Appendices

Appendix 1 Metadata reports for GIS data layers

A1.1 Aerial surveys of waterbirds conducted in the Top End of the Northern Territory (April 2000) and Kakadu National Park (November 2003)

DATASET INFORMATION

ANZLIC identifier:	ANZNT0002002011[5]
Dataset name(s)	Aerial surveys of waterbirds conducted in the Top End of the Northern Territory (April 2000) and Kakadu National Park (November 2003).
Custodian(s):	Northern Territory Department of Natural Resources, Environment and the Arts (formerly NT Department of Infrastructure, Planning and Environment), Parks and Wildlife Commission of the Northern Territory and Parks Australia North.
Jurisdiction:	Top End of Northern Territory including Kakadu National Park, Australia

DESCRIPTION

Abstract

Monitoring waterbird populations, including the magpie goose, has been undertaken by the PWCNT across the Top End since 1983. The key purpose of monitoring is to detect changing trends in distribution and abundance of major species. The seasonal timing of surveys is variable although most occur during the magpie goose nesting period (late wet season to early dry season). The datasets reported here relate to two standardised aerial surveys conducted in 2000 during the late wet season and 2003 during the dry season. The 2000 survey includes records of the distribution and number of magpie goose nests, as this survey coincided with the annual nesting season in early April.

Both surveys cover the major wetlands of the Kakadu region. While the 2003 survey targeted wetlands of KNP only, the 2000 survey provided complete coverage of Top End wetlands as defined by the PWCNT magpie goose monitoring program (PWCNT 2003), extending from KNP to include Top End wetlands as far west as the Moyle River catchment. The locations and extent of transects for each survey are shown in Figure 4. The distribution and numbers of magpie geese counted on the Magela floodplain for this survey are mapped in Figure 5.

Individual records are stored as point data, rather than records relating to a specific area, with spatial coordinates derived from Garmin™ GPS tracking systems. A description of the attributes contained in original shapefiles is provided in Table A2.1. For selected common species counted in the 2003 survey and for nest counts of magpie geese, raster data files have also been derived from point records as a spatial subset for the Magela ecological risk assessment.

Information on related datasets (pre-2000) and survey methodology standards have been documented in various reports and publications (Bayliss & Yeomans 1990, Saalfeld 1990, Colley 1999, Chatto 2000, PWCNT 2003, Chatto 2006). Data can be sourced through PWCNT. Scientific comparison with other monitoring datasets should be is limited to surveys using similar methodology.

ANZLIC keyword(s)

FAUNA Native; Surveys, Monitoring, Indicators, Biodiversity, Distribution, Conservation

ISO topic category: Biota

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[5] The ANZLIC ID code has been assigned to the Magpie goose (MG) dataset only. The 2003 survey of KNP (a spatial subset of the full MG monitoring program conducted by PWCNT) included counts of other waterbird species and has not been assigned an ID code at the time of publication.

Geographic bounding box (decimal degrees), GDA 1994

	Latitude		Longitude	
	North	South	East	West
2000 Survey[1]	-11.675000°	-14.325000°	133.045898°	129.699905°
2003 Survey[1]	-12.115378°	-13.208714°	133.007423°	131.879663°
Magela extent[2]	-12.225455°	-12.606458°	132.936360°	132.749360°

[1]Full coverage. [2]Spatial subset for Magela ecological risk assessment

Data currency

Beginning date: 19900101

Ending date: Current

Dataset status

Progress: ongoing

Maintenance and update frequency: as needed

Access

Data representation: vector

Stored data format(s)

ESRI point shapefiles and Excel spreadsheets. Raster data layers (points represented as grid cells) are collated in text format as separate worksheets in an Excel workbook. Total dataset size is under 7 Mega bytes.

Available format type

Parent datasets are provided as ESRI point shapefiles registered to the Geodetic Datum of Australia 1994, and projected using the Map Grid of Australia, zone 53 (Kakadu coverage only) or geographic coordinates (Top End coverage).

Access and use constraint(s)

Open. The Parks and Wildlife Commission of the Northern Territory and authors, for datasets relating to specific publications, should be acknowledged. Contact the PWCNT Data Management Officer to discuss requirements.

Data quality

Lineage

Data were collected by trained observers and originated from two systematic aerial surveys conducted in 2000 and 2003 involving standardised sample counts and using pre-determined parallel transect lines spaced at regular 2.5 km intervals and flown using fixed-wing aircraft. Along each transect a height of 73 m (250 ft) and an average speed of 186 km/hr was flown. Observer counts were made within a 200 m swath along each transect concurrently from port and starboard side by separate trained observers using marks on the aircraft wings as guides. Data relating to magpie goose abundance, collated here, will be amalgamated with the PWCNT 'magpie goose' dataset (ANZNT0002002011).

The same general methods were employed for both surveys: 1) conducted in 2000, led by Keith Saalfeld (KS) of PWCNT and; 2) conducted in 2003, led by Peter Bayliss (PB) of ***eriss***. To help maintain observer consistency between surveys, Keith Saalfeld was an observer common to both surveys. Similarly designed surveys have been conducted by the PWCNT on magpie goose populations and nesting distribution since 1983. The 2003 survey also included observations of feral animals which have been extracted as a separate dataset (section 3.2.1).

For the 2003 survey observations were recorded onto a mini-disk audio-recording system. Recordings for PB and Peter Christopherson (observer trainee) appear together on the same minidisk recordings, together. A separate minidisk system was used to record observations by KS. Recordings were transcribed by Caroline Camilleri (CC), James Boyden (JB), and Sarah Gooding (SG) – a volunteer supervised by JB. Transcribing by CC was done directly from mini-disk to an Excel spreadsheet. Transcribing done by JB and SG was first written into log-book then entered into Excel. All raw data are contained in the Excel spreadsheet file named 'Aerial survey data_11_03.XLS'. A description of worksheet in the file is provided in Table 4. Original minidisk recordings and log-book records are retained by Peter Bayliss.

Geographic coordinates for records in the 2003 survey were interpolated using a Visual Basic™ macro program written by KS. This procedure used as input the location coordinates and time for the start and finish points for each transect to interpolate spatial coordinates for individual count records. The formula is based on the linear distance and average flight speed between the beginning and end of each transect and the time at which each data record was logged. The program utilises two input files, 'transect.txt' and 'sighting.txt' and produces an output file, 'sight_ll.txt', containing interpolated positions for each count. The output file was imported to a point shapefile for further manipulation in ArcGIS™. Geographic coordinates for records of the survey conducted in 2000 were derived directly from a Garmin GPS.

For selected species counted in the surveys, Spatial Analyst™ was used to calculate the sum of point-data counts within gridcells intersecting transect lines at 250 m, 500 m and 1 km grid scales. Gridcells that intersected transect lines but contained no point observations for a particular species were given a zero value. Gridcells not intersecting transect lines were treated as 'missing data' and given a value of -9999. The procedures used for making the grid calculations are detailed in Appendix 4.

Positional accuracy

The PWCNT have nominally assigned a horizontal accuracy of ±250 m for datasets adopting this survey methodology.

Spatial coordinates for point records were checked in ArcMap™ for positional anomalies against original waypoint and track-log files logged in OziExplorer™ from a Garmin GPS. Some positional errors were found and corrected (see Table A5.1), after which interpolated point data showed good correlation against track-logs generated from a Garmin™ GPS, although there was evidence of some error propagation on the east-west axis (orientation of transect lines).

The Garmin GPS, considered accurate to ± 15 m, had a position update rate of one second. Thus error propagation on the east-west axis (along the direction of flight) was introduced and can be estimated to be equal to the distance the aircraft travelled in one second. Given the aircraft was travelling at a speed of 186 km/hr, distance travelled in one second is 52 m. This gives a flight-direction error of about 70 m. Deductive estimates of accuracy were also made by *ad hoc* comparison of the distribution of certain features against the AUSLIG 1:250000 map of water bodies. For example, it was shown that there was good correlation between distribution of wetland birds and the distribution of wetland areas on the AUSLIG map series.

Attribute accuracy

Attribute data were screened for errors and corrections made by 1) checking values against original log-book transcriptions; 2) checking for the correct logical sequence of entries (eg time sequence); 3) checking for outlier values for specific observation types. Based on this QA/QC screening, attribute accuracy is considered to be high.

Logical consistency

Logical consistency is considered to be high. Logical consistency tests undertaken included a check for valid values within each attribute field, and visual checks of maps produced from data.

Completeness

The 2000 survey provides complete coverage, within the scale limits of the survey design, of the wetland landscapes between the Moyle River and the East Alligator River; which includes lowland landscapes and wetlands across northern KNP. The 2003 survey provides complete coverage of wetlands of the KNP region only.

The dataset has been subject to rigorous verification and assessment. Attribute data have been validated and are complete.

In conjunction with species count records annotations relating, for example to habitat were sometimes, but not consistently noted. Habitat descriptions and other general notes were recorded under separate attribute fields. These attributes provide only a general guide and have limited use for quantitative data analysis as they are incomplete and inconsistent (observer biased).

Contact information

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URL:	http://www.nt.gov.au/nreta/parks/

Metadata date

Date:	20070710
Additional metadata:	Native dataset environment. Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Bayliss P & K Yeomans 1990a. Seasonal distribution and abundance of Magpie Goose, *Anseranas semipalmata* Latham, in the Northern Territory and their relationship to habitat, 1983–1986. *Australian Wildlife Research* 17, 15–38.

Bayliss P & K Yeomans 1990b. The use of low level aerial photography to correct bias in aerial survey estimates of Magpie Goose and whistle duck density on Northern Territory floodplains Australia. *Australian Wildlife Research* 17, 1–10.

Chatto R. 2006. The distribution and status of waterbirds around the coast and coastal wetlands of the Northern Territory. Technical Report No 76, Parks and Wildlife Commission of the Northern Territory.

Chatto R 2000. Waterbird breeding colonies in the Top End of the Northern Territory. Technical Report No 69. Palmerston, Parks and Wildlife Commission of the Northern Territory.

Colley T 1999. Spatial analysis of Magpie Goose nesting habitat in coastal wetlands of northern Australia, Honours thesis, Northern Territory University.

PWCNT 2003. Management program for Magpie goose (*Anseranas semipalmata*) in the Northern Territory of Australia: 2003–2007. Parks and Wildlife Commission of the Northern Territory. Internal report accessed from http://www.nt.gov.au/ipe/pwcnt/docs/management_program_for_magpie_goose.pdf

Saalfeld W 1990. Aerial survey of Magpie Goose populations and nesting in the Top End of the Northern Territory – wet Season 1990. Technical Report Number 50. Darwin, Conservation Commission of the Northern Territory.

A1.2 Aerial surveys of waterbirds conducted in the Alligator Rivers Region from 1981 to 1984 by Morton and Brennan

DATASET INFORMATION

ANZLIC identifier: Not assigned

Dataset names(s) Aerial surveys of waterbirds conducted in the Alligator Rivers Region from 1981 to 1984 by Morton and Brennan

Custodian: Environmental Research Institute of the Supervising Scientist, Department of the Environment, Water, Heritage and the Arts, Australian Government

Jurisdiction: Alligator Rivers Region, including Kakadu National Park, NT, Australia

DESCRIPTION

Abstract

Data presented here relate to a monitoring study on waterbird populations of major wetlands in the Alligator Rivers Region conducted between June 1981 and August 1984 by Morton et al (1991). The study aimed to assess seasonal trends in abundance and distribution for all waterbird species and used a combination of aerial & ground surveys techniques to assess abundance, distribution, and habitat preference (including vegetation) for specific species, resulting in a number of scientific publications (see also Morton et al 1990a&b, Morton et al 1991, Morton et al 1993a&b)

Original data from aerial survey component, until recently, had never been incorporated into a GIS. In 2005 the complete original hardcopy transcripts of the aerial survey dataset was digitised to MS Excel. Selected data from this dataset have been migrated to the ***eriss*** GIS: for the Magela floodplain site only and for magpie geese and egrets only and for the sampling times October '81,'82, '83 and May '82 and '83 only. A map of magpie goose distribution and numbers for the Magela floodplain excerpted from these data is provided in Figure 6.

Despite some differences in survey methodology between these data and the PWCNT waterbird monitoring program (section 2.1.1), this dataset complements more recent surveys and will allow a meta analysis to examine long-term trends in distribution and abundance of waterbird species.

ANZLIC keyword(s)

FAUNA Native: Surveys, Monitoring, Indicators, Biodiversity, Distribution, Conservation

ISO topic category: Biota

Geographic bounding box (decimal degrees), GDA 1994

	Latitude		Longitude	
	North	South	East	West
Transect line coverage for the Magela floodplain site	-12.256786	-12.547485	132.908098	132.774248
Magela extent[2]	-12.225455°	-12.606458°	132.936360°	132.749360°

1 Full coverage for Magela floodplain survey site (note that other sites in the ARR extend outside these bounds

2 Spatial subset for Magela ecological risk assessment

Data currency

Beginning date: June 1981

Ending date: ongoing

Dataset status

Progress: required

Maintenance and update frequency: As needed

Access

Data representation: vector and text

Stored data format(s)

The working spatial datasets produced only for selected species and sample times (at time of publication) are stored as ESRI Point shapefiles, while the complete digital dataset transcribed from original datasheets is stored as an Excel workbook. Raster data layers for selected species (magpie geese & egrets) were produced as a subset for ecological risk assessment studies of the Magela Creek floodplain and have been collated in text format as separate worksheets in a Excel workbook. Total dataset size is under 7 MB.

Available format type

Parent spatial datasets are provided as ESRI Point shapefiles in the Australian Geodetic Datum 1966, and projected using the Map Grid of Australia, zone 53, and have also been produced in GDA94, MGA zone 53. An Excel workbook contains the complete dataset.

Access and use constraint(s)

Open. The Environmental Research Institute of the Supervising Scientist and authors, for datasets relating to specific publications, should be acknowledged. Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

The description provided here is for aerial survey data for the Magela floodplain. Full descriptions of data collection methods for the study are described in (Morton, Brennan & Armstrong 1991). The Magela floodplain was sampled monthly from June 1981 to August 1984 using seventeen predetermined, roughly parallel, east-west oriented transect lines intersecting the Magela floodplain at a spacing of between 1 to 2 km. Transects did not extend into surrounding terrestrial woodland and transect length was dependent on the shape of the floodplain. Transects were navigated according to natural features (prior to the use of GPS technology). Transects were flown in a fixed wing Cessna 206 at a height of 30 m (100 ft) and at an average ground speed of 140 km/h (75 knots). A transect observation view width of 100 m (on the ground) was demarcated by two marks on each wing strut. The aerial surveys were conducted with two observers located from back-right (S Morton) and back-left (K Brennan), and a navigator.

Observers estimated the number of birds of all species, noting the counts on a cassette recorder, with a time-stamp being called by the navigator every 30 seconds. Cassette recorders were switched on for the entire transect, allowing counts to be divided into 30 second increments (approximately 1.2 km on the ground). On return to the laboratory the navigator (MD Armstrong) transcribed counts onto datasheets and adjusted the timing of segments such that each transect was composed of the appropriate number of units. This ensured that the counts in each unit were based on a ground observation distance of 1.2 km (Morton et al 1991).

The complete original hardcopy transcripts from aerial survey tape-cassette recordings were digitised to MS Excel by Gary Fox in 2005, and includes the sites: Magela, Nourlangie, East Alligator, Cooper and Boggy Plains. Thence selected aerial survey data from the Magela floodplain transects were migrated to ArcGIS™ for magpie geese and egrets for the following sample times: October 1981, ’82, ’83 and May 1982,’83.

Geographic coordinates for the selected records were interpolated using a Visual Basic Macro written by KS. For each transect this procedure used, as input, the location coordinates and time for the start and finish points of each transect to interpolate spatial coordinates for count records (grouped into 30 sec intervals). The position estimate was then determined by the linear distance between the beginning and end of each transect and the time (in this case the 30 second time unit) at which each data record was logged. The program utilises two input files, ‘transect.txt’ and ‘sighting.txt’ and produces an output file, ‘sight_ll.txt’, containing interpolated positions for each count. The output file was imported to a point shapefile for further manipulation in ArcGIS™.

The resulting shapefiles generated for magpie geese and egret data provide, for each 1.2 km unit along a transect, two points representing a counts for each observer. Note that a ‘point’ observation represents the total count for one observer within a specified 1.2 km transect unit, and that each unit will have two observation points sharing exactly the same spatial coordinates.

For selected sample times (October 1982 & May 1983 surveys), raster datasets were derived at 250m grid resolution for magpie geese and egrets. These dataset layers were derived to represent the total count (summed from both observers) within each 1.2 km transect unit.

MS Access™ was used to calculate the sum of counts from both observers for each transect unit. Raster files were generated from the summary tables using Spatial Analyst™. Gridcells intersecting transect lines, but contained no point observations, were given a zero value. Gridcells not intersecting transect lines were treated as 'missing data' and given a value of -9999. The procedures used for making the grid calculations are detailed in Appendix 4.

Attribute accuracy

Attribute accuracy is considered to be good. Attribute data were screened for errors and corrections made by 1) checking values against original log-book transcriptions; 2) checking for the correct logical sequence of entries (eg time sequence); 3) checking for outlier values for specific observation types.

Logical consistency

Logical consistency is considered to be high. Logical consistency tests undertaken included a check for valid values within each attribute field, and visual checks of maps derived from data.

Completeness

Original hardcopy transcriptions for the entire aerial survey study have been digitised to MS Excel™. Only a subset of this dataset has been migrated to GIS form. This subset is considered complete and includes only magpie goose and egret data for the Magela floodplain site for the sampling times October '81,'82, '83 and May '82 and '83.

Contact information

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Metadata date

Date: 20070710

Additional metadata: Native dataset environment. Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Morton S, Brennan K & Armstrong M 1990a. Distribution and abundance of Ducks in the Alligator Rivers Region, Northern Territory. *Australian Wildlife Research* 17, 573–590.

Morton S, Brennan K & Armstrong M 1990b. Distribution and abundance of magpie geese, Anseranas semipalmata, in the Alligator Rivers Region, Northern Territory. *Australian Journal of Ecology* 15, 307–320.

Morton S, Brennan K & Armstrong M 1991. Distribution and abundance of waterbirds in the Alligator Rivers Region, Northern Territory. Open file record 86, Supervising Scientist for the Alligator Rivers Region, Canberra. Unpublished paper.

Morton S, Brennan K & Armstrong M 1993a. Distribution and abundance of Grebes, Pelicans, Darters, Cormorants, Rails and Terns in the Alligator Rivers Region, Northern Territory. *Wildlife Research* 20, 203–217.

Morton S, Brennan K & Armstrong M 1993b. Distribution and abundance of Herons, Egrets, Ibises, and Spoonbills in the Alligator Rivers Region, Northern Territory. *Wildlife Research* 20, 23–43.

A1.3 Kakadu National Park Vegetation (Schodde et al 1987)

DATASET INFORMATION

ANZLIC identifier: ANZCW0501002741

Dataset name(s): Kakadu National Park Vegetation (Schodde et al 1987)

Custodian: Parks Australia North, Department of the Environment, Water, Heritage and the Arts, Australian Government

Jurisdiction: Kakadu National Park, Northern Territory, Australia

Description

Abstract

The vegetation of Kakadu National Park is a structural classification of the upper-storey vegetation cover. The vegetation polygons were originally mapped as unique mapping units onto 1969 1:60,000 black and white aerial photos as part of the Alligator Rivers region 'fact finding study' which preceded gazettal of Kakadu National Park. After two unsuccessful attempts to produce a vegetation map for the region (Schodde et al 1987) a project was developed to transfer the line-work from the original air photos onto topographic compilation map sheets at the 1:100 000 scale to produce a planimetrically corrected vegetation coverage. Additional mapping was undertaken over the Mary River catchment since the original Alligator Rivers region study did not extend beyond that catchment. The project was funded under the Australian National Parks and Wildlife Service Research and Survey Program project 190/101/14.

The vegetation map has 31 different vegetation classes fully described in Schodde et al 1987. Each grid cell has a unique vegetation type, for example, Open Forest, Paperbark Forest, and Sandstone Woodland. The data includes various coverages of specific issues in paperbark distribution (eg mortality due to salinity). The map includes full attributing where these have been available. A description of attribute fields for the shapefile version is provided in Table A6.1.

An excerpt from this map for the Magela floodplain ecological risk assessment is provided in Figure 8. Significant differences are observed between this map and other map productions for the Magela floodplain region. Specific reasons for the observed differences can not be ascertained although they probably relate to differences in survey scale, methodology, and classification topology; and not to real differences relating to vegetation change. Therefore caution should be exercised when making scientific comparison between the different maps.

ANZLIC keyword(s)

VEGETATION Structural; FLORA Native; Classification, Distribution, Mapping

ISO topic category: Biota

Geographic bounding box (decimal degrees)

Bounding Latitude		Bounding Longitude	
North	South	East	West
-12°	-14°	133°	131°

Data currency

Beginning date: 1 August 1986

Ending date: 1 August 1987

Dataset status

Progress: Complete

Maintenance and update frequency: Not planned

Access

Data representation: vector

Stored data format(s)

The working dataset is stored as an ArcGIS™ polygon shapefile. Derived datasets include: 1) A full coverage raster layer of KNP at 1km resolution for the purpose of spatial risk assessment studies on feral animals in KNP. This file is stored as a separate worksheet within a Excel workbook; and 2) Two raster layers derived for ecological risk assessment at the extent of the Magela Ck floodplain at 250 m and 500 m resolution, respectively, stored as separate worksheets within a Excel workbook. Total dataset size is under 24 Mb

Available format type

Parent datasets are provided as an ArcGIS™ polygon shapefile in the Australian Geodetic Datum 1966, and projected using the Map Grid of Australia, zone 53, and have also been re-projected to GDA94, MGA zone 53.

Access and use constraint(s)

No restrictions. The Department of the Environment, Water, Heritage and the Arts and original author should be acknowledged in any use of the data.

Data quality

Lineage

Each 1:100 000 map sheet produced by the ANPWS Research and Survey Program under project 190/101/14 was scanned by AUSLIG to produce 100m resolution raster coverage of the vegetation. The map was sent to ANPWS for ground checking. The original artwork was kept by AUSLIG. Once the vegetation data were revised they were imported into the Kakadu ERMS database using a 100 m cell-size.

All coverages were taken from ERMS with an initial 16Bit ERDAS GIS export. Conversion was undertaken using Imagegrid/Gridpoly in Arc/Info to an Arc coverage. Topology was applied through MapInfo using export/import for transport.

As a result of the conversion process, it was found that the coverage file contained a number of missing data 'sliver' polygons, between the boundaries of some map classes, having a maximum width of 100 metres. To clean these slivers, the coverage was first converted to a polygon shapefile. Slivers were then eliminated using the 'Eliminate' function in ArcToolbox under the 'Data Management Tools' Generalisation menu. Slivers were merging with neighbouring polygons with the largest shared border.

For the purposes of Ecological Risk Assessment the Spatial Analyst™ was used to produce spatial subsets in raster format for the Magela floodplain area at 250 and 500 m grid cell resolutions. A 1 km raster grid was also produced for the entire KNP coverage area.

Positional accuracy: Horizontal accuracy considered to be ±100 m

Attribute accuracy

V032: Death of paperbarks Jan 1993 includes attributes classifying density of mortalities.

V034: Primary paperbark forest with undefined grid-code.

V014: Death of paperbarks Dec 1992 includes attributes classifying cause and rate of death. grid-codes undefined.

V134: Primary paperbark patches with grid-code defined in field Table to define type of 'patch'.

Logical consistency

No particular tests carried out by Department of the Environment, Water, Heritage and the Arts. However, missing data 'slivers' (of up to 100 m in width) resulting from the export/import process were detected and removed (see lineage section)

Completeness: Complete for year of coverage.

Contact information

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Metadata date

Date: 20070710

Additional metadata: Native dataset environment Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcGIS™ 9

Supplementary information

Schodde R, Headley AB, Mason IJ & Martenz PN 1987. Vegetation habitats Kakadu National Park, Alligator Rivers Region, Northern Territory, Australia. Final Report to Australia National Parks and Wildlife Service. CSIRO Division of Wildlife and Rangelands Research, Canberra.

A1.4 Land units of the Magela Creek catchment (Wells 1979)

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name(s): Land units of the Magela Creek catchment (Wells 1979)

Custodian: Northern Territory Government Department of Natural Resources, Environment and the Arts is custodian of the original dataset while Environmental Research Institute of the Supervising Scientist is the custodian of the re-projected dataset (see Abstract);

Jurisdiction: Alligator Rivers Region, Kakadu National Park, NT, Australia

Description

Abstract

The land unit classification of the Magela catchment was produced by Wells (1979) of the Land Conservation Unit of the Territory Parks and Wildlife Commission of the NT for the former Alligator Rivers Region Research Institute (now ***eriss***). This work is a refinement of previous broader scale land system classifications conducted by Christian and Stewart (1953), Storey et al (1969) at a scales of 1:1 000 000 and 1:250 000 respectively, and preliminary land unit classification work undertaken by the Land Conservation Unit by Schaeffer et al (1969) using 1:50 000 aerial photography. The land unit delineation at 1:50 000 was substantially revised by Wells (1979), after discovering a large number of inconsistencies and omissions in previous mapping, and including new information on soil and landform characteristics obtained for 320 field sites in the catchment, where vegetation information was also obtained for 137 of these sites. The most recent account of land systems within which land units can occur is provided by Storey et al (1976)

A conventional approach to land unit classification was applied to areas originally delineated from 1:50 000 aerial photos, with primary class differentiation occurring on the basis of landform and terrain type, secondary criteria on the basis of soil type and slope, and further breakdown based on vegetation, drainage, and rock outcrop differences (Wells 1979). Land units within regions identified as areas subject to major change due to development and therefore at higher risk of soil erosion, such as from mining (Ranger & Jabiluka projects) and the Jabiru regional township, were surveyed more intensively for soils to obtain a map at 1:10000 scale for land units within these areas. A detailed account of methodologies and description of land unit associations is provided in the Wells (1979) report. An excerpt map from the dataset is provided in Figure 9 and a description of the land unit attributes is presented in Table A6.2.

ANZLIC keyword(s)

BOUNDARIES, Biophysical classification. ECOLOGY Landscape classification, LAND cover classification, FLORA native, distribution, classification

ISO topic category: Biota

Geographic bounding box

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Original dataset[1]	-12.246441°	-12.849589°	133.006645°	132.718131°
Magela extent[2]	-12.225455°	-12.606458°	132.93636°	132.74936°

[1]Complete dataset. [2]Derived spatial subset for ecological risk assessment of the Magela floodplain

Data currency

Beginning date: 1979

Ending date: 1979

Dataset status

Progress: Complete

Maintenance and update frequency: Irregular

Access

Data representation: vector

Stored data format(s):

The working dataset is stored as an ArcGIS™ polygon shapefile. The raster grid produced for ecological risk assessment of Magela floodplain at 250 m resolution is stored as text in a Excel workbook. Dataset size is approximately 2.2 MB.

Available format type

ArcGIS™ polygon shapefiles. The dataset is provided in both Geodetic Datum of Australia 1994, projected using the Map Grid of Australia, zone 53; and Australian Geodetic datum 1966, projected in Australian Map Grid zone 53.

Access and use constraint(s)

Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

The land unit classification of the Magela catchment was produced by Wells (1979) for the Land Conservation Unit of the Territory Parks and Wildlife Commission of the NT. Data were supplied to ***eriss*** by PWCNT as an Arc Coverage file with simple attribute identification. More comprehensive attribute descriptions were added by John Lowry of ***eriss***, basing descriptions on the Wells (1979) report.

The land unit map was checked for registration anomalies against base Landsat scenes of known datum and projection. The Land unit map did not align well with either AGD66, WGS84, or GDA94 datums, with a visible shift of at least 400 m against the Landsat AGD66 image. A decision was made to re-register the data using procedures in ENVI™ and ArcGIS as detailed in Appendix 7.

The re-registered dataset was then used to derive the spatial subset for the Magela floodplain ecological risk assessment.

Positional accuracy

100 m horizontal accuracy based on 1:50000 aerial photo accuracy. The average RMS error calculated for the GCP file used to re-register the map to a base Landsat scene was 27 metres, using 198 GCPs.

Attribute accuracy

Considered to be high. Details of land unit classification methods are provided in Wells 1979.

Logical consistency

A visual check of maps in the preparatory stages of map production was used to check logical consistency. Map class attributes of the re-registered image were also checked visually against original land units map.

Completeness

Complete

Contact information

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Metadata date:

Date: 20070710

Additional metadata:

Native dataset environment; Microsoft Windows XP Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Wells MR 1979. Soil studies in the Magela Creek catchment, 1978. Part 1. 1979. Northern Territory. Territory Parks and Wildlife Commission, Land Conservation Unit.

Christian CS & Stewart GA 1953. *General report on the survey of the Katherine – Darwin Region*, 1946. Land Research Series No 2 CSIRO, Australia.

Story R, Williams MAJ, Hooper ADL, O'Ferrall RE & JR McAlpine 1969. *Lands of the Adelaide–Alligator Area, Northern Territory*. Land Research Series No 25, CSIRO Australia

Story R, Galloway RW, McAlpine JR, Aldrick JM, & MAJ Williams 1976. *Lands of the Alligator Rivers Area, Northern Territory*. Land Research Series No 38, CSIRO Australia.

A1.5 A macrophyte vegetation classification of the Magela Creek floodplain, Alligator Rivers Region (Finlayson, Bailey et al 1989)

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name: A macrophyte vegetation classification of the Magela Creek floodplain, Alligator Rivers Region (Finlayson, Bailey & Cowie 1989).

Custodian: Environmental Research Institute of the Supervising Scientist (***eriss***), Supervising Scientist Division, Department of the Environment, Water, Heritage and the Arts; Australian Government

Jurisdiction: Northern Territory including Kakadu National Park, Australia

Description

Abstract

A generalised classification of vegetation was prepared from wet season vegetation maps and descriptions. Tree dominated communities were mapped using black and white photographs taken in September 1978 (non-stereoscopic), June 1975 and Oct 1982 (stereoscopic). Grass, sedge, and herb communities were mapped from a series of aerial colour photographs taken between 12 April 1984 and 4 June 1986, with a hand-held camera. Major plant communities were delineated on the basis of interpretation of patterns of colour and texture in the aerial photographs and from ground surveys. Details of species composition of communities, and of height of tree species were derived from field transects and field work incidental to the mapping over a period of 4 years (1983–1986). The resulting map is provided in Figure 10. See Finlayson et al (1989) for further details.

ANZLIC keyword(s)

VEGETATION Floristic; FLORA Native; Classification, Distribution, Mapping

ISO topic category: Biota

Geographic bounding box

The following coordinates represent the bounding box chosen for each of the data layers developed for the risk assessment. This area incorporates the Magela floodplain and the immediate surrounds. These coordinates do not represent the extents of the actual data points sampled.

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Parent dataset	-12.2271327	-12.589817	132.906773	132.795271
Magela extent[2]	-12.225455°	-12.606458°	132.93636°	132.74936°

[1]Parent dataset. [2]Derived dataset for Magela ecological risk assessment

Data currency

Beginning date: March 1982

Ending date: 1986

Dataset status

Progress: Complete

Maintenance and update frequency: Irregular

Access

Data representation: vector

Stored data format(s)

The working dataset is stored as an ArcGIS™ polygon shapefile. Raster layers produced at 250 m and 500 m resolution for the ecological risk assessment of Magela floodplain (incomplete coverage) are stored in a Excel workbook as separate worksheets. Dataset size is approximately 12.8 MB

Available format type

ArcGIS™ polygon shapefile. Data are provided in Geodetic Datum of Australia 1994, and projected using the Map Grid of Australia, zone 53

Access and use constraint(s)

Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

There is no available information on how the vegetation map produced by Finlayson 1989 was transferred to a digital spatial data file. However, it is likely the map was digitally scanned and the resulting raster map was registered to either the 1:100 000 or 1: 250 000 topographic map series using spatial adjustment tools in ArcGIS™. From the raster layer data a polygon shapefile was likely produced by hand using the edit facility in ArcGIS™, using the registered raster layer as a background for the digitisation process.

Positional accuracy

A nominal accuracy of ± 250 m has been assigned based map registration using the AUSLIG 1:250 000 topographic map series. Positional accuracy is uncertain, particularly since it is unclear how the original vegetation map was geo-registered in an ArcGIS™ environment. However a visual check of the map against IKONOS satellite imagery show reasonable accuracy of the floodplain boundary

Attribute accuracy

Map classes used are broad categories. Map classes were defined manually by aerial photo interpretation and may be subject to observer biases. Vegetation communities have been described qualitatively. Geo-referenced ground-validation data is absent so a quantitative accuracy assessment is not available.

Logical consistency

A visual check of maps in the preparatory stages of map production

Completeness

Complete

Contact information

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E-mail address:	john.lowry@environment.gov.au

Metadata date

Date:	20070710

Additional metadata

Native dataset environment. Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Finlayson CM, Bailey BJ & Cowie ID 1989. *Macrophyte vegetation of the Magela Creek flood plain, Alligator Rivers Region, Northern Territory*. Research Report 5, Supervising Scientist for the Alligator Rivers Region, AGPS, Canberra.

A1.6 A vegetation map of the Magela floodplain (Lowry et al, in prep)

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name(s): A vegetation map of the Magela floodplain (Lowry et al, in prep)

Custodian: Environmental Research Institute of the Supervising Scientist (*eriss*); Supervising Scientist Division; Department of the Environment, Water, Heritage and the Arts; Australian Government

Jurisdiction: Kakadu National Park, NT, Australia

Description

Abstract

The aim in producing a new vegetation map for the Magela floodplain was to assess change in vegetation communities in context to previous map classifications for the floodplain. In particular change was to be assessed over a 30-year timeframe in context to the vegetation classification produced by Finalyson et al 1989). Map assessment was undertaken by combining information from ground (airboat) and aerial surveys. The new map (Figure 11) by Lowry et al (in prep) was produced from a systematic survey conducted between March and April 2003.

ANZLIC keyword(s)

VEGETATION Floristic; FLORA Native; Classification, Distribution, Mapping, Monitoring, Fire

ISO topic category: Biota

Geographic bounding box (decimal degrees)

The following coordinates represent the bounding box chosen for each of the data layers developed for the risk assessment. This area incorporates the Magela floodplain and the immediate surrounds. These coordinates do not represent the extents of the actual data points sampled.

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Parent dataset	-12.2271327	-12.589817	132.906773	132.795271

Beginning date: 2003

Ending date: 2003

Dataset status

Progress: ongoing

Maintenance and update frequency: Irregular

Access

Data representation: raster & vector

Stored data format(s)

Working dataset is an ArcGIS™ polygon shapefile. Dataset size is approximately 700 Kb

Available format type

ArcGIS™ polygon shapefile Data are provided in Geodetic Datum of Australia 1994, and projected using the Map Grid of Australia, zone 53

Access and use constraint(s)

Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

A provisional vegetation map was prepared from high-resolution IKONOS satellite imagery captured in June 2002. Using this map and historical data (from other vegetation maps, including

Finalyson et al 1989), and focussing on areas where vegetation change was apparent a systematic survey of the floodplain was then undertaken by airboat and helicopter. Full details on map production are provided in Lowry et al (in prep).

Positional accuracy

No quantitative positional accuracy assessment available, however outline of floodplain appears to correspond with AUSLIG 1:100 000 map features

Attribute accuracy

Map class attributes represent generalised cover classes similar to those used in Finalyson et al 1989

Logical consistency

A visual check of maps in the preparatory stages of map production

Completeness: accompanying publication not completed

Contact information

Contact organisation: Environmental Research Institute of the Supervising Scientist

Contact position: GIS Officer

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E-mail address: john.lowry@environment.gov.au

Metadata date

Date: 20070710

Additional metadata

Native dataset environment. Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Lowry JB, Boyden JM, Finlayson CM & Begg GW (in prep). Biophysical mapping of the Magela floodplain. Supervising Scientist Report, Supervising Scientist, Darwin NT.

A1.7 Para grass distribution at 1991 and 1996 for a selected area of the Magela floodplain (Knerr 1998)

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name(s): Para grass distribution at 1991 and 1996 for a selected area of the Magela floodplain (Knerr 1998)

Custodian: Environmental Research Institute of the Supervising Scientist (Supervising Scientist Division) for Parks Australia North; Department of the Environment, Water, Heritage and the Arts; Australian Government.

Jurisdiction: Kakadu National Park, Northern Territory, Australia.

Description

Abstract

As part of a university honours project, a vegetation survey and mapping study was conducted by Nunzio Knerr to estimate the change in distribution of para grass (*Urochloa mutica*, or formerly *Brachiaria mutica*) from 1991 to 1996 for a selected area of the Magela. floodplain (Knerr 1998). Four vegetation communities were examined (dominated by either *Urochloa mutica*, *Oryza meriondalis*, *Hymenachne acutigluma*, and *Pseudoraphis spinecens*). The plant communities used for mapping units follow Finalyson et al (1989), with the addition of para grass, which was described as 'growing in dense clumps and dominates… throughout the year'. Knerr (1998) concluded that the Oryza grassland was the primary native community displaced by para grass invasion, based on comparisons with historical records (Finalyson et al 1989). Mapping was undertaken using georefereced ground data in conjunction with aerial photo interpretation at a scale of 1:25000.

Positional anomalies in the projection of the original GIS dataset were identified and have been rectified for the 1996 dataset to an acceptable accuracy level (by re-registering to a standard QuickBird™ satellite image using the RST procedure in ENVI™). Resulting map is shown in Figure 12. To date, projection anomalies have not been resolved for the 1991 distribution map, and this will need to be reregistered if it is to be of any value.

ANZLIC keyword(s)

FLORA Exotic: Monitoring, Surveys, Indicators, Distribution, Mapping, Models

ISO topic category: Biota

Geographic bounding box

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Parent dataset[1]	-12.394600	-12.441590	132.80704	132.88491

[1]Parent dataset provides incomplete coverage of the Magela floodplain

Data currency

Beginning date: 1996

Ending date: 1998

Progress: Complete

Maintenance and update frequency: Irregular

Access

Data representation: raster and vector

Stored data format(s)

Available format type

Access and use constraint(s)

Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

Field data for mapping was obtained from visual assessment of dominant species at 1048 (differential) GPS locations recorded between April and May 1996. These data were plotted at a scale of 1:25000 (using Garmin PCX interface software and ArcInfo GIS). Colour aerial photos for the area of interest on the floodplain were captured in June 1996 at 1:25000 (with 60% forward overlap and 20% side overlap for stereo viewing and mosaic purposes). Eight ground control targets georefereced with a differential GPS were placed at strategic locations to enable the 1991 photography to be geo-registered. In conjunction with geo-referenced field data, vegetation communities were interpreted from photos. The vegetation types were mapped by tracing onto drafting film using a stereo viewer. Para grass infested areas were mapped in more detail by adding an 8x objective lens to the stereo viewer. Maps were then digitised using Generic Cadd 6.1 software with a digitising tablet. This area of the floodplain was mapped also using the same method for 1991 aerial photo (for which detailed field data did not exist). Images were converted into DXF format and then imported into ArcInfo version 6. Images were then georectified using the reference markers and 10 other readily identifiable locations.

In 2005 the GIS dataset was sourced from the ***eriss*** archives and QA/QC checks were undertaken. Projection anomalies were discovered with the image not aligning accurately against standard projections (WGS84, AGD66 GDA94). The original projection remains a mystery as no metadata have been found specifically relating to the GIS data files. However, the 1996 data were re-registered by James Boyden against a standard 'map-registered' QuickBird™ product to a to a reasonable standard using 160 points (identifiable channel boundaries and floodplain margins as control points). '

Positional accuracy

The 1996 image was originally validated used 1048 georefereced locations. However, the validation dataset (location and vegetation composition information) has been lost. Therefore the spatial accuracy of the para grass distribution produced cannot be independently validated with quantified accuracy using original field data,

Positional alignment problems were encountered in attempting to overlay vector layers produced in the original study onto a reference image. However, when the 1996 image was re-registered to a standard map registered QuickBird™ base image the horizontal RMS error was ±13 m using 160 GCPs.

Attribute accuracy

Because the quantitative field dataset for the 1996 image has been lost it is not possible to check the density of para grass in areas defined as 'para grass'. However it can be assumed that the mapping unit for para grass was based on areas of dense para grass cover, as indicated by Knerrs' description of the community: Para grass 'grows in dense clumps and dominates this community throughout the year'.

Aerial photographic interpretation techniques only, and in the absence of field data for the same time period, was used to determine para grass distribution from the 1991 imagery.

Logical consistency

A visual check of maps in the preparatory stages of map production

Completeness

data are complete for the para grass attribute for area of image coverage. Map units for Surrounding vegetation communities (*Oryza* & *Hymenachne*) are missing from the current vector dataset, but can be determined from hardcopy maps produce in the accompanying thesis (Knerr 1998)

Contact information

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Metadata date

Date: 20070710

Additional metadata

Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Knerr NJA 1998. Grassland community dynamics of a freshwater tropical floodplain: Invasion of Brachiaria mutica (Para grass) on the Magela Floodplain, Kakadu National Park. Internal report 275, Supervising Scientist, Canberra. Unpublished paper.

Finlayson CM, Bailey BJ & Cowie ID 1989. *Macrophyte vegetation of the Magela Creek flood plain, Alligator Rivers Region, Northern Territory*. Research Report 5, Supervising Scientist for the Alligator Rivers Region, AGPS, Canberra.

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

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name: Airboat and helicopter surveys of para grass on the Magela floodplain conducted by the Environmental Research Institute of the Supervising Scientist from 2003–2004

Custodian: Environmental Research Institute of the Supervising Scientist (***eriss***, Supervising Scientist Division) for Parks Australia North, Department of the Environment, Water, Heritage and the Arts; Australian Government

Jurisdiction: Kakadu National Park, Northern Territory, Australia

Description

Abstract

With limited resources it was not possible to conduct a systematic survey of para grass for the entire Magela floodplain. However, in March 2003, as part of a broader floodplain vegetation mapping program (Sections 2.2.4 & A1.6, Figure 11), two rapid-assessment, mobile-airboat surveys were conducted by a trained observer/recorder, where vegetation types, including para grass, were ranked in order of cover dominance for about 1200 locations spanning the length of the floodplain. Using this information and historical information on para grass distribution (Knerr 1998), it was decided to focus further para grass-specific survey efforts within the region of the largest infestation located near the centre of the Magela floodplain where the aim was to obtain more detailed information on environmental and native plant associations of para grass across its range. Therefore in June 2004, another airboat survey of this region was completed, followed by a low level helicopter survey. For this airboat survey, the percentage cover of dominant plant species and open water were recorded in detail for some 80 sites located along four transverse (east-west orientated) transects (each approximately 3.5 km in length and spaced at about 1km intervals) and two longitudinal adjoining transects. Sites observations were made at approximately 250 m intervals along the transect where each was taken in a 20 m radius of the bow from the standing airboat.. Water depth measurements (with coincident measurement at the Jabiluka gauging station) and photographs were also taken at most 2004 sites. The main purpose of the accompanying helicopter survey was to delineate larger, homogeneous patches of para grass across a broader extent than could be achieved using the airboat alone. Larger patches of homogeneous vegetation were later used as training (and validation sites) for classification of a coincident remote sensing image capture (Sections 3.1.3 & A1.9, Figure 13).

Surveys of dominant floodplain vegetation types in the Magela floodplain were conducted using airboats on 05/03/03 – 06/03/03 & 18/03/03 – 19/03/03 & 16/06/04. The helicopter survey was conducted on 18/06/04. The locations of all observation points for all surveys were recorded using a handheld Garmin eTrex™ GPS unit. Point data records for para grass are illustrated in Figure 12

ANZLIC keyword(s)

FLORA Exotic and Native: monitoring, surveys, indicators, distribution

ISO topic category: Biota

Geographic bounding box (decimal degrees)

The following coordinates represent the bounding box chosen for each of the data layers developed for the risk assessment. This area incorporates the Magela floodplain and the immediate surrounds. These coordinates do not represent the extents of the actual data points sampled.

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Parent dataset[1]	-12.225455°	12.606458°	132.936368°	132.74936°
Magela extent[2]	-12.225455°	-12.606458°	132.93636°	132.74936°

[1]Parent dataset combining both 2001 & 2003 surveys. [2]Derived subset for Magela ecological risk assessment

Data currency

Beginning date: 05/03/03 (See abstract for details)

Ending date: 18/06/04 (See abstract for details)

Dataset status

Progress: ongoing

Maintenance and update frequency: Irregular

Access

Data representation: vector and raster

Stored data format(s)

ESRI point shapefiles and raster text files. Total dataset size approximately 5 MB

Available format type

ESRI point shapefiles projected to the Geodetic Datum of Australia 1994, Map Grid of Australia, zone 53

Access and use constraint(s)

Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

Field waypoints obtained with a Garmin eTrex GPS were downloaded to excel spreadsheets as geographic coordinates projected to WGS84. All observations (for the relevant waypoint) taken at each site (see abstract) were manually entered into the spreadsheets by James Boyden and Dave Walden from the original field notebooks. Each entry was later checked by DW. Each vegetation type was given a code (see Appendix A3.2–3.5) and these were entered for each waypoint to represent the dominant community at that point. Para grass waypoints were extracted for each of the individual surveys and combined to give all para grass sited within the survey area.

Positional accuracy

A positional accuracy of +/- 15 m is known for the Garmin GPS equipment used to collect point data from while stationary. A more realistic estimate of accuracy is likely to be +/- 50 m as further error may have been introduced from movement in helicopter and airboat, while GPS information was being logged

Attribute accuracy

Attribute data were checked for errors against original field notes

Logical consistency

A visual check of maps in the preparatory stages of map production

Completeness: Complete

Contact information

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Metadata date

Date: 20070710

Additional Metadata: Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Walden D, Bayliss P, Boyden J & K Ferdinands (in press). An ecological risk assessment of the major weeds on the Magela Creek floodplain, Kakadu National Park. Supervising Scientist Report 194, Supervising Scientist, Darwin NT.

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

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name: 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 25th June 2004

Custodian: Environmental Research Institute of the Supervising Scientist (***eriss***, Supervising Scientist Division) for Parks Australia North; Department of the Environment, Water, Heritage and the Arts, Australian Government.

Jurisdiction: Kakadu National Park, Northern Territory, Australia.

Description

Abstract

This map production shows the distribution and density of the environmental weed, para grass (*Urochloa mutica*) over a central 64 km² area of the Magela Creek floodplain. It was produced using supervised classification of multispectral QuickBird™ satellite imagery (captured on 25 June 2004), in conjunction with spatially referenced ground and helicopter survey data. The quality of the base QuickBird™ image is excellent. Image capture timing occurred when fire had not occurred and spectral discrimination of para grass from other major floodplain plant communities was considered most pronounced. However, it was apparent that some senescent grassland types associated with surrounding open woodland (non-floodplain areas) were misclassified as para grass. Classification accuracy assessment indicated an overall accuracy of 86% and a producer accuracy for para grass ranging from 90 to 97%, indicating that there is potential to monitor para grass using QuickBird™ imagery (Boyden et. al. 2007)

The satellite image captures an Area of Interest (AOI) considered to be the centre of the largest para grass infestation of the floodplain located in the Nankeen billabong area. The AOI also incorporates native vegetation communities that are potentially threatened by this infestation (*Oryza*, *Eleocharis* and *Hymenachne* spp), in addition to floodplain margin areas that already have para grass infestations or have the potential to become infested. Full coverage of the floodplain was not possible at the time of image capture due to the relatively high cost of this type of imagery.

The percentage cover of para grass was calculated within 250 m² grid cells using zone statistics in Spatial Analyst™ (Figure 13).

The map assists monitoring and weed control targeting, and the layer may be overlayed with other spatial data such as bathymetry and native vegetation to facilitate predictive modelling.

ANZLIC keyword(s)

FLORA Exotic: Monitoring, Surveys, Indicators, Distribution, Mapping, Models

ISO topic category: Biota

Geographic bounding box

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Parent dataset[1]	-12.371°	-12.465°	132.820°	132.905°
Magela extent[2]	-12.225455°	-12.606458°	132.93636°	132.74936°

[1]Parent dataset combining both 2001 & 2003 surveys. [2]Derived subset for Magela ecological risk assessment

Data currency

Beginning date: 25 June 2004 (time of image capture)

Ending date: 25 June 2004 (time of image capture)

Progress: ongoing

Maintenance and update frequency Irregular

Access

Data representation: raster and vector

Stored data format(s)

Original satellite image coverage supplied by Digital Globe™ as six images in QuickBird™ GeoTiff format. A mosaic of these images is also stored in ENVI™ format. Original map classification files are stored in ENVI™ classification file formats. The original para grass percent-cover map produced at 250 m resolution is stored as an ESRI grid file and a shapefile. This data produced for the ecological risk assessment of the Magela floodplain is stored as a separate worksheet in a Excel workbook. Total size of datasets, combined, is approximately 4.4 Gigabytes.

Available format type

Original data supplied as six images in QuickBird™ GeoTiff format projected to the WGS84 geographic coordinate system. Map classification files supplied in ENVI™ classification format, re-projected to Geodetic Datum of Australia 1994, using the Map Grid of Australia, zone 53.

Access and use constraint(s)

Contact the GIS Officer to discuss user requirements for citation etc. The use and/or dissemination of this data and/or of any product in any way derived there from are restricted. Unauthorised use and/or dissemination is prohibited. Refer to Digital Globe Inc. end user license agreement for Order No 51771, Order item No 000000126361.

Data quality

Lineage

The vegetation class map was derived from a high-resolution QuickBird™ satellite remote sensing using multispectral (RGB-visible and Near-Infrared bands at 2.7 m pixel resolution) and panchromatic (0.6 m pixel resolution) images. A ENVI™ mosaic of the complete coverage (constituting six GeoTiff files) of multispectral data was created from which the floodplain area, and fringing vegetation was clipped out as a separate ENVI™ file. Image classification was conducted on this clipped file in ENVI™ using the Maximum Likelihood Classifier algorithm.

Training-sites for classification were selected using spatially referenced field notes and photographs. Vegetation surveys conducted from the ground (05/03/03–06/03/03 & 18/03/03–19/03/03 & 16/06/04) and by helicopter (18/06/04) using a Garmin eTrex™ GPS, were used to provide this information and additionally provided ground-truth data for classification validation. In cases where there was uncertainly between the interpretation of field notes and the location of features on imagery, areas were omitted from the training-site selection process.

Para grass growing in moister areas was spectrally distinct to that found in drier areas, having a greener and less ‘senescent’ signature (and with moister stands being confined to lower-elevation floodplain areas and drier stands to floodplain margins). Accordingly, the classification procedure used three sets of training sites, ‘greener’ to ‘more senescent’, to guide classification and improve accuracy.

Classification accuracy assessment, using independent validation site data produced an overall map accuracy of 86% (kappa coefficient = 0.83) was calculated for the classification. Producer accuracy for para grass ranged from 90 to 97% between the three forms of para grass (Boyden et al 2007).

The resulting class map was resampled to 5 m pixels in ENVI™ using nearest neighbour resampling. From this map a raster layer was produced for para grass only (other map classes removed). Using this file (and a 250 m zone-grid overlay of the coverage area), the percentage cover of para grass within each 250 m grid cells was calculated using the Zone Statistics option of Spatial Analyst in ArcGIS™. That is the total number of 5 m ‘para grass’ pixels falling within each 250 m grid cell was divided by the total area of each grid cell to derive a percentage cover (Figure 13).

Positional accuracy

Reflective 3 m^2 Ground Control Points (GCPs) were deployed in the field at the time of image capture and geo-referenced with a Omnistar™ dGPS (horizontal accuracy to within 1 metre) to validate horizontal accuracy of the standard, map-registered, QuickBird™ product provided by to Digital Globe Inc. All targets were identified on the QuickBird™ image within 1 to 2-pixels (4 m) from dGPS coordinates. The use of fixed GCPs also allows potential for future co-registration of multi-temporal imagery for monitoring purposes.

Training sites and ground-truth data were geo-referenced using a Garmin™ Etrex GPS (at ±15 m accuracy with a 1-second position update frequency).

Attribute accuracy

No systematic field validation, post-classification, was undertaken to confirm classification accuracy of the vegetation map produced using the Maximum Likelihood algorithm. It was apparent that some senescent grassland types associated with surrounding open woodland (non-floodplain areas) were misclassified with the 'senescent para grass' sub-class produced in this initial classification. Para grass distribution is restricted to the floodplain and its margins and generally does not extend into the drier open woodland areas.

Logical consistency

A visual check of maps in the preparatory stages of map production.

Completeness

Data are complete for a 64 km portion of the Magela floodplain.

Classification is incomplete insofar that only an initial classification has been conducted. Accuracy assessment and refinement of the classification method, including validation of training site information and the adoption of suitable sample sizes for supervised classification and accuracy assessment still needs to be conducted.

Legends provide only limited descriptive information on major plant species or vegetation communities occurring at ground level. Trees (paperbark forest) were omitted from the classification

Contact information

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Metadata date

Date: 20070710

Additional metadata

Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Boyden J, Walden D, Bartolo R & Bayliss P 2007. Utility of VHR remote sensing data for landscape scale assessment of the environmental weed Para grass [*Urochloa mutica*, (FORSSK), Nguyen] on a tropical floodplain. In *Proceedings of the 28th Asian Conference on Remote Sensing*. Kuala Lumpur November 12–16 2007 (published on CD ROM).

Walden D, Bayliss P, Boyden J & K Ferdinands (in press). An ecological risk assessment of the major weeds on the Magela Creek floodplain, Kakadu National Park. Supervising Scientist Report 194, Supervising Scientist, Darwin NT.

A1.10 Aerial surveys of feral animals conducted in Kakadu National Park in November 2001(south KNP) and November 2003 (north KNP)

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name: **Aerial surveys of feral animals conducted in Kakadu National Park in November 2001(south KNP) and November 2003 (north KNP).**

Custodian: **Environmental Research Institute of the Supervising Scientist (*eriss*, Supervising Scientist Division) for Parks Australia North; Department of the Environment, Water, Heritage and the Arts; Australian Government.**

Jurisdiction: Kakadu National Park, Northern Territory, Australia

Description

Abstract

The dataset provides information on the distribution and abundance of feral animals (pigs, buffalo, cattle, horses and donkeys) and visual estimates of ground surface damage by pigs and buffalo within KNP from aerial survey conducted in 2001 and 2003. Combined data offers complete coverage of the lowland landscapes within KNP. A map showing the location and coverage of the transects is shown in Figure A2.1. All records are point records rather than records relating to a specific area.

Data originated from two systematic aerial surveys involving standardised sample counts and using pre-determined transect lines spaced at regular intervals and flown using fixed-wing aircraft. The aircraft flew at a height of 72.6 m (250 ft) at an average speed of 186 km/hr along each transect. Observer counts were made from both the port and starboard side by trained observers within a 200 m swath along each transect (using marks on the aircraft wings as guides). Transects were 2.5 km apart over the coverage area. The same general methods were applied to both surveys.

Observations were made of feral animal abundances (Figures 16–20), as well as a visual assessment of feral animal damage, where areas of low, medium, or extensive ground disturbance were recorded. Feral animal ground damage was distinguished, where possible, as being caused by either Pigs or by Buffalo, as listed by 'species' attribute as either 'Pig rooting' or 'Buffalo damage'. However observers have expressed some doubt as to the ability to consistently and accurately separate between the specific types of ground damage (Bayliss pers com 2005). Nevertheless the vast majority of damage observed in the 2001 and 2003 surveys was attributed to feral pigs. The level of observed damage is classified by the 'Number' attribute by the values of 1, 2 and 3, representing either low, medium, or extensive damage, respectively (Figures 14–15).

Damage estimate data are complementary to abundance data and are considered a more robust method of estimating actual population levels for pigs, in comparison to aerial counts methods. However there remains a paucity of quantitative data linking damage extent to actual population levels, and relationships are likely to be site-specific.

Each record has spatial coordinates and is stored as a point, rather than records relating to a specific area. However, raster data files have also been derived from point records, for each animal species counted in the survey. In these cases Spatial Analyst™ was used to calculate the sum of point-data counts for within grid cells that intersected transect lines at 250 m, 500 m and 1 km grid scales.

All attribute fields for the shapefile are described in Table A2.1. A map showing the location and coverage of the transects for both surveys is shown in Figure A2.1. All records are point records rather than records relating to a specific area.

Scientific comparison with other datasets should be limited to surveys using similar methodology. NRETA have been conducting similar surveys (eg 'Top End Feral 1985', ANZLIC identity code ANZNT0002002015).

ANZLIC keyword(s)

FAUNA Exotic: Monitoring, Surveys, Indicators, Distribution

ISO topic category: Biota

Geographic bounding box

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Parent dataset[1]	-12.115378°	-13.208714°	133.007423°	131.879663°
Magela extent[2]	-12.225455°	-12.606458°	132.93636°	132.74936°

[1]Parent dataset combining both 2001 & 2003 surveys. [2]Derived subset for Magela ecological risk assessment

Data currency

Beginning date: 25 November 2001

Ending date : 13 November 2003

Dataset status

Progress: Complete

Maintenance and update frequency: Irregular

Access

Data representation: vector and text

Stored data format(s)

The parent datasets are stored as ESRI Point shapefiles. Raster layers were also produced for all feral species counted for the full KNP coverage and for each ground disturbance class (pigs and buffalo) at 1km resolution and are stored as text in separate worksheets in a Excel workbook. Similar data were produced for the Magela floodplain extent for pigs and ground disturbance classes only and are stored in a Excel file. These files contain brief metadata summaries for each layer. Dataset size is approximately 13.9 MB.

Available format type

Data (produced as subsets for separate species and as a complete dataset) are provided as ESRI Point shapefiles in Geodetic Datum of Australia 1994, and projected using the Map Grid of Australia, zone 53.

Access and use constraint(s)

The data is generally available for distribution within the Northern Territory. Charges may apply for both hard and digital copy. For digital information, a digital data agreement may be required. Please refer to the contact within this metadata to discuss specific user requirements for citation etc.

Data quality

Lineage

Data originated from two systematic aerial surveys involving standardised sample counts and using pre-determined transect lines spaced at regular intervals. Surveys were flown using fixed-wing aircraft at a height of 72.6 m (250 ft) and an average speed of 186 km/hr. Observer counts were made within a 200 m swath along each transect using marks on the aircraft wings as guides. This was done concurrently from port and starboard sides by independent trained observers. Transect lines had a east-west orientation and were spaced at 2.5 km intervals across the coverage area.

The same general methods were adopted for the two surveys: 1) conducted in 2002 of the southern half of Kakadu National Park (KNP), led by Keith Saalfeld (NRETA) and; 2) conducted in 2003 of the northern half of Kakadu National Park (KNP), led by Peter Bayliss (***eriss***). Along each transect observations were made from port and starboard by separate observers of feral animal abundances and a visual assessment of feral animal damage, where areas of low, medium, or extensive ground disturbance were recorded.

Observations were recorded onto a mini-disk audio-recording system in the 2003 survey. Recordings for PB and PC appear on the same minidisk recordings, together, while KS recordings were made on a separate minidisk system. Recordings were transcribed by Caroline Camilleri (CC), James Boyden (JB), and Sarah Gooding (SG) – a volunteer supervised by JB. Transcribing by CC was done directly from mini-disk to an Excel spreadsheet. Transcribing done by JB and SG was first written into log-book then typed into Excel. All raw data are contained in the Excel spreadsheet file named ‘Aerial survey data_11_03.XLS’. A description of each worksheet in the file is provided in Appendix 2A.

Coordinates for records in the 2003 survey were interpolated using a Visual Basic Macro program written by KS. This procedure used the location coordinates and the time of the start and finish points for each transect to interpolate the spatial coordinates of individual count records. The formula is based on the linear direction and average flight speed between the beginning and end of each transect and the time at which each data record was logged. The program utilises two input files, ‘transect.txt’ and ‘sighting.txt’ and produces an output file, ‘sight_ll.txt’, containing interpolated positions for each count. The output file was imported to a point shapefile for further manipulation in ArcGIS™. Spatial coordinates for the survey conducted in 2001 were derived directly from a Garmin GPS.

Each survey covered a separate area of the KNP, the 2001 survey the southern half, and the 2003 survey the northern half. The combined survey data provides complete coverage of the lowland landscapes within KNP, while a small area of the east Arnhem escarpment and plateau bounded by the coordinates (North Bounding Latitude –13.18°; South Bounding Latitude –13.59°; East Bounding Longitude –132.99°; West Bounding Longitude –132.43°) was omitted from the survey. Original data files for each survey were merged into one shapefile. An additional attribute named ‘survey’, was added to identify the original source file from both surveys.

From the merged dataset for each animal species counted, Spatial Analyst was used to calculate the sum of point-data counts for within grid cells that intersected transect lines at 250 m, 500 m and 1 km grid scales. Grid cells that intersected transect lines but contained no point observations for a particular species were given a zero value. Grid cells not intersecting transect lines were treated as ‘missing data’ and given a value of –9999. The procedures used for making the grid calculations are outlined in Appendix 4.

Positional accuracy

A nominal horizontal accuracy of ± 70 m has bee assigned based on the details that follow.

Spatial coordinates for point records were checked in ArcMap™ for positional anomalies against original waypoint and tracklog files in OziExplorer™. A number of positional errors were found and corrected (see Table A2.3), after which interpolated point data showed good correlation against tracklogs generated from a Garmin™ GPS, although there was evidence of some error propagation on the east-west axis (orientation of transect lines).

It should be noted that the Garmin GPS device, considered accurate to ± 15 m, had a position update rate of one second, and that error would also be introduced on the east-west axis equal to the distance the aircraft travelled in one second. Given the aircraft was travelling at a speed of 186 km/hr, distance travelled in one second is 52 m. Deductive estimates of accuracy were also made by ad-hoc comparison of the distribution of certain features against AUSLIG 1:250000 map of water bodies. For example, it was shown that there was good correlation between distribution of wetland birds, feral animal damage, and distribution of wetland areas provided from the AUSLIG 1:250k topographic map series.

Attribute accuracy

Attribute data were screened for errors and corrections made by 1) checking values against original log-book transcriptions; 2) checking for the correct logical sequence of entries (eg time sequence); 3) checking for outlier values that differ from allowable values for specific observation types (eg feral damage estimates had a value of 1, 2 or 3 only).

Published data, using similar methods, show that count precision and accuracy is sufficient for estimating population density at a landscape scale for buffalo, cattle, horses and donkeys (Bayliss & Yeomans 1989). In the 1985 survey of the Top End, NT, standard error rates (as a percentage of total count) were found to be ± 6.6, 5.7, 8.5, and 21 for buffalo, cattle, horses, and donkeys respectively. Accuracy and precision is species specific and is influenced by a number of factors including habitat (eg the amount of obstructive canopy cover), where it has been found that accuracy can be improved by applying habitat-specific visibility correction factors (Bayliss & Yeomans 1989). Observer bias is another source of potential error but there are methods for measuring and accounting for this factor and thereby improving overall accuracy (Bayliss & Yeomans 1989b) although this has not been assessed for the current dataset. Ideally there should be at least one trained observer common between independent surveys so biases can be accounted for and corrected between surveys.

Pig numbers can not be estimated with sufficient accuracy using these survey methods (Bayliss & Yeomans 1989). However, it has been postulated that the relationship between the degree and extent of ground disturbance (measured during the survey) and actual population abundance of pigs could be used as a surrogate to measure pig abundance.

Logical consistency

Logical consistency tests undertaken included a check for valid values within each feral animal damage class, and visual checks of maps derived from data.

Completeness

The combined surveys provide complete coverage of the lowland landscapes within KNP. Each survey covered a separate area of the KNP, the 2001 survey the southern half, and the 2003 survey the northern half. When combined complete coverage is provided within the boundary of KNP except for a region of the east Arnhem Land escarpment and plateau bounded by the coordinates:

North Bounding Latitude: -13.18°

South Bounding Latitude: -13.59°

East Bounding Longitude: 132.99°

West Bounding Longitude: 132.43°

The dataset has been subject to rigorous verification and assessment. While positional data have been interpolated for the 2003 survey the spatial accuracy of data appears to be good. Attribute data have been validated and are complete.

Along with species count and feral damage estimates, ancillary data were sometimes, but not consistently recorded. This included habitat descriptions, general notes, and descriptions regarding the ‘type’ of feral damage observed, recorded under three separate attribute fields. Since these attributes are incomplete and inconsistent they provide only general guide and have limited use for quantitative data analysis.

Contact information

Contact organisation: Environmental Research Institute of the Supervising Scientist

Contact position: GIS Officer

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E-mail address: john.lowry@environment.gov.au

Metadata date

Date: 20070710

Additional metadata

Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

‘Top End Feral 1985’, ANZLIC identity code ANZNT0002002015

Bayliss P & Yeomans K 1989. Distribution and abundance of feral livestock in the 'Top End' of the Northern Territory (1985–96), and their relation to population control. *Australian Wildlife Research* 16, 651–76.

A1.11 Preliminary management zones for the control of feral animals in Kakadu National Park

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name(s): Preliminary management zones for the control of feral animals in Kakadu National Park

Custodian: Environmental Research Institute of the Supervising Scientist (***eriss***, Supervising Scientist Division) for Parks Australia North; Department of the Environment, Water, Heritage and the Arts; Australian Government.

Jurisdiction: Northern Territory including Kakadu National Park, Australia

Description

Abstract

This dataset delineates zones for the management, control, and monitoring of feral animals in KNP by PAN (Figure 21). The Natural Resource Management unit of PAN collect monitoring information within each zone with respect to the numbers of feral animals (eg pigs and buffalo) removed by regular shooting programs. The demarcation of management zones assists managers in making quantitative assessment of the effectiveness of feral animal control within and across different zones, thereby facilitating the optimum allocation of resources for targeted feral animal control within KNP.

ANZLIC keyword(s)

BOUNDARIES Administrative; FAUNA Exotic: monitoring, feral animals

ISO topic category: Environment

Geographic bounding box

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Parent dataset[1]	-12.082352°	-12.982354°	132.980946°	131.966137°
Magela extent[2]	-12.225455°	-12.606458°	132.93636°	132.74936°

[1]Parent dataset combining both 2001 & 2003 surveys. [2]Derived subset for Magela ecological risk assessment

Data currency

Beginning date: 2003

Ending date: 2003

Dataset status

Progress: Complete

Maintenance and update frequency : As needed

Access

Data representation: vector

Stored data format(s)

The working dataset is an ESRI polygon shapefile. Dataset size is approximately 1.1 Megabyte

Available format type

Data are provided as a ESRI polygon shapefile in Geodetic Datum of Australia 1994, and projected using the Map Grid of Australia, zone 53

Access and use constraint(s)

REQUIRED: Restrictions and legal prerequisites for accessing the data set.

REQUIRED: Restrictions and legal prerequisites for using the data set after access is granted.

This element may describe access constraints applied to assure the protection of privacy or intellectual property, and any special restrictions or limitations on obtaining the resource. If access is unrestricted, that too should be stated.

Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

The management zones were provided by Simon O'Connor in 2003 to ***eriss*** on AUSLIG 1:50 000 and 1:100 000 topographic map sheets as hand-drawn areas from the NRM group of PAN. The zones were then hand-digitised in ArcMap to a polygon shapefile by James Boyden using geo-referenced versions of the same maps projected in AGD66, AMG zone 53. The resulting shapefile was reprojected to GDA94, MGA zone 53.

The initial array contained 69 zones and many small areas that often overlapped into multiple zones, or contained 'sub-zones'. Consequently, the allocation of zones within the initial array were rationalised such that each zone was representative of a unique and unambiguous area, defined only by one bounding polygon, and not related to other zones.

The original allocation of zones, and the modified version are provided as two separate shapefiles.

Positional accuracy

Horizontal accuracy is considered accurate to ± 100m based on 1:100 000 maps. Accuracy of zone boundaries was checked after the initial digitisation process against original maps provided by PAN, and

Attribute accuracy

Currently there are no attributes associated with this dataset other than the name given to individual zones. These names are considered correct

Logical consistency

Topological consistency was maintained by ensuring boundaries between zones did not overlap using the 'snap-to' function in ArcMap editor. A unique name attribute was assigned to individual zones allowing demarcation.

Completeness

Since its creation the digital dataset has not been reviewed by the NRM group of PAN. It is envisaged that managers will review the dataset and make any additions to on a needs basis, and that monitoring information associated with each zone will eventually be incorporated as additional attributes.

Contact information

Contact organisation: Environmental Research Institute of the Supervising Scientist

Contact position: GIS Officer

Mail address: GPO Box 461,Darwin, NT, Australia 0801

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Metadata date

Date: 20070710

Additional metadata

Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

No supplementary information at time of publication

A1.12 Digital elevation data of the Magela floodplain downstream of the Ranger uranium mine

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name: Digital elevation data of the Magela floodplain downstream of the Ranger uranium mine

Custodian: Environmental Research Institute of the Supervising Scientist (***eriss***); Supervising Scientist Division; Department of the Environment, Water, Heritage and the Arts; Australian Government.

Jurisdiction: Kakadu National Park, Northern Territory, Australia

Description

Abstract

The DEM developed for the ecological risk assessment of Magela was produced by merging two data sources standardised to AHD: 1) DIGO Level 2 Digital Terrain Elevation data (provided as ESRI GRID); and 2) a higher-resolution dataset produced by AUSLIG for ***eriss*** from aerial photography covering most of the Magela floodplain generated at 30 m horizontal resolution. The resulting dataset has provides continuous coverage over the Magela floodplain, with higher accuracy in low relief areas with surrounding terrestrial woodland and floodplain fringes provided at lower resolution. Vertical accuracy is believed to be in order of ± 0.2 m for the higher resolution component (covering most of the low-relief floodplain area), with the surrounding terrestrial woodland area having an absolute vertical accuracy of ±30 m linear error at 90%.

ANZLIC keyword(s)

LAND Topography

ISO category: Environment

Elevation

Geographic bounding box

The following coordinates represent the bounding box chosen for each of the data layers developed for the risk assessment. This area incorporates the Magela floodplain and the immediate surrounds.

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Magela extent	-12.225455°	-12.606459°	132.93646°	132.74936°

Beginning date: 20060623

Ending date: 20060623

Dataset status

Progress: Complete

Maintenance and update frequency: Irregular

Access

Data representation: vector and raster

Stored data format(s)

Low-resolution data (1-second DEM) were originally supplied by DIGO as a ESRI grid file at 250 m pixel resolution. The file size is 1 degree x 1 degree geographic cell identified by its southwest corner attributes. A mosaic dataset providing complete coverage of KNP was produced from these data tiles.

The original ‘high-resolution dataset is provided as a ESRI coverage and point shapefiles, with points arranged at 30 m intervals forming a grid across the coverage area, with each point representing the estimated height in metres (AHD). The dataset is projected using GDA 94

The derived data file which includes high- and low-resolution data resample to a 30 m grid, and covering the AOI for ecological risk assessment of the Magela floodplain only, is stored as ESRI grid and polygon shapefiles. A further file was derived from this at 250m raster resolution and is stored as a separate worksheet in a Excel workbook. Total size of combined dataset is approximately 3.4 Gigabytes

Available format type

Data have been reproduced in the Geodetic Datum of Australia 1994, re-projected to the Map Grid of Australia, zone 53. Vertical height is in metres, represented as the Australian Height Datum.

Access and use constraint(s)

Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

The DEM data used for the ecological risk assessment modelling was adapted from two data sources; 1) a high-resolution 30 m raster dataset from AUSLIG covering most of the Magela floodplain; and 2) a one-second resolution DTM with vertical precision of 1m from DIGO:

Documentation has not been cited for this dataset, however the following is believed to be correct. A high-resolution DEM was produced in about 1984 by AUSLIG (Darwin) for the Environmental Research Institute of the Supervising Scientist from aerial photography flown by AirResearch Pty Ltd . Data cover most of the Magela Creek floodplain including, and downstream of, the Ranger Uranium Mine. Conventional stereo-photogrammetric techniques were used to generate x,y,z data-points. Data was originally received by ***eriss*** in ‘x y z’ format. The GENERATE command in ARC/INFO was used for importing these points into a coverage. The original data was manipulated with ‘nawk’ in Unix using the following command:

cat original_file | nawk '{print NR ‘,’ $1 ‘,’ $2 ‘,’ $3}' > elevxyz Put the word 'END' at the end of the file.

A similar procedure, using the JOINITEM command to add the z values to the P-Attribute-Table of the coverage, was adopted to get a file with z values that was easy to use:

cat elevxyz | nawk '{print NR ‘,’ $4 }' > elevz.

Easting and northing coordinates are in AGD66, AMG and elevation in meters. There are some 553491 data points distributed mostly in a grid pattern at 30–35 m resolution, with a higher concentration of points taken at the edged of drainage channels on the floodplain (lowest point heights).

Digital Terrain Elevation Data, Level 2 produced by DIGO is a uniform matrix of terrain elevation values which provides basic quantitative data. This was developed by DIGO for military systems that require terrain elevations, slope, and/or surface roughness information. Level 2 post spacing is 1 arc second (approximately 30 metres). For complete product specifications refer to MIL–D–89020, Digital Elevation Terrain Data Level 2, 26 February 1990 and DMA Product Specifications for Digital Terrain Elevation Data Level 2, Second Edition, April 1986 (PS/1CD/200). From this dataset a raster coverage was generated at 30 m resolution for the entire KNP

Rationale for amalgamating low and high resolution DEM datasets

There was a need to retain the high-resolution information necessary to define low gradient relief of the floodplain while also providing complete coverage of the area selected for the ecological risk assessment of Magela. As the higher-resolution dataset did not provide complete spatial coverage, gaps in the high-resolution data (in non-floodplain woodland, and at the fringes of the floodplain) were substituted with the DIGO dataset.

Interpolation procedure for high-resolution DEM

Interpolation of the high-resolution raster DEM was conducted using the Inverse Distance Weighted (IDW) technique in the Spatial Analyst Toolbox of ArcGIS™ 9. The DEM surface was generated at 30 m resolution from point data using a fixed 40 m search radius to derive averages from surrounding point values. An absence of point data records within drainage channels resulted in a number of small gaps occurring along channels at the lowest heights on the floodplain. This was due to point height records being distributed only up to the edges of drainage channels (heights were taken from vegetation and not from water), therefore a channel wider than 40m would result in a gap in the DEM. In these cases each gap was substituted with the average value calculated from abounding raster values for each ‘channel gap’. Averages were calculated using Spatial Analyst zone statistics, and a 30 m buffer zone generated from the boundaries of channel gaps. Derived values were then manually substituted by creating a polygon for each ‘channel gap’ using ArcGIS™ editor and working on a arc-shapefile created from the original Interpolated ESRI GRID file.

Positional accuracy

Accuracy of the ‘high-resolution’ data component is thought to be ±0.2 m vertical and ±2.0 m horizontal (pers com Mike Roberts at AUSLIG Darwin). However no metadata appear to have been compiled at the time of production.

For the ‘low-resolution’ component: accuracy statements are generally calculated for every DIGO product and provided in the file header metadata. However in this case no accuracy information was recorded or provided with header metadata. In general accuracy objectives for Level 2 data are : Absolute Horizontal- 50 metres circular error at 90%. Absolute Vertical- ±30 m linear error at 90%. The information content is approximately equivalent to a 1:50 000 scale resolution. Exploitation at larger scales must consider each individual cell's accuracy evaluation.

Attribute accuracy

Before DEM data were integrated (from the two sources) a number of data quality checks and comparisons were conducted to ensure the compatibility of the datasets for integration. While both datasets were known to be calibrated to AHD a comparison of corresponding z-values was made, where data overlapped spatially, using simple linear regression and some 80 randomly selected points. Regression confirmed that similarity was in the order of 95%.

A visual check of point data values (from the high-resolution dataset) revealed several records with ‘zero’ values that made no logical sense when related to surrounding point records (surrounding points had values several meters greater). A decision was made to omit these point values from the dataset before interpolating the raster DEM.

Logical consistency

Not relevant

Completeness: Complete

Contact information

Contact organisation: Environmental Research Institute of the Supervising Scientist

Contact position: GIS Officer

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E-mail address: john.lowry@environment.gov.au

Metadata date

Date: 20070710

Additional Metadata

Native dataset environment is Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

http://www.defence.gov.au/digo/Products/Digital_Products/ProductsDTED2.htm

A1.13 Remote sensing fire-scar mapping of annual 'early' and 'late' dry season burning for Kakadu National Park (1980–2006) and adjoining West Arnhemland (1995–2006)

DATASET INFORMATION

ANZLIC identifier:	ANZCW0501002721 (assigned for Kakadu National Park component only)
Dataset name(s):	Remote sensing fire-scar mapping of annual 'early' and 'late' dry season burning for Kakadu National Park (1980–2006) and adjoining West Arnhemland (1995–2006)
Custodian(s):	Bushfires Council of the NT and Parks Australia North
Jurisdiction:	Kakadu National Park and West Arnhemland, Northern Territory

Description

Abstract

The full metadata report for this dataset is provided in Appendix 1.13. The fire history of Kakadu and adjoining west Arnhem Land provides broad scale annual mapping of both early (April-July) and late dry season (August-end of dry season) fire-scars as derived from satellite remote sensing. The two regions, Kakadu and west Arnhem Land, are kept as separate datasets. The Kakadu dataset provided continuous annual monitoring for the period 1980 to 2006, while the adjacent area in western Arnhem Land provides continuous monitoring for the period 1995 to 2006. The regional monitoring program continues at the time of this publication, and fire-scar mapping is compiled and updated annually by the Fire Research Unit of the Bush Fires Council of the NT. Detailed documentation of the datasets is provided in Russell-Smith and Ryan (1994), Russell-Smith, et al (1997), Gill et al (2000) and Turner et al (2002).

Fire-scar history is interpreted from satellite imagery captured at strategic times to determine the frequency and extent of early and late dry season burning. Fire scars were interpreted from Landsat MSS satellite imagery (56x78 m pixel resolution then re-sampled to 100 x 100 m) for the period 1980 to 1995. From 1996 to 2004 data are derived from Landsat TM/ETM (30 m x 30 m re-sampled to 25 m x 25 m). For the west-Arnhem Land component derivation of fire-scars was from Landsat TM, MODIS and AVHRR. Coarser resolution AVHRR (1.09 km^2) and MODIS imagery were substituted for the LDS captures for the periods 1995–2001, and 2002–2004, respectively. The resolution of these data is coarser (200 x 200 m pixels), although it can still be used to reliably detect areas where fire has occurred.

For any one year, mapping of 'Early' and 'Late' dry season burning is undertaken. Early fires (EDS) are defined as fires occurring from May to July. For this period imagery is captured at least twice to address the potential problem of under-sampling, where fire-scars can be missed, unless a suitable number image capture times are used (Russell-Smith et al 1997). Late burns (LDS) are defined as fires occurring from August onwards and are derived from a at least one capture time, preferably as late in the dry season as possible (before the onset of cloudy conditions). Cumulative probability estimates of early and late dry season fires for Kakadu and the Magela floodplain regions are illustrated in Figures 22–25.

Table A1.1 Summary of data sources and methods used to derive fire scar histories for Kakadu and West Arnhemland

Period	source	Kakadu	West Arnhemland
1980–90	Landsat MSS	1980–90 manual digitising and interpretation from FCC hardcopies (1:250000 & 1:500000) by Paul Ryan	Not obtained
1991–94	Landsat MSS	1991–94 Richard Durieu using TNTMips to perform interactive digital classification of scanned FCC hardcopies (1991,93,94) and original digital data (1992).	Not obtained. Some data exist but are of questionable quality (Edwards pers com)
1995–2005	Landsat TM/ETM	1995–2005 unsupervised classification in conjunction with interactive ground-truth validation by Andrew Edwards and BFC	1995–2005 unsupervised classification in conjunction with interactive ground-truth validation by Andrew Edwards and BFC AVHRR substituted for LDS mapping 1995–2001 MODIS substituted for LDS mapping 2002–2004

ANZLIC keyword(s)

HAZARDS Fire; PHOTOGRAPHY AND IMAGERY remote sensing, classification, mapping, monitoring

ISO category: Environment

Geographic bounding box (decimal degrees)

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Parent dataset (KNP)[1]	-12.05897	-14.01906	131.88661	134.14803
Parent dataset (West Arnhem Land)[1]	-11.53702	-14.73151	132.29499	134.55655
Combined dataset (ARR)[3]	-11.53702	-14.73151	131.88661	134.55655
Magela extent[2]	-12.225455°	-12.606458°	132.93636°	132.74936°

[1]Parent dataset obtained from BFC. [2]Derived subset for Magela ecological risk assessment [3]Dataset produced by combining parent datasets to derive complete coverage of ARR

Data currency

Beginning date: 1980

Ending date: Current, new monitoring data appended annually by BFC

Dataset status

Progress: In progress

Maintenance and update frequency: Annual

Access

Data representation: vector and raster

Stored data format(s)

Raster format is stored as ESRI grid, ASCII text and text layers in an Excel workbook. Vector format stored as ESRI polygon shapefiles.

Available format type

Data are provided as a polygon shapefile projected to the Geodetic Datum of Australia 1994 using the Map Grid of Australia, zone 53.

Access and use constraint(s)

Open. Parks Australia North and the Bushfires Research Unit of the Bushfires Council of the NT must be acknowledged as the source of the data. Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

From 1980-90 interpretation of fire-scars was undertaken using Landsat MSS false-colour composite (FCC) imagery (bands 4,5 and 7) produced as hardcopies at 1:250 000 and 1:500 000 scales. To minimise operator biases Paul Ryan performed all interpretations and digitisation of fire scars for the period 1980–90. The methodology he developed is outlined in Ryan et al (1995). For each year, clear acetate film printed with key geo-referenced linear features and was overlaid, aligned correctly using a 'best fit method', and then secured firmly onto hardcopy scenes. Fire scars were then interpreted and traced onto film with a fine-tip pen. The process was repeated using the same film for subsequent dry season images, which facilitated verification of preceding interpretations. The film was then manually digitised as separate EDS and LDS vector coverages using the PAN GIS, and then subsequently converted to 100m raster format.

From 1991–94 Richard Durieu was appointed as the new image processor. In 1992 digital Landsat MSS data were acquired, and processing and interpretation of fire scars was undertaken using the interactive classification procedure of TNTMips (Skrdla 1992). All other years in this period were also processed using interactive classification, however high-resolution scans of Landsat MSS geo-rectified hardcopy originals (as FCC) were substituted instead of original digital data in these cases.

As outlined in (Turner et al 2002), fire scar data for the 1995–2000 period were produced by the Fire Research Unit of the Bushfires council of the NT from Landsat TM digital imagery. Finer resolution TM data, with 30 m x 30 m pixels, approximates to a scale of 1:100 000. In these cases ER Mapper™ image processing software was used to a) co-register imagery to an initial set of July 1996 images, b) perform an unsupervised classification of each image; and c) select classes representing fire. The class selection step was performed in conjunction with ground staff and this often involved re-iterating the classification to separate mis-classified 'fire ' classes from spectrally similar features such as water or shadow. During this period ground-truthing information was collected chiefly from helicopter surveys where extensive GPS waypoint data were collected en-route to each monitoring plot. Records were typically taken every 30 seconds where the status of vegetation was recorded as: unburnt; fully burnt within a 100 m radius; or partially burnt (<20% burnt within 100 m radius).

Although the general principle for mapping has remained the same a number of modifications to methods have occurred over the years. It is assumed that the procedure outlined in the above paragraph is that currently used by BFC and PAN for fire scar mapping and validation, and includes all data from 1995 to 2004. Fire scars continue to be monitored by BFC for PAN using these methods.

Positional accuracy

From 1980–90 boundary positional errors constrained to pen thickness using 1:500 000 images is considered to be about ±150 m . Other positional errors of up to ±100 m are anticipated, associated with the rectification of interpreted fire scars. For the period 1991–94, positional errors are estimated to be of ±270 m on fire scar maps produced from 1:250 000 and ±200 m at 1:100 000 scales. As such positional errors may be in the order of 2–3 pixels when applied to a raster of 100 x 100 m.

Positional error may be considered smaller for data derived from 1:100 000 Landsat TM.

Attribute accuracy

Authors of this work have noted the potential for missing fire scar information due to rapid re-growth of vegetation after fire, particularly in the EDS where soil may still be moist. For the EDS this potential source of error was addressed by obtaining imagery at shorter intervals. Capturing at least 2 scenes during the EDS period has been considered sufficient to overcome this problem, however, it is probable that many small fire-scars remain undetected. Lack of detection of fire scars may also be apparent with floodplain fires. However, such fires occur late in the dry season when the floodplain is dry.

Cloudiness at the LDS-wet season interface adds a small but significant source of error, since fires occurring during this time cannot be mapped. While LDS imagery is obtained as late in the dry season as possible the authors are aware that in some years significant fires occurred after the date of image capture, especially on the floodplains, associated both with lightening strikes and traditional hunting/management practices. It has also been noted, given strategic wet-season burning practices to reduce annual Sorghum, the major grass fuel of the lateritic lowlands, that reliability of fire histories would also be further decreased due to the inability to capture images during cloudy periods.

No ground-truth data are available for the years 1980–92. Ground-truthing was undertaken in 1993 and 1994 by helicopter immediately prior to satellite overpass using a series of stratified, random-start transects flown over the Park to ensure that the northern, central and southern sectors of the Park were sampled relatively uniformly. Altitude and speed were held constant at 100m and 60knots, respectively. Every 30 seconds one observer recorded the GPS location, and another observer recorded the state of vegetation and fire history. This study confirmed a high overall agreement of 80% between mapped interpretation of fire scars and ground-truth data (Russell-Smith et al 1997).

Logical consistency

Files are named according to the period within each dry season, and the year. For example the files named E84, L04, and T80 represent fire scars layers for early dry season 1984, late dry season 2004, and total area burnt for 1980, respectively. Data have been designated logical values accordingly:

Burnt area = 1

Unburnt area = 0

Completeness

Complete for period specified.

Contact information

Contact organisation: Bushfires Council of the Northern Territory

Mail address: PO Box 30, Palmerston NT 0831

E-mail address: andrew.edwards@nt.gov.au

Metadata date

Date: 20070710

Additional metadata

Native dataset environment is Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Gill AM, Ryan PG, Moore PHR & Gibson M 2000. Fire regimes of world heritage Kakadu National Park, Australia. *Austral Ecology* 25(6), 616–625.

Russell-Smith J & Ryan P 1994. *Long-term monitoring of the effects of management imposed fire regimes on old growth vegetation in Kakadu National Park : Fire history 1980–1993*. Department of Sports, the Environment and Territories, Canberra.

Russell-Smith J, Ryan PG, & Durieu R 1997. A LANDSAT MSS-derived fire history of Kakadu National Park, monsoonal northern Australia. *Journal of Applied Ecology* 34, 748–766.

Ryan P, Russell-Smith J, & Durieu R 1995. *Long-term satellite monitoring of fire regimes in Kakadu National Park, Northern Territory*. In *NARGIS 95: 2nd North Australian Remote Sensing and Geographic Information Systems Forum*, Darwin, NT, 18-20 July 1995 Darwin, Northern Territory, Supervising Scientist & Australasian Urban and Regional Information Systems Association Inc AURISA Monograph 11, AGPS, Canberra, 13–20.

Turner A, Fordham B, Hamann S, Morrison S, Muller, R, Pickworth, A, Edwards, A & Russell-Smith J 2002. Kakadu National Park fire monitoring plot survey and analysis. Kakadu National Park and Bushfires Council of the NT, Darwin.

A.1.14 Infrastructure of the Magela Creek floodplain region (June 2001)

DATASET INFORMATION

ANZLIC identifier: Not defined

Dataset name(s): Infrastructure of the Magela floodplain region (June 2001)

Custodian: Environmental Research Institute of the Supervising Scientist (***eriss***); Supervising Scientist Division; Department of the Environment, Water, Heritage and the Arts; Australian Government.

Jurisdiction: Kakadu National Park , Northern Territory, Australia

Description

Abstract

This vector dataset combines data available for roads, tracks, fence lines, and building boundaries from the DIGO 1:50 000 topographic map series and linear features digitised from IKONOS satellite imagery captured during June 2001 for the entire Magela floodplain region. The dataset was produced for the ecological risk assessment study of the Magela floodplain and covers this area only (Figure 26).

ANZLIC keyword(s)

HUMAN ENVIRONMENT Structures and facilities

Geographic bounding box

(decimal degrees) The following coordinates represent the bounding box chosen for each of the data layers developed for the risk assessment. This area incorporates the Magela floodplain and the immediate surrounds. These coordinates do not represent the extents of the actual data points sampled.

	Bounding Latitude		Bounding Longitude	
	North	South	East	West
Magela floodplain extent	-12.225455°	-12.606458°	132.93636°	132.74936°

Beginning date: unknown

Ending date: unknown

Dataset status

Progress: Complete

Maintenance and update frequency: Irregular

Access

Data representation: vector and raster

Stored data format(s)

Working dataset is stored as a ESRI polyline shapefile. Dataset size is approximately 170 Kilobytes.

Available format type

Dataset is supplied as a ESRI polyline shapefile projected to the Geodetic Datum of Australia 1994, Map Grid of Australia, zone 53.

Access and use constraint(s)

Contact the GIS Officer to discuss user requirements for citation etc.

Data quality

Lineage

The dataset was produced by John Lowry, GIS officer at the Environmental Research Institute of the Supervising Scientist . Vector data from the 1:50 000 topographic line map series for the

Magela region were combined from ‘sealed’ and ‘unsealed’ roads, ‘tracks’ and ‘buildings’ as a single shapefile (WGS84, MGA zone 53). Further vector data were gathered as a separate shapefile for fence-lines and other linear features using IKONOS imagery (captured during June 2001) as a base map for interpretation. Data from the two sources were then combined as a single shapefile.

Positional accuracy

No less than 90% of well defined detail within ±0.5 mm of map scale (25 metres) of their true position.

Attribute accuracy

Considered accurate at the time of map production.

Logical consistency

A visual check of maps in the preparatory stages of map production

Completeness

Considered complete with respect to the linear detail that could be discerned from IKONOS imagery (4 m pixel MS resolution & 1m pixel Panchromatic resolution).

Contact information

Contact organisation: Environmental Research Institute of the Supervising Scientist

Contact position: GIS Officer

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E-mail address: john.lowry@environment.gov.au

Metadata date

Date: 20070710

Additional Metadata: Microsoft Windows 2000 Version 5.0 (Build 2195) Service Pack 4; ESRI ArcCatalog 8.3.0.800

Supplementary information

Metadata for the IKONOS satellite imagery used to derive linear features (captured during June 2001) is stored as a ‘readme.txt’ file on the SSD Oracle database, information explorer, and is located in the directory: \\Spatial Data Management and Storage\Raster\Satellite Imagery\IKONOS\Alligator Rivers Region/Kakadu National Park\Files\