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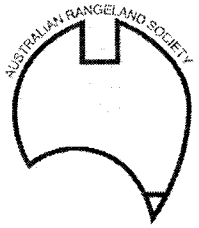

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VEGETATION MONITORING AT THE PADDOCK LEVEL FORTESCUE FLOODPLAIN CASE STUDY

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On the Fortescue River valley, Pilbara District, Western Australia (22° 55' S, 120 ° 15' E), transects have been established on Ethel Creek Station. There are on a floodplain dominated by *Eucalyptus victrix* with numerous understory herb and grass species. The soil is a red clay, of neutral to slightly alkaline pH. Gilgai drainage form holes as the waterlogged clay dries and contracts. Species diversity in this study is moderate high, 30 species occur in the transects, nine are trees and shurbs and the rest grasses or herbs.

Vegetation condition at a paddock level might be relevant not only for the ecologist studying changing patterns with time but also to the pastoralist. The pastoralist will aim to maximise resources and economise on efforts. Simple maps that identify areas with peak greenness will prove useful in mustering, by enabling cattle to be found promptly. A state of "no change" in greenness posterior to rainfall/flooding events is likely to indicate deterioration. A catastrophic event, such as fire or flooding for a long period, may reduce the ability of perennial grasses to re-sprout or locally deplete the seed bank. A "no change" near watering points where trampling andconsumption of herbaceous plants is concentrated and intense, would indicate overstocking.

DOLA Remote Sensing provides NDVI values from NOAA-AVHRR satellites series. The NDVI is related to the proportion of photosynthetically absorbed radiation. The NDVI is calculated form atmospherically corrected surface reflectanc form the visible and near infrared channels. To observe "greenness" changes since 1991 the Fortescue River floodplain was divided into 16 windows (4 by 4 km). Fortnightly values were rescaled to monthly figures and missing values due to cloud/shadow effects were regressed from adjacent values.

A positive NDVI trend since 1999 is explained by above average rainfall 1999 - 2002 (Fig. 1).
Differences were not observed between Roy Hill and Ethel Creek stations. Higher NDVI values for June-August 1993, despite only average summer rainfall, might be explained by winter rainfall but is more likely to be a result of NOAA-AVHRR 11 orbital drift by its useful life.

Investigation is necessary to determine timing of flooding events and when the Ophthalmia Dam overflowed (in 1995 and 2002) and if this caused flooding in the study areas. Since the Fortescue was dammed in 1981, is has become clearer that flooding events in the Fortescue River floodplain are driven more by the Jigalong River. This affects predominantly those paddocks in the north of Ethel Creek and south of Roy Hill station.

The satellite images to support this study comprise more than 20 years (1972 -2002) consist of Ladsat TM and MSS, ASTER, NOAA-AVHRR and MODIS. They were georeferenced to the AGD 66, projected to the UTM 51.

In oprder to determine riparian tree changes, the Landsat and ASTER imagery has been calibrated to invariant values. In adddition to investigate seasonal variation in grasses to NDVI values, a perpendicular index using visible bands is explored to correlated against grass cover.

Two transects (500 m) laid out in 1997 (Fig. 2) are used to record density (number of individuals), live cover (%) and green dry weight (g) per square meter. Transect 1 in River's Paddock, runs south-north 200 m west of the main Fortescue channel. Transect 2 is in Jackson's Paddock, running north to south 300 m east of the main Fortescue channel.

This part of Jackson's paddock is an open grassland whereas in River's paddock the tree E. victrix and the shurb Acacia farnesiana are common.

Biomass dry weights are presented (Fig. 1). The swamp grass, Eriachne benthamii is the main species in the Jackson's paddock transect while the grasses Panicum decompositum and P. laevinode tend to be more common in the River paddock transect area.

In April 1998 tree cover and height were estimated for 2.5 ha of River's Paddock (adjacent to the transect). The same general area was re-visited in June 2002. Preliminary results show an increase in A. farnesiana from 12 individuals in 1998, to 33 individuals in 2002. E. victrix also increased during this 3 year period from 4 individuals to 19 new trees by 2002. The ability of A. farnesiana to dominate is shown by abundant fruiting and healthy foliage in June 2002.

During 2002 MODIS NDVI difference from March 8 to May 27, and May 2 to July 3 offer information about the capability of vegetation to increase after summer rains (400 mm).

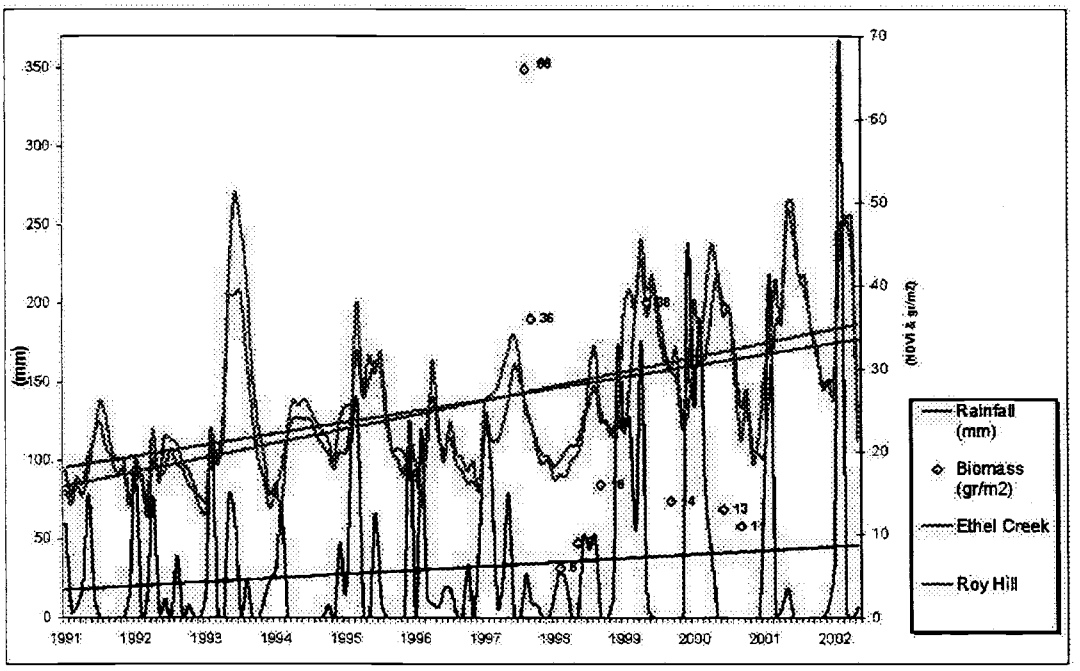

Figure 1. NDVI trends (red & green), Biomass (numbers) and rainfall (blue)

Figure 2 shows areas where NDVI increased from May 2 to July 3 (green) as a result of combined rainfall and flooding events. Areas inside the floodplain with no increase in greenness result from water logging effects on the vegetation. Some parts of Back Bullock paddock did not increase in greenness probably as a continuing result of fire in 1997 but coupled with inundaton for most of February 2002, observed on a MODIS image for 27th February.
A rehabilitation paddock cultivated in 1991 and then excluded from grazing, revealed that its eastern side did not increase in NDVI for the period.
Around Central Bore, there is an area of about 38 ha interpreted as degraded, as result of excessive grazing. This region was basically bare in the drought year of 1994.

The presence, vigour and distribution of grassess during the dry season will offer an indication of landscape stability, while lacks of them indicates degraded ecosystem.

It is intended that this project will set up a trial Web Map Server service to allow access to the NDVI images derived from MODIS monthly NDVI maps. The Fortescue River floodplain will be overlain by station fences, bore locations, roads, land systems and areas burned. The Station manager will be

encouraged to review these and feed back to the project team his assessment of the usefulness of the information.

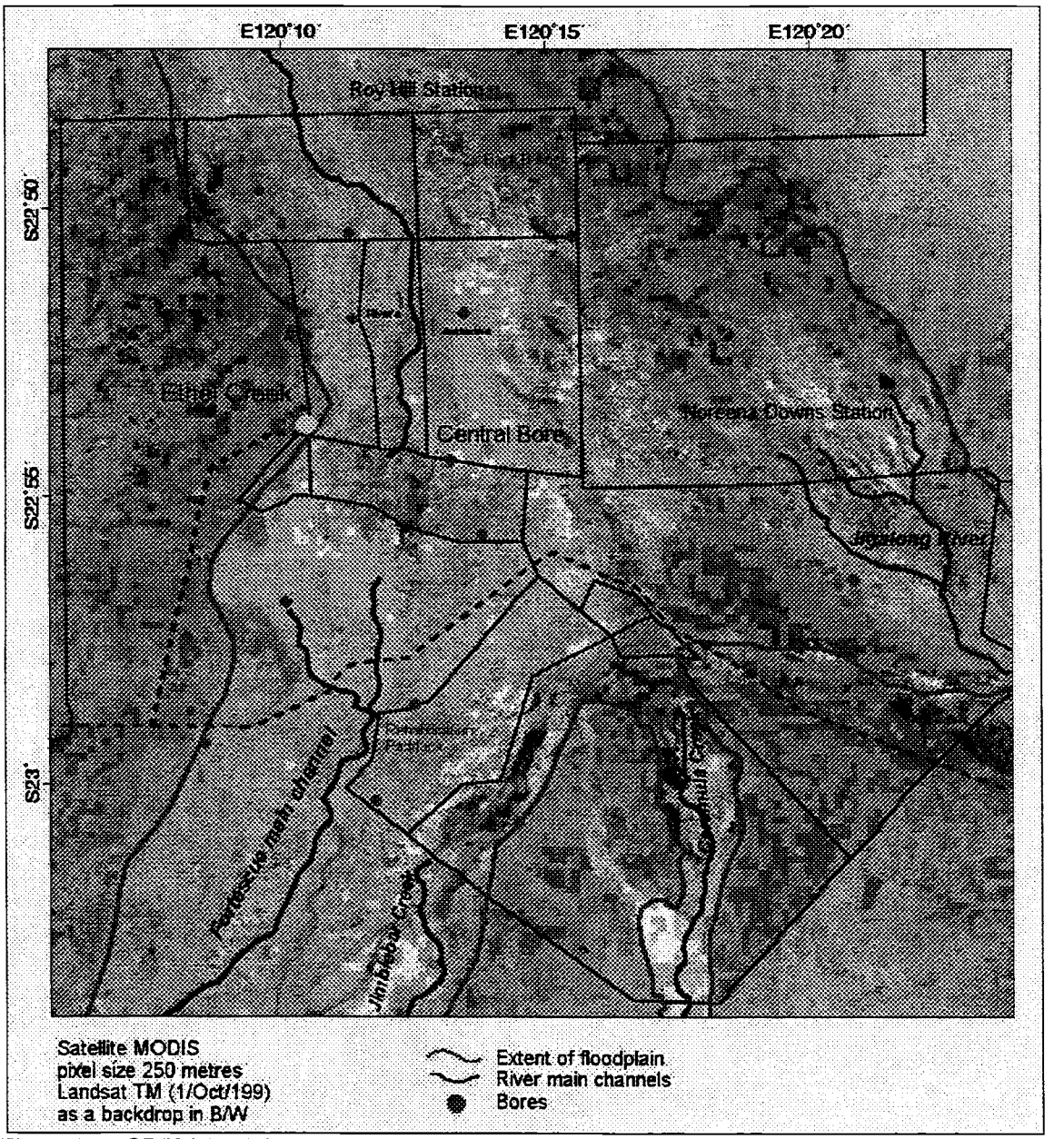

Figure 2. MODIS NDVI increase from May to July 2002

NOTE: DOLA Department of Land Administration W.A.
NDVI Normalised Difference Vegetation Index
NOAA National Oceanic and Atmospheric Administration
AVHRR Advance Very High Resolution Radiometer)
MODIS Moderate Resolution Imaging Radiometer
AGD Australian Grid Datum
ASTER Advance Speceborne Thermal Emission and Reflection Radiometer
TM Thematic Mapper
MSS Multispectral Scanner

	Sensor	Date	Type/ Level	Sun elevation	Sun Azimuth	Pixel Size (m.)
1	L1	30/11/1972	MSS	57	94?	60
2	L3	10/02/1980	MSS			60
3	L3	28/02/1980	MSS			60
4	L2	4/09/1980	MSS	39	58	60
5	L2	10/10/1980	MSS	49		60
6	?	12/08/1981	MSS			60
7	?	19/09/1983	MSS			60
8	L5	27/07/1984	MSS			60
9	L5	19/08/1986	MSS			60
10	L5	5/08/1987	MSS			60
11	L5	17/09/1991	MSS			60
12	L5	23/06/1989	TM	30.07	41.7	30
13	L5	17/09/1991	TM		59.97	30
14	L5	6/09/1993	TM		56.31	30
15	L5	2/04/1994	TM	42	60	30
16	L7	15/09/1999	ETM	50.15	52.48	30/15
17	L7	1/10/1999	ETM			30/15
18	L7	22/12/200	ETM	61.2	97.21	30/15
19	ASTER	3/10/2000	1B			15
20	ASTER	22/12/2000	1B			15

High resolution multispectral sensor

	Sensor	Date	Type	Number		Pixel
21	AVHRR	1991- current	NOAA	9, 11, 14 & 16		1000
22	MODIS	2002 – current	TERRA launched 1999		B. 1 & 2	250