

PROJECT SUMMARIES

LIST OF PROJECT SUMMARIES

Projects for Stage Two of the Brigalow Belt South Bioregion assessment were undertaken with the participation of key agencies and regional stakeholders.

The following project summaries are attached:

- WRA 16 Targeted flora survey and mapping
- WRA 18 Aboriginal Cultural Heritage Assessment and Community Consultation
- WRA 19 Geology - Integration and upgrade
- WRA 20 Mineral and Petroleum Resources and Potential
- WRA 21 Soil Landscape Reconnaissance Mapping
- WRA 23/27 Vertebrate Fauna Survey, Analysis and Modelling
- WRA 24 Joint Vegetation Mapping Project (report being finalised)
- WRA 26 Timber Resources (Regional Wood Supply Appraisal System - reports being finalised)
- WRA 28 Micro Forest Industry and Region profiles (report being finalised)
- WRA 29 GIS Socio-Economic Assessment Tool
- WRA 30 Assessment of Forest Development Opportunities
- WRA 31 Response to Disturbance and Land Management (report being finalised)
- WRA 32 Non-Indigenous Cultural Heritage
- WRA 33 Community Data Search and Biodiversity Survey
- WRA 36 Development of Conservation criteria

Reference copies of project reports are available at exhibition sites listed in this kit.

The following projects were also commissioned for Stage 2:

- WRA 34 Crown Tenure Layer (no report necessary)
- WRA 35 Development of a Bioregional Landscape Conservation Framework (report being finalised)

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WRA16 TARGETED FLORA SURVEY AND MAPPING

This report describes a project undertaken for the Resource and Conservation Assessment Council (RACAC) as part of the regional assessments of western New South Wales. RACAC advises the State Government on broad-based land use planning and allocation issues. An essential process for the western regional assessments is to identify gaps in data information and the best ways in which to proceed with data gathering and evaluation.

Project objective

The *BBSB Targeted Flora Survey and Mapping Project* was established to provide biodiversity information on the flora of the Brigalow Belt South Bioregion (BBSB) for use in the design of regional conservation and resource management strategies.

Methods

This project involved data collation and audit to identify floristic data gaps and compile autecological data on significant taxa. Targeted field surveys of priority taxa were undertaken to confirm species localities and collect additional site information. PATN analysis of systematic data and a review of Aerial Photographic Interpretation mapping provided information on significant plant communities. Predictive modelling of priority taxa and plant communities identified potential habitat areas and an assessment of vegetation cover identified potential core habitat areas and corridors.

Key results

This study has established that the flora of the BBSB is surprisingly diverse, with at least 2,075 native flora taxa. The vegetation of the bioregion is also regarded as complex, with 75 woody and 109 herbaceous communities identified from the project and various sources. The plant communities range from Snow Gum forests to rainforest, to sclerophyll woodland, mallee and heath. Communities more widespread in far western New South Wales are also represented, including Poplar Box-Belah semi-arid woodland and River Red Gum-Coolabah forest. New plant species continue to be discovered and this report lists 7 taxa awaiting formal description. At least 100 other species are considered to be rare or threatened. Several areas of rare plant concentrations have been identified in the vicinity of the Warrumbungles, Kaputar National Park, Warialda State Forest and Severn State Forest.

In addition to the research findings that directly relate to the flora and vegetation of the BBSB, this study has applied state-of-the-art analytical techniques to the modelling of plant community distributions, including Generalised Additive Modelling and Generalised Dissimilarity Modelling. The striking correspondence between the outputs of these quite different modelling techniques demonstrates the power of the geostatistical approach to the study of plant-environment relationships.

WRA18 ABORIGINAL CULTURAL HERITAGE ASSESSMENT AND COMMUNITY CONSULTATION

This report describes a project undertaken for the Resource and Conservation Assessment Council (RACAC) as part of the regional assessments of western New South Wales. RACAC advises the State Government on broad-based land use planning and allocation issues. An essential process for the western regional assessments is to identify gaps in data information and the best ways in which to proceed with data gathering and evaluation.

The New South Wales National Parks and Wildlife Service (NPWS) undertook the Aboriginal cultural heritage assessment project for RACAC. The assessment took place in two stages, with Stage 1 focusing on the Pilliga and Goonoo State Forests and Stage 2 assessing the remainder of the Brigalow Belt South Bioregion (BBSB). The assessment structure was the same for Stage 1 and Stage 2 and comprised three parts: Aboriginal cultural heritage consultation, oral history and archival investigation, and cultural heritage field survey. The Stage 2 projects built upon and extended the Stage 1 projects.

Stage 2 project objectives

The cultural heritage assessment aimed to build upon work carried out in Stage 1 to increase understanding of the cultural links between Aboriginal people and the BBSB. This was done by:

- Continuing to consult with Aboriginal communities associated with the bioregion;
- Continuing to expand upon the oral history and archival investigation, started in Stage 1;
- Extending the cultural field survey done during Stage 1 to sample representative areas, using identified landforms as the basis for sample area selection.

Methods

Aboriginal cultural heritage consultation project

The Project team distributed detailed information about the project to Aboriginal people throughout the bioregion, and then followed up with formal and informal meetings with Aboriginal people and organisations to seek guidance on and participation in the project.

Oral history and archival investigation

Aboriginal people from a variety of communities conducted interviews with members of their own communities and facilitated interviews between contracted historians and community members. Contract researchers, including members of the Aboriginal community, carried out an examination of documentary material relevant to the bioregion.

Cultural heritage field survey

The assessment team approach involved selecting areas for sampling where there were the types of landforms expected to be associated with Aboriginal cultural heritage. The team used information from Aboriginal people, the results of the Stage 1 sampling investigation, registered sites, and landform assessment of the bioregion, to determine areas which would be most useful to investigate for the purpose of locating and recording Aboriginal sites and other features of cultural significance.

Key results and products

Aboriginal people, through oral histories, historical records and consultation articulated a strong sense of historical and contemporary attachment to the BBSB. Information gathered during the assessment produced an improved understanding of the Aboriginal cultural heritage values of the bioregion and demonstrated clear links between Aboriginal people and landform types.

At the completion of Stage 1 and Stage 2, the project teams had:

- Recorded and transcribed 110 oral history interviews;
- Retrieved and researched numerous documents highlighting Aboriginal association with forests, travelling stock reserves, rural properties and towns;
- Located and recorded 1,038 Aboriginal sites;
- Documented 60 traditionally used plant species; and
- Identified and mapped a variety of landforms, which have Aboriginal cultural heritage.

Aboriginal guidance and participation provided direction to the project team in the gathering of cultural heritage information. Ninety-two Aboriginal people from various communities in the bioregion were employed in the project, 110 Aboriginal people were interviewed on tape and 17 Local Aboriginal Land Councils were contacted about the project.

The information gathered during the project will provide new opportunities for improving cultural heritage management using mapped information about landforms and their relationship with Aboriginal heritage.

The assessment process reinforced existing relationships and established new relationships between NPWS and the Aboriginal communities in the BBSB.

Project objective

The Geology – Integration and Upgrade project for the Brigalow Belt South Bioregion was implemented by the NSW Department of Mineral Resources, Geological Survey of New South Wales branch. The aim was to significantly, and rapidly, improve the existing geological mapping. The objective was to prepare an integrated and upgraded geological data set for use in scientific and resource assessments and as natural heritage information.

Methods

The project was implemented in two phases:

- **Phase One** required the assembly and integration of immediately available digital geoscience mapping data across the bioregion. This allowed early release of existing information as a composite working data set. No new data was generated during this phase. Some source data was over thirty years old and quality varied.
- **Phase Two** encompassed the rapid upgrading of geological mapping using the best available remote sensed and supporting data sets. This phase built on the geological understanding in existing maps supplemented by information derived from newer geological publications, reports and theses. The major advance in geological information derived from the interpretation of remote sensed data comprising high resolution geophysics (magnetics and radiometrics), Landsat 7 satellite data, and digital terrain data.

Comparison of existing geological information with remote sensed data allowed on-screen mapping and revision of the geology. Interpretations were validated using existing data (for example maps, drill hole databases, and geoscience observation sites). A small amount of field reconnaissance was undertaken. Absolute age dates were determined for several samples.

A number of “break through” methods using new technologies were developed and applied during Phase Two. These methods significantly improved the speed and accuracy of new geological interpretations and enhanced integration with existing knowledge.

Key results and products

The key product is a new, internally consistent interpretation of the surface geology. This interpretation exists as digital spatial data of geological units. Attribute tables in these data sets allow many different types of data enquiry. A report describes the data produced and summarises the geology of the bioregion.

The geology mapping upgrade project has resulted in:

- a significantly more detailed map of the surface geology of the bioregion
- identification of large areas as weathered Cretaceous rock sequences
- Quaternary surficial deposits being classified into morphostratigraphic systems including alluvial, piedmont, colluvial and residual systems
- classification of the radiometric response of mapped surficial units
- correlation and simplification of names of widespread geological units
- an improved geological understanding for mineral potential analysis.

The maps and data sets should be useful for many aspects of natural resource assessment and modelling, for improved geological understanding and for mineral potential studies.

WRA 20 MINERAL AND PETROLEUM RESOURCES AND POTENTIAL

This report describes a project undertaken for the Resource and Conservation Assessment Council (RACAC) as part of the regional assessments of western New South Wales. RACAC advises the State Government on broad-based land use planning and allocation issues. An essential process for the western regional assessments is to identify gaps in data information and the best ways in which to proceed with data gathering and evaluation.

Project objective

The Mineral and Petroleum Resources and Potential project for the Brigalow Belt South Bioregion (BBSB) was implemented by the New South Wales Department of Mineral Resources, Geological Survey of New South Wales branch. The objective of the project is to provide an assessment of the mineral and petroleum resources and potential of the BBSB.

Methods

The NSW Department of Mineral Resources conducted a largely analytical and interpretive integrated review, but with some important new information gained through associated drilling and mapping projects. It used the best available expert advice to assess mineral resource potential, including contractors where required. It used exploration industry data wherever possible, with permission. The assessment required the assembly and integration of large amounts of information, including the new information, and its critical assessment through a number of established industry standard resource assessment procedures.

Key results and products

The key results of the project are set out in Chapters 7 and 8 of the full report and on the accompanying tract maps. Areas of varying potential (potential tract maps) have been identified for relevant metallic and industrial minerals, for construction materials, and for coal, coal seam methane, and conventional petroleum. The tracts are described in detail in the text and are displayed as mineral and petroleum potential tract maps. The maps show the areas within the BBSB with high, moderate and low potential for economic, mineral and petroleum discoveries and future mining operations. Figures 27 and 28 summarise the weighted composite and weighted cumulative mineral and petroleum potential for the BBSB. The maps and data sets assembled will assist the development of a whole-of-Government approach to land use options for the bioregion.

WRA21 SOIL LANDSCAPE RECONNAISSANCE MAPPING

The NSW Department of Land and Water Conservation (DLWC) provided reconnaissance-level soil landscape mapping and soil attribute information for the Brigalow Belt South Bioregion (BBSB), an area of approximately 52,400km². This information was used in native vegetation mapping and to assist with the determination of soil and land capability for the assessment.

Project objective

The project's objective was to provide fundamental soil and other biophysical attribute data for modelling projects within the New South Wales western regional assessment process. These projects include assessments of the distribution of individual plant and animal species, the extent and predicted distribution of vegetation communities, site quality and associated fertility for timber resources. The project also aimed to provide information concerning soil properties and limitations useful for sustainable land use planning.

Methods

Innovative computer modelling methods were used to map the BBSB in a more rapid, quantitative and repeatable manner than could be achieved by using traditional reconnaissance land resource mapping methods. In the southern portion of the mapping area the technique used involved recursive partitioning of available environmental variables trained on existing soil landscape mapping to develop rules for allocating soil mapping classes to adjacent areas. The environmental variables included Digital Elevation Models (DEMs) and climate interpolative drapes as well as geology and soil parent material maps and gamma radiometric imagery.

In the northern and western parts of the BBSB, where soils information was not available, nine smaller training areas were chosen for representative soil mapping, which was then modelled throughout those areas based on the rules developed in the training areas.

Several key environmental variables such as surface geology and gamma radiometrics were neither continuous nor wholly available at the time of survey, which hampered modelling progress. Combined with limited digital elevation information in areas of lowest relief in the west of the study area, this presented challenges that need to be addressed before starting similar surveys.

Initial outputs from the model were originally applied universally over the entire area. It was found, however, that this over-represented the landscape-forming processes that dominate the south-eastern part of the study area but are not as prevalent elsewhere. The study area was subsequently subdivided into seven provinces. This allowed geographic differences in landscape and soil formation processes in the bioregion to be modelled individually. This approach was adjusted with further refining of province boundaries and subdivision of mapping areas for individual modelling.

Training area information, and other compiled soil data, was used for iterative refining of the soils map over the remainder of the area by using various combinations of repeated recursive partitioning.

Advice on model success or otherwise was only possible using critical feedback from the soil surveyors and technical officers who extensively sampled soils and landscape conditions in the study area. Location of sampling points was guided by the use of a flexible gap analysis software package running on laptop computers. The model-feedback approach was developed, in some cases, down to individual soil landscapes. In some areas, the model was modified more than eight times until further improvement could not be obtained within the constraints of the project. In some instances, modelling reverted to the use of radiometrics classifications, existing

mapping and hand-drawn polygons because the available environmental variables could not sufficiently delineate soil boundaries.

A smoothing and editing process was employed to resolve edge matches caused by discontinuities in the environmental surfaces.

Mapping was conducted at a technical standard consistent with national agreements and standards developed under the Australian Collaborative Land Evaluation Program by DLWC's Soil Survey Unit team of trained and qualified soil surveyors.

Key results and products

Over 3,500 soil profiles were collected from existing records or described as part of this project and entered into DLWC's NSW Soil and Land Information System. This compares with around 1,300 soil profile records available for the area at the start of the project. An independent sampling set, which is being finalised, will feature around 80 sites taken from the same locations as fauna and flora descriptions. This data will be valuable for double-checking against vegetation mapping predictions.

The main product is a reconnaissance Soil Landscape Map for use in Geographic Information System format. Each mapping unit is linked to a corresponding record in an MS Access database. Main attributes include:

- Soil type;
- Soil depth;
- Drainage;
- Estimated rooting depth;
- Fertility;
- Estimated plant available water capacity; and
- Soil regolith stability class.

Further, each map unit has been assessed for localised or widespread presence of:

- Seasonal waterlogging, flood hazard, high run-on, groundwater pollution hazard;
- Gully erosion risk, sheet erosion risk, wind erosion hazard;
- Shallow soil, non-cohesive soil, complex soil;
- Seepage scalds, saline discharge, potential recharge;
- Foundation hazard, surface movement potential; and
- Steep slopes, mass movement hazard.

Soil attribute information can be linked to DEMs to produce a higher resolution of soil attributes at more intense scales.

A feature of the project was the use of 180 stratified random soil profiles to compare with predictions of the mapped surfaces. For the five major attributes tested the mapping was found to be correct to category level in more than 70% of cases. Soil landscape mapping which is almost three times more expensive is expected to be accurate to category level in 85% of cases.

Beyond the scope of this project, DLWC undertakes to make these and other map views available over the Internet in the future. This mapping is provided at reconnaissance level and should be used only as a guide to the distribution of specific soil attributes identified for the purposes of this project.

WRA 23/27 VERTEBRATE FAUNA SURVEY, ANALYSIS AND MODELLING PROJECTS

This report describes two projects undertaken for the Resource and Conservation Assessment Council (RACAC) as part of the regional assessments of Western New South Wales. RACAC advises the State Government on broad-based land use planning and allocation issues. An essential process for the western regional assessments is to identify geographic gaps in data information and the best ways in which to proceed with data gathering and evaluation.

Project objectives

RACAC approved two projects to collect and assess data about the vertebrate fauna of the Brigalow Belt South Bioregion (BBSB). These were the *Vertebrate fauna survey (Stage 2) project*, and the *Vertebrate fauna survey data analysis and preliminary species/assemblage distribution and habitat modelling project*. Both these projects were closely linked and essentially formed two parts of the same task. This task was to provide accurate information about the distribution and habitat use of vertebrates in the New South Wales portion of the BBSB. The key objective of the fauna survey project was the collection of field data about the distribution and abundance of vertebrates within the forest and woodland vegetation of the bioregion, with emphasis on filling known gaps in the data previously available. The key objective of the fauna analysis project was to compile and apply analysis techniques to the data collected during the survey project with the aim of identifying areas of high conservation value within the bioregion.

Methods

Standardised systematic methods were used to collect data for vertebrate species from 108 two-hectare plots selected in woody vegetation throughout the bioregion. Specific methods used at each site were: timed diurnal bird census, Elliott trapping, harp trapping, site-based spotlighting, habitat search, ultrasonic (Anabat) detection, nocturnal call-playback and a spotlight transect associated with the site. The majority of the methods used were comparable to those used for the survey conducted during the preliminary (Stage 1) and other surveys conducted in adjacent bioregions.

Key results and products

The key results from these projects are a greatly improved knowledge of vertebrate species composition and distribution across all tenures within the bioregion.

Key products are:

- systematically collected fauna data, filling known gaps;
- a database of all known reliable vertebrate fauna records;
- classification analysis results, identifying faunal assemblages on a bioregional scale;
- Predictive models for 30 species of conservation concern; and
- Profiles for 37 species of conservation concern that were recorded during the survey.

*Specific fauna studies by SFNSW

State Forests of New South Wales (SFNSW) supervised fauna studies specifically for WRA23. Targeted studies of the following species are due to be published in October 2002:

- | | |
|------------------------|-------------------------|
| ■ Pale headed snake | ■ Squirrel glider |
| ■ Eastern Pygmy possum | ■ Glossy Black Cockatoo |

WRA 24 JOINT VEGETATION MAPPING PROJECT

This report describes a project undertaken for the Resource and Conservation Assessment Council as part of the regional assessments of western New South Wales. The Resource and Conservation Assessment Council advises the State Government on broad-based land use planning and allocation issues.

Project objectives

The key objectives of this project were to provide:

1. An extant vegetation map showing the distribution of vegetation communities at the landscape level.
2. A pre clearing vegetation map showing the potential distribution of vegetation communities at the landscape level.
3. Six map sheets completed to Department of Land and Water Conservation (DLWC) *Guidelines for mapping native vegetation* technical standards.
4. Floristic classification of all sampled native plant species identified via systematic floristic survey within the bioregion using agreed classification techniques.

Methods

The project utilised the following methods:

1. Data audit and gap analysis to determine the priority locations for full floristic survey.
2. Full floristic survey of the BBSB incorporating floristic, physiographic and structural information which met the DLWC *Guidelines for mapping native vegetation*. The DLWC Guidelines were adopted as the minimum standard for vegetation mapping for the Joint Vegetation Mapping Project (JVMP).
3. Aerial photographic interpretation (API) was carried out to the technical standards as described in the DLWC *Guidelines for mapping native vegetation*. API was carried out as either full Native Vegetation Mapping Program spatial extent or as targeted API to the agreed technical standard.
4. All available API was then compiled to produce a composite API vegetation layer for use in the modelling process.
5. Data was entered into the National Parks and Wildlife Service YETI and YOWIE databases. These relational databases provide ready accessibility to data and utilise the Microsoft Access database DRAFT REPORT WRA24 JVMP 8 August 2002 platform. This allows ready use of the queries, forms, reports, macros and modules allowing easier interrogation and interpretation of the data.
6. Data pre-processing was required prior to analysis so that the various floristic survey data sets could be brought to a uniform standard. Primarily standardisation of the Braun-Blanquet scale for cover abundance was required along with substantial changes to the taxonomic tables to ensure nomenclature was current.
7. Data analysis was carried out using PATN software to investigate the relationships between survey sites and floristics. PATN encompasses a suite of multivariate statistical tools which utilise both hierarchical and non-hierarchical methods. One hundred and fifteen vegetation communities were identified utilising this process.

8. Data modelling was carried out by the NPWS GIS Research and Development unit in Armidale with technical input and post modelling analysis by the JVMP Technical Working Group. A Generalised Dissimilarity Model was utilised to develop the relationship between a suite of edaphic variables and the floristic survey data.
9. The vegetation communities as derived from the PATN analysis were then introduced to the model to determine the relationship between the modelled space and the vegetation communities. Lastly the composite API vegetation layer was introduced to the model to act as a constraint on the model.

Key products

1. The production of 118 probability surfaces providing information on the probability of the potential distribution of vegetation communities within the bioregion.
2. The production of 118 probability surfaces masked to the extant vegetation within the bioregion showing the current distribution of native vegetation communities within the bioregion.
3. The production of a composite map showing the modelled potential vegetation distribution of the highest probability surfaces.
4. The production of an extant vegetation map based upon the modelled composite map and the DLWC land use data set.

Key results

1. Increased level of knowledge of the vegetation community-environment relationships and of the floristic and structural diversity of the vegetation communities of the BBSB.
2. Mapping of 2,739,814 ha of extant native vegetation which accounts for 52% of the area of the bioregion.

Project objective

The Western Regional Wood Supply Appraisal System (WRWSAS) was developed to provide a planning tool that could determine sustainable wood flow for a range of management options and a varying resource base.

Methods and key results and products

The WRWSAS project comprised four modules;

- **Strategic Inventory.** The strategic inventory was carried out on State forests in two stages, 1999-2000 and 2001-2002 and was designed to provide estimates of merchantable volume at a strategic level. The attributes measured at the plot level included location, slope, site height, structure and regeneration; while at the tree level included species, diameter, a range of heights, stem quality and tree availability. Stage 1 of the inventory was pre-stratified and plots allocated using the equal allocation technique. Stage 2 was designed to ensure maximum flexibility with post measurement stratification. In the final stratification, 23 strata and 502 plots were used.
- **Biometric models.** A key element in WRWSAS is a series of biometric models that make up the growth component in the Yield Simulator. There are three major types of functions of native forest growth modelling, these are diameter or basal area increment, mortality and recruitment. These models, based on a range of long repeated measurement plots, predict diameter growth, mortality and recruitment of individual trees over time.
- **Modifier modules.** These modifiers represent key factors that significantly influence the accurate prediction of timber information from inventory data. The first modifier was the tree product recovery modifier. Plots were measured prior to harvesting and the individual log products were measured as they were harvested. This data was used to develop a recovery factor for the adjustment of predicted (standing) volume to actual (recovered) volume for quota sawlog (High Quality) in both white cypress and ironbark species. The second modifier was the net area modifier. Net area is the gross area less mapped exclusions less net area modifiers. The mappable exclusions include stream exclusions of varying width based on stream order, zones of preferred management intent, and areas associated with roads. The Net area modifier is used to account for unmappable non harvest areas generated from threatened species buffers, stream exclusion zones, unmappable drainage and various physical impediments to harvesting unaccounted for in mapped exclusions.
- **Yield Simulator/Scheduler.** The yield simulator/scheduler will be used for providing reliable estimates of future timber volumes from strategic inventory data in response to a range of silvicultural prescriptions and management strategies.

This project is part of a group of projects aimed at providing a better understanding of socio-economic attributes and activities on public and, to the extent possible, private lands in the Brigalow Belt South Bioregion (BBSB).

Project objectives

This project is one of a suite of three projects covering the socio-economic assessment of the BBSB. The work in this project has two broad functions:

- To provide descriptive and analytic information on the BBSB to provide a socio-economic context for the assessment.
- To develop a set of analytical tools that can be used to assess proposed land use and management changes.

Methods

Three specific tools have been developed. They are:

- Models of timber processing operations to examine the impact of proposed changes in timber milling and log supply on the industry.
- An input-output model with supporting data on Local Government Areas (LGAs) to undertake regional economic impact assessments of proposed changes that will affect business activity in the region.
- Farm models of a range of farming systems are under development to inform on different types of farming operations in the region.

This work builds on Stage 1 in a number of ways. Information included in the economic profile has been supplemented with additional data, more detail relating to LGAs, updating of information where possible and further development of the analytic modelling capability. In addition, the coverage has been extended to include three more LGAs. Information on farm models is also provided.

Key results and products

The results are more recent data on demographic change within the region, taken from the 2001 Population Census. More detailed Census data on employment will not be available until the end of 2002. The information on timber production and processing has been updated using information supplied by State Forests of New South Wales and from a field survey undertaken by the consultants. Farm models are available: these models are to inform the assessment on the scale for different types of farming operations and within different sub-areas of the region.

WRA29 GIS SOCIO-ECONOMIC ASSESSMENT TOOL

This project is part of a group of projects aimed at providing a better understanding of socio-economic attributes and activities on public and, to the extent possible, private lands in the Brigalow Belt South Bioregion (BBSB).

Project objective/s

This project involved the development of a Geographic Information System (GIS) Toolkit to allow users to view the key social and economic information gathered and compiled for the BBSB assessment.

The project aims to give decision-makers a clearer picture – therefore a better understanding of the linkages between the public forests and regional and local communities as well as individuals in those communities who use or work in public forests in the region.

Methods

Dr Mark Fenton, a specialist social researcher was engaged to develop and operationalise the Toolkit. The Toolkit visually displays the socio-economic data collected from this project and the linked projects (WRA 28 & 30) to assist in developing outcomes for the region. Dr Fenton's work included an initial review of existing available tools. The most appropriate tool for use in the BBSB assessment was then selected and constructed for use. Criteria included that the tool should be 'user friendly' and the information accessible to all communities. The data used in the Toolkit is validated Stage 1 data and additional survey information. Survey information has been included from mail out and face-to-face surveys of forest users and businesses in the region.

Key results and products

The interactive tool brings together the social and economic information from linked studies for use in the assessment. The tool is available on CD-ROM and will be available on the RACAC website: www.racac.nsw.gov.au. Socio-economic data can be compared over different areas using mapped information, as well as providing the user with a total picture of the region.

The survey information has been made into a computerised map of the region to show what forest-based businesses, workers and communities might be affected with any proposed change in forestry – positive or negative. It is a social map – a database with a GIS front-end - a first in New South Wales, which, if successful, will hopefully be used more widely to understand the locational impacts of natural resource decisions on local communities.

WRA30 ASSESSMENT OF FOREST DEVELOPMENT OPPORTUNITIES

This project is part of a group of projects aimed at providing a better understanding of socio-economic attributes and activities on public and, to the extent possible, private lands in the Brigalow Belt South Bioregion (BBSB).

Project objectives

The objectives of this project are to identify potential development/expansion opportunities for existing and/or new significant forest-related industries/activities; and to identify opportunities for synergies between existing industries/activities.

Methods

The study included both desk based research and consultation with industry and community members. Opportunities were ranked on the basis of evaluation criteria which included resource availability, markets, employment, capacity to attract investors, scale of impact, supporting infrastructure, capacity to create opportunities for the Aboriginal community, government/community support and government assistance required.

Key results and products

Opportunities reviewed included conventional products such as timber, firewood, fencing and private native forestry as well as products for emerging markets such as oils distilled from cypress, laminated timbers and manufactured briquettes. Opportunities for the Aboriginal community were explored through extensive consultations with local Indigenous stakeholders.

The high-priority development opportunities include:

- Oil and gas industry exploration and development
- A lamination plant to add value to lower grade cypress timbers
- Supplementary thinning of cypress regrowth as per the *Friends of the Pilliga* proposal
- Harvesting and processing of the ironbark resource previously believed to be “sub-economic”
- Firewood harvesting from greenwood thinnings and under utilised species
- Apiary growth linked to market demand and continued access to BBSB sites
- The Pilliga Cultural Heritage Centre.

Medium-importance opportunities were identified for exports of cypress, oil distillation, briquette manufacture, local generation of electricity from forest by-products, ethanol from mill wastes, regional tourism, and various activities with Aboriginal involvement. The report emphasised that establishment of the Pilliga Cultural Heritage Centre could be expected to generate a range of associated opportunities for the Aboriginal community including cultural heritage tourism, arts and crafts, bushfoods, and Aboriginal studies.

WRA31 RESPONSE TO DISTURBANCE AND LAND MANAGEMENT

This report describes a project undertaken for the Resource and Conservation Assessment Council as part of the regional assessments of western New South Wales. The Resource and Conservation Assessment Council advises the State Government on broad-based land use planning and allocation issues. An essential process for the western regional assessments is to identify gaps in data information and the best ways in which to proceed with data gathering and evaluation.

Project objective/s

The objective of this project was to consider key species and communities and the significant disturbances and land management practices that affect them across all tenures within the Brigalow Belt South Bioregion of NSW.

Specific objectives of the project were to:

- provide a ranked list of important species, populations and ecological communities found within the bioregion;
- provide a ranked list of the most important issues/factors likely to influence (positively or negatively) them;
- review existing information on each species, population and ecological community;
- review the ecological effects and intensity of the disturbances and land management practices across the bioregion;
- produce a large scale map highlighting areas within the bioregion that are having the most significant effect on important species, populations and ecological communities;
- describe data gaps/limitations to the project;
- compile a set of 'Profiles of Response to Disturbance and Land Management Practices' for each key species, population, ecological community and ecological processes identified during the study; and,
- provide recommendations on land management and conservation that could be used in a socio-economic study looking at the costs of implementation of such recommendations.

Methods

The project proceeded in four stages:

- Stage 1: Compilation of species lists for plants and terrestrial vertebrate animals occurring in the bioregion and a list of vegetation communities;
- Stage 2: Development of criteria to rank species and communities in terms of conservation concern and the application of the criteria to the species and communities;
- Stage 3: Identification of disturbances or land management practices impacting species and communities of highest conservation concern; and
- Stage 4: Development of species and disturbance profiles for the bioregion.

Outputs from the project, such as the ranked species lists and the species profiles were reviewed in a series of two expert workshops.

Key results and products

Within the Brigalow Belt South Bioregion of NSW, 471 species of terrestrial vertebrates have been recorded. Based on the ranking procedures, 94 species are considered to have the highest conservation priority.

Nineteen disturbances were identified for these animal species. By far the greatest disturbance is Land Clearance, which has impacted 80 species in the highest conservation priority, and for 64 of these species it is considered the primary disturbance. The second highest disturbance for animals in the bioregion is grazing followed by inappropriate fire regimes (Figure A).

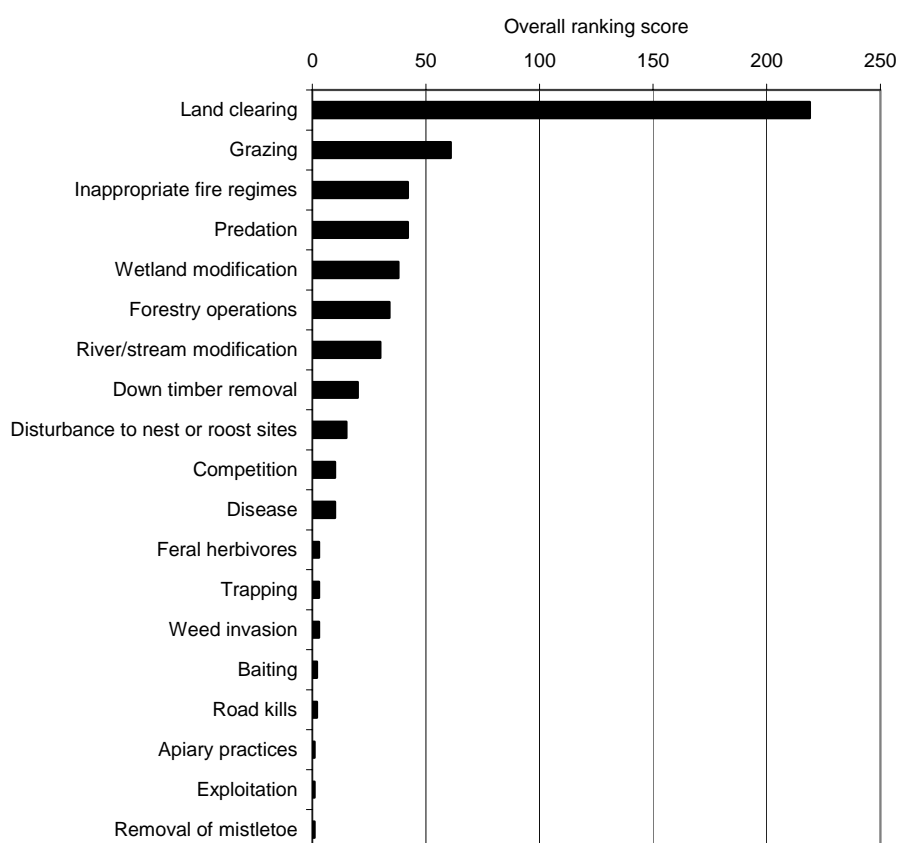


Figure A: Overall ranked disturbances for terrestrial vertebrate fauna in the Brigalow Belt South Bioregion of NSW

A total of 1823 species of plant have been recorded in the bioregion. Over 50% of these species have at least Regional significance if not State or National. Ten disturbances were identified for these plant species. By far the greatest disturbance is disturbance by feral animals, followed by weed invasion and land clearance (Figure B).

A complete list of vegetation communities was not available for this project and so the list of endangered ecological communities as listed under the *Environment Protection and Biodiversity Conservation Act 1999* and the *Threatened Species Conservation Act 1995* was used to determine communities at risk. Seven endangered ecological communities are present in the bioregion.

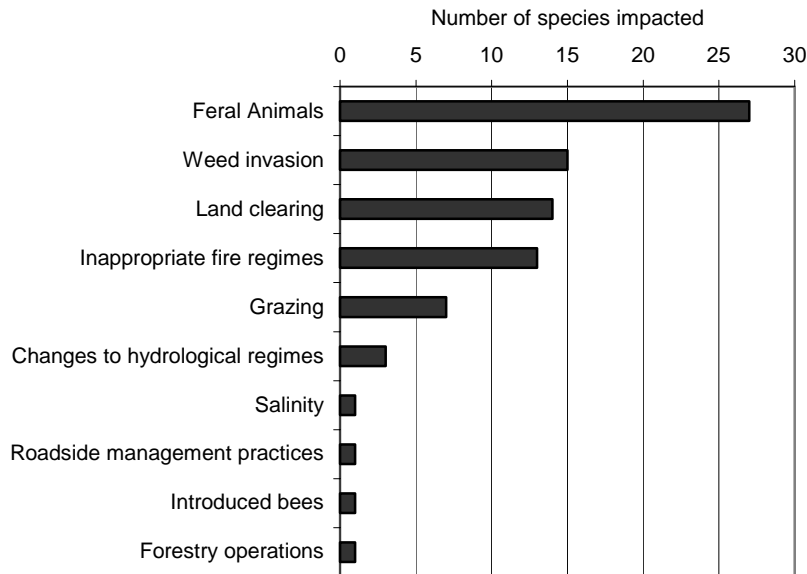


Figure B: Number of key plant species impacted by disturbances in the Brigalow Belt South Bioregion of NSW

By far the greatest disturbance listed for endangered ecological communities was land clearance, followed by grazing and inappropriate fire regimes, based on the Key Threatening Processes listed in final determinations for these communities.

Species profiles for each of the key species have been prepared including key disturbances and conservation areas as well as management recommendations. Disturbance profiles have also been prepared for the major disturbances.

Information from this project can be used to:

- assist in maintaining biodiversity and ecological processes in the bioregion; and
- provide data to inform local and regional planning

Project Objectives

The primary objective of this study is to provide an overview of the non-Indigenous cultural heritage items in forested areas of the Brigalow Belt South Bioregion (BBSB). A large proportion of the bioregion is devoted to agricultural/pastoral activity. Despite clearing associated with pastoral settlement and later agricultural industry, the BBSB still contains significant tracts of forest.

The role these forests played in the historical development of New South Wales is poorly understood and this study aims to clarify this role and to provide an historical framework identifying significant places and/or items. It is important to note that this study provides only an overview of the bioregion. Further detailed studies would build a more complete picture of non-Indigenous cultural heritage in forested areas.

Methods

There were two major components – historical research/documentation and field surveys. Historical research was carried out at a variety of archives and institutions, including the Mitchell Library (NSW), Land Titles Office of NSW, Department of Land and Water Conservation, the NSW State Forests Archives at West Pennant Hills, National Parks & Wildlife Service (NPWS) Archives at Hurstville, and the Department of Mineral Resources Archives at St Leonards. Additional research was carried out with the assistance of many district historical societies throughout the study area and oral history interviews conducted during the field survey phase. Information on previously identified heritage items was obtained from all local governments in the study area and buffer area, many also providing background information and maps and contacting local historians, retired foresters and district historical societies on behalf of the study team.

The project manager undertook a reconnaissance of the whole study area in February. Field surveys of the nominated forests in the study area were conducted in April and May 2002. Wherever possible, guidance from local experts was sought and resources were concentrated on those areas where historical research and/or local knowledge supported the likelihood of heritage items being found. In a number of instances, forests were surveyed without local input or assistance and in most cases still yielded items of heritage significance.

Key results and products

The most important outcome of this study was the ‘discovery’ of numerous items of heritage significance and their contribution to our knowledge and understanding of the region’s history. The study highlighted the importance of forest industries to the development of our rural, regional and state economies and the role these industries played in the settlement of the central north-west of New South Wales. The study also highlighted the urgent need for systematic studies of smaller forest groups, supported by thematic historical research.

Although this study has produced a sizeable quantity of heritage items to be added to statutory registers, we consider the primary product to be the enhanced knowledge and understanding of the history and development of forest management practices in New South Wales and how this overlaps with and coexists with other activities such as pastoralism and beekeeping. This knowledge will help communities to appreciate and effectively utilise their environment through better forest management practices and heritage-based tourism.

A State Heritage Inventory database has been developed which lists 188 sites. This will eventually form part of the New South Wales State Heritage Inventory that can be accessed through the New South Wales Heritage Office website: www.heritage.nsw.gov.au.

WRA33 COMMUNITY DATA SEARCH AND BIODIVERSITY SURVEY OF THE BRIGALOW BELT SOUTH BIOREGION

Project Objective

This project sought to achieve two key aims:

- The provision of statistically valid and consistent fauna and flora survey data for use in the fauna and flora modelling projects.
- The provision of baseline biological data for various public lands in the bioregion in a format readily used by agency databases.

Methods

This project was undertaken by local community environment organisations with considerable knowledge of their local environment and expertise in gathering biological and ecological information.

Two sorts of project were undertaken, old data collation exercises and new biodiversity surveys.

Biodiversity surveys were undertaken by local naturalists with the aid of agency personnel and using standard data gathering proformas as used by agencies for the Brigalow Belt South Bioregion assessment. Data gathered from biodiversity surveys suitable for agency modelling exercises were conducted over 47 flora sites and seven general fauna survey sites.

Key results and products

Additional bird data from another 39 sites, reptile data from eight sites, mammals data from 95 sites and plant data from a further 22 sites were entered into agency biotic databases and used for targeted analyses. Two projects just provided species lists without specific locations. This study identified about 1000 species of plants and 150 species of vertebrate animal.

Twenty-four threatened species in New South Wales were detected during the surveys, including two endangered species, the Malleefowl and the Bush Stone Curlew, and one Rare or Threatened Australian Plant (ROTAP) listed species.

Assessment of the conservation value of specific remnant areas revealed a range of ongoing activities that may pose a threat to ecosystem function or biodiversity, namely hardwood and cypress logging, firewood collection, leasehold fence construction and clearing, stock grazing, feral animal activity (bees, pigs, goats and foxes).

Local knowledge of specific areas of public land has assisted an evaluation of the conservation priorities for the bioregion. Priorities listed in this report include reservation of high conservation value areas, the need for wide-ranging feral animal control programs, and further assessment of additional Crown lands.

WRA36 DEVELOPMENT OF CONSERVATION CRITERIA AND TARGETS FOR THE BRIGALOW BELT SOUTH BIOREGION

The biophysical circumstances in the Brigalow Belt South Bioregion (BBSB) are such that real conservation gains depend heavily on a landscape approach, restoring the condition and expanding the extent of native ecosystems, and rehabilitating landscape function.

The magnitude of this challenge would require many years to address. The relatively small proportion of public land further limits the ability to generate a comprehensive, adequate and representative reserve system from the Crown-managed land, and the contribution it could make to improving conservation outcomes.

Project Objectives

This project sought to develop criteria and measuring/reporting that could be used to provide for conservation of natural values across the landscape through land management decision-making over time, and more immediately, for consideration of management options for public lands.

The project was largely based on expert opinion and responses on proposals from stakeholder technical representatives and agency personnel. However, the time available was short, and the depth of consultation and debate was constrained.

Key results and Products

The project provided geomorphic units, management priority classification, tenure grouping, a broad taxonomic classification, and certainty of conservation management classification.

Twenty six criteria under ten primary/sub-primary values were proposed. Of these, fourteen were implemented for options and recommendations deliberations. The criteria implemented covered six of the proposed ten conservation values.

The table on the next page summarises the status of the criteria proposed by this project. Each criterion is presented separately, and each primary value is presented separately. No lumping of criteria occurs, and no weightings are applied.

The reporting has been specified. The criteria are measurable parameters that quantify key elements of the primary values they fall under. They are not additive, nor comprehensive. They simply provide a quantified and objective relative measure. The data for each criterion is consolidated to encapsulate the criterion outcome at landscape or bioregional scale, and is reported for the value it falls under.

Recommendations in this report include the need to task competent processes and institutional arrangements to apply the criteria over time, to refine them, and to undertake monitoring. Monitoring is fundamental to the effective use of these criteria for contributing to improved conservation of biodiversity and cultural heritage in the bioregion.

With coverage limited to the Crown-managed land for many implemented criteria, incomplete data sets, and much of the data being coarse or strategic reliability, the implemented criteria are likely to understate results. The report considers that the criteria implemented all appear unsuitable as a basis for setting and pursuing firm landscape-scale or bioregion-wide targets. The criteria implemented do appear suitable for strategic application such as indicative or contextual use in guiding deliberations, as was the aim of this project. This conclusion is based on subjective consideration of the degree to which the coverage and reliability relate to the intended usage in the deliberations.

The concept and methodology appear sound and are appropriate for further development.

STATUS OF CRITERIA PROPOSED BY THIS PROJECT

Criteria			Implemented			Not implemented		
Value code	Criterion code	Short name	Coverage	Character	Use	Available but culturally sensitive	Available but not priority for agency	Lacks data, needs development
A	a	Native veg extent	Bioregion	Strategic	Context			
	b	Native veg condition						#
	c	Native veg distinctiveness						#
B	a	Aboriginal responsibility (broad)	Crown areas	Reliable	Context			
	b	Aboriginal influence (broad)	Crown areas	Reliable	Context			
	c	Cultural plants				#		
C1	a	River health						#
	b	Surface water						#
	c	Groundwater					#	
	d	Energy / nutrient						#
C2	a	Connectivity / patches	Bioregion	Strategic	Context			
	b	Successional change						#
C3	a	Management priority	Bioregion	Surrogate	Context			
C4	a	Veg groups (general)	Crown areas	Strategic	C-plan I			
	b	Veg groups (vulnerable)	Crown areas	Strategic	C-plan I			
	c	Veg groups (rare & endangered)	Crown areas	Strategic	C-plan I			
	d	Habitat of particular quality	Crown areas	Coarse	C-plan G			
	e	Late mature						#
	f	Wilderness	Crown areas	Reliable **	C-plan I			
	g	Cultural heritage sites	Crown areas	Reliable ** ¹	Context			
C5	a	Exotics						#
D	a	Aboriginal responsibility (places)	Crown areas	Reliable	Context			
	b	Aboriginal influence (places)	Crown areas	Reliable	Context			
	c	Geomorphic mapping	Pilliga/Goonoo	Reliable ²	Context			
F	a	State of knowledge					#	
F	a	Ecosystem vulnerability						#
10	26		14			1	2	9

** data sets are incomplete, and reliability applies only to the data available.

¹ Aboriginal sites were excluded due to potential cultural sensitivity.

² Nature / use of the data will not be known until presentation of the Aboriginal Cultural Heritage project report.

Character: subjective evaluation based on input data sets.

Reliable: relatively reliable for the stated coverage.

Context: informs the participants in the deliberations, but does not drive any software outputs.

C-plan G: has a broad guideline (maximise) that could be used in C-plan to derive the irreplacability index.

C-plan I: has a numeric indicator that is used in C-plan to derive the irreplacability index.