

Department of Planning and Environment and Regional Growth NSW  
Development Corporation

# Moree Special Activation Precinct (SAP)

## Biodiversity Management Plan

July 2022



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## Moree Special Activation Precinct (SAP) Biodiversity Management Plan

Department of Planning and Environment and Regional Growth NSW Development Corporation

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WSP acknowledges that every project we work on takes place on First Peoples lands.  
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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# Abbreviations

BAM	Biodiversity Assessment Method 2020
BC Act	NSW Biodiversity Conservation Act 2016
BCT	Biodiversity Conservation Trust
DPE	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment (former)
EPBC Act	<i>Commonwealth Environmental Protection and Biodiversity Conservation Act 1999</i>
Ha	Hectares
LLS	Local Land Services
PCT	Plant Community Type

# Executive summary

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## Moree Special Activation Precinct

The Moree Special Activation Precinct (SAP) is a 4,716 hectare (ha) site, located to the south of the Moree township, incorporating the existing Moree Regional Airport and Inland Rail corridor.

The Precinct will leverage the region's existing strengths in agriculture through opportunities for processing and related value adding of primary produce, and Moree's strategic location at the junction of the Newell, Gwydir and Carnarvon Highways, and direct interface with the Melbourne to Brisbane Inland Rail. The Moree Special Activation Precinct has been planned as a rural industrial environment that will accommodate brownfield and greenfield development in a low density environment. Specific land uses will take advantage of access to water, and road, rail and utility infrastructure in areas best suited to their requirements. The development scale will allow some areas to be self-generating and sufficient, thereby reducing the reliance on extensive utility infrastructure.

The use of Connecting with Country guidelines and partnerships with the local Indigenous community to activate land within the Moree Special Activation Precinct will create empowerment and self-determination for local Aboriginal people.

The delivery of Special Activation Precincts in regional NSW is the responsibility of the Regional Growth NSW Development Corporation. The aim of the Special Activation Precinct Delivery Plan is to:

- identify development controls
- provides guidelines, controls and/or strategies and plans for
  - Aboriginal cultural heritage environmental protection and management
  - protection of amenity
  - infrastructure and services staging.
- provides procedures for ongoing monitoring and reporting.

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## Scope of report

The scope of this report is to develop a precinct-wide revegetation strategy to inform the Delivery Plan and develop precinct-wide biodiversity management plan satisfying the requirements of the *Biodiversity Conservation Act 2016* and the *Environment Protection and Biodiversity Conservation Act 1999*, namely, to address planning for avoid, minimise or offset within the precinct.

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## Existing environment

The Gamilaroi people have a strong connection to Country and are acknowledged as the custodians of the Moree SAP area. Caring for Country and conservation of biodiversity is a Cultural responsibility and the management of the biodiversity within the Moree SAP area provides an opportunity for Gamilaroi people to care for Country and also to practice Culture on Country.

### *Landscape context*

The Moree SAP area falls within the Moree Plains Local Government Area and within the Brigalow Belt South IBRA region (Northern Outwash subregion) and Gwydir Alluvial Plains Mitchell Landscape. The landscape is generally flat plains with gentle undulation with no obvious physical barriers to movement across the landscape. These plains consist of grassland/herbland with surface conditions that are cracked with a poor drainage profile and slight erosion hazard.

Halls Creek (1st and 2nd Order stream) is a tributary of Mehi River approximately 500m to the North of the Moree SAP area and Drainage features including Clarks Creeks.

The Newell Highway dissects the Moree SAP area in a north-south direction and limits the connectivity of the riparian corridors of Halls Creek and Mehi River (located north of the SAP area). The Newell Highway also limits habitat connectivity in the native grassland vegetation recorded in Travelling Stock Routes (TSR).

### *Plant community types*

Within the Moree SAP area, approximately 731.86 ha of native vegetation was recorded, comprising 10% of the total SAP area. Of this, 212.30 will be impacted (29%) and 480.77 (66%) will be protected. There are six Plant Community Types (PCTs) known from the Moree SAP area including:

- PCT 1 Candidate Native Grasslands (likely to be PCT 52).
- PCT 52 Queensland Bluegrass +/- Mitchell Grass.
- PCT 27 Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion.
- PCT 39 Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion.
- PCT 55 Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.
- PCT 56 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW.

### *Threatened ecological communities*

The following TECs are determined likely to occur within or directly adjacent to the Moree SAP area:

- Artesian Springs Ecological Community in the Great Artesian Basin (BC Act listed).
- Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland which can be associated with PCT 52 (EPBC Act listed).
- Lowland Darling River aquatic ecological community (FM Act listed).
- Poplar Box Grassy Woodland on Alluvial Plains (EPBC Act listed).
- Weeping myall woodlands (BC Act and EPBC Act listed).
- Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (BC Act and EPBC Act listed).

### *Weeds*

Field investigations identified 16 exotic species, three of which are listed as Weeds of National Significance (WONS) within the Moree SAP Area. Other notable exotic species within the Moree SAP area include *Vachellia farnesiana* (Mimosa Bush), an aggressive pioneer species which require monitoring and management. WONS and other exotic species require active management measures to reduce cover in order to improve condition in remnant vegetation, habitat corridors and riparian vegetation.

### *High conservation values*

Within the Moree SAP area, important areas of biodiversity value will be protected and enhanced, as detailed in the Master Plan (DPE, 2022). This includes:

- Remnant vegetation – A total of 480.77 ha of remnant vegetation within the Moree SAP area will be retained. Impact to these areas of remnant vegetation has been avoided where possible due their high biodiversity value. These areas of remnant vegetation may be zoned as environmental protection or parks and recreation areas as part of the Moree Master Plan. These main areas of remnant vegetation are located between the Gwydir Highway and Werris Creek Mungindi Railway, the Travelling Stock Route (TSR), the Halls Creek riparian zone, along Burrington Road, and between Newell Highway and Barton Plains Road.



- Habitat corridors (Connectivity corridor) – Establishing connectivity corridors between areas of protected vegetation is proposed to link areas of high biodiversity value. This is proposed to link the TSR.
  - Riparian vegetation – Setbacks or buffers have been calculated based on Strahler order of waterways within the Moree SAP. In accordance with BAM 2020 and the *Water Management Act 2000*, riparian corridor width is based on a buffer being applied to each side of the waterway. A 10 m wide buffer is applicable to Clarks Creek and drainage features of Halls Creek while Halls Creek itself is slightly larger and required a 20 m buffer.
- 

## Potential offsets

The following as potential offset options have been identified for the Moree SAP under the assumption that the Moree SAP will obtain strategic biodiversity certification. The options include:

- retiring credits based on the like-for-like rules
- making a payment to the Biodiversity Conservation Fund.

In addition to the retirement of biodiversity credits, strategic biodiversity certification provides access to additional approved conservation measures for the preferred Structure Plan such as:

- reservation of land under the *National Parks and Wildlife Act 1974* (NPW Act)
  - adoption of development controls or state infrastructure contributions under the EP&A Act that conserve or enhance the natural environment
  - any other measure determined to be an approved conservation measure by the Minister for the Environment.
- 

## Landscape treatments

The following landscape treatments are proposed for the Moree SAP area:

- remnant vegetation outside of riparian buffers (subject to weed control and monitoring)
- habitat corridors (subject to weed control, supplementary planting and monitoring)
- riparian corridors (subject to weed control, supplementary planting and monitoring).

### *Weed control*

Weed control in all high biodiversity areas is proposed to increase vegetation integrity. Weed control is to prioritise WONS and Priority weeds due to their invasive nature. Weed control methods should be informed by the physical and chemical control options published by the Department of Primary Industries using the NSW WeedWise database (Department of Primary Industries, 2022). Weed control is required prior to planting (at least 6 months in advance) and as part of ongoing management of high biodiversity areas (BCT, 2020a).

### *Traditional land management*

Allowing, encouraging and reviving traditional land management practices within the SAP will help Country recover. This is work well suited to those Aboriginal people who want to work on Country and creates employment opportunities for the local community on Country.

The recommendation is to engage with Moree LALC and/or other Aboriginal organisations to explore the reinvigoration of cultural land management including fire practice within the landscape as an ongoing land management technique. This will allow Gamilaroi people to take an active role in looking after Country and maintain their cultural responsibilities while enhancing ecosystem health and wellbeing of the community.

## Revegetation

Supplementary planting is proposed for areas of riparian vegetation and connectivity corridors to improve vegetation integrity, connect areas of existing habitat and increase available habitat for threatened biodiversity. This landscape treatment has been proposed in general accordance with the Biodiversity Conservation Trusts Restoring Native Vegetation Guidelines (2020a).

### Planting densities

Planting densities and other biodiversity values are based on the community condition benchmarks (plus 20% for planting densities) for the listed biodiversity target published by the DPE on the Vegetation Classification Database. As such, average planting densities have been provided and each PCT has been allocated a specific planting density. An additional 20% has been added for richness in each stratum to account for an 80% survival rate of plantings.

### Planting palate

Species lists have been tailored to recreate PCTs known to occur or likely to occur based on field verified vegetation, adjoining remnant native vegetation and landscape position. Species palates have been obtained from the scientific description for each plant community type in the Department of Planning and Environments Vegetation Classification Database (2022).

### Reintroduction of Dhulu trees, native yurrul-bush food and medicines

All remnant vegetation holds potential cultural significance and it is the Gamilaroi people, the Traditional Owners, that will know which areas to improve, maintain and restore to enhance significance and care for Country.

Gamilaroi names and traditional uses of plant species for use in revegetation are provided, where known. Appropriate engagement will uncover the areas of high cultural importance to focus reintroduction of Dhulu trees and planting of native yurrul-bush food and medicines. Identifying such areas will allow for a targeted approach with most benefit to Country and people.

### Habitat augmentation

Habitat augmentation refers to creating habitat for native fauna. This is proposed in woodland communities only and does not apply to PCT 52. Conservation measures for threatened species include the following habitat augmentation actions:

- retain hollows from impact areas and relocate to areas to be retained
- plant native hollow-producing species
- install artificial hollows (nest boxes) in areas currently lacking hollows
- retain fallen logs as habitat.

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## Monitoring

Monitoring of remnant vegetation has been designed in general accordance with the Biodiversity Conservation Trust's Ecological Monitoring Module (2020) and Operational manual (2021). Monitoring using BAM 2020 through permanent monitoring plots established during baseline data collection is the preferred approach.

# Acknowledgment of Country

We acknowledge Country and pay respects to the Gamilaroi people as the Traditional Owners and Custodians of the of the Moree Plains on which the Moree Special Activation Precinct is situated. We acknowledge the living connection to Country held by the Gamilaroi people, embodied in the land, ecosystems, skies and water of Moree. We pay our respects to Gamilaroi Elders past and present and to the community members and knowledge holders who have contributed to the Moree Special Activation Precinct project.

# 1 Introduction

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## 1.1 Moree special activation precinct

The Moree Special Activation Precinct is a 4,716 hectare (ha) site, located to the south of the Moree township, incorporating the existing Moree Regional Airport and Inland Rail corridor (see Figure 1.1). The NSW Government announced Moree as a Special Activation Precinct investigation area in December 2019.

The Precinct will leverage the region's existing strengths in agriculture through opportunities for processing and related value adding of primary produce and Moree's strategic location at the junction of the Newell, Gwydir and Carnarvon Highways, and direct interface with the Melbourne to Brisbane Inland Rail. Moree also has rail access to Newcastle and Botany Ports and connections to other regional centres in south-east Queensland and regional NSW.

The Moree Special Activation Precinct will also build on the solar energy potential of the region, and access to high quality water and highly productive soils to generate economic growth and business and employment opportunities for the region.

The rezoning of land within the Precinct will allow for traditional and non-traditional activities in the form of value-add agriculture and horticulture to be realised. Development within the Precinct will support skills and training pathways for the local community to take up employment opportunities generated by the investment in the Special Activation Precinct, enabling Moree to better retain its youth and increase the economic participation of the Gamilaroi people through employment.

The Moree Special Activation Precinct has been planned as a rural industrial environment that will accommodate brownfield and greenfield development in a low density environment. Specific land uses will take advantage of access to water, and road, rail and utility infrastructure in areas best suited to their requirements. The development scale will allow some areas to be self-generating and sufficient, thereby reducing the reliance on extensive utility infrastructure.

The use of Connecting with Country guidelines and partnerships with the Indigenous community to activate land within the Moree Special Activation Precinct aims to create empowerment and self-determination for local Aboriginal people.

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## 1.2 Special activation precinct delivery plan

The delivery of Special Activation Precincts in regional NSW is the responsibility of the Regional Growth NSW Development Corporation.

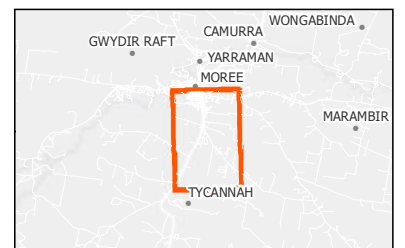
The aim of the Special Activation Precinct Delivery Plan is to:

- identify development controls
- provides guidelines, controls and/or strategies and plans for
  - Aboriginal cultural heritage environmental protection and management
  - protection of amenity
  - infrastructure and services staging.
- provides procedures for ongoing monitoring and reporting.

Figure 1.1  
Location of the Moree  
Special Activation Precinct

Legend

- Road
- ▭ SAP Boundary



Coordinate system: GDA 1994 MGA Zone 55  
Scale ratio correct when printed at A3  
1:38,484 Date: 30/06/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia  
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## 1.3 Scope of report

The scope of this report is to:

- Develop a precinct-wide revegetation strategy to input into the Delivery Plan, including:
  - strategy and location for the reintroduction of native yurrul (bush / scrub) yuul (food / bush tucker) and medicines
  - strategy and location for increasing the number of dhulu (trees), including strategic revegetation to connect existing habitat
  - strategy and identification of riparian corridors requiring revegetation
  - strategy for replanting and rehabilitation of environmental areas, including planting responsibility (funding, commissioning, management etc.).
- Develop precinct-wide biodiversity management plan satisfying the requirements of the *Biodiversity Conservation Act 2016* and the *Environment Protection and Biodiversity Conservation Act 1999* to address planning for avoid, minimise or offset within the precinct. This includes:
  - Incorporation of traditional Aboriginal land management techniques for high biodiversity areas.
  - Acknowledgment and discussion of Gamilaroi traditional customs and management of the land and Warrambul watercourses and waterways.
  - Respect Gamilaroi people's rights, obligations and roles as traditional custodians of the land and Warrambul watercourses and waterways.
  - Identifying landscape features and site context components.
  - Identifying, describing and illustrating the PCTs recorded within the site and whether any of these are representative of any threatened ecological communities.
  - Spatial identification of environmental setbacks from vegetation or riparian waterway corridors consistent with other legislative requirements and/or best practice.
  - Design objectives for development interfacing with Warrambul (watercourses), including Connection to Country design objectives.
  - Spatial identification of areas specifically dedicated for environmental protection, rehabilitation or function, including connecting of strategic landscape corridors to support improved landscape and environmental functions (and where appropriate, human interaction such as nature trails, cycle tracks etc.).
  - Strategy for the retention and maintenance of remnant vegetation.
  - Identifying opportunities for biodiversity offsets as part of the conservation management within the SAP.

## 2 Gamilaroi connection with Country

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### 2.1 Connection with Country framework

The *Draft Connecting with Country Framework* advocates for connection to Country to inform planning, design, and delivery of built environments. This framework has been considered in the development of this BMP.

The framework's aspiration includes a commitment to help support the health and wellbeing of Country by valuing, respecting, and being guided by Aboriginal people. The long-term strategic goals of this approach are to:

- reduce the impacts of natural events such as fire, drought, and flooding through sustainable land and water use practices
- value and respect Aboriginal cultural knowledge with Aboriginal people co-leading design and development of all NSW infrastructure projects
- ensure Country is cared for appropriately and sensitive sites are protected by Aboriginal people having access to their homelands to continue their cultural practices.

The Connecting with Country Framework sets out four pathways for working with Aboriginal people to design with Country, in a Country centric way. These pathways are key aspects to develop successful Connection to Country for the Moree SAP and this BMP. This includes:

- 1 Learning from First Nation languages that tell us about the physical characteristics and purpose of Country.
- 2 Developing mutually beneficial relationships with Country – exploring and honouring the connection to nature. Aboriginal cultural practices honour this connection. Building long term relationships with the Aboriginal community, enabling leadership in understanding how if we look after Country, Country will look after us.
- 3 Reawakening memories of cultural landscapes, walking with Aboriginal knowledge-holders and Traditional Custodians.
- 4 Knowledge sharing and finding common ground to overcome barriers and allow for two way thinking.

The Gamilaroi people have a strong connection to Country and are acknowledged as the custodians of the Moree SAP area. Caring for Country and conservation of biodiversity is a Cultural responsibility and the management of the biodiversity within the Moree SAP area provides an opportunity for Gamilaroi people to care for Country and also to practice Culture on Country.

The biodiversity management plan for Moree SAP seeks to:

- explore and honour Gamilaroi peoples connection to Country
- incorporate traditional land management techniques
- integrate Indigenous planting into public spaces and revegetation areas
- outline opportunities for the Gamilaroi community to guide the biodiversity management, share knowledge and care for Country.

The retention and rehabilitation of the remnant native vegetation and bush tucker within the Moree SAP Area was identified in consultation with the RAPs as elements that should be included as part of the precinct development (Aurecon, 2021).

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## 2.2 Traditional land management

### 2.2.1 *What is traditional land management?*

The practice of traditional land management includes a wide range of environmental, natural resource, commercial, economic and cultural resource management activities undertaken by individuals, groups and organisations across Australia. (Hill et al. 2013). These practices have evolved within Aboriginal and Torres Strait Islander societies as a part of their custodian responsibilities to land, sea, water and sky. Since the colonisation of this continent, the European concept of ‘wilderness’ persists in Australian thinking, however it fails to recognise the involvement of Aboriginal and Torres Strait Islander people in curating and maintaining ecological systems for a prolonged period of time which have evolved over at least 50,000 years (University of Melbourne). The colonisation process has changed the landscape to what it is today, with significant concerns over declining ecosystem health, unsustainable land and water management practices, numerous species on the brink of extinction, and climate change (University of Melbourne).

Traditional land practices and management originated from a reciprocal relationship between Aboriginal and Torres Strait Islander societies and their kinship connections to their Country. The activities are diverse and relate to the conditions and features of the place where people belong. Activities can include customary or cultural resource management (e.g. hunting, gathering, burning, ceremony, knowledge sharing) and actions to improve conditions in settlements. Some examples include: dust mitigation, firewood collection, and management of water supplies. They also include commercial economic activities such as bush harvest for sale, pastoral, management, art; and threat abatement for example: weed and feral animal control, fire management, threatened species management and revegetation. (Hill, R., et al. 2013).

In contemporary times the involvement of Aboriginal and Torres Strait people in land management has increased and the understanding that they hold different aims, goals and outcomes across the landscape according to the location of cultural sites, contemporary land tenure arrangements and the availability of funding to engage in particular activities is slowly being understood by the broader community (University of Melbourne). Today there is a shift to recognise that Aboriginal and Torres Strait people have sophisticated sustainable land management systems and there is growing adoption of these practices to repair the damage done by European farming activities (Gillies, 2017).

### 2.2.2 *Cultural fire practices*

The use of fire across this continent using traditional practices has created environments that plants and animals thrived in. Ecosystems such as grasslands were encouraged through the use of ‘cool fire’ which attracted kangaroos and other native herbivores to come and eat the new growth that was in abundance after fire was applied to the landscape, they were later hunted for food by Aboriginal people (Gillies, 2017). The knowledge of when to burn the different ecosystems, the interval between fires, the extent of each burn and the type of fire (e.g. a cool burn that trickles through the undergrowth removing small saplings, reducing fuel loads and encouraging grasses to flourish) is a part of the knowledge that Aboriginal people hold and have maintained throughout generations. This created a mosaic of different vegetation types with differing structures and levels of combustion resulting in ecosystems that were robust and able to reduce the possibility of the hot wildfires we have seen in recent years.

Since colonisation the fire regime established by using these traditional methods was disrupted as fire was regarded as something to fear and be prevented by the settler societies. This has created a different ecosystem moving away from open grassy forest systems to become thicker bush and scrub and bushland that is more prone to hot wildfires (Gillies, 2017).

### 2.2.3 *Traditional water management*

Aboriginal people have been observing and working with natural systems across this continent for millennium and understanding water and how to care for it has played a significant part in their survival on the driest inhabited continent. Water helped in defining language boundaries and ceremonial places and also underpins many land management practices (Rose, DB, 1996).



Aboriginal people have a cultural obligation to protect both surface and ground water sources. Over many centuries Aboriginal people have evolved their water storage practises and evidence of Aboriginal people using and protecting precious water sources is still found in many places despite the ongoing effects of colonisation (Queensland Government, undated).

The presence of particular birds, animals and plants can help to find water, as it is understood by Aboriginal people that in particular areas many species of bird, animal and plant life could not exist without a constant water source. Following certain species during seasonal movements of animals would lead the trackers directly to water (Queensland Government, undated).

The act of sharing cultural knowledge through Dreaming stories shows the connection of ancestors to water sources. Many of these stories highlight the role of spirits in creating sources of water—rivers, creeks, rock wells, lakes, lagoons, seas and springs—and the ongoing supply and control of these watercourses by ancestral spirits and creation beings. Adults memorised the sequence and locations of water supplies and taught their children while travelling along the chain of water sources. (Bayley, 1999).

Gamilaroi water scientist Bradley Moggridge explains that many traditional rites and activities are triggered by water-related phenomena, such as particular species of fish spawning, or particular types of plant going into flower. It is through observations and awareness of these changes made over millennia that provide insight into changes of the health of rivers and groundwater systems (Masterson, 2017).

#### 2.2.4 *Dhulu trees, native yurrul-bush food and medicines*

The use of plants over thousands of years by Gamilaroi people has led to an incredibly detailed knowledge base which is held and maintained within Aboriginal culture. Over many generations Aboriginal people lived with the land and accessed its resources for everything they needed for survival including medicine, food, shelter, clothing and their spirituality (McKemey & White 2014). Sustainable practices of harvesting plants and animals ensured there were enough resources left for the following generations. Through cultural practices such as the totemic system and kinship rules Gamilaroi people would not take more than what they needed as they have a responsibility to look after totems and their habitat (McKemey & White 2014).

Aboriginal people living on the land need to know which plants can be eaten throughout the seasons, which plants are available that can heal diseases and help fix broken bones. They would know which plants would provide habitat for animals and which areas to hunt, fish and collect eggs. Knowing where to find materials to make a shelter, tools was also imperative along with what resources were available to carry out cultural and spiritual obligations such as ceremonies and funerals (McKemey & White 2014).

Areas surrounding Moree and the SAP region were traditionally a rich economic resource for Gamilaroi people (Hunter & Earl, 1999). Particularly the Narran Lake area to the west of Moree was a rich economic resource, which played a vital role in the settlement pattern of the region. It is thought to have supported a relatively large, possibly semi-permanent population and was a major meeting place and ceremonial centre (Hunter & Earl, 1999).

A vegetation survey by Hunter and Earl in 1999 of the grasslands in the Moree Plains region found that the removal and modification of native vegetation had reached the limits of ecological sustainability, and are threatening the viability of both natural and agricultural ecosystems. They found that the regions that have been most denuded are those areas that contain the more fertile soils on the more desirable cultivation slopes associated with the northwest plains of NSW (Hunter & Earl, 1999).

These findings highlight the importance of the revegetation including reintroduction and restoration of native bush foods and medicines into the SAP as the cultural heritage and ecological integrity will be enhanced and maintained for future generations through activities such as vegetative restoration.

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## 2.3 Strategy for connection with Country

### 2.3.1 *Location for traditional land management*

All remnant vegetation holds potential cultural significance and it is the Traditional Owners that will know which areas to improve, maintain and restore to enhance significance and care for Country. Appropriate engagement will uncover the areas of high cultural importance to focus reintroduction of Dhulu trees and planting of native yurrul-bush food and medicines. Identifying such areas will allow for a targeted approach with most benefit to Country and people.

Riparian areas are vulnerable to the pressures of increased urbanisation and vegetation loss. Enhancing these areas with appropriate vegetative restoration along with ongoing maintenance can provide ecological services such as improvement of water quality, habitat for animals and increased public amenity. The enhancement of the Travelling Stock Route across the SAP area is an opportunity to create a wildlife corridor with habitat suited to animal species needing to move across the landscape. Reinvigorating the grassland areas using cultural land management techniques such as appropriate fire regimes can allow for niche habitat that has been lost in the broader landscape while reducing the risk of wildfires and effects of drought through building resilience within the ecosystem.

### 2.3.2 *Engagement and consultation with Gamilaroi community*

#### 2.3.2.1 Consultation

To understand cultural needs when restoring biological features in the Moree SAP area engagement with Gamilaroi People, is crucial to obtaining results that are meaningful and sustainable. Consultation with relevant Knowledge Holders, Elders and organisations such as the Moree Local Aboriginal Land Council, Local Land Services and other experts that know Gamilaroi Country will ensure that the objectives will be reached. Consultation with the Gamilaroi community on the biodiversity management plan will be undertaken during public exhibition of the Delivery Plan.

Consultation should be undertaken with the Moree Aboriginal Reference Group (ARG) which is being coordinated by Moree Plains Shire Council's Aboriginal liaison officer. Establishing and defining Terms of Reference (TOR) and a Memorandum of Understanding (MOU) for this project is recommended for the Aboriginal Reference Group to work within. The initial engagement process in establishing the TOR and MOU will help to understand the community interest in and ability to undertake cultural land and water activities within the SAP precinct. It is the Aboriginal Reference Group and program delivery team that will decide on the details of how cultural land management will be undertaken in the SAP precinct, the time frames and ongoing program of works required to restore Country to health after extensive agricultural pressures.

Engaging a local Aboriginal advisor or consultant to help in the establishment of the TOR and MOU is recommended to help unpack and understand detail around capacity and identifying any skills gaps within the available community members in undertaking traditional land management practices. Understanding local capacity will help to identify if cultural consultants or practitioners need to be engaged to train and / or mentor more community members to enable delivery of the program. Training such as the Conservation Land Management certificates provided by TAFE may be offered to ensure that there is local capacity to deliver the on-ground activities required.

A long-term program for cultural land and water practices will provide the time needed to effectively restore the cultural values into the SAP precinct while providing ongoing employment opportunities to the local Aboriginal community.

It is recommended that the Aboriginal Reference Group and cultural land managers be appropriately remunerated for the time involved in developing a program of works and long term on-ground delivery of the program.

#### 2.3.2.2 Co-design approach

It is recommended to establish and follow a co-design methodology where opportunities are made for a variety of voices from Gamilaroi community members to decide on what, where and how the restoration and cultural land and water practices will take place. Engaging an expert in Aboriginal community consultation and engagement is recommended if

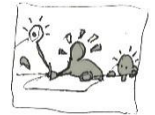
these services are not available within the program delivery team, along with the above recommendation to engage Aboriginal cultural land managers to help mentor and train the local practitioners.

Meetings on Country and in workshop settings allow for the co-design process to unfold where information regarding the needs of community are realised and understood. An iterative review process with the Aboriginal Reference Group allows for fine-tuning of information shared ensuring that it has been translated into plans and actions that have the best outcomes for all stakeholders.

The key steps are:

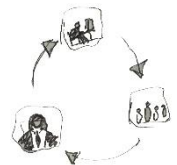
### 1 Engagement:

The first step will be to engage with the relevant Aboriginal group (elder, Lands Council etc), early and often, through a series of ‘yarns’ or conversations about the potential opportunities to incorporate the values contained within the SAP into delivery outcomes.



### 2 Co-design:

To kick off the co-design process delivery teams are given time to integrate the values and information into the scope of the project.



### 3 Co Design workshops:

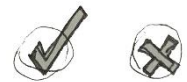
Engagement workshops with the Moree Aboriginal Reference Group where everyone gets in the room to co-design cultural solutions to project outcomes. In this process Gamilaroi voices should be given preference to ensure they are heard.



Activities such as a ‘Walk on Country’ and workshops with relevant Gamilaroi people and organisations allow for an information exchange in which their voices and interests are communicated and understood by the delivery team. Allowing sufficient time for these collaborative activities to take place is important for capturing important information that will inform future restorations activities.

### 4 Endorsement and Cultural IP:

All content that uses local Aboriginal information will need to be endorsed by the Aboriginal Reference Group. Through this process it is important that Cultural Intellectual Property is identified and protected.



### 5 Other opportunities:

Other opportunities should be highlighted and put forward to ensure the Gamilaroi community has opportunities, economic outcomes and better connections to their Country, throughout the project lifecycle from design to implementation and to ongoing maintenance.



## 2.3.2.3 Opportunities

Creating opportunities to employ Gamilaroi rangers, land managers and Knowledge Holders to be a part of the restoration process is an offering which can have a myriad of potential benefits beyond the project lifetime. The sense of ownership, value and respect which can come out of such employment opportunities can result in empowering the Gamilaroi community to have a sense of belonging, custodianship and responsibility to look after these parts of their Country that they have historically be restricted from.

### 3 Baseline data

The findings of this report are informed Biodiversity Report prepared for the Moree Special Activation Precinct (SAP) Environmental Package by Aurecon (2021). No field surveys were undertaken by WSP.

An initial baseline site investigation was undertaken in late July 2020. Field surveys were then undertaken over a three day period between the 1<sup>st</sup> and 3<sup>rd</sup> of October 2020 and involved vegetation integrity plots using BAM 2020, meandering transects, Australian Rivers Assessment and dawn bird surveys. Incidental fauna observations were also recorded (Aurecon 2021). The information derived from field investigations was used to ground truth biodiversity values ascertained from the desktop assessments and identify other biodiversity values that were not determined from desktop assessments. Of note is that the landscape is described as being in drought conditions during this time and consequently the floristic biodiversity values obtained from the survey are not likely to be representative of optimal conditions.

To sufficiently determine species composition and overall condition of each plant community type, assign candidate plant community types to NSW recognised PCTs and confirm the presence of threatened ecological communities, resurveying plot locations during non-drought conditions is recommended. Collection of baseline data in non-drought conditions will more accurately inform planting densities, level of weed control required and management evaluation (through comparison of monitoring results). Other recommendations include:

- targeted surveys for threatened flora and fauna species to confirm presence
- additional BAM plots within the proposed SAP boundary to satisfy minimum number of plots required (Table 3 of BAM 2020).

# 4 Existing environment

Field surveys were not undertaken as part of this project by WSP and all findings are based on those made by Aurecon (2021) as part of the Biodiversity Report prepared for the Department of Planning and Environment (formerly Department of Planning, Industry and Environment).

## 4.1 Landscape features

The Moree SAP area falls within the Moree Plains region and is generally flat plains with gentle undulation with no obvious physical barriers to movement across the landscape. These plains consist of grassland/herbland with surface conditions that are cracked with a poor drainage profile and slight erosion hazard. Local geology consists of large areas of unconsolidated alluvial deposits 100 metres (m) thick in some places consisting of medium to heavy clay textured soils. Soils are very dark grey to black in colour, the Quaternary alluvial deposits that make up the vast plains are referred to as the ‘Black Plains’. These highly fertile soils are conducive to fast plant growth. Alluvial deposits are overlain on a mosaic of sedimentary rocks that form part of the Great Artesian Basin (Aurecon, 2021).

Other landscape features including drainage and connectivity are detailed in Table 4.1.

Table 4.1 Summary of landscape features within the Moree SAP area

Landscape feature	Moree SAP area
IBRA region and subregion	Brigalow Belt South IBRA region, Northern Outwash subregion
NSW landscape regions (Mitchell landscapes)	Gwydir Alluvial Plains
Local Government Area (LGA)	Moree Plains Local Government Area
Rivers, streams and estuaries	Halls Creek (1 <sup>st</sup> and 2 <sup>nd</sup> Order stream) is a tributary of Mehi River approximately 500m to the North of the Moree SAP area and Drainage features including Clarks Creeks.
Important and local wetlands	Floodplains of the Gwydir Catchment are throughout the Moree SAP area. No wetlands occur within the Moree SAP area however Gwydir Wetlands approximately 60km to the West.
Connectivity features	The Newell Highway dissects the Moree SAP area in a north-south direction and limits connectivity association with the riparian corridors of Halls Creek and Mehi River (located north of the SAP area). Habitat connectivity is also limited in the native grassland vegetation recorded in Travelling Stock Routes (Aurecon, 2021) by the Newell Highway.
Travelling Stock Reserves (TSRs)	A TSR intersects the Moree SAP area to the south of the Moree Regional Airport in an east-west direction following Halls Creek. The TSR runs south along Burrington Road, west through the Boland Sales yards and continues south along the Newell Highway (Aurecon, 2021).

Landscape feature	Moree SAP area
Areas of geological significance and soil hazard features	<p>The geological features surrounding the banks and the Mehi River make Moree a flood-liable region. The Moree Plains become inundated during high rainfall events and major floods due to the flat undulating topography associated with the landscape (MPSC 2008). The geology of Moree and the surrounding landscape consists of the following:</p> <ul style="list-style-type: none"> <li>— Quaternary colluvial deposits Lithology; Colluvial deposits are unconsolidated sediments that are found downslope from hills. They form by erosion of hills and by creep or sheetwash.</li> <li>— Quaternary alluvial deposits Lithology; Current and recent mud, silt, sand and gravel deposited by river (alluvial) systems.</li> </ul> <p>No karts, caves, crevices, cliffs, rock of other geological features of significance were recorded within the Moree SAP area (Aurecon, 2021).</p>
Areas of outstanding biodiversity value	None recorded.

## 4.2 Plant community types

Within the Moree SAP area, approximately 731.86 ha of native vegetation was recorded, comprising 10% of the total area. Of this, 212.30 will be impacted (29%) and 480.77 (66%) will be protected. Native vegetation which aligns with Threatened Ecological Communities (TECs) have been identified in Table 4.2.

It should be noted that detailed survey outside of drought conditions will ultimately determine the presence of TECs and assign candidate native grasslands (PCT 1) to recognised NSW PCTs (Aurecon, 2021). Until this baseline data is collected a precautionary approach has been taken and presence has been assumed for those PCTs which align. Each TEC is detailed further in Section 4.3.

There are six Plant Community Types known from the Moree SAP area (see Figure 4.1) including:

- PCT 1 Candidate Native Grasslands (likely to be PCT 52).
- PCT 52 Queensland Bluegrass +/- Mitchell Grass.
- PCT 27 Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion.
- PCT 39 Coolabah – River Coobah – Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion.
- PCT 55 Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.
- PCT 56 Poplar Box – Belah woodland on clay-loam soils on alluvial plains of north-central NSW.

The distribution of PCTs within the Moree SAP area is driven by the underlying geology and soils. The distribution of soil landscapes in the Moree SAP area are illustrated in Figure 4.2). The grey and black clay soils of the Watercourse Road soil landscape are found throughout the town centre but are not of consequence to this Biodiversity Management Plan as no replanting or rehabilitation is proposed on this landscape. The Gurley soil landscape is the dominant soil landscape type within the Moree SAP area. This landscape is one of level plains to undulating rises on Pleistocene alluvium with Brown and Grey Vertosol soils (clays) (with small areas of Black Vertosols) with high shrink-swell properties and are Epipedal to self-mulching. These soils generally only support extensive areas of native grasslands and some areas of woodland and forest dominated by tree species that have root adaptations that enable the species to survive in soils with high shrink-swell properties such as *Acacia pendula* (Weeping Myall), *Casuarina cristata* (Belah), and

*Acacia harpophylla* (Brigalow). Within the Gurley Soil landscape there are smaller areas of the following soil landscapes:

- Mehi River: present-day active river channels, anabranches and oxbow lakes of the Mehi River and other major rivers on Quaternary alluvium of the Marra Creek formation. Found in the Moree SAP area along Halls Creek. The dominant soils are moderate to very deep imperfectly drained Rudosols and Tenosols (alluvial soils), with some giant (>500 cm), very slowly permeable and very slowly drained Grey Vertosols (grey clays), and rare Sodosols. Vegetation is dominated by species including *Eucalyptus camaldulensis* (River Red Gum) occasionally with *Eucalyptus largiflorens* (black box), *Eucalyptus melliodora* (yellow box) or *Eucalyptus microcarpa* (grey box). *Acacia salicina* (cooba) and *Acacia stenophylla* (River Coobah) are common small trees.
- Terry Hie Hie: palaeo-levee remnants on the Terry Hie Hie and Croppa Creek fan systems. Found in the Moree SAP area in the very southern extent associated with the channelised drainage line. Geology is Quaternary alluvium with clayey soils consisting of deep to very deep, imperfectly drained Grey and Brown Dermosols and Grey Vertosols (grey clays) on plains. The vegetation would most likely have been dominated by species including *Eucalyptus populnea* (Poplar Box) and *Acacia pendula* (Weeping Myall) and *Casuarina cristata* (Belah).
- Nee Nee Creek: largely abandoned and relict sections of former floodplain channels, intermittent shallow channels and swales, and other areas of poor drainage on alluvial plains throughout the Moree Plains. Found in the Moree SAP area associated with the drainage line that feeds Halls Creek and Clarks Creek. Soils are generally deep to very deep (>150 cm), imperfectly drained Black Vertosols (black earths) and Grey Vertosols (grey clays) in swales, prior stream channels and drainage lines. The vegetation would most likely have been floodplain swamps and transition woodlands dominated by species including *Eucalyptus populnea* (Poplar Box), *Eucalyptus coolibah* (Coolibah) and *Acacia stenophylla* (River Cooba) with low-lying areas dominated by *Duma florulenta* (Lignum).
- Boolcarroll: slightly elevated sinuous level to very gently inclined meander plains and levees on Quaternary alluvium. Located within the Gurley soil landscape in locations near the Mehi River, Nee Nee Creek, and Terry Hie Hie soil landscapes. The geology is generally coarser than the surrounding clay plains and soils are a mosaic of Brown, Grey and Red Vertosols (clays) and well drained Red and Brown Chromosols (Red-Brown Earths). The vegetation is likely to have been a mixture of *Corymbia tessellaris* (Carbeen) and *Eucalyptus populnea* (Poplar Box) with highest areas characterised by *Flindersia maculosa* (Leopardwood) and *Eremophila mitchellii* (Budda).

Table 4.2 Native vegetation recorded within Moree SAP Area

Native vegetation recorded within Moree SAP Area	Associated soil landscape	Threatened Ecological Community?	Area protected (Ha)	Area impacted (Ha)
PCT 1 – Candidate Native Grasslands	Gurley Meehi River	TBC	3.60	0.00
PCT 52 Queensland Bluegrass +/- Mitchell Grass	Boolcarroll Gurley Meehi River Nee Nee Creek Terry Hie Hie	Yes	387.80	212.30
PCT 27 Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Gurley	Yes	43.01	0.00
PCT 39 Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	Gurley Meehi River	Yes	29.54	0.00
PCT 55 Belah woodland on alluvial plains and low rises	Gurley	No	2.22	0.00

Native vegetation recorded within Moree SAP Area	Associated soil landscape	Threatened Ecological Community?	Area protected (Ha)	Area impacted (Ha)
in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	Meehi River			
PCT 56 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Boolcarroll Gurley	Yes	14.60	0.00
<b>Total</b>			<b>480.77</b>	<b>212.30</b>

Source: Aurecon, 2021

### 4.3 Threatened ecological communities

Based on a review of existing literature and desktop studies the following TECs are determined likely to occur within or directly adjacent to the Moree SAP area (Aurecon, 2021):

- Natural grasslands on basalt and fine-textured alluvial plains of northern NSW and southern Queensland which can be associated with PCT 52 (OzArk 2010, Jacobs 2018).
- Lowland Darling River aquatic ecological community (OzArk 2010, Jacobs 2018).
- Poplar Box Grassy Woodland on Alluvial Plains – EPBC Act listed as endangered 2019.
- Weeping myall woodlands – EPBC Act listed as endangered (DAWE 2020c).
- Coolabah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions – EPBC Act listed as endangered.
- Lowland Darling River aquatic ecological community (FM Act listed).

### 4.4 Threatened species

Four threatened plants species listed under the BC Act are known to occur within the Moree SAP area including *Desmodium campylocaulon*, *Dichanthium setosum*, *Digitaria porrecta*, and *Swainsona murrayana*.

Other threatened plant species that are known to be associated with the PCTs that are found within the Moree SAP area include *Cyperus conicus*, *Lepidium aschersonii*, and *Homopholis belsonii*. *Homopholis belsonii* is abundant along the Newell Highway to the north and south of Moree in habitats similar to that found within the Moree SAP area.

Threatened fauna species known from the Moree SAP area include Little Eagle, Square-tailed Kite, Magpie Goose, Black-necked Stork, Pale-headed Snake, Yellow-bellied Sheathtail-bat, Black-striped Wallaby, Koala, and Barking Owl. Other threatened fauna species associated with PCTs that are found within the Moree SAP area include Australian Bustard, Bush Stone-curlew, Glossy Black-Cockatoo, White-bellied Sea-Eagle, and Grey-headed Flying-fox.

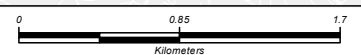
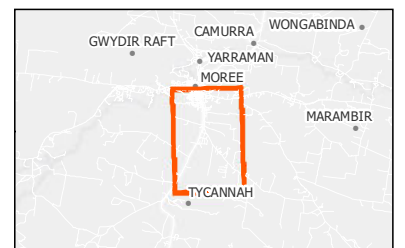


**Figure 4.1**  
Plant Community Types within  
the Moree SAP area



**Legend**

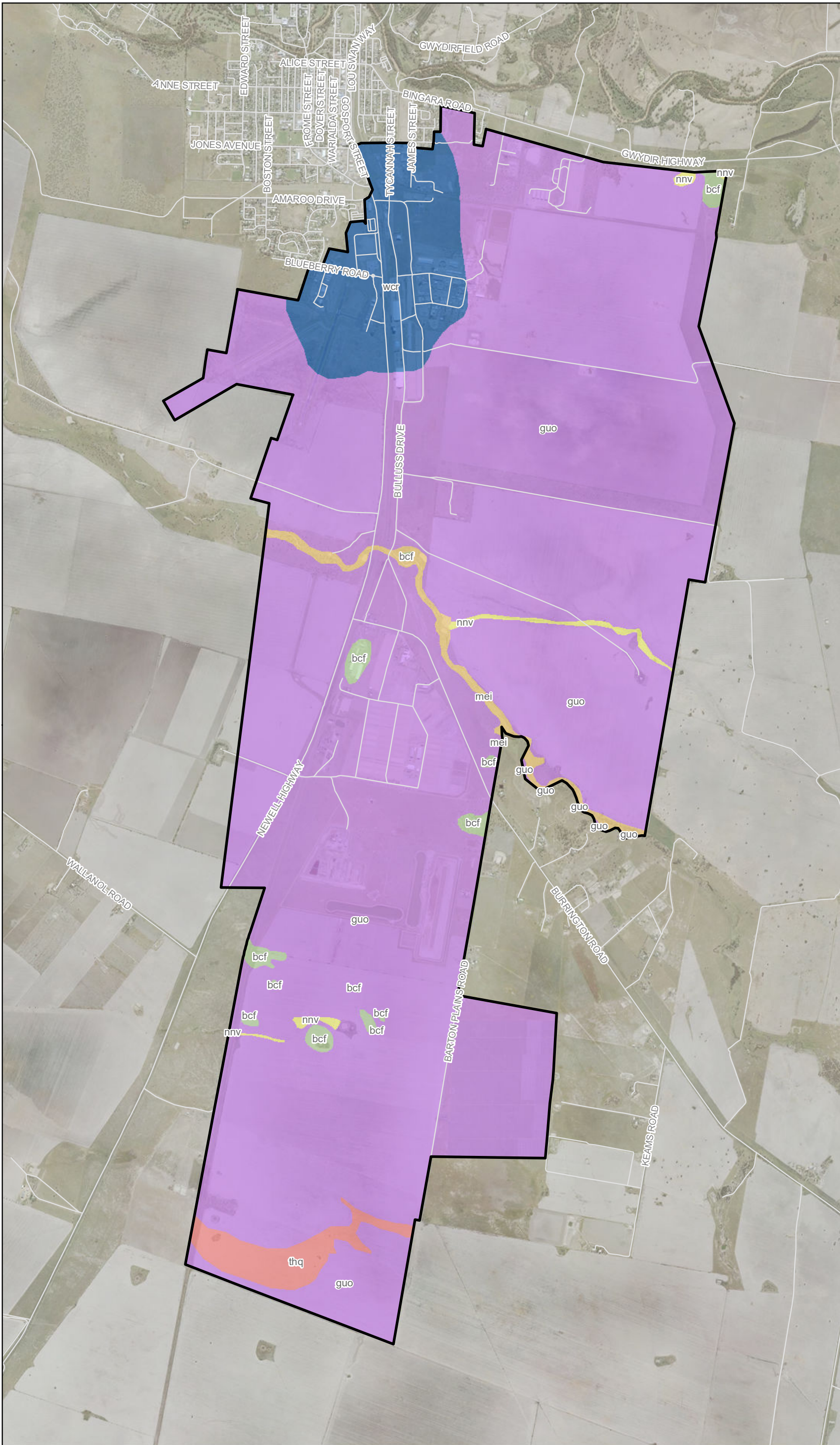
- Road
- ▭ SAP Boundary
- Protected Vegetation**
- Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions
- Candidate Native Grasslands
- Coolibah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion
- Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW
- Queensland Bluegrass +/- Mitchell Grass
- Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion
- Not Native



Coordinate system: GDA 1994 MGA Zone 55  
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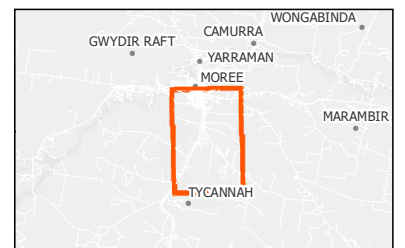
Data sources: - DNRME, TMR, Translink, Geoscience Australia  
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**Figure 4.2**  
Soil landscapes within the Moree SAP area



**Legend**

- Road
- SAP Boundary
- Soil Landscapes**
- Boolcarroll
- Gurley
- Mehi River
- Nee Nee Creek
- Terry Hie Hie
- Watercourse Road



Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

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Date: 30/06/2022

Data sources: - DNRME, TMR, Translink, Geoscience Australia  
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Table 4.3 Threatened Ecological Communities likely to occur within the Moree SAP area

<b>NSW Threatened Ecological Community (BC Act)</b>	<b>Commonwealth Threatened Ecological Community (EPBC Act)</b>	<b>Aligning PCT</b>	<b>Total area (Ha)</b>	<b>Area impacted (Ha)</b>
N/A	Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	PCT 52 Queensland Bluegrass +/- Mitchell Grass	621.97	212.30
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	PCT 27 Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	43.02	0.00
Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions	Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	PCT 39 Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	3.74	0.00
Artesian Springs Ecological Community in the Great Artesian Basin	N/A	PCT 39 Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	3.74	0.00
N/A	Poplar Box Grassy Woodland on Alluvial Plains	PCT 56 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	31.35	0.00

## 4.5 Weeds

Field investigations carried out by Aurecon (2021) identified 16 exotic species, three of which are listed as Weeds of National Significance (WONS) within the Moree SAP Area. Exotic species which have been listed by the Commonwealth as WONS are typically invasive, readily spread and are associated with negative environment, social and economic outcomes. All WONS were also listed as Priority Weeds for the North West region with biosecurity duties prescribed under the NSW Biosecurity Act 2016.

Each exotic species recorded and their listing is provided in Table 4.4. Other notable exotic species within the Moree SAP area include *Vachellia farnesiana* (Mimosa Bush), an aggressive pioneer species which require monitoring and management. WONS and other exotic species require active management measures to reduce cover in order to improve condition in remnant vegetation, habitat corridors and riparian vegetation. Management is discussed further below in Section 6.

Table 4.4 Exotic flora species recorded during field surveys

Scientific name	Common Name	WONS	Priority Weed biosecurity duty <sup>1</sup>
<i>Convolvulus sp.</i>	-	No	-
<i>Citrullus lanatus var. lanatus</i>	Wild Melon	No	-
<i>Cucumis myriocarpus subsp. leptodermis</i>	Paddy Melon	No	-
<i>Eleusine tristachya</i>	Goose Grass	No	-
<i>Eragrostis sp.</i>	A Lovegrass	No	-
<i>Eragrostis sp.</i>	Granite Lovegrass	No	-
<i>Gomphrena celosioides</i>	Gomphrena Weed	No	-
<i>Lolium perenne</i>	Perennial Ryegrass	No	-
<i>Lycium ferocissimum</i>	African Boxthorn	Yes	Prohibition on certain dealings; Regional Recommended Measure
<i>Malvastrum americanum</i>	Spiked Malvastrum	No	-
<i>Medicago polymorpha</i>	Burr Medic	No	-
<i>Opuntia aurantiaca</i>	Tiger Pear	Yes	Prohibition on certain dealings; Regional Recommended Measure
<i>Opuntia stricta</i>	Common Prickly Pear	Yes	Prohibition on certain dealings
<i>Sida rhombifolia</i>	Paddys Lucerne	No	-
<i>Solanum sp.</i>	-	No	-
<i>Xanthium occidentale</i>	Noogoora Burr	No	-

Source: Aurecon, 2021

(1) Prohibition on certain dealings: Must not be imported into the state, sold, bartered, exchanged or offered for sale.

Regional Recommended Measure: Land managers should mitigate the risk of new weeds being introduced to their land. Land managers should prevent seed and propagules spreading from their land. Land managers reduce impacts from the plant on priority assets.

## 5 High biodiversity values

The Moree SAP area contains a number of high conservation values including the presence of remnant vegetation, threatened ecological communities, threatened species and their habitats, and riparian areas. Biodiversity within the Moree SAP area would benefit greatly from protection and implementation of this Biodiversity Management Plan. The vegetation types within the Moree SAP area are under extreme pressure and are at high risk of extinction in the short to medium term. For example,

- PCT 52: Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion has undergone a 70% reduction in its original extent.
- PCT 27: Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion has undergone an 86% reduction in extent.
- PCT 55: Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions has undergone a 83% reduction in extent.
- PCT 56: Poplar Box – Belah woodland on clay-loam soils on alluvial plains of north-central NSW has undergone a 78% reduction in extent.
- Protection of these PCTs within the Moree SAP area contributes significantly to the long-term viability of these PCTs, threatened ecological communities and threatened species that inhabit them.

Within the Moree SAP area important areas of biodiversity value will be protected and enhanced, as detailed in the Moree Special Activation Precinct Master Plan (DPE, 2022).

Figure 5.1 identifies areas of high conservation value as detailed on the Moree Activation Precinct Environmental Conservation Areas Map (DPIE, 2020a) prepared for the Precinct-Regional SEPP 2021. Each area of high conservation value has been categorised into one of three categories: Protected Vegetation, Habitat corridors (Connectivity Corridors), Riparian Vegetation and Potential Offsets.

Table 5.1 outlines the specific features of each mapped high conservation value area.

Table 5.1 High conservation area within the Moree SAP area

High conservation area	Biodiversity Values
Protected Vegetation	Travelling Stock Route containing PCT 52 PCT 27; PCT 39; PCT 52; PCT 55; PCT 56
Riparian vegetation	PCT 39; PCT 52; PCT 56 within riparian zone
Connectivity Corridor	Cleared land with connectivity to TSR and PCT 52
Potential Offsets	<i>Desmodium campylocaulon</i> (known) and <i>Dichanthium setosum</i> , <i>Digitaria porrecta</i> , <i>Swainsona murrayana</i> (potential) within the Evergreen Offset Area

## 5.1 Protected vegetation

A total of 480.77 Ha of remnant vegetation was recorded within the SAP area which will be retained includes six PCTs which have been shown in Table 5.2. These PCTs contain habitat for threatened species as outlined in Section 4.4. These main areas of remnant vegetation are located between the Gwydir Highway and Werris Creek Mungindi Railway, the Travelling Stock Route (TSR), the Halls Creek riparian zone, along Burrington Road, and between Newell Highway and Barton Plains Road (see Figure 5.1).

Impact to these areas has been avoided where possible due their high biodiversity value and may be zoned as environmental protection or parks and recreation areas as part of the Moree Master Plan. This option is discussed in section 8.3 of the Moree SAP Biodiversity Report (Aurecon, 2021).

Table 5.2 Native vegetation to be retained

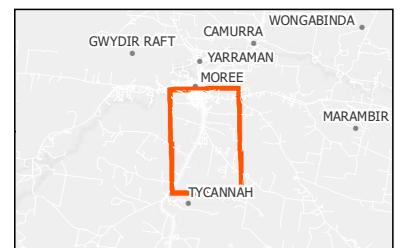
<b>Native vegetation recorded within Moree SAP Area</b>	<b>Threatened Ecological Community?</b>	<b>Total area to be retained (Ha)</b>
PCT 1 Candidate Native Grasslands (Likely to be PCT 52)	TBC	3.60
PCT 52 Queensland Bluegrass +/- Mitchell Grass	Yes	387.80
PCT 27 Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Yes	43.01
PCT 39 Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	Yes	29.54
PCT 55 Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions	No	2.22
PCT 56 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Yes	14.60
<b>Total</b>		<b>480.77</b>

**Figure 5.1**  
High conservation values  
protected within the Moree SAP area



**Legend**

- Road
- SAP Boundary
- ▨ Biodiversity Recreated Habitat Connectivity Corridor
- ▤ Riparian Zone
- Protected Vegetation**
- Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions
- Candidate Native Grasslands
- Coolibah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion
- Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW
- Queensland Bluegrass +/- Mitchell Grass
- Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion
- Potential Offsets**
- 0: Desmodium campylocaulon offset area
- 1: Candidate Native Grasslands
- 39: Coolibah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion
- 52: Queensland Bluegrass +/- Mitchell Grass
- 55: Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions
- 56: Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW



Coordinate system: GDA 1994 MGA Zone 55  
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## 5.2 Habitat corridors (connectivity corridor)

Establishing connectivity corridors between areas of protected vegetation is proposed for areas identified on Figure 5.1 to link areas of high biodiversity value. Remnant vegetation in TSRs which adjoin the proposed connectivity corridor were recorded as PCT 52 Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion.

Aurecon (2021) did not record native vegetation in the area proposed for revegetation and satellite imagery suggests that the current land use for this area is cropping. Considerable intervention will be required to restore this area to native vegetation.

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## 5.3 Riparian vegetation

The Moree SAP area contains riparian corridors including Halls Creek (1st and 2nd Order stream) which is a tributary of the Mehi River (located approximately 500m to the North of the Moree SAP area) and drainage features including Clarks Creek.

In addition to the high biodiversity values for the riparian areas, these areas are of cultural importance. Important clusters of Aboriginal heritage sites were identified along Halls Creek and confirmed by Aboriginal stakeholders that this area was important in both the value of the existing sites but also for the biodiversity values associated with the native food and medicinal plants present. Halls Creek was also identified as an area of importance where people swim and enjoy the outdoors (Aurecon, 2021). Halls Creek corridor and related sites hold high cultural value to the community where the area known as “Crawbob” creek is still utilised for gathering and subsistence purposes in more recent times.

Section 8.3 of the Moree Special Activation Precinct Environmental Package: Biodiversity Report (Aurecon, 2021) proposes development controls for riparian corridors to ensure waterways and native vegetation are not impacted by pollution and litter. The strategy to identify riparian corridors requiring revegetation is based on setbacks or buffers to Halls Creek and Clarks Creek that have been calculated based on Strahler order of waterways. The riparian buffers within the Moree SAP area align to riparian buffers outlined in Appendix E of BAM 2020.

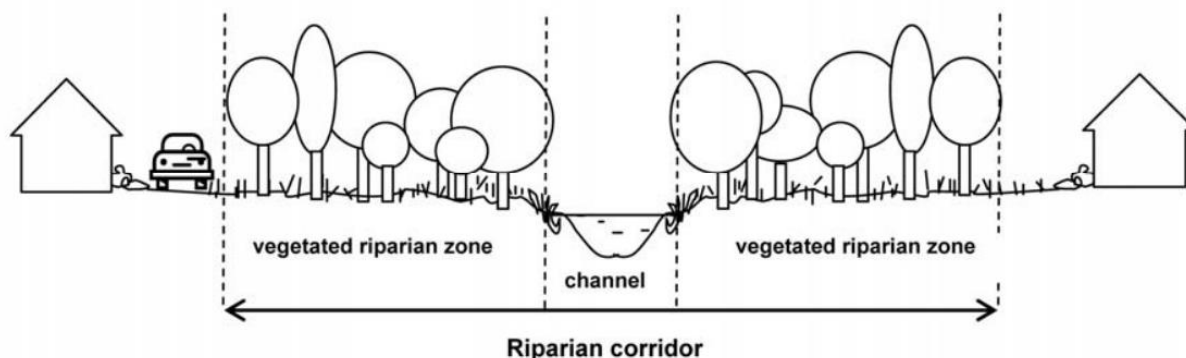
In accordance with BAM 2020 and Water Management Act 2000, riparian corridor width is based on a buffer being applied to each side of the waterway and have been outlined in Table 5.3 and represented in Figure 5.2 where the riparian zone width is shown from the outer edge of bank.

Biodiversity focused revegetation of riparian corridors to recreate plant community types known to occur or likely to occur based on field verified mapping, adjoining remnant vegetation and landscape position is the preferred approach. Field verified mapping (Aurecon, 2021) has informed the target PCT with species planting lists provided below in Appendix A.



Table 5.3 Waterways recorded within the Moree SAP area and riparian corridors

Name	Strahler Order	Riparian zone width (each side of waterway from outer edge of bank)	Plant Community Type (Mapped / Likely)
Clarks Creek	1	10m	PCT 52 Queensland Bluegrass +/- Mitchell Grass
Drainage features of Halls Creek	1	10m	PCT 52 Queensland Bluegrass +/- Mitchell Grass
Halls Creek	2	20m	PCT 39: Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion PCT 52 Queensland Bluegrass +/- Mitchell Grass PCT 56: Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW



Source: Department of Primary Industries, 2012

Figure 5.2 An example of a vegetated riparian corridor

## 5.4 Potential offsets

Potential offset options for the Moree SAP, under the assumption that the Moree SAP will obtain strategic biodiversity certification, include:

- Retiring credits based on the like-for-like rules. Residual direct impacts on biodiversity values from clearing native vegetation and habitat loss may be offset by retiring the required number of biodiversity credits with a class of credit that meets the like-for-like rules under clause 6.3 of the BC Regulation.
- Making a payment to the Biodiversity Conservation Fund. Residual direct impacts on biodiversity values from clearing native vegetation and habitat loss may be offset by making the required payment to the Biodiversity Conservation Fund.

In addition to the retirement of biodiversity credits, strategic biodiversity certification provides access to additional approved conservation measures for the preferred Structure Plan such as:

- Reservation of land under the *National Parks and Wildlife Act 1974* (NPW Act). An opportunity to purchase private land which could be incorporated into the nearby Terry Hie Hie Aboriginal Area or other nearby National Parks such as Bullala National Park.
- Adoption of development controls or state infrastructure contributions under the EP&A Act that conserve or enhance the natural environment:
  - retention and protection of areas within environmental protection zones
  - avoidance of development within the TSR, with the exception of the Intermodal Sub-Precinct identified as part of the draft Structure Plan
  - provision of development setbacks from riparian corridors to ensure waterways and native vegetation are not impacted by pollution and litter:
    - 10 m for 1st order streams (drainage feature of Halls Creek and Clarks Creek)
    - 20 m for 2nd order streams (Halls Creek)
  - minimising clearing for precinct development, where possible, and no development extending beyond the boundary of the precinct.
- Any other measure determined to be an approved conservation measure by the Minister for the Environment. The Minister has the discretion to identify any other appropriate conservation measures.

The Evergreen Precinct which is located within the proposed SAP boundary as the *Desmodium campylocaulon* offset area could be utilised to conserve threatened species that have the potential to be impacted by future development within the proposed SAP boundary (Aurecon, 2021). This area would be suitable for revegetation with PCT 52 Queensland Bluegrass +/- Mitchell Grass. Options to protect and manage this area may include erection of vermin proof fencing and conservation of threatened species including *Desmodium campylocaulon*, *Dichanthium setosum*, *Digitaria porrecta*, and *Swainsona murrayana*.

Another option to meet the offset obligations is to establish a relationship with landholders to develop a Biodiversity Stewardship Agreement or purchase land within the greater Moree region which contains biodiversity values that will benefit from a conservation agreement.

Funding ecological research for relevant species may also be a potential offsetting option for the Moree SAP. This may be suitable for threatened species where there are recognised gaps in the current research including *Desmodium campylocaulon*, *Dichanthium setosum*, *Digitaria porrecta*, and *Swainsona murrayana*.

# 6 Landscape treatments

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## 6.1 Summary of landscape treatments

The following landscape treatments, or landscape zones, are proposed for the Moree SAP area:

- remnant vegetation outside of riparian buffers
- riparian corridors
- habitat corridors (connectivity corridor).

The landscape treatments are illustrated in Figure 6.1.

Within each landscape treatment there is a focus on the use of traditional Aboriginal land management techniques combined with best practice weed control and revegetation techniques.

Revegetation within each landscape treatment will vary and will be dependent on the existing conditions. For example creation of a native grassland in the Connectivity Corridor east of Bulluss Drive will involve large scale intervention while remnant vegetation may only require supplementary planting.

Appropriate application of traditional land management techniques would be determined working with Traditional Owners and may include cultural fire, resource collection, monitoring of plants and animals, Planting of Dhulu (trees) and Planting native Yurrul (Bush) Food and Medicines is a feature.

Habitat augmentation and Monitoring will be required for all landscape treatments. Before any works begin, a thorough site assessment must be undertaken to determine the level of intervention required.

The proposed actions for each landscape treatment are outlined in the subsections below.

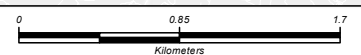
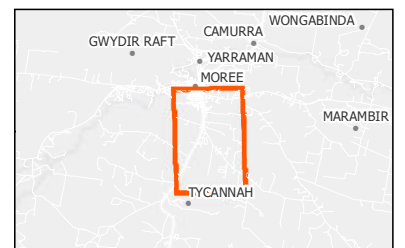
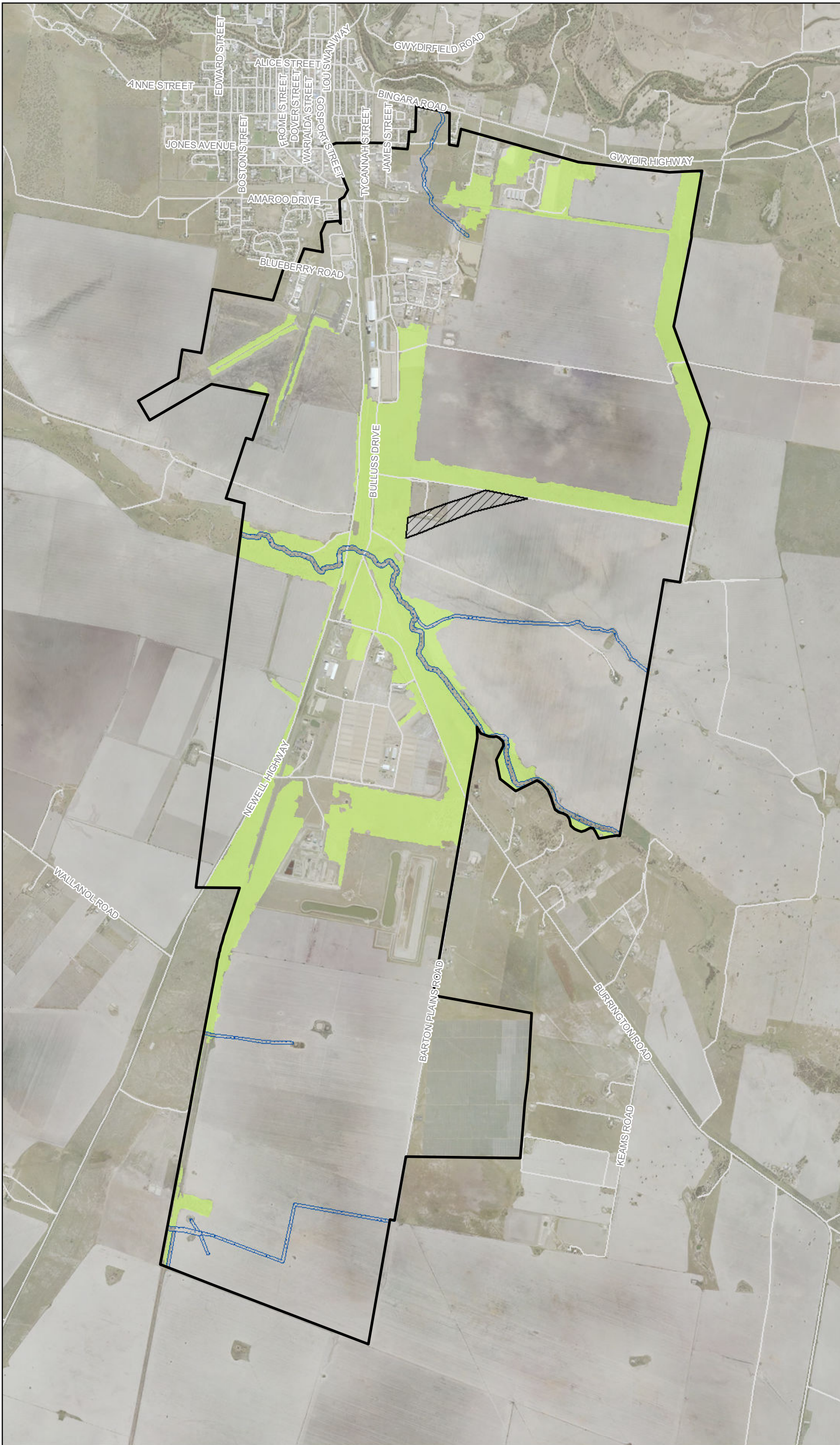
Table 6.1 A summary of the landscape treatments and actions proposed for the Moree SAP area

<b>High biodiversity areas</b>	<b>Site assessment</b>	<b>Traditional Aboriginal land management</b>	<b>Weed control</b>	<b>Revegetation</b>	<b>Planting Dhulu (trees) and native Yurrul (Bush) Food and Medicines</b>	<b>Habitat augmentation</b>	<b>Monitoring</b>
Remnant vegetation outside of riparian buffers	X	X	X		X	X	X
Riparian corridors	X	X	X	X	X	X	X
Habitat corridors	X	X	X	X	X	X	X

**Figure 6.1**  
Landscape treatments within  
the Moree SAP area

**Legend**

- Road
- ▭ SAP Boundary
- ▨ Habitat corridors
- Remnant vegetation outside of riparian buffers



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## 6.2 Site assessment

Before any restoration or revegetation works begin, each landscape treatment area will be assessed to determine the level of intervention required. Baseline vegetation surveys will be done in each area so that the starting condition (in terms of Vegetation Integrity score) can be determined so that progress towards can be tracked. It is vital that soil testing is undertaken as the first step in restoration so that soil conditions can be understood. Existing nutrient levels, particularly nitrogen and phosphorous levels, will need to be understood in the Connectivity Corridor as this area is currently used for cropping. Nutrient levels in the soils within the Connectivity Corridor will be compared to that of more intact examples of the reference grassland vegetation type (i.e. PCT 52). Soil nutrient testing will be done to determine soil pH, texture, colour, and electrical conductivity (EC). The weed soil seedbank load will also be determined through testing via seed bed germination of soil samples within a nursery.

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## 6.3 Traditional Aboriginal land management techniques

The delivery plan and Biodiversity Management Plan for the SAP area includes regeneration and repair of some of the riparian and habitat corridors. This is work well suited to those Aboriginal people who want to work on Country and creates employment opportunities for the local community on Country.

Allowing, encouraging and reviving traditional land management practices within the SAP will help Country recover after years of farming and grazing. When Country is looked after by its people, the whole community benefits including plants and animals and everything held within Country.

Appropriate cultural fire management is a complementary management pathway for looking after Country, including waterways and habitat by using the right fire at the right time for that type of Country. Native grasses are encouraged through the appropriate use of fire, which in turn encourage native animals to use and access resources they provide. Areas adjacent to waterways, road reserves and other open space can be managed in a culturally appropriate way that inevitably reduces erosion, wildfire damage and habitat degradation while fostering a healthy relationship with community by providing meaningful work opportunities and a sense of pride and value.

The recommendation is to engage with Moree LALC and/or other Aboriginal organisations to explore the reinvigoration of cultural fire practice within the landscape as an ongoing land management technique. This will allow Gamilaroi people to take an active role in looking after Country and maintain their cultural responsibilities while enhancing ecosystem health and wellbeing of the community.

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## 6.4 Weed control

Weed control in all high biodiversity areas is proposed to increase vegetation integrity. Section 4.5 outlined weed species recorded during field surveys (Aurecon, 2021). Weed control is to prioritise WONS and Priority weeds due to their invasive nature however extent beyond the exotic species list provided (Table 4.4).

Weed control methods should be informed by the physical and chemical control options published by the Department of Primary Industries using the NSW WeedWise database (Department of Primary Industries, 2022). Within the Connectivity Corridor the soil seedbank tests will drive the type of intervention required. If there is a significant weed seed load in the soil seedbank, soil scalping (e.g. with a road grader) will be an efficient method to remove the weed biomass and soil seedbank load in this area.

Weed control is required prior to planting (at least 6 months in advance) and as part of ongoing management of high biodiversity areas (BCT, 2020a).

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## 6.5 Revegetation

Revegetation is proposed for areas of riparian vegetation and connectivity corridors to improve vegetation integrity, connect areas of existing habitat and increase available habitat for threatened biodiversity. This landscape treatment has been proposed in general accordance with the Biodiversity Conservation Trusts *Restoring Native Vegetation Guidelines* (2020a).

Extensive site preparation prior to planting may be required for areas currently void of native vegetation (proposed Connectivity Corridor). Site preparation may include but is not limited to:

- nutrient/pH/salinity testing
- burning if there is stubble from previous seasons crop
- deep ripping to break hard clays and improve soil permeability
- fencing to reduce grazing of native and feral herbivores.

Where site assessment within the Connectivity Corridor indicates that soil nutrient levels are elevated and/or the weed seed bank is high, re-creation of an open grassy woodland and grassland will best be done through scalping and direct seeding. Soil scalping (top 100 mm of soil) is very effective in removing the soil weed bank and lowering soil nutrients (phosphorus and nitrogen) thereby reducing competition from weeds. Where sodic soils are found, amelioration will be required by application of gypsum (calcium sulfate) to rectify issues with soil structure before soil scalping commences. Alternatives where soil scalping is not appropriate may include techniques such as soil inversion, nutrient stripping, reverse fertilisation, dense planting of *Themeda triandra* to reduce nitrogen levels, or burning. These techniques may also be used in varying combinations.

### 6.5.1 Planting densities

Planting densities should be informed by existing site conditions. Planting into remnant vegetation in riparian corridors will require lower densities than planting into cleared land in areas adjacent to native vegetation (i.e. connectivity corridors). As such, evaluation of site conditions is required prior to supplementary planting.

Planting densities and other biodiversity values listed in Table 6.2 are based on the community condition benchmarks (plus 20% for planting densities) for the listed biodiversity target published by the DPE on the Vegetation Classification Database. As such, average planting densities have been provided. An additional 20% has been added for richness in each stratum to account for an 80% survival rate of plantings.

Table 6.2 Biodiversity targets, planting densities and other biodiversity values

Biodiversity target	Vegetation formation	Vegetation Class	Richness per stratum (planting density)	Other biodiversity values
PCT 27: Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Semi-arid Woodlands (Grassy sub-formation)	Riverine Plain Woodlands	60 trees, 210 shrubs and 600 groundcovers per Ha	Length of fallen Timber: 250m/Ha Hollows: 100/Ha Litter: 45%/m <sup>2</sup>
PCT 39: Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	Semi-arid Woodlands (Grassy sub-formation)	North-west Floodplain Woodlands	90 trees, 270 shrubs and 480 groundcovers per Ha	Length of fallen Timber: 700 m/Ha Hollows: 125/Ha Litter: 35%/m <sup>2</sup>
PCT 52: Queensland Bluegrass +/- Mitchell Grass	Grasslands	Semi-arid Floodplain Grasslands	30 trees, 270 shrubs and 510 groundcovers per Ha	Length of fallen Timber: 0 m/Ha Hollows: 0/Ha Litter: 30%/m <sup>2</sup>
PCT 55 Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.	Semi-arid Woodlands (Grassy sub-formation)	North-west Floodplain Woodlands	90 trees, 270 shrubs and 480 groundcovers per Ha	Length of fallen Timber: 700 m/Ha Hollows: 125/Ha Litter: 35% / m <sup>2</sup>
PCT 56: Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Grassy Woodlands	Floodplain Transition Woodlands	120 trees, 180 shrubs and 630 groundcovers per Ha	Length of fallen Timber: 1125m/Ha Hollows: 75/Ha Litter: 60%/m <sup>2</sup>

Notes: Planting densities determined using benchmarks (DPE, 2022)



### 6.5.2 *Planting palate*

Species lists have been tailored to recreate plant community types known to occur or likely to occur based on field verified vegetation, adjoining remnant native vegetation, landscape position, and the *Reconstructed Vegetation Map of Moree Plains*. VIS\_ID 929 (State Government of NSW and Department of Planning, Industry and Environment 2013). The reconstructed vegetation mapping within the Moree SAP area is shown in Figure 6.2.

The soil landscape must be worked with to ensure the correct species are used to ensure survival of plantings and maintain the landscape character. Field verified mapping (Aurecon, 2021) has informed the biodiversity target with species planting lists provided below in Appendix A. Species palates have been obtained from the scientific description for each plant community type in the Department of Planning and Environments Vegetation Classification Database (2022). The planting palate has been informed by the need to incorporate dhulu (trees) and native yurrul (bush) food and medicines (discussed further below in section 6.5 and 6.6).

The specific areas where each PCT would be suitable are as follows:

- Remnant vegetation outside of riparian buffers: this will be a mixture of PCTs depending on location as determined through the site assessment including:
  - PCT 52 Queensland Bluegrass +/- Mitchell Grass.
  - PCT 27 Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion.
  - PCT 55 Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.
  - PCT 56 Poplar Box – Belah woodland on clay-loam soils on alluvial plains of north-central NSW.
- Riparian corridors: the vegetation type in the riparian corridors of Halls Creek and Clarks Creek and other watercourses is a mixture of PCTs depending on location as determined through the site assessment including:
  - PCT 39 Coolabah – River Coobah – Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion.
  - PCT 55 Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions.
  - PCT 56 Poplar Box – Belah woodland on clay-loam soils on alluvial plains of north-central NSW.
- Habitat corridors (the Connectivity Corridor east of Bulluss Drive): revegetation in this area will be a mixture of grassland and woodland PCTs as determined through site assessment including:
  - PCT 52 Queensland Bluegrass +/- Mitchell Grass.
  - PCT 56 Poplar Box – Belah woodland on clay-loam soils on alluvial plains of north-central NSW.

### 6.5.3 *Reintroduction of Dhulu trees, native yurrul-bush food and medicines*

Revegetation areas also provide opportunity to reintroduce native bush food and medicines to the area.

Several examples of native bush tucker to the area were identified by the Aboriginal representatives (Aurecon, 2021), including:

- *Tetragonia tetragonioides* (Native spinach (Galan Galan))
- *Myoporum montanum* (Bimble box (boobialla)) which is generally used for chest rub medicine
- *Solanum* sp. (Bush tomatoes (gumi))
- *Crinum flaccidum* (Darling Lilly (Dhaygalbaarrayn)) which the bulb of the plant is similar to a vegetable like a parsnip or ground into flour with water and paste to bake
- *Atriplex* sp. (Old man saltbush) and *Enchylaena tomentosa* (ruby saltbush (burra)) which are herbs used to flavour
- *Tarrat* which includes a red fruit used for medicine
- *Eremophila debilis* (Winter apple (mulla))

- *Scaevola spinescens* (Marroon bush (Murrin Murrin))
- *Geijera parviflora* (Wilga; Quinoa gadabanya; yard river gum).

Gamilaroi names and traditional uses of plant species for use in revegetation are provided in Appendix A, where known. Appropriate engagement with Gamilaroi people (Section 2.3) will uncover the areas and species of high cultural importance to focus reintroduction of Dhulu trees and planting of native yurrul-bush food and medicines.

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## 6.6 Habitat augmentation

Habitat augmentation refers to creating habitat for native fauna. This is proposed in woodland communities only, for example the Poplar Box dominated woodland off Burrington Road, the Coolabah community along Halls Creek west of the Newell Highway, and the Weeping Myall community north of the Werris Creek Mungindi Railway, and does not apply to the natural grassland areas (PCT 52).

Conservation measures for threatened species include the following habitat augmentation actions:

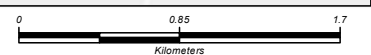
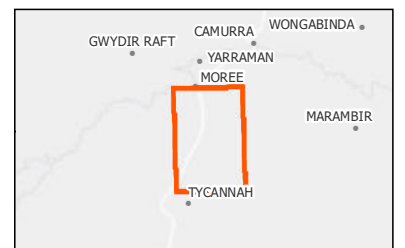
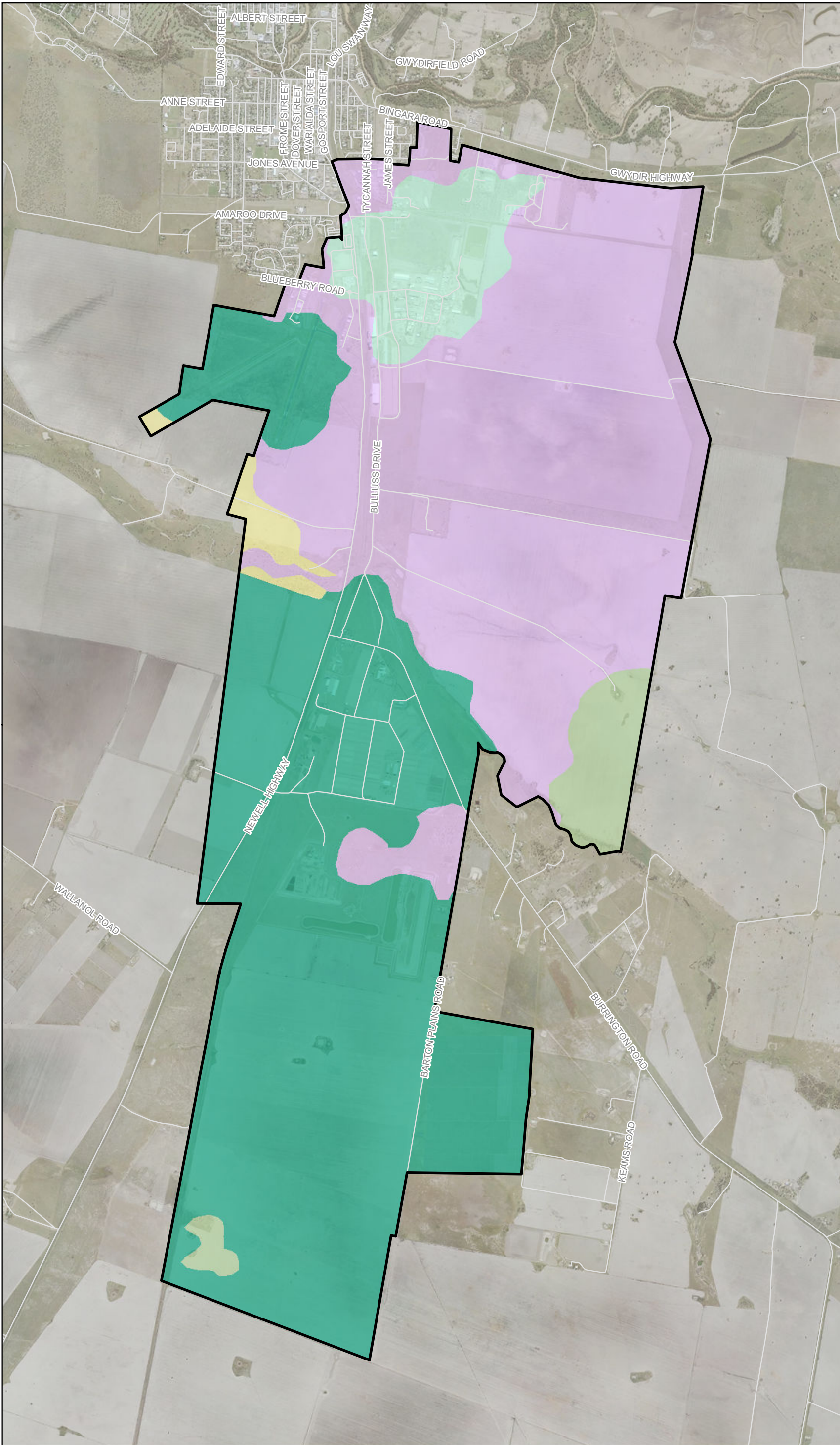
- retain hollows from impact areas and relocate to areas to be retained
- plant native hollow-producing species
- install artificial hollows (nest boxes) in areas currently lacking hollows
- retain fallen logs as habitat.

Length of fallen timber, hollows and litter are function attributes measured using BAM 2020 and will be captured during baseline data collection and monitoring. Benchmarks for function attributes have been outlined in Table 6.2 to provide an average guideline for each biodiversity target.

**Figure 6.2**  
Reconstructed Vegetation  
Map within the Moree SAP area

**Legend**

- Road
- SAP Boundary
- Reconstructed Vegetation Communities**
- Alluvial Plains Grassland
- Belah Woodland / Shrubland on Floodplain and Rolling Downs
- Bimble Box Woodlands on Alluvial Plain
- Black Box and Coolabah Floodplain Woodland
- Myall/Rosewood woodlands on Alluvial Plain



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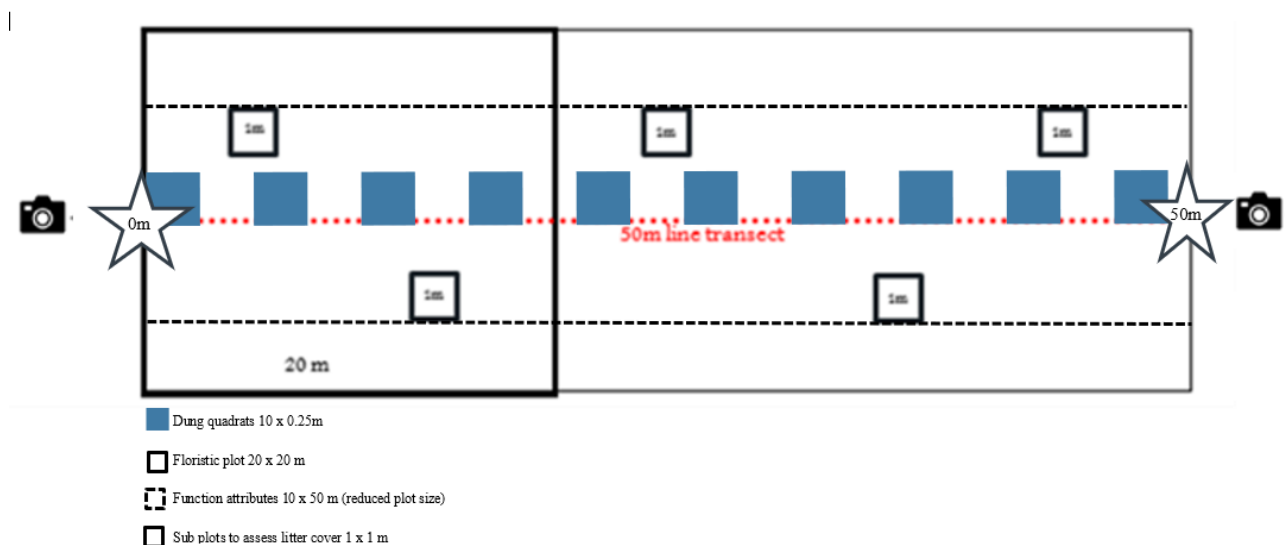
## 6.7 Monitoring

Monitoring of remnant vegetation has been designed in general accordance with the Biodiversity Conservation Trust's Ecological Monitoring Module (2020) and Operational manual (2021).

Monitoring using BAM 2020 through permanent monitoring plots established during baseline data collection is the preferred approach. Monitoring should be carried out yearly within the Moree SAP Area until year 10 (when plantings are assumed to be established) and then at 5-yearly intervals.

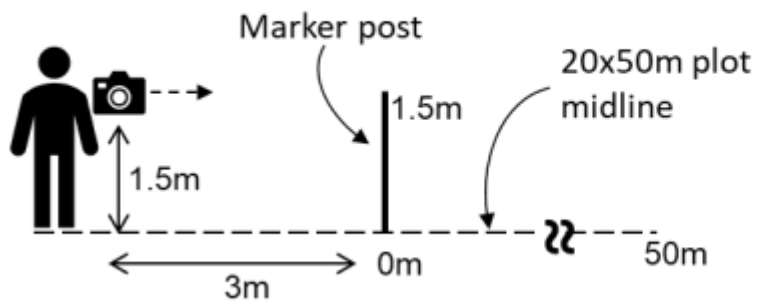
Data collected at each monitoring location include:

- vegetation integrity plot data in accordance with BAM 2020 (refer to Figure 6.3):
  - location
  - vegetation structure and dominant species and vegetation condition
  - native and exotic species richness (within a 400-metre squared quadrat)
  - number of trees with hollows (in reduced 500 metre squared quadrat)
  - number of large trees and stem size diversity (in reduced 500 metre squared quadrat)
  - total length of fallen logs ( in reduced 500 metre squared quadrat)
  - litter cover
  - evaluation of regeneration
- photo points at 0m and 50m (refer to Figure 6.4)
- dung assessment.



Source: BCT, 2021

Figure 6.3 Layout for monitoring plot and sub plots



Source: BCT, 2021

Figure 6.4 Set up for photo points at monitoring plots

# 7 Conclusions

This Biodiversity Management Plan provides a precinct-wide vegetation management strategy to input into the Delivery Plan that focuses on the protection of high biodiversity values and restoration of native yurrul (bush / scrub) yuul (food / bush tucker) and medicines of the Gamilaroi people. Strategic revegetation to connect existing habitats is provided (the Connectivity Corridor) along with a plan to increase the number of dhulu (trees). Riparian corridors requiring revegetation have been identified.

This precinct wide Biodiversity Management Plan satisfies the requirements of the BC Act and the EPBC Act in terms of planning to avoid, minimise or offset within the precinct. Areas of high biodiversity value including remnant vegetation, TECs, and threatened species habitats have been avoided and protected through allocation to High Conservation Areas including areas for potential offsets, protected vegetation, riparian vegetation and connectivity corridors.

Through a combination of detailed site assessment, best practice weed control, and modern revegetation techniques, the high biodiversity areas will conserve some highly threatened vegetation types and habitats for threatened species. The number of dhulu (trees) in riparian areas will be increased significantly and the landscape will be enhanced through planting of native yurrul (bush) food and medicines.

Importantly, this Biodiversity Management Plan follows the *draft Connection to Country Framework* and :

- honours the Gamilaroi peoples ongoing connection to Country
- incorporates traditional land management techniques
- integrate Indigenous planting into public spaces and revegetation areas
- outlines opportunities for the Gamilaroi community to guide the biodiversity management, share knowledge and care for Country.

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# Appendix A

Planting palates



Table A.1 Species planting lists for each plant community type

Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<b>Trees</b>							
<i>Acacia oswaldii</i>	Umbrella Wattle		X			X	
<i>Acacia pendula</i>	Weeping Myall (Maayal/Maayaal/Mayal)	Seeds, wood, bark	X	X		X	
<i>Acacia salicina</i>	Cooba, Black wattle (dhulan)	Seeds, wood, bark. Used for flour, fish poison and dye.	X	X			
<i>Acacia stenophylla</i>	River Cooba			X	X		
<i>Alectryon oleifolius subsp. elongatus</i>	Rosewood		X		X	X	X
<i>Allocasuarina luehmannii</i>	Buloke						X
<i>Alstonia constricta</i>	Quinine Bush (Gudiebah)	Medicinal uses of bark include treatment of diabetes, diarrhoea, fever, snake bite; latex used for sore throats and fever. Bruised stems and leaves are used to stupefy fish.		X			
<i>Atalaya hemiglauca</i>	Whitewood		X		X	X	X
<i>Callitris glaucophylla</i>	White Cypress Pine (Gurraari)	Sap, wood, seeds, leaves					X
<i>Casuarina cristata</i>	Belah (Bilaarr)	Wood, for spears. Habitat and food for totemic species: Black cockatoo.	X	X			X
<i>Corymbia tessellaris</i>	Carbeen	Food- insects found under bark; medicine; Trees used for shelter, timber, firewood and oils.					X
<i>Eucalyptus camaldulensis subsp. camaldulensis</i>	River Red Gum (Yarraan)	Leaves, bark, gum, sap		X			

Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<i>Eucalyptus coolabah subsp. coolabah</i>	Coolibah (Gulabaa)	Roots contain water, leaves used for headache, sore throats and fever. Wood used for implements: coolamons, canoes, didgeridoos, spears, shields and woomearas. Branches used for decorations in ceremonies.		X	X	X	
<i>Eucalyptus largiflorens</i>	Black Box (Guburruu)	Bark used to construct shelters, wood used for implements: coolamons, canoes, didgeridoos, spears, shields and woomearas. Tree used as habitat for animals such as possum which was hunted.	X	X		X	
<i>Eucalyptus microcarpa</i>	Grey Box					X	X
<i>Eucalyptus populnea subsp. Bimbil</i>	Bimbil Box (Buubaya/Bibil)	Wood, bark, habitat in hollows for possums. Leaves eaten by koalas and used as an antiseptic. Made implements such as coolamons, shields and woomearas and shelters.	X		X		X
<i>Melaleuca trichostachya</i>	Honey myrtle (Nguu)	Bark used for shelters, bandages, carriers, a type of food wrapping or container. Oil from leaves used as medicine. Nectar for drinks and flowers for decorations.		X			
<i>Notelaea microcarpa var. microcarpa</i>	Velvet Mock Olive						X
<i>Owenia acidula</i>	Gooya, Emu apple (Guri)	Fruit was eaten; wood used as medicine.			X		
<b>Shrubs</b>							
<i>Abutilon oxycarpum</i>	Lantern Bush			X			X
<i>Apophyllum anomalum</i>	Warrior Bush (Wayaarra)	Fruit eaten, branches used for brooms.		X		X	X
<i>Atriplex leptocarpa</i>	Slender-fruit Saltbush	Herb used to flavour	X		X		X

Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<i>Atriplex nummularia</i>	Old Man Saltbush	Herb used to flavour	X				
<i>Atriplex semibaccata</i>	Creeping Saltbush	Herb used to flavour	X				
<i>Atriplex stipitata</i>	Mallee Saltbush	Herb used to flavour	X				
<i>Capparis mitchellii</i>	Wild Orange (Bambul)	Leaves, fruit, seeds	X	X		X	X
<i>Citrus glauca</i>	Desert Lime (Gayn.gayn)	Fruit					X
<i>Duma florulenta</i>	Lignum			X	X	X	
<i>Enchylaena tomentosa</i>	Ruby Saltbush (Burra)	Herb used to flavor, leaves boiled and eaten as vegetable.	X			X	X
<i>Eremophila bignoniiflora</i>	Bignonia Emu-bush (Yuurraa)	Used for ceremonial, spiritual and medicinal purposes		X			
<i>Eremophila deserti</i>	Turkeybush					X	X
<i>Eremophila longifolia</i>	Emubush					X	
<i>Eremophila maculata</i>	Spotted Fuchsia-bush			X		X	
<i>Eremophila mitchellii</i>	Budda (Badha)	Tools, medicine and mosquito repellent.		X		X	
<i>Exocarpos aphyllus</i>	Leafless Ballart					X	
<i>Geijera parviflora</i>	Wilga (Dhiil)	Medicinal use including pain relief and for sore eyes. Tools, shelter and native bees.		X		X	X
<i>Maireana aphylla</i>	Cotton Bush		X				
<i>Maireana coronata</i>	Crown Fissure-weed						X
<i>Maireana decalvans</i>	Black Cotton Bush				X		X
<i>Maireana enchylaenoides</i>	Wingless Bluebush					X	
<i>Myoporum montanum</i>	Western Boobialla (Boobiella)	Chest rub medicine	X			X	X

Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<i>Pimelea microcephala subsp. microcephala</i>	-					X	
<i>Pimelea neoanglica</i>	Poison Pimelea		X				
<i>Ptilotus sessilifolius</i>	Crimson Foxtail				X		
<i>Rhagodia spinescens</i>	Berry saltbush		X	X		X	X
<i>Salsola australis</i>	-				X		
<i>Santalum acuminatum</i>	Sweet quandong					X	X
<i>Senna form taxon 'filifolia'</i>	-					X	
<i>Senna form taxon 'zygophylla'</i>	-					X	
<i>Sclerolaena bicornis var. bicornis</i>	Goathead Burr			X			
<i>Sclerolaena birchii</i>	Galvanised Burr			X	X	X	X
<i>Sclerolaena brachyptera</i>	-		X				
<i>Sclerolaena calcarata</i>	Redburr			X		X	
<i>Sclerolaena divaricata</i>	Pale Poverty Bush					X	
<i>Sclerolaena intricata</i>	Poverty Bush			X			
<i>Sclerolaena limbata</i>	-		X				
<i>Sclerolaena muricata</i>	Black Rolypoly		X	X	X	X	X
<i>Sclerolaena stelligera</i>	-		X		X		X
<i>Sclerolaena tricuspis</i>	Giant Redburr						X
<i>Sclerolaena tubata</i>	-			X			

Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<b>Groundcovers – Grasses</b>							
<i>Anthosachne scabra</i>	Wheatgrass					X	
<i>Aristida behriana</i>	Bunch Wiregrass						X
<i>Aristida calycina</i> var. <i>praealta</i>	-				X		
<i>Aristida jerichoensis</i> var. <i>jerichoensis</i>	Jericho Wiregrass						X
<i>Aristida leptopoda</i>	White Speargrass		X		X		
<i>Aristida platychaeta</i>	-				X		
<i>Astrebla elymoides</i>	Mitchell Grass				X		
<i>Astrebla lappacea</i>	Curly Mitchell Grass		X				
<i>Astrebla pectinata</i>	Barley Mitchell Grass (Ganalay)	Seeds an important carbohydrate used to make flour and damper. Grass sometimes used to weave nets.	X		X		
<i>Astrebla squarrosa</i>	Bull Mitchell Grass				X		
<i>Austrostipa aristiglumis</i>	Plains Grass		X		X	X	
<i>Austrostipa blackii</i>	-		X				
<i>Austrostipa scabra</i> subsp. <i>scabra</i>	Speargrass					X	X
<i>Austrostipa verticillata</i>	Slender Bamboo Grass		X				X
<i>Carex inversa</i>	-				X	X	
<i>Chloris truncata</i>	Windmill Grass		X	X	X	X	X
<i>Chloris ventricosa</i>	Tall Windmill Grass			X			
<i>Cyperus betchei</i> subsp. <i>betchei</i>	(Warringaay)	<i>Cyperus</i> sp. tubers eaten as food, medicine; weaving and making string.					X

Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<i>Cyperus bifax</i>	Downs Nutgrass			X	X		
<i>Cyperus concinnus</i>	Trim Flat-sedge			X			
<i>Cyperus victoriensis</i>	-			X			
<i>Dichanthium sericeum subsp. sericeum</i>	Bluegrass		X	X	X	X	X
<i>Digitaria divaricatissima</i>	Umbrella Grass				X		
<i>Diplachne muelleri</i>	Brown Beetle Grass						X
<i>Eleocharis pallens</i>	Pale Spike-sedge			X		X	
<i>Eleocharis pusilla</i>	-					X	
<i>Eleocharis plana</i>	Flat Spike-sedge			X	X		
<i>Enteropogon acicularis</i>	-		X		X	X	X
<i>Eragrostis elongata</i>	Clustered Lovegrass						X
<i>Eragrostis leptostachya</i>	Paddock Lovegrass		X				X
<i>Eragrostis parviflora</i>	Weeping Lovegrass		X				
<i>Eriochloa crebra</i>	Cup Grass				X		
<i>Eriochloa pseudoacrotricha</i>	Early Spring Grass		X				
<i>Iseilema membranaceum</i>	Small Flinders Grass		X				
<i>Juncus radula</i>	-					X	
<i>Lachnagrostis filiformis</i>	-			X			
<i>Leptochloa digitata</i>	Umbrella Canegrass			X			
<i>Leptochloa divaricatissima</i>	-					X	
<i>Monachather paradoxus</i>	Bandicoot Grass		X		X	X	



Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<i>Panicum decompositum</i>	Native Millet (Guli)	Seed was collected, ground and made into flour, mixed with water to make damper.		X	X		
<i>Panicum simile</i>	Two-colour Panic					X	
<i>Paspalidium caespitosum</i>	Brigalow Grass					X	
<i>Paspalidium constrictum</i>	Knottybutt Grass					X	
<i>Paspalidium globoideum</i>	Shotgrass				X		
<i>Paspalidium jubiflorum</i>	Warrego Grass			X			
<i>Phyllanthus virgatus</i>	-						X
<i>Rytidosperma fulvum</i>	Wallaby Grass					X	
<i>Rytidosperma setaceum</i>	Smallflower Wallaby Grass		X			X	
<i>Sporobolus actinocladus</i>	Katoora Grass		X				X
<i>Sporobolus caroli</i>	Fairy Grass		X	X	X	X	
<i>Sporobolus elongatus</i>	Slender Rat's Tail Grass				X		
<i>Sporobolus mitchellii</i>	Rat's Tail Couch				X		
<i>Thellungia advena</i>	Coolibah Grass						X
<i>Themeda avenacea</i>	Oat Kangaroo Grass (Garaarr/Ggaraarr)	Seeds collected, ground and made into flour and damper.	X				
<i>Walwhalleya proluta</i>	-		X			X	
<b>Groundcovers – Forbs</b>							
<i>Ajuga australis</i>	Austral bugle						X
<i>Abutilon oxycarpum var. subsagittatum</i>	Flannel Weed					X	
<i>Alternanthera denticulata</i>	Lesser Joyweed				X	X	

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<i>Alternanthera nodiflora</i>	Common Joyweed			X			
<i>Atriplex leptocarpa</i>	Slender-fruit Saltbush					X	
<i>Atriplex muelleri</i>	-			X			
<i>Atriplex semibaccata</i>	Berry Saltbush					X	
<i>Boerhavia dominii</i>	Tarvine (Wuthugaa/Wudhugaa)	Taproot edible			X	X	
<i>Brachyscome dentata</i>	-						X
<i>Brunoniella australis</i>	Blue Trumpet						X
<i>Bulbine alata</i>	Bulbine Lily			X			X
<i>Calocephalus sonderi</i>	Pale Beauty-heads						X
<i>Calotis cuneifolia</i>	Purple Burr-daisy		X				
<i>Calotis lappulacea</i>	Yellow Burr-daisy				X		
<i>Calotis scabiosifolia</i> var. <i>integrifolia</i>	Rough Burr-daisy		X				
<i>Chenopodium desertorum</i> subsp. <i>desertorum</i>	-					X	
<i>Craspedia variabilis</i>	common billy buttons		X				
<i>Crinum flaccidum</i>	Murray Lily (Dhaygalbaarrayn)	Bulb of the plant is similar to a vegetable like a parsnip or ground into flour with water and paste to bake	X				
<i>Crotalaria dissitiflora</i> subsp. <i>dissitiflora</i>	Grey Rattlepod		X				
<i>Cullen tenax</i>	Emu-foot		X				
<i>Daucus glochidiatus</i>	Native Carrot		X	X			
<i>Einadia nutans</i> subsp. <i>nutans</i>	Climbing Saltbush		X	X	X	X	X

Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<i>Einadia polygonoides</i>	-				X		
<i>Erodium cicutarium</i>	Blue Crowfoot (Maayal)	The leaves and seed eaten, root was roasted and eaten.					X
<i>Eryngium paludosum</i>	Long Eryngium		X				
<i>Euphorbia drummondii</i>	Caustic Weed				X		
<i>Galium gaudichaudii</i>	Rough Bedstraw						X
<i>Glycine tabacina</i>	-					X	
<i>Goodenia fascicularis</i>	-		X				X
<i>Goodenia glauca</i>	-		X				
<i>Goodenia pusilliflora</i>	-			X			
<i>Hibiscus trionum</i>	Flower-of-an-hour				X		
<i>Hypericum gramineum</i>	Small St. John's Wort						X
<i>Leiocarpa brevicompta</i>	Flat Billy-buttons				X		
<i>Leiocarpa leptolepis</i>	Pale Plover-daisy		X				
<i>Leiocarpa panaetioides</i>	Woolly Buttons		X		X		
<i>Leiocarpa tomentosa</i>	Woolly Plover-daisy		X				
<i>Lepidium pseudohyssopifolium</i>	Peppercress		X				
<i>Malvastrum coromandelianum</i>	Prickly Malvastrum						X
<i>Neptunia gracilis f. gracilis</i>	Sensitive Plant				X		
<i>Oxalis chnoodes</i>	-				X	X	X
<i>Oxalis perennans</i>	-		X				
<i>Plantago debilis</i>	-				X		

Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<i>Plantago varia</i>	-		X		X		
<i>Plectranthus parviflorus</i>	Cockspur flower					X	
<i>Portulaca oleracea</i>	Pigweed (Dhamu)	All parts can be eaten, seeds, leaves, stems, roots.			X		
<i>Pratia concolor</i>	Poison Pratia			X			X
<i>Ptilotus exaltatus var. exaltatus</i>	Showy Foxtail						X
<i>Pycnosorus globosus</i>	Billy Buttons				X		X
<i>Pycnosorus thompsonianus</i>	Billy Buttons		X				
<i>Rhodanthe corymbiflora</i>	Small White Sunray		X				
<i>Roepera apiculata</i>	Common Twinleaf					X	
<i>Rostellularia adscendens subsp. adscendens</i>	-		X				
<i>Sida corrugata</i>	Corrugated sida		X			X	X
<i>Sida trichopoda</i>	Hairy Sida				X	X	
<i>Solanum esuriale</i>	Quena (Gumi)	Fruit, medicine.	X	X	X		X
<i>Stellaria angustifolia</i>	Swamp Starwort			X			
<i>Swainsona galegifolia</i>	Smooth Darling-pea (Gilaan)	Plants often poisonous and should not be eaten. Leaves were used as a dye to colour baskets, stems used to make twine and string. Stems used for fire drills and light spears.	X		X		
<i>Swainsona swainsonioides</i>	Downy Swainson-pea (Gilaan)	Plants often poisonous and should not be eaten. Leaves were used as a dye to colour baskets, stems used to make twine and string. Stems used for fire drills and light spears.			X		
<i>Tetragonia moorei</i>	-						X

Scientific name	Common Name (Gamilaroi name)	Use by Gamilaroi People	PCT 27	PCT 39	PCT 52	PCT 55	PCT 56
<i>Tetragonia tetragonioides</i>	New Zealand Spinach (Galan.galaan)	Leaves and stems used like spinach.		X	X		
<i>Velleia paradoxa</i>	Spur Velleia						X
<i>Verbena gaudichaudii</i>	-		X				
<i>Vittadinia cuneata</i> var. <i>cuneata</i>	Fuzzweed		X			X	
<i>Vittadinia pterochaeta</i>	Winged New Holland Daisy				X		
<i>Vittadinia sulcata</i>	-						X
<i>Wahlenbergia communis</i>	Tufted Bluebell						X
<i>Wahlenbergia fluminalis</i>	River Bluebell					X	X
<i>Wahlenbergia gracilis</i>	Sprawling Bluebell		X				X
<b>Groundcovers – Ferns and other</b>							
<i>Capparis lasiantha</i>	Nepine, Native passionfruit (Ngaybaan)	Fruit and medicine.					X
<i>Convolvulus clementii</i>	Desert Bindweed		X				
<i>Convolvulus erubescens</i>	Blushing Bindweed					X	
<i>Marsilea drummondii</i>	Common Nardoo (Bal)	Spores collected and processed to make flour and damper, drought resilient food source.		X	X	X	
<i>Marsilea hirsuta</i>	Nardoo		X			X	
<i>Parsonsia eucalyptophylla</i>	Gargaloo					X	

#### Notes

Species lists obtained from Vegetation Information Systems Database for each Plant Community Type (DPE, 2022a)

Gamilaroi names and uses obtained from McKemey, M., & White, H., 2011, Bush Tucker, boomerangs and Bandages: traditional Aboriginal plant use in the Border and Gwydir Catchments, Border Rivers-Gwydir Catchment Management Authority, New South Wales.

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