process by which the mature larva or caterpillar turns into a pupa, or cocoon, the non-breeding stage of metamorphosis.

Dorsal: back.

distribution



Known Distribution

questions and activities

- (1) Why would having two overlapping generations of butterfly emerging at different times of the year assist in the species' survival?
- (2) The yellowish skipper butterfly has only one plant food, thatching grass (*Gahnia filum*). Why is this a disadvantage?
- (3) Why does the butterfly lay her eggs on the underside of leaves?
- (4) What other species build shelters from leaves?
- (5) Compare the life cycle of this butterfly with other more common species. What are the differences and similarities?
- (6) What might prey on the yellowish skipper during the different stages in its life cycle?

references

"Butterflies of South Australia", R.H. Fisher, 1978. Government Printer, Adelaide 1978.

"Butterflies of Australia", revised edition, I.F.B. Common & D.F. Waterhouse. Australian National Science Library, Angus & Robertson 1981.

Personal comments R.H. Fisher.

For further information and advice, contact the Conservation Centre, 120 Wakefield Street, Adelaide. 5000 (08) 223 5155



Appendix 2 - Site Description Records

Site descriptions have been prepared for each confirmed potential butterfly habitat site in the Northern Adelaide Plains area. These descriptions comprise geographic details including location, access, and size of the site as well as information on the land use, threats and general site condition.

A “confirmed potential habitat” site is a site where existing plants of *Gahnia filum* occur. Each confirmed potential habitat site for the Yellowish Sedge Skipper Butterfly has been marked on the relevant 1:25,000 scale topographic map sheet, and also recorded in the Butterfly Recovery Team’s site reference file and a site evaluation has been carried out.

Site descriptions are included in this Appendix for the following locations:

Site	Location	Site type/comments
1*	St Kilda Road, DSTO land and road reserve fenceline	Existing plants - medium
2	Brooks Road, United Water land	Existing plants - few
3*	Brooks Road, Penrice Soda Products Dry Creek Saltfield	Existing plants – major site
4	Brooks Road, road reserve	Existing plants - few
5	Brooks Road, road reserve	Existing plants - few
6	Brooks Road, road reserve	Existing plants - few
7	Brooks Road, Playford drainage easement, Penrice Soda Products Dry Creek Saltfield	Existing plants - few
8	Brooks Road, road reserve	Existing plants - few
9*	Thompson Creek, riparian zone at Thompson Road, Morgold Pty Ltd	Existing plants – major site
10*	Constellation Model Aeroplane Club, Brooks Road	Existing plants – medium site
11	Symes Road, DSTO land and road reserve fenceline	Existing plants - few
12*	Symes Road, road reserve	Existing plants – medium site
13	Cnr Symes and Casson Roads, road reserve	Existing plants - few

Table 5 - Confirmed potential habitat locations

MapLand SA has provided an aerial photograph of each confirmed potential habitat of significant size in a 1:2,500 scale. Aerial photographs allow the total area of potential habitat to be clearly identified. Aerial photographs are included at the end of this appendix. Additionally, an aerial photograph of the habitat creation site on DSTO land at St Kilda has been included.



Areas known to have supported *Gahnia filum* in the recent past, or other areas suitable for the creation of habitat are listed in this appendix as “habitat creation” sites. They are described, and mapped on the relevant 1:25,000 scale topographic map sheet.

Site	Location	Site type/comments
14*	DSTO land, St Kilda	Agreed habitat creation
15	Whiting St Reserve wetland	Proposed, may be suitable for habitat creation
16	Little Para Estuary riparian rehabilitation project	Proposed, may be suitable for habitat creation
17*	Kauna Park wetlands, Burton	Established habitat creation
18*	Greenfields wetlands, The Levels & Dry Creek	Possible habitat creation
19*	Barker Inlet wetlands	Agreed habitat creation

Table 6 - Habitat creation sites

In both Table 5 and Table 6 sites marked with an asterisk* are considered a high priority for planting programs. They are either sites with existing *Gahnia filum* that could be augmented and/or supplemented with appropriate nectaring species, or sites where a sizable area is available for habitat creation. Sites 1, 3, 9, 10 and 12 are the most suitable for community projects. The Defence Estate Organisation has undertaken to arrange the plantings at Site 14, of plants donated by Penrice Soda Products and the City of Salisbury. The City of Salisbury has undertaken to continue its planting projects at Sites 17 and 18. The Wetlands Manager for the Barker Inlet wetlands (Site 19) has agreed to incorporate butterfly habitat plants into his ongoing planting program. Penrice Soda Products is supplying 500 plants for the Barker Inlet Wetlands by May/June 2000.

Finally, the following sites (marked on the relevant 1:25,000 scale topographic map sheet) are sites where *Gahnia filum* has been reported as occurring, but that have not yet been confirmed for this recovery plan.

Site	Location	Comment
20	Bolivar Treatment Works, Bolivar	Owner to be contacted
21	Allotment 12, File Plan 106266	Owner to be contacted

Table 7 - Unconfirmed habitat sites



Site 1: St Kilda Road, road reserve/DSTO land, 138°33'02"E 34°43'55"S

Date: 26 Nov 1999

Time: (period) 10am-10:15am

Owner/Manager: Defence Estate Organisation (CT 5308/707) & Corporation of City of Salisbury (road reserve fenceline)

Weather: (Sunny/overcast/wind/temperature etc)

Sunny, calm

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

None observed

Other Butterflies (species/number/breeding/lava/location/behaviour)**Thatching Grass:** (Condition/extent/grazed/habit)

Twenty-two (22) along the edge of the paddock and intertwined in the fenceline, onto the road reserve. Many plants slashed to a remnant by road and paddock maintenance procedures

Vegetation: (Species flowering/utilised)

Dense sward of introduced grass on the road reserve, some tussocks of tall wheatgrass in the paddock

Insects: (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)

Road verge and paddock maintenance has kept woody weeds under control

Introduced grasses are crowding the tussocks

Actions Required: (Weeding/fencing/signage etc.)

The plants need to be given space to expand (fencing could be moved), habitat signage and additional tubestock planting



**Site 2: Brooks Road, United Water drain easement, N of Symes Rd, 138°32'28"E
34°43'10"S**

Date: 26 Nov 1999

Time: (period) 10:20am-10:25am

Owner/Manager: United Water (CT 4110/204) and City of Playford (road reserve)

Weather: (Sunny/overcast/wind/temperature etc)

Sunny, calm

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

None observed

Other Butterflies (species/number/breeding/lava/location/behaviour)

Caper white (*Anaphaeis java teutonica*) several, passing through

Cabbage white (*Pieris rapae rapae*) one, passing

Thatching Grass: (Condition/extent/grazed/habit)

Three (3) plants growing on United Water property, two (2) plants on the road reserve

Plants quite healthy, good sized specimens

Vegetation: (Species flowering/utilised)

Growing in a lowlying emergent saltmarsh community comprising *Halosarcia* sp, *Distichlis distichophylla*, *Suaeda* sp. and *Sporobolus* sp.

Insects: (Other insects on *Gahnia*, presence of ants etc.)

None observed

Weeds: (Species/type/location)

Parapholis incurva (curly rye) along road edge, unidentified annual grasses on United Water land

Actions Required: (Weeding/fencing/signage etc.)

Road verge specimens are located just opposite a road-base stockpile. The low-lying nature of the stockpile area suggests it may have hosted *Gahnia* in the past. Habitat signage needed.



Site Number 3: Brooks Road, Penrice Soda Products Dry Creek Saltfield**Location:** 138°31'55"E 34°42'29"S

Conservation status, history and notes: Currently the area is marked as "Conservation" on maps held as part of the Penrice Soda Products Dry Creek Saltfields Environmental Management System, and tasks relating to its management are incorporated into the Saltfields Environmental Management Plan and Environmental Improvement Plans.

The company (and its predecessor, Imperial Chemical Industries) has a long history of attempts to ensure the security of conservation areas within the saltfields. On 28 April 1938 the saltfields were proclaimed a Sanctuary under the *Animals and Birds Protection Act 1919-1934*. In 1959 further areas were added to the Sanctuary, under the same Act (*Government Gazette*, 30 July 1959). In the same year the ponds themselves were proclaimed a Closed Area under the *Fisheries Act 1917-1956* to assist in the protection of fishlife (*Government Gazette*, 24 September 1959). Changes to State legislation resulted in the revocation of the saltfields' Sanctuary status under the *Animals and Birds Protection Act 1919-1934* in 1966, followed by an immediate new proclamation under the *Fauna Conservation Act 1964-1965* (*Government Gazette*, 1 September 1966). This proclamation was revoked with the introduction of the *National Parks and Wildlife Act 1972*. The company requested a new proclamation, however correspondence from the Department of the Environment (Barker, departmental document 1041/72) reveals that by 1979 the Department was still working on amendments to the Act that would allow the proclamation of private sanctuaries. The company decided to continue its course of managing the property as a Sanctuary independently, and signposted it as one.

The Brooks road site is the largest remaining original stand of *Gahnia filum* in the St Kilda area. The plants are co-existing with other indigenous plant species on a small portion of Allotment 11 of Deposited Plan 1671. The land is held freehold under CT 5404/395.



**Site 3: Brooks Road, Penrice Soda Products Dry Creek Saltfield, 138°31'55"E
34°42'29"S**

Date: 26 Nov, 1999

Time: (period) 10:30 am-12 noon, 2:30pm-5pm

Owner/Manager: Penrice Soda Products Dry Creek Saltfields

Weather: (Sunny/overcast/wind/temperature etc)

Sunny, calm in morning, light breeze in afternoon

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)

Caper white (*Anaphaeis java teutonica*) many, nectaring

Cabbage white (*Pieris rapae rapae*), Wanderer (*Danaus plexippus plexippus*) many, nectaring

Unidentified: brown butterfly, orange-brown day-flying moth, small moths, small "blue"

Thatching Grass: (Condition/extent/grazed/habit)

At least 3500 plants in an area approximately 150m x 50m. Very dry, dense, many old plants,

Some young plants in the depression at the west. Tall annual grasses surrounding many sedges.

Vegetation: (Species flowering/utilised)

Atriplex paludosa, *Disphyma crassifolium*, *Suaeda australis*, *Rhagodia crassifolia*, *Halosarcia* sp. and *Sarcocornia*

Maireana sp, *Dianella revoluta*, *Stipa elegantissima*, *Danthonia* sp. *Stipa drummondii*, *Eutaxia microphylla*, dense mosses,

Vittadinia gracilis, *Pittosporum phylliraeoides*, *Thredkeldia diffusa*, *Enchylaena tomentosa*, *Frankenia pauciflora*

Insects: (Other insects on *Gahnia*, presence of ants etc.)

Many ants, trapdoor spiders, colonial-web christmas spiders (*Gasteracantha* sp), dragonflies, grasshoppers and cicadas. The day-flying moths noted above were fluttering through and above the *Gahnia* tussocks only. They may have been Lymantriidae (tussock moths)?

Weeds: (Species/type/location)

Galenia spp (coast and pink galenia), introduced grasses - *Avena barbata*, *Bromus diandrus*, many annual grasses growing amongst the *Gahnia* clumps. *Lycium ferocissimum* (boxthorn)

Actions Required: (Weeding/fencing/signage etc.)

Boxthorns have been cut and swabbed. Fencing needs repairing, signage. Investigate methods of removing annual grasses. Additional tubestock in western zone. Neighbours contacted.

Consider whether small internal drain on site could be diverted back onto property (very dry)



**Site 4: Brooks Road, road reserve site 1, 0.75 km S of Ryans Rd, 138°31'55"E
34°42'20"S**

Date: 26 Nov, 1999

Time: (period) 12:15pm-12:25pm

Owner/Manager: Corporation of the City of Playford

Weather: (Sunny/overcast/wind/temperature etc)

Sunny, calm, warm

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)

Not observed

Thatching Grass: (Condition/extent/grazed/habit)

Five (5) clumps, some on either side of the road, just south of the entry to the

Model aeroplane club

Vegetation: (Species flowering/utilised)**Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)**Actions Required:** (Weeding/fencing/signage etc.)

Habitat signage



**Site 5: Brooks Road, road reserve site 2, 0.25km S of Ryans Rd, 138°31'51"E
34°42'10"S**

Date: 26 Nov 1999

Time: (period) 12:25pm-12:35pm

Owner/Manager: Corporation of the City of Playford

Weather: (Sunny/overcast/wind/temperature etc)

Sunny, light breeze, warm

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)

Not observed

Thatching Grass: (Condition/extent/grazed/habit)One (1) clump of *Gahnia* on the western side of the road**Vegetation:** (Species flowering/utilised)**Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)**Actions Required:** (Weeding/fencing/signage etc.)

Habitat signage



Site 6: Brooks Road, road reserve site 3, 50m N of Ryans Road, 138°31'50"E 34°42'04"S

Date: 26 Nov, 1999

Time: (period): 12:40pm-12:45pm

Owner/Manager: Corporation of the City of Playford

Weather: (Sunny/overcast/wind/temperature etc)

Warm, sunny, light breeze

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)

Not observed

Thatching Grass: (Condition/extent/grazed/habit)

One (1) huge clump (very healthy, but mature) on western side of road

Vegetation: (Species flowering/utilised)**Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)**Actions Required:** (Weeding/fencing/signage etc.)

Habitat signage



Site 7: Brooks Road, Playford drain, PSP Dry Creek Saltfield, 138°31'42"E 34°41'45"S

Date: 26 Nov, 1999

Time: (period): 12:50pm-12:55pm

Owner/Manager: Corporation of City of Playford easement on PSP freehold CT5404/395

Weather: (Sunny/overcast/wind/temperature etc)

Warm, sunny, light breeze

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)

Not observed

Thatching Grass: (Condition/extent/grazed/habit)One (1) large clump in drainage easement, upstream from an area of *Bolboschoenus***Vegetation:** (Species flowering/utilised)Chenopods (*Halosarcia* and *Sarcocornia*) and *Bolboschoenus***Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)**Actions Required:** (Weeding/fencing/signage etc.)

Repair fence, habitat signage, talk to northern neighbour (Copanapra)

adjacent to the drainage reserve, about paddock maintenance activities adjacent to *Gahnia*.

**Site 8: Brooks Road, road reserve site 4, 0.5km N of Thompson Rd, 138°31'19"E
34°40'36"S**

Date: 26 Nov, 1999

Time: (period): 1pm-1:10pm

Owner/Manager: Corporation of the City of Playford

Weather: (Sunny/overcast/wind/temperature etc)

Warm, sunny, light breeze

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)

Not observed

Thatching Grass: (Condition/extent/grazed/habit)

Two (2) large clumps on western side of road reserve

Vegetation: (Species flowering/utilised)**Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)**Actions Required:** (Weeding/fencing/signage etc.)

Habitat signage



Site 9: Thompson Creek, riparian zone at Thompson Road, 138°30'53"E 34°41'04"S

Date: 26 Nov, 1999

Time: (period): 1:15pm:1:30pm

Owner/Manager: Morgold Pty Ltd (Mr Zane Pitt) freehold CT 5447/585

Weather: (Sunny/overcast/wind/temperature etc)

Warm, sunny, light breeze

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)Cabbage white (*Pieris rapae rapae*), Wanderer (*Danaus plexippus plexippus*), several, passing**Thatching Grass:** (Condition/extent/grazed/habit)

Approximately forty (40) plants along the southern side of the creek, from where it forms a small billabong, westward. Clusters of 4-12 plants. Healthy plants, mature, in dense saltmarsh

Vegetation: (Species flowering/utilised)Saltmarsh/intertidal freshwater riparian zone. Dense cover of chenopods (mainly *Halosarcia* spp.)**Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)**Actions Required:** (Weeding/fencing/signage etc.)

May not need fencing, quite low visibility from the road. Supplemental planting should succeed. Owner contacted to discuss project and management of the site. Rubbish removal from riparian zone would improve aesthetics.



Site 10: Constellation Model Aeroplane Club, Brooks Rd. Allotment 7 FP 18569

Date: 22/2/2000

Time: (period): 10am – 10:45

Owner/Manager: Constellation Model Aeroplane Club, freehold, CT 5450/311

Weather: (Sunny/overcast/wind/temperature etc)

Cool, clear

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)**Thatching Grass:** (Condition/extent/grazed/habit)30 plants, varying ages, south eastern corner. May have been more at one stage, a patch of young plants that may be *Gahnia* starting to grow in previously cleared area.**Vegetation:** (Species flowering/utilised)**Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)**Actions Required:** (Weeding/fencing/signage etc.)

Redirection of some water from drain may be beneficial. Supplementary tubestock planting recommended. Club secretary contacted to discuss project. Habitat signage.



Site 11: Symes Road, road reserve adjacent to Allotment 2 DP 40178

Date: 18/01/2000

Time: (period): 2pm – 2:15pm

Owner/Manager: City of Playford (road reserve) abutting DSTO property

Weather: (Sunny/overcast/wind/temperature etc)

Sunny, hot

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)**Thatching Grass:** (Condition/extent/grazed/habit)

11 healthy clumps along fenceline on the south side of the road

Vegetation: (Species flowering/utilised)*Enchylaena tomentosa***Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)**Actions Required:** (Weeding/fencing/signage etc.)

Habitat signage



Site 12: Symes Road, road reserve adjacent to Allotment 36 DP 6978

Date: 18/01/2000

Time: (period): 2:30pm – 2:45 pm

Owner/Manager: City of Playford

Weather: (Sunny/overcast/wind/temperature etc)

Sunny, hot

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)**Thatching Grass:** (Condition/extent/grazed/habit)

30 clumps on northern side of the road.

Vegetation: (Species flowering/utilised)*Atriplex paludosa* (saltbush), *Halosarcia* spp (samphire)**Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)*Olea europaea* (olives), *Cakile maritima* (sea-rocket)**Actions Required:** (Weeding/fencing/signage etc.)

Habitat signage, supplemental planting recommended for this site (northern remnants of the original DSTO habitat, about halfway between sites 1 and 3). Contact adjacent landowner.



Site 13: Cnr Symes and Casson Road, road reserve adjacent to Allotment 35 DP6978

Date: 18/01/2000

Time: (period): 2:45 pm – 3 pm

Owner/Manager: City of Playford

Weather: (Sunny/overcast/wind/temperature etc)

Sunny, hot

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Not observed

Other Butterflies (species/number/breeding/lava/location/behaviour)**Thatching Grass:** (Condition/extent/grazed/habit)

Seven young clumps

Vegetation: (Species flowering/utilised)*Atriplex paludosa* (saltbush)**Insects:** (Other insects on *Gahnia*, presence of ants etc.)**Weeds:** (Species/type/location)*Cakile maritima* (sea-rocket), *Lycium ferocissimum* (boxthorn), several types of cats-ear and

Intorduced grasses

Actions Required: (Weeding/fencing/signage etc.)

Habitat signage, contact adjacent landowner.



Aerial photographs of sites 1-14 follow. They were flown in October 1998 (Surveys 5558 and 5560) and are reproduced here at an approximate scale of 1:2500.

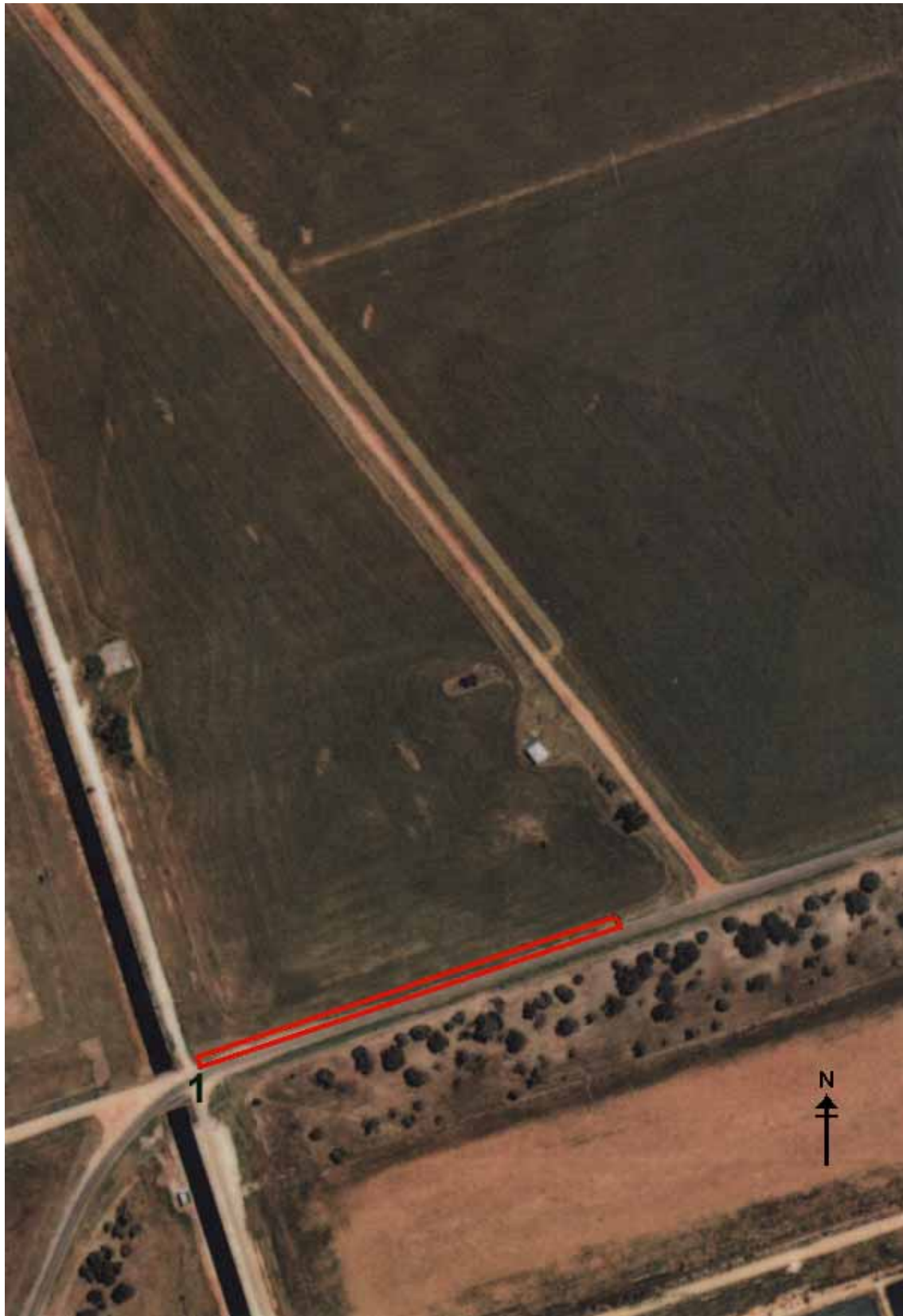
Photography supplied by:-

MAPLAND

Resource Information

Department for Environment Heritage
And Aboriginal Affairs
The Government of South Australia





















Appendix 3 - Weed Control Guidelines

Weed invasion is a significant issue for habitat quality, as the currently known potential butterfly habitats are all very small. The control of the weeds is determined by their penetration into the potential habitat and they have been mapped as part of the Site Descriptions. For weeds outside the potential habitat area, control should be by conventional means and is the responsibility of the relevant landowner or manager. For weed control within the actual area of mapped habitat the guidelines outlined below should be applied.

Mapping

The Butterfly Recovery Team shall produce a map of the weed problem with the extent of weeds marked on the site aerial photo, mentioned above. The scale of the photo is to be 1:2,500 to allow for the accurate location of the habitat area and associated weeds.

Control

Weed control programs shall utilise bush regeneration techniques (Buchanan, 1989) such as the “cut and swab” method where the weedy shrub is cut off close to the ground and herbicide is applied to the cut stem. In riparian zones, only herbicides marked as suitable for use in a riparian zone should be used. Hand removal of weeds could also be considered where it would not cause undue disturbance to adjacent *Gahnia filum*. Hand removal is also useful for small infestations of some weeds that set seed in response to herbicide application (eg Calomba Daisy, *Pentzia suffruticosa*). Generally the optimum period for control works are when the weeds are actively growing, in September to December, depending on the seasonal conditions.

Control should start in the most weed-free zone, gradually working towards the more badly infested areas over several years. Where ‘gaps’ in the vegetation result from weed control, they should be utilised to plant appropriate endemic species.

Priority

Priority for weed control is to be given to the largest potential habitat area, or to the area with the largest butterfly population regardless of tenure.

Funding

Both the Corporations of the Cities of Salisbury and Playford and the Penrice Soda Products’ Saltfields have committed to undertake ongoing weed control of sites under their management. If other potential habitat sites are discovered on private land, the responsibility for weed control shall rest with the landholder. Landowners who enter into Heritage Agreements may be able to obtain financial assistance for fencing, weed control and revegetation from a local or State government agency.



Appendix 4 - Fire Management Guidelines

Gahnia filum burns readily when it is dry. While the butterflies prefer young growth, burning is a risky operation that may destroy entire areas of the sedge. There is a risk of destroying the butterflies or their larvae during burns.

Where the sedge is growing in moist conditions, burning is seldom required to stimulate new growth. Where the sedge is in poor conditions or is stressed by lack of water, burning may kill the plant. In many cases light top-slashing of small areas may be sufficient to rejuvenate mature stands. Managing road verges to keep annual grasses low reduces the risk of accidental fires.

Prescribed burning may be appropriate when the site assessment indicates:

- *Gahnia filum* is being excluded or suppressed by shrub or dense grass competition,
- Fuels within the site have been identified as a risk to adjacent property.

Appendix 5 details the Site Assessment Guidelines that will be undertaken by the Butterfly Recovery Team each year. The site assessments will indicate whether prescribed burning is appropriate, or in fact desirable, for any particular habitat.

Where prescribed burning is proposed the following guidelines shall apply:

- The Butterfly Recovery Team must complete the site assessments so that any population present can be detected and the area the butterflies are using mapped. Areas being used by butterflies are not to be burnt.
- Where prescribed burning is being proposed to reduce fuel loads prior to the summer fire danger period, consideration should be given to excluding butterfly habitat from the operation. The small areas of habitat that exist should not constitute a hazard to adjacent properties.
- In the event of an uncontrolled grassfire, potential habitat areas of the Yellowish Sedge-skipper Butterfly should be excluded from any backburning operations or fireline construction. The use of retardants within potential habitats of the Yellowish Sedge-skipper Butterfly should be avoided.
- Only a proportion (<50%) of any single site should be treated in any one year.
- An interval of at least five years should be left before treating the remaining area. Burnt habitat needs to recover before adjacent areas are treated.
- Prescribed burning should only be undertaken between April and August, when the damp conditions allow better control and a lower temperature of the fire.



Appendix 5 - Site Assessment Guidelines

The Butterfly Recovery Team on an annual basis during general butterfly flying season, which is usually Spring or Autumn, will undertake site assessments. Components of the site assessment are designed to monitor changes in the vegetation structure, distribution and density of any butterflies within the habitat, the health of *Gahnia filum* and the presence of other insects.

Timing

The site assessment should be undertaken on calm sunny days during the times of peak butterfly activity. While the emergence of butterflies is complicated by the species having two overlapping generations per year, most butterflies emerge in Spring or Autumn.

Habitat Monitoring

(Protocol developed by the NSW National Parks and Wildlife Service, 1999)

A fixed reference point consisting of a yellow painted wooden stake shall be located within or adjacent to each potential habitat site. Photographs of the core or typical habitat will be taken from these reference points every two years. The photographs shall be used to monitor changes in the structure of the vegetation that may be linked to declines or re-emergence in the Yellow Sedge-skipper Butterfly population and other butterfly populations at that site.

The key to habitat monitoring is the understanding that many butterfly species require sunny exposed sites. Photo monitoring will detect shrub competition with the host *Gahnia filum* that may indicate that a low intensity prescribed burn (see *Appendix 4*) or selective top-slashing is required. Alternatively a severe fire event may result in the recruitment of dense swards of exotic grasses or the encroachment of invasive shrubby weeds. These may exclude butterflies by shading out the site.

Where the habitat is identified as a fire risk to adjacent property, the fuels shall be assessed as part of the site assessment using the Overall Fuel Hazard Guide (McCarthy *et al*, 1998).

Population Monitoring

Should Yellowish Sedge-skipper Butterflies be recorded at any site, an estimate of distribution and relative abundance of the butterfly at the site should be undertaken each year. Additionally, any other butterfly species present at each site should be recorded each year. Detailed information on population densities and distribution is critical to understanding the natural population dynamics, dispersal mechanisms and response to events such as fire. Regular monitoring is essential to detect any loss or decline of populations so that threats or causes can be identified and remedial actions taken.

The aerial photo provided under the Site Description in *Appendix 1* is used during this protocol. The site is walked, and the distribution and occurrence of butterflies is described by marking the aerial photo where butterflies were observed. Each marking is coded and code-matched notes on the number, condition and behaviour of the butterflies is recorded in a field notebook. This is particularly important if the butterflies are mating or feeding. Nectaring plants where the butterflies are feeding should be noted on the photograph and the species recorded.



The protocol is qualitative rather than quantitative, with a population estimate categorised between common and none observed. It represents the minimum action required to monitor the population of Yellowish Sedge-skipper Butterflies at each site. A more comprehensive protocol for estimating population is described by van Praagh (1996) and this more thorough method should be utilised by anyone undertaking ecological research on the butterflies.

Gahnia filum

An assessment should be made on the growth form of the *Gahnia filum*. The presence of juvenile plants should be noted, along with any signs of resprouting. An estimation of the percentage of mature plants with mature blades should be made. The extent of grazing of *Gahnia filum* blades should also be noted although it may not necessarily reflect Yellowish Sedge-skipper Butterfly activity.

Actions Required

As part of the annual site assessment a record shall be made of issues or threats to the butterfly or its habitat. The assessment shall recommend the appropriate remedial action consistent with the recovery plan.

Record all details on the Site Assessment Form provided over the page.



Yellowish Sedge-skipper Butterfly Site Assessment Form**Site:**

Date: Time: (period)

Owner/Manager:

Weather: (Sunny/overcast/wind/temperature etc)

Y.S.S. Butterfly (Was it observed/number observed/breeding/lava/location/behaviour)

Other Butterflies (species/number/breeding/lava/location/behaviour)

Thatching Grass: (Condition/extent/grazed/habit)

Vegetation: (Species flowering/utilised)

Insects: (Other insects on *Gahnia*, presence of ants etc.)

Weeds: (Species/type/location)

Actions Required: (Weeding/fencing/signage etc.)



Appendix 6 - Agriculture Operation Guidelines

These guidelines contain recommendations for the management of agricultural operations on land containing Yellowish Sedge-skipper Butterfly habitat.

What does Yellowish Sedge-skipper habitat look like?

Yellowish Sedge-skipper butterflies depend upon *Gahnia filum* (a sedge often called Thatching Grass) as their larval food plant. The sedge grows around the edges of low-lying swampy areas that may have water standing for some time after winter rains. The lowest areas may dry out in summer forming pans, and these may have samphires (glassworts) growing on them. *Gahnia* is a large tussocky sedge with sharp blades that can cause cuts if it handled carelessly. The leaves are dark green and the flowering heads are dark reddish-brown.

What should I do to protect Yellowish Sedge-skipper habitat on my property?

Where *Gahnia filum* occurs on a property, it should be fenced so that grazing can be controlled.

If possible, try to improve the quality and quantity of the *Gahnia filum* on your land. Consider redirecting some winter floodwaters back onto the areas where the sedge is growing, or planting out more plants. Clear weeds from around the base of plants.

How often can stock graze the *Gahnia filum* plants?

When all the *Gahnia filum* clumps in an area are mature, light grazing by smaller stock such as sheep may help encourage new growth and remove encroaching grasses. Heavier animals such as cattle are not appropriate.

Are there other plants that could improve the butterfly habitat areas on my property?

A fenced buffer zone surrounding the *Gahnia filum* plants can provide additional habitat benefits. Locally indigenous vegetation can provide nectar sources for the adult butterflies as well as providing shelter from strong winds.

In areas close to watercourses, swamps and lagoons the following plants can be planted as a buffer zone: *Melaleuca halmaturorum*, *Muehlenbeckia florulenta*, *Muehlenbeckia gunnii*, *Myoporum parvifolium*, *Myoporum insulare* and *Brachycome parvula*.

In salty or lowlying areas the following plants could be used: *Melaleuca halmaturorum*, *Amyema melaleucae*, *Muehlenbeckia gunnii*, *Myoporum insulare*, *Atriplex paludosa*, *Enchylaena tomentosa*, *Nitraria billardierei*, *Rhagodia candolleana*, *Myoporum parvifolium*, *Sporobolus virginicus*, *Puccinellia stricta*, *Distichlis distichophylla* and *Wilsonia humilis*.

On sandy rises appropriate plantings would include: *Melaleuca halmaturorum*, *Amyema melaleucae*, *Myoporum insulare*, *Atriplex paludosa*, *Atriplex semibaccata*, *Olearia axillaris*, *Pittosporum phyllireoides*, *Frankenia pauciflora*, *Nitraria billardierei*, *Rhagodia candolleana*, *Thredkeldia diffusa*, *Poa poiformis*, *Puccinellia stricta*, *Sporobolus virginicus*, *Angianthus priessianus*, *Calostemma purpureum*, *Myoporum parvifolium*, *Mimulus repens*, *Lotus australis*, *Vittadinia gracilis*, *Stipa elegantissima*, and *Stipa drummondii*.



What about herbicide and insecticide use?

Insecticides are fatal to all stages of the butterfly life cycle. This includes bacterial insecticides such as Bti and Dipel©, used to control mosquitoes and cabbage whites. Herbicides may kill *Gahnia filum*, the host plant. If horticulture is carried out on land adjacent to butterfly habitat areas and spraying is necessary, the following points need bearing in mind:

Where possible use hand applications (for example, treating mosquito larvae by applying Abate directly to mosquito-infested standing water, or by cutting and swabbing weeds) rather than spray applications,

If spraying is necessary, spray on still days, or

Spray only when the breeze will take overspray **away** from butterfly habitat sites.

Who do I contact to find out more?

Butterfly Recovery Team (Peri Coleman)
C/- Penrice Soda Products Dry Creek or
Saltfields,
Magazine Road,
Dry Creek SA 5094

Ph: 08 8262 2405

Urban Forest Biodiversity Program
(Fiona Chambers)
C/- Corporation of the City of Salisbury
PO Box 8
Salisbury SA 5108

Ph: 08 0406 8506



Appendix 7 - Implementation Costs

The source of funds for this project come from four sources: Penrice Soda Products' Dry Creek Saltfields (PSP), the Corporation of the City of Salisbury (SC), the Corporation of the City of Playford (PC) and an Urban Forests Biodiversity Program grant (UFBP).

Penrice Soda Products Dry Creek Saltfields is providing \$5,540 of in-kind funding, the Councils are providing a total of \$7,220 of in-kind funding and the Urban Forests Biodiversity Program granted the Butterfly Recovery Team \$6,000.

Table 8 - Costs of Recovery Program for 1999/2000

Action	Description	Funding Source	Amount	Total
10.3.1	Assessment of threats operating on freehold and Commonwealth land	UFBP (initial assessment and Recovery Plan)	\$2500	\$2500
10.3.2	Clearing prevention, habitat fragmentation and impact assessment	LC (1000 tubestock and voluntary labour contribution) PSP (voluntary labour contribution) DEO (planting team for DSTO revegetation area)	\$4400 \$2400 \$??	\$6800
10.3.3	Management of weeds	LC (herbicide/labour) PSP (herbicide/labour) DEO (herbicide/labour)	\$430 \$430 \$??	\$860
10.3.5	Management of vehicular access and recreational vehicle use	LC (fencing materials and equipment) PSP (ditto) UFBP (ditto) DEO (fencing materials for DSTO revegetation area, and contour bank)	\$2300 \$2300 \$2000 \$??	\$6600
10.3.7	Management of road surfaces / embankments and maintenance activities – including “Conservation Area” signage	LC (erect “Conservation Area” or “Roadside Marker” signage) PSP (purchase and erect “Sanctuary” and informational signs)	?? ??	
10.3.9	Management of impacts associated with feral animals	BRT, PSP	??	
11.3.1	Increase knowledge within the local community about the significance and issues associated with the recovery of the Yellowish Sedge-skipper Butterfly	UFBP (Signage) PSP (Field day consultant) LC (Project officer, leaflets/folder, bus hire)	\$500 \$400 \$1100	\$2000
				\$18760



Appendix 8 – Species List

The following plants are all suitable for use in this recovery plan's planting programs:

Species name	Common name
<i>Alyxia buxifolia</i>	Sea box
<i>Amyema melaleucae</i>	Mistletoe (grows on <i>Melaleucas</i> only)
<i>Angianthus priessianus</i>	Common cup-flower
<i>Atriplex paludosa</i>	Marsh saltbush
<i>Atriplex semibaccata</i>	Scrambling berry saltbush
<i>Brachycome parvula</i>	Coast daisy
<i>Calostemma purpureum</i>	Purple bells, or garland lily
<i>Distichlis distichophylla</i>	Emu grass
<i>Dodonea viscosa</i>	Sticky hop-bush
<i>Enchylaena tomentosa</i>	Ruby saltbush
<i>Frankenia pauciflora</i>	Common sea-heath
<i>Gahnia filum</i>	Thatching grass
<i>Lotus australis</i>	Australian trefoil
<i>Melaleuca halmaturorum</i>	South Australian swamp paperbark
<i>Melaleuca lanceolata</i>	Moonah
<i>Mimulus repens</i>	Creeping monkey-flower
<i>Muehlenbeckia florulenta</i> (<i>cunninghamii</i>)	Lignum
<i>Muehlenbeckia gunnii</i>	Coastal lignum
<i>Myoporum insulare</i>	Native juniper
<i>Myoporum parvifolium</i>	Creeping boobialla
<i>Nitraria billardierei</i>	Nitre bush, or dillon berry
<i>Olearia axillaris</i>	Coast daisy bush, or native rosemary
<i>Pittosporum phyllireaoides</i>	Native apricot
<i>Poa poiformis</i>	Tussock grass
<i>Puccinellia stricta</i>	Australian salt-marsh grass
<i>Rhagodia candolleana</i>	Seaberry saltbush
<i>Rhagodia crassifolia</i>	Fleshy saltbush
<i>Samolus repens</i>	Creeping brookweed
<i>Sporobolus virginicus</i>	Salt couch
<i>Stipa drummondii</i>	Cottony spear-grass
<i>Stipa elegantissima</i>	Elegant spear-grass
<i>Thredkeldia diffusa</i>	Coast bonefruit
<i>Vittadinia gracilis</i>	Woolly New Holland daisy
<i>Wilsonia humilis</i>	Silky wilsonia

