F I N A L R E P O R T

ACRIS – Reporting environmental change on Indigenous lands

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Contents

Figures

Tables

This report summarises a research project commissioned by the Natural Resource Management Policy Branch of the Department of Environment and Heritage to explore opportunities for reporting environmental change on Indigenous land as part of the Australian Collaborative Rangelands Information System (ACRIS).

The findings presented here have been developed from a qualitative consultation process undertaken by the consultant and a literature review (URS 2007) which explored the broader theses associated with the research question. The consultations involved a combination of phone and face-to-face interviews that took place with more than seventy informants that are either directly connected with Indigenous Land Management Organisations (ILMOs) or who work closely with them. The literature review drew on sources dealing with Indigenous ways of knowing and interpreting the rangelands and the work done in rangeland inventory and trend detection within the scientific community.

This Executive Summary summarises the findings, conclusions and recommendations from both sources of information.

1.1 Main findings

The main findings from the study are as follows:

ACRIS has developed within the Non-Indigenous scientific tradition of knowing rangelands

ACRIS products have been developed within one system of rangeland knowledge being the Non-Indigenous 'rational' scientific tradition with a focus on commercial grazing of domestic animals. Indigenous people in these situations need access to this information, but have not usually been included within the ACRIS network. It is also evident from the literature reviewed and people consulted that there are distinct Indigenous ways of knowing and managing rangelands that are important for Indigenous management objectives, and the welfare of the people living in them.

Indigenous values are very different to Euro-centric values

Traditional Aboriginal management of the landscape often relies on song and ceremony, and knowledge of management is passed on through tradition and culture. 'Hard' systems of management, such as those typically employed by non-Aboriginal managers, are often regarded as having very little or no value to the Traditional Owners (TOs). For example, many of the concerns that non-Aboriginal people have about land degradation are not the concern of the TOs.

Ethno-biological knowledge has clear cross-cultural value; it should not be separated

Many TOs would appear happy to share appropriate traditional knowledge about their country (e.g. bush tucker and medicines), especially where it provided the opportunity for future Indigenous

from other potentially valuable cultural landscape features

generations to access such knowledge. Such information may provide valuable insights about the relationships between plants, animals and environment.

TOs are also concerned with seasonal variation – how a plant's physiology changes and is impacted by seasonal conditions.

Other landscape features with cultural significance to TOs would include: water courses; water quality and quantity; sacred sites; hunting areas; story places; birth places; rock art sites; and, camping sites. Table E1 presents a list of landscape features together with their data implications.

Fire has always had, and still does, an important role in Indigenous land management

Data on fire history would be enormously useful to TOs, mainly because it would help with decision-making for monitoring recovery and strategic burning. However, not all ILMOs are able to practice traditional management because of increasing difficulties in accessing country (see below).

Weeds and feral animals are as much a concern to TOs as they are to other rangeland managers

While this may be the case, many species that are regarded as 'feral' from the Euro-centric perspective are regarded more positively by Indigenous people. The criteria that many TOs are concerned with is how easy (or not) an animal is to catch and how it 'tastes'.

Coastal management and climate change are of special importance to many Indigenous communities

There are numerous Indigenous communities located in the coastal fringes of the rangelands and the marine and coastal resources available to these communities are important to them, economically and culturally (see Southern and Northern Gulf NRM Regional Strategies). The stability of coastal landforms is an important consideration, especially when they are subjected to frequent and inappropriate use. Further, the flora and fauna in coastal habitats are confined to narrow habitats and can easily be affected by excessive harvesting, or habitat depletion. Communities with custodianship for sections of coastline need localised and site specific data and information on the coastal resources and trends in those areas.

Given the close association of many Indigenous people with particular areas of land, and in some cases a direct dependence on that land for food and cultural support, predicted climate change will pose special difficulties in adaptation for these people.

Land capability information would assist Indigenous pastoralists

ACRIS has abundant information sources targeted at commercial grazing use of rangelands. Yet pastoral issues were not raised by many informants interviewed in this study. However, those that have been involved with ILMOs that have commercial pastoral properties commented on the value of land capability information. Building familiarity with the available information is required. Rangeland management history would also be of use to contemporary managers.

Land information custodianship is a central issue to TOs

Historically, land information from Aboriginal people has tended to be used by settlers to effectively dispossess Traditional Owners. Consequently, land information exchange systems need to be developed in such a manner that they assist in establishing trust. There is a need to establish suitable protocols to ensure that ethno-ecological information is distributed only to those that have permission to receive it and that the context of use is understood by the providers.

There is a clear need for further funding to support ILMOs in their land management

All informants interviewed emphasised the need for further resourcing to both provide infrastructural capacity (vehicles to access country, computer hardware and software, monitoring equipment, GPSs etc) and to build human capacity (training and skills development).

Clearly ILMOs need to become better equipped in this regard in order that they are better able to manage their country and it will also assist in data exchange processes also.

Funding is also necessary so that ILMOs can employ skilled-up project officers to support TO with land information systems. Suitable training courses and materials will almost certainly need to be developed.

Many informants commented on the costs involved in purchasing land information data. If agencies could make land information available to ILMOs free of charge, without any restrictions on its use, it would help to overcome at least one resource issue and perhaps it might also help rebuild trust between agencies and ILMOs. Such arrangements may or may not be possible and there is a case for investigating the degree to which this issue is a constraint to the accessibility of relevant information.

Building capacity within ILMOs is necessary if these organisations are to be able to collect, access and manage

As the above point emphasises, building human capacity is a crucial issue. Even if 'state of the art' land information systems were funded and installed ILMOs need to develop the capacity to use the systems. Further training and education is essential for empowering local people

land information

in the on-going use and management of such information systems.

It is also clear that many local ILMOs are unaware of what agency information (and ACRIS products) are available. Training is also required in this area.

Accessing country is becoming increasingly difficult

Some informants expressed difficulty accessing their traditional lands (especially where their country is very remote) because of a lack of infrastructure e.g. vehicles and roads being inadequate. There is some concern that access to sites is being made difficult by constraints imposed by pastoralists and other land users e.g. mining companies. It seems likely that this has become a more serious issue since Native Title claims have become more commonplace in the rangelands. If this is a widespread problem then will make it difficult for Elders to pass on their knowledge of country to future generations, and it will inhibit landscape monitoring.

The question of appropriate boundaries and scale for land information is central to ILMOs

The scalar hierarchy for land management across Indigenous land in the rangelands varies across the States and Territories. In fact, so variable is this that it is difficult to present a generalised description. What can be said however is that there are regional, sub-regional and local scales operating but the specific responsibilities of ILMOs varies enormously even at the regional level. Most critical for natural resource management (NRM) perhaps is the fact that most Commonwealth funding arrangements recognise the regional and sub-regional levels. Regional organisations, such as the Central and Northern Land Councils in the NT and the Cape York Land Council in Queensland for example are well established and acknowledged. However, it would seem that the sub-regional and especially local levels are less established – especially when it comes to their delineated boundaries. It has been suggested that catchment boundaries (commonly identified as suitable local land units in Euro-centric NRM) may not be appropriate for Indigenous lands. Boundaries based on language and/or tribal areas may be far more meaningful to Traditional Owners. This question seems worthy of further investigation.

Land information data are not being accessed by local Aboriginal Corporations

Some ILMOs are accessing land information available in the public domain (see Table E3). Conversely, many local Indigenous organisations have responsibilities that have little to do with land management e.g. Aboriginal health, education etc. However, of those that were contacted which we presumed would have a land

management role, very few either collected land information themselves or accessed data from external agencies. It seems that most know little about what data could be provided and most also believe it would be of little relevance anyway – not useful information or not provided at a meaningful scale.

Table E2 describes some of the more notable land information being accessed by larger ILMOs.

There appear not to be any generic standards or protocols for land information management in the rangelands

It would be beneficial if metadata arrangements are 'standardised' across the rangelands but if this is to occur standards will have to be developed for the monitoring of country and data capture. Standards are under development (e.g. the Balkanu Traditional Knowledge Recording Project and the Wet Tropics Management Authority) and it would be useful to examine these more closely to determine whether a generic system might be developed.

Intellectual Property (IP) and cultural sensitivity is a crucial component of information exchange

The two most pertinent issues with respect to accessing land information from TOs is: not consulting the right people (i.e. who is able to speak for country); and, lack of mechanisms to protect Indigenous knowledge. Traditional laws and customs vary across the rangelands and each TO group will have a different way of connecting to and speaking for that country – the TO group concerned must retain all rights.

1.2 Suggested information needs

Based on a review of the literature on Indigenous land values and management, and the rangelands scientific tradition, a suggested list of Indigenous information needs is presented in the tables below, categorised according to the type of rangeland use and the scale. The suggestions in the table below are drawn from the literature review.

Table E1: Suggested information needs from the literature review

Rangeland use	Information type	Scale	Current availability
Pastoral use	Rangeland inventory and condition	Leasehold to paddock level	Reasonable in all jurisdictions
	Range trend	Leasehold to paddock level	Limited in some jurisdictions
	Management guides	Leasehold to paddock level	Reasonable in all jurisdictions

Rangeland use	Information type	Scale	Current availability
Coastal use	Coastal stability	Regional to local scale to site-based	Limited information only for favoured locations
	Coastal flora and fauna	Regional to local scale	Mainly localised and site-based information only
Tourism use	Site based stability in preferred areas	Local to site scale	Limited information only for favoured locations
	Site based impacts on flora and fauna	Local to site scale	Limited information only for favoured locations
Cultural and heritage use	Spatial description of resources as recognised by Indigenous peoples	Regional to local scale to site-based	Mainly localised and site-based information only
	Threats (fire, weeds, climate change) to special locations and areas	Mainly local to site-based	Can be available locally
Part subsistence living	Resources (fuel, bush foods, fauna)	Regional scale information Leasehold to paddock level	For isolated intensively studies areas only
	Climatic information as it affects availability of resources for subsistence, and access	Regional scale information	Regional information available. Climate trends becoming available
	Feral animals, pests and weeds	Leasehold to paddock level	Some information available
	Fire history and patterns	Regional to leasehold to very localised	Regional and localised information available
Conservation management	Spatial description of resources as recognised by Indigenous peoples	Regional to local scale	Mainly localised and site-based information only
	Biodiversity status and trends	Regional to local to site-based	Becoming available for key locations (e.g. Kakadu)
	Climatic information as it affects fire and drought frequency	Regional scale information	Regional information available. Climate trends becoming available
	Feral animals, pests and weeds	Regional to local to site-based	Becoming available for key locations (e.g. Kakadu)
	Fire history and patterns	Regional to local to site-based	Regional and localised information available
Climate change impacts	Predicted cyclone frequency and intensity	Regional scale information	Predictions being developed by BOM
	Predicted changes in fire regimes	Regional scale information	Regional predictions being developed

Rangeland use	Information type	Scale	Current availability
	Predicted sea level changes	For coastal areas subject to storm and tidal surges	Coastal vulnerability information being acquired by Geoscience Australia
	Predicted changed in flora and fauna availability	Regional to local scale (if possible)	Limited information becoming available
	Human health related factors (e.g. mosquitos, disease incidence)	Regional to local scale (if possible)	Limited information becoming available

The information presented in Table E2 is an attempt to summarise the data types, scales and probable metadata arrangements that would apply to the rangeland landscape features described above. Again, the list of landscape features presented cannot be considered exhaustive and it would almost certainly vary in detail depending upon the geographic area. That said those identified are likely to at least be generic to all rangeland areas.

Table E2: Landscape data types, scales and metadata for monitoring landscape change in the rangelands

Landscape feature	Most applicable scales	Data type/s	Possible metadata criteria*
Ethnobotanical e.g. bush foods & medicines	Regional & local	Oral history (audio, CD or documented); photos	• Type/s of data captured • Date captured • Author or person who captured the data • Description • Cultural value • Environmental value • Data projection (e.g. GDA) • Datum used (e.g. WGS 84)
Ethnozoological e.g. hunting species, totem species	Regional & local	Oral history (audio, CD or documented); photos	
Weeds (woody; aquatic etc)	Regional & local	GPS coordinates; aerial photos; photos of vigour; management zones	
Feral animals	Regional & local	Photos; scats	
Fire history	Regional & local	Photos; aerial photos; management zones	
Waterways	Regional & local	Aerial photos; photos; topographic maps	
Wetlands	Regional & local	Aerial photos; photos; topographic maps	
Waterway flows	Regional & local	GPS coordinates; flow history	
Water quality	Regional & local	GPS coordinates; photos (turbidity)	
Stocking rates (pastoral areas)	Regional & local	Stocking histories; management zones	
Stock forage productivity	Regional & local	Aerial photos; photos; management zones	
Fencing	Local	Photos; management zones	
Erosion	Regional & local	Aerial photos; photos	

Landscape feature	Most applicable scales	Data type/s	Possible metadata criteria*
Salinity	Regional & local	Aerial photos; photos	
Sacred sites	Local	GPS coordinates; photos; audio; CD; documents	
Hunting areas	Local	Management areas; CD; photos	
Story places	Local	GPS coordinates; CD; photos; audio	
Birth places	Local	GPS coordinates; CD; photos; audio	
Rock art sites	Local	GPS coordinates; CD; photos; audio	
Camping sites	Local	GPS coordinates; CD; photos; audio	
Tribal/language areas	Regional & local	Anthropologist's reports/maps	

* The metadata arrangements were suggested by the Aboriginal Rainforest Council (2007)

The material in Table E3 summarises the land information that many regional and sub-regional ILMOs are either already accessing or that they might wish to access. Again, the information contained in this Table is likely to represent the generic needs of regional and sub-regional ILMOs; specific needs will again vary according to geographic context and it will almost certainly vary for those organisations operating at the local scale.

Table E3. External land information/data accessed by the larger rangeland ILMOs

Data accessed	Providers	Probable scales
Vegetation	State/Territory gov't agencies	1:1,000,000
Geology	State/Territory gov't agencies	1:500,000
Digital Elevation Models (DEM)	State/Territory gov't agencies	
Roads, Drainage, Community Locations etc	Auslig	1:1,000,000
Fire History	State/Territory gov't agencies	Various
Ramsar or other important wetlands	ERIN; State/Territory gov't agencies	inadequate
Bore Locations	State/Territory gov't agencies	
Bioregions	Environment Australia	Poor resolution
Land use e.g. agriculture, forestry, mining	State/Territory gov't agencies	Poor resolution
Land tenure	State/Territory gov't agencies	Good resolution
Satellite Imagery 107/77X9	ACRES	Good resolution
Quick Look mosaics	Auslig; State/Territory gov't agencies	Poor resolution
Topographic maps	State/Territory gov't agencies	1:250,000
Aboriginal heritage sites registers	State/Territory gov't agencies	Good resolution

1.3 Recommendations

The following recommendations are suggested as a way forward to progress land information exchange between ACRIS, its partner agencies and ILMOs. These are drawn collectively from the Literature Review and the consultation process.

Recommendation 1: Develop and maintain a capacity within ACRIS to carry out on-going research into Indigenous knowledge requirements and contributions. This should extend to the inclusion of a national Indigenous organisation (e.g. Indigenous Land Corporation or the Office of Indigenous Policy Coordination, or another suitable body) as a full partner in ACRIS.

Recommendation 2: Evaluate the collective suggestions for information capture and provision provided in the preceding tables and decide on their appropriateness and feasibility for management within ACRIS.

Recommendation 3: Develop platforms that enable better access by Indigenous people to relevant information. This may include GIS applications that can better handle traditional ecological knowledge.

Recommendation 4: Develop a program of Indigenous capacity building for ILMOs operating at the sub-regional and local levels. Establish formal training for Indigenous organisations in the access of, and use of ACRIS products. Further resources (funding) is required assist ILMOs at all levels to build capacity and provide the necessary infrastructure to both monitor environmental condition and to store and manage land information.

Recommendation 5: Provide relevant rangeland management history to Indigenous stakeholders both in the forms of corporate memory and the physical legacy of research sites and monitoring systems.

Recommendation 6: There are clear links between traditional and scientific knowledge. Many Traditional Knowledge systems are being developed for Traditional Owners across the rangelands. A more extensive investigation of these seems warranted to explore opportunities for developing them further to become land management systems also. Ultimately, ACRIS and Indigenous partners should work towards developing a duality of rangeland environmental knowledge that provides added value to both Indigenous and scientific traditions of how the rangelands are known.

Recommendation 7: Further partnerships in information collection and dissemination between scientists and traditional owners. Increase the number of Indigenous organisations that are networked within ACRIS (e.g. ILMOs, language centres, research centres in universities.

Recommendation 8: Implement cross-cultural training for staff working in ACRIS. This training has been very successful in improving relationships in other domains (health, education, mining).

This report summarises the findings from a qualitative investigation that explored Indigenous use of and need for information on rangeland management and the information available from the Australian Collaborative Rangelands Information System (ACRIS).

This is the final of three reports that have been delivered to the Natural Resource Management Policy Branch of the Department of the Environment and Heritage as part of URS's commitment to the *ACRIS (Australian Collaborative Rangelands Information System) – Reporting environmental change on Indigenous land project.* The previous reports were a Literature Review and an Issues Paper. All three papers should be read to obtain a complete picture of the activities in the project.

2.1 Project objectives

The objectives listed for this project included, but were not limited to the following:

1. Identify and document criteria and/or indicators used by Indigenous and management organisations (and, where feasible, individual land managers) to account for change in environmental condition in the rangelands;

2. Assess the potential for, and constraints against ACRIS using reports from Indigenous Land Management Organisations (and, where feasible, individual land managers) as a means for accounting for and responding to environmental change in the rangelands; and

3. Briefly document 'best practice' examples of some of these issues (for example, the use of traditional ecological knowledge in monitoring environmental change; how Indigenous people's skills contribute to effective monitoring).

This final report is mostly concerned with Objectives 2 and 3 and it has come about as a result of preliminary discussions and meetings with a variety of Indigenous Land Management Organisations (ILMOs) and associated organisations involved with resource management and ILMOs in the rangelands.

2.2 Geography of the rangelands

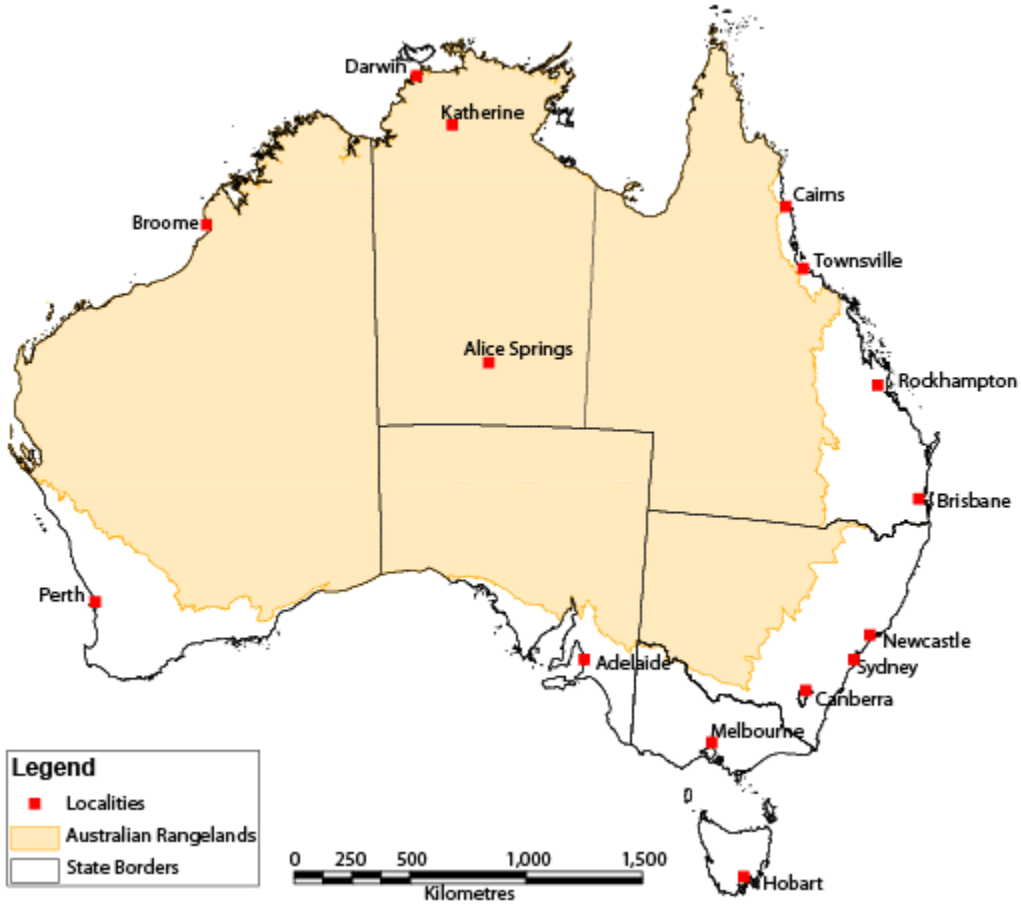
The rangelands covers approximately 75 per cent of the Australian continent and it includes some of the most remote and least disturbed landscapes in the country (Figure 1).

The rangelands are home to around 11 per cent of Australia's total population, which appears to be a relatively small portion of the total Australian population; however, a relatively large proportion of the rangeland people are Indigenous. In terms of land area, approximately 18 per cent of the rangelands are under Aboriginal ownership and management.

The ecosystems of the rangelands can be broadly categorised according to the main vegetation types. These are: grasslands, shrublands, woodlands, and savanna. The rangelands are also home to a significant number of rare fauna and flora species and it is habitat for rare, threatened and endangered species.

There are around 6,000 pastoral enterprises which occupy about 58 per cent of the land area. Some of the land degradation issues within the rangelands include: altered vegetation structure, accelerated soil erosion, an increase in the number and distribution of weeds and feral animals, reduced water quality, soil salinity and decreased biodiversity.

Figure 1: The Rangelands of Australia



Source: Department of Environment & Water Resources (2007)[1]

2.3 The Australian Collaborative Rangelands Information System

Sustainable management of the rangelands requires an ability to assess environmental changes, and then act upon the observed change. Consequently, monitoring, assessment and reporting environmental change are all important to support improved and protective management of the rangelands. Aboriginal land uses vary enormously but they include: traditional and cultural activities e.g. hunting and gathering;

[1] Available: http://www.environment.gov.au/land/management/rangelands/

semi-commercial wildlife harvesting; pastoralism; mining (usually managed by corporate entities); ecotourism; and, there are various reserves.

The Australian Collaborative Rangeland Information System (ACRIS) is the Commonwealth Government's coordinating mechanism that collates rangeland information from State, Northern Territory and Australian Government agencies and other sources (DEWR 2007). According to the ACRIS website, ACRIS is still evolving and its final form and functioning are still uncertain.

ACRIS will be dependent upon its partner agencies and other organisations for the provision of data. According to the ACRIS website, the following State/Territory agencies already do or will support ACRIS.

- Department of Agriculture and Food, WA.
- Department of Environment and Conservation, WA.
- Department pf Infrastructure, Planning, Environment and the Arts, NT.
- Department of Primary Industries and Fisheries, Qld.
- Department of Natural Resources and Mines, Qld.
- Environmental Protection Agency, Qld.
- Department of Natural Resources, NSW.
- Department of Water, Land and Biodiversity Conservation, SA.
- Department of Environment and Water Resources, Australia.
- Department of Agriculture, Fisheries and Forestry, Australia.
- National Land and Water Resources Audit.
- CSIRO Sustainable Ecosystems.
- Cooperative Research Centre for Desert Knowledge.

It seems notable here that at the time of writing this report there is no single Indigenous organisation partnered to ACRIS.

2.4 Indigenous Land Management Organisations

There is a very large number of Indigenous Land Management Organisations (ILMOs) of various kinds throughout the ACRIS defined rangeland area. Land management is often not the primary role of many of these organisations; for example, many can be defined as Aboriginal communities where management

concerns are more aligned with social and/or cultural needs. Nevertheless, land management often falls within the responsibilities of many organisations by default.

Other organisations have clear land management responsibilities. Typically, these operate at much larger regional scales and consequently they are also likely to be accessing Natural Heritage Trust (NHT) and/or National Action Plan (NAP) funding to help fund various land management initiatives within their regions. Perhaps the largest of these are the Aboriginal Lands Trust (ALT). In WA for example, the ALT has land management responsibilities for approximately 13 per cent of the state and most of the land that falls within their jurisdiction is within the rangelands. The Indigenous Land Councils such as the Northern Land Council (NLC) and the Central Land Council (CLC) are other examples of large organisations with land management responsibilities although the primary responsibilities of these may vary slightly between jurisdictions e.g. the Northern and Central Land Councils of the NT seem primarily concerned with Native Title Claims rather than NRM *per se*. However, some councils have developed a NRM focus and associated programs. The Northern Land Council's *Caring for Country* initiative has developed most of the Ranger groups in the 'top end' and has driven some of the recent policy developments including the developing *Healthy Country Healthy People* schedule under the NT/Australian Government Bilateral Arrangements for NRM. Further south in the NT, the Central Land Council alone has around 25 staff dedicated to land management.

Others organisations operate at what might be described as a sub-regional level. For example, the WA Rangelands NRM Co-ordinating Group has four sub-regions: the Kimberley, the Pilbara, the Gascoyne-Murchison and the Goldfields-Nullarbor. The Darwin-Katherine region and the Ord NRM sub-region (which straddles the NT and WA border) may also be considered as other examples at this scale; there is also the Mary River and Daly River Sub-regions in the NT.

ILMOs are managing Indigenous Protected Areas (IPAs) that they have declared on their lands, which form part of the National Reserve System (NRS). Example ILMOs that are managing IPAs include the Anangu Pitjantjatjara Land Council's Land Management section, and Ngaanyatjarra Council's Land Management section.

At the local scale there are very many Aboriginal Corporations in the rangelands and many of these have assumed NRM responsibilities, with or without resources or capability. However, perhaps just as many of these (or even more), have no particular interest in NRM or environmental management. For example, many are concerned with Aboriginal health; many are concerned with cultural concerns such as preserving language or developing educational programs or artistic activities, and so on.

The complexity of organisations with some level of responsibility for and capability in NRM presents a challenge for effective information generation and exchange that assists Indigenous people in land management.

This section of the report explains the methodological approach used to consult with ILMOs about their data needs and the potential for information exchange between ILMOs and ACRIS.

3.1 Identifying Indigenous Land Management Organisations (ILMOs)

Given the potential number of ILMOs in the rangelands clearly it was not possible to contact them all in a project of this scope and nature. Also, it was acknowledged from the outset that many would be unable or unwilling to provide inputs to the project so one of the first questions that had to be considered was, what sorts of organisations can and ought to be consulted? The question of scale is important here because as noted above there are numerous ILMOs operating at the local level compared with the sub-regional or regional levels. That said, there is clearly merit in identifying a range of ILMOs that have responsibilities at different scales; this is because what is regarded as important by ILMOs operating at the local level may not necessarily be regarded as important at the sub-regional or regional levels, or *visa-versa*.

In theory, carrying out a thorough, systematic or structured sampling approach to identifying ILMOs would first involve identifying all possible ILMOs from the rangelands from within each State/Territory. This in itself would be a very involved process because there are no 'one-stop-shops' offering databases or lists of all ILMOs within the States/Territory. Had there been so, then the ILMOs could have been 'categorised' according to scale (the size of the land area of their concern) or perhaps thematically in some way, and from this a random sample could have been identified. Such a process would have constituted a structured random sampling process. However, the data availability and project constraints would not allow such a quantitative approach to take place. Therefore, a qualitative approach was regarded as necessary. There were essentially four processes used to identify ILMOs [2].

1. The larger regional and sub-regional ILMOs are well known to the Client and project team so it was felt that these should at least have the opportunity to contribute in whatever capacity they wished.

2. To help Indigenous Australians address their land management needs, to contribute to national objectives, and to gain access to Natural Heritage Trust (NHT) funding, the Australian Government has established a national network of 13 Indigenous Land Management Facilitators. These were all contacted and asked to recommend ILMOs in their areas of operation.

3. A number of ILMOs took part in the *ACRIS/Indigenous Land Management Data Needs* Workshop that was held in Adelaide in April 2006. These participants/organisations were contacted to ascertain whether they had interest in further involvement through this project.

[2] It must be acknowledged that the four stage sampling approach described here has limitations in that it inevitably means that the more 'progressive' ILMOs end up being selected for contact while that vast majority that have not or are not developing environmental change monitoring/data collection processes fail to be identified. .

4. A ‘snowballing’ (referrals) process was used to identify other ILMOs and non-Indigenous organisations that could contribute. This process simply involved asking those organisations that were identified from any of the above processes to recommend others that might also be able to contribute.

3.2 Development of questionnaire / interview guide

The literature review associated with Stage 3 of this project provided many insights into the issues surrounding Indigenous values with respect to land management, their data needs, and their reporting processes. The purpose of conducting the consultation process with ILMOs was to present these findings and explore the issues further. What follows in the remainder of this section is a summary of the main themes that emerged from the literature review, supported by comments from initial contacts. These themes and comments were used to develop the questionnaire / interview guide.

3.2.1 Indigenous values

Indigenous values were not something that required major investigation within this project; however, any investigation of this type must at least acknowledge the differing values perspectives between the Euro-centric and Aboriginal views and in the end seek to confirm what land management issues are most important to Indigenous people. In this sense then, it formed a starting point in the discussions with ILMOs.

The Aboriginal world view with respect to the landscape is rather different to the Euro-centric view. The ‘Dreaming’ period underpins the Aboriginal worldview and for Aboriginal people – the Traditional Owners – the form and changes that take place in the landscape are linked with the creation spirits that occupy the landscape. Traditional Aboriginal management of the landscape often relies on song and ceremony, and knowledge of management is passed on through tradition and culture. ‘Hard’ systems of management, such as those typically employed by non-Aboriginal managers, are often regarded as having very little or no value to the Traditional Owners (TOs). For example, many of the concerns that non-Aboriginal people have about land degradation are not so much the concern of the TOs.

As anticipated, the informants consulted in this study confirmed that Indigenous people’s view about the landscape cannot be separated from their cultural worldview; for example, the following comment was made: ‘the two are intrinsically linked and cannot be separated…to do so undermines the meaning of country’ (King 2007 *pers. comm.*).

3.2.2 Fire

Fire has always had a major role in the management of country for Aboriginal people, and it still does. Fire was traditionally used to encourage wildlife and to aid in accessing country. In times past, it was also used in warfare and in communication. It still has an important cultural and spiritual place in Aboriginal society. Since European settlement however there have been changes in burning practices,

especially at the hands of 'white' pastoralists, and the use of fire (especially small-scale burns) declined resulting in changes to the landscape – more dense vegetation resulting in larger more intense fires when they do occur. However, in recent times, fire management is more closely aligned with traditional Aboriginal practice. Any information on fire history would therefore appear to be one of the most obvious data needs.

The subject of fire was raised by seven informants and most emphasised that it must be regarded as one of the most important land management tools ILMOs use. Most also confirmed that data on fire history would be enormously useful to them, mainly because it would help with decision-making for monitoring recovery and strategic burning. But as Crowley emphasised, there is a resource issue when it comes to fire management; not all ILMOs are able to practice traditional management because of the difficulties many have in accessing country (Crowley 2007 *pers. comm*.).

3.2.3 Bush tucker/medicines

The subject of bush tucker and bush medicines did not receive its own heading within the literature review for this project; nevertheless, many Aboriginal people in the rangelands still utilise these and they help provide many with economic independence. It was therefore be regarded as a subject worthy of further investigation during consultation. However, like fire, knowledge about these and their management tends to be collected and passed on between and within family and kin groups by word of mouth. Much of this information is also likely to be 'guarded' because of its cultural implications and because of the economic potential. In other words, there are Intellectual Property (IP) implications (this subject is also dealt with in Sections 3.2.10 and 4.6.1).

Ethno-biological issues were raised by nearly all the informants at various times during the interviews. The subject is clearly at the forefront of concerns for ILMOs and many are already undertaking various projects to document information of this kind. For example, the Tiwi people in the NT have been collecting data and generating hierarchical lists of threatened species (in terms of the risk of threat) – especially where these have cultural implications or are used for ceremonial purposes (Hadden 2007 *pers. comm*.). Interestingly, the subject of IP was nearly always raised when the topic of ethno-biological information was discussed. This is clearly a central issue for ILMOs. However, it would seem that at least some Traditional Owners are keen to document their knowledge about bush tucker and medicines. King (2007 *pers. comm*.) emphasised that the Elders she knew were all keen to go into country with just about anyone who is interested to discover what they know – especially if they are interested about the stories, songs and ceremonies associated with these. She also emphasised the urgency in this because so many of the Elders that have this knowledge are becoming too old or incapacitated to make these journeys.

3.2.4 Weeds and Feral Animals

All land owners/managers have responsibilities in relation to declared noxious weeds and many ILMOs recognise the problematic nature of weeds whether aquatic or terrestrial. However, many Aboriginal people have a different perspective about feral animals compared with non-Aboriginal people. Some

feral animals are now considered to have acquired cultural status and economic value. Nevertheless, information about the spread of weeds and the extent or spread of feral animals, and their harvesting, is likely be of value to ILMOs and government alike.

Hadden (2007 *pers. comm*.) and many other informants confirmed that many species that are regarded as 'feral' from the Euro-centric perspective are in fact regarded more highly by Indigenous people. She explained that as far as the Tiwi people are concerned, the criteria that they are concerned with is how easy (or not) the animal is to catch and how it 'tastes'. And again, cultural implications are also more important than its impact on the environment. That is not to say that the environmental impacts associated with weeds and feral animals are being ignored by ILMOs. Most informants also confirmed that they are concerned with these issues (e.g. Haddon 2007 *pers. comm*.; Standley 2007 *pers. comm*.).

3.2.5 Water resources

Water was not a subject that received significant attention in the literature review specifically; however, it was acknowledged that natural water flows have been disrupted by the inappropriate construction of drainage channels and roads. The problem of stock and feral animal accessing waterways and waterholes and the resulting degradation was also noted. It was also acknowledged that lack of information on the availability of water in the rangelands has severely limited the planning of outstations thus preventing Aboriginal people form taking best advantage of local resources. Again, it seemed appropriate to explore information needs with respect to water in the consultation process.

As expected, the informants confirmed that water and water quality is one of the central management issues to ILMOs. However, those consulted did not present any particular examples of what might be described as 'rigorous' water monitoring data collection efforts. That said, it would seem that water quantity/quality is one of the most common indicators that Indigenous people recognise as a 'change' indicator. Haddon (2007 *pers. comm*.) commented that, 'if there's no change then they don't get concerned but if they do see changes, such as algal blooms or sediment in the water, then they do get worried. This is really just a perception only though because very often these sorts of changes are entirely natural and not the result of anything that's wrong in the environment; nevertheless, if it's perceived to be real to them then it is real'.

3.2.6 Wildlife

Aboriginal people's awareness that wildlife resources are limited is suggested by their general dislike of waste such as when they see non-Indigenous landowners culling kangaroos or wombats because of pasture and crop damage, or when feral animal control programmes kill animals without using them. The decline, and/or unsustainable harvesting of wildlife communities is also something which Aboriginal people have concerns about, perhaps because low populations make hunting more time consuming and expensive. Monitoring methods, particularly those that draw on traditional Indigenous wildlife management systems are likely to be more meaningful to indigenous people and these could be useful to both ILMOs and government.

3.2.7 Pastoralism

The review confirmed that Aboriginal people are increasingly purchasing pastoral leases and while much of the motivation for this is cultural (i.e. the desire to return to country) they nevertheless recognise the economic opportunities and constraints that come with pastoral lease ownership. It was also noted that many of these leases are located in marginal country and that often they have a history of overgrazing which has resulted in land degradation of various forms. Like any other pastoral land managers, Aboriginal managers are likely to need information on carrying capacity and the potential for land degradation and rehabilitation.

It is interesting that unlike the other topics explored in the interviews the subject of pastoralism was not considered all that important. However, this finding is probably a function of the informant sample; very few of the informants were involved with ILMOs are involved with, or support commercial pastoral properties. That said, two of the informants did comment on the value of land capability information (Monaghan 2007 *pers. comm.*; Roberts 2007 *pers. comm*.) and the implication was that is could be used in supporting pastoral management.

3.2.8 Traditional knowledge

The review demonstrated that there is a strong desire among many Indigenous groups (especially the ageing Elders) that their traditional knowledge be documented in some manner. At least part of this desire has come about because of concern that such knowledge may be lost as Elders pass on if it is not documented. The review also showed that traditional ecological and ethno-biological knowledge has cross-cultural value; for example, it may provide valuable insights about the relationships between plants, animals and the environments in which they are found. However, as yet it is unclear about how this might best be achieved and how such information might be made available to systems such as ACRIS. We therefore saw this question as a central one to the question of environmental monitoring/data capture for Indigenous lands in the rangelands.

As noted above (Section 2.2.3) it is clear that many Traditional Owners are happy to share appropriate traditional knowledge about their country, especially where it provided the opportunity for future Indigenous generations to access such knowledge. And, if that means that the recording process must involve modern processes and governmental systems then better that than not at all (Salee 2007 *pers. comm*.).

3.2.9 Information exchange/presentation

There is clearly a major gap between Euro-centric information systems, which seek to compartmentalise features of the landscape through sophisticated knowledge systems, compared with the much subtler but more holistic Aboriginal perspective. Consequently there is a need for a common interpretation system that has the capacity to ‘bridge’ the cultural gap. Studies have demonstrated that some forms of ‘modern’ media are desired by Aboriginal land managers, including: photos, video, tape recordings, CD-Roms,

posters, well illustrated books and Aboriginal paintings and drawings etc. Again, how information in this form might be made available to ACRIS seemed a pertinent question for exploration here.

3.2.10 Information custodianship

While many Indigenous people want to see ethno-ecological knowledge documented so that it may be available to future generations, the ownership of such knowledge is a critically important issue. The Euro-centric perspective about environmental information is that it is generally regarded as a public good; it may collected, managed and made available in any manner that seems appropriate and most useful. However, this is not the view of most Indigenous people who see such information from a cultural perspective – meaning it should only be made available to the immediate clan or perhaps others under special circumstances. According to Smyth (2007 *pers. comm.*) Traditional Owners are understandably very suspicious of any initiatives that might involve them collecting and providing land information (in whatever form) to governing authorities/agencies. The history of land information exchange between Aboriginal people and 'white' settlers is that it has tended to be used to assist settlers disposes the Traditional Owners. So, any information exchange systems will need to be developed in such a manner that they assist in establishing trust. There is obviously a very important and complicated ethical issue here also. There is a need to establish suitable protocols to ensure that any ethno-ecological information (in whatever form it may be held in) is distributed only to those that have permission to receive it and that the context of use is understood by the providers. Again, any information about how this is currently being achieved or could be done seems extremely pertinent for the ACRIS partners.

3.2.11 Resources

It has been noted above that many ILMOs have responsibilities for land in remote and inaccessible areas. This disadvantages many of them because communications are often difficult from and within such places. Basic access by way of phone and fax is usually not so much the concern but if there are needs of a more sophisticated nature (e.g. for satellite imagery or electronic mapping etc) then the lines of communication also need to be made sophisticated enough for data transfer to take place. For example, Geographic Information System (GIS) capabilities are not available to the vast majority of ILMOs especially those with more local rather than regional responsibilities. The review also argued that there is a need to improve human capacity within ILMOs by way of training and placing such people, together with their operational facilities (e.g. vehicles), on the ground so that they are able to support ILMOs in a more dedicated manner. All of these developments will require financial resourcing and there are questions about how much is needed; what capacity and facilities are needed, and where.

All informants interviewed emphasised the need for further resourcing to both provide infrastructural capacity (vehicles to access country, computer hardware and software, monitoring equipment, GPSs etc) and to build human capacity (training and skills development). The problem was summarised by Chris Roberts (2007 *pers. com.*):

> 'We are yet to see serious consideration of a trust fund that can retain base core capacity in perpetuity in Indigenous communities, by retaining and investing a capital fund in suitable growth portfolios and using

the interest to employ say even two rangers, a support person and maintain a vehicle and or boat in each sub-region. The size of the areas we are talking about is immense and two rangers in each community and one vehicle would not be sufficient in Cape sub-regions, but it would at least represent a start… at the moment it is more about survival than strategic NRM.'

3.3 Information needs

A suggested list of Indigenous information needs drawn from the literature review is presented in Table 1 below, categorised according to the type of rangeland use and the scale. This information was used in part to frame the approach to the consultation described elsewhere in this report.

Table 1: Suggested information needs from the literature review

Rangeland use	Information type	Scale	Current availability
Pastoral use	Rangeland inventory and condition	Leasehold to paddock level	Reasonable in all jurisdictions
	Range trend	Leasehold to paddock level	Limited in some jurisdictions
	Management guides	Leasehold to paddock level	Reasonable in all jurisdictions
Coastal use	Coastal stability	Regional to local scale to site-based	Limited information only for favoured locations
	Coastal flora and fauna	Regional to local scale	Mainly localised and site-based information only
Tourism use	Site based stability in preferred areas	Local to site scale	Limited information only for favoured locations
	Site based impacts on flora and fauna	Local to site scale	Limited information only for favoured locations
Cultural and heritage use	Spatial description of resources as recognised by Indigenous peoples	Regional to local scale to site-based	Mainly localised and site-based information only
	Threats (fire, weeds, climate change) to special locations and areas	Mainly local to site-based	Can be available locally
Part subsistence living	Resources (fuel, bush foods, fauna)	Regional scale information Leasehold to paddock level	For isolated intensively studies areas only
	Climatic information as it affects availability of resources for subsistence, and access	Regional scale information	Regional information available. Climate trends becoming available
	Feral animals, pests and weeds	Leasehold to paddock level	Some information available

Rangeland use	Information type	Scale	Current availability
	Fire history and patterns	Regional to leasehold to very localised	Regional and localised information available
Conservation management	Spatial description of resources as recognised by Indigenous peoples	Regional to local scale	Mainly localised and site-based information only
	Biodiversity status and trends	Regional to local to site-based	Becoming available for key locations (e.g. Kakadu)
	Climatic information as it affects fire and drought frequency	Regional scale information	Regional information available. Climate trends becoming available
	Feral animals, pests and weeds	Regional to local to site-based	Becoming available for key locations (e.g. Kakadu)
	Fire history and patterns	Regional to local to site-based	Regional and localised information available
Climate change impacts	Predicted cyclone frequency and intensity	Regional scale information	Predictions being developed by BOM
	Predicted changes in fire regimes	Regional scale information	Regional predictions being developed
	Predicted sea level changes	For coastal areas subject to storm and tidal surges	Coastal vulnerability information being acquired by Geoscience Australia
	Predicted changed in flora and fauna availability	Regional to local scale (if possible)	Limited information becoming available
	Human health related factors (e.g. mosquitos, disease incidence)	Regional to local scale (if possible)	Limited information becoming available

3.4 The questionnaire / interview guide

The above 'list' of issues and suggested information needs was turned into a more structured interview guide (questionnaire) (see Appendix 8.1 for complete details). These issues were explored during consultations with representatives from ILMOs and others that have worked with them.

The consultations were of two forms: first, there was a desk-top consultation process where informants were contacted by phone and/or email. Secondly, Darwin and Cairns were visited by Colin Macgregor in March 2007 to meet with informants 'face-to-face' to discuss the issues directly. The main questions explored during this consultation were as follows.

- The most significant land management issues; and, the most significant environmental/cultural features of the landscape (the above criteria were used to 'prompt' responses when it was felt necessary)?

- What data are being collected and how?
- How environmental change is or could be monitored?
- How such data are compiled/managed?
- What information is accessed from outside their area e.g. government agency data?
- What opportunities are there for data exchange e.g. intellectual property rights?
- What difficulties do or might arise with such data exchanges?
- What are the main information/data gaps that need to be addressed?
- Are there any other 'sensitivities' with data exchange that must be recognised?

Appendix 8.2 provides details of the most notable contacts and contributors to the consultation process.

The next section provides a summary of the findings from the consultations with ILMOs and others that work closely with them.

Main findings from telephone & face-to-face consultation

SECTION 4

Many of the main issues identified in the literature review were confirmed as important during the various interviews. This section presents the main additional findings from the consultation process that took place with Indigenous Land Management Organisations (ILMOs) and others who work with them in either research or natural resource management contexts.

4.1 Response rate

Conducting remote consultations via telephone and email can be difficult even in the best of circumstances. However, the situation is made all the more challenging in projects of this nature because Indigenous people rely more on what can loosely be described as 'contagious' social capital (kin networks, relationships and trust) than does Euro-centric culture. As noted above, establishing trust with representatives of ILMOs is almost essential in order to succeed in an Indigenous consultation process. Unfortunately the circumstances and scope of this project did not allow much opportunity for trust between the research team and informants to be developed. This undoubtedly affected the response rate.

Since the sampling process was highly qualitative, the informants who did offer the most 'useful' information tended to represent the more regional scale ILMOs rather than those at the local scale. However, it could be argued that this is entirely appropriate since any information exchange with ACRIS (initially at least) is likely occur at this level in the scalar hierarchy.

Over the course of the whole consultation period, which was run over February and March 2007, a total of 77 individuals representing a variety of organisations[3] (see Appendix 8.2 for full details) were contacted either by phone or email. Attempts were made to contact many other organisations and where this failed there were, in some cases, opportunities to review information from their websites instead.

The questions in the interview guide formed the basis of the conversations. Notes were taken during these conversations and transcribed and then a thematic analysis undertaken. This confirmed the most dominant issues of concern.

It was originally anticipated that two workshops or focus groups would be conducted in Darwin and Cairns to explore the questions identified above (Section 3.3) in more detail. However, given the apparent difficulties in obtaining participant commitment to such a process it was decided that it would be more effective to carry out 'face-to-face' interviews with a small number of key informants instead. In all, 12 people were interviewed (4 in Darwin and 8 in Cairns).

4.2 Other unanticipated but important land management issues

The telephone survey and interviews confirmed that the land management issues listed in Section 3 would appear to be the most common and significant to ILMOs. This suggests that the literature review

[3] Not all organisations were specifically 'Indigenous'; for example, some informants from the CSIRO and the TS-CRC were contacted because they have people working on projects that involve ILMOs.

prepared for Stage 3 of this project correctly identified the main issues. However, as expected, other pertinent issues arose especially during the face-to-face meetings. For example, there is some evidence to suggest that the priorities that Aboriginal people have with respect to land management may be influenced by age; some informants said that younger Aboriginal people are more concerned with the same land management issues as non-Aboriginal people: weeds, feral animals, erosion etc and that the cultural significance of these and other aspects of the landscape are of less concern.

There were other unanticipated issues raised by the informants. Many of these can be regarded as locally or regionally specific and so probably not so much the concern of this project. However, there were other issues that can be regarded as being more geographically generic and that are not so dependent upon scale. In this sense, they may be regarded as meaningful to all the rangelands which makes them particularly notable in this project. What follows now is a review of these issues.

4.2.1 Accessing country

The first of the issues can be summarised under the heading of 'access to country' but arguably there could be a number of sub-headings implied here. In many ways this also relates to resourcing because some informants expressed difficulty accessing their traditional lands (especially where their country is very remote) because of a lack of infrastructure e.g. vehicles and roads being inadequate. But there are also concerns with respect to different land uses, especially where pastoral use and traditional uses clash. In essence, there is some concern that Indigenous people's access to sites is being made difficult by constraints imposed by pastoralists and others e.g. mining companies. It would also appear that this has become more of an issue since Native Title claims have become more commonplace in the rangelands (Jackson 2007 *pers. comm*.). If this is a widespread problem then it obviously has major implications to Indigenous people since access to country plays an important role in the maintenance of their culture. It will also affect the Elders' capacity to pass on their knowledge of country to future generations if they are unable to take the new generations to the country and to sites of cultural importance.

The extent of the access problem really needs further investigation to determine its significance compared to other issues raised. If there is a problem here then it must also have implications for monitoring; if access is difficult then monitoring resources and environmental changes from 'on the ground' and/or ground truthing will be difficult or perhaps impossible.

It seems that over-access may be as much of a concern as inability to access. A number of informants expressed concern that people without permission (regardless of culture and ethnicity) are accessing sites of special cultural significance. This is obviously more of a concern where infrastructural access e.g. roads, are available. Signage pointing out the cultural significance of sites and signs that request potential trespassers not to access, in many ways, only draws attention to the sites which effectively encourages access by undesirable and/or irresponsible users. Arguably this is not an NRM issue and therefore perhaps it is an issue that lies outside the scope of this project; nevertheless, it is an issue of concern that was identified by a few ILMOs (e.g. King 2007 *pers. comm*.).

4.2.2 Longitudinal perspectives

Another theme that arose, which has a temporal implication, relates to bush tucker and bush medicines. A few informants (e.g. Crowley 2007 *pers. comm*.) commented that Traditional Owners are not only concerned with the geographic distribution and health of bush tucker and bush medicine species but they are also concerned with seasonal variation – how a change in a plant's physiology is impacted by seasonal conditions. This may have longer-term implications given the predicted climate change scenarios which will affect the nature of seasons in the rangelands. Fire history is also significant here because some species apparently undergo physiological changes when exposed to the influence of fire (e.g. smoke).

4.2.3 Land capability

As noted above (Section 2.2.7) two informants suggested that it would be useful if information about the productive capacity of country was available. One felt that this information would be enormously useful to ILMOs so that they could determine what prospects there were in obtaining an economic return from country. The implication here is a reference to land capability and there is a long history of land capability assessment in the agricultural industry. However, it is unclear at this stage how much data of that kind would be available for non-pastoral; uses at jurisdictional and regional scale. It is certainly something worthy of investigation.

4.2.4 Fencing

Another issue that also relates to resourcing is fencing. Many ILMOs want to be better informed about the condition of fencing in their country – especially where water holes are concerned. They clearly recognise the potential damage feral animals in particular can cause in and around water resources and they see fence condition as important in preventing erosion and other damage.

4.2.5 Sense of powerlessness

It was noted in the review that many Traditional Owners feel a sense of powerlessness and/or autonomy when it comes to the management of their country. This theme was also very evident during the interviews with our informants.

4.2.6 Appropriate geographic boundaries and scales

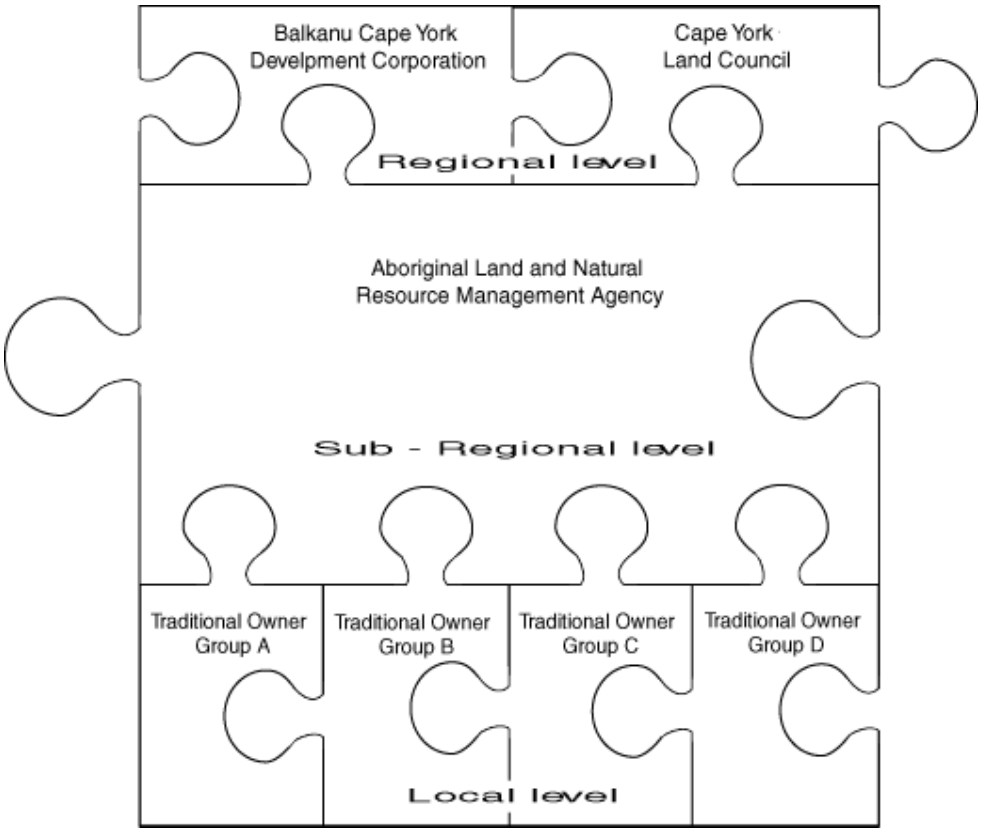
A common theme to emerge in the discussions with informants was the issue of appropriate landscape definition for NRM. Two main considerations emerged; first, there is the question of scale, and secondly, there is the question of definitions of boundaries.

Clearly the considered 'appropriate' scale for delivery of NRM programs in the rangelands is the so-called 'regional' scale. The NRM regional NHT and NAP areas have become the main jurisdiction boundaries acknowledged by government – especially the Australian Government. While one of the main

purposes of these is setting strategic directions for Australian Government NRM funding, it is acknowledged that each Body responsible for NRM in its region will then allocate funding to its sub-regional areas in an appropriate manner according to these regional strategic plans which set out the NRM actions for its region. There has been some debate over the appropriateness of these regional scales for NRM since their introduction but it was not really the purpose of this project to explore this in any detail. That said it seems notable that since there is concern over the suitability of these boundaries in the commercial agricultural/pastoral sectors, then the question seems all the more pertinent when considering the Indigenous circumstance because resources appear to be one of the central issues facing ILMOs.

The far north Queensland situation is perhaps a useful example to consider here (Figure 2).

Figure 2: Schematic diagram of scale hierarchy for NRM in Cape York, Queensland[4]



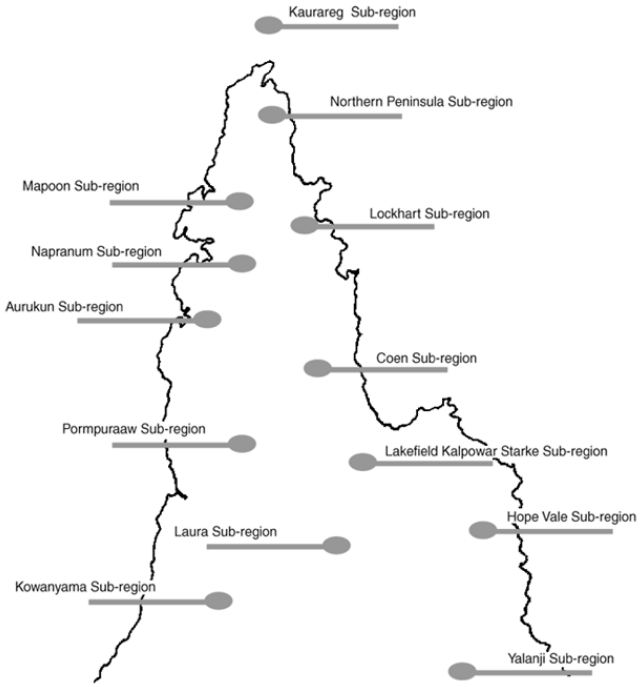
At the regional scale is the Balkanu Cape York Development Corporation (BCYDC) and the Cape York Land Council (CYLC). It is perhaps notable that the Wet Tropics too is operating at the regional scale and in bioregional terms, this seems entirely appropriate that NRM strategies, and therefore funding

[4] Balkanu Cape York Development Corporation (1999)

arrangements, be designed around these areas. Similarly, the CYLC has a strategic plan to progress NRM at the regional scale.

Operating at a sub-regional level are what can be described as the Aboriginal Land and Natural Resource Management Agencies, e.g. Kowanyama, where Indigenous communities have established independent bodies to develop programs for the environmental and cultural management of their land. More of these have been proposed by BCYDC (Figure 3) because they see this scale as being ideal for strategic NRM and funding arrangements.

Figure 3: Proposed sub-regional NRM areas for Cape York, Queensland[5]



Dermot Smyth argued that, in a cultural sense, regional and even sub-regional scales appear inappropriate. He suggests that tribal languages, and even the differing dialectic variations, are culturally more important to Indigenous people than those derived or perhaps 'imposed' by governmental agencies outside the localities of concern (Smyth 2007 *pers. comm.*). The implication is that mapped language boundaries or tribal areas, such as those demonstrated by writers such as Tindale (1974), Dixon (1976) and Chase and Sutton (1981), would probably be more meaningful to traditional owners and so could encourage greater involvement in NRM and environmental monitoring and reporting. Considering this point with respect to Figure 3 above, it seems appropriate perhaps that the local boundaries consider these

[5] Balkanu Cape York Development Corporation (1999)

language and tribal areas. It is unclear to URS at this stage what if any such local boundary arrangements exist at this time. Further investigation of this seems warranted.

The geographic hierarchical nature of land information needs to be considered i.e. the regional and local (language, tribal, clan) contexts must be considered when considering data about country. Any systems that are established to manage land information will have to also ensure that sensitive cultural information is secure and that data exchange is conducted in accordance with information sharing agreements.

4.3 Monitoring environmental change and data collection from within Indigenous lands

It is clear from the telephone interviews and face-to-face meetings that there are no standard protocols for the monitoring of environmental change within Indigenous lands. Approaches and methods vary considerably depending upon what is of concern; again, the capacity of the particular ILMO also seems important. One of the more common approaches that emerged is the use of photography using photo points to make assessments – usually of vegetation cover to determine the impact of stock or more specifically following a fire. Trap and release programs are also being used by the Indigenous Land Councils to monitor some rare and threatened species (Crossing 2007 *pers. comm.*).

The resource and environmental data being collected by ILMOs appears to vary greatly and what is collected depends very much upon the scale of responsibility and the organisational capacity of the ILMOs. The Indigenous Land Councils appear to be the most sophisticated data collectors and the Land Councils have some well funded projects with data collection objectives (Crossing 2007 *pers. comm.*). Nearly all the smaller Aboriginal Corporations contacted collect little if any actual 'data' that could be delivered or utilised at larger scales. But at the regional level, it can be confirmed that data are being collected by some organisations on phenomena like: rare and/or threatened species, biodiversity, feral animals, invasive weeds, waterhole maintenance, wetland condition and fire history. The quality of these data are difficult to ascertain from the phone calls and short meetings that took place within this project and further investigation seems necessary to explore this. Again however it is clear that the quality of data will vary from ILMO to ILMO and once again resourcing is clearly implied as a factor determining what is collected and how well. Finally, assessing the value and availability of these data should be an activity for ACRIS partners.

A study carried out by Scott (2004) set out to summarise digital Indigenous Knowledge databases in Northern Australia. While the findings of this study are now three years old, they are nevertheless relevant to this project and so the main points are now summarised [6].

Scott (2004) was able to identify 38 Indigenous Knowledge databases in all. Seven of these were available through websites, five were only available by CD-Rom and 16 were stored on computer hard drives. The databases held information on the following:

[6] Details of the most notable of these datasets have been included in the Appendix to this report (Section 7.3).

- Ethno-botanical (12)
- Ethno-zoological (7)
- Linguistic (9)
- Genealogical (3)
- General environmental (8)
- Other (including local history and art) (17)

Perhaps not all of these databases are of specific interest to ACRIS but certainly all environmental data will be of relevance.

More specifically, there were a host of other culturally important landscape features considered worthy of monitoring emerged during the consultation process. These would include but are not restricted to the following: water courses; water quality and quantity; sacred sites; hunting areas; story places; birth places; rock art sites; and, camping sites. It would seem likely that there is potential for environmental monitoring where data are also being collected on these.

4.4 Land data management within Indigenous lands

It was quite difficult to illicit meaningful responses to the question of land data management. For the smallest ILMOs contacted, the question seemed largely irrelevant since land management data are not something they have necessarily considered. For the largest organisations – the Indigenous Land Councils, the larger Indigenous Land Management Organisations and major government programs, who are using GIS facilities, for example – they are clearly managing digital data in quite a sophisticated manner in some cases. Examples of such systems are detailed in Appendix 8.3.

Table 2 is an attempt to summarise the data types, scales and probable metadata arrangements that would apply to the rangeland landscape features described above. Again, the list of landscape features presented cannot be considered exhaustive and it would almost certainly vary in detail depending upon the geographic area. That said those identified are likely to at least be generic to all rangeland areas.

Table 2: Landscape data types, scales and metadata for monitoring landscape change in the rangelands

Landscape feature	Most applicable scales	Data type/s	Possible metadata criteria*
Ethnobotanical e.g. bush foods & medicines	Regional & local	Oral history (audio, CD or documented); photos	• Type/s of data captured • Date captured • Author or person who captured the data • Description • Cultural value • Environmental value • Data projection (e.g. GDA) • Datum used (e.g. WGS 84)
Ethnozoological e.g. hunting species, totem species	Regional & local	Oral history (audio, CD or documented); photos	
Weeds (woody; aquatic etc)	Regional & local	GPS coordinates; aerial photos; photos of vigour; management zones	
Feral animals	Regional & local	Photos; scats	
Fire history	Regional & local	Photos; aerial photos; management zones	
Waterways	Regional & local	Aerial photos; photos; topographic maps	
Wetlands	Regional & local	Aerial photos; photos; topographic maps	
Waterway flows	Regional & local	GPS coordinates; flow history	
Water quality	Regional & local	GPS coordinates; photos (turbidity)	
Stocking rates (pastoral areas)	Regional & local	Stocking histories; management zones	
Stock forage productivity	Regional & local	Aerial photos; photos; management zones	
Fencing	Local	Photos; management zones	
Erosion	Regional & local	Aerial photos; photos	
Salinity	Regional & local	Aerial photos; photos	
Sacred sites	Local	GPS coordinates; photos; audio; CD; documents	
Hunting areas	Local	Management areas; CD; photos	
Story places	Local	GPS coordinates; CD; photos; audio	
Birth places	Local	GPS coordinates; CD; photos; audio	
Rock art sites	Local	GPS coordinates; CD; photos; audio	
Camping sites	Local	GPS coordinates; CD; photos; audio	
Tribal/language areas	Regional & local	Anthropologist's reports/maps	

* The metadata arrangements were suggested by the Aboriginal Rainforest Council (2007)

Metadata refers to 'data about data'. It therefore includes such things as 'when the data were collected (date), what format the data are in (e.g. raster data, coordinate data etc), who or what is featured in photographs, and so on. It will be essential to 'standardise' metadata arrangements as much as is possible so that information exchange between ILMOs and external agencies can take place.

Of course the subject of metadata arises when considering electronic data storage and management systems. Clearly ILMOs need to become better equipped in this regard in order that they are better able to manage their country and it will also assist in data exchange processes also. However, as the literature review noted and it came up again during the interviews, human capacity is a crucial issue. Even if such information systems are installed by external support the ILMOs will need to develop the capacity to use the systems so training and education will be essential for empowering local people in the on-going use and management of such information systems (Rodder 2007 *pers. com.*).

Inevitably it will be necessary for funding to be provided to regional and sub-regional ILMOs so that they can employ skilled-up project officers to support Traditional Owners with such systems. Suitable training courses and materials will almost certainly need to be produced for training purposes. And, cultural sensitivities come into play here also; the choice of officer must take account of gender and other avoidance issues (e.g. age, ongoing relationship or trust within the community) relevant to particular groups and the information they wish to be supported in recording and mapping (Aboriginal Rainforest Trust 2007).

4.5 Land data accessed by ILMOs from external agencies

Most of the data available through national data providers such as ERIN or the NLWRA is regarded as being at a scale that is inadequate even at the regional, but certainly at the sub-regional and local levels. Nevertheless, a large variety of land information is apparently accessed by ILMOs but it would appear that different organisations access different data. Again, it seems that for many of the smaller Aboriginal Corporations this question is of little relevance. For the larger ILMOs usually most of the land data obtained comes in the form of maps e.g. soils maps, vegetation maps, geological maps and for those that have computer (if not GIS) facilities, these are provided digitally when possible. Other non-map land information products are also accessed; for example, satellite imagery, air photos, photo mosaics, and topographic maps. In WA and the NT at least, fire history data can be accessed via the internet. More specific data is also accessed by the larger ILMOs – the CLC for example is accessing data on sites of botanical significance, wetlands and threatened species (Crossing 2007 *pers. comm.*). Most of these data are descriptive of the resources, with the exception of fire, specific information on change in these resources over time was less mentioned.

Most of the data accessed by the ILMOs contacted are being acquired from State/Territory governments – from the land information and/or resources agencies. But data is also accessed form Commonwealth agencies such as satellite imagery and other maps products form the Australian Centre for Remote Sensing (ACRES) and the Australian Surveying and Land Information Group (AUSLIG).

One dataset that was mentioned by a few informants as being needed was biodiversity information but this is apparently difficult to obtain and there are issues with respect to scale (see below). As noted

above, land capability and land systems data would also be considered useful but again most of this seems only available for pastoral lands and much less is available for other Aboriginal lands. The scale of information availability was also raised, with the perception being from those interviewed that information at useful scales cannot be accessed. In the case of pastoral lands, where there is good information in many regions, this may be a situation of people not being aware of just what is available.

The subject of resourcing also came up here with many informants commenting about the costs involved in purchasing land information data. Given the problem of trust (discussed previously in Section 3.2.10) it would seem that there is an opportunity here to both overcome the resourcing problem and trust at the same time. If 'non-free' data could be made available to ILMOs free of charge, without any restrictions on its use, then perhaps a long-term 'win-win' situation could be achieved – where both ILMOs and State/Territory government agencies build mutually beneficial institutional arrangements through the provision of land information data. Such arrangements may or may not be possible and there is a case for investigating the degree to which this issue is a constraint to the accessibility of relevant information.

There is concern by some who work with ILMOs that many do not have the capacity (skills) to work with land information data as it is presented by such agencies. In other words, the data medium (whether it be map or otherwise) is not easily understood by many Traditional Owners. As noted in the literature review for this project, this may in fact be a more critical question than resourcing because even if data could be made available free of charge, it would not prove very beneficial to ILMOs if they lacked the capacity to interpret and use it.

Spatial data is provided at a variety of scales – from 1:1,000,000 down to 1:10,000 depending upon what is accessed. Again, many of the informants commented that the level of detail provided by Commonwealth, State and Territory governments was inadequate (basically suggesting they would prefer higher resolutions) because it is insufficient for on-ground field work (e.g. Haddon 2007 *pers. comm*.). For example, 1,000,000 vegetation maps are regarded as being of little real use. Most of the higher resolution data collected, for example for stocking rates, tends to be generated by specific projects that have been funded independently (Jackson 2007 *pers. comm*.).

Table 3 summarises the land information that many regional and sub-regional ILMOs are either already accessing or that they might wish to access. Again, the information contained in this Table is likely to represent the generic needs of regional and sub-regional ILMOs; specific needs will again vary according to geographic context and it will almost certainly vary for those organisations operating at the local scale.

There may also be a range of socio-demographic and socio-economic data that might be of interest to regional and sub-regional ILMOs (Haddon 2007 *pers. comm*.) but such data are considered outside the scope of this project given its focus on environmental resource monitoring and data.

Table 3: External land information/data accessed by the larger rangeland ILMOs

Data accessed	Providers	Probable scales
Vegetation	State/Territory gov't agencies	1:1,000,000
Geology	State/Territory gov't agencies	1:500,000
Digital Elevation Models (DEM)	State/Territory gov't agencies	
Roads, Drainage, Community Locations etc	Auslig	1:1,000,000
Fire History	State/Territory gov't agencies	Various
Ramsar or other important wetlands	ERIN; State/Territory gov't agencies	inadequate
Bore Locations	State/Territory gov't agencies	
Bioregions	Environment Australia	Poor resolution
Land use e.g. agriculture, forestry, mining	State/Territory gov't agencies	Poor resolution
Land tenure	State/Territory gov't agencies	Good resolution
Satellite Imagery 107/77X9	ACRES	Good resolution
Quick Look mosaics	Auslig; State/Territory gov't agencies	Poor resolution
Topographic maps	State/Territory gov't agencies	1:250,000
Aboriginal heritage sites registers	State/Territory gov't agencies	Good resolution

4.6 Opportunities for data exchange (ACRIS & ILMOs)

The telephone interviews and face-to-face meetings suggest that for the most part there is much land information that could be potentially exchanged if the media are flexible enough to cope with the cultural requirements and if trust can be developed to the degree that ILMOs are confident about how their information is treated. In terms of top-down arrangements i.e. government making data available to ILMOs, it is clear than many ILMOs are already accessing land information from both Commonwealth and State/Territory agencies in the same manner as other more conventional NRM organisations – especially those operating at the regional level. For those ILMOs operating at the more local scale, the main problem appears to be one of communication; most contacted in this study seem largely unaware of what might be available and even if such information were to be provided, it would seem likely that they would not appreciate how such data could be used or their relevance. There is perhaps a case to investigate more fully the extent of this problem and consider best ways to communicate the potential benefits of accessing and using such information.

However there is a problem of relevance; the small Aboriginal Corporations seem not to be accessing such information because they see little value in obtaining such information (the scale issue discussed above may be a major impediment). Again, this question needs further investigation with closer contact with the small-scale ILMOs.

In terms of bottom-up processes, i.e. ILMOs providing data to government agencies/arrangements concerned with data collection, there would appear to opportunities for this to take place with some data that is collected but there are certainly limitations on others. For example, data about sites of special spiritual/cultural significance, e.g. sacred sites or burial grounds, which apparently feature highly in terms of many ILMO priorities; such information is unlikely to be made available willingly. Similarly, there are intellectual property implications with some data, especially those of an ethno-biological nature – bush foods and medicines. One informant described an example where information on a particular fish was made publicly available which resulted in a commercial company accessing the area only to fish it out completely (Hadden 2007 *pers. comm*.). Such stories only reiterate the need to closely guard such information.

It seems clear that ILMOs are increasingly collecting data about their country in digital photographic form and video. This presents a challenge for agencies wanting to integrate such data into their reporting systems and exchange arrangements will need to be developed so that they are able to cope with large volumes of data that is likely to be transferred. Having access to this information could be very valuable in complementing other ACRIS data sources to provide a richer picture of land status and trends.

4.6.1 Data access standards

Standards and protocols is an area that will present continual challenges to both ILMOs and governmental agencies looking to report on environmental condition. There are at least two areas that must be considered. First, as discussed above, it will clearly be beneficial if metadata arrangements are 'standardised' as far as is possible across the rangelands. However, for this to occur, standards will also have to be developed for the monitoring and data capture of country. There are some standards of this kind under development (e.g. the Balkanu Traditional Knowledge Recording Project) and the Wet Tropics Management Authority and perhaps there are opportunities to examine these more closely to determine whether a generic system might be developed (Aboriginal Rainforest Council 2007).

Secondly, as identified above (Section 3.2.10), there are important Intellectual Property (IP) and cultural sensitivities that must be considered when it comes to accessing and exchanging land information for Indigenous lands. This is especially true in 'bottom-up' circumstances i.e. where information is being gleaned from ILMOs about their land. The *Indigenous Knowledge Forum* that was held in Alice Springs in May 2003 acknowledged some of the issues in this regard, the two most pertinent in this context being: not consulting the right people (i.e. who is able to speak for country); and, lack of mechanisms to protect Indigenous knowledge (Department of Environment & Water Resources 2007), where the second point here is essentially concerned with IP.

4.6.2 Data access protocols

It seems clear that there are no standard protocols for the management of land information by ILMOs – given the enormous variation in the size and jurisdictional responsibilities ILMOs have in the rangelands, it maybe unrealistic to expect such protocols to be adopted even if they could be developed. The Aboriginal Rainforest Council (2007 p.7) also noted that, 'each country and each Traditional Owner

group will have a different way of connecting to and speaking for that country and different cultural obligations in terms of collective ownership'. Chris Roberts (Balkanu Cape York Development Corporation) summed up the issue of IP when he said. 'In relation to Intellectual Property and copyright, the community or Indigenous group concerned should retain all rights as this is likely to encourage participation' (2007 *pers. com*.).

What is clear is that careful consideration must be given to the rights and obligations of Traditional Owners with respect to land information are determined under traditional laws and customs to ensure that the individual and groups concerned are only providing information that is appropriate. This will require careful investigation at the local and regional geographic contexts concerned because these considerations will vary from place to place over the rangelands.

The issue of empowerment seems notable again here also. If Traditional Owners feel confident that their knowledge is being protected and handled appropriately then they will feel empowered to manage their country; consequently, they may be more likely to seek out and use land information provided by others such a governmental agencies (Rodder 2007 *pers. com*.).

In summary, appropriate intellectual property and access to information protocols will need to be established for each region, sub-region and locality that can facilitate authorization of summarised data to be transferred to external agencies (Aboriginal Rainforest Council 2007).

Findings, conclusions and recommendations

SECTION 5

This section summarises the findings, conclusions and recommendations from the project, drawing on both the literature review and the consultation phases of the project.

5.1 Findings

The main findings from the study are as follows:

ACRIS has developed within the Non-Indigenous scientific tradition of knowing rangelands

ACRIS products have been developed within one system of rangeland knowledge being the Non-Indigenous 'rational' scientific tradition with a focus on commercial grazing of domestic animals. Indigenous people in these situations need access to this information, but have not usually been included within the ACRIS network. It is also evident from the literature reviewed and people consulted that there are distinct Indigenous ways of knowing and managing rangelands that are important for Indigenous management objectives, and the welfare of the people living in them.

Indigenous values are very different to Euro-centric values

Traditional Aboriginal management of the landscape often relies on song and ceremony, and knowledge of management is passed on through tradition and culture. 'Hard' systems of management, such as those typically employed by non-Aboriginal managers, are often regarded as having very little or no value to the Traditional Owners (TOs). For example, many of the concerns that non-Aboriginal people have about land degradation are not the concern of the TOs.

Ethno-biological knowledge has clear cross-cultural value; it should not be separated from other potentially valuable cultural landscape features

Many TOs would appear happy to share appropriate traditional knowledge about their country (e.g. bush tucker and medicines), especially where it provided the opportunity for future Indigenous generations to access such knowledge. Such information may provide valuable insights about the relationships between plants, animals and environment.

TOs are also concerned with seasonal variation – how a plant's physiology changes and is impacted by seasonal conditions.

Other landscape features with cultural significance to TOs would include: water courses; water quality and quantity; sacred sites; hunting areas; story places; birth places; rock art sites; and, camping sites.

Fire has always had, and still does, an important role in Indigenous land management

Data on fire history would be enormously useful to TOs, mainly because it would help with decision-making for monitoring recovery and strategic burning. However, not all ILMOs are able to practice traditional management because of increasing difficulties in accessing country (see below).

Weeds and feral animals are as much a concern to TOs as they are to other rangeland managers

While this may be the case, many species that are regarded as 'feral' from the Euro-centric perspective are regarded more positively by Indigenous people. The criteria that many TOs are concerned with is how easy (or not) an animal is to catch and how it 'tastes'.

Coastal management and climate change are of special importance to many Indigenous communities

There are numerous Indigenous communities located in the coastal fringes of the rangelands and the marine and coastal resources available to these communities are important to them, economically and culturally (see Southern and Northern Gulf NRM Regional Strategies). The stability of coastal landforms is an important consideration, especially when they are subjected to frequent and inappropriate use. Further, the flora and fauna in coastal habitats are confined to narrow habitats and can easily be affected by excessive harvesting, or habitat depletion. Communities with custodianship for sections of coastline need localised and site specific data and information on the coastal resources and trends in those areas.

Given the close association of many Indigenous people with particular areas of land, and in some cases a direct dependence on that land for food and cultural support, predicted climate change will pose special difficulties in adaptation for these people.

Land capability information would assist Indigenous pastoralists

ACRIS has abundant information sources targeted at commercial grazing use of rangelands. Yet pastoral issues were not raised by many informants interviewed in this study. However, those that have been involved with ILMOs that have commercial pastoral properties commented on the value of land capability information. Building familiarity with the available information is required. Rangeland management history would also be of use to contemporary managers.

Land information custodianship is a central issue to TOs

Historically, land information from Aboriginal people has tended to be used by settlers to effectively dispossess Traditional Owners. Consequently, land information exchange systems need to be developed in such a manner that they assist in establishing trust. There is a need to establish suitable protocols to ensure that ethno-ecological

information is distributed only to those that have permission to receive it and that the context of use is understood by the providers.

There is a clear need for further funding to support ILMOs in their land management

All informants interviewed emphasised the need for further resourcing to both provide infrastructural capacity (vehicles to access country, computer hardware and software, monitoring equipment, GPSs etc) and to build human capacity (training and skills development).

Clearly ILMOs need to become better equipped in this regard in order that they are better able to manage their country and it will also assist in data exchange processes also.

Funding is also necessary so that ILMOs can employ skilled-up project officers to support TO with land information systems. Suitable training courses and materials will almost certainly need to be developed.

Many informants commented on the costs involved in purchasing land information data. If agencies could make land information available to ILMOs free of charge, without any restrictions on its use, it would help to overcome at least one resource issue and perhaps it might also help rebuild trust between agencies and ILMOs. Such arrangements may or may not be possible and there is a case for investigating the degree to which this issue is a constraint to the accessibility of relevant information.

Building capacity within ILMOs is necessary if these organisations are to be able to collect, access and manage land information

As the above point emphasises, building human capacity is a crucial issue. Even if 'state of the art' land information systems were funded and installed ILMOs need to develop the capacity to use the systems. Further training and education is essential for empowering local people in the on-going use and management of such information systems.

It is also clear that many local ILMOs are unaware of what agency information (and ACRIS products) are available. Training is also required in this area.

Accessing country is becoming increasingly difficult

Some informants expressed difficulty accessing their traditional lands (especially where their country is very remote) because of a lack of infrastructure e.g. vehicles and roads being inadequate. There is some concern that access to sites is being made difficult by constraints imposed by pastoralists and other land users e.g. mining companies. It seems likely that this has become a more serious issue since Native Title claims have become more commonplace in the rangelands. If this is a widespread problem then will make it difficult for Elders to

pass on their knowledge of country to future generations, and it will inhibit landscape monitoring.

The question of appropriate boundaries and scale for land information is central to ILMOs

The scalar hierarchy for land management across Indigenous land in the rangelands varies across the States and Territories. In fact, so variable is this that it is difficult to present a generalised description. What can be said however is that there are regional, sub-regional and local scales operating but the specific responsibilities of ILMOs varies enormously even at the regional level. Most critical for natural resource management (NRM) perhaps is the fact that most Commonwealth funding arrangements recognise the regional and sub-regional levels. Regional organisations, such as the Central and Northern Land Councils in the NT and the Cape York Land Council in Queensland for example are well established and acknowledged. However, it would seem that the sub-regional and especially local levels are less established – especially when it comes to their delineated boundaries. It has been suggested that catchment boundaries (commonly identified as suitable local land units in Euro-centric NRM) may not be appropriate for Indigenous lands. Boundaries based on language and/or tribal areas may be far more meaningful to Traditional Owners. This question seems worthy of further investigation.

Land information data are not being accessed by local Aboriginal Corporations

Some ILMOs are accessing land information available in the public domain (see Table E3). Conversely, many local Indigenous organisations have responsibilities that have little to do with land management e.g. Aboriginal health, education etc. However, of those that were contacted which we presumed would have a land management role, very few either collected land information themselves or accessed data from external agencies. It seems that most know little about what data could be provided and most also believe it would be of little relevance anyway – not useful information or not provided at a meaningful scale.

There appear not to be any generic standards or protocols for land information management in the rangelands

It would be beneficial if metadata arrangements are 'standardised' across the rangelands but if this is to occur standards will have to be developed for the monitoring of country and data capture. Standards are under development (e.g. the Balkanu Traditional Knowledge Recording Project and the Wet Tropics Management Authority) and it would be useful to examine these more closely to determine whether a generic system might be developed.

Intellectual Property (IP) and cultural sensitivity is a crucial component of information exchange

The two most pertinent issues with respect to accessing land information from TOs is: not consulting the right people (i.e. who is able to speak for country); and, lack of mechanisms to protect Indigenous knowledge. Traditional laws and customs vary across the rangelands and each TO group will have a different way of connecting to and speaking for that country – the TO group concerned must retain all rights.

5.2 Conclusions

5.2.1 Recognising diverse Indigenous interests in land

> 'The viability of people is a co-requisite for delivery of NRM outcomes in northern Australia. Travelling solely down the road of biophysical targets is not going to be enough in this region.' (Roberts 2007 *pers. com*.)
>
> 'Traditional Owner participation in any process requires respect for people, their history, their values and their circumstances' (Roberts 2007 *pers. com*.).
>
> 'It is perhaps not so much how the capacity of Indigenous people can be developed to address NRM issues, but how innovative approaches to NRM and planning may be used to address serious issues of social and economic disadvantage for Indigenous people in the region' Mark Fenton 2004. (Quoted in FNQ NRM Ltd and Rainforest CRC, 2004).

Aboriginal land is subject to a variety of land uses and each of these occurs within a different environmental, economic, social and political context. The management of Aboriginal lands is a complex issue. From a physical perspective the enormous land area and remoteness of many locations present particular challenges. The challenge is to put into place systems of management which can function in this complex environment and which meet a number of basic criteria. These basic criteria include sustainability, Aboriginal management and control and optimal economic, social and cultural benefits.

There is a 'need for further research into Aboriginal perceptions and management techniques as there remains a paucity of information on which to base future land management policy in respect of Indigenous interests. While it is not the task of ACRIS *per se* to address this deficiency, ACRIS can lead by example in increasing the amount of information targeted at Indigenous interests in future ACRIS products.

5.2.2 Indigenous views of rangeland management processes

Many of the ILMOs contacted expressed frustration with non-Indigenous land management processes in the rangelands, especially those that involve government. The frustration has two sides to it: first, there is still a strong perception that the Traditional owners are not being consulted enough about land use and development in and around their areas. Secondly, many feel under-resourced – that government is merely paying lip-service to their needs rather than providing the resource necessary for them to really get to grips with the land management problems that they face. There is clearly a human capacity issue also; many lack the necessary skills to embrace the language and technological implications of national land condition reporting systems. When it comes to resourcing, many have difficulty in accessing resources that could improve their infrastructure, which could both assist them to access and manage data from outside their areas of concern and provide them with better opportunities to access their country so that they could monitor the condition of their country.

5.2.3 Increasing the accessibility of relevant information

Pastoral management information

Conventional rangeland management information is readily available to non-aboriginal pastoralists through various government bodies, based on many years operational experience in developing techniques and media for how this information can best be generated and presented. This information is tailored towards the needs and interests of commercial grazing enterprises. However, it is equally important to Indigenous managers of grazing enterprises. Not surprisingly, Aboriginal people have difficulties accessing this information, understanding how it should be applied to address multiple values and objectives, and then obtaining the support and resources to put 'new' knowledge into practice.

Ongoing research into Aboriginal perceptions of land management issues will provide a basis for this information transfer, but there is also a need for a re-assessment of Aboriginal access to resources for the practical implementation of sound land management practices and in particular for any rehabilitation which may be necessary as a result of past land use.

Indigenous environmental and cultural information

The enthusiasm and commitment amongst Indigenous peoples for the capture and use of traditional ecological knowledge is being realised in a number of projects (past and present) that are recording this knowledge in spatial and non-spatial dimensions in many locations. One useful initiative would be for a central organisation to develop a nationally applicable platform for the storage and presentation of this material (after considering that which is culturally sensitive and should not be made available) in a format that provides an overall Indigenous view of rangeland resources at spatial and non-spatial scales.

Towards a 'duality' in rangeland environmental knowledge

ACRIS products have been developed within one system of rangeland knowledge being the Non-Indigenous 'rational' scientific tradition with a focus on commercial grazing of domestic animals. Indigenous people in these situations need access to this information. It is also evident from the literature reviewed that there are distinct Indigenous ways of knowing rangelands that are important for Indigenous management objectives, and the welfare of Indigenous people.

Ultimately, it may be that we can move towards a duality in landscape description and change detection, that reports and cross-references non-Indigenous and Indigenous spatial and descriptive ways of interpreting the same physical phenomena. The potential benefits for both parties, and the synergies that would result from this increased richness in landscape understanding would enhance our capacity to manage the rangelands.

5.2.4 Developing long-term partnerships in Information generation, transfer and use

Providing rangeland management history to Indigenous landholders

There is a long history of 'scientific' rangeland management in Australia, most of which has occurred with no Indigenous involvement. Providing Indigenous land users and managers with this corporate memory and the available physical legacy would seem an appropriate gesture in partnership building, especially as Indigenous people expand their land holdings. Indigenous people can access the corporate memory via training, as discussed below. However, the physical legacy of ground-based sites that are no longer used or maintained because of resource constraints in government, but that have on-going value at local level could be provided to Indigenous people where those people have responsibility for the land involved.

Looking forward

Aboriginal people should be involved in scientific research activities. Opportunities for collaboration with researchers should be optimised to allow for maximum benefit in relation to biodiversity conservation, cultural diversity and recognition of native title rights and interests.

Partnerships built around sharing information will bring the best results. One-off meetings or other forms of one-way communication where information is presented have not been successful. Long-term partnerships are required for Indigenous knowledge to intersect with Non-Indigenous scientific knowledge systems. Very few government agencies have the capacity to undertake this level of involvement. Also, education that is community driven, rather than agency driven is better able to incorporate traditional ecological knowledge and integrate traditional and western knowledge for land management.

Traditional owners and scientists should work together on ecological surveys, projects and monitoring programs in ways that all groups negotiate and agree with. Also, equivalent or greater time and resources should be allocated to communicate effectively the results of research to Aboriginal collaborators as occurs currently for scientific peers, colleagues, and funding agencies.

Cross-cultural training for ACRIS staff

Most staff working in Government agencies responsible for the collection and dissemination of rangeland environmental information are non-Indigenous. In the same manner as large mining companies operating in the rangelands have embedded cross-cultural training into their standard workforce training (see BHP Billiton and Rio Tinto websites, and sustainability reports), if ACRIS staff are to have a meaningful dialogue with Indigenous land managers, then cross-cultural training and exposure is an essential requirement.

5.2.5 Building Indigenous capacity in information use

Being able to access information is in itself not sufficient for sound land management, a point made repeatedly in the standard adoption literature. The resources to use information and the capacity to implement and benefit from the information are also required.

Current barriers to implementing land management include a lack of appropriate land management programs and services, poor coordination of existing land management programs and services, inadequate availability of appropriate information for Aboriginal land managers, the lack of appropriate Aboriginal driven land use planning processes and an immediate need for information exchange between Aboriginal and non-Aboriginal land managers at all levels.

Indigenous Land Management Organisations (ILMOs) comprising Aboriginal Land Councils, resource organisations and cultural centres (e.g. language centres) are in the best position to identify the requirements of their constituents. These groups should be an essential link for directing government resources aimed at addressing Aboriginal land management problems. Land management departments and agencies need to be made aware of the needs of Aboriginal people and conversely Aboriginal people need access to information on land degradation and sound land management practices.

5.3 Recommendations

The following recommendations are suggested as a way forward to progress land information exchange between ACRIS, its partner agencies and ILMOs. These are drawn collectively from the Literature Review and the consultation process.

Recommendation 1: Develop and maintain a capacity within ACRIS to carry out on-going research into Indigenous knowledge requirements and contributions. This should extend to the inclusion of a national Indigenous organisation (e.g. Indigenous Land Corporation or the Office of Indigenous Policy Coordination or another suitable body) as a full partner in ACRIS.

Recommendation 2: Evaluate the collective suggestions for information capture and provision provided in the preceding tables and decide on their appropriateness and feasibility for management within ACRIS.

Recommendation 3: Develop platforms that enable better access by Indigenous people to relevant information. This may include GIS applications that can better handle traditional ecological knowledge.

Recommendation 4: Develop a program of Indigenous capacity building for ILMOs operating at the sub-regional and local levels. Establish formal training for Indigenous organisations in the access of, and use of ACRIS products. Further resources (funding) is required assist ILMOs at all levels to build capacity and provide the necessary infrastructure to both monitor environmental condition and to store and manage land information.

Recommendation 5: Provide relevant rangeland management history to Indigenous stakeholders both in the forms of corporate memory and the physical legacy of research sites and monitoring systems.

Recommendation 6: There are clear links between traditional and scientific knowledge. Many Traditional Knowledge systems are being developed for Traditional Owners across the rangelands. A more extensive investigation of these seems warranted to explore opportunities for developing them further to become land management systems also. Ultimately, ACRIS and Indigenous partners should work towards developing a duality of rangeland environmental knowledge that provides added value to both Indigenous and scientific traditions of how the rangelands are known.

Recommendation 7: Further partnerships in information collection and dissemination between scientists and traditional owners. Increase the number of Indigenous organisations that are networked within ACRIS (e.g. ILMOs, language centres, research centres in universities.

Recommendation 8: Implement cross-cultural training for staff working in ACRIS. This training has been very successful in improving relationships in other domains (health, education, mining).

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8.1 Questionnaire used to explore ILMO data needs

ACRIS – Reporting Environmental Change on Indigenous Land

Questions for Indigenous

Land Management Organisations (ILMOs)

Name of ILMO:……

Name of contact person:…….. Phone number:…….

Introduction

This project is concerned with the land management data needs of ILMOs. The project's main aim is to explore Indigenous land management values and data transfer opportunities mainly at the regional level. The project falls under the Australian Collaborative Rangeland Information System (ACRIS) which is the Commonwealth Government's coordinating mechanism for collating and distributing land information data on the rangelands.

The following questions have been compiled to explore issues that are thought to be of concern, however, the items identified are not intended to be exhaustive; there may be other issues that you would like to highlight and we would welcome that input as well.

1 What are the most significant land management issues that are most important to Indigenous people in your area? (list as many as may be appropriate)

2 What environmental/cultural features of the landscape are most important to Indigenous people? (list as many as may be appropriate)

3 Is your organisation collecting data for any of these?

4 How are you monitoring/collecting data on land/environmental condition/change?

5 How is land info being compiled/managed? e.g. what infrastructure does your organisation have access to – information centre, computers, internet facilities, broadband, a GIS etc?

6 What land information/data (if any) would you like to collect?

7 What land information/data (if any) do you access from outside your area?

8 What land information/data (if any) do you access from government agencies? Which agencies supply these data?

9 Would your organisation be willing to exchange land information/data with ACRIS? If yes, what kind of information and under what circumstances?

10 Would you expect there to be any difficulties in exchanging such data? If so, what might these be?

11 Do you have any cultural sensitivities with respect to land information/data (e.g. sites of special and/or cultural significance; sites for men/women)? If yes, are you able to explain the sensitivities?

12 Do you know of any other notable ILMOs that are concerned with land management and more specifically environmental/natural resource condition monitoring?

13 Which of these ILMOs would you say are the most 'progressive' in thinking about data needs for land management? (Contact details please: phone numbers/emails etc)

14 Is there anything else you'd like to say about Indigenous data needs?

That is the end of the questionnaire. Thank you for your effort.

8.2 People and organisations contacted during this project

The following people and organisations were contacted or in some way contributed to this project:

Contact	Organisation
Harold (Ally) Coe	NSW - ILMF
Robert Clegg	NSW - ILMF
Jeremy Russell-Smith	NT - Bushfires Council of the Northern Territory
Martin Young	NT - CDU
Tony Griffiths	NT - CDU
Peter Jacklyn	NT - Tropical Savanna CRC
David Garnett	NT - CDU & Tropical Savanna CRC
Natasha Stacey	NT - CDU Environmental Research
Kate Crossing	NT - Central Land Council
Mark Stafford-Smith	NT - CSIRO
Jocelyn Davies	NT - CSIRO
* Sue Jackson	NT - CSIRO
* Rosemary Hill	NT - CSIRO Sustainable Ecosystems
Alan Andersen	NT - CSIRO Trop Ecosystems Research Cntr
Sue Jackson	NT - CSIRO Trop Ecosystems Research Cntr
Glenn Wightman	NT - Herbarium
Maree Meredeth	NT - ILMF
Jane Munday	NT - Independent Consultant
* Cerise King	NT - Katherine Regional Language Centre
Kelvin Costello	NT - Larrakia Nation Aboriginal Corp
Dave Calland	NT - Larrakia Nation Aboriginal Corp
Donna Jackson	NT - Larrakia Nation Aboriginal Corp
Rod Kennett	NT - NAILSMA
Jean Fenton	NT - NAILSMA
Lorrae McArthur	NT - NAILSMA
Honorlea Massarella	NT - NAILSMA
Joe Morrison	NT - NAILSMA
Paul Josif	NT - Northern Land Council
Belinda Oliver	NT - Northern Land Council
Peter Cooke	NT - Northern Land Council - Caring For

Contact	Organisation
	Country Unit
Justine Yanner	NT - Northern Land Council - Caring For Country Unit
Bill Panton	NT - Parks & Wildlife Commission
* Kate Hadden	NT - Tiwi Land Council
John Hicks	NT - Tiwi Land Council
* Gabriel Crowley	NT – Tropical Savanna CRC
* Chantal Roder	Qld - Aboriginal Rainforest Council
* Troy Mallrie	Qld - Aboriginal Rainforest Council
* Robinson Salee	Qld - Angkamugti Traditional Owner
Melissa George	Qld - Burdekin Dry Tropics NRM
Marnie Parkinson	Qld - Carpentaria Land Council Aboriginal Corp
* Jim Monaghan	Qld - CSIRO
Michelle Craigie	Qld - ILMF
Barry Hunter	Qld - ILMF
Cliff Cobbo	Qld - ILMF
* Peta-Marie Standley	Qld - JCU Traditional Knowledge Recording Project
* Dermot Smyth	Qld - Smyth and Szabo Consulting
Miya Isherwood	Qld - Torres Strait Regional Authority
* Chris Roberts	Qld Balkanu Cape York Devp Corp
Daniel Fisher	Qld Balkanu Cape York Devp Corp
Phil Rist	Qld Girringun Aboriginal Corp
Eddie Smallwood	Qld Gudjuda Aboriginal Corp
Ron Archer	Qld ILMO Northern Gulf Indig Savannah Group
Bruce Hammond	SA - ILMF
David Singh	SA Aboriginal Lands Trust
Roger Ridney	SA Aboriginal Lands Trust
Jonathan Clifton	SA Aboriginal Lands Trust
John Chester	SA Aboriginal Lands Trust
Richard Mills	SA ILMO Alinytjara Wilurara INRM group
Lorraine Rosenberg	SA ILMO GM AWNRM (also ILMF)
Paul Jenkins	SA ILMO Indig Mand Corp
Andrew Drenen	SA ILMO Ngaanyatjarra Land Mgm't Unit
Steve Johnson	TS-CRC
Helen Ross	University of Queensland
Ronnie Atkins	WA - Alligator Hole Aboriginal Group
Murray McGregor	WA - Curtin University
Oral McGuire	WA - Gundi Corp (consultant)

Contact	Organisation
Charles Prouse	WA - ILMF
Paul Bowers	WA - ILMF
Kevin Walley	WA - ILMF
Allan Padgett	WA - Indigenous Land Council
Leonie Cameron	WA - Kalumburu Aboriginal Corp
Maureen	WA - Kennedy Ranges Indigenous Group
Jane Blackwood	WA - Kimberley Land Council
Peter McEntee	WA - Kimberley Aboriginal Pastoral Association
Rob Thomas	WA Aboriginal Lands Trust
Arped Kalotas	WA Aboriginal Lands Trust
Jessica Clearence	WA Aboriginal Lands Trust

* These informants were interviewed ‘face-to-face’

8.3 Details of 'Best Practice' examples of Indigenous knowledge datasets of ILMOs & associated organisations in the rangelands

Most of the following tables have been extracted (and in some cases up-dated) from Scott's (2004) report *Audit of Indigenous Knowledge Databases in Northern Australia.* Scott's report also contains other tables but many of these contain information that is of little relevance to this project, which is mainly concerned with environmental change, so those have not be included here. It is notable that since 3 years have elapsed since Scott prepared his report, one must assume that many of these systems he described may now be more developed than stated below.

Where a table has been developed as a result of consultations in this project, this is noted.

Balkanu – Cape York Development Corporation

About the organisation	Balkanu is a community and business development organisation set up by the Aboriginal people of Cape York. It works in a collaborative style with traditional owners and other organisations. It is based in Cairns.
Person to contact	Nick Smith or Chris Roberts
Overview	Ethno-ecology database for the Kaanju people (see: www.kaanjugaachi.com.au)
Rights management – IP and negotiation	Kaanju people gave permission for the data to be collected. Data is already back with communities at the Chuulangun Aboriginal Corporation.
Content	The GIS has primarily been used for land management planning, including weed and feral animal control and sustainable economic development.
Data structure	Input mechanisms are based on a GIS system, video and text, but currently this is fragmented and temporary.
Technical and design	Filemaker Pro
General comments	Looking for a database where the input mechanisms are more easily integrated.
Overall assessment	Currently in development.

About the organisation	See above
Person to contact	Nick Smith or Chris Roberts
Overview	Kuku Thaypan Project – conserving plant knowledge and sustainable plant use. (See: www.balkanu.com.au/projects/landresearch/) This project involved the establishment of a partnership between Kuku Thaypan people, Balkanu Cape York Development corp. and the Ang-gnarra Aboriginal Corp. Efforts have been concentrated on developing an ethnobotanical database, which will identify the plants and animals of the region that have been used for food, medicine, tools and other cultural purposes. Funding come form the Natural Heritage Trust.

Content	Since late April 2001 Kuku Thaypan traditional owners, Ang-gnarra Rangers and Nick Smith have undertaken many field trips to the country around Laura. Developing the database involves creating checklists to identify plants by their Latin names, cataloguing photographs and producing flash cards and videos.
Overall assessment	Potential for input to suitable GIS

About the organisation	See above
Person to contact	Nick Smith or Chris Roberts
Overview	Kuku Yalanji Project 'Junjuy Junjuy Yalanji-nga' – Indigenous Knowledge of Biodiversity. (See: www.balkanu.com.au/projects/landresearch/) From May to July 2001 Kuku Yalanji elders worked on this project with Adelaide Baird and Nick Smith (Balkanu). During this time they set out to develop a process by which the traditional plant and animal knowledge of the elders will be transferred and conserved. Part of this process included the production of a multimedia CD Rom that provides an example of how the aims of the project can be achieved. The CD Rom is now available to the community for their use.
General comments	Balkanu plans further work on this project and in particular aims to target skills development in young Kuku Yalanji people. These skills will involve recording and analysing the classification, use and management of plants and animal species. Further funding has been sought from Environment Australia to continue the project.
Overall assessment	Capacity building.

About the organisation	See Above
Person to contact	Sarah Edwards, Royal Botanic Gardens, Kew, UK
Overview	Wik and Kugu Project – Conserving Indigenous plant and animal knowledge for our future generations. Aurukun Ethnobiological database. (See: www.balkanu.com.au/projects/landresearch/) Wik, Wik Way and Kugu traditional owners have developed a partnership with Balkanu and the Aurukun Shire Council to collect, record and pass on information about their local plants and animals. The database integrates traditional Wik, Wik-Way and Kugu knowledge with 'western' scientific data, but gives parity to both knowledge systems.
Rights management – IP and negotiation	Data collection is directed by local Wik and Kugu people. All cultural information has the information source and flags to indicate if the information is 'sensitive' or 'women's business'. Anything that was 'secret' etc was not recorded, to avoid compromising local people in any way.
Content	Ethnozoological and ethnopharmaceutical information is being collected – bush medicines, materials, plant dyes, bush foods. To date (April 2004) it

	had over 200 Wik taxa and more than 1,000 scientific taxa.
Data structure	Scientific information includes nomenclature, taxanomic descriptions, chemical/nutritional/toxicity data and references.
Users	Workshops held with local councillors, Elders and Justice Group members to ensure all were happy with who should have access and control of the data. It was decided that the database would be held by the Land & Sea Management Centre of Aurukun Shire Council (who commissioned the project) and they were happy that it should be used in the school, with MOUs signed with the School Principal to ensure that no illegal copying etc takes place. It was also decided in a community meeting that the local health clinic could access the database, so that health professionals would know about alternative therapies people may be using and able to make informed assessment of potential health benefits or problems.
Technical and design	Database uses MS Access/VB/SQL software
Overall assessment	Could have uses in land management assessments

Balkanu Traditional Knowledge Recording Project (data extracted from the Aboriginal Rainforest Council (2007))

About the organisation	See Above
Person to contact	Chris Roberts
Overview	The Traditional Knowledge Recording Project seeks to empower traditional owners to capture traditional knowledge information using various methods including photography and video recording. Key attributes of the system include: references to compressed video, photos, and documents; transcripts, translation of language and other descriptive data; information categorised under locally determined themes e.g. bushtucker and fire management. There is a training hub used to train and support user groups. Data collection and computer hardware kit available to new user groups.
Data structure	Data is stored within FileMaker database. All data is stored in a relational database and is accessed via a user-friendly interface. Approx 20 TKRP databases have been installed in communities across Cape York and the northern Wet Tropics region. Installed on local computer and available to client computers on a local area network (LAN).
Rights management – IP and negotiation	Restricted access through password protection techniques; two levels of security available
Comments	This system and technology will be expanded across Queensland in 2007 and 2008 (including the country supported by the Girringun Aboriginal Corporation. Potential future data storage in partnership with Cisco – using a vault system located in Cairns or Sydney. Currently no spatial referencing exists in the system i.e. no GIS or mapping capability.

Central Land Council

About the organisation	The CLC is a Commonwealth statutory body incorporated under the Aboriginal Land Rights (NT) Act 1976 and is funded through the Aboriginal Benefits Reserve. It is an elected Aboriginal body which represents all Aboriginal people in the southern part of the NT. It is also a native title representative body.
Person to contact	David Alexander
Overview	Data has been collected for Indigenous Ecological Knowledge reports for some Aboriginal groups e.g. two Land Trust areas west of Tennant Creek six years ago (April 2004). Such studies are used for planning purposes by CLC and traditional owners and to record the knowledge of the old people. Funding has come from Environment Australia.
Rights management – IP and negotiation	Aboriginal traditional owners give permission for the studies. Any policy for returning data to communities would be tied up with IP issues.
Content	Plant and animal uses, fire management.
Data structure	Text and photos (not scanned as yet – April 2004)
Users	Traditional owners have hard copy reports and can request information from CLC
Overall assessment	If the data has been digitised then there is potential for incorporation to a GIS (if not already done so)

Cultural Site Management Systems – Uluru and Vanuatu (data extracted from the Aboriginal Rainforest Council (2007) and from observations made in accessing the Systems[7])

About the organisation	The Cultural Site Management System developed at Uluru Kata-Tjuta National Park between 1999 and 2005 was initially conceptualised by the traditional owners. Drawings were made in the sand to illustrate how a system could be used to appropriately manage cultural heritage sites. Systems developers took these ideas and developed an intuitive local and web-based database and map system that supported traditional owners to undertake the formal management and monitoring of these sites. More recently the principles behind this system have been adapted and progressed for the development of the Vanuatu Cultural Site Management System, and the Shoalhaven Defence Estate Heritage Database at Jarvis Bay.
Person to contact	Troy Mallie c/o Aboriginal Rainforest Council
Overview	Key attributes of the Cultural Site Management System include: data archive and management tool for the maintenance of cultural heritage sites and areas; internet and intranet GIS and map based application accessible to all users;

[7] Access was made possible with permissions provided by Troy Mallie, Project Officer attached to the two sites.

	ability to store a diverse range of data that can be related back to a site, area or track; field based data collection tools can be synchronised to the central (server based) system – using a palm top computer / electronic personal organiser; systems maintenance and administration can be performed locally or remotely; the system can support hundreds of users at the same time provided they have a connection to the server via a local network or the internet.
Rights management – IP and negotiation	Multiple security levels prevents unauthorised users from accessing sensitive information; ability to hide information according to cultural protocols e.g. when someone passes away – the ability to hide any information that pertains to them to respect sorry business.
Comments	This system has enormous potential for Indigenous NRM. It is user friendly, accessible, very flexible and empowering. The Aboriginal Rainforest Council is developing a similar system for its Cultural mapping project (see 2007 reference).

Department of the Environment and Heritage – Parks Australia

About the organisation	The Dept of Environment and Heritage is a Commonwealth Government agency. Kakadu NP is managed through a joint arrangement between the Aboriginal traditional owners and the Director of NPs. The Director manages Commonwealth national parks through Parks Australia, which is part of the Dept of the Environment and Heritage.
Person to contact	Zig Madycki and Rob McKinnon, Kakadu NP HQ
Overview	Collection of cultural information in Kakadu NP. Databases include an archaeological, historical, and rock art site register, language and ethnobiological data. Parks staff or anthropological consultants collected data in varying levels of collaboration with Aboriginal people. Databases are for use by Parks staff to help in the joint management of Kakadu. Some Indigenous knowledge information is on the Kakadu NP website (See: www.deh.gov.au/parks/kakadu/artculture/index.html)
Rights management – IP and negotiation	Traditional owners gave permission for data to be collected, but with some data there are no access protocols in existence. Currently (April 2004) writing to clan groups to find out what they want done with the data.
Content	Language; ethnobotanical, ethnozoological; rock art site information; archaeological and historical. For website – general information on the seasonal calendar, clans and kinship, ceremonial and dreaming sites.
Data structure	Some material collected in Aboriginal languages (e.g. on rock art sites); some in Creole; most in English.
Users	Parks Australia staff; public for internet site
Technical and design	Older material has been stored on a Paradox database or on Excel spreadsheets but is being up-dated to Access. ArcView GIS is being used for

	sites register. Electronic language dictionary is a word document. Most language data is only in hard copy.
General comments	Kakadu NP staff were hopeful that the data could be integrated into one large database (as in Parks NSW).
Overall assessment	Potential for land management and environmental monitoring if data is in time series.

About the organisation	See above
Person to contact	Mirjana Jambrecina, Uluru-Kata Tjuta National Park HQ; Paul Black, Natural and Cultural Resources Section, DEH.
Overview	Uluru-Kata Tjuta National park database. Fauna survey completed with traditional owners (Anangu) ten years ago which led to an Environment Australia report. Database is up-dated every 4 years and includes ethnozoological data when the consultants have time. Database is with the consultant Steve McAlpine – based in NSW) and does not reach Parks Australia or Anangu. The consultant sends a report. Flora surveys have also been completed. Access to Ara Irititja for Parks Australia staff is apparently restricted to traditional owners.
Overall assessment	Data has potential and further enquiries are necessary to determine recent data availability.

Dhimurru Land Management Aboriginal Corporation

About the organisation	Dhimurru is an incorporated Aboriginal organisation established by Yolngu land owners in Northeast Arnhem Land. The aim of Dhimurru is to address natural and cultural management priorities identified by its members.
Person to contact	Steve Roeger
Overview	Some ethnobotanical data is available from the Dhimurru website: http://members.iinet.net.au/~dhimurru/plants.htm A CD-Rom of Nanydjaka heritage values report has also been produced. Dhimurru is currently conducting an ethnozoological study in Melville Bay to feed into Alcan's environmental management plan at the alumina refinery. Dhimurru will also use the information to identify commercial opportunities.
Rights management – IP and negotiation	Information from the ethnozoological database is confidential unless Dhimurru decides to distribute more broadly, but there are no plans to do so. Dhimurru has marketing rights to the database.
Content	Plant use information comes from *Rirrtjingu Ethnobotany: Aboriginal Plant Use from Yirrkala, Arnhem Land Australia*, which covers the Manydjarrarrnga-Nnanydjaaka area. The ethnozoological project is in its early stages (April 2004).
Data structure	Website data includes genus; species; TENP; RE; Yolngu name. Photos for

	some plants are included. Ethnozoological database will consist of photos, video text and maps.
Users	Public access to ethnobotanical data through Dhimurru website. Only Alcan and Dhimurru have access to the ethnozoological database.
Technical and design	A purpose-built Filemaker Pro Package has been constructed for the ethnozoological study by David Head – based in Darwin/Palmerston
General comments	Useful data for environmental monitoring if access could be negotiated

Girringun Aboriginal Corporation GIS and cultural heritage database (CHD) (data extracted from the Aboriginal Rainforest Council (2007))

About the organisation	The Girringun Aboriginal Corporation cultural heritage database has been developed over the past 10 years. The system that supports the database is locally installed at the Girringun Aboriginal Corporation in Cardwell and supports the recording and management of cultural heritage information on behalf of the Bandjin, Djiru, Girramay, Gugu Badhun, Gulnay, Jirrbal, Nywaigi, Warrgamay, and Warunggnu Rainforest Aboriginal groups.
Person to contact	Phil Rist, Girringun Aboriginal Corporation
Overview	Key attributes of the system include: data archive and education tool; all sites are referenced by point location; images, video and audio files and descriptive transcripts are referenced;
Data structure	Data stored with the database has been geo-referenced and stored within an Access database environment so that it can be displayed and analysed using a GIS.
Rights management – IP and negotiation	Protocols for collecting GPS data, and photos have been developed. Data accessible via heritage staff on the advice of the traditional owners and the Girringun Board. Access is given to one member of staff at a time.
Comments	Primarily a scientifically based GIS data archive. Data stored has the potential to guide management and planning decisions. The concept of 1km grid system has been proposed to communicate non-specific cultural site locations to external agencies.

Kimberley Land Council

About the organisation	The Kimberley Land Council is the Native Title Representative Body for the Kimberley region in WA. It also has a land and sea management unit.
Person to contact	Hugh Wallace-Smith; Tom Vigilante
Overview	Currently (April 2004) trying to get ethnographic material on a database, but is hampered by excessive workload associated with native title claims and lack of government funding from the Commonwealth. Most of the ethnographic work has been done around Broome and Kununurra.

General comments	Needs up-dated information on KLC activities

Larrakia Nation Aboriginal Corporation

About the organisation	The Larrakia Nation Aboriginal Corporation was established in 1997. This was a proactive step by the Larrakia people in forming an umbrella organisation for members of the larger Larrakia family groups. In January 2001, LNAC represented seven Larrakia family groups. They are considered the peak representative body for any issues regarding Larrakia people.
Person to contact	Donna Jackson (Ranger)
Overview	Donna Jackson has been involved in ethnobiological surveys in conjunction with the former Conservation Commission NT (now Parks and Wildlife) in the Keep River and Upper Katherine River areas. This data is mostly held by Glenn Wightman at the Herbarium and in hard copy format with the traditional owners. Some work has also been done on Larrakia country with Lorraine Williams.
Rights management – IP and negotiation	This is considered to be a top priority. Concern was expressed that in previous discussions with NT University IP issues were a stumbling block as the University wanted copyright.
General comments	Larrakia Nation is very keen to set up an Indigenous knowledge database and also to include items like heritage photos. The main problem has been a lack of funding and lack of practical research on database design.
Overall assessment	If the IP issues could be resolved then Larrakia have potentially useful info

Northern Land Council

About the organisation	The NLC was established in 1973 to represent traditional Aboriginal owners in the Top End. It now acts according to the provisions of the Aboriginal Land Rights (NT) Act 1976, supporting land claims and negotiating with mining companies on behalf of traditional owners. It is also a native title representative body and increasingly plays a key role in land and sea management.
Person to contact	Justine Yanner, Manager Land and Sea Country Unit; Peter Cooke about W. Arnhem Land project.
Overview	Land Claims books which are digitised – comprises work done by the NLC to prepare for land claims hearings.
Rights management – IP and negotiation	Would be a decision up to the Land Council
Users	Some items can be found in the NLC library, which requires users to search the library catalogue.
Technical design	MS Word documents

Overall assessment	This information needs up-dating – there's almost certainly more useful information available for environmental monitoring

Ord-Bonaparte Program (Kimberley Land Council, Land and water Australia, CSIRO)

About the organisation	The Ord-Bonaparte Program was a research and development partnership between government, researchers, industry and the wider East Kimberley community. It aimed to build on existing knowledge and activities in developing effective tools, methods, processes and strategies to underpin policy planning and management for sustainable use of the region's natural resources. The lead agency was Land & Water Australia. Funding partners included: WA Dep'ts of Agriculture, CALM, and Water and Rivers Commission; Kimberley Land Council; Fisheries Australia; Aust Inst of Marine Science; Australian National University, and the CRC for Tropical Savannas.
Person to contact	Kylie Pursche, Ethno-botanist Glenn Wightmann and GIS consultant Greg Mules
Overview	Ethno-ecological database for the Kija and Jaru people (as part of the Aboriginal Planning and Management for Country Sub-program). The project was completed at the end of 2003. The purpose was to help Aboriginal people plan for and manage their country. Glenn Wightman worked with Kija and Jaru elders on their country – approx Turkey Creek to halls Creek in the East Kimberley. Funding came for the CSIRO and Land & Water Australia.
Rights management – IP and negotiation	Permission for the project came from Kija and Jaru traditional owners. It was the intention of the project to return the data. At present (April 2004) it is only in report form (at Language Centres) and as posters. Traditional owners would like a book and maybe a video/CD-Rom, but funding had not eventuated.
Content	Kija and Jaru plant names and use. Ecological and language information currently on the separate databases used by the consultants.
Data structure	Text, photos, audio, maps which could all be integrated into one database
Users	Not very useable form at this time (April 2004). Data are on consultant's own databases (e.g. Glenn Wightman). Want to put on an Access database to be integrated with a GIS.
Technical and design	Greg Mules developed the GIS
General comments	Would like to see the integration of disparate databases into a centralised GIS and also do more individual and group biographies this year (2004) – cultural mapping. The project has laid a good foundation through the process of setting up the project (influenced by Aboriginal Mapping guidebooks from Canada). But lack of funds has hampered delivery of information to Kija and Jaru people in a useable format.

Overall assessment	Would be useful to follow up on this work with Greg Mules to see what if anything has been developed in GIS format.

Tiwi Land Council

About the organisation	Establishment of the Tiwi Land Council followed representation by the Tiwi for recognition of their distinct geographic and cultural identity. These representations were a consequence of the Aboriginal Land Rights (NT) Act 1976. The organisation is involved in land and natural resource management.
Person to contact	Rohan Fisher from Cycad Media; Kate Hadden (TLC)
Overview	Tiwi Land Information Story CD-Rom. This is an innovative educational tool for the Tiwi Island primary schools. It received funding from the Natural heritage Trust.
Rights management – IP and negotiation	Tiwi people gave permission for the CD to be produced.
Content	This interactive CD-Rom includes over 45 mins of video narrated by Ted Egan describing a range of contemporary resource management issues on the Tiwi Islands. It is presented using a unique combination of 3D satellite image animation and aerial video to create an exciting visual experience. It also includes: natural resource maps; traditional dances; reports and posters; interactive/animated climate and weather information; and, traditional stories. Some of the contents were pre-existing, mainly from Gov't agency land reports and maps. John Hicks and Kate Hadden (TLC) wrote stories for the video. Photos etc were gathered from TLC archives; information was also taken from *Tiwi Plants and Animals* book (2001). CD-Rom will also include a Tiwi language version.
Users	CD-Rom will sit on the Tiwi school computer network systems (LATIS) in both Tiwi and English language versions. English language version is already used in the Tiwi Islands' schools. It is available to the public, but not widely distributed yet.
Technical and design	CD-Rom was produced by Rohan Fisher (Cycad Media)
Overall assessment	The CD-Rom format is clearly favoured by Indigenous peoples.

Tropical Savannas CRC

About the organisation	The TS-CRC based at Charles Darwin University helps make land management research more useful to the various land managers and agencies across the tropical savannas – and in this way helps ensure sustainable conservation and use of the tropical savannas. Researchers are drawn from 16 partner agencies and are spread out over northern Australia.

Person to contact	Peter Jacklyn
Overview	Savanna Search database and Savanna Explorer on the Tropical Savannas CRC website. On Savanna Search – published material catalogue. (As at April 2004) includes 99 records under keyword 'Aboriginal' and 58 under keyword 'Indigenous'. Savanna Explorer contains web pages on Aboriginal fire management (including Central Arnhem Land). Geographical coverage is northern Australian tropical savannas from the Kimberley to Cape York.