A.7 A summary of Kimberley ecology

The walkingcountry is situated in the Victoria-Bonaparte bioregion which spans the Phanerozoic sediments of the Bonaparte basin across the Western Australian and Northern Territory border, and includes areas of quartz-sandstone ranges (Graham, 2001) such as those around *the walkingcountry*. Just to the east in the Carr Boyd Ranges are areas of the Ord Victoria Plain bioregion with which *the walkingcountry* shares affinities. Taking European invasion as a defining moment, there have been a number of ecological changes in the region as a whole.

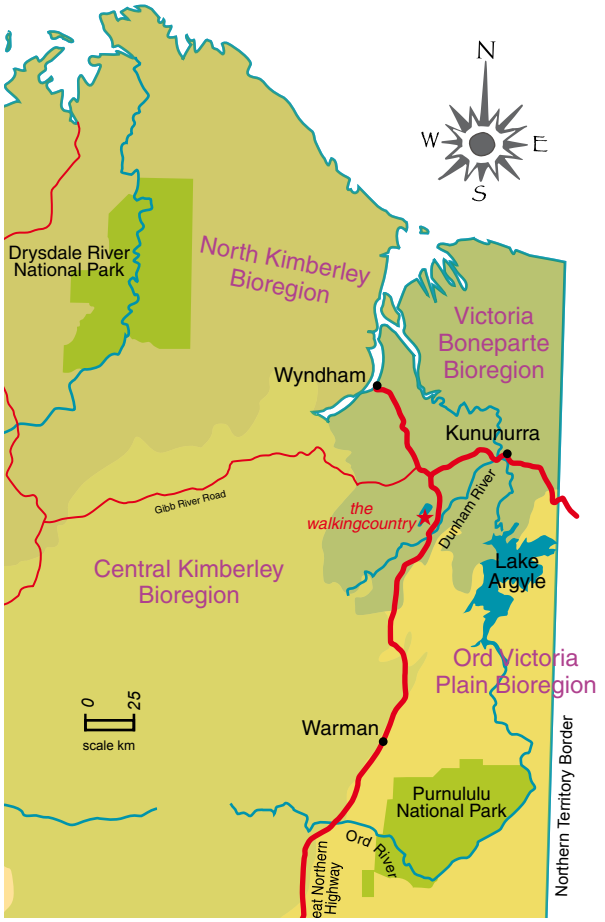

Figure A.7.1 Bioregions of the east Kimberley, from Department of Environment and Heritage (2000).

The most important factor has been changes in fire patterns[1]. Prior to human habitation, fires from thunderstorms were frequent during the late Dry as grasses from the Wet dried out (the wet-dry-lightning cycle). Aboriginal fire management included fire exclusion areas (eg rainforest patches) and burning small patches of landscape throughout the Dry. With the removal of Aboriginal management from most of the landscape, fires have become greater in size and intensity, and more frequent (Myers et al., 2004). There are a number of consequences that are either the direct or indirect result of changing fire patterns. These range from changes in the distribution of plants and animals and changes to overall vegetation structure, to wider issues such as regional climate change. It is believed that changes in fire regimes are at least "partly responsible" for the decline of biodiversity in tropical savanna (Myers et al., 2004, p. iv). Some plants do not survive fires and either favour protected areas or must resprout from seeds (eg *Callitris intratropica* has become much less common). Some species benefit from fire, and other species need longer time periods (three to five years) between burning to produce sufficient seeds (fire interval sensitive plants -- Myers et al., 2004). Many herbivores take advantage of the green pick that grows after fire. Some animals such as possums need tree hollows available in older larger *Eucalypts*, which large hot fires may be affecting (fire intensity sensitive plants -- Myers et al., 2004).

1 Fire regime: the size, frequency, season, pattern and intensity of fires.

Landscape heterogeneity is a measure of the patchiness of a landscape in time and space. Fire is an important contributor to landscape heterogeneity. Small fire areas are beneficial. This is because plants can recolonise from the adjacent areas. Many animals can survive in areas that are unburnt and some depend upon a mix of different aged vegetations to supply a suite of needs. This appears to be the case with the Gouldian finch (*Erythrura gouldiae*) that depends critically on a narrow range of grass seeds being available all year round in a limited territorial range. Even when the specific requirements of individual plants and animals are not known, a fine scale mosaic of different fire ages and intensities allows for greatest variety and variability in the landscape. "As a general rule, large areas of monotonous habitat, whether created by extensive frequent wildfires or total fire exclusion [in pastoral areas], are likely to cater for fewer species and lower abundance of many of those that are there, than would be the same areas if the contained a variety of habitats generated by fire" (Myers et al., 2004, p. 18).

Changing fire regimes also affect soil conditions by influencing litter levels, nutrient dynamics, soil micro- and macro-fauna, water infiltration rates, and rates of soil erosion. Another factor affecting soils is pastoralism. In general, hard-hoofed cattle have affected surface soil conditions. Overgrazing has considerably affected some landscapes, especially those near waterpoints and land degradation was recognised as a serious problem in the Ord catchment in the 1960s (Fitzgerald, 1968). The range of the purple-

Figure A.7.2 A fresh fire scar on the eastern slopes of the Saw Range towards the southern head of the Wheelbarrow Creek valley, July 2005.

crowned fairy-wren (*Malurus coronatus coronatus*) that lives in riparian communities has been severely reduced due to vegetation loss/trampling (Rowley, 1993; L. A. Smith & Johnstone, 1977). Another consequence of pastoralism has been the introduction of weed species. The Kimberley is free of some species such as *Mimosa pigra* and prickly acacia (*Acacia nilotica*) but Noogoora burr (*Xanthium occidental*), Bellyache bush (*Jatropha gossypifolia*), *Parkinsonia aculeate* and *Calotropis proceris* are significant weeds. Some have been accidentally introduced in associated coloniser activities, but others are escaped pasture species (eg buffel grass, *Cenchrus ciliaris*).

Historically, many mammal species were once found in much higher numbers. The Western Quoll (*Dasyurus geoffroii*) has disappeared completely from the Kimberley and the distributions of the northern quoll (*Dasyurus hallucatus*), golden-backed tree-rat (*Mesembriomys macrusus*), Golden Bandicoot (*Isoodon auratus auratus*) have decreased severely. This ecologically diverse group of animals belong to a larger group of extinct or declining animals throughout Australia that all fall within the critical weight range (CWR) of 300 g to 5 kg. Possible causes include habitat destruction and fragmentation (below a certain viable size), changed fire regimes, disease, competition and predation by feral animals[2] or weeds (through displacement of native plants). It is most likely that these decreases and extinctions have been caused by combinations and interactions of these factors in time and space (such as combinations of feral predation, local fire events and habitat homogenisation or fragmentation).

Relatively smaller land areas of the Kimberley are affected directly by mining and intensive agriculture (eg the irrigation farm downstream of *the walkingcountry*, and the larger Ord River Irrigation Area at Kununurra). Both types of activities can affect surface and ground water quality downstream. The hydrology of the Ord River from Lake Argyle down to the sea has changed from ephemeral to permanent, with weed species becoming more prevalent in many areas. The expansion of the Ord Irrigation Project in the next few years will result in loss of habitat through clearing.

In the future, global warming will affect lowlands through rising sea levels and saltwater intrusions into surface aquifers. Rainfall trends in the Kimberley have shown an increase over the last fifty years (Commonwealth Bureau of Meteorology, 2003). Increased CO_2 will probably make grass grow faster, and combined with greater rainfall, the chances of wildfires will probably increase (A. Reynolds, 2002). Global warming is expected to affect the spatial location (i.e. the "climatic envelopes"[3] of species), and whether populations will be able to adapt to these circumstances depends upon the speed of change, how mobile they are and whether there are areas that they can colonise (Department of Natural Resources Environment and the Arts Northern Territory Government, 2005). Questions of how the carbon cycle of tropical savannas relate to wider carbon debates will no doubt become more important in the future.

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2 Feral animals found in the Kimberley include donkeys, cats, pigs and horses (and cattle outside of pastoral lands).

3 The sum of conditions within which a plant or animal can grow.