supervising scientist report

192

A GIS compendium for

landscape-scale risk

assessment of the Magela

Creek floodplain and

broader Alligator Rivers

Region, NT

J Boyden, D Walden, P Bayliss & K Saalfeld



Australian Government

Department of the Environment, Water, Heritage and the Arts Supervising Scientist It is SSD policy for reports in the SSR series to be reviewed as part of the publications process. This Supervising Scientist Report has been formally refereed by two external independent experts.

J Boyden – Environmental Research Institute of the Supervising Scientist, GPO Box 461, Darwin NT 0801, Australia

D Walden – Environmental Research Institute of the Supervising Scientist, GPO Box 461, Darwin NT 0801, Australia

P Bayliss – Environmental Research Institute of the Supervising Scientist, GPO Box 461, Darwin NT 0801, Australia

K Saalfeld – Northern Terrirtory Department of Natural Resources, Environment and the Arts, Biodiversity North, GPO Box 496, Palmerston, NT 0831, Australia

This report should be cited as follows:

Boyden J, Walden D, Bayliss P & Saalfeld K 2008. A GIS compendium for landscape-scale risk assessment of the Magela Creek floodplain and broader Alligator Rivers Region, NT. Supervising Scientist Report 192, Supervising Scientist, Darwin NT.

The Supervising Scientist is part of the Australian Government Department of the Environment, Water, Heritage and the Arts.

© Commonwealth of Australia 2008

Supervising Scientist Department of the Environment, Water, Heritage and the Arts GPO Box 461, Darwin NT 0801 Australia

ISSN 1325-1554

ISBN-13: 978-1-921069-06-2

ISBN-10: 1-921069-06-6

This work is copyright. Apart from any use as permitted under the Copyright Act 1968, no part may be reproduced by any process without prior written permission from the Supervising Scientist. Requests and inquiries concerning reproduction and rights should be addressed to Publications Inquiries, *Supervising Scientist*, GPO Box 461, Darwin NT 0801.

e-mail: publications_ssd@environment.gov.au

Internet: www.environment.gov.au/ssd (www.environment.gov.au/ssd/publications)

The views and opinions expressed in this report do not necessarily reflect those of the Commonwealth of Australia. While reasonable efforts have been made to ensure that the contents of this report are factually correct, some essential data rely on the references cited and the Supervising Scientist and the Commonwealth of Australia do not accept responsibility for the accuracy, currency or completeness of the contents of this report, and shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the report. Readers should exercise their own skill and judgment with respect to their use of the material contained in this report.

Contents

E)	ecut	tive sı	ımmary	ix
Ac	ckno	wledg	ments	x
Ał	obrev	viatior	IS	xi
GI	ossa	ary of	terms for key metadata elements	xii
1	Bac	ckgrou	und	1
	1.1	Meas	urement endpoints used for risk assessment	2
	1.2	Spatia	al data reporting	4
2	En	/ironm	nental assets	9
	2.1	Water	birds	9
		2.1.1	Aerial surveys of waterbirds conducted in the Top End of the Northern Territory (April 2000) and Kakadu National Park (November 2003)	10
		2.1.2	Aerial surveys of waterbirds conducted in the Alligator Rivers Region from 1981 to 1984 by Morton and Brennan	11
	2.2	Native	e plant communities of wetlands	14
		2.2.1	Kakadu National Park vegetation	16
		2.2.2	Land units of the Magela Creek catchment	16
		2.2.3	A macrophyte vegetation classification of the Magela Creek floodplain, Alligator Rivers Region	19
		2.2.4	A vegetation map of the Magela floodplain	19
3	En	/ironn	nental threats	22
	3.1	Weed	ls	22
		3.1.1	Para grass distribution at 1991 and 1996 for a selected area of the Magela floodplain	25
		3.1.2	Airboat and helicopter surveys of para grass on the Magela floodplain conducted by <i>eriss</i> from 2003–2004	25
		3.1.3	A preliminary classification of para grass distribution on a selected region of the Magela floodplain derived from high resolution multi-spectral Quickbird™ satellite imagery captured on 25 June 2004	26
	3.2	Feral	animals	26
		3.2.1	Aerial surveys of feral animals conducted in Kakadu National Park in November 2001 (south KNP) and November 2003 (north KNP)	30

		3.2.2	Preliminary management zones for the control of feral animals in Kakadu National Park	36
4	En	/iro nr	nental characteristics	37
	4.1	Торо	graphic elevation data	37
		4.1.1	Digital elevation data of the Magela floodplain downstream of the Ranger uranium mine	38
	4.2	Fire h	nistory	38
		4.2.1	Remote sensing fire-scar mapping of annual 'early' and 'late' dry season burning for Kakadu National Park (1980–2004) and adjoining West Arnhemland (1995–2006)	38
	4.3	Infras	structure	42
		4.3.1	Infrastructure of the Magela Creek floodplain region (June 2001)	42
5	Dis	cussi	on	43
Bi	bliog	graph	у	45
Ap	open	dices)	51
	Арр	endix	1 Metadata reports for GIS data layers	52
		A1.1	Aerial surveys of waterbirds conducted in the Top End of the Northern Territory (April 2000) and Kakadu National Park (November 2003)	52
		A1.2	Aerial surveys of waterbirds conducted in the Alligator Rivers Region from 1981 to 1984 by Morton and Brennan	56
		A1.3	Kakadu National Park Vegetation (Schodde et al 1987)	59
		A1.4	Land units of the Magela Creek catchment (Wells 1979)	62
		A1.5	A macrophyte vegetation classification of the Magela Creek floodplain, Alligator Rivers Region (Finlayson, Bailey et al 1989)	65
		A1.6	A vegetation map of the Magela floodplain (Lowry et al in prep)	67
		A1.7	Para grass distribution at 1991 and 1996 for a selected area of the Magela floodplain (Knerr 1998)	69
		A1.8	Airboat and helicopter surveys of para grass on the Magela floodplain conducted by the Environmental Research Institute of the Supervising Scientist from 2003–2004	72
		A1.9	A preliminary classification of para grass distribution on a selected region of the Magela floodplain derived from high resolution multi-spectral Quickbird [™] satellite imagery captured on 25 June 2004	75
		A1.10	Aerial surveys of feral animals conducted in Kakadu National Park in November 2001(south KNP) and November 2003 (north KNP)	78

A1.11 Preliminary management a Kakadu National Park	zones for the control of feral animals in	82
A1.12 Digital elevation data of the Ranger uranium mine	e Magela floodplain downstream of the	84
A1.13 Remote sensing fire-scar r season burning for Kakad adjoining West Arnhemlar	napping of annual 'early' and 'late' dry u National Park (1980–2006) and nd (1995–2006)	87
A1.14 Infrastructure of the Magel	a Creek floodplain region (June 2001)	92
Appendix 2 Descriptions of attribute animals and waterbirds	e data for aerial surveys of feral	94
Appendix 3 Attribute field description	ons for ESRI shapefiles	97
Appendix 4 Methods for developing	g raster layers in ArcGIS™	102
Appendix 5 Error checking procedu	Ires	106
Appendix 6 Description of attribute vegetation and land unit classi	fields associated with the fication maps	107
Appendix 7 Procedure used to geo units classification for the Mag	-register and reproject the land ela catchment	112

Tables

Table 1 Datasets used to characterise risk to World Heritage Values of Magela floodplain, the measurement endpoints used, and potential limitations of data sources	5
Table 2 Summary of spatial data layers available for the ARR with potential use in ecological risk assessment grouped by assets, threats, environmental character and management zones	7
Table A1.1 Summary of data sources and methods used to derive fire scar histories for Kakadu and West Arnhemland	88
Table A2.1 Field definitions for the shapefile attribute tables for the feralanimals and birds aerial survey data, 2003	95
Table A2.2 Description of worksheets within the Excel workbook file 'Aerial survey datat_11_03.XLS', containing complete data for the aerial survey conducted in November 2003	95
Table A2.3 Error corrections conducted on aerial survey data collectedfor the 2003 dry season for feral animals and waterbirds	96
Table A2.4 Field definitions for the shapefile attribute tables for aerial surveys of waterbirds on the Magela floodplain conducted by Morton and Brennan between 1981 and 1985	96
Table A3.1 Attribute field descriptions for shapefiles produced for aerial surveys of waterbirds and feral animals	97

Table A3.1aAttribute field descriptions for shapefiles produced foraerial surveys of feral animals	97
Table A3.2 Attribute field descriptions for shapefiles produced for the para grass airboat survey on the Magela floodplain conducted 5–6 March 2003	98
Table A3.3 Attribute field descriptions for shapefiles produced for the para grass airboat survey on the Magela floodplain conducted 18–19 March 2003	99
Table A3.4 Attribute field descriptions for shapefiles produced for the para grass airboat survey on the Magela floodplain conducted 16 June 2004	100
Table A3.5 Attribute field descriptions for shapefiles produced for the para grass helicopter survey on the Magela floodplain conducted 16 June 2004	101
Table A5.1 Summary of error checking procedures	106
Table A6.1 Description of attribute fields associated with the Vegetationclassification map for KNP produced by Schodde et al 1987	107
Table A6.2 Description of map codes associated with the land unitclassification of Magela Creek catchment (Wells 1979)	108

Figures

Figure 1 A basic framework for conducting Ecological Risk Assessment	3
Figure 2 Ecological stressors considered in the relative risk model for the Magela floodplain	3
Figure 3 The Alligator Rivers Region in Australia's Northern Territory showing the area for landscape scale risk assessment of the Magela floodplain	6
Figure 4 Distribution of magpie goose nests recorded by aerial survey in the wet season of 2000 by Keith Saalfeld	12
Figure 5 Magpie goose numbers recorded by aerial survey during the late dry season of 2003 on the Magela Creek floodplain by Keith Saalfeld	13
Figure 6 Total magpie goose numbers recorded by aerial survey on the Magela Creek floodplain during the late dry season of 1982 (green) and the late wet season of 1983 (blue) by Morton and Brennan	13
Figure 7 Generalised vegetation change classes for the Magela floodplain since 1983 derived by overlaying the Finlayson (1989) and Lowry (2004) vegetation maps	15

Figure 8 Vegetation assemblages of the Magela Creek floodplain and surrounding landscape produced from the Kakadu National Park Vegetation classification	17
Figure 9 Land units of the Magela Creek catchment	18
Figure 10 Vegetation assemblages of the Magela Creek floodplain produced by Finlayson et al 1989	20
Figure 11 Biophysical features and vegetation assemblages of the Magela Creek floodplain produced by Lowry et al 2002	21
Figure 12 Para grass distribution on the Magela Creek floodplain from Knerr 1998 and point observation records by helicopter and airboat between 2003–2004 from eriss surveys and records from NT Government	23
Figure 13 Estimates of para grass cover derived from supervised classification of remotely sensed data collected in 2004	24
Figure 14 Estimates of ground disturbance by pigs and buffalo for the Magela floodplain region of KNP as recorded in the aerial survey conducted in November 2003	28
Figure 15 Estimates of ground disturbance by pigs and buffalo in KNP as recorded in the aerial survey conducted in November 2001 and November 2003	29
Figure 16 Distribution and number of pigs recorded during aerial surveys of KNP conducted in 2001 and 2003	31
Figure 17 Distribution and number of Buffalo recorded during aerial surveys conducted in 2001 and 2003	32
Figure 18 Distribution and number of horses recorded during aerial surveys conducted in 2001 and 2003	33
Figure 19 Distribution and number of Cattle recorded during aerial surveys conducted in 2001 and 2003	34
Figure 20 Distribution and number of Donkeys recorded during aerial surveys conducted in 2001 and 2003	35
Figure 21 Preliminary feral animal management zones produced for the Natural Resource Management Unit of PAN to monitor and assess feral animal control programs in KNP	36
Figure 22 Probability estimates for early dry Season burning across the Kakadu region derived from annual monitoring over a 25-year period (1980–2004) using Landsat fire scar mapping	39
Figure 23 Probability estimates for late dry Season burning across the Kakadu region derived from annual monitoring over a 25-year period (1980–2004) using Landsat fire scar mapping	40
Figure 24 Probability estimates of early dry Season burning across the Magela floodplain region derived from annual monitoring over a 25-year period (1980–2004) using Landsat fire scar mapping	41

Figure 25 Probability estimates of late dry season burning across the Magela floodplain region derived from annual monitoring over a 25-year period (1980 to 2004) using Landsat fire scar mapping	41
Figure 26 Delineation of roads and tracks of the Magela creek floodplain region derived from 1:250 k AUSLIG topographic map series, 1:50 k topo maps, and IKONOS satellite imagery	42
Figure A2.1 Location and extent of transects for aerial survey of waterbirds and feral animals conducted in 2001 and 2003 by Saalfeld and Bayliss	94
Figure A7.1 Procedures used in ENVI™ to re-project the land unit classification of the Magela catchment	112
Figure A7.2 Procedures used in ArcGIS [™] to amalgamate re-projected data files produced in ENVI [™]	113