BIOLOGICAL SURVEY OF

THE SOUTHERN LITTLE SANDY DESERT

Project (N706)

Progress Report

September 1996

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Date: ***September 1996***

PRECIS

BIOLOGICAL SURVEY OF THE SOUTHERN LITTLE SANDY DESERT

Project N706

Fifteen sampling sites in the southern portion of the Little Sandy Desert have been established. These sites represent the array of biotic assemblages present in the project area. The arrangement of sampling sites within the project area will facilitate the documentation of heterogeneity between similar habitats as a consequence of any north-south environmental gradients.

One sampling trip, conducted in June 1996, has been undertaken as part of this project. Six research staff from CALM and two from the Kings Park Board undertook systematic and opportunistic sampling of the biota in the project area over a 19 day period. The three camp sites, Savory, Cooma and Beyondie, were all visited during this field program.

During the June field program 335 plant specimens representing approximately 285 taxa were collected or recorded in the study area. Two new populations of Eucalyptus rameliana *were discovered along with several populations of* Calothamnus 'footeana'. *A novel taxon of* Halosarcia *was also collected.*

Eighty one species of bird were observed during the June field program. Interesting observations were of nesting Cygnus atratus *(Black Swans) on Savory Creek and* Hamirosta melanosternon *(Black-breasted Buzzards) overhead at most sandstone ridges. Nineteen species of native mammals were recorded in the study area including* Psuedomys chapmanii *(Pebble-mound mouse),* Sminthopsis hirtipes *(Hairy-footed Dunnart) and* S. longicaudata *(Long-tailed Dunnarts). An additional seven species of introduced mammals were also observed. Thirty nine species of reptiles and five species of amphibians were also collected.*

The development of specimen databases, the identification of vouchers and their incorporation into the appropriate repositories is continuing. The acquisition and development of GIS themes has also continued, as highlighted by a joint investigation with the Leeuwin Centre, into NDVI stochasticity throughout the project area over the past five years.

Another field trip to the study area is planned for October when nine researchers will be present.

TITLE OF PROJECT:

Biological survey of the Southern Little Sandy Desert

AGENCY:

Western Australian Department of Conservation and Land Management (CALM), Science and Information Division.

CHIEF INVESTIGATOR:

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AIM OF PROJECT:

To conduct a comprehensive biological survey of the southern Little Sandy Desert, Keartland Botanical District, to facilitate an evaluation of the region's nature conservation values and make recommendations for reservation.

SCOPE:

1. Continue to refine an overview and appraisal of the physical environment (geology, geomorphology, soils and climate), including a description of gradients and patterns and extent, of the southern part of the Little Sandy Desert Biogeographic Region.

2. Continue to review the systematic survey design for the flora and fauna (flora/vegetation, animals, birds, reptiles, amphibians and ants) within the Little Sandy Desert Biogeographical Region using existing biophysical information (surveys, maps, reports, remote sensing data) as well as field inspections. Ensure sites selected represent the array of assemblages typical of the southern portion of the Little Sandy Desert.

3. Undertake the first and second of three systematic surveys of landform units, biotic composition, habitat types and vegetation associations of the southern portion of the Little Sandy Desert in June and October 1996, respectively.

4. For the data compiled and collected above, commence data entry into computer databases (for use in GIS mapping and analysis) and undertake preliminary data checking.

5. Begin the identification of the conservation values of the area with reference to species and communities of conservation significance, together with the broader nature conservation values of the region.

6. Begin the analysis of the representativeness of the existing reserve system with reference to species and communities of conservation

significance, together with the broader nature conservation values of the region.

7. Begin the identification of the threatening processes impinging on the nature conservation values of the region.

8. Begin the identification of the range of appropriate conservation management options available to the Department of Conservation and Land Management for mapping the conservation values identified within the region. Discuss the costs and benefits of these options to all stakeholders in the area.

9. Begin the formulation of management guidelines and priorities for any proposed additions to the reserve system.

10. Begin the identification of the resources required to define the hierarchy of biophysical sub-regions within the study area from existing resource survey information.

PROGRESS TOWARDS COMPLETION OF SCOPE ITEMS:

Since the submission of the last progress report in January 1996 progression has been made towards completion of many of this project's scope items. The majority of the research effort over the past nine months as been directed towards undertaking the first systematic sampling trip, processing the numerous flora and fauna specimens collected and continuing the development and enhancement of specimen databases and GIS themes. Considerable preparatory effort has also been directed towards organisation of the second field trip which will be undertaken in October.

Progress on this project, addressing each of the Scope items, is outlined below.

Scope 1:

No new data on the biological and ecological attributes of the project area has been identified through various literature and bibliographic searches. Endeavours are still underway to obtain copies of A. W. Canning's journals for the period in 1904 when he surveyed the route for the No 1 Rabbit Proof Fence. Similarly, efforts are also being made to obtain information on F. H. Hann's expedition through the project area in 1902.

Knowledge of the botanical attributes of the project area were enhanced through an interrogation of the Western Australian Herbarium Specimen Database. This interrogation identified 210 taxa of plants which have been collected in the Little Sandy Desert, Keartland Botanical District. Many of these species probably also occur in the project area.

Scope 2:

A systematic survey design has been developed for this study which will encompass the array of representative biological assemblages present in the

project area. This survey design incorporates thirty permanent benchmark quadrats in which the biota (flora, vegetation, birds, mammals, reptiles, amphibians and selected invertebrate groups) are being sampled in a systematic, repetitive manner. These quadrats are replicated twice within 15 survey sites which are positioned across the project area (Figure 1).

The edaphic characteristics (chemistry, nutrient status, texture, water holding capacity) of each quadrat are being delimited. This biophysical information will provide an important tool which will assist with justifying the patterns of environmental heterogeneity and stochasticity observed across the project area.

The establishment of supplementary quadrats throughout the project area is also planned. Within these quadrats the flora and edaphic attributes will be documented thus augmenting the survey design and enhance the opportunity to justify environmental patterns observed in the project area. Similarly, such quadrats will also enhance the biological database obtained for the project area.

In an effort to identify areas of high biological activity/productivity, an analysis of Normalised Difference Vegetation Index (NDVI) imagery for the project area was undertaken with the assistance of the Department of Land Administration at the Leeuwin Centre. This analysis consisted of calculating the mean and variance in NDVI twice-monthly over the project area between 1991 and 1995. The interrogation of the NDVI data over this time frame was designed to minimise the impact of temporal fluctuations promoted by rainfall events and fire and to reduce the impact of noise in the imagery promoted primarily through atmospheric conditions (cloud and smoke).

A total of 105 samples were interrogated to produce the final greyscale imagery. Figure 2 illustrates the results of the mean NDVI interrogation with dark pixels indicating low greenness while lighter pixels indicate a higher greenness index. Inherently drainage lines (eg. Ilgarari Creek) and water run-on areas are depicted as almost white pixels while water shedding areas (eg. Bullen Hill) are a dark grey on the image. Figure 3 illustrates the results of the variance NDVI interrogation. Dark pixels illustrate areas of low variation in the greenness index while lighter pixels indicate areas which are more variable. The image (Figure 3) demonstrates that between 1991 and 1995 the northern portion of the study area was less variable than the southern portion.

Further analyses and interrogation of these NDVI data sets is planned. Comparisons between the NDVI variance imagery and vegetation type maps/imagery would appear to be useful and will be pursued.

Scope 3:

During June 1996 the first systematic sampling trip to the southern portion of the Little Sandy Desert was completed. Six research staff from CALM and two from the Kings Park Botanic Gardens undertook fieldwork in the project area over a nineteen day period. During this time the biota in all permanent benchmark quadrats were systematically sampled. Considerable opportunistic sampling

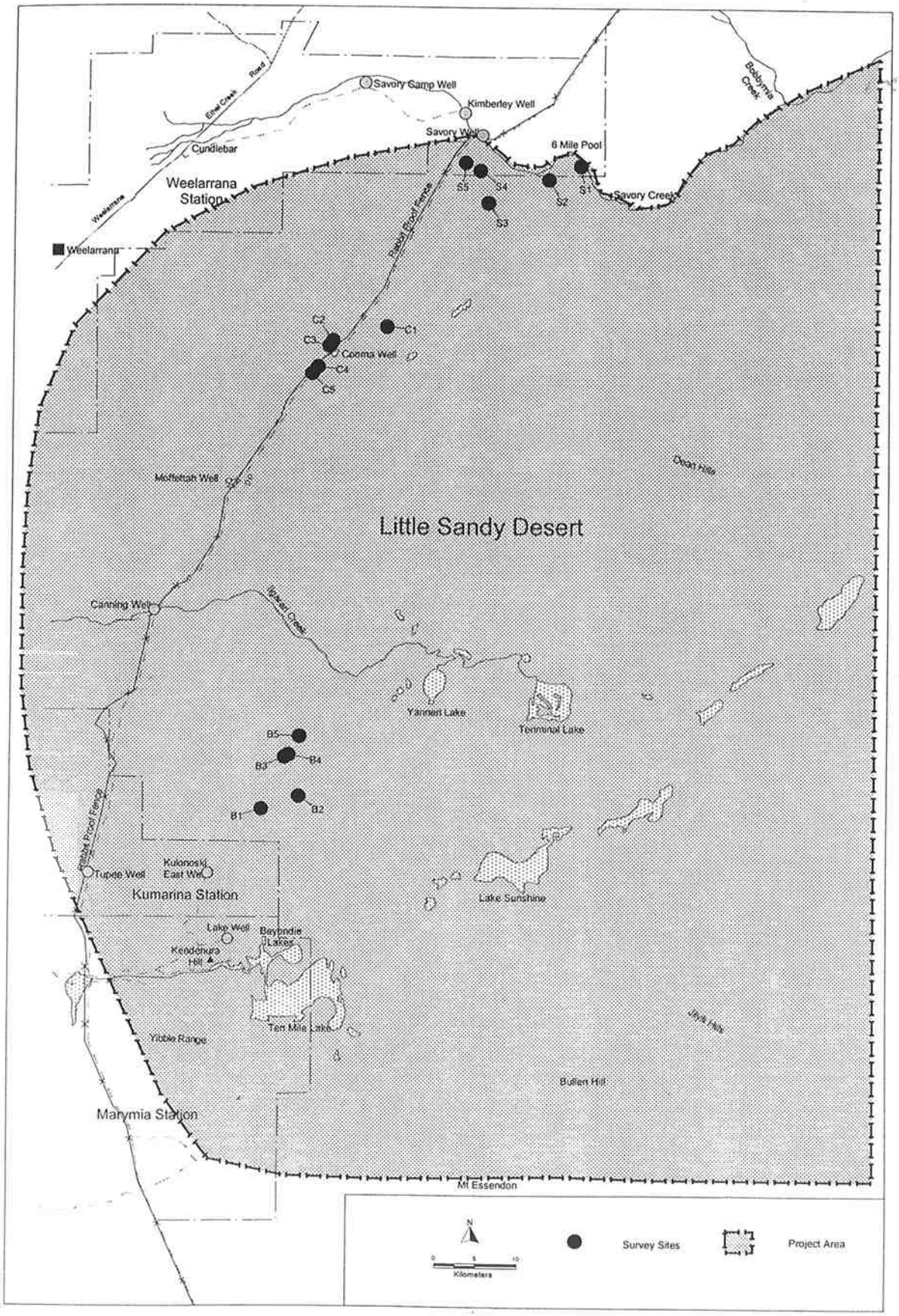

Figure 1 **Location of the southern Little Sandy Desert project area and the 15 permanent benchmark biological survey sites.**

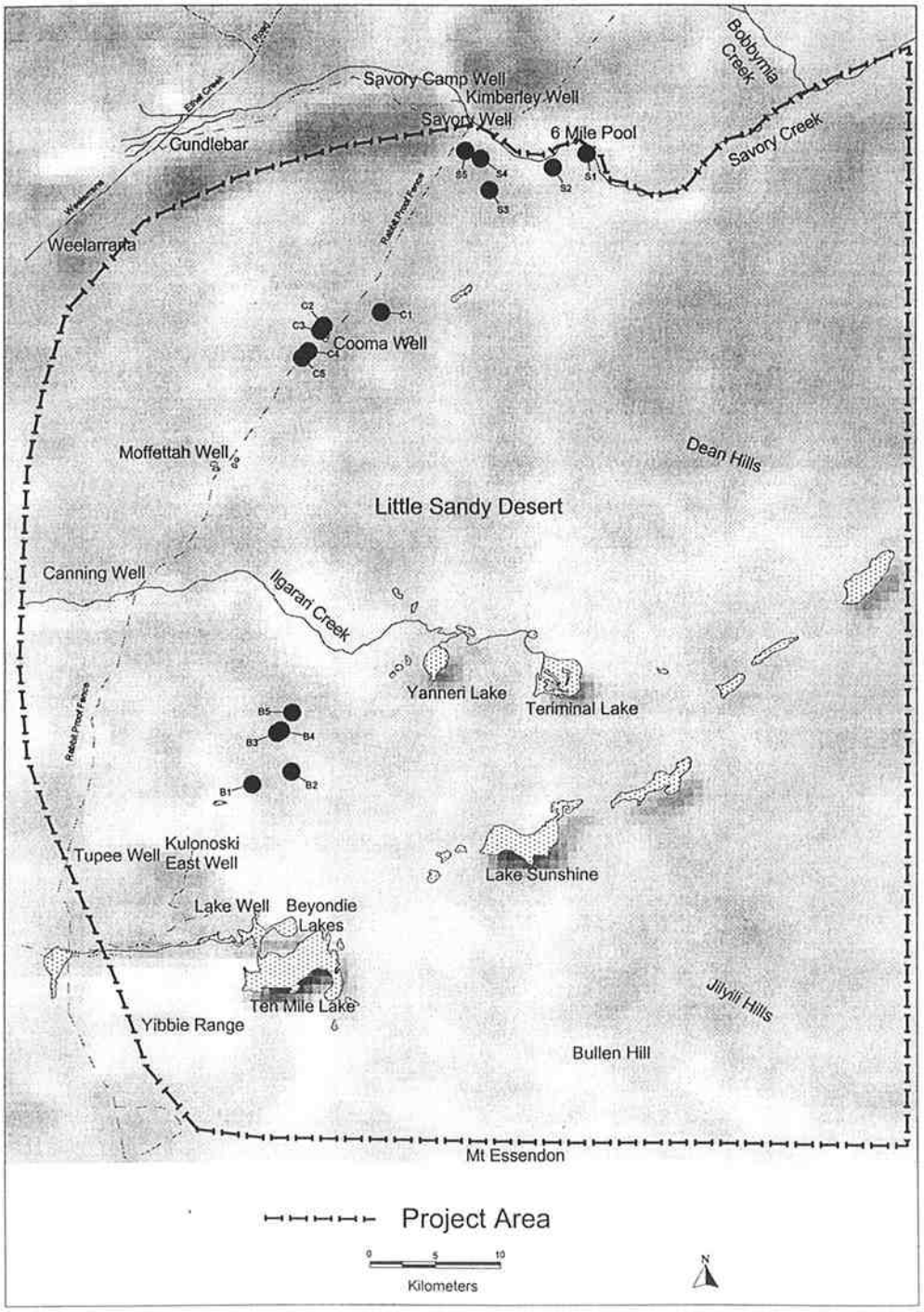

Figure 2 **Mean NDVI imagery of the southern Little Sandy Desert project area between 1991 and 1995.** (dark pixels indicate low greenness, light pixels indicate high greenness)

Figure 3 **Variance in NDVI imagery of the southern Little Sandy Desert project area between 1991 and 1995.** (dark pixels indicate low variation in the greenness index, light pixels indicate high variation in the greenness index)

outside permanent quadrats was also undertaken to augment specimen databases.

Soil samples were collected from all permanent quadrats and have been forwarded to the appropriate agencies for chemical and physical analysis.

Scope 4:

During the June field trip, 335 plant specimens were collected representing approximately 285 taxa. Coupled with previous field activities, 415 plant specimens have now been collected from the project area representing approximately 300 taxa. While many specimens are awaiting identification it would appear that the flora of the project area is dominated by species of *Acacia*, although taxa in the Papilionaceae, Goodeniaceae and Chenopodiaceae also appear to be important elements of the project area's flora.

Interesting flora records obtained during the June trips include:

- The identification of two new populations of *Eucalyptus rameliana*. One population was located just south of Savory Creek and represents the most northerly record for this species. The other population was located in the vicinity of the Beyondie camp and is towards the southern extremity of the species distribution. The species now has a geographical range of 110 km. Both populations were small consisting of less that 10 plants.

- Several new populations of *Calothamnus 'footeana'* were also located, especially along the approaches to Savory Creek. All populations consisted of numerous plants which were in full to late flower.

- The collection of a *Halosarcia* taxon which appears to be a novel species. This taxon was found on a playa in the vicinity of Yanneri Lake. Although sterile at the time it has distinguishing taxonomic features, unlike any other recognised species. It is similar in appearance to another undescribed *Halosarcia* taxon found further north on the Fortescue marsh and may indeed be the same species. Further material is required to confirm the taxonomic status of this taxon.

- Several new populations of *Eucalyptus mannensis* were also located, extending further the geographical range of this species. These populations were in the vicinity of Moffettah Well. This taxon was previously restricted to the Gascoyne - Murchison Region, however, has now been recorded twice in the project area.

Numerous fauna records were obtained during the June field trip. A total of 81 species of avifauna were observed in the project area. Most records were obtained from within the permanent benchmark quadrats, however, considerable opportunistic sampling augmented records. Interesting records included observation of nesting *Cygnus atratus* (Black Swans) on Savory Creek and *Hamirosta melanosternon* (Black-breasted Buzzards) overhead at most sandstone ridges sites.

Twenty six species of mammal were recorded during the June field trip. Seven of these species were introduced species. Of the nineteen mammals recorded eleven were marsupials and the remainder were rodents. Interesting mammal records obtained during the June trip included:

- The collection of *Psuedomys chapmanii* (Pebble-mound Mouse) and the identification of several active mounds. These mounds were collected on sandstone screes and breakaways in the vicinity of the Savory Creek. This location represents a link between western populations in the Hamersley and Collier Ranges and those found to the east in the Rudall River National Park and Throssell Range.

- The collection of several specimens of the *Sminthopsis longicaudata* (Long-tailed Dunnart). This rodent was previously thought to be extinct however, has been collected on several occasions over the past decade from remote and roughed regions of the Pilbara and adjacent deserts. This species was collected from sandstone habitats at the Savory Creek and Beyondie study areas.

- The collection of *Sminthopsis hirtipes* (Hairy-footed Dunnart). This is a poorly known species which until recently was presumed to be rare. The use of more appropriate capture methods (pitfall traps) has revealed, however, that it is more abundant than previous assumed. Specimens of this taxon were collected from the Cooma and Beyondie study sites and represent a north western range extension for this species.

- The recording of several abandoned nests of *Leporillus apicalis* (Lesser Stick-net Rat) on sandstone ridges in the Cooma study area. This species is now extinct.

Thirty nine species of reptile and five species of frog were recorded during the June field program. Members of the skink and gecko families were the most abundant with species in the genus *Ctenotus* and *Gehyra* dominating. Interesting records obtained included the following:

- Several specimens of *Egernia depressa* (Pygmy Spiny-tailed Skink) were collected from mulga woodland at the Beyondie study area. This location represents a link between the species main distribution and disjunct outliers further east.

- The collection of one specimen of *Moloch horridus* (Mountain Devil) at the Beyondie study area. This collection fills a gap in the species distribution for the central western portions of Western Australia.

- The collection of several specimens of a *Lerista* (Sand Swimmer) which appears to be morphologically similar in appearance to *L. macropisthopus.*

Identification, confirmation, processing and incorporation of voucher specimens collected during the June field trip is continuing. Similarly the deposition of vouchers into the appropriate repository is underway. Development of specimen databases for each biotic group has occurred and will continue as additional specimens are processed and identified.

Scope 5:

Identification of the projects conservation values has commenced. Preliminary results indicate that several species of flora and fauna which occur in the project area are of conservation significance. These species are primarily *E. rameliana*, *C. 'footeana'*, the novel *Halosarcia*, *P. chapmanii* and *S. longicaudata*. Undoubtedly other species of conservation significance will be identified as more of the specimens collected during the June field trip are processed and databased.

Several communities of conservation significance have already been identified. They include:

- The alluvial flats along the fringe of Savory Creek. These alluvial flats support a diverse assemblage of annual plants many of which appear to be at the limits of their distribution.
- The sandstone rises and ridges within the project area which support populations of S. *longicaudata* and provide suitable habitat for *P. chapmanii.*
- Playa systems along Ilgarari Creek which support the novel *Halosarcia* populations.
- Dune fields to the east of Comma Well which support large populations of *E. rameliana* and *C. 'footeana'*.
- *Allocasuarina decaisneana* woodlands to the east of Cooma Well as they represent an unusual vegetation association in the project area. These woodlands are extensive and support a diverse understorey dominated by shrub mallee and *Acacia* thickets.

Scope 6:

As there are no existing reserves in the project area or in close proximity, it appears that the existing nature conservation reserve system inadequately represents the species and communities present in the project area. The closest conservation reserve is Collier Range National Park, approximately 70 km to the west of the project area. This reserve is located in the Gascoyne Biogeographical Region, has an underlying geology dominated by sandstone, contains only a small dune field and appears to be predominantly vegetated by *Acacia* and *Eremophila* shrub savanna. While no comprehensive flora and fauna list is available for Collier Range National Park there appears to be large inconsistencies in species composition between this reserve and the project area. This is highlighted by the absence of *E. rameliana*, *C. 'footeana'* and

A. decaisneana from Collier Range. Similarly, the absence of *Dasycercus cristicauda* (Mulgara) from the project area, despite its presence in the Collier Range, also emphases incongruity between the two areas.

Rudall River National Park is the only conservation reserve in the Little Sandy Desert Biogeographical Region. Many of the flora species collected in the project area also appear to occur at Rudall River, however, communities like the *E. rameliana* and *C. 'footeana'* dominated dune fields are not represented in this conservation reserve. No comparison can be made for the fauna at present as records for Rudall River are limited and have not been databased.

Land included in the proposed Carnarvon Range National Park may encompass a representative example of the flora and fauna of the project area, however further examination of this reserve proposal is required.

No adequate assessment of the representativeness of the existing and proposed reserve system and the project area can be made until more biological data has been collected and analysed.

Scope 7:

Several threatening processes within the project area have been identified. They include:

- Grazing by *Camelus dromedarius* (Camel) and *Equus asinus* (Donkey). Camels are common throughout the project area especially in the vicinity of Savory Creek, Ilgarari Creek and Beyondie Lake. Superficially their impact appears to be minimal, however, on closer examination they seem to have a marked affect on the chenopod scrub communities fringing some playas. This effect is manifested through grazing and trampling. Grazing pressure by camels also appears to be responsible for the 'lollipop' appears of *Brachychiton* trees where the canopy skirt is neatly trimmed to camel-reach height. Similarly, grazing by camels may be responsible for the general absence of any *Brachychiton* seedlings or juvenile plants. Camel grazing may also be promoting a similar affect on *A. decaisneana* plants, although more evidence is available.

  Donkeys are abundant on areas adjacent to Savory Creek and appear to be having a noticeable effect on the riverine vegetation. Donkeys were also observed foraging on the lateritic and sandstone rises adjacent to Savory Creek.

- Grazing by cattle and horses along Savory Creek and in the vicinity of Beyondie Lake may also be having an affect, however, this is a legitimate activity on these pastoral lease areas.

- Fire may also be considered a threatening process as the project area generally appears to have been unburnt for a long period and consists of relatively homogeneous fuels. Examination of thematic Landsat imagery indicates a few fire scars in the project area. These scars appear to be

confined to shrublands adjacent to sandstone ridges and on lateritic rises. In the dune fields, fire scars are small and appear to be restricted to swale areas. The apparent homogeneous nature of the project area with respect to fire may indicate that the area is not susceptible to large conflagrations. Antidotal evidence supporting this proposition is provided through the persistence of extensive *Acacia aneura* (mulga) woodland in the project area. These woodlands and in particular individuals of *A. aneura* are fire sensitive and usually restricted to refugial sites (fire avoiding) in environments where fire is a frequent habitat modifying force.

Scope 8:

Management options to ensure the conservation of the flora and fauna in the project area include:

- The reservation of an appropriate representative area of the southern Little Sandy Desert. This reservation will ensure that the biota of the project area is protected and will provide a legislative framework for the implementation of future land management programs. The formalisation of such a reserve proposal will also facilitate discussion and negotiation with other landusers (Native Title, miners, pastoralists) who have aspirations for the project area. Such discussions and negotiations will hopefully resolve any conflicting landuse issues.

- The implementation of a feral animal control program. This program will be designed to reduce the impacts of grazing by camels and donkeys on the project area. Adjacent leaseholders will benefit from such a program as a reduction in feral animal numbers will reduce competition with stock for grazing fodder and will also mitigate damage to infrastructure like fences and improved waters.

- The development and implementation of a fire management strategy which mitigates any deleterious burning impacts. To reduce the potential for large conflagrations it may be appropriate to implement fire management strategies which aims to create a heterogeneous mosaic of fire histories across the project area. This management aim may be implemented through controlled burning with the aid of aerial ignition. CALM currently implement similar fire management strategies in the Gibson and Great Victoria Deserts.

Scope 9:

The selection of priority areas within the project area for addition to the reserve system has begun, however, it is currently in its infancy and is not based on any quantifiable data. Preliminary discussions with colleagues, field inspections and interrogation of existing GIS data sets indicate that a reserve in the vicinity of Moffettah and Cooma Wells, which encompasses the Dean Hills and the Ilgarari Creek system and its associated lakes, may be appropriate (Figure 4). Such a reserve would encompass all the landform and vegetation associations present

in the project area, although the representativeness of the biota can not yet be determined.

Reserves along Savory Creek and in the vicinity of the Beyondie study sites are also worthy of consideration.

Scope 10:

Resources required to identify the biophysical sub-regions in the project area using the information collected during this survey will primarily focus on the use of satellite imagery. Preliminary ideas focus on the use of Landsat imagery to identify and delimit the extent of those geological and landscape themes which govern the distribution of biota, especially the vegetation, in the project area. Further sampling and analysis of the biota throughout the project area and comparison with information from adjacent areas in the same and neighbouring Biogeographical Regions is however, required before the suitability of this approach to the identification of bio-physical sub-regions can be undertaken.

PLANNED ACTIVITIES TOWARDS COMPLETION OF SCOPE ITEMS:

Work is continuing on this project. Voucher specimens collected during the two 1995 field trips and the June 1996 field trip are still being processed. Specimen and GIS databases are continually being developed and augmented with the addition of new recorded and themes.

The next trip to the project area is planned for October 1996. Personnel on this trip will be Stephen van Leeuwen (Chief Investigator, flora), Bob Bromilow (technical support), Peter Kendrick (fauna), Phil Fuller (birds), John Angus (mammals), David Knowles (reptiles and invertebrates), Brad Marrion (reptiles), Norm McKenzie (bats) and Bill Muir (technical support).

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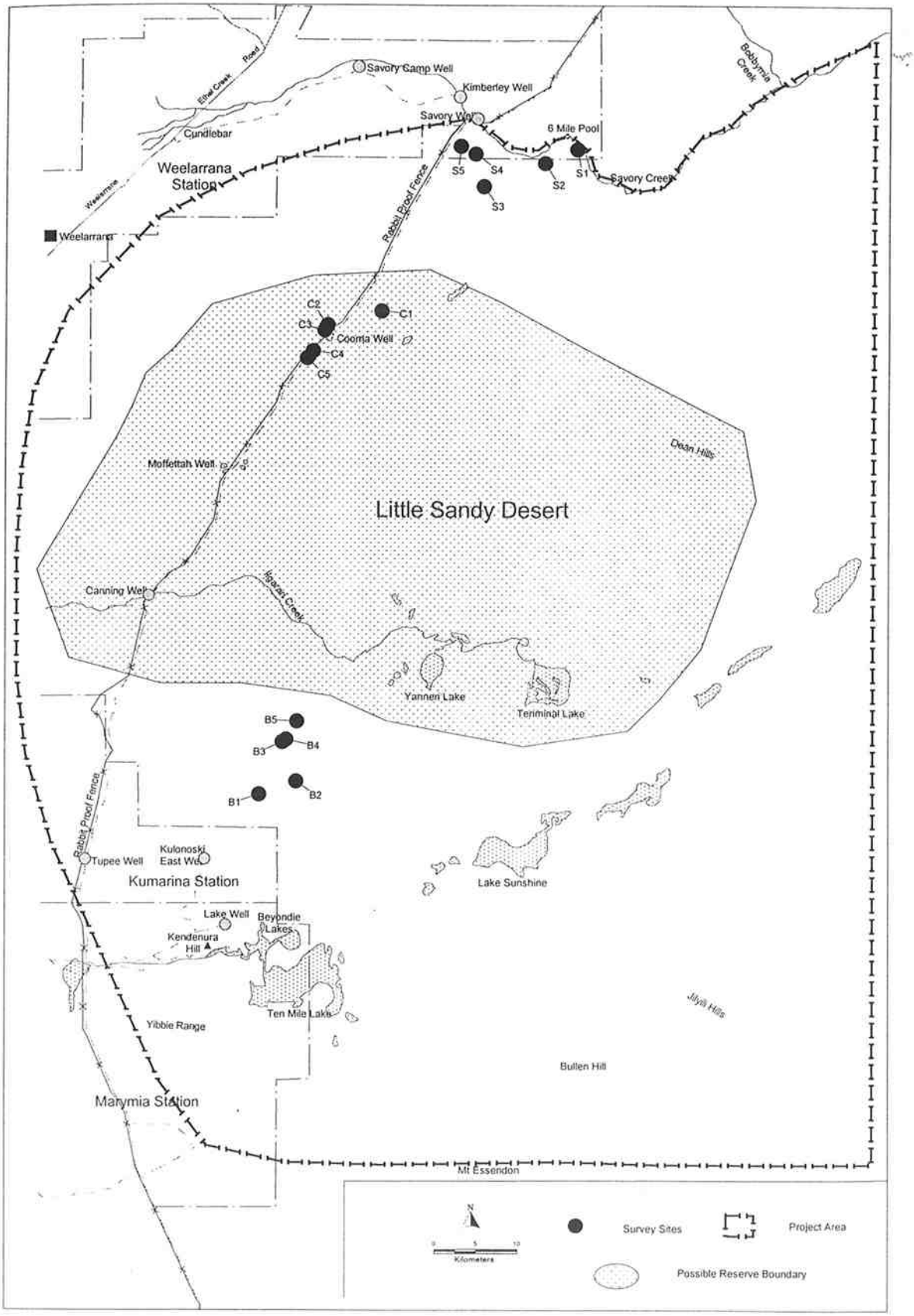

Figure 4 **Location of the principal priority area in the southern portion of the Little Sandy Desert for addition to the reserve system.**