THE SPREAD OF BUFFEL GRASS IN INLAND AUSTRALIA: LAND USE CONFLICTS

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Summary. Buffel grass has spread along road sides, river systems and into sheltered mountain habitats in central Australia. It is altering the biological integrity of many of these systems and may affect future native mammal re-introduction attempts. It is occupying restricted moist habitats in the ranges where most of our rare and relict native species occur. There are few options to limit further spread. The invasion provides important lessons for assessing new introductions and controlling species targeted for particular areas.

INTRODUCTION

Buffel grass (*Cenchrus ciliaris*) is widely distributed across northern and inland Australia, established from early accidental introductions and many programs of deliberate propagation for erosion control and pasture improvement (14, 2). There is no evidence to suggest that the likely spread or impact of the species to non-targeted areas was ever given consideration. It is now spreading, un-aided, into many areas that were never targeted for its establishment (8). Grass invasions throughout the world have often had devastating consequences (5).

Buffel grass is propagated in many areas in central Australia (8, 1). It had a restricted distribution for most of the time it has been established in central Australia. It spread rapidly during high rainfall periods and extensive flooding in the 1970's. Buffel grass now dominates most river frontage areas with self-maintaining populations, altering fire regimes and displacing food plants for native animals (12). It is dense in significant conservation areas of Uluru National Park (7). It is a major threat to food plants of Aboriginal people (10).

The establishment and spread of buffel grass raises at least two important issues to land managers. First, the criteria by which potential introductions are assessed do not include the invasive potential of the species into rangelands and conservation areas. Second, before species are established on target areas, mechanisms for limiting undesirable spread need to be in place.

I show how and where buffel grass has spread through areas of mountain ranges of central Australia. I discuss the conservation significance of the invasion and highlight some issues of introductions in rangeland and conservation areas.

METHODS

Data were collected from an extensive area of mountain ranges in central Australia. The data comprise presence records of buffel grass on different geological units and in different topographical positions on those units. I examine the frequency of records according to geology and topography.

During 1991 I sampled 308 one-kilometre transects within the central mountain ranges. On each transect I recorded if buffel grass was present within a site of 20 m radius at every 50 m interval along each transect. I recorded the location for each transect in AMG co-ordinates. At each record site I noted geological and topographical data to correlate with the occurrence of buffel grass. Each transect was confined to a geological unit so I have only recorded here if buffel grass was present on a unit. I have classified the units into fewer rock types. The mean values of a range of oxides for each rock type were calculated from data available from the Bureau of Mineral Resources. No geochemical data were available for alluvial sites. The site topographical data were used to determine if the presence of buffel grass was associated with particular morphological features. I classified morphological features into common landform types. I calculated annual solar radiation levels of sites.

RESULTS AND DISCUSSION

Buffel grass prefers alluvial soils and rock types that are low in SiO_2 and high in CaO (Table 1). These rock types generally provide alkaline soils richer in nutrients than sandstones and quartzites. These results are consistent with the other findings (4) that buffel grass generally fails to establish on acidic soils.

Table 1. The percent frequency of buffel grass on rock types and the mean percent by volume of oxides in the rock types

Rock type	Frequency	Mean percent by volume of oxides								
		Al_2O_3	CaO	Fe_2O_3	K_2O	Mgo	Mno	Na_2O	P_2O_5	SiO_2
Alluvium	86	-	-	-	-	-	-	-	-	-
Gneiss	51	10.0	3.1	3.7	2.3	1.6	0.0	1.7	0.0	44.7
Dolomite	33	5.4	3.1	1.9	3.5	3.0	0.4	0.6	0.4	54.4
Limestone	27	7.1	5.2	4.8	2.2	4.7	0.3	1.0	0.3	26.6
Quartzite	7	7.9	1.6	3.1	2.5	1.3	0.3	0.9	0.4	76.4
Sandstone	6	5.8	2.5	2.5	2.4	1.7	0.4	0.5	0.6	79.0

Lower parts of drainage systems and alluvial flats, particularly flood-outs, are preferred landforms for buffel grass (Table 2). It was frequent on cliffs, ledges and benches. These habitats in the higher parts of the mountains are sheltered from high solar radiation levels (Fig. 1).

Buffel grass is very common about the town of Alice Springs (Fig. 2) where it has spread from intensive plantings (9) by means of wind and water. Where it occurs on sites distant from Alice Springs it is predominantly in drainage systems and on alluvial flats. The spread of buffel grass along drainage systems is consistent with recordings of its habitat preference in other areas of Australia (8). The drainage systems are those areas where cattle grazing is most common and floods frequently disturb the soil surface.

Table 2. Percent frequency of buffel grass in different landform types in the mountains of central Australia

High ridges		Hill slopes		Drainage systems		Alluvial flats	
Ledge	32.0	Cliff	20.7	Head-waters	22.3	Flood-out	69.7
Bluff	5.2	Bench	22.6	Creek	23.2		
Peak	8.7	Slope	5.5	River	37.5		
		Shoulder	4.9				

It is unlikely that cattle are responsible for significant spread of buffel grass since seeds rarely survive ingestion (6). Evidence from Uluru National Park (7) suggests that transport of seed along road corridors is largely by wind generated from vehicles.

Buffel grass is established or spreading into habitats critical for conservation in central Australia. Its establishment in the very restricted habitats of shaded cliffs and gorges in the hills brings it into direct competition with many of the known rare and relict plant species of central Australia (3, 11). Its dominance along the lower drainage systems is altering the habitats known to have harboured many small mammals that have gone locally or globally extinct in Australia (13). Alteration of these rich areas may limit attempts to re-introduce many mammal species to their former habitats.

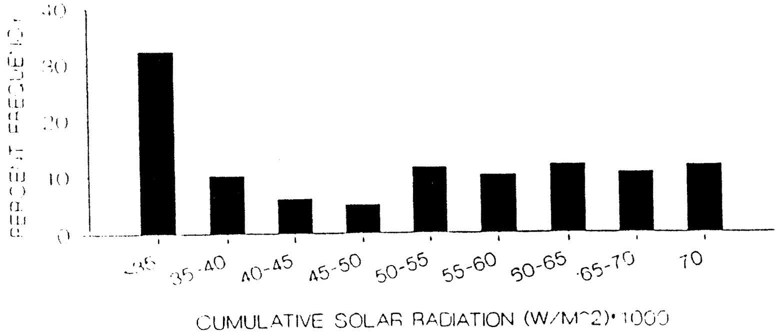

Figure 1. Percent frequency of buffel grass on sites with different levels of annual solar radiation.

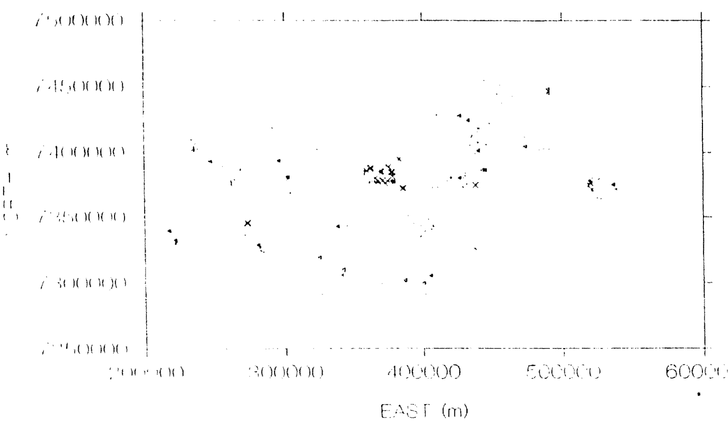

Figure 2. Map of the distribution of transect samples showing the occurrence of buffel grass. X = present on creeks and flats, □ present on hills, ◃ = absent on creeks and flats, ▹ = absent on hills. Alice Springs is located at approximately 385000E 7377000N.

Weed status

Trading off the perceived positive effects of introduced species against the negative effects requires that the effects are understood and considered. Agricultural or horticultural criteria are largely used for assessing species for introduction into Australia. I suggest that any future assessments need to take much greater account of the impact of species in natural rangelands and conservation areas. Strong and growing public concern for the maintenance of biodiversity may sway opinion against more introductions that could homogenise our biota (15). We need alternatives to conventional introductions.

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