North Kimberley 1 *(NK1 – Mitchell subregion)*

GORDON GRAHAM
AUGUST 2001

Subregional description and biodiversity values

Description and area

This is the dissected plateau of Kimberley Basin. Savannah woodland over high *Sorghum* grasses and hummock grasses on shallow sandy soils on outcropping Proterozoic siliceous sandstone strata. Savannah woodlands over high *Sorghum* grasses on red and yellow earths mantling basic Proterozoic volcanics. Riparian closed forests of *Melaleuca* and *Pandanus* occur along drainage lines. A prominent feature is the rugged sunken coastline with extensive Mangal occurring in estuaries and deep, sheltered embayments. Numerous small patches of monsoon rainforest are scattered through the district. The climate is dry hot tropical, sub-humid with high summer rainfall (1100 – 1500 mm annually). Areas of laterite upland with open forests and alluvial floors along major river valleys. Subregional area is 6, 079, 985 ha.

Broad scale vegetation mapping of the area describes the following components;

- Mangroves.
- *Eucalyptus* spp., *Eucalyptus miniata* (Northern woollybutt) and / or *Eucalyptus tetrodonta* (Darwin stringybark) open-woodland with *Triodia bitextura* (curly spinifex) and Sorghum grasses (*Sorghum* spp.).
- *Eucalyptus tectifica* (Darwin box) and / or *Eucalyptus grandifolia* (large-leaved cabbage gum) and / or *Eucalyptus byrnesii* (fan-leaved bloodwood) woodland with *Sorghum* spp. (sorghum) and *Sehima nervosum* (white grass) tall grasses.
- *Eucalyptus miniata* (Darwin Northern woollybutt) grassy woodland.
- *Eucalyptus tetrodonta* (Darwin stringybark) and *Eucalyptus miniata* (Darwin Northern woollybutt) and / or *Eucalyptus bleeseri* (rusty-barked bloodwood) woodland with *Sorghum* spp. tall-grasses.
- Semi-deciduous vine thickets on sandstone.

Dominant land use

Landuses include: (ix) Grazing – Native pastures (see Appendix B, key b), (x) Aboriginal reserves, (xi) UCL and Crown reserves, and (xiii) Conservation.

Continental Stress Class

NK1 has a Continental Stress Class of 6.

Known special values in relation to landscape, ecosystem, species and genetic values

Rare Features:
Including:

- A sunken coastline with extensive coastal archipelagos from Buccaneer to Sir Graham Moore Island that form a microcosm of the subregion and present an opportunity to protect intact ecosystem. In particular Augustus Island (17,952 ha.) and Bigge Island (17,190 ha.) are large, near-coastal, uninhabited islands with no known feral animals and a diverse intact terrestrial fauna.
- Mound springs and swamp rainforest.
- Middle Osborn Island is a volcanic plug.
- There is tropical laterite flora. In particular the *Livistona eastonii* palm community, a palm dominated landscape, is unique in Western Australia.
- The flora and fauna of north-western margin is still intact.
- The Cape Bougainville rainforest on laterite and volcanics has no hoofed feral animals and is the largest single patch of rainforest in the Kimberley.
- Airfield Swamp on the Mitchell Plateau is a large perched paperbark forest wetland.
- The Prince Regent Lineament encompassing the Prince Regent River.
- Critical weight range mammal fauna persist in this subregion.
- There are animals of special interest such as the Golden Bandicoot (*Isoodon auratus*), Scaly-tailed Possum (*Wyulda squamicaudata*), Monjon (*Petrogale burbidgei*), Nabarlek (*Peradorcas concinna*), Golden-backed Tree-rat (*Mesembriomys macrurus*), Kimberley Rock-rat (*Zyzomys woodwardi*), Rough-scaled Python (*Morelia carinata*), Black Grasswren (*Amytornis housei*).
- The subregion is fox and rabbit free and essentially uninhabited.

Centres of Endemism:

- There are a number of endemic vertebrates: Mammal species include Scaly-tailed Possum (*Wyulda squamicaudata*), Monjon (*Petrogale burbidgei*); a single bird species Black Grasswren (*Amytornis housei*); snake species *Ramphotyphlops howi*, *R. kimberleyensis*, *R. yampiensis*, Grey Whipsnake (*Demansia simplex*), Rough-scaled Python (*Morelia carinata*); dragon species *Diporiphora albilabris*, *D. convergens*, *D. superba*, *Pogona microlepidota*; gecko species *Diplodactylus mcmillani*, *Gehyra occidentalis*, *G. xenopus*, *Oedura filicipoda*, *O. gracilis*, *O. obscura*, *Pseudothecadactylus cavaticus*; skink species *Carlia johnstonei*, *Ctenotus burbidgei*, *C. ehmanni*, *C. mastigura*, *C. yampiensis*, *Cyclodomorphus maximus*, *Glaphyromorphus brongersmai*, *Lerista kalumburu*, *L. praefrontalis*, *L. walkeri*; frog species Javelin frog (*Litoria microbelos*), Cave-dwelling

frog (*L. cavernicola*), Fat Toadlet (*Uperoleia crassa*), Marbled Toadlet (*U. marmorata*), Small Toadlet (*U.*).

- Endemic plants include *Acacia kenneallyi*, *Acacia smeringa* (Packhorse Range), *Gossypium londonderriense* (Cape Londonderry), *Grevillea cravenii* (Princess May Range, Prince Regent Nature Reserve), *Grevillea donaldiana* (Sale River), *Grevillea maherae* (Mt Elizabeth), *Grevillea microstyla* (Bachsten Creek), *Typhonium peltandroides* (Grevillea Gorge, Beverley Springs), *Auranticarpa resinosa* (Hunter River – this species may be extinct) and *Hibbertia ledifolia*. The cycads, *Cycas basaltica* and *Cycas lane-poolei* appear to be endemic to this subregion.

- Rainforest patches are particularly important to invertebrates such as Camaenid land snails and annelids. Camaenid land snails have a large number of endemic species and some endemic genera showing strongly localised patterns of endemism. All the rainforest patches studied to date have endemic earthworm species associated with them. There is one rainforest endemic plant (*Hibiscus peralbus*).

Refugia:
The nature of this aspect is poorly known. 'Dry' rainforest patches, as well as swamp rainforests provide dry season refuges. Mangroves and riparian zones also provide refugia. Further research is required to define the extent to which this aspect may apply to sandstone country because of its ability to provide fire protection.

High Species and Ecosystem Diversity:
Sandstone communities may provide areas of high species and ecosystem diversity. Laterite rainforests are of note. Rainforests are defined by their vegetation associations and are resource centres for a variety of faunal taxa that are either directly linked to rainforests or are more widely ranging species that are dependent on them. Examples include fruit pigeons and flying foxes.

Existing subregional or bioregional plans and/or systematic reviews of biodiversity and threats

The CTRC report in 1974 System 7 formed the basis of the Department's publication "Nature Conservation Reserves in the Kimberley" which has itself been incorporated in a Departmental Draft Regional Management Plan. These reports were focused on non-production lands and those areas not likely to be prospective for minerals. Action statements and strategies in the draft regional management plan do not go to the scale of subregion or even bioregion. There has been some biological survey work published for the islands of the northwest Kimberley coast, the Prince Regent Nature Reserve and the Mitchell Plateau. These surveys occurred at greater than 20 years ago and there is a need to resample these areas for comparative purposes. Previous rainforest studies are applicable (McKenzie *et al* 1991).

Apart from specific survey work there has been no systematic review of biodiversity but on-going changes to the status of fauna (particularly mammals) are reported. There is reasonable evidence about continuing changes to vegetation structure (e.g. loss of shrub layer), composition (e.g. perennial vs. annual grasses), vegetation cover, leaf litter, and organics in the upper soil horizon. It is generally recognised that flow-on effects of changes in the physical components of the environment, vegetation structure changes and other factors (e.g. exotic predators) can have significant effects on fauna. Work to date has been of a general nature.

Wetlands

Wetlands of National significance (DIWA listings)

Name and Code	Description[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Mitchell River System WA063	B1	iv	vi	iii	vii, iv
Prince Regent River System WA064	B1	iv	vi	iii	vii, iv
Yampi Sound Training Area WA115		iii	iii	iii	vii, iv

[1]Appendix B, key d; [2]Appendix C, rank 2; [3]Appendix C, rank 3; [4]Appendix C, rank 1; [5]Appendix B, key e

Wetlands of subregional significance (in addition to the DIWA listed wetlands)

Name	Location	Description[1]	Special Values[2]	Condition[3]	Trend[4]	Reliability[5]	Threatening Processes[6]
Walcott Inlet System including Munja Lagoon and the lower reaches of the Isdell and the Charnley Rivers.	16°25'S 124°50'E	B4, B6	ii	iv	iv	ii	Unknown threatening processes

Name	Location	Description[1]	Special Values[2]	Condition[3]	Trend[4]	Reliability[5]	Threatening Processes[6]
Airfield Swamp – Mitchell Plateau	14°46'14"S, 125°49'02"E	B14	iv	iv	iv	ii	iv
Glauerts Lagoon – Mitchell Plateau		B5	iv	iv	iv	ii	iv

[1]Appendix B, key d; [2]Appendix B, key c; [3]Appendix C, rank 2; [4]Appendix C, rank 3; [5]Appendix C, rank 1; [6]Appendix B, key e

Riparian zone vegetation

Name	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
All fringing vegetation of riparian zones	iii	iii	ii	vii, iv (feral herbivores), v, x, vi

[1]Appendix C, rank 2; [2]Appendix C, rank 3; [3]Appendix C, rank 1; [4]Appendix B, key e

Ecosystems at risk

Threatened ecological communities (TECs)

Community	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Processes[5]
Black Spring organic mound spring community.	E	2	iii	iv	iii	iv, vii, xii (fences require annual maintenance to exclude cattle)
Organic mound springs of the southern North Kimberley Bioregion.	V	2	ii	ii-iii	iii	iv, vii
Roe River Swamp Rainforest	V	2	Unknown	iv	iii	Unknown threatening processes, though cattle are likely to impacting community
Theda Soak Rainforest.	V	2	iii	iv	iii	iv, vii, xii (fences require annual maintenance to exclude cattle)
Walcott Inlet Rainforest Swamp.	V	2	Unknown	iv	iii	Unknown threatening processes, though cattle are likely to impacting community

[1]Appendix B, key f; [2]Appendix C, rank 2; [3]Appendix C, rank 3; [4]Appendix C, rank 1; [5]Appendix B, key e

Other ecosystems at risk

There are many widespread vegetation types across this subregion that are threatened by changed fire regimes.

Ecosystem	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Process[5]
Savannah communities of which *Callitris intratropica* is a component.	V	11	Unknown	iii	iii	vii
Rainforest patches of the Kimberley savannah generally. Example rainforest patches on the Mitchell Plateau and in the supratidal flats.	V	2	Unknown	iii	iii	iv, vii
Flora and fauna assemblages of upland swamps of the Kimberley. On laterite plateaus and sandstone [Airfield Swamp and Beverley Springs Station].	V	15, 38	Unknown	iv	ii	iv
Assemblages of permanent/ephemeral wetlands, damplands, and riparian habitat of the Kimberley region.	V	15, 38, 42	ii	iii	ii	iv, vii
Invertebrate community in creek near Pago Mission.	V	N/A	Unknown	iv	iii	Unknown threatening processes
Eucalyptus tectifica community of the Gibb River and Mt Barnett regions.	V	10	ii, needs investigation	iii	ii	vii
Eucalyptus jensenii woodlands of Gibb River and Mt Barnett regions.	V	10	ii-iii, needs investigation	iii	ii	vii (changed fire regimes)
Plant assemblages of sand plain seepage areas between/near sandstone ridges.	V	38	Unknown	vi	i	iv, vii

Ecosystem	Status	NVIS[1]	Condition[2]	Trend[3]	Reliability[4]	Threatening Process[5]
Riparian communities dominated by *Phragmites karka.* Charnley River on Beverley Springs Station.	V	43	ii, needs investigation	vi	i	iv, vii
Herbfields of sandstone pavements of NW Kimberley. Fire could be a threat where spinifex builds up.	V	38	Unknown	vi	i	vii (possibly fire but needs more work)

[1]Appendix B, key f; [2]Appendix C, rank 2; [3]Appendix C, rank 3; [4]Appendix C, rank 1; [5]Appendix B, key e

Species at risk

Fauna

Species	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 1 (MAMMALS)					
Isoodon auratus auratus	V	Unknown	iii	ii	vii, v
Mesembriomys macrurus	V	Unknown	vi	Unknown	Unknown threatening processes
Sminthopsis butleri	V	Unknown	vi	Unknown	Unknown threatening processes
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 2 (BIRDS)					
Erythrura gouldiae	E	Unknown	iii	ii	vii
Falcunculus frontatus whitei	E	Unknown	vi	Unknown	Unknown threatening processes
Erythrotriorchis radiatus	V	Unknown	vi	Unknown	Unknown threatening processes
Malurus coronatus coronatus	V	Unknown	vi	ii	vii, iv
Petrophassa smithii blaauwi	V	Unknown	vi	Unknown	vii
SCHEDULE 1; RARE/LIKELY TO BECOME EXTINCT, DIV 3 (REPTILES)					
Caretta caretta	E	Unknown	vi	Unknown	Unknown threatening processes
Lepidochelys olivacea	E	Unknown.	vi	Unknown	Unknown threatening processes
Chelonia mydas	V	Unknown	vi	Unknown	Unknown threatening processes
Dermochelys coriacea	V	Unknown	vi	Unknown	Unknown threatening processes
Eretmochelys imbricata	V	Unknown	vi	Unknown	Unknown threatening processes
Natator depressus	V	Unknown	vi	Unknown	Unknown threatening processes
SCHEDULE 4; OTHER SPECIALLY PROTECTED FAUNA. DIVISION 1 (MAMMALS)					
Mesembriomys gouldii	S1	Unknown	vi	Unknown	Unknown threatening processes
Rhinonicteris aurantius	S1	Unknown	vi	Unknown	Unknown threatening processes
SCHEDULE 4; OTHER SPECIALLY PROTECTED FAUNA. DIVISION 2 (BIRDS)					
Chalcophaps indica yamashinai	S3	Unknown	vi	Unknown	Unknown threatening processes
Falco peregrinus	S4	Unknown	vi	Unknown	Unknown threatening processes
Tadorna radjah	S4	Unknown	vi	Unknown	Unknown threatening processes
SCHEDULE 4; OTHER SPECIALLY PROTECTED FAUNA. DIVISION 3 (REPTILES)					
Crocodylus johnstoni	S4	Unknown	iv	iii	Unknown threatening processes
Crocodylus porosus	S4	Unknown	v	iii	Unknown threatening processes
OTHER SPECIES AT RISK IN THE SUBREGION					
Ardeotis australis	Near threatened	Unknown	vi	Unknown	Unknown threatening processes
Dasyurus hallucatus	Near threatened	Unknown	iii	ii	Unknown threatening processes
Species	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
Falco hypoleucos	Near threatened	Unknown	vi	Unknown	Unknown threatening processes
Heteromunia pectoralis	Near threatened	Unknown	vi	Unknown	Unknown threatening processes
Macroderma gigas	Near threatened	Unknown	vi	Unknown	Unknown threatening processes
Peradorcas concinna	Near threatened	Unknown	vi	Unknown	Unknown threatening processes
Petrogale burbidgei	Near threatened	Unknown	vi	Unknown	Unknown threatening processes
Wyulda squamicaudata	Near threatened	Unknown	vi	Unknown	Unknown threatening processes

[1]Appendix C, rank 2; [2]Appendix C, rank 3; [3]Appendix C, rank 1; [4]Appendix B, key e

Declared rare and priority flora

Species Name	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
PRIORITY 1					
Acacia paula	1	Unknown	vi	Unknown	Unknown threatening processes
Acacia vincentii	1	Unknown	vi	Unknown	Unknown threatening processes
Ailanthus triphysa	1	Unknown	vi	Unknown	vii
Colubrina asiatica	1	Unknown	vi	Unknown	Unknown threatening processes
Corchorus capsularis	1	Unknown	vi	Unknown	Unknown threatening processes
Didymoplexis pallens	1	Unknown	vi	Unknown	Unknown threatening processes
Euphorbia sarcostemmoides	1	Unknown	vi	Unknown	Unknown threatening processes
Fimbristylis pilifera	1	Unknown	vi	Unknown	Unknown threatening processes
Gossypium enthyle	1	Unknown	vi	Unknown	Unknown threatening processes
Gossypium marchantii	1	Unknown	vi	Unknown	Unknown threatening processes

Gossypium pilosum	1	Unknown	vi	Unknown	Unknown threatening processes
Hydrocotyle grammatocarpa	1	Unknown	vi	Unknown	Unknown threatening processes
Ondinea purpurea subsp. *petaloidea*	1	Unknown	iv	Unknown	Unknown threatening processes
Phyllanthus aridus	1	Unknown	vi	Unknown	Unknown threatening processes
Phyllanthus indigoferoides	1	Unknown	vi	Unknown	Unknown threatening processes
Ptilotus crispus	1	Unknown	vi	Unknown	Unknown threatening processes
Schizachyrium mitchelliana	1	Unknown	vi	Unknown	Unknown threatening processes
Thysanotus banksii	1	Unknown	vi	Unknown	Unknown threatening processes
Triumfetta saccata	1	Unknown	vi	Unknown	Unknown threatening processes
Triumfetta trisecta	1	Unknown	vi	Unknown	Unknown threatening processes
Typhonium peltandroides	1	Unknown	vi	Unknown	Unknown threatening processes
PRIORITY 2					
Acacia deltoidea	2	Unknown	vi	Unknown	Unknown threatening processes
Boronia filicifolia	2	Unknown	vi	Unknown	Unknown threatening processes
Cleome kenneallyi	2	Unknown	vi	Unknown	Unknown threatening processes
Erpodium australiense	2	Unknown	vi	Unknown	Unknown threatening processes
Eucalyptus fitzgeraldii	2	Unknown	vi	Unknown	Unknown threatening processes
Glycine albicans	2	Unknown	vi	Unknown	Unknown threatening processes
Gossypium pulchellum	2	Unknown	vi	Unknown	Unknown threatening processes
Grevillea donaldiana	2	Unknown	vi	Unknown	Unknown threatening processes
Grevillea latifolia	2	Unknown	vi	Unknown	Unknown threatening processes
Lindernia macrosiphonia	2	Unknown	vi	Unknown	Unknown threatening processes
Minuria macrorhiza	2	Unknown	vi	Unknown	Unknown threatening processes

Species Name	Status	Condition[1]	Trend[2]	Reliability[3]	Threatening Processes[4]
Myriophyllum callitrichoides subsp. *striatum*	2	Unknown	vi	Unknown	Unknown threatening processes
Myriophyllum costatum	2	Unknown	vi	Unknown	Unknown threatening processes
Pertusaria trachyspora	2	Unknown	vi	Unknown	Unknown threatening processes
Ricinocarpos marginatus	2	Unknown	vi	Unknown	Unknown threatening processes
Sauropus torridus	2	Unknown	vi	Unknown	Unknown threatening processes
Stylidium fimbriatum	2	Unknown	vi	Unknown	No known threatening processes
Stylidium rubriscapum	2	Unknown	vi	Unknown	No known threatening processes
Triumfetta rubiginosa	2	Unknown	vi	Unknown	Unknown threatening processes

[1]Appendix C, rank 2; [2]Appendix C, rank 3; [3]Appendix C, rank 1; [4]Appendix B, key e

Analysis of appropriate management scenarios

Reservation priorities of ecosystems

The following North Kimberley bioregion vegetation associations are not reserved within the bioregion:

Beard Veg Assoc	Description	Area (Ha.)
12	Medium woodland-tropical; Darwin stringybark (*Eucalyptus tetrodonta*) and Northern woollybutt (*Eucalyptus miniata*).	7,274
43	Low forest; mangroves.	8,657
60	Grasslands, tall bunch grass savannah woodland, Darwin box (*Eucalyptus tectifica*) and cabbage gum over ribbon grass (*Chrysopogon* spp).	47,170
61	Grasslands, tall bunch grass savannah woodland, coolibah over ribbon grass (*Chrysopogon* spp).	17,443
75	Grasslands, curly spinifex, low tree savannah woodland; scarlet gum (*Eucalyptus phoenicea*) and *Eucalyptus ferruginea* over *Triodia bitextura*.	1,193
125	Bare areas; salt lakes.	89
589	Mosaic: Hummock grasslands, grass steppe; curly spinifex (*Triodia bitextura*).	26
744	Grasslands, tall bunch grass savannah sparse low tree; *Acacia suberosa* and bauhinia (*Bauhinia cunninghamii*) over Mitchell and ribbon/blue grass (*Astrebla* spp./*Chrysopogon* spp./ *Bothriochloa* spp.) on black soil.	4,249
754	Shrublands, pindan; *Acacia tumida* shrubland with Northern woollybutt (*Eucalyptus miniata*) and cabbage gum (*Eucalyptus grandifolia*) medium woodland over ribbon grass (*Chrysopogon* spp) and curly spinifex (*Triodia bitextura*).	9,915
773	Grasslands, high grass savannah low tree; bloodwood (*Eucalyptus* spp.) and Darwin box (*Eucalyptus tectifica*) *over* white grass (*Sehima nervosum*) and/or upland tall grass.	10,672
800	Grasslands, high grass savannah woodland; Darwin stringybark and Northern woollybutt (*Eucalyptus miniata*) over (upland tall grass and) curly spinifex (*Triodia bitextura*).	267,377
807	Grasslands, tall bunch grass savannah sparse low tree; acacia over grass on black soil.	1,346
808	Grasslands, curly spinifex (*Triodia bitextura*), low tree savannah; snappy gum (*Eucalyptus brevifolia*) over curly spinifex (*Triodia bitextura*).	5,255
814	Hummock grasslands, low steppe woodland; silver-leaved box (*Eucalyptus pruinosa*) and *Melaleuca* over *Plectrachne*.	61,579
835	Grasslands, high grass savannah woodland; Darwin box (*Eucalyptus tectifica*) and *Eucalyptus greeniana* over spinifex and white grass (*Sehima nervosum*).	59,510
838	Grasslands, high grass savannah woodland; ghost gum (*Eucalyptus bella*) and bloodwood (*Eucalyptus polycarpa*) over spinifex and tall upland grass.	3,579
902	Hummock grasslands, low tree steppe; scattered low rare eucalypts in open curly spinifex (*Triodia bitextura*).	11,322
907	Grasslands, high grass savannah woodland; ghost gum (*Eucalyptus bella*) and bloodwood (*Eucalyptus polycarpa*) over ribbon (*Chrysopogon* spp.) and tall upland grass.	10,954
914	Grasslands, high grass savannah woodland; Darwin box (*Eucalyptus tectifica*) and *Eucalyptus greeniana* over kangaroo (*Themeda australis*) and white grass (*Sehima nervosum*).	4,312
8001	Grasslands, curly spinifex (*Triodia bitextura*), low tree savannah; bloodwood (*Eucalyptus* spp.) and Northern woollybutt (*Eucalyptus miniata*) over curly spinifex (*Triodia bitextura*) on islands.	209,565

Poorly represented ecosystems subject to threat:

Black Spring Mound Community
Theda Soak Rainforest
Walcott Inlet Rainforest Swamp
Roe River Swamp Rainforest
Organic mound springs of the southern North Kimberley Bioregion
Savannah communities of which *Callitris intratropica* is a component
Mount Elizabeth Mounds
Rainforest patches anywhere in the tropical savannah of the Kimberley region where cattle/fire occur. Eg. Rainforests of the Mitchell Plateau and in the supratidal flats.
Flora and fauna assemblages of upland swamps of the Kimberley. On lateritic plateaux and sandstone [Airfield Swamp and Beverley Springs Station].
Assemblages of permanent/ephemeral wetlands, damplands, and riparian habitat of the Kimberley region.
Invertebrate community in creek near Pago Mission
Eucalyptus tectifica community of the Gibb River and Mt Barnett regions
Eucalyptus jensenii woodlands of Gibb River and Mt Barnett regions

Note: the lack of study in some areas precludes statements about the level of reservation required.

Subregional constraints in order of priority

(see Appendix B, key g)

Competing Land Uses: Particularly pastoral production

Land Prices: For pastoral leases

Other: Our knowledge of biodiversity patterns across the subregion's landscape does not have enough resolution to accurately define all acquisition priorities on the ground.

Bioregional and subregional priority for reserve consolidation

The North Kimberley bioregion has a ranking priority under the preliminary bioregional NRS priorities of 4 (see Appendix D, and Appendix C, rank 4). However this may need to be 3 due to the continued impact of inappropriate fire regimes and uncontrolled stock grazing. It can also be argued that there is a bias in the reserve system because some ecosystems not reserved are those that are being grazed and have been grazed the longest and are often burnt the most often (or the most frequency x intensity). There is a lack of adequate data on the condition of the Berkeley subregion to compare this to the Mitchell subregion in terms of prioritising between the two.

Reserve management standard

The bioregion is ranked at poor i) to fair ii) (see Appendix C, rank 5). Apart from the donkey control program undertaken by the Department of Agriculture (WA) there are no concerted feral animal control programs in place. There is limited strategic aerial prescribed burning along with some opportunistic hand burns with the latter being confined to very small areas of the Mitchell subregion. Extent of other threatening processes, for example weeds, yet to be determined. Due to uncontrolled stock access, changes are occurring within parks particularly in valley systems and noticeably within the Mitchell subregion.

Estate	Rank[1]	Issues
NATIONAL PARKS		
Mitchell River	ii	Management ability is being developed. Currently one ranger on location during the tourist season. Full extent of threatening processes (Fire, weeds, feral animals) need to be documented. Stock impact occurring.
Lawley River	i	Remote and inaccessible. Issues have not been identified. Inappropriate fire regimes of note.
Drysdale River	i	No documentation of impacts over time. Biological survey undertaken in the 1970's. No knowledge of visitation.
CONSERVATION PARKS		
Laterite	ii	Location makes the park accessible. Small amount of biodiversity assessment being undertaken. Full extent of threatening processes (Fire, weeds, feral animals) need to be documented. Stock impact occurring.
Camp Creek	i	Rainforest monitoring being undertaken on the impact of stock grazing and fire. Stock impact occurring.
NATURE RESERVES		
Prince Regent River	i	Full extent of threatening processes (Fire, weeds, feral animals) need to be documented. Stock impact occurring. Biological survey undertaken in the 1970's

[1]Appendix C, rank 5

Off reserve conservation

Priority species or groups

- Threatening processes operate from the species to landscape level.
- Little is known of the status of critical weight range mammals in the Berkeley subregion.
- Action is required to identify appropriate fire regimes.
- The effect of fire and cattle on critical weight range mammals, granivorous birds and savannah composition and structure is of concern.
- Changed grassland structures are of concern.
- There is evidence that changes have, and continue, to occur for the balance between annual and perennial grasses.
- Landscape level threatening processes also bring about changes to the organic profile layer in soils, water infiltration rates and surface flow velocity after rain.
- Impacts on rainforest patches of inappropriate fire regimes and specifically rainforest fire / cattle interaction is of concern.
- There have been changes to riparian zones due to the impact of changed fire regimes, grazing and the indirect effects from changed hydrology.
- Action is required to identify what is at risk and components of the biota at most risk then recommend and research appropriate management.
- Little is known of the distribution, status and impact of weed species.

Existing species recovery plans

The Action Plan for Australian Bats.
The Action Plan for Australian Birds 2000.
Action Plan for Australian Marsupials and Monotremes.
Gouldian Finch Recovery Plan.
Draft Kimberley Region Management Plan (various strategies).

Appropriate species recovery actions

Fire Management: Move to biodiversity driven approaches to fire management strategies. Avoid frequent, broad scale, hot, late dry-season burning in savannah.

Weed Control: Need to define weeds priorities both in an agricultural resource sense and an environmental sense. Resources required for already identified State and regional weed strategies.

Capacity Building: Need organisational responsibility for coordinating management efforts across tenure and management responsibilities. Local adoption of strategies. Capacity building in pastoral industry and Aboriginal groups to optimise biodiversity and savannah productivity. Minimise loss of the mineral A horizon and protection of organic layers.

Feral Animal Control: Removal of feral stock from conservation estate and management of stock on other lands e.g. close order husbandry of cattle herds to prevent overgrazing. Eradication of feral animals especially cattle, donkeys and pigs.

Ecosystems and appropriate recovery actions

This is a general savannah issue and fire is the main driver in addressing this. The next most important, and linked, issue is grazing. Actions that are required are linked to management research and better-coordinated efforts between Government agencies, the pastoral grazing industry, traditional owners and the broader community. For example with mound springs the recovery actions would be (ix) fire management, (vii) feral animal control, and (vi) weed control.

Existing ecosystem recovery plans

There are no existing recovery plans that are relevant to ecosystems at risk in NK1.

Subregion priority for off reserve conservation

The priority for off park conservation in NK1 is (iii) (see Appendix C, rank 6), indicating that limited off park measures will result in significant conservation gains.

Conservation actions as an integral part of NRM

Existing NRM actions

Legislation: Pastoral lease inspections are undertaken by the Department of Agriculture and leaseholders notified of any problems via the Pastoral Lands Board. Final scenario is that the Commissioner for Soil Conservation can institute formal proceedings if issues are not being addressed. The last is rarely undertaken.

Threat Abatement Planning as Part of NRM: Concerted and coordinated effort by the Department of Agriculture in the control of donkeys.

Capacity: Land Conservation District Committees established and provide a venue for discussion on conservation matters.

Integration With Property Management Planning, Catchment Planning and Landcare: Land Conservation District Committees provide an opportunity for integration of land management activities.

Feasible opportunities for NRM

Environmental Management Systems: Research is needed on the mechanism and impacts of threatening processes. Outputs of this should assess potential cost / effective solutions. There has been some development in the co-ordination of multiple research initiatives and communication of this; Environmental planning across tenure (weeds, fire and feral animals) coordinated through Land Conservation District Committee.

Legislation: Improved implementation of existing legislation.

Capacity Building: Improved communication required between all stakeholders and an acknowledgement of differing land management objectives.

Other Planning Opportunities: Shire plan incorporating biodiversity objectives and an acknowledgement of the worth of the natural environment e.g. tourism including the cost of management. such as making national parks accessible.

Integration With Property Management Planning, Catchment Planning and Landcare: Development of catchment and regional plans involving all stakeholders.

Impediments or constraints to opportunities

A limited financial resource is a major constraint. The number of people available to implement strategies is a constraint. There is a need to increase awareness of conservation values throughout the community.

Subregions where specific NRM actions are a priority to pursue

A more coordinated approach to land management would be a priority for the Mitchell subregion. This is because of differing and potentially competing land uses, the increase in multiple land uses and landscape threats. Whilst still important the Berkeley subregion has fewer stakeholders to deal with however research into issue identification for this subregion may change the priority. The rank for both subregions is (ii) (see Appendix C, rank 7), indicating that there are significant constraints to integrate conservation as part of production or development system.

Data gaps

Gaps in data needed for the identification of biodiversity values and management responses

Vegetation and Regional Ecosystem Mapping: Much finer scale (at 100,000:1 or better) vegetation / regional ecosystem mapping required for most of the widespread surfaces. This needs to align with soil maps and environmental geology maps and these do not yet exist at better than 1:250 000 scale.

Systematic Fauna Survey: No systematic quadrat based fauna sampling programme across the subregion to provide a basis for modeling species distribution / status.

Floristic Data: Data is sparse. Some potential for adapting WARMS monitoring methodology.

Ecological and Life History Data: Information is lacking on the habitat requirements of fauna species.

Other Priority Data Gaps Include:

- Further research is required on the conservation status of many fauna and flora taxa as well as the effects of threatening processes such exotic predators (cats), stock (cattle, donkeys and pigs), fire and weeds.

Sources

References cited

No.	Author	Date	Title	Publication Details	Pub. Type
714	Dostine, Peter	(1998).	Gouldian finch recovery plan, *Erythrura gouldiae*	Parks & Wildlife Commission of the Northern Territory, Darwin	R
258	Duncan, A., Barry Baker, G. and Montgomery, N.	(1999).	The Action Plan for Australian Bats.	Environment Australia.	R
298	Garnett, S.T. and Crowley, G.M.	(2000).	The Action Plan for Australian Birds.	Environment Australia, Canberra.	R
483	Maxwell, S., Burbidge, A.A. and Morris, K. (eds).	(1996).	The 1996 Action Plan for Australian Marsupials and Monotremes. Wildlife Australia Endangered Species Program Project Number 50.	Environment Australia, Canberra.	R
495	McKenzie, N.L., Johnston, R.B. and Kendrick, P.G. (Eds.)	(1991).	Kimberley Rainforests of Australia.	Surrey Beatty and Sons.	B

R = Report; J = Journal article; O = Other.

Other relevant publications

See reference numbers 016, 018, 042, 094, 100, 118, 121, 132, 155, 163, 173, 197, 268, 286, 418, 436, 492, 494, 503, 551, 556, 592, 626, 634, 635, 636, 637, 648, 692 and 693 in Appendix A.