NORTH WEST NSW

# Natural Resource

## MANAGEMENT PLAN

2019 - 2024

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We acknowledge the traditional custodians of the lands of the North West, and we pay our respects to the Elders, past, present and future.


## DISCLAIMER

This report was prepared for and according to the scope, brief and project information provided by North West Local Land Services. All findings, conclusions or recommendations in the report are based on the information provided and collected for this project. 2rog Consulting accepts no liability or responsibility for its use by other parties.



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# EXECUTIVE SUMMARY

The North West region of New South Wales (NSW) comprises seven local government areas or "subregions" which support a diversity of land uses and industries, with irrigated and dry land cropping and grazing dominant in the region. Natural resource management in the North West is undertaken by its communities in collaboration with North West Local Land Services (North West LLS) and many partners, including Landcare.

This North West NSW Natural Resource Management Plan 2019-2024 (NRM Plan) considers specific goals, targets and actions to be implemented by North West LLS across the North West region over the next five years to help it achieve its business goals. The Plan defines the most critical assets relevant for community and government intervention in consideration of investor preferences and proximity to critical thresholds. The people and communities of the North West Region of NSW will have this plan to assist them in planning for healthy and resilient soils, flora, fauna, rivers, wetlands and aquifers for future generations to thrive.

Natural resource management (NRM) in the North West region has always been and will continue to be based on partnerships and collaboration with a wide range of community and government stakeholders at multiple scales. Achieving a healthy, resilient and adaptable natural resource base in keeping with investor preferences and whole-of-government and community agreed priorities will be key to driving the development of annual implementation plans at a range of scales for the life of this NRM Plan. Ongoing monitoring, evaluation, reporting and improvement (MERI) and adaptive management will continue to ensure investment is targeted to those areas and activities that provide maximum beneficial returns on investments in NRM.

To develop this NRM Plan, a review was undertaken based on the following NRM planning documents and information:

- North West LLS Transitional Regional NRM Plan (2013);
- Climate change in the North West Local Land Services region (2016);
- Commonwealth Government's Regional Land Partnership Program Outcomes (2018-2023); and
- New science and information on the status of assets across the North West region.

From this review and from external consultation with the communities and stakeholders of the North West region, a set of revised and updated goals, targets and actions were developed. These goals, targets and actions are shown in the following tables of this Plan and have been endorsed by the community and stakeholders of the North West. As part of the consultation process, priorities for each subregion were highlighted (Sections 03 to 09 of this Plan).

Implementation and adaptive management of the Plan throughout its lifetime (2019-2024) are summarised in Section 10. A comprehensive approach to annually review this Plan against measured progress toward targets and goals is detailed, including how North West LLS can ensure that community and stakeholders are engaged in the Plan through regular consultation.

The chief purpose of this Plan is to provide an approach to achieve improved NRM outcomes via implementation of the Regional Land Partnerships Program (2019-2023) across the North West region of NSW.

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# ABBREVIATIONS

| Abbreviation | Description |
|---|---|
| Cth | Commonwealth |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 (Cth) |
| DPIE EES | Department of Planning, Industry and Environment- Energy, Environment and Science (formerly OEH) |
| LALC | Local Aboriginal Land Council |
| LGA | Local Government Areas |
| LLS | Local Land Services |
| LSC | Land and Soil Capability |
| MERI | Monitoring Evaluation Reporting and Improvement |
| NCCARF | National Climate Change Adaptation Research Facility |
| NRM | Natural Resource Management |
| NSW | New South Wales |
| OEH | Office of Environment and Heritage |
| RLP | Regional Land Partnerships |
| RVC | Regional Vegetation Community |
| TEC | Threatened Ecological Community |
| TS | Threatened Species |

# DEFINITIONS

**Adaptive capacity:** the ability of people to adjust to changing environmental and socio-economic conditions. Adaptive capacity is determined by the ability of institutions and networks to learn and store knowledge; creative flexibility in decision making and problem solving; and the existence of power structures that are responsive to change and consider the needs of all stakeholders.

**Beneficial use (water):** the principle purpose of water use is sustained while not compromising water use by others and ensuring that environmental services associated with water in the landscape continue to be delivered i.e. the water quantity or quality enables certain uses for ongoing sustained benefit (e.g. agriculture or human consumption).

**Biomass:** the total quantity or weight of organisms in a given area or volume (e.g. pasture biomass is the quantity of pasture plants in a set area and is usually measured as kg/m2 or t/ha).

**Custodianship:** the act of someone being in charge of the management of a natural resource asset (e.g. a caretaker including Aboriginal person, farmer, landholder, or institution may have custodianship over a parcel of land).

**Culturally significant:** a species or community or landscape that is important to the traditional owners of the land.

**Derived grasslands:** grasslands are ecological communities dominated by native grasses with no or only sparse tree or shrub cover. Derived grasslands are those in which the woody species (trees and/or shrubs) have been removed for farming, leaving only the native herbaceous ground layer.

**Ecosystem services:** the flow of benefits that humans freely gain from functioning ecosystems within the natural environment e.g. beneficial insects, amenity etc.

**General Biosecurity Duty:** Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised.

**Groundcover:** in the context of this plan, groundcover includes plants (living and dead), rock, litter (small and large) and any cover that protects the soil from erosion via wind or rain action.

**Groundwater:** freshwater resources under the earth's surface including aquifers, groundwater alluvium, and water bearing rock, gravel and other substrates.

**Groundwater Dependent Ecosystems:** ecosystems that rely on groundwater for some or all of their water requirements (e.g. river red gum communities rely on alluvium groundwater).

**Litter:** In relation to this plan, litter is decomposing plant debris that forms an organic layer on top of the soil and contributes to soil aeration, soil carbon, and soil microbial activity.

**Land capability:** the inherent physical capacity of the land to sustain long-term land uses and management practices without degradation to soil, land, air and water resources. The LSC classification scheme takes account of limitations for sustainable use arising from water erosion, wind erosion, salinity, topsoil acidification, shallow soils/rockiness, soil structure decline, waterlogging and mass movement.

**Native vegetation:** assemblages of native plants including trees, shrubs, grasses and forbs that have remained in the landscape since European settlement, and whose structure, function and composition is largely unchanged. When referred to in this plan native vegetation also includes native wetlands and native grasslands (but not derived grasslands- see definition of derived grasslands).

**Surface water:** water resources that occur on the surface of the ground such as waterholes, creeks, rivers, dams, lakes and reservoirs.

**Travelling Stock Reserves:** land gazetted in NSW for authorised thoroughfare of stock (mostly sheep and cattle), and that are collectively known as "the Long Paddock".

**Threatened Species:** flora or fauna species that are listed as 'threatened' under Commonwealth and/or NSW environmental legislation on account of them being considered at risk of extinction.

**Threatened Ecological Community:** vegetation types that are listed under Commonwealth and/or State environmental legislation on account of their: rarity, uniqueness or landscape significance; level of past clearing; and level of ongoing threat from agriculture and other land uses.

**Wetland:** native vegetation type that is reliant on permanent or temporary standing water and is dominated by unique groups of native plant and animal species.

**Ramsar-listed wetlands:** wetlands that are rare or unique, or that are important for conserving biological diversity. These sites are added to the Ramsar Convention list of Wetlands of International Importance and become known as Ramsar sites.

**Regionally significant/important wetlands:** wetlands that provide important refugia, breeding sites and habitat for species and ecosystems. In addition to Ramsar sites, regionally significant wetlands are also culturally important, particularly for Aboriginal people.

**Resilience:** the capacity of a system to absorb shocks without changing the structure or function of the system.

**Riparian:** 'of the river', riparian vegetation includes species of plants that commonly grow close to a river, or "riparian zone" which is the area alongside a river or creek.

**Sustainable agriculture:** agriculture that seeks to meet society's demand for food and fibre in the present without compromising the ability of future generations to meet their own needs, via economic profitability, social and economic equity, and maintenance of a healthy environment.

# 1

# INTRODUCTION

This document presents natural resource management (NRM) goals, targets and actions (2019-2024) for the North West region of New South Wales (NSW). These goals, targets and actions have been informed from a review of the previous North West Local Land Services (North West LLS) Transitional Regional NRM Plan, the Regional Land Partnerships (RLP) Outcomes, and relevant new science, as well as community and stakeholder consultation undertaken in May 2019.

This NRM Plan (the "Plan") will be used in each subregion to guide NRM investment. The subregions directly align with the seven Local Government Areas (LGAs) that make up the North West region: Gunnedah; Gwydir; Liverpool Plains; Moree Plains; Narrabri; Tamworth; and Walgett.

The Plan will guide NRM investment for the next 5 years, July 2019 - June 2024. The Plan's goals, targets and actions will be delivered through continued partnerships with community government and other stakeholders. The Plan defines the most critical assets relevant for community and government intervention in consideration of investor preferences and proximity to critical thresholds.

# 1.1 Planning hierarchy and alignment

For ease of comprehension this Plan is divided into three themes: landscapes; water; and people and their communities. These are summarised as follows:

1. Landscapes: terrestrial land systems that support a mosaic of agricultural land and native forest, woodland and grassland. Landscapes provide the soils that underpin cropping and pastures, and the topography that facilitates delivery of water to farms and ecosystems.
2. Water: aquatic habitats including rivers, creeks, reservoirs, lakes, wetlands and aquifers. A functional part of healthy landscapes, but separated on account of specific goals, targets and actions that are established to manage water resources.
3. People and Communities: the vibrant and diverse social fabric of the north west, individuals and groups can have a profound influence on the biophysical assets of Water and Landscapes and are integral to NRM planning and action.

A hierarchy of goals, targets and actions is established for each theme under this Plan, where goals are long-term guiding principles (often aspirational), targets are desired qualitative or quantitative outcomes, providing a basis for tracking performance, and actions are priority management activities to be undertaken by the community to strive to achieve targets and meet long-term goals.

The Plan has strong linkages with a number of existing planning documents at multiple scales including, but not limited to:

- Regional Land Partnerships Objectives 2018-2023;
- NSW Biodiversity Conservation Act 2016;
- NSW Fisheries Management Act 1994;
- Commonwealth Environment Protection and Biodiversity Conservation Act 1999;
- Australian Pest Animal Strategy 2017-2027;
- North West Regional Strategic Pest Animal Management Plan 2018-2023;
- Australian Weeds Strategy 2017-2027;
- North West Regional Strategic Weed Management Plan 2017-2022;
- NSW Biosecurity Act 2015 and Biosecurity Strategy 2013-2021;
- Local Land Services Strategic Plan 2016-2026;
- North West Local Land Services Local Strategic Plan 2016-2021; and
- 2017-2027 Community Strategic Plans for seven LGAs in the North West.

# 1.2 The North West Local Land Services Region

The North West LLS region extends across 8,249,624 hectares in the north west of NSW. It includes the major population centres of Tamworth, Gunnedah, Moree and Narrabri and stretches from Nundle in the south-east to Boggabilla in the north-east and Lightning Ridge and Walgett in the west. The region is made up of seven LGAs referred to as subregions, namely Gunnedah, Gwydir, Liverpool Plains, Moree Plains, Narrabri, Tamworth and Walgett **(Figure 011)**.

### Local Government Areas (LGA) of North West LLS

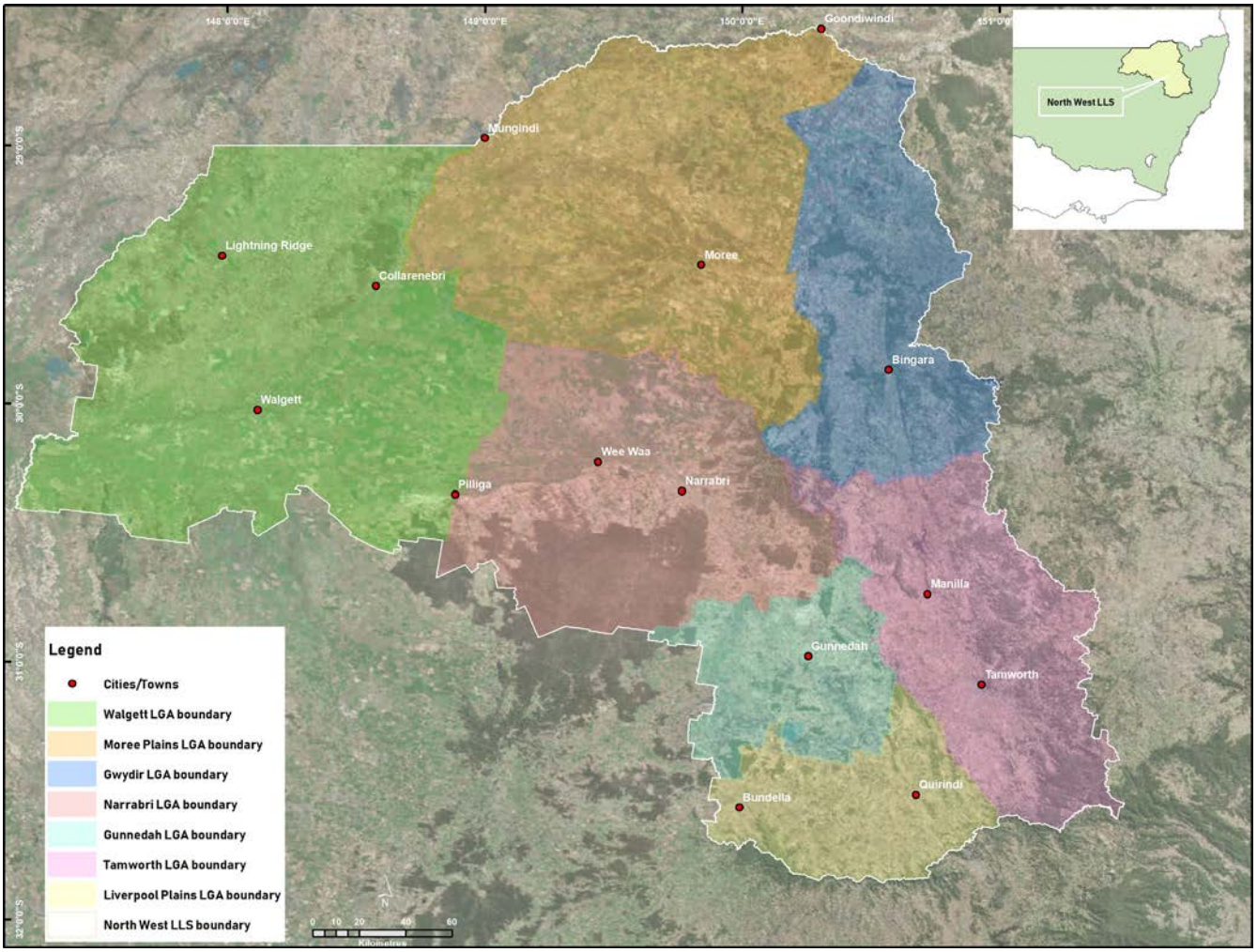



**Figure 011 North West LLS region and seven subregions**

According to the 2016 census, the population of the North West LLS region is 120,189 with most residents living within the Moree Plains, Narrabri, Gunnedah, and Tamworth subregions. This population is projected to increase to 124,984 within the life of this plan (NSW Healthstats 2018), with most growth occurring in the Gunnedah and Tamworth subregions.

The North West region has always been an important region for indigenous peoples, supporting a large Aboriginal population of the Kamilaroi (Gomaroi, Gamilaraay) Nation. Neighbouring Nations include the Ngemba, Ualarai, Murrawarri, Wailwan to the west and the Anewan to the east. There are also many important cultural locations through the region that are of local, regional, state and national significance. Local Land Services works closely with the Indigenous people of the North West of NSW

including through the Local Aboriginal Land Councils (LALCs). There are 14 LALCs associated with the main tribe, the Kamilaroi people, two LALCs in the east associated with the Anaiwan tribe (Anaiwan and Armidale LALCs) and one LALC in the South West Brewarrina associated with the Ngemba, Ualarai, Murrawarri, Wailwan peoples **(Figure 012)**.

### Local Aboriginal Land Councils in North West LLS

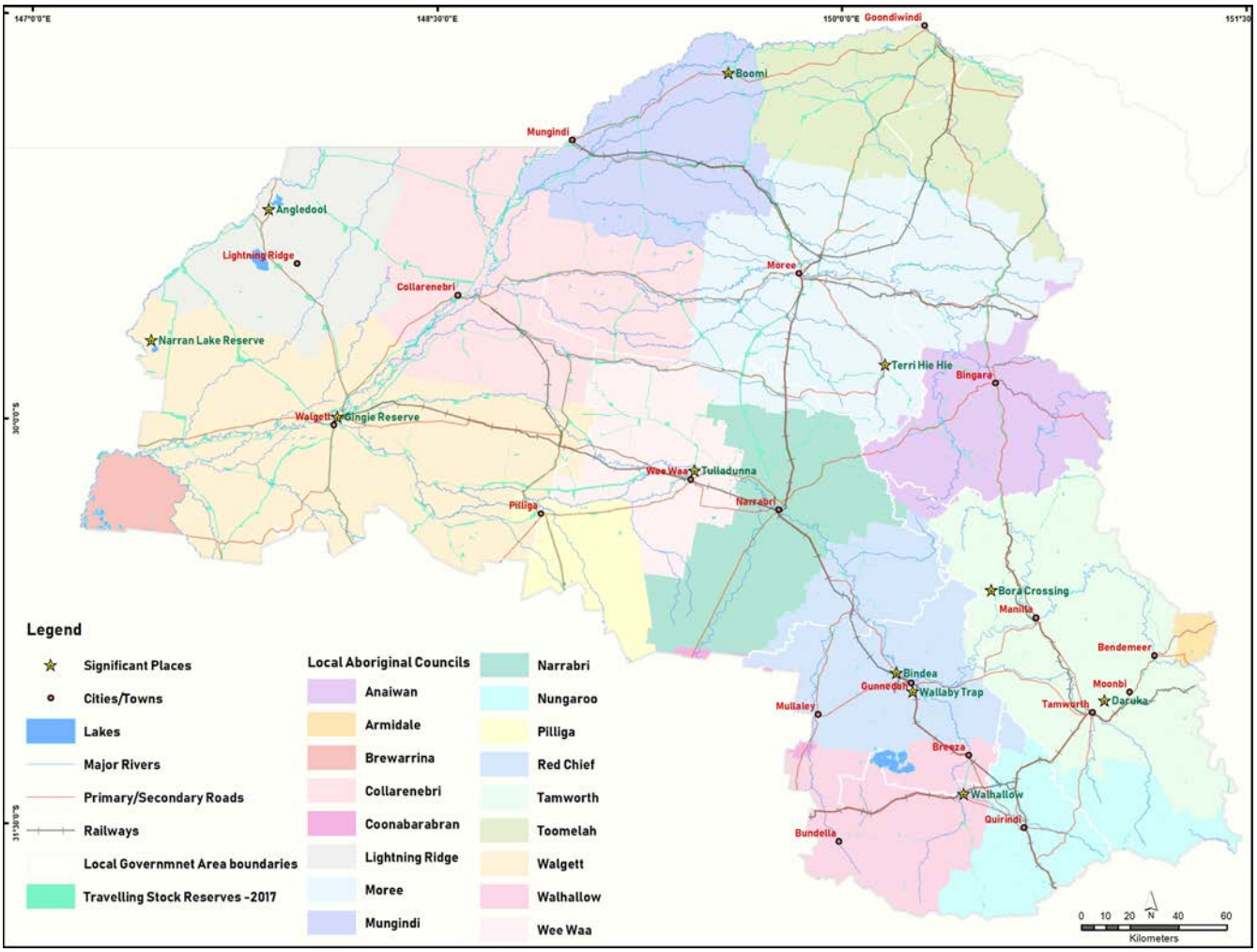



**Figure 012 Major Local Aboriginal Land Councils in the North West Region**

The North West region is diverse, ranging from areas of tablelands in the east to the sweeping native grasslands and riparian floodplains in the west. The region has unique natural features including important wetlands such as the Gwydir Wetlands which includes sites protected under the Ramsar Convention, large open woodlands including the Pilliga Scrub which represents a vast area of high conservation significance, and upland forests of the Nandewar Range including Mount Kaputar. The region is home to rare and threatened wildlife, flora species and vegetation communities identified by NSW and Commonwealth environmental legislation.

The North West region is also a productive agricultural area with summer-dominant rainfall and a climate allowing for crop and pasture growth most of the year. There are significant groundwater resources and surface water allocations that enable irrigation industries to contribute about 48% of the gross value of agricultural production to the region's economy (Houghton and Harvey 2014a). Other key agricultural sectors of the region include grazing, cropping and intensive animal industries (equine sporting facilities, multiple large feedlots and abattoirs) and a growing poultry industry.

Mining as a land use has existed in the region for over 150 years and is a substantial contributor to the state and regional economy. There is currently an expansion in the number of open cut and long-wall mines for coal, and coal seam gas extraction is also planned for the Gunnedah Basin. There are consequent issues within the local agricultural and township communities over land and resource use conflict in the region. Whilst it is acknowledged that mining and its expansion will impact on the assets covered in this Plan, mining issues are not covered here as they are the responsibility of authorities other than Local Land Services.

The North West region also contains 162,000 hectares of Travelling Stock Reserves/Routes (TSRs). This estate quantifies the North West LLS as the region's largest land manager with nearly 8,000 neighbours. Historically, TSRs have been managed to provide pasture reserves for travelling stock or in times of drought. Over the years, the use of the reserves has expanded to include public recreation, apiary sites and areas for the protection and conservation of native flora and fauna and culturally significant sites for Aboriginal communities. The value of TSRs as ecological assets cannot be understated as the vegetation on them is often the last intact stand of native woodland in some landscapes. Coupled with this is their linear configuration which allows them to serve as landscape-scale corridors for native species to move across the landscape.

Coinciding with a varied and rich landscape, the North West has a high level of human capital that reside and make a living from its natural asset resources. The population of the region varies in resilience across a number of socio-economic indicators (Houghton and Harvey 2014b). The North West region population has a higher resilience ranking in relation to NSW as a whole in terms of the value of agricultural production per resident; the percentage of the workforces who are managers; volunteering; child bearing propensity; and age dependency ratio (Hogan et al 2012). The population has a lower resilience ranking across the region for employment and ethnic diversity, mortgage debt, tertiary education and flow on/natural resource based employment.

The people and communities of the North West Region of NSW will have this plan to assist them in planning for healthy and resilient soils, flora, fauna, rivers, wetlands and aquifers for future generations to thrive.

## 1.3 Alignment with other strategies and plans

North West LLS has an overarching strategy that guides its business - the Local Strategic Plan 2016-2021. Of the four goals in the Local Strategic Plan, NRM relates most strongly with Goal 3: Healthy, diverse and connected natural environments. Coupled with the Vision of the LLS "Resilient communities in healthy productive landscapes", this NRM Plan will set the North West region on a positive path for the future across the three identified themes: Landscapes, Water, and People and their Communities.

This Plan is aligned with the LLS Performance Standard (Natural Resources Commission 2015) in relation to the use of latest and best science, the use of appropriate scale and governance structures, and consultation with the stakeholders and community. The 2016 Climate Change addendum was reviewed, and it was decided that, being a key driver for the natural resources of the North West, relevant goals and targets tackling climate change is a necessary inclusion in this Plan.

The NRM Plan aligns with the five year Australian Government National Landcare Program 2018-2023, specifically in relation to the Regional Land Partnership (RLP) Program Outcomes, namely:

**Outcome 1:** By 2023 there is restoration of, and reduction in threats to, the ecological character of Ramsar sites, through the implementation of priority actions.

**Outcome 2:** By 2023, the trajectory of species targeted under the NSW Threatened Species Strategy and other EPBC Act priority species, is stabilised or improved.

**Outcome 3*:** By 2023, invasive species management has reduced threats to the natural heritage Outstanding Universal Value of World Heritage properties through the implementation of priority actions

**Outcome 4:** By 2023, the implementation of priority actions is leading to an improvement in the condition of EPBC Act listed Threatened Ecological Communities.

**Outcome 5:** By 2023, there is an increase in the awareness and adoption of land management practices that improve and protect the condition of soil, biodiversity and vegetation.

**Outcome 6:** By 2023, there is an increase in the capacity of agriculture systems to adapt to significant changes in climate and market demands for information on provenance and sustainable production. (Department of Resources and Energy 2018).

* Outcome 3 is not covered in this plan due to there not being any World Heritage properties in the North West Region.

Finally, this Plan aligns with Local Government Community Strategic Plans (2017-2027) and other Local Government publicly available plans and documents outlining their environmental approaches for each of the seven LGAs across the Region.

## 1.4 Resilience Thinking Approach

The composite Catchment Action Plans that formed the goals and targets of the previous NRM planning document, the Transitional NRM Plan 2013, were developed using a resilience thinking approach. Whilst a similar approach has been maintained for this Plan, some mandatory targets for the NRM plan have diverged from the resilience thinking methodology.

Resilience is defined as the capacity of a system to absorb disturbance and still retain its basic function and structure (Walker and Salt 2006). Resilience thinking arose because other approaches to sustainable natural resource management was falling short to deliver on expectations. Older approaches are challenged because they rely on modelling of average conditions and ignore the impacts of major disturbances. Using a sustainability approach alone fails to recognise that the world as a whole is changing and we need to be in a position to work with and adapt to change, rather than being vulnerable to it.

Resilience thinking identifies "Social-Ecological Systems". It assumes we all live and operate in social systems that are acting on and underpinned by ecological systems. Social-Ecological Systems are complex adaptive systems that do not stay the same, and the changes do not happen in predictable

linear or incremental ways. These systems can also change state in response to a shock or a slow pattern of change. The point at which a system will change into a different state is called a threshold. The attribute of resilience is referring to a Social-Ecological System's capacity to absorb shocks and disturbances without crossing a threshold.

Social-Ecological Systems are complex and controlled by multiple variables, however only a handful of these variables that are the critical drivers of change in a system. Within each of these variables there could be a threshold that, if crossed, means that the system will behave in a different way. Once the threshold has been crossed, it is usually not possible to get back to the previous state. When managing for resilience, one is managing to create or maintain a safe distance between where the system is now and where the thresholds might be.

Resilience thinking tells us we must know what we need to do to establish the resilience of natural assets so that we can continue to rely on them despite changes and shocks, therefore implications of continued trends and shocks on the asset are identified. There are often limits to how far a system can be pushed before it tips into a different and undesirable state, therefore possible undesirable states should be identified. Resilience focuses on threshold "tipping points" between alternate states or regimes of a system, thus the need to identify thresholds where possible. The relevant identified thresholds can be found in Appendix A: Resilience thinking critical thresholds for the North West.

The composite Catchment Action Plans to the Transitional NRM Plan from which the majority of the goals and targets have been formulated in this NRM Plan, have used a Resilience Thinking approach, and where possible this approach has been maintained.

## 1.5 New Science and Evidence used in this Plan

A search for new data and evidence was undertaken amongst data and evidence that North West LLS and other government agencies had gathered since inception, under the following categories:

- Climate change (North West LLS 2015)
- Condition of assets such as TSRs
- DPIE EES (formerly OEH) woody vegetation extent data
- ABS data
- NSW Government land use and land capability data
- Groundcover
- Water resource data including Water Sharing Plans
- Survey data, including adaptive capacity and resilience studies
- Aboriginal traditional ecological knowledge

### 1.5.1 CLIMATE CHANGE

Understanding the impacts of climate change is vital for regional planning. In 2015 North West LLS developed a Climate Change addendum to the Transitional NRM Plan to address climate change using the most recent climatic data and the results of a series of adaptation projects undertaken 2013-2016. From this report, we know that since 1880, average air temperatures have risen by around 0.85oC globally. In Australia, over the last fifteen years the frequency of very warm months has increased five-fold and the frequency of very cool months has declined by a third (1951-1980). Coupled with this Australia's rainfall patterns have changed, with many regions experiencing more enduring periods of dry conditions.

The climate change project in the North West has highlighted the region as being particularly vulnerable. Much hotter temperatures and a more variable climate will affect the natural and socio-economic systems in the region. Although natural variability from year to year can mask or enhance long-term trends (particularly for the near future and for rainfall), it is nevertheless possible to predict certain events with varying levels of confidence under various emission scenarios. For the North West the broad predictions include:

- There will be more hot days, longer warm spells and fewer frosts
- Average winter rainfall is likely to decrease, and time spent in drought is likely to increase
- A harsher fire-weather climate is expected in the future

Whilst most landholders in the North West have stated that they have the skills to adapt to climate change (North West LLS 2016), 21% of landholders stated that they would not change their practices in response to climate change because they did not believe long-term climate change would occur or would be any different from the pattern of climate change that had occurred in the past (North West LLS 2016). This group of landholders may have changed their views in light of recent climate events including record heatwaves, ongoing drought and local fire events. This is supported by an Australia-wide study (IPSOS Climate Change Report 2018) which uncovered a growing momentum for action on climate change and acceptance of the role of humans in causing it.

The prevalence of extended drought and increased frequency of drought in particular, has triggered a need for change in the understanding of the context of drought for Australians. That is, policy, community and industry understanding needs to shift from considering 'drought as crisis' toward acknowledging the variability of the Australian climate (Kiem and Austin 2016). In this way, multi-year droughts should not be unexpected, and we accept that they may become more frequent. The way that a drought impacts a community has a number of contributing variables including remoteness, ageing, globalisation of agriculture, national and international economics and policy, deregulation, water trading, land use and resource conflict, food, water and energy security, mental health and wellbeing, and land management policies and practices (Kiem and Austin 2016).

Climate variability is likely to pose future risk to primary production across the North West including:

- Increased temperatures and periods of reduced rainfall events resulting in localised crop failures and changes in planting opportunities;
- A reduction in annual pasture production and subsequent impacts on grazing enterprises; and
- Increased erosion thus loss of productive capacity from high intensity rainfall events and major dust storms.

For the environment of the North West, it is expected that climate change will contribute to higher rates of local species extinction, transformation of ecological communities, and reduction of the ecosystem services that sustain human well-being and the economy. A number of ecological responses to climate change are expected in the North West including:

- Changes in the composition of ecosystems;
- Movement of ecotone boundaries;
- Changes in species' geographical ranges;
- Changes in the life cycle of species due to seasonality shifts; and
- Change in populations (accretion, reduction, extinction).

Despite these effects, a strong science knowledge-base is available to advise on investment priorities to help agricultural industries and natural systems to adapt to a changing climate. Through 3C modelling for example, predicted shifts in bio-climatic classes (environmental envelopes suitable to many species) over time have been modelled and these changes can be built into NRM investment planning (North West LLS, 2016). For iconic species including the Koala, food tree distributions have been mapped and are predicted to contract eastwards and southwards with fragmented distribution. By linking these habitats through planned revegetation between existing landscape links we can help this species adapt to the changing climate. Landholders can also invest in carbon sequestration and storage through permanent plantings of mixed species, to generate income from trading credits while building landscape resilience over the long term.

The National Climate Change Adaptation Research Facility (NCCARF) has presented a number of findings since the development of the North West Climate Change addendum including the latest principles for successful climate change adaptation (Capon et al 2017) including:

1. Using a shared responsibility;
2. Factoring climate risks in to decision making;
3. An evidence-based risk management approach;
4. Helping the vulnerable;
5. Collaborative, values based choices; and
6. Revisiting decisions and outcomes over time.

Others including Williams et al (2017) agree that more research is required to allow terrestrial ecosystems to adapt, such as:

1. Greater spatial targeting with a stepwise approach to population restoration;
2. Defining priority areas based on likely future distributions;
3. Designing land-uses to maximise incidental biodiversity benefits; and
4. Restoring native vegetation at the whole property scale.

Potentially the most significant threat to global biodiversity is the synergistic interactions between climate change and other human pressures. Most studies report the direct effects of climate change as land cover change, habitat loss, habitat fragmentation, and so on. However, understanding the synergistic or cumulative implications of such impacts across scales will assist in allocating resources between mitigating existing stressors and implementing new adaptive strategies that specifically incorporate climate change as a factor (Barlow et al 2013).

Dealing with and adapting to climate change will require consistent, continuous and holistic cross agency and multidisciplinary policy, particularly to address competing demands on water, land and other natural resources while also maintaining or improving the liveability of rural communities (Kiem and Austin 2016). Building individual and community adaptive capacity will be required in unison, particularly through improving mental health, wellbeing, social capital, and encouraging help-seeking behaviours. Conversations about climate change and adaptation should frame the picture positively by focussing on maximising opportunities and providing access to evidence and support for making progressive and adaptive decisions that lead to sustainability, liveability and profitability (Kiem and Austin 2016).

### 1.5.2 TRAVELLING STOCK RESERVES

North West LLS encompasses 163,000 ha of TSRs, comprising almost a third of the state's TSR asset. TSRs offer an excellent opportunity for the region to support its community's resilience and well-being, grazing industries and biodiversity and climate change adaptation for a number of reasons.

TSRs provide the backbone of a network of corridors allowing wildlife to move through the landscape, including in times of crisis such as drought, fire, flood or in response to climate change. There is broad consensus that TSRs provide critical natural infrastructure to assist adaptation opportunities that protect biodiversity across the region and NSW. Many TSRs support threatened ecological communities (TECs) including some of the largest stands of Coolibah-Black Box Woodland; Weeping Myall Woodland, Brigalow; Natural Grasslands on Alluvial Plains; Semi-evergreen Vine Thicket; Box-Gum Grassy Woodland, Carbeen Forest and Grey Box Woodland that remain in relatively good condition (Spark 2015). As some these TECs are otherwise poorly represented in Nature Reserves and National Parks in the region, remnants within TSRs have very high conservation values.

Protecting and enhancing corridors in over-cleared farming landscapes is critical for maintaining viable populations of native flora and fauna species. Small isolated populations are at risk of extinction from inbreeding, extinction debt and catastrophic events such as fire, drought and biosecurity threats. TSRs are thereby an important asset for the North West region, to manage carefully and strategically for persistence of biodiversity values.

TSR management is growing to embrace values in addition to the traditional grazing and droving values, to include biodiversity conservation, Aboriginal Culture and Heritage values, science and learning, and recreation. Managing the co-existence and enhancement of these values is an important objective announced by the NSW Government in the Crown Land Review initiated in 2012. LLS has undertaken to improve management in light of the broad values through a TSR Management Plan which will be implemented in 2019.

### 1.5.3 VEGETATION EXTENT

Regional vegetation mapping is an essential tool in NRM, informing regional vegetation management strategies and guiding the setting of priorities for allocation of funding for conservation and revegetation programs. Maps that include the current and former (pre-European) distribution of native vegetation communities are particularly useful, as they enable the identification, ranking and mapping of conservation status of vegetation types, and assist in the planning of large-scale planting and strategic enhancement projects.

Recent vegetation data provided by OEH combined with Regional Vegetation Community (RVC) mapping (ELA 2014) has indicated that the North West Region has only 36% of its native vegetation remaining. The current extent of broad vegetation types in the North West is shown in Figure 013.

**Broad Vegetation Types in North West LLS**

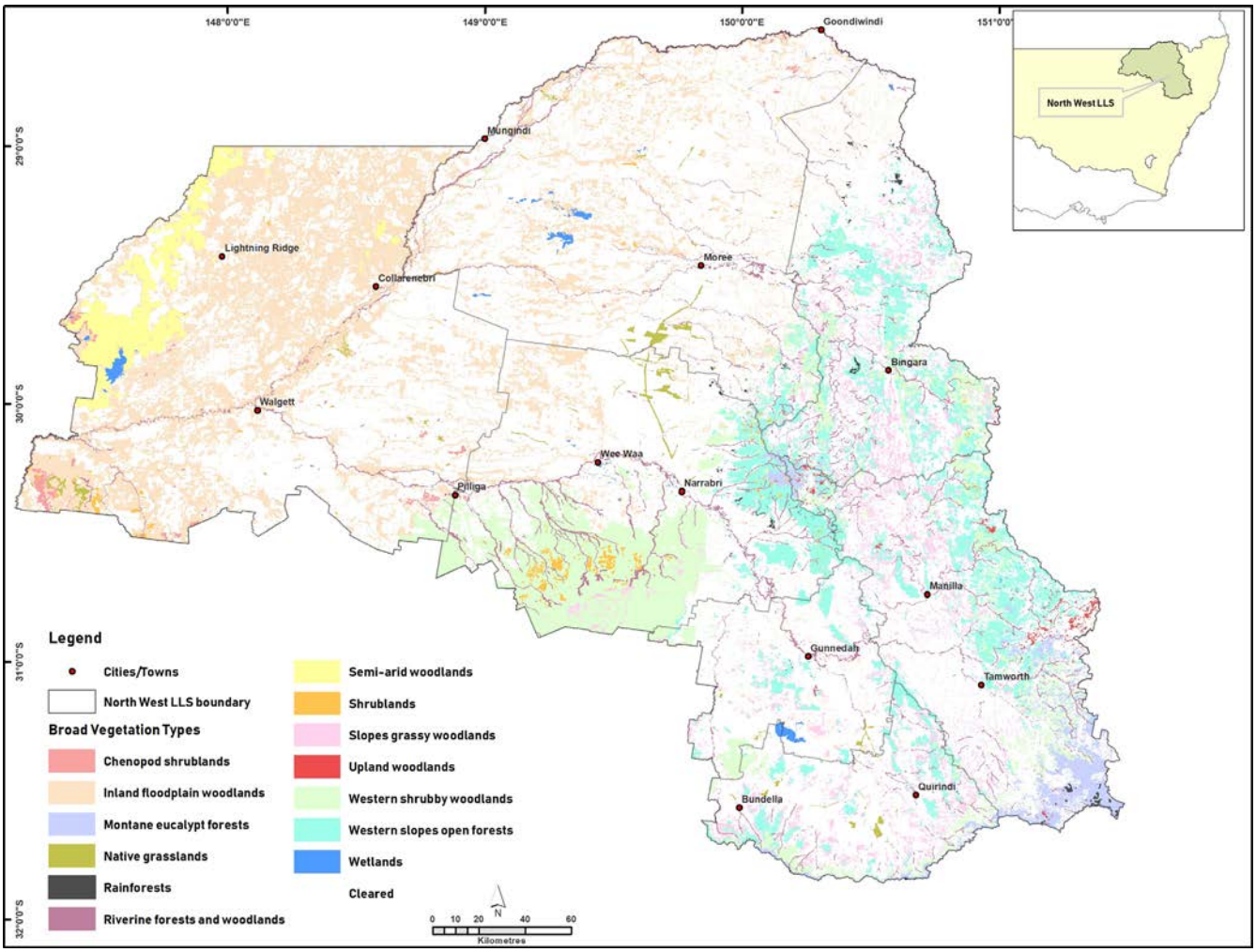



**Figure 013 Extent of broad types of native vegetation across the North West region (OEH 2017)**

## 1.5.4 UPDATED WATER SHARING PLANS

The NSW Water Management Act 2000 applies to areas of New South Wales that have a water sharing plan. Information on all water sharing plans that have commenced can be found on the Department of Primary Industries - Water website. A water sharing plan is generally in place for 10 years but may be suspended from time to time under Section 49(a) of the Act due to severe water shortages.

Some of the water sharing plans (Table 011) are currently being reviewed as part of the development of water resource plans under the Basin Plan 2012 or as part of the review process when a water sharing plan is nearing the end of its term. A number of amendments are being considered, and consultation on proposed amendments is being undertaken through public exhibition.

**Table 011 Water Sharing Plans and Status across the North West Region**

| Water Sharing Plan | Status | Due Date |
|---|---|---|
| Barwon Darling Unregulated & Alluvium | Commenced | July 2022 |
| Gwydir Regulated River | Replaced | July 2026 |
| Gwydir Unregulated & Alluvium | Commenced | July 2022 |
| Lower Gwydir Groundwater | Commenced | July 2019 |
| Namoi Unregulated & Alluvium | Commenced | July 2022 |
| NSW Border Rivers Regulated River | Commenced | July 2019 |
| NSW Border Rivers Unregulated & Alluvial | Commenced | July 2022 |
| NSW Great Artesian Basin Groundwater | Commenced | July 2020 |
| NSW Great Artesian Basin Shallow Groundwater | Commenced | July 2022 |
| NSW Murray Darling Basin Fractured Rock Groundwater | Commenced | July 2022 |
| NSW Murray Darling Basin Porous Rock Groundwater | Commenced | July 2022 |
| Peel Valley Regulated, Unregulated, Alluvial & Fractured Rock | Commenced | July 2020 |
| Upper & Lower Namoi Groundwater | Commenced | July 2019 |
| Upper & Lower Namoi Regulated River | Commenced | July 2026 |

## 1.6 How to read this NRM Plan

North West LLS region spans an area of 8,249,624 hectares across varying landscapes, climatic zones and biomes. The agricultural pursuits and communities they support also vary across the landscape. For ease of planning, communication and community ownership of the Plan, the North West has been split into seven subregions, based on LGAs for ease of the public identifying with the subregion in which they reside.

A set of goals, targets and actions has been formulated and endorsed by the community for the North West region. Community consultation within each subregion has enabled a prioritisation of the goals, targets and actions. Community priorities were also cross referenced with each of the relevant Community Strategic Plan (2017-2027) for each LGA. As a result, an overarching set of goals, targets and actions have been developed for the whole region, and a specific set of prioritised targets and associated actions produced for each subregion.

2

# NORTH WEST REGIONAL GOALS, TARGETS AND ACTIONS FOR NRM PLANNING

The overarching goals, targets and actions for the Plan are listed in **Table 021, Table 022 and Table 023**. A draft version of these were used for consultation in each subregion, which were improved throughout the consultation process and thereby remain as the community approved goals, targets and actions for the entire North West Region.

Subregion-specific targets and actions are included in Sections 03 to 09 of the Plan.

# Table 021: Summary of goals, targets and actions for Landscapes in the North West LLS NRM region

**GOAL: Healthy and resilient landscapes sustaining our unique flora and fauna for future generations**

**Target 1:** By 2024, there is an increase in native vegetation extent across the North West and in each Local Government Area
**Target 2:** By 2024, no further regional vegetation community decreases to less than 30% extent as identified by the 2017 baseline

1. Invest in education, extension and community engagement and develop knowledge products to facilitate improved understanding of the importance of woody vegetation, native grasslands, and culturally significant species such as bush tucker for their roles in biodiversity, climate change adaptation and mitigation
2. Increase the area of private and public land to be managed to maintain or improve native woody vegetation extent through improved awareness of custodianship, traditional management and the importance of maintaining diversity of vegetation and native bush tucker and culturally significant species for future generations
3. Undertake targeted revegetation/regeneration of regional vegetation communities that are close to the 70%-cleared threshold
4. Encourage planning authorities to take account of the above targets and thresholds when considering any land-use change
5. Increase the area of private and public land to be managed in accordance with the NSW biodiversity strategy and EPBC Act 1999 (Cth)
6. Increase the area of private and public land to be managed for maintenance of regional vegetation including improving vegetation community and habitat condition
7. Investigate species of specific importance to Aboriginal people so that these species can be better protected, and awareness can be built for land managers

**Target 3:** By 2024, contribute to the recovery of priority Threatened Ecological Communities

8. Invest in education, extension and community engagement and develop knowledge products to facilitate improved understanding of viable threatened species, populations and ecological communities
9. Decrease threatening processes where intervention will directly improve priority Threatened Ecological Communities
10. Promote active management of native vegetation to maintain or improve vegetation structure and composition, including perennial and native groundcover species and native bush tucker in known traditional gathering areas
11. Increase the area of private and public land to be managed in accordance with the Biodiversity Conservation Act 2016 and EPBC Act 1999 (Cth)

**Target 4:** By 2024, contribute to the recovery of priority threatened species populations

12. Invest in education, extension and community engagement and develop knowledge products to facilitate improved understanding of the importance of regional vegetation communities to sustainable fauna populations and threatened species
13. Increase the area of private and public land to be managed for biodiversity outcomes in accordance with the Biodiversity Conservation Act 2016, Fisheries Management Act 1994 and EPBC Act 1999 (Cth) to maintain sustainable populations of a range of native fauna, aquatic and plant species including those targeted under the Threatened Species Strategy

14. Increase the area of private and public land to be managed for maintenance of key habitat to maintain sustainable populations of a range of native fauna, aquatic and plant species, including those targeted under the NSW Threatened Species Strategy
15. Consider investigating and mapping the areas of known refugia for species during dry times and in a changing climate

**Target 5: By 2024, there is an improvement in landscape scale connectivity of native vegetation through targeted revegetation and enhancement to improve resilience in a changing climate**

16. Invest in education, extension and community engagement and develop knowledge products to facilitate improved understanding of climate change science so that trajectory can be monitored, and adaptation adjusted accordingly
17. Manage and revegetate native vegetation located within strategic corridors (including riparian zones and culturally significant species) to enhance landscape connectivity to allow flow of species as the climate changes
18. Assist private and public landholders to protect landscapes of cultural significance through improved education and access to knowledge where permission from the appropriate Aboriginal community has been granted
19. Encourage landholders to retain patches of native vegetation including paddock trees and riparian zones to retain local connectivity, and to maintain the beneficial activities of native pollinators and native predators of agricultural pests

**Target 6: By 2024, no new invasive species are established in the region and the spread of key emerging invasive plants and animals is limited**

20. Invest in education, extension and community and stakeholder engagement and develop knowledge products to facilitate improved understanding of potential new invasive species and related emergency response measures
21. Build links and networks of land and water managers, invasive species experts and stakeholders to establish early warning procedures for new invasive plants and animals entering the region
22. Build awareness of native species including culturally significant native bush tucker so that these can be protected from overspray when private and public landholders are undertaking weed control
23. Consider invasive species in accordance with the Australian Pest Animal Strategy 2017-2027 and the Australian Weeds Strategy 2017-2027.
24. Identify and assess the level of threat of new invasive plants and animals entering or becoming established in the region including aquatic plants
25. Increase the area of private and public land and waterways where strategic control measures are implemented to limit the spread of key emerging invasive plants and animals.
26. Manage the impacts of priority weeds on primary production and biodiversity as identified by regional weed management plans
27. Manage the impacts of priority pests on primary production and biodiversity as identified by regional pest animal management plans
28. Support community and landholder groups to abide by their general biosecurity duties under the Biosecurity Act 2015 in a coordinated and effective manner

**Target 7: By 2024, groundcover is maintained at 90% in the eastern LGAs, 70% in the central LGAs and 40% in the west**

29. Increase the area of private and public land (including TSRs) to be managed for 90%/70%/40% groundcover by investing in education, extension, knowledge products and community engagement in soil health outcomes including soil organic carbon, litter, pasture biomass and native vegetation (grasses and forbs) and carbon sequestration opportunities
30. Increase the area of private and public land (including TSRs) to be managed in accordance with practices to achieve and maintain adequate groundcover, including litter, soil organic carbon,

pasture biomass and native vegetation (grasses and forbs)

31. Invest in changed land management practices to better match with the land and soil use capabilities (e.g. on sodic and high-value soils at risk from declining soil organic matter and soil structure) to improve groundcover, soil health and air quality by reducing dust
32. Promote the adoption of sustainable cropping, and progressive grazing and agricultural management systems to improve landscape function, water and rainfall use efficiency and manage land within its capability
33. Invest in education, extension and community engagement and develop knowledge products to facilitate improved understanding of land capability, the importance of groundcover and management systems available to regenerate the land and improve production

# Table 022: Summary of goals, targets and actions for Water in the North West LLS NRM region

**GOAL: Healthy and resilient aquifers, waterways and wetlands**

**Target 8: By 2024, there is an improvement in the condition of RAMSAR and regionally important wetlands and the extent of those wetlands is maintained**

34. Invest in education, extension and community engagement, and develop knowledge products to facilitate improved management and understanding of the importance of natural wetlands including understanding of the cultural significance of wetlands for Aboriginal people
35. Work with landholders around wetlands and connect with Aboriginal people to build opportunities for access to country and the sharing of traditional knowledge at important cultural sites
36. Support infrastructure programs, water efficiency programs, and water planning and implementation programs in line with Commonwealth and State policies
37. Mitigate the impact of grazing pressure on wetland areas and mound springs
38. Manage floodplains to support ecological functions
39. Maintain and enhance riparian and in-stream habitat upstream from wetlands
40. Mitigate in-stream barriers to improve passage of fish and other species and to enhance riverine connectivity

**Target 9: By 2024, there is an improvement in riparian condition by protecting waterways through improved livestock and vegetation management**

41. Invest in education, extension and community engagement and develop knowledge products to facilitate improved understanding of riparian protection and the importance of rivers to Aboriginal people including providing opportunities for the sharing of this traditional knowledge between traditional and current custodians of riparian lands
42. Increase the number of landholders implementing strategic grazing, off stream watering points, and avoiding set stock grazing in riparian zones
43. Increase the area of river reach that is managed to re-establish, maintain and improve riparian vegetation condition and extent
44. Identify river and stream reaches that are in good geomorphic condition and provide key refugia, and prioritise for protection

**Target 10: By 2024, there is increased support provided to communities to operate within water policy settings to achieve sustainable and efficient water use**

45. Invest in education, extension and community engagement, and develop knowledge products to facilitate improved understanding of riparian health thresholds and priorities including bringing stakeholders to the water policy discussion table
46. Support Federal and State restructure, water use efficiency programs, water planning and implementation programs and investments in reductions in water entitlement and allocations
47. Collaborate in the development and implementation of water planning processes, including environmental and cultural access licences
48. Build adaptive capacity to reduce reliance on surface water sources that are unlikely to remain reliable under climate change scenarios and that need to be increasingly managed to meet river health objectives

**Target 11:** By 2024, the ability of groundwater aquifers to support groundwater dependent ecosystems and designated beneficial uses is maintained

49. Engage and invest in improving understanding of groundwater aquifers, recharge and likely impacts of climate change
50. Use increased understanding of aquifers across the region to map areas vulnerable to system changes such as climate change or resource management
51. Build adaptive capacity to reduce reliance on disconnected aquifers or aquifers unlikely to remain reliable under climate change scenarios

# Table 023: Summary of goals, targets and actions for People and Communities in the North West LLS NRM region

**GOAL: A region that is healthy, resilient and adaptable to a changing climate**

**Target 12:** By 2024, there is an increase in the community's adaptive capacity and social wellbeing across the region to prepare for shocks and threats such as those associated with climate change

52. Engage with stakeholders and existing social networks to build partnerships that will develop a collective understanding of adaptive capacity and social wellbeing in the regions and subregions, and appropriate interventions to assist people to withstand shocks and slow drivers of change (e.g. fires, floods and climate change)
53. Identify communities that are vulnerable due to their reliance on natural resource assets that may have already crossed critical thresholds or be at risk from system changes such as climate change
54. Invest in supplying information about natural resources and how they underpin human activity, including the implications of crossing identified thresholds including future generations
55. Support land managers to increase farm business diversification
56. Support land managers to adapt to a range of climate change scenarios
57. Build agile/flexible planning arrangements so that a range of climate change scenarios can be managed adaptively
58. Support land managers to adopt new skills, knowledge, practices and technologies including succession planning through connecting to appropriate services
59. Investigate and seek permission to increase awareness of traditional adaptation and management practices implemented by local Aboriginal people and communities
60. Identify training and skills requirements to improve adaptive capacity
61. Ensure that information moves through the region about shocks and drivers and how they are likely to affect the people in the region
62. Promote activities and programs that encourage innovation, diversification and the ability to respond to changing business and physical environments
63. Support the grazing industry to improve management of groundcover and soils in the context of seasonal variability and moisture stress
64. Support the development of viable and measurable management systems, based in the delivery of ecosystem services such as carbon sequestration, active conservation management and groundcover maintenance

**GOAL: Sustainable, productive, profitable and progressive agriculture**

**Target 13:** By 2024, there is an increase in the number of community members undertaking practice change to improve natural resource management and achieve sustainable, productive, profitable and progressive agriculture

65. Increase the uptake of sustainable cropping and progressive farming methods on cropping farms, including improvement in water use efficiency measures
66. Improve community capacity and farm viability through research, pilots, education and training and improving access to services
67. Develop stronger partnerships with industry groups to enhance industry viability, innovation, productivity, profitability and sustainability
68. Provide opportunities to increase the number of land managers participating in awareness raising and capacity building activities
69. Promote the adoption of sustainable agricultural management systems to improve landscape function and manage land within its capability including protecting groundcover, soil organic carbon, litter, pasture biomass and native vegetation including grasses and forbs

70. Continue to develop and promote Landcare networks across the region including urban Landcare groups

**GOAL: Aboriginal people connected to country, culture and heritage**

**Target 14: By 2024, there is an increase in support for Aboriginal people to connect to country and share traditional ecological knowledge with their communities through partnerships and participation in natural resource management**

71. Promote opportunities for Aboriginal People to connect to country for the purpose of practising traditional culture, transferring knowledge and implementing natural resource management practices
72. Negotiate opportunities for Aboriginal people to connect to places of significance on TSRs and other public lands and use these sites as a showcase to the broader community of what can be achieved, and to break down barriers to access to country on privately owned lands (and use these examples to showcase to surrounding Aboriginal organisations such as LALCS how NRM activities can provide access to country and traditional knowledge sharing opportunities for future generations)
73. Promote positive relationships, trust and respect between Aboriginal people and non-Aboriginal land managers through awareness and education opportunities to share knowledge
74. Increase Aboriginal employment and training opportunities in natural resource management in the North West LLS region
75. Provide connections and partnership opportunities to Aboriginal organisations to commercialise tourism and/or bush tucker production
76. Strengthen and communicate duty of care for Aboriginal cultural landscapes
77. Increase youth awareness and knowledge of natural resource management and Aboriginal culture
78. Facilitate engagement of the Aboriginal community in natural resource management and cultural practices
79. Increase consultation and plain English communication with LALCs and Aboriginal organisations to build trust and good will in the community

# 3

# TAMWORTH SUBREGION

# 3.1 Description of Tamworth Subregion

The Tamworth subregion is coincident with Tamworth Regional LGA. Its regional centre, Tamworth, is located 310 km north of Sydney and 450 km south-west from Brisbane. An overview map is presented in **Figure 031**.

Tamworth Subregion is 9,653 km2 and is home to 61,000 residents, Tamworth being the largest township in the North West region. The region comprises a variety of landforms from higher altitude tablelands and slopes to the east encompassing the small towns of Nundle, Bendemeer, Kootingal and Barraba, to the floodplains of the Peel River and lower plains around Manilla. The population has an annual growth of 1% per year and 85% of the population reside in Tamworth.

The Tamworth Subregion is characterised by its diversity in population and industry. It is a major hub for livestock processing, grazing, poultry, dryland cereal for grain or seed, and irrigated fodder production. Tourism, manufacturing, processing, education, health, cropping, grazing, equine and sporting venues bring a diversity of enterprises to the region. The largest industry is healthcare and social assistance.

The rivers and streams in the subregion are regulated, with major storages Chaffey, Dungowan and Split Rock dams providing water resources to some of the regions industries. The strong economic position of the Tamworth Subregion is shown in its gross regional product of $3.21 billion that has shown continued growth over the past 10 years (TRC Annual Report 2017/18). While the subregion is highly developed for agriculture and residential use, it also has some significant remnant vegetation and protected areas that support biodiversity.

Key drivers for change in the Tamworth Subregion are considered by the community to be shifts in the socio-economic profile of the region, water availability, climate change and government policy. The issues associated with socio-economic change are identified as the poultry enterprise expansion and developments for residential and other industry expansion, changing demographics, cost pressures of production, land use change and global economics. Climate change is of concern, particularly in relation to extreme weather events and increased variability, mostly drought but also flood and fire. Government is seen as a key driver of change through policy, legislation, planning and compliance (Namoi CMA 2013).

## SUBREGION PROFILE

**Regional Centre Location:**

310km north of Sydney
450km south-west of Brisbane

**Size:**

9,653 km2

**Population:**

61,000

**Gross Regional Product:**

$3.21 billion

# 3.2 Assets

## 3.2.1 NATIVE VEGETATION

The Tamworth Subregion has had 60% of its native vegetation cleared since European settlement. However, a diverse range of remnant vegetation persists including some large intact areas. There are a number of conservation reserves in the area including Kaputar, Ben Halls Gap and Warrabah National Parks and Ironbark, Watsons Creek and Attunga Nature Reserves, a number of state forests including Nundle, Hanging Rock and Tomalla, and numerous TSRs, many of which have significant values (**Figure 031**). Main threats to vegetation and the biodiversity it supports include clearing for urban and agricultural development, pest animal and domestic attack on native fauna, degradation of condition of vegetation communities due to weeds and pests, and long-term impacts of climate change.

### Tamworth Local Government Area (LGA)

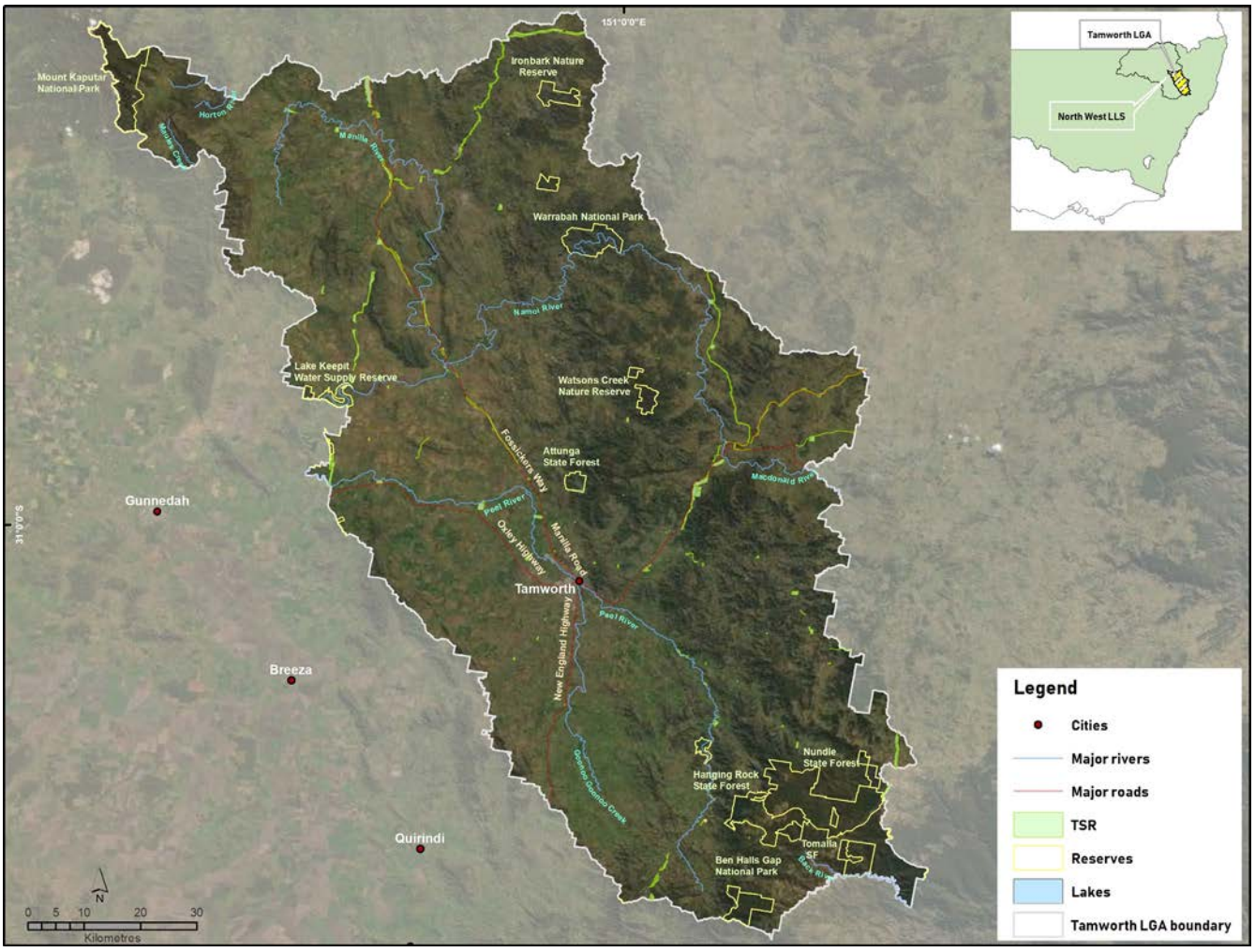



Figure 031 Map of the Tamworth Subregion

Regional vegetation communities that are either close to the 70%-cleared threshold or are equivalent to a threatened ecological community are identified as priorities for protection and enhancement under this Plan. Landscape corridors are also recognised as priorities for protection, enhancement (green areas) and targeted revegetation (orange areas) under this Plan. **Figure 032** shows the extent of these priority areas within Tamworth Subregion. While these areas may provide a strategic focus for actions and achievement of targets under this Plan, actions should be undertaken in any part of the subregion should opportunities arise, as long as those actions are consistent with the Plan and represent good investment value.

**Priority areas in Tamworth LGA for ecosystem protection & enhancement and revegetation**

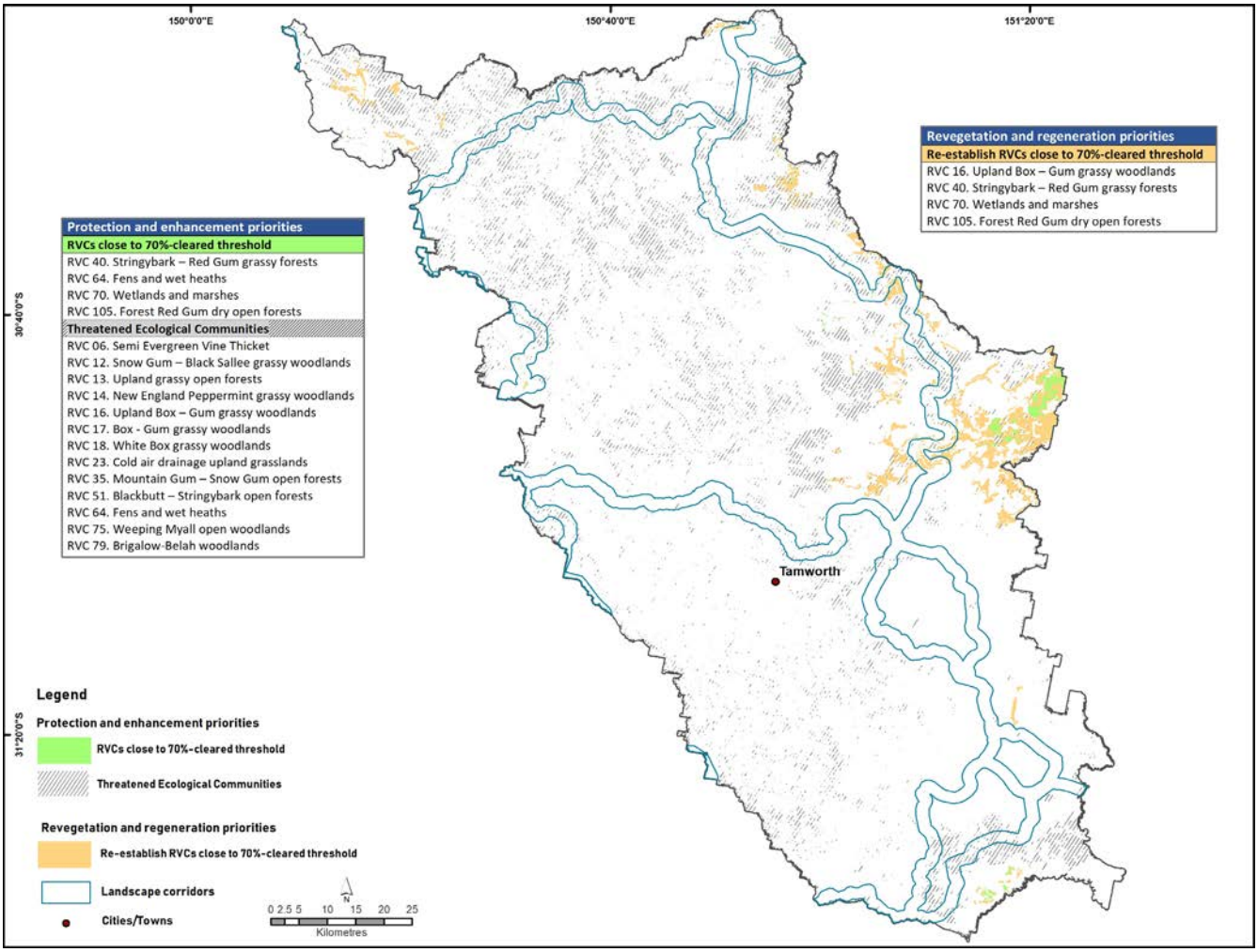



**Figure 032 Vegetation Priorities in the Tamworth Subregion (green areas representing areas for protection and enhancement, orange areas are areas prioritised for revegetation works)**

### 3.2.2 LAND USE AND SOIL CAPABILITY

Land use and soil and land capability in the Tamworth Subregion are illustrated in **Figure 033**. Land used beyond its capability is a threat to soil and land condition in the region. Groundcover improvement can be used to reduce land degradation and conserve soil moisture and is ideally required even in times of drought when the drivers of wind erosion are most severe.

**Land Use & Land Soil Capability (LSC) within Tamworth LGA**

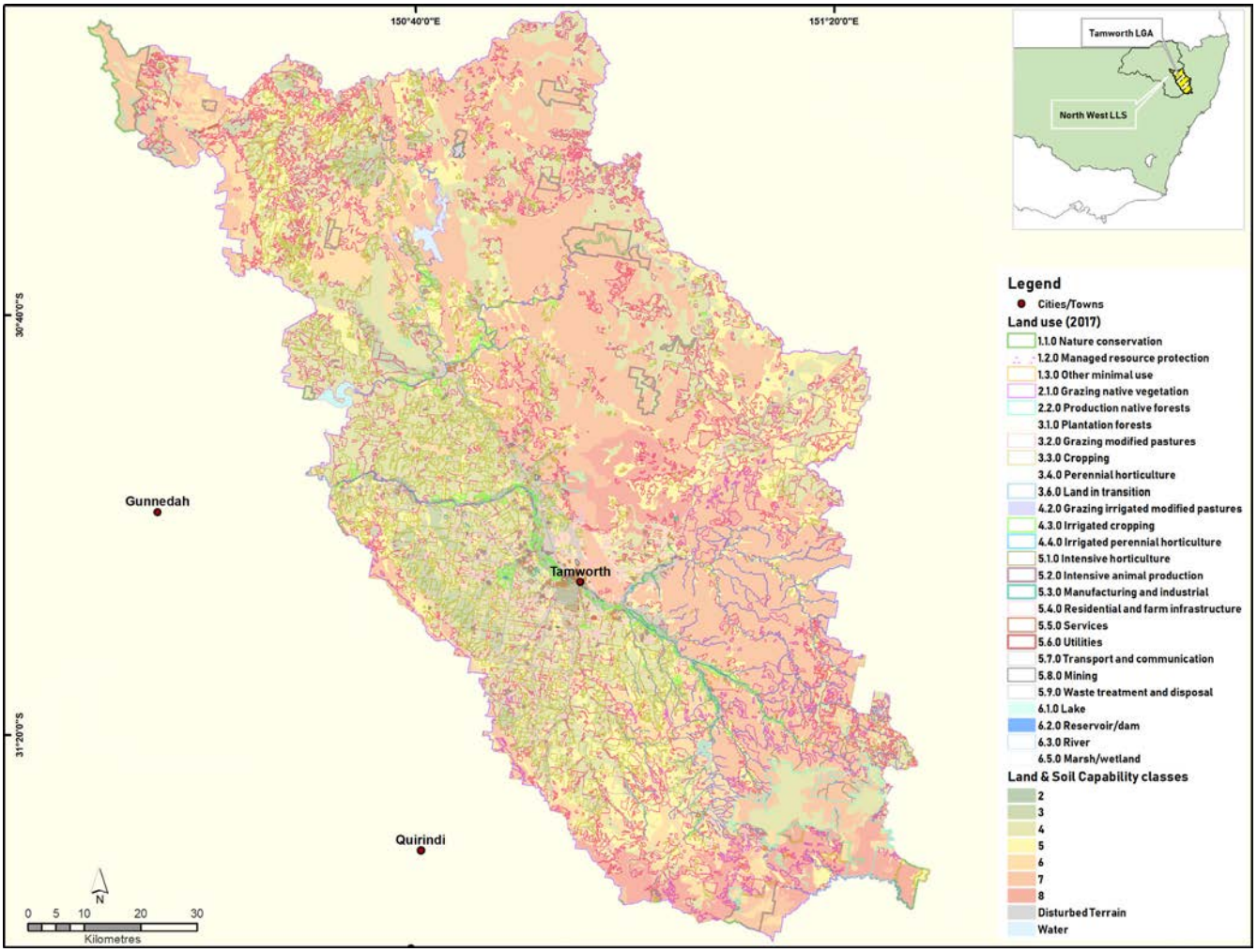



**Figure 033 Soil, Land Capability and Land Use in the Tamworth Subregion**

### 3.2.3 WATER

Water assets in the Tamworth Subregion include 3,977 ha of water reservoirs (each greater than 1 ha). These include the major storages of Chaffey, Dungowan, Split-Rock and Keepit Dams.

Major rivers in the Tamworth Subregion include the Peel, McDonald and Namoi Rivers. These rivers have a combined length of 582 km in the subregion, 44% of which is vegetated. Minor rivers in the subregion have a combined length of 6,788 km, with close to 60% of them vegetated.

Tamworth Subregion supports 42 km2 of mapped wetland vegetation although no named wetlands are included in the data. All surface water assets in the subregion are shown in **Figure 034**.

The Peel Alluvium represents a key groundwater resource in the subregion.

Water security is an ongoing threat to the resilience and sustainability of agriculture and the communities of the Tamworth Subregion.

**Water Resources within Tamworth LGA**

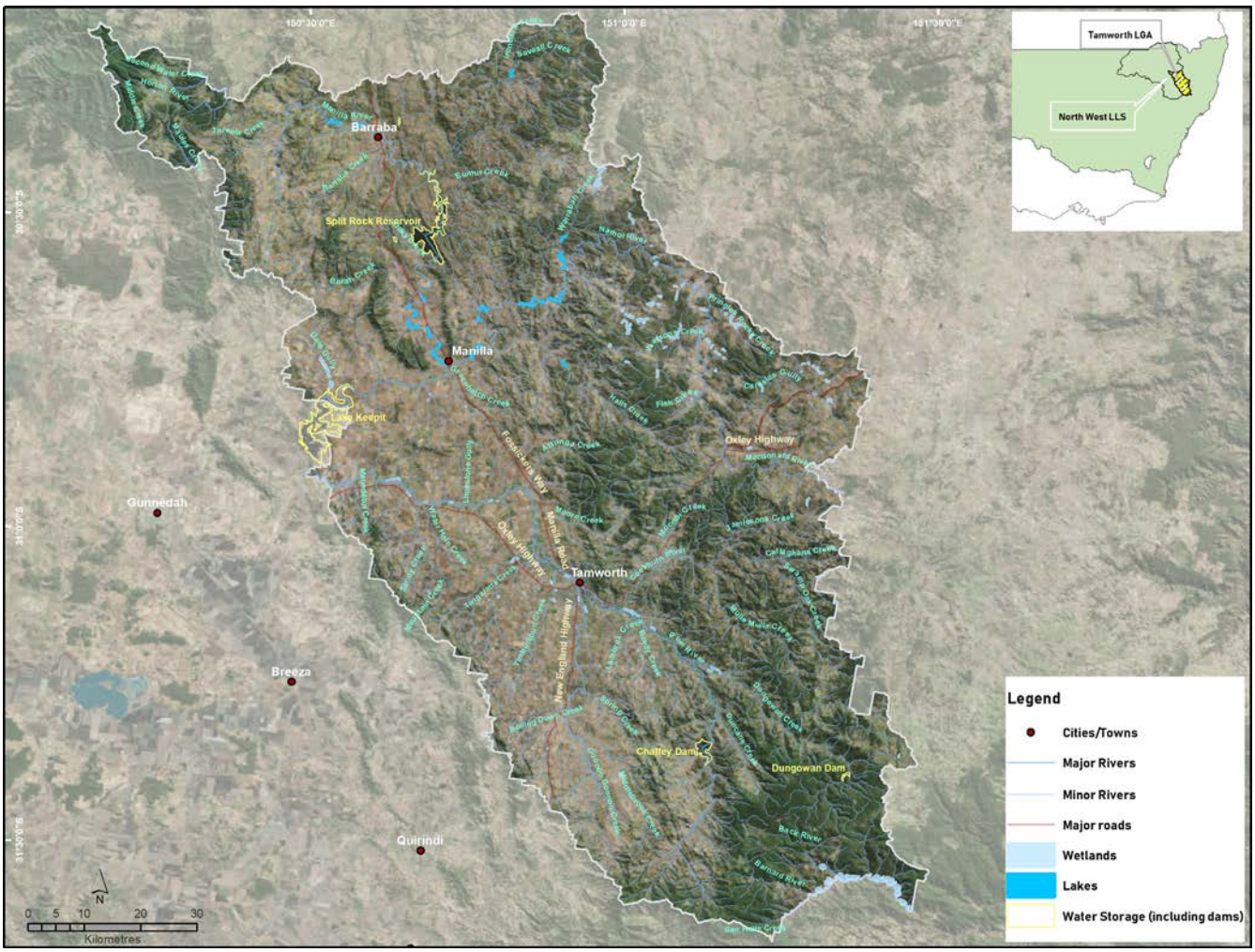



**Figure 034 Water Resource Assets in the Tamworth Subregion**

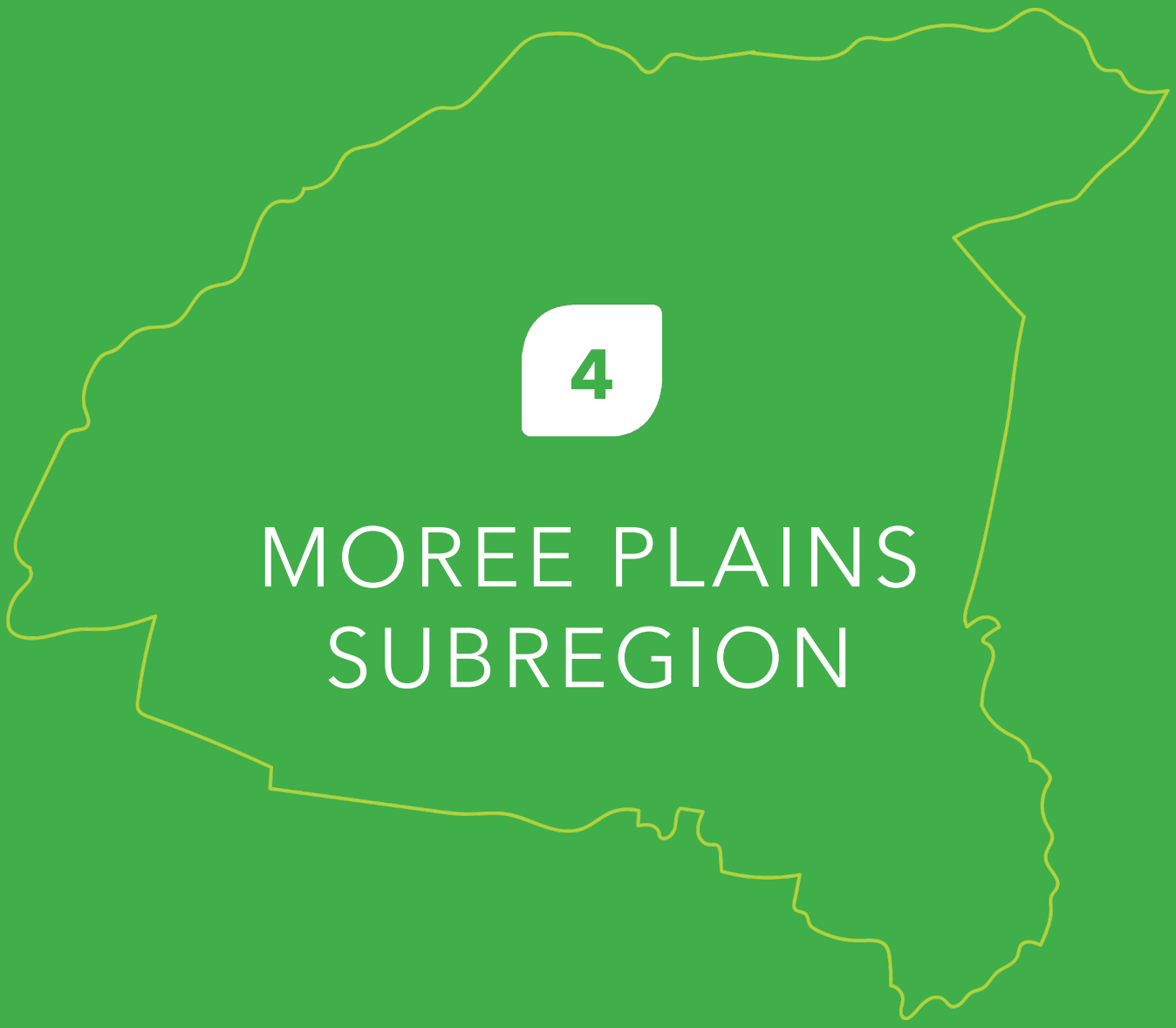
## 3.3 Goals, Targets and Actions

Review of draft whole-of-region goals, targets and actions was undertaken via a community consultation workshop on 3rd June 2019 in Tamworth. At this workshop, community participants chose the following targets as priorities for the Tamworth Subregion (**Table 031**).

The actions for each of these prioritised targets can be found in **Table 021, Table 022 and Table 023**.

# Table 031: Priority Goals and Targets for the Tamworth Subregion

| |
|---|
| **GOAL: Healthy and resilient landscapes sustaining our unique flora and fauna for future generations** |
| **Target 1:** By 2024, there is an increase in native vegetation extent across the North West and in the Tamworth Subregion |
| **Target 2:** By 2024, no further regional vegetation community decreases to less than 30% extent as identified by the 2017 baseline |
| **Target 3:** By 2024, contribute to the recovery of priority Threatened Ecological Communities |
| **Target 4:** By 2024, contribute to the recovery of priority threatened species populations |
| **Target 5:** By 2024, there is an improvement in landscape scale connectivity of native vegetation through targeted revegetation and enhancement to improve resilience in a changing climate |
| **Target 6:** By 2024, no new invasive species are established in the region and the spread of key emerging invasive plants and animals is limited |
| **Target 7:** By 2024, groundcover is maintained at 90% in the Tamworth Subregion |
| **GOAL: Healthy and resilient aquifers, waterways and wetlands** |
| **Target 9:** By 2024, there is an improvement in riparian condition by protecting waterways through improved livestock and vegetation management |
| **Target 10:** By 2024, there is increased support provided to communities to operate within water policy settings to achieve sustainable and efficient water use |
| **Target 11:** By 2024, the ability of groundwater aquifers to support groundwater dependent ecosystems and designated beneficial uses is maintained |
| **GOAL: A region that is healthy, resilient and adaptable to a changing climate** |
| **Target 12:** By 2024, there is an increase in the community's adaptive capacity and social wellbeing across the region to prepare for shocks and threats such those associated with as climate change |
| **GOAL: Sustainable, productive, profitable and progressive agriculture** |
| **Target 13:** By 2024, there is an increase in the number of community members undertaking practice change to improve natural resource management and achieve sustainable, productive, profitable and progressive agriculture |
| **GOAL: Aboriginal people connected to country, culture and heritage** |
| **Target 14:** By 2024, there is an increase in support for Aboriginal people to connect to country and share traditional ecological knowledge with their communities through partnerships and participation in natural resource management |



4

# MOREE PLAINS SUBREGION

# 4.1 Description of Moree Plains Subregion

Moree Plains Subregion is coincident with Moree Plains LGA. Its regional centre is Moree, which is located 510 km north of Sydney and 380 km south-west of Brisbane. An overview map is presented in **Figure 041**.

Moree Plains Subregion covers an area of approximately 17,930 km2 and according to Census data, had a population of 13,159 in 2016. The subregion's Indigenous residents make up approximately 21.6% of the total population. The Indigenous people of the area belong to the second largest Aboriginal nation on the eastern coast of Australia, the Kamilaroi people. The township of Moree has a population of over 9,000 people and is the largest centre in the subregion. Other villages include Ashley, Biniguy, Boggabilla, Boomi, Bullarah, Garah, Gurley, Mungindi, Pallamallawa, Terry Hie Hie and Weemelah. Aboriginal communities managed by LALCs are located at Toomelah, near Boggabilla, and at Mehi Crescent and Stanley Village in Moree.

The Moree Plains Subregion is characterised by its black soil plains that supports cultivation agriculture. The subregion has strong agricultural industries in cotton, wheat, sorghum, soybeans, chickpeas, oilseeds and livestock. With a gross regional productivity of more than $750 million, Moree Plains Subregion is one of the most agriculturally productive regions in Australia. Major rivers within the subregion include the Mehi, Gwydir, Barwon and Macintyre Rivers. These rivers are all regulated via the major storage of Copeton Dam, providing irrigation allocations to the major cropping industries.

The bore water of the Great Artesian Basin is a major tourist attraction and community asset in the Moree region. In contrast to much of inland Australia, there is an abundant supply of groundwater as the area overlies a portion of the Great Artesian Basin and has access to extensive artesian and sub-artesian underground water resources.

Key assets of the Moree Plains Subregion include the richly fertile alluvial floodplain soils, the travelling stock routes and reserve network, the Great Artesian Basin and local aquifers, as well as numerous rivers and watercourses. The natural drainage system also includes many wetlands of high environmental and Aboriginal cultural significance, linking the Dromana Wetlands, Bunnor Wetlands, Morella Lagoon, Boobera Lagoon, Bundabina Falls, Collymongle Lagoon, Butti Lagoon and the Meeki Creek Billabong. The wetlands include individual sites that comprise the broader Gwydir wetland system, including a number of Ramsar listed sites.

The high value and diversity in cropping and livestock enterprises in the region support a high level of adaptive capacity of the local people, at least in terms of financial capital. However native vegetation cover is low and conservation reserves account for only 4% of the subregion's area. Priorities for this subregion are land use degradation risk, salinity-hazard, riparian restoration and vegetation management.

## SUBREGION PROFILE

**Regional Centre Location:**

510km north of Sydney
380km south-west of Brisbane

**Size:**

17,930 km2

**Population:**

13,159 (2016)

**Gross Regional Product:**

$750 million

# 4.2 Assets

## 4.2.1 NATIVE VEGETATION

The Moree Plains Subregion is one of the most heavily cleared in the North West region, with 80.6% of the original extent of native vegetation removed since European settlement. Only 4% of land is protected in conservation reserves and state forests (e.g. Terry Hie Hie, Berrygill, Careunga and Courallie), thus protection and restoration of native vegetation is a priority for the Moree Plains Subregion. This was confirmed during community consultation and is supported by scientific evidence.

Moree Plains Subregion has numerous TSRs, many of which have significant values (**Figure 041**). Main threats to vegetation and the biodiversity it supports include ongoing clearing for agricultural development, pest animal and domestic attack on native fauna, degradation of condition of vegetation communities due to weeds and pests, and long-term impacts of climate change.

### Moree Plains Local Government Area (LGA)

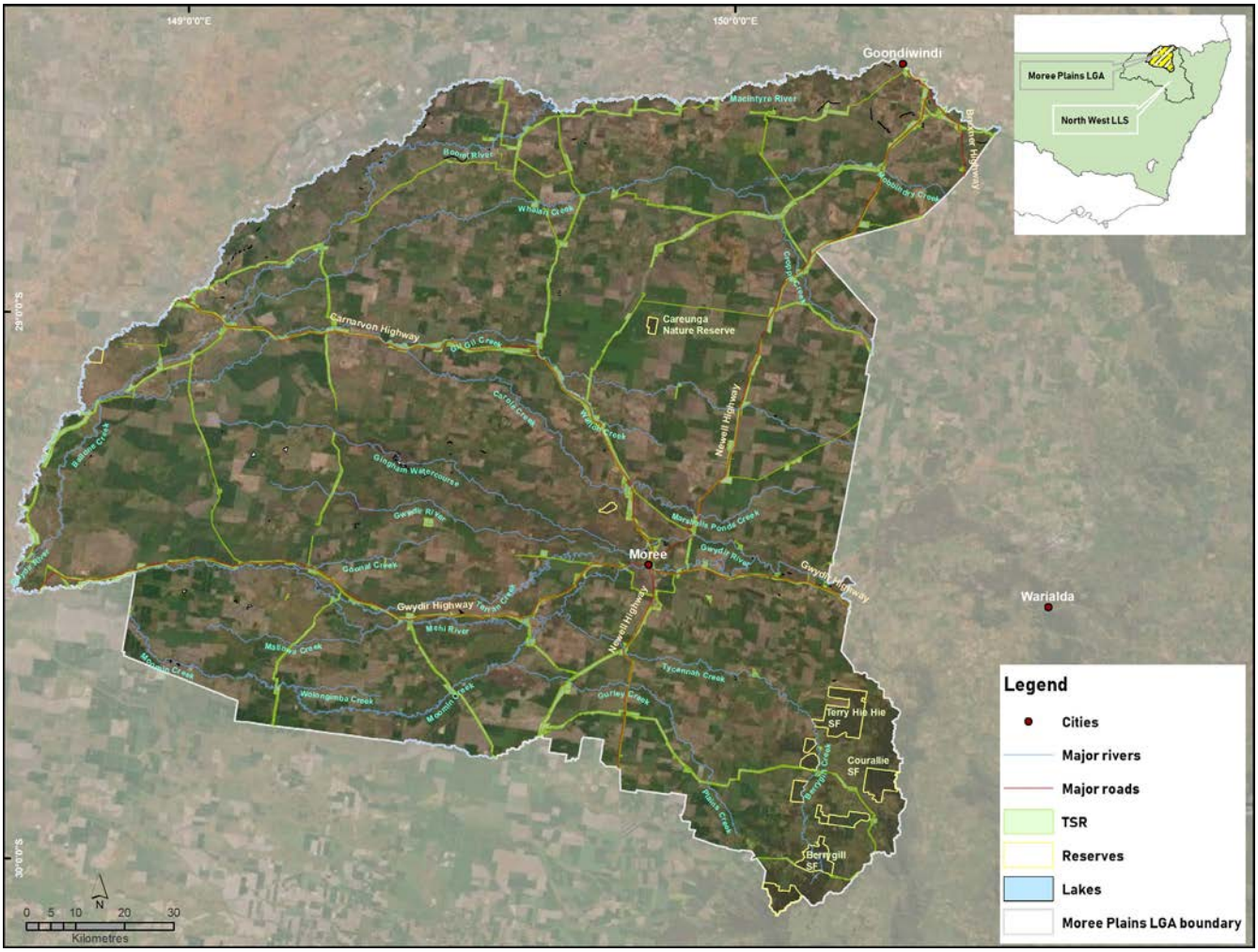



**Figure 041 Map of the Moree Plains Subregion**

Regional vegetation communities that are either close to the 70%-cleared threshold or are equivalent to a threatened ecological community are identified as priorities for protection and enhancement under this Plan. Landscape corridors are also recognised as priorities for protection, enhancement (green areas) and targeted revegetation (orange areas) under this Plan. **Figure 042** shows the extent of these priority areas within Moree Plains Subregion. While these areas may provide a strategic focus for actions and achievement of targets under this Plan, actions should be undertaken in any part of the subregion, should opportunities arise, as long as those actions are consistent with the Plan and represent good investment value.

**Priority areas in Moree Plains LGA for ecosystem protection & enhancement and revegetation**

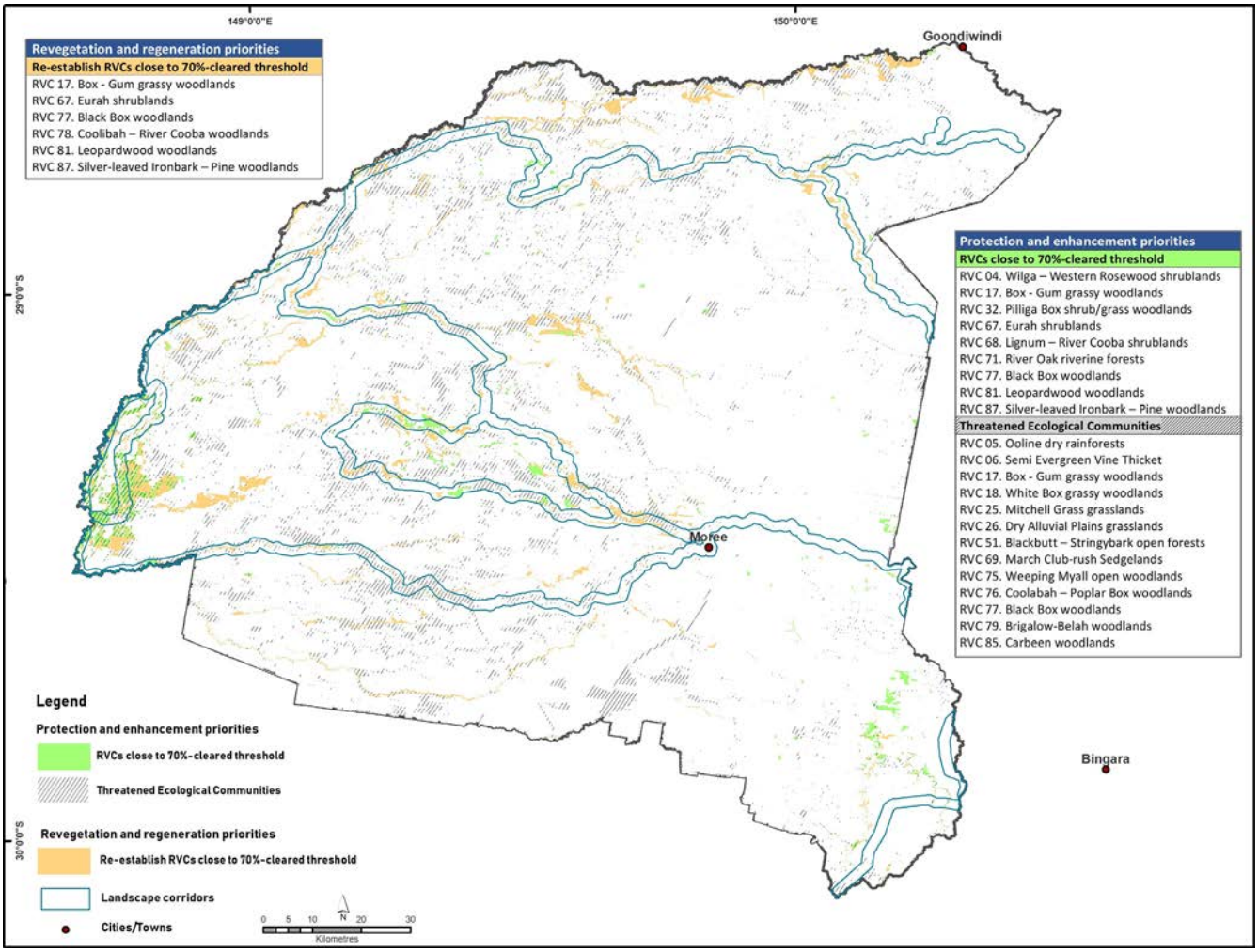



**Figure 042 Vegetation Priorities in the Moree Plains Subregion (green areas representing areas for protection and enhancement, orange areas are areas prioritised for revegetation works)**

## 4.2.2 LAND USE AND SOIL CAPABILITY

Land use and soil and land capability in the Moree Plains Subregion are illustrated in **Figure 043**. Much of the subregion is class 2, 3 and 4. Coupled with the regulated water resources, Moree Plains Subregion is an area known for its valuable agricultural productivity. However, land used beyond its capability is a threat to soil and land condition in the region. Groundcover improvement can be used to reduce land degradation and conserve soil moisture and is ideally required even in times of drought when the drivers of wind erosion are most severe.

**Land Use & Land Soil Capability (LSC) within Moree Plains LGA**

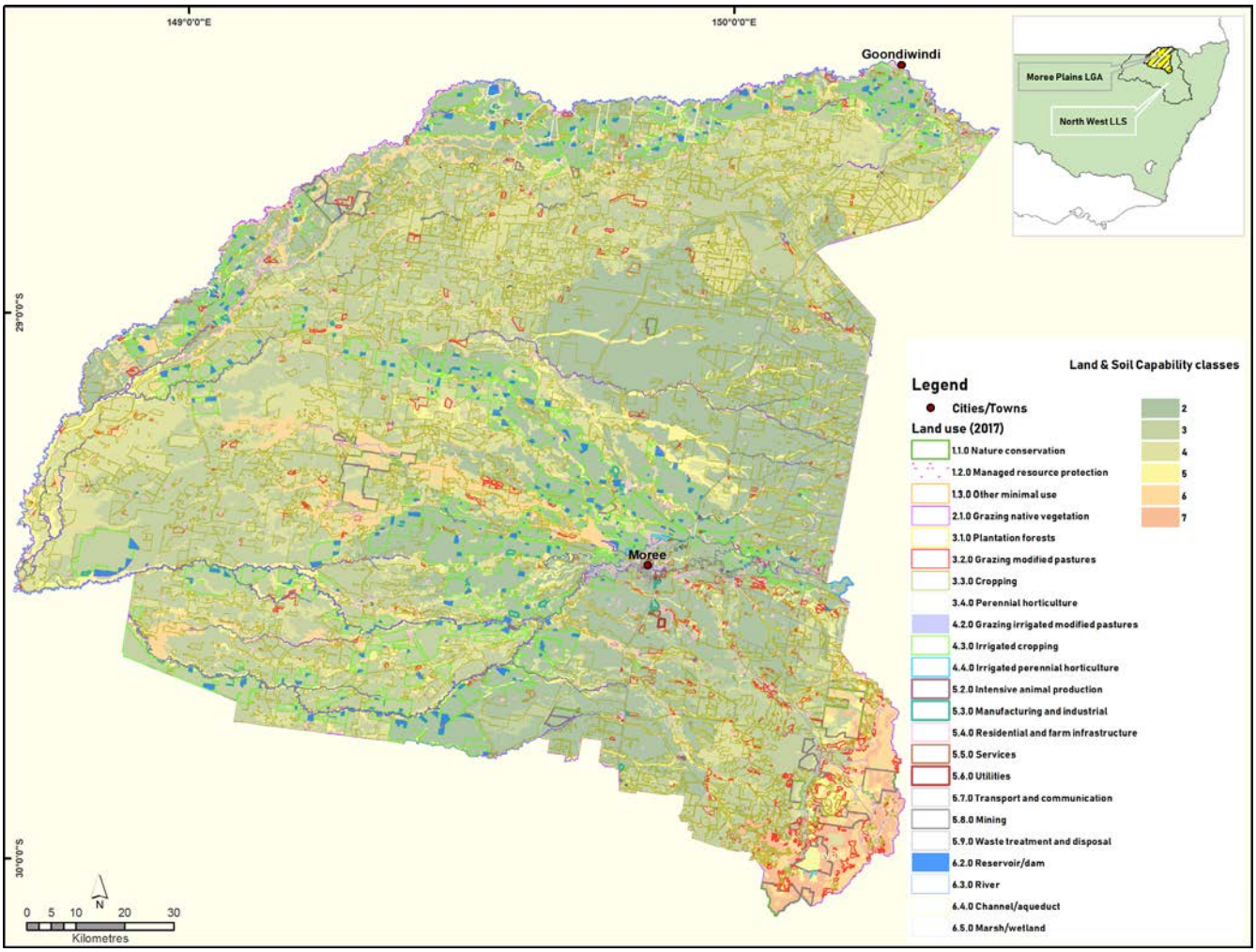



**Figure 043 Soil, Land Capability and Land Use in the Moree Plains Subregion**

## 4.2.3 WATER

Water resources are critical for the agricultural and natural systems in the Moree Plains Subregion. The total length of major river in the region is 2,132 km (Gwydir, Mehi, MacIntyre and Barwon Rivers), 71% of which is vegetated. These rivers are located downstream of Copeton Dam, which is critically important infrastructure for irrigation development that has occurred in the region.

In addition to major rivers, a combined length of 4,438 km of minor river occur in the region, 53% of which are vegetated. The region also has 8.6 km2 of Ramsar-listed wetlands (Gwydir River Floodplains: Crinolyn, Goddard's Lease, Old Dromana and Windella Ramsar sites). All surface water assets are illustrated in **Figure 044**.

Major aquifers of the Moree Plains Subregion include the Gwydir Unregulated Alluvium, Lower Gwydir Groundwater, NSW Border Rivers Alluvial, NSW Great Artesian Basin Groundwater and Shallow groundwater, NSW Murray Darling Basin Fractured Rock Groundwater and the NSW Murray-Darling Basin Porous Rock Groundwater. These assets have also been essential for regional development, both in terms of agriculture and tourism.

**Water Resources within Moree Plains LGA**

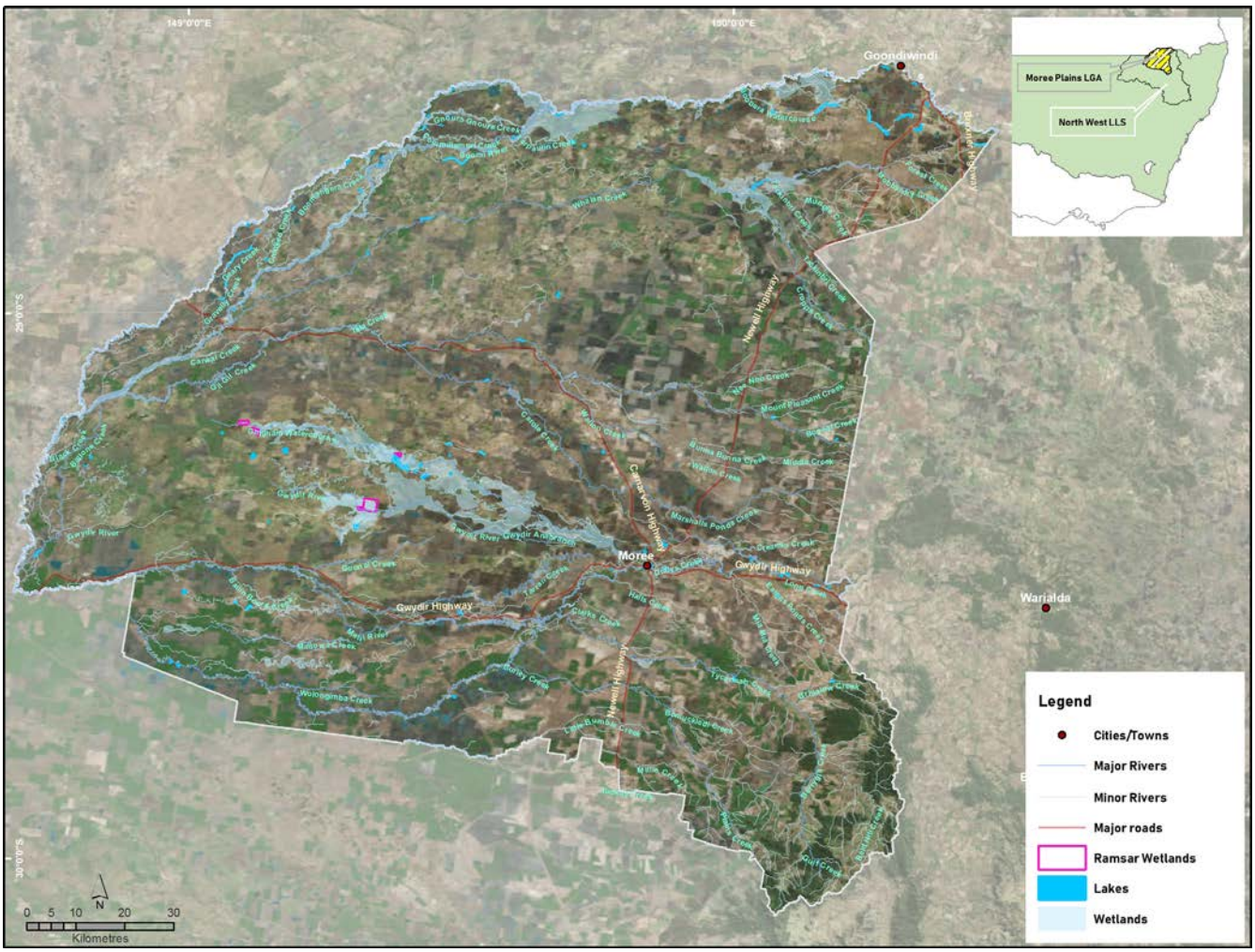



**Figure 044 Water Resource Assets in the Moree Plains Subregion**

## 4.3 Goals, Targets and Actions

Review of draft whole-of-region goals, targets and actions was undertaken via a community consultation workshop on 23rd May 2019 in Moree. At this workshop, community participants chose the following targets as priorities for the Moree Plains Subregion (**Table 041**).

The actions for each of these prioritised targets can be found in **Table 021, Table 022 and Table 023.**

# Table 041: Priority Goals and Targets for the Moree Plains Subregion

| |
|---|
| **GOAL: Healthy and resilient landscapes sustaining our unique flora and fauna for future generations** |
| **Target 1:** By 2024, there is an increase in native vegetation extent across the North West and in the Moree Plains Subregion |
| **Target 5:** By 2024, there is an improvement in landscape scale connectivity of native vegetation through targeted revegetation and enhancement to improve resilience in a changing climate |
| **Target 6:** By 2024, no new invasive species are established in the region and the spread of key emerging invasive plants and animals is limited |
| **Target 7:** By 2024, groundcover is maintained at 70% in the Moree Plains Subregion |
| **GOAL: Healthy and resilient aquifers, waterways and wetlands** |
| **Target 8:** By 2024, there is an improvement in the condition of RAMSAR and regionally important wetlands and the extent of those wetlands is maintained |
| **Target 9:** By 2024, there is an improvement in riparian condition by protecting waterways through improved livestock and vegetation management |
| **Target 10:** By 2024, there is increased support provided to communities to operate within water policy settings to achieve sustainable and efficient water use |
| **Target 11:** By 2024, the ability of groundwater aquifers to support groundwater dependent ecosystems and designated beneficial uses is maintained |
| **GOAL: A region that is healthy, resilient and adaptable to a changing climate** |
| **Target 12:** By 2024, there is an increase in the community's adaptive capacity and social wellbeing across the region to prepare for shocks and threats such those associated with as climate change |
| **GOAL: Sustainable, productive, profitable and progressive agriculture** |
| **Target 13:** By 2024, there is an increase in the number of community members undertaking practice change to improve natural resource management and achieve sustainable, productive, profitable and progressive agriculture |
| **GOAL: Aboriginal people connected to country, culture and heritage** |
| **Target 14:** By 2024, there is an increase in support for Aboriginal people to connect to country and share traditional ecological knowledge with their communities through partnerships and participation in natural resource management |

5

# LIVERPOOL PLAINS SUBREGION

# 5.1 Description of Liverpool Plains Subregion

The Liverpool Plains Subregion is coincident with Liverpool Plains LGA. Its regional centre, Quirindi, is located 270 km north of Sydney and 500 km south-west of Brisbane. An overview map is presented in **Figure 051**.

Liverpool Plains Subregion covers 5,086 km2 and sits in the north-western slopes of NSW. The local population of 7,874 reside across the townships of Quirindi, Willow Tree, Werris Creek and Currabubula.

This subregion incorporates some of the most productive agricultural land in Australia, with rich black soil plains underlain by extensive ground water resources. The subregion is also part of the Gunnedah Basin coal field.

The local economy has traditionally been driven by the agricultural sector, with coal mining having an increasing influence over the past decade. The region's dependence on agriculture and to a lesser extent mining, exposes it to the 'boom and bust' cycles in both sectors. The local economy is also exposed to the structural changes occurring within the agricultural community resulting from the introduction of the Murray-Darling Basin Plan and the progressive reduction in surface and ground water allocations for agricultural use. The direct competition of nearby centre Tamworth to local retail, service and education sectors is also a challenge for the Liverpool Plains community.

Key drivers for change in the subregion are considered by the community to be shifts in the socio-economic profile of the region, water availability, climate change and government policy. The issues associated with socio-economic change are identified as mining (long-wall and open-cut), changing demographics, cost-pressures of production, land use change and global economics. Climate change is of concern, particularly in relation to extreme weather events and increased variability, mostly drought but also flood and fire. Government is seen as a key driver of change through policy, legislation, planning and compliance (Namoi CMA 2013).

## SUBREGION PROFILE

**Regional Centre Location:**

270km north of Sydney
500km south-west of Brisbane

**Size:**

5,086 km2

**Population:**

7,874

# 5.2 Assets

## 5.2.1 NATIVE VEGETATION

Since European settlement in the mid-1800s the Liverpool Plains Subregion has lost 70% of its native vegetation extent due to agricultural development, and more recently, mining developments and exploration. However, there are a number of important public land reserves in the area including the eastern edge of Trinkey, Pine Ridge and Spring Ridge State Forests, and Wallabadah Nature Reserve. Coolah Tops National Park, on the southern border of the subregion, is part of the Liverpool Ranges that contributes to an important landscape corridor network. Several TSRs also contribute to connectivity across this landscape (**Figure 051**).

### Liverpool Plains Local Government Area (LGA)

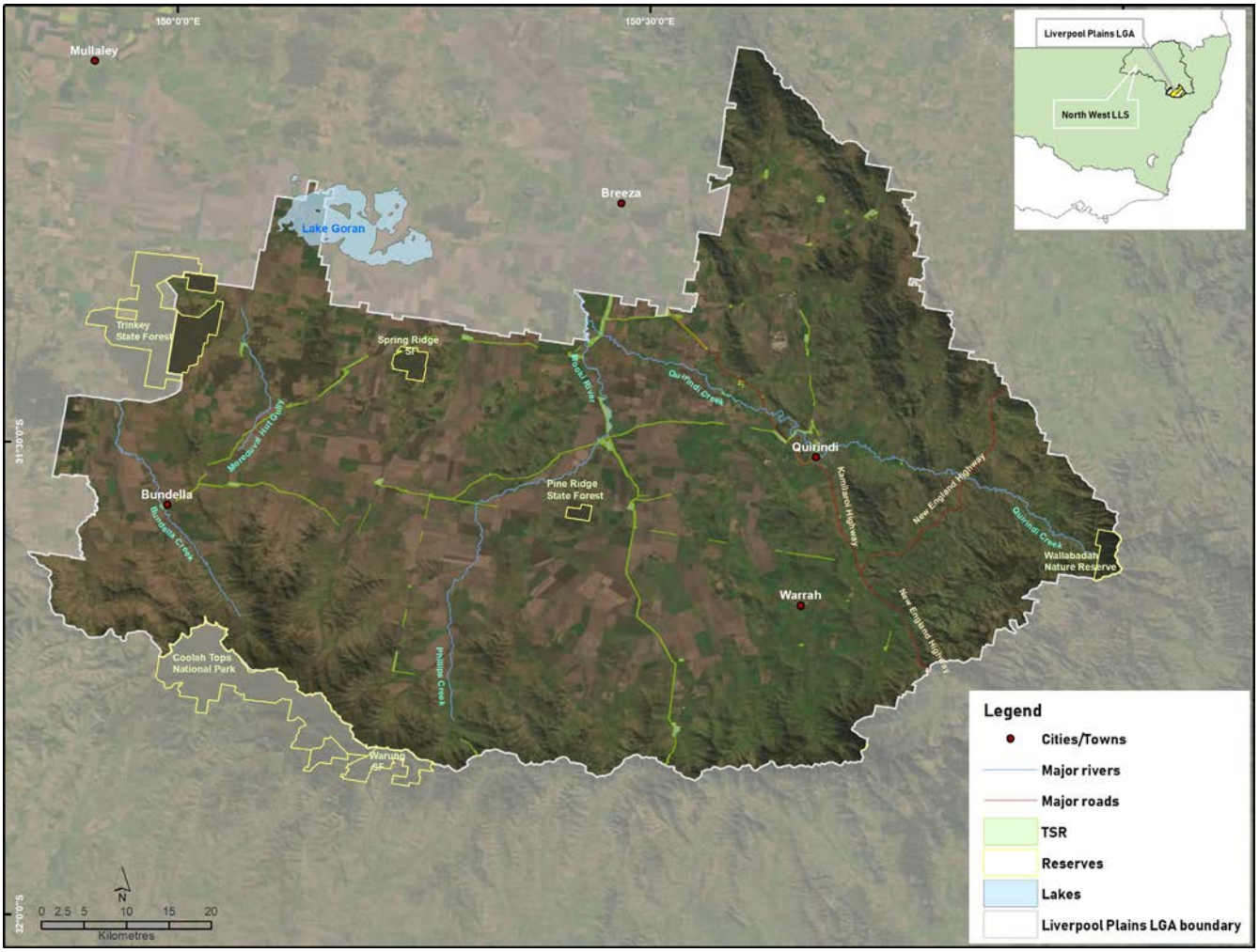



Figure 051 Map of the Liverpool Plains Subregion

Regional vegetation communities that are either close to the 70%-cleared threshold or are equivalent to a threatened ecological community are identified as priorities for protection and enhancement under this Plan. RVC 18 (White Box grassy woodlands- equivalent to box-gum grassy woodland TEC) is a key vegetation type for action in the subregion. Landscape corridors are also recognised as priorities for protection, enhancement (green areas) and targeted revegetation (orange areas) under this Plan. **Figure 052** shows the extent of these priority areas within Liverpool Plains Subregion. While these areas may provide a strategic focus for actions and achievement of targets under this Plan, actions should be undertaken in any part of the subregion should opportunities arise, as long as those actions are consistent with the Plan and represent good investment value.

**Priority areas in Liverpool Plains LGA for ecosystem protection & enhancement and revegetation**

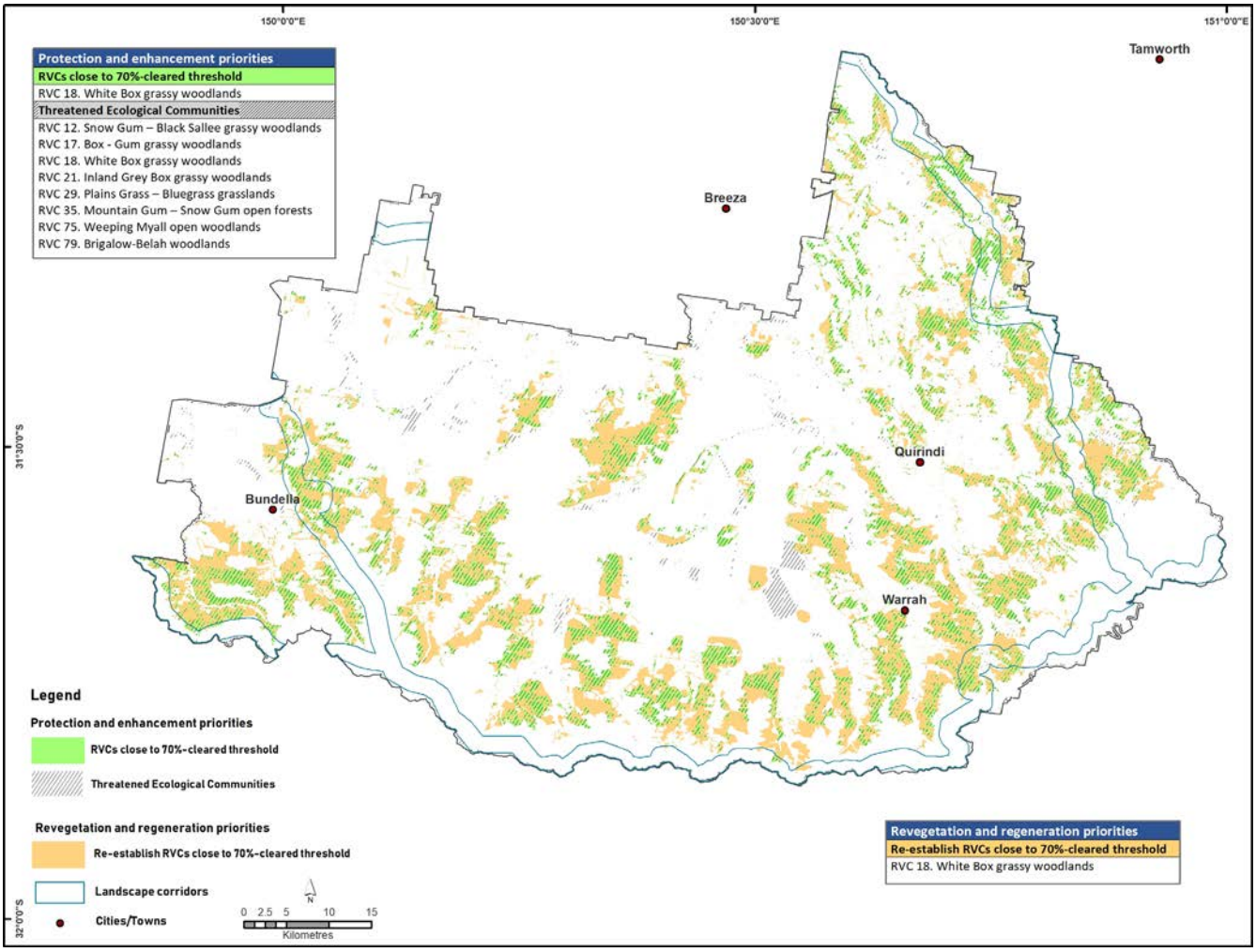



**Figure 052 Vegetation Priorities in the Liverpool Subregion (green areas representing areas for protection and enhancement, orange areas are areas prioritised for revegetation works)**

## 5.2.2 LAND USE AND SOIL CAPABILITY

Land use and soil and land capability in the Liverpool Plains Subregion are illustrated in **Figure 053**. Much of the subregion is class 2, 3 and 4. Coupled with the Upper Namoi groundwater resource, the Liverpool Plains is an area known for its valuable agricultural productivity. However, land used beyond its capability is a threat to soil and land condition in the region. Groundcover improvement can be used to reduce land degradation and conserve soil moisture and is ideally required even in times of drought when the drivers of wind erosion are most severe.

**Land Use & Land Soil Capability (LSC) within Liverpool Plains LGA**

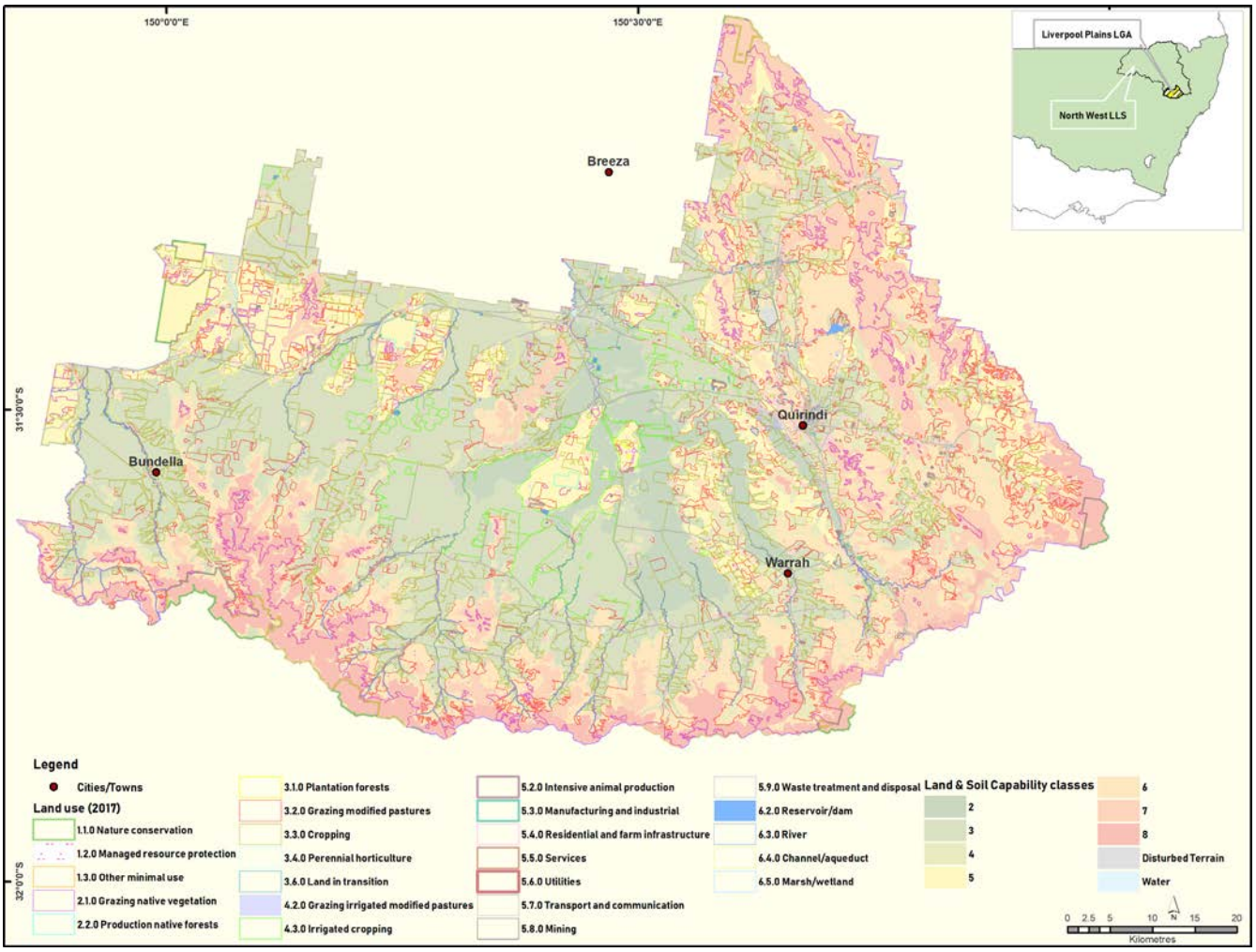



**Figure 053 Soil, Land Capability and Land Use in the Liverpool Plains Subregion**

## 5.2.3 WATER

The Liverpool Plains Subregion contains six major rivers with a combined length of 215 km and hundreds of minor creeks with a combined length of 3,010 km, 39% of which remain vegetated.

There are a number of wetlands in the subregion, including a part of Goran Lake a large ephemeral and significant waterbody occurring in the north-west of the subregion. All surface water assets in the Liverpool Plains Subregion are shown in **Figure 054**.

The Upper Namoi Alluvium is a major groundwater resource for the Liverpool Plains. However, there is an absence of major water storages serving the region thus agriculture is highly dependent on the alluvial groundwater that lies beneath the volcanic soils.

**Water Resources within Liverpool Plains LGA**

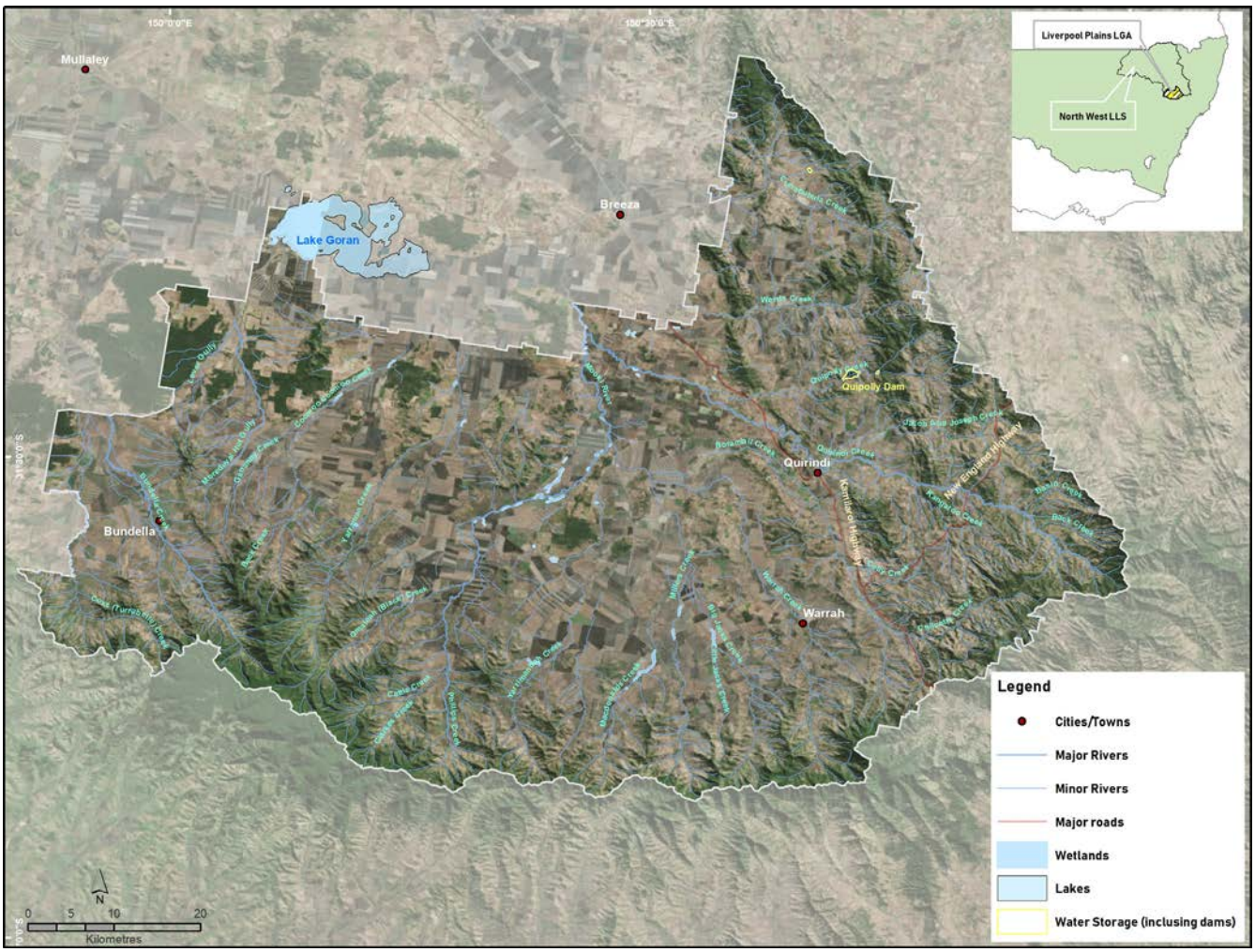



**Figure 054 Water Resource Assets in the Liverpool Plains Subregion**

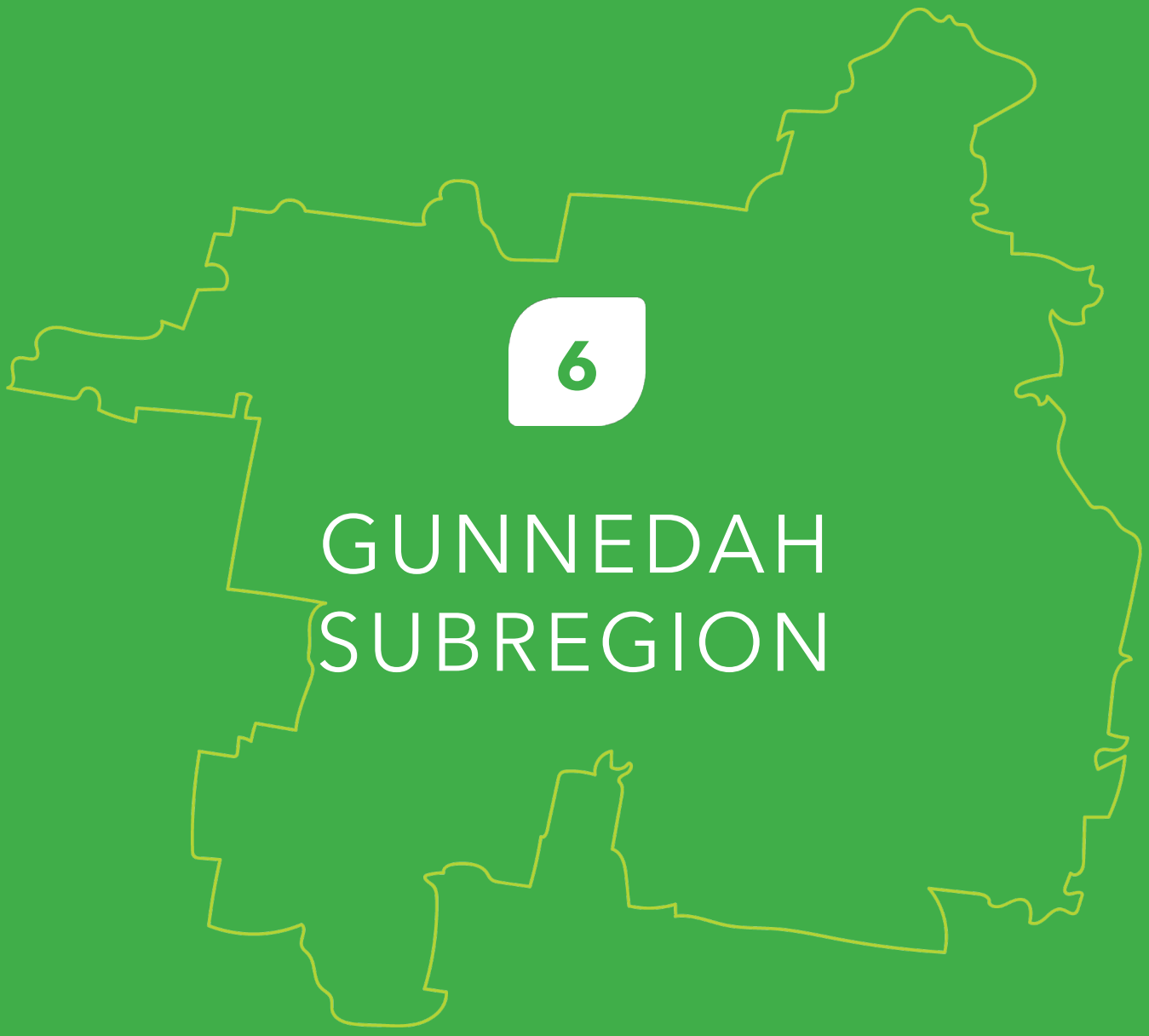
## 5.3 Goals, Targets and Actions

Review of draft whole-of-region goals, targets and actions was undertaken via a community consultation workshop on 4th June 2019 in Quirindi. At this workshop, community participants chose the following targets as priorities for the Liverpool Plains Subregion (**Table 051**).

The actions for each of these prioritised targets can be found in **Table 021, Table 022 and Table 023.**

# Table 051: Priority Goals and Targets for the Liverpool Plains Subregion

| |
|---|
| **GOAL: Healthy and resilient landscapes sustaining our unique flora and fauna for future generations** |
| **Target 1:** By 2024, there is an increase in native vegetation extent across the North West and in the Liverpool Plains Subregion |
| **Target 2:** By 2024, no further regional vegetation community decreases to less than 30% extent as identified by the 2017 baseline |
| **Target 3:** By 2024, contribute to the recovery of priority Threatened Ecological Communities |
| **Target 4:** By 2024, contribute to the recovery of priority threatened species populations |
| **Target 5:** By 2024, there is an improvement in landscape scale connectivity of native vegetation through targeted revegetation and enhancement to improve resilience in a changing climate |
| **Target 6:** By 2024, no new invasive species are established in the region and the spread of key emerging invasive plants and animals is limited |
| **Target 7:** By 2024, groundcover is maintained at 90% in the Liverpool Plains Subregion |
| **GOAL: Healthy and resilient aquifers, waterways and wetlands** |
| **Target 9:** By 2024, there is an improvement in riparian condition by protecting waterways through improved livestock and vegetation management |
| **Target 10:** By 2024, there is increased support provided to communities to operate within water policy settings to achieve sustainable and efficient water use |
| **Target 11:** By 2024, the ability of groundwater aquifers to support groundwater dependent ecosystems and designated beneficial uses is maintained |
| **GOAL: A region that is healthy, resilient and adaptable to a changing climate** |
| **Target 12:** By 2024, there is an increase in the community's adaptive capacity and social wellbeing across the region to prepare for shocks and threats such those associated with as climate change |
| **GOAL: Sustainable, productive, profitable and progressive agriculture** |
| **Target 13:** By 2024, there is an increase in the number of community members undertaking practice change to improve natural resource management and achieve sustainable, productive, profitable and progressive agriculture |
| **GOAL: Aboriginal people connected to country, culture and heritage** |
| **Target 14:** By 2024, there is an increase in support for Aboriginal people to connect to country and share traditional ecological knowledge with their communities through partnerships and participation in natural resource management |



6

# GUNNEDAH SUBREGION

# 6.1 Description of Gunnedah Subregion

Gunnedah Subregion is coincident with Gunnedah LGA and incorporates part of the Liverpool Plains. The regional centre Gunnedah, is located 330 km from Sydney and 480 km south-west of Brisbane. An overview map is presented in **Figure 061**.

The Gunnedah Subregion covers 4,994 km2 of mostly agricultural land and includes the major town of Gunnedah and smaller villages of Curlewis, Breeza, Carroll, Mullaley, Emerald Hill, Tambar Springs, and Kelvin. The population continues to grow due to the extractive industries, with a current population of around 12,550 people. The projected population of the area in 2021 is 13,073 (NSW Heathstat 2018). The gross regional product has also grown in the last year by 6.7% ($0.7 billion 2017/18 Gunnedah Shire Council Annual Report).

Gunnedah Subregion is considered to be one of the richest pockets of agricultural land and also sits on one of Australia's richest mineral seams, the Gunnedah Basin. Mining has existed in the region for over 150 years and recent growth in the resources sector (coal mining and coal seam gas extraction) has resulted in significant land use conflicts.

Agricultural industries in the region include pasture for grazing, dryland cereal for grain or seed and cotton production. The Mooki River rises at the junction of Omaleah Creek and Phillips Creek below the Liverpool Range, south-west of Quirindi, which is joined by three minor tributaries, before reaching its confluence with the Namoi River north-east of Gunnedah. The flow of the Namoi River is impacted by Lake Keepit and Split Rock Dam.

Gunnedah is the only subregion with a Koala Plan of Management in place. This plan was commissioned by the North West LLS to help protect and manage this iconic species and its habitat. The Koala is a key tourism attraction for the area.

Key drivers for change in the subregion are considered by the community to be shifts in the socio-economic profile of the region, water availability, climate change and government policy. The issues associated with socio-economic change are identified as mining and coal seam gas, changing demographics, cost-pressures of production, land use change and global economics. Climate change is of concern, particularly in relation to extreme weather events and increased variability, mostly drought but also flood and fire. Government is seen as a key driver of change through policy, legislation, planning and compliance (Namoi CMA 2013).

## SUBREGION PROFILE

**Regional Centre Location:**

330km north of Sydney
480km south-west of Brisbane

**Size:**

4,994 km2

**Population:**

12, 550

**Gross Regional Product:**

$0.7 billion

# 6.2 Assets

## 6.2.1 NATIVE VEGETATION

The Gunnedah Subregion has lost approximately 81% extant of native vegetation since European settlement as a result of agricultural development and to a lesser degree mining. Much of the remaining vegetation is consolidated within a number of large state forests (Trinkey, Doona, Kelvin, Somerton, Wondoba, Breeza and Kerigle) and the eastern edge of the Pilliga Nature Reserve. There is also a network of important TSRs in the subregion (**Figure 061**).

### Gunnedah Local Government Area (LGA)

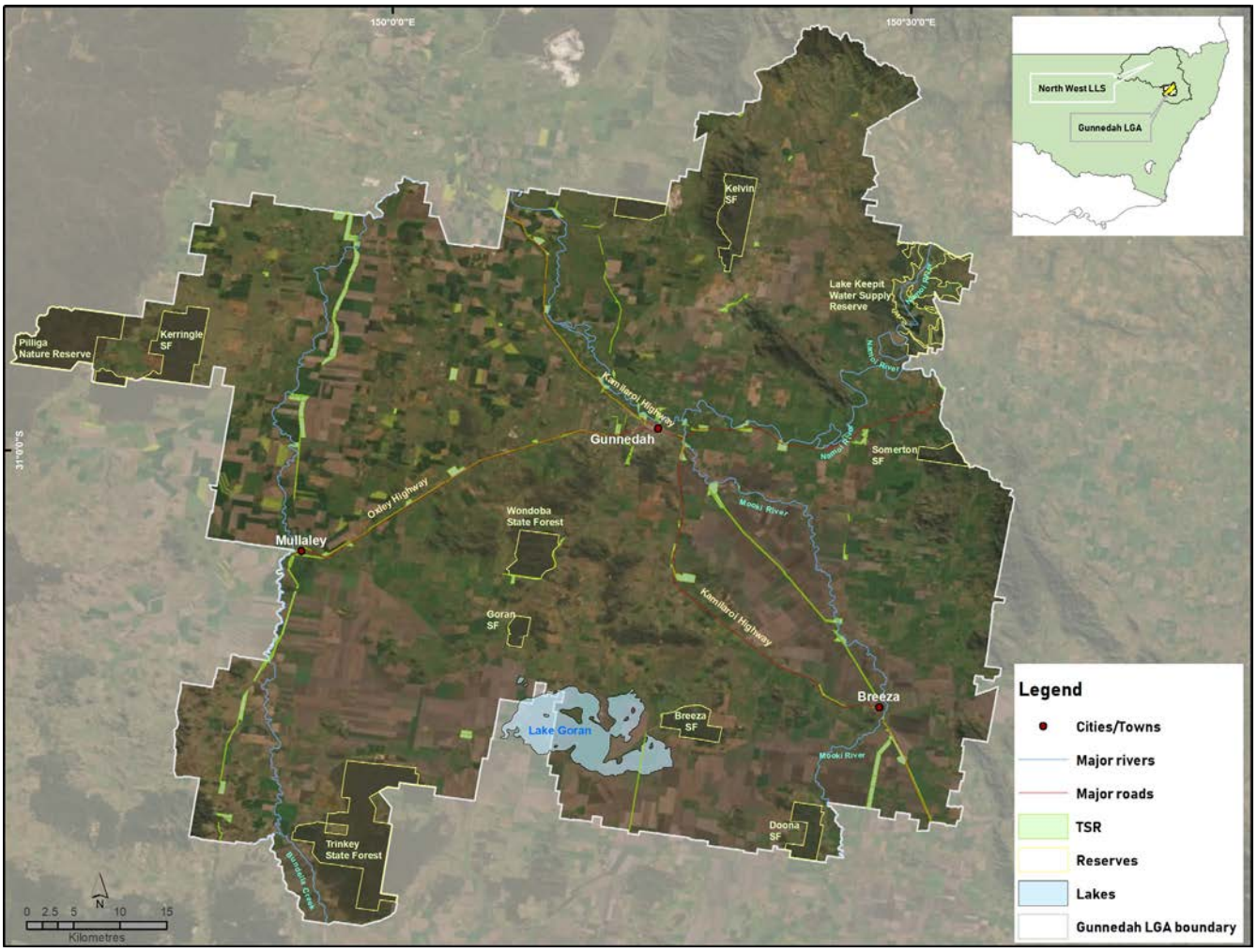



**Figure 061 Map of the Gunnedah Subregion**

There are a number of priority Threatened Ecological Communities in the subregion that can be targeted from protection and enhancement under the Plan. These include Ooline Dry Rainforests, Box Gum Grassy Woodlands and Brigalow-Belah Woodlands (Figure 062). The Red River Gum RVC has been prioritised for protection and enhancement. This RVC and the River Oak RVC have also been targeted for revegetation within and adjacent to the banks of major rivers and streams across the subregion (**Figure 062**).

Landscape corridors are also recognised as priorities for protection, enhancement and targeted revegetation under this Plan (**Figure 062**). Of particular importance to the region is the threatened koala population, which is vulnerable to continued habitat loss and increasing temperatures in a changing climate. The landscape corridors are particularly important for this iconic fauna species.

**Priority areas in Gunnedah LGA for ecosystem protection & enhancement and revegetation**

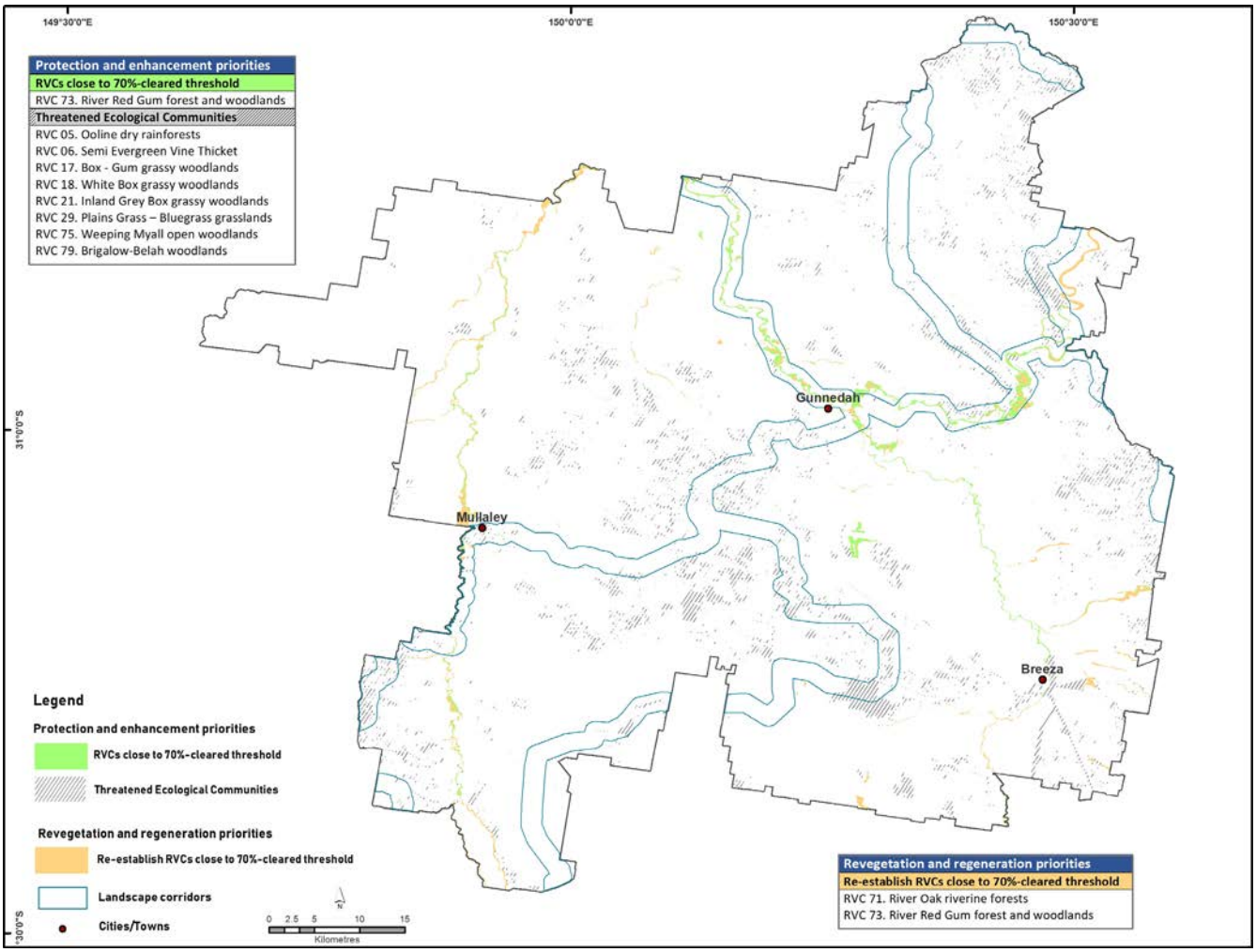



**Figure 062 Vegetation Priorities in the Gunnedah Subregion (green areas representing areas for protection and enhancement, orange areas are areas prioritised for revegetation works)**

## 6.2.2 LAND USE AND SOIL CAPABILITY

Much of the Gunnedah Subregion has land and soil capability classes ranging from 2 to 4 (**Figure 063**), representing fertile black soil plains that support highly valuable agricultural land. Coincident availability of groundwater from the Upper Namoi Alluvium makes this a highly productive cropping landscape. Land used beyond its capability is a threat to soil and land condition in the region. Groundcover improvement can be used to reduce land degradation and conserve soil moisture and is ideally required even in times of drought when the drivers of soil loss are most severe.

### Land Use & Land Soil Capability (LSC) within Gunnedah LGA

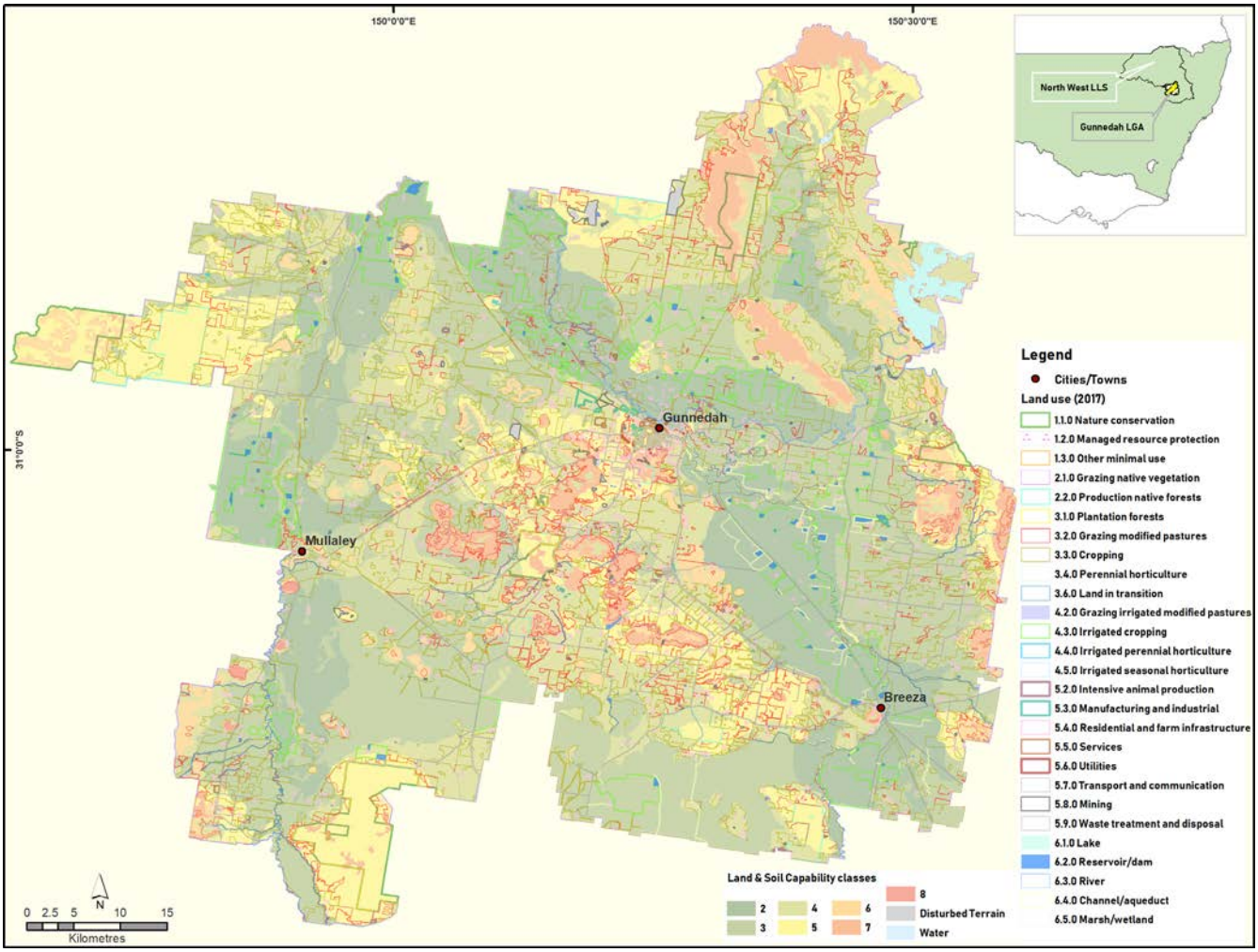



**Figure 063 Soil, Land Capability and Land Use in the Gunnedah Subregion**

## 6.2.3 WATER

Gunnedah Subregion comprises seven major rivers including the Namoi River, with a combined length of 313 km, of which about 30% retains its adjacent vegetation. The subregion also contains many small creeks that total 1,904 km in length. The regionally important wetland Goran Lake is located in the south while Lake Keepit reservoir is located in the east (**Figure 064**), providing regulated water into the Namoi River.

The major aquifer is the Upper Namoi which represents an essential water resource for agriculture and towns.

**Water Resources within Gunnedah LGA**

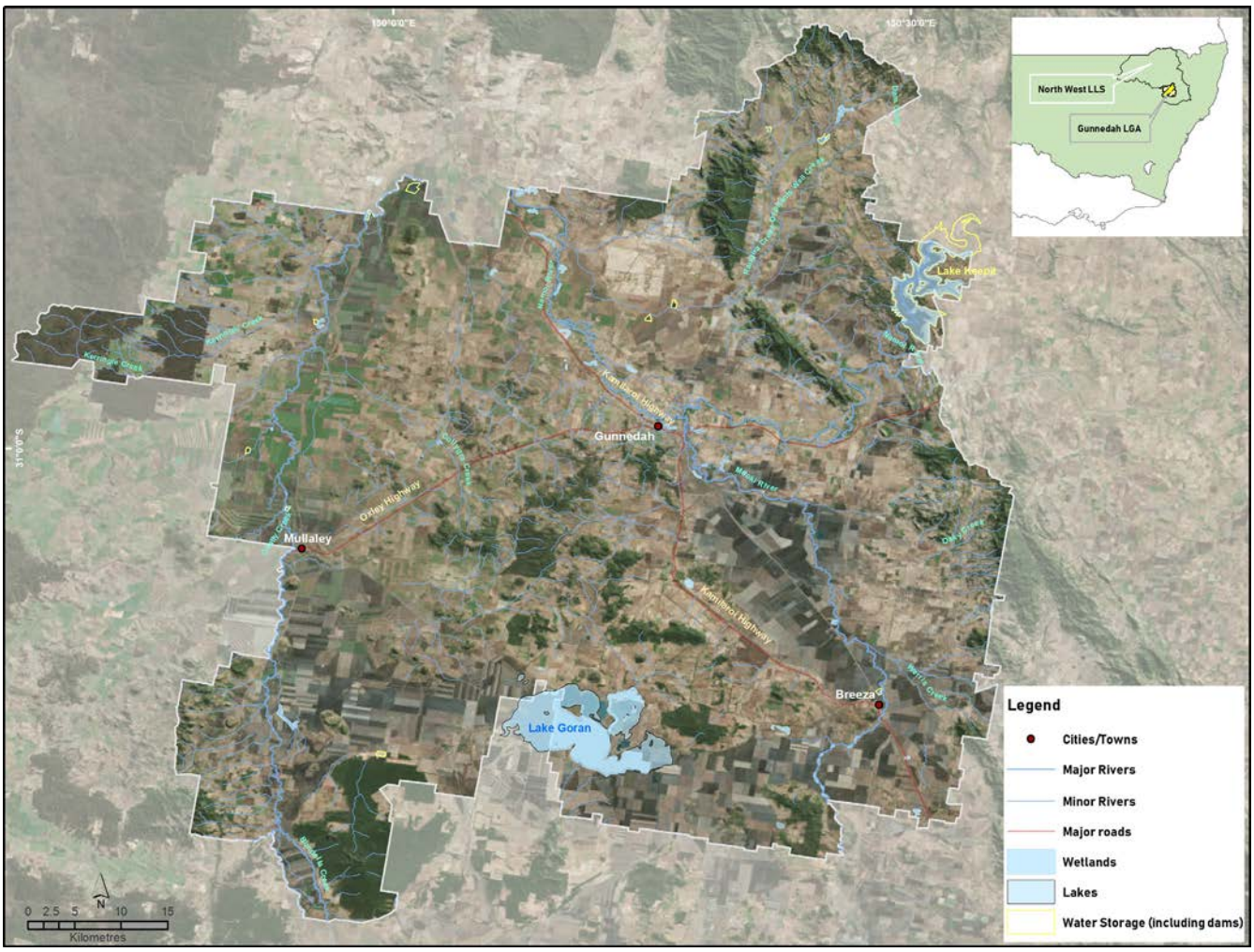



**Figure 064 Water Resource Assets in the Gunnedah Subregion**

## 6.3 Goals, Targets and Actions

Review of draft whole-of-region goals, targets and actions was undertaken via a community consultation workshop on 29th May 2019 in Gunnedah. At this workshop, community participants chose the following targets as priorities for the Gunnedah Subregion (**Table 061**).

The actions for each of these prioritised targets can be found in **Table 021, Table 022 and Table 023.**

# Table 061: Priority Goals and Targets for the Gunnedah Subregion

| GOAL: Healthy and resilient landscapes sustaining our unique flora and fauna for future generations |
|---|
| **Target 1:** By 2024, there is an increase in native vegetation extent across the North West and in the Gunnedah Subregion |
| **Target 2:** By 2024, no further regional vegetation community decreases to less than 30% extent as identified by the 2017 baseline |
| **Target 3:** By 2024, contribute to the recovery of priority Threatened Ecological Communities |
| **Target 4:** By 2024, contribute to the recovery of priority threatened species populations |
| **Target 5:** By 2024, there is an improvement in landscape scale connectivity of native vegetation through targeted revegetation and enhancement to improve resilience in a changing climate |
| **Target 6:** By 2024, no new invasive species are established in the region and the spread of key emerging invasive plants and animals is limited |
| **Target 7:** By 2024, groundcover is maintained at 90% in the Gunnedah Subregion |
| **GOAL: Healthy and resilient aquifers, waterways and wetlands** |
| **Target 9:** By 2024, there is an improvement in riparian condition by protecting waterways through improved livestock and vegetation management |
| **Target 10:** By 2024, there is increased support provided to communities to operate within water policy settings to achieve sustainable and efficient water use |
| **Target 11:** By 2024, the ability of groundwater aquifers to support groundwater dependent ecosystems and designated beneficial uses is maintained |
| **GOAL: A region that is healthy, resilient and adaptable to a changing climate** |
| **Target 12:** By 2024, there is an increase in the community's adaptive capacity and social wellbeing across the region to prepare for shocks and threats such those associated with as climate change |
| **GOAL: Sustainable, productive, profitable and progressive agriculture** |
| **Target 13:** By 2024, there is an increase in the number of community members undertaking practice change to improve natural resource management and achieve sustainable, productive, profitable and progressive agriculture |
| **GOAL: Aboriginal people connected to country, culture and heritage** |
| **Target 14:** By 2024, there is an increase in support for Aboriginal people to connect to country and share traditional ecological knowledge with their communities through partnerships and participation in natural resource management |

7

# GWYDIR SUBREGION

# 7.1 Description of Gwydir Subregion

Gwydir Subregion is coincident with Gwydir LGA and incorporates part of the upper Gwydir floodplain. There are two regional centres, Bingara and Warialda. Bingara is located in the central part of the subregion and is 450 km north of Sydney and 360 km south-west of Brisbane. An overview map is presented in **Figure 071**.

Incorporating a total area of 9,122 square kilometres, Gwydir Subregion includes a large part of the Nandewar Range including flanks of Mount Kaputar in the south-west, and parts of the Gwydir floodplain in the central valley. The estimated population is 5,326 including 5.7% identifying as Aboriginal or Torres Strait Islander. The subregion has two regional towns, Bingara and Warialda, located approximately 40 km apart. Bingara services the southern part of the subregion and is located on the Gwydir River, while Warialda is located on the Gwydir Highway, midway between Inverell and Moree in the northern part of the subregion, and is a service centre for both the surrounding rural area and highway travellers The subregion also has five rural villages, North Star, Croppa Creek, Coolatai, Gravesend and Upper Horton.

The landscapes of the Gwydir Subregion are diverse. The southern and central areas are located within the Gwydir River catchment area with the Gwydir River flowing through Bingara and Gravesend. The southern areas are hilly with pockets of highly fertile river flats along the Gwydir River and its main tributaries. Parts of Mount Kaputar National Park occur in the south-west of the subregion. The northern part of the shire lies within the 'Golden Triangle' on the black soils from basalt outflows of the New England, it is one of the most productive agricultural areas in Australia.

Agriculture is the primary land use and economic activity within Gwydir Subregion. Livestock production dominates in the southern and central areas, which produce prime beef, lamb and pork. The subregion has a collection of cattle and sheep stations and a number of renowned beef studs. Broadacre cropping is undertaken in the northern part of the subregion, with the main crops being wheat, sorghum and barley. Other crops include dryland cotton, other grains (oats, maize, triticale), hay and pasture seeds, pulses (chickpeas, field beans) and oilseeds (canola, soybeans and sunflowers).

Important assets identified by the community include the Gwydir River, the fertile agricultural lands in the valleys, the travelling stock routes and reserves, and its wetlands. The region has a rich cultural heritage ranging from mining and homestead sites to a number of significant Aboriginal cultural sites. Key priorities for this subregion are addressing land use degradation risk through improving soil condition and groundcover; managing land use within land and soil capability; undertaking riparian restoration and rehabilitation of watercourses; and managing and improving the condition, extent and connectivity of native vegetation through vegetation management (Border Rivers-Gwydir CMA 2012).

## SUBREGION PROFILE

**Regional Centre Location:**

450km north of Sydney
360km south-west of Brisbane

**Size:**

9, 122 km2

**Population:**

5, 326

# 7.2 Assets

## 7.2.1 NATIVE VEGETATION

The Gwydir Subregion has lost about 63% of its original native vegetation since European settlement. However, there are significant areas of intact and contiguous forest and woodland within the subregion that maintain a high level of biodiversity and natural resilience. The region includes parts of Mount Kaputar National Park, several state forests including Munro, Warialda, Bullala and Planchonella, part of the Copeton State Recreation Area and a significant network of TSRs (**Figure 071**).

### Gwydir Local Government Area (LGA)

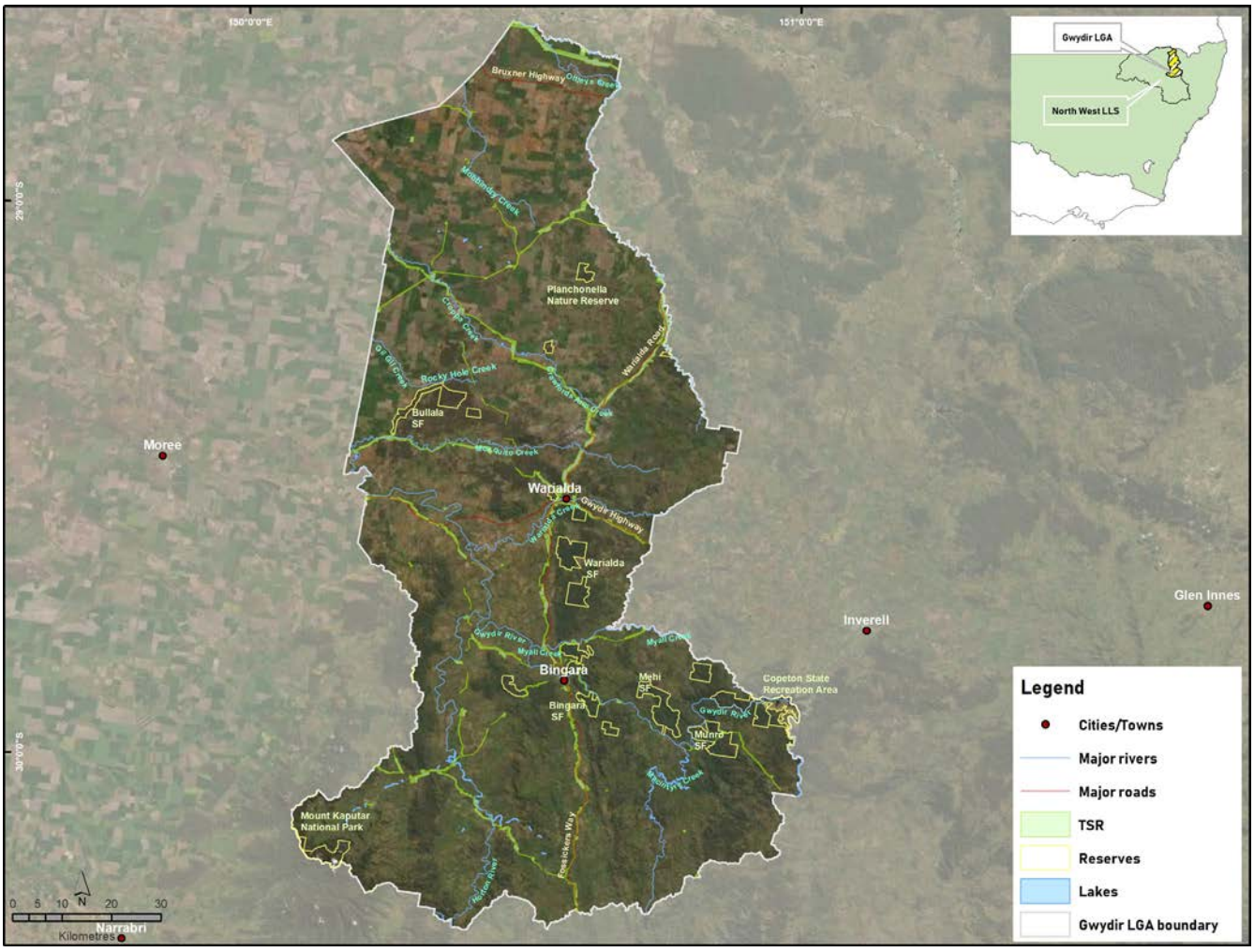



Figure 071 Map of the Gwydir Subregion

Regional vegetation communities that are either close to the 70%-cleared threshold or are equivalent to a threatened ecological community are identified as priorities for protection and enhancement in the Gwydir Subregion under this Plan. RVC 17, Yellow Box – Red Gum grassy woodlands (equivalent to box-gum grassy woodland TEC) is a key vegetation type for action in the subregion. There are a number of significant landscape corridors important for conservation purposes in the subregion and these are also recognised as priorities for protection, enhancement and targeted revegetation under this Plan. **Figure 072** shows the extent of priority areas within Gwydir Subregion. While these areas may provide a strategic focus for actions and achievement of targets under this Plan, actions should be undertaken in any part of the subregion if opportunities arise, as long as those actions are consistent with the Plan and represent good investment value.

**Priority areas in Gwydir LGA for ecosystem protection & enhancement and revegetation**

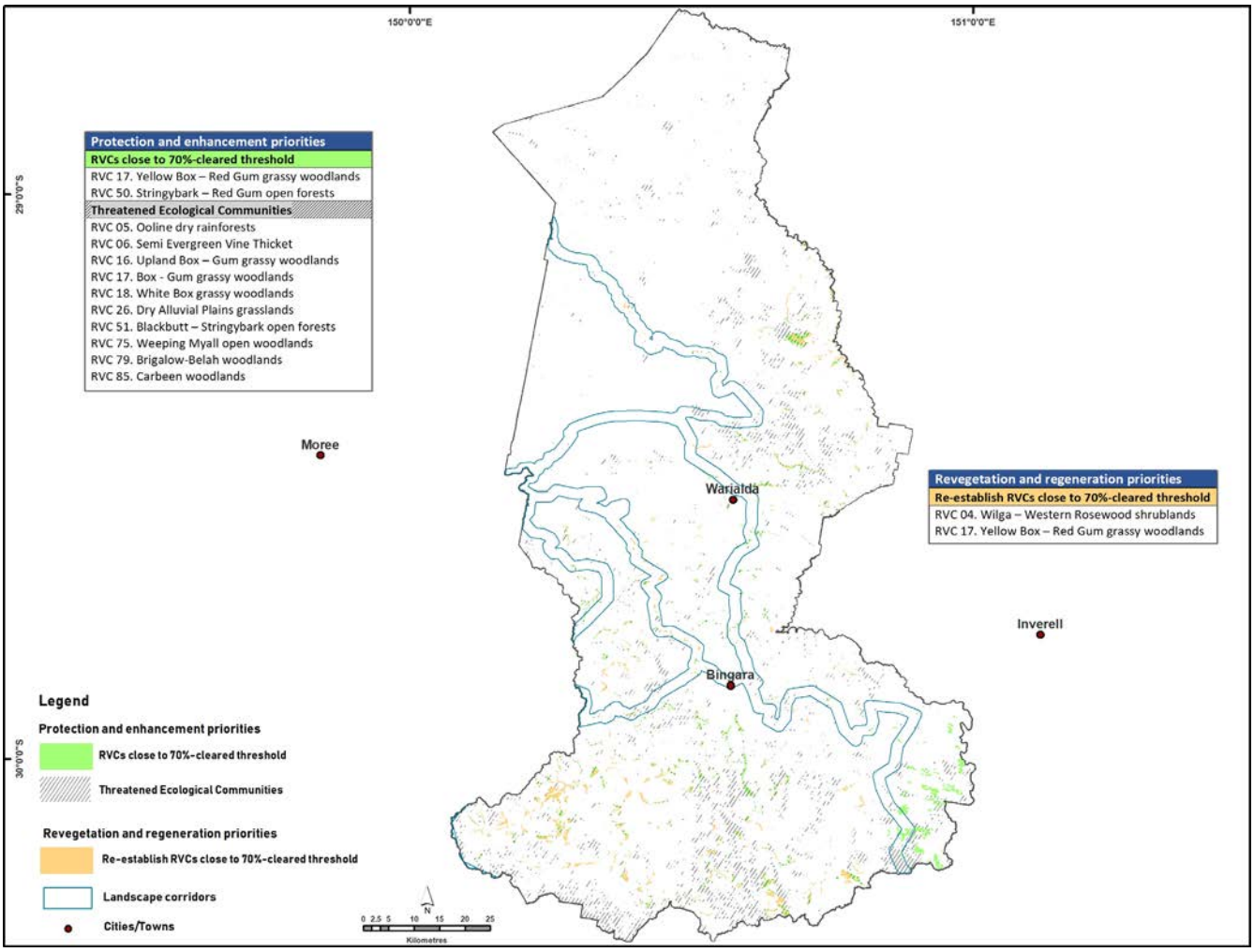



**Figure 072 Vegetation Priorities in the Gwydir Subregion (green areas representing areas for protection and enhancement, orange areas are areas prioritised for revegetation works)**

### 7.2.2 LAND USE AND SOIL CAPABILITY

Much of the Gwydir Subregion has a land and soil capability class 4-7 (**Figure 073**), which are mostly useful for grazing and occasional cropping. The area to the north of the subregion, known as the "Golden Triangle" has highly valuable agricultural land, classed as 2-4. **Figure 073** shows some areas of Class 5 land that is used for cropping, a practice that may lead to land degradation if these areas are being used beyond their capability.

**Land Use & Land Soil Capability (LSC) within Gwydir LGA**

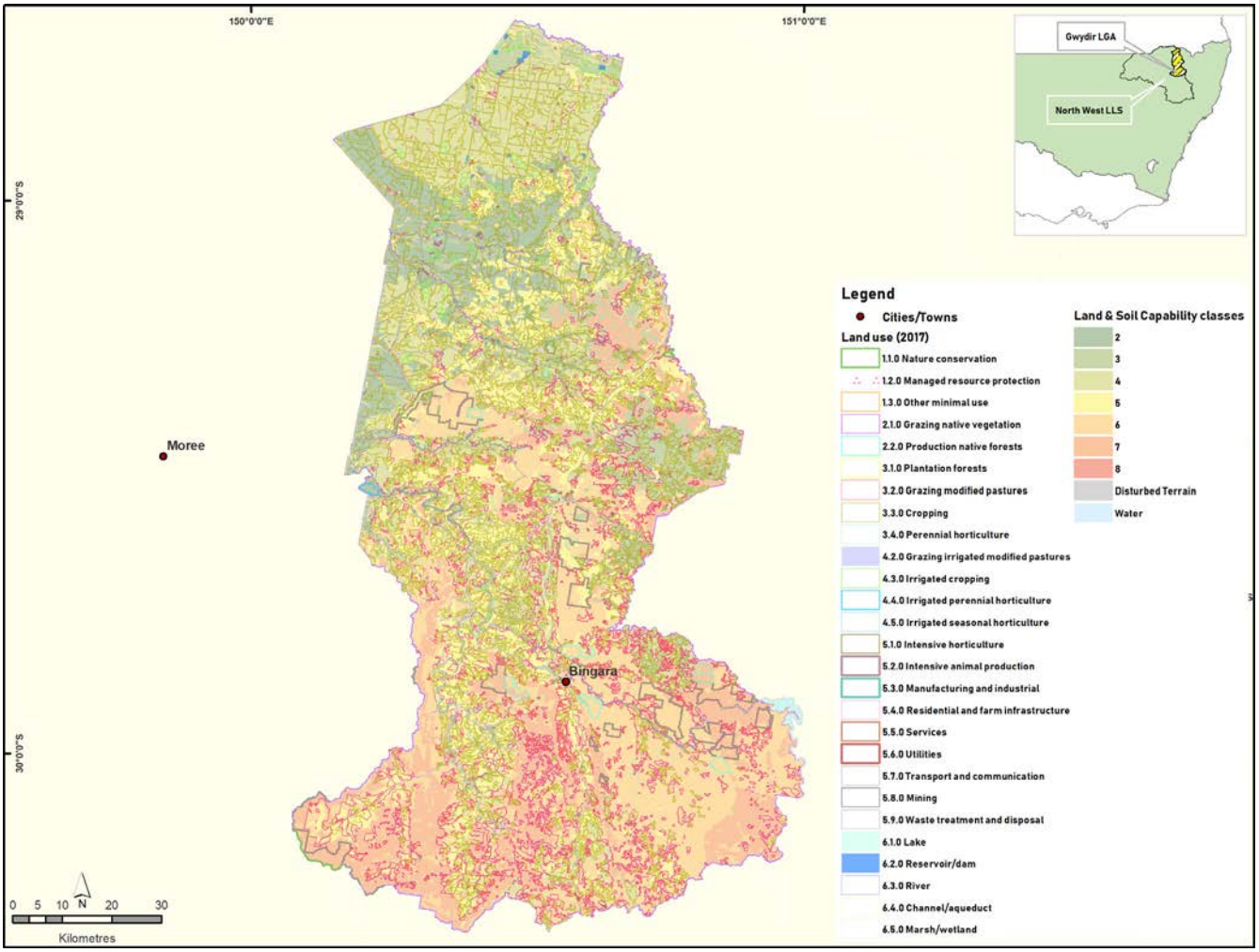



**Figure 073 Soil, Land Capability and Land Use in the Gwydir Subregion**

### 7.2.3 WATER

The Gwydir Subregion incorporates 15 major rivers. These rivers share a combined length of 727 km, 56% of which is vegetated. A total of 5,368 km of minor rivers also occur in the region, of which 52% are vegetated. There is clear scope under this Plan to improve riparian management in the subregion by protecting the remaining riparian vegetation and revegetating and restoring areas that have been previously cleared, for water quality and habitat purposes.

A total area of 35 km2 of local wetland is mapped in the subregion, although none are listed as regionally important or under the Ramsar convention. However, the listed Gwydir wetlands that occur in the Moree Subregion downstream highlight the importance of improved riparian management in the Gwydir subregion.

The area of major reservoirs in the Gwydir Subregion total 2,122 ha, most of which is encompassed by a portion of Copeton Dam which sits on the eastern edge of the boundary. **Figure 074** shows the location of main water assets in the Gwydir Subregion.

**Water Resources within Gwydir LGA**

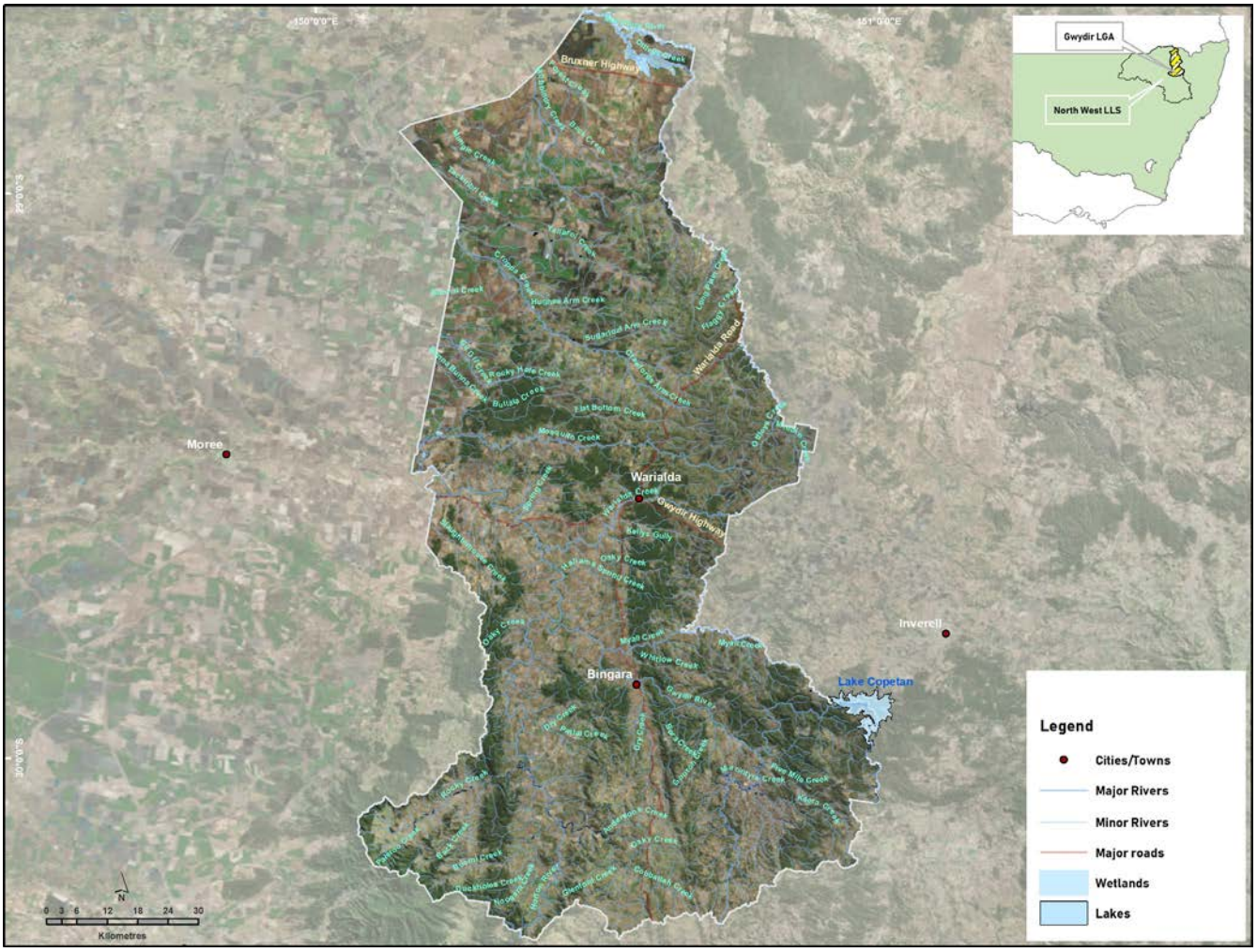



**Figure 074 Water Resource Assets in the Gwydir Subregion**

## 7.3 Goals, Targets and Actions

Review of draft whole-of-region goals, targets and actions was undertaken via a community consultation workshop on 28th May 2019 in Bingara. At this workshop, community participants chose the following targets as priorities for the Gwydir Subregion (**Table 071**).

The actions for each of these prioritised targets can be found in **Table 021, Table 022 and Table 023.**

# Table 071: Priority Goals and Targets for the Gwydir Subregion

| |
|---|
| **GOAL: Healthy and resilient landscapes sustaining our unique flora and fauna for future generations** |
| **Target 1:** By 2024, there is an increase in native vegetation extent across the North West and in the Gwydir Subregion |
| **Target 2:** By 2024, no further regional vegetation community decreases to less than 30% extent as identified by the 2017 baseline |
| **Target 5:** By 2024, there is an improvement in landscape scale connectivity of native vegetation through targeted revegetation and enhancement to improve resilience in a changing climate |
| **Target 6:** By 2024, no new invasive species are established in the region and the spread of key emerging invasive plants and animals is limited |
| **Target 7:** By 2024, groundcover is maintained at 100% in the Gwydir Subregion |
| **GOAL: Healthy and resilient aquifers, waterways and wetlands** |
| **Target 9:** By 2024, there is an improvement in riparian condition by protecting waterways through improved livestock and vegetation management |
| **Target 11:** By 2024, the ability of groundwater aquifers to support groundwater dependent ecosystems and designated beneficial uses is maintained |
| **GOAL: A region that is healthy, resilient and adaptable to a changing climate** |
| **Target 12:** By 2024, there is an increase in the community's adaptive capacity and social wellbeing across the region to prepare for shocks and threats such those associated with as climate change |
| **GOAL: Sustainable, productive, profitable and progressive agriculture** |
| **Target 13:** By 2024, there is an increase in the number of community members undertaking practice change to improve natural resource management and achieve sustainable, productive, profitable and progressive agriculture |
| **GOAL: Aboriginal people connected to country, culture and heritage** |
| **Target 14:** By 2024, there is an increase in support for Aboriginal people to connect to country and share traditional ecological knowledge with their communities through partnerships and participation in natural resource management |

8

# NARRABRI SUBREGION

# 8.1 Description of Narrabri Subregion

Narrabri Subregion is coincident with Narrabri LGA. The regional centre Narrabri, is located 420 km north of Sydney and 450 km south-west of Brisbane. An overview map is presented in **Figure 081**.

Narrabri Subregion has a population of about 13,480 residents and covers an area of about 13,000 km2. Smaller towns include Boggabri, Wee Waa, Pilliga, Gwabegar, Bellata, Edgeroi and Baan Baa. Narrabri Subregion is located in the heart of the Namoi Valley in the North West Slopes and Plains of New South Wales. It is set against the backdrop of the Nandewar Ranges and on the banks of the Namoi River.

The communities of Narrabri subregion have diversified from their traditional agricultural base of grain, cotton, wool, beef and prime lamb production into coal mining and gas extraction and exploration. The advent of these new resource-based industries in conjunction with ancillary business is providing a breadth and depth of job opportunities in the subregion.

The landscape grades from fertile river plains through to rugged mountain ranges. The Namoi River is the major watercourse in the region that meanders across the plains and is regulated and fed from Lake Keepit. The rivers and streams of the area are under greater stress than some other parts of the North West in terms of water flow, and most are in moderate or poor geomorphic condition. Agriculture is highly developed due to the subregion's fertile soils and ground and surface water resources, but the region also has some significant areas of remnant native vegetation and protected areas that support biodiversity, including the Pilliga Forest and Mount Kaputar National Park.

Key drivers of change in the Narrabri Subregion are considered by the community to be shifts in the socio-economic profile of the region (particularly driven by land use change through rapid expansion of the mining sector), the impacts of climate change, and governance. Issues associated with socio-economic change are identified as conflict in land use, employment, fly in fly out workforce, access to education and services, access to labour and finance and terms of trade. Climate change is of concern, particularly in relation to greater variability in and likelihood of more extreme events of drought, flood and fire. Governance is seen as a key driver of change in terms of succession, leadership (both formal and informal), equality, planning and ethics (Namoi CMA 2013).

## SUBREGION PROFILE

**Regional Centre Location:**

420km north of Sydney
450km south-west of Brisbane

**Size:**

13, 000 km2

**Population:**

13, 480

# 8.2 Assets

## 8.2.1 NATIVE VEGETATION

The Narrabri Subregion has lost just over half (54%) of its original native vegetation extent through agricultural development, and more recently coal mining. However large contiguous areas remain including nature reserves and state forests of the Pilliga forests, most of Mount Kaputar National Park, and Leard, Bobbiwaa, Plagyan, Deriah, Moema and other state forests (**Figure 081**). These areas support a wide diversity of vegetation communities, from sandy ironbark-cypress woodlands of the Pilliga to sub-alpine grassy forests / stringybark-gum forests of Mount Kaputar.

### Narrabri Local Government Area (LGA)

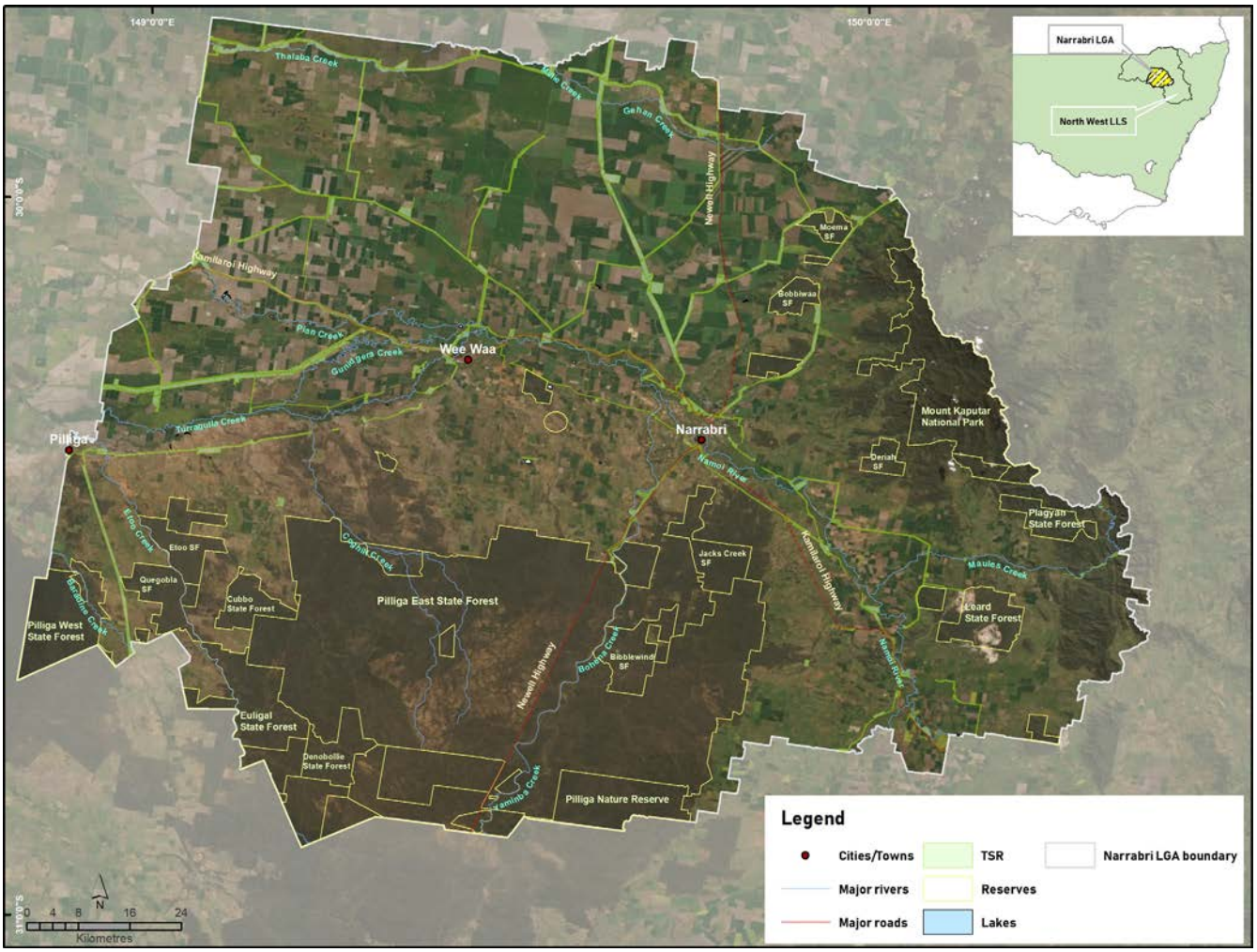



**Figure 081 Map of the Narrabri Subregion**

Regional vegetation communities that are either close to the 70%-cleared threshold or are equivalent to a threatened ecological community are identified as priorities for protection and enhancement. There are many TECs in the region that may be targeted for action, including Ooline dry rainforest, Box-Gum grassy woodlands, Coolibah - Black Box woodlands, Brigalow woodlands, Weeping Myall woodlands, and Carbeen woodlands. There are also a number of significant landscape corridors in the subregion which are recognised as priorities for protection, enhancement and targeted revegetation under this Plan. **Figure 082** shows the extent of priority areas within the Narrabri Subregion. While these areas may provide a strategic focus for actions and achievement of targets under this Plan, actions can be undertaken in any part of the subregion if opportunities arise, as long as those actions are consistent with the Plan and represent good investment value.

**Priority areas in Narrabri LGA for ecosystem protection & enhancement and revegetation**

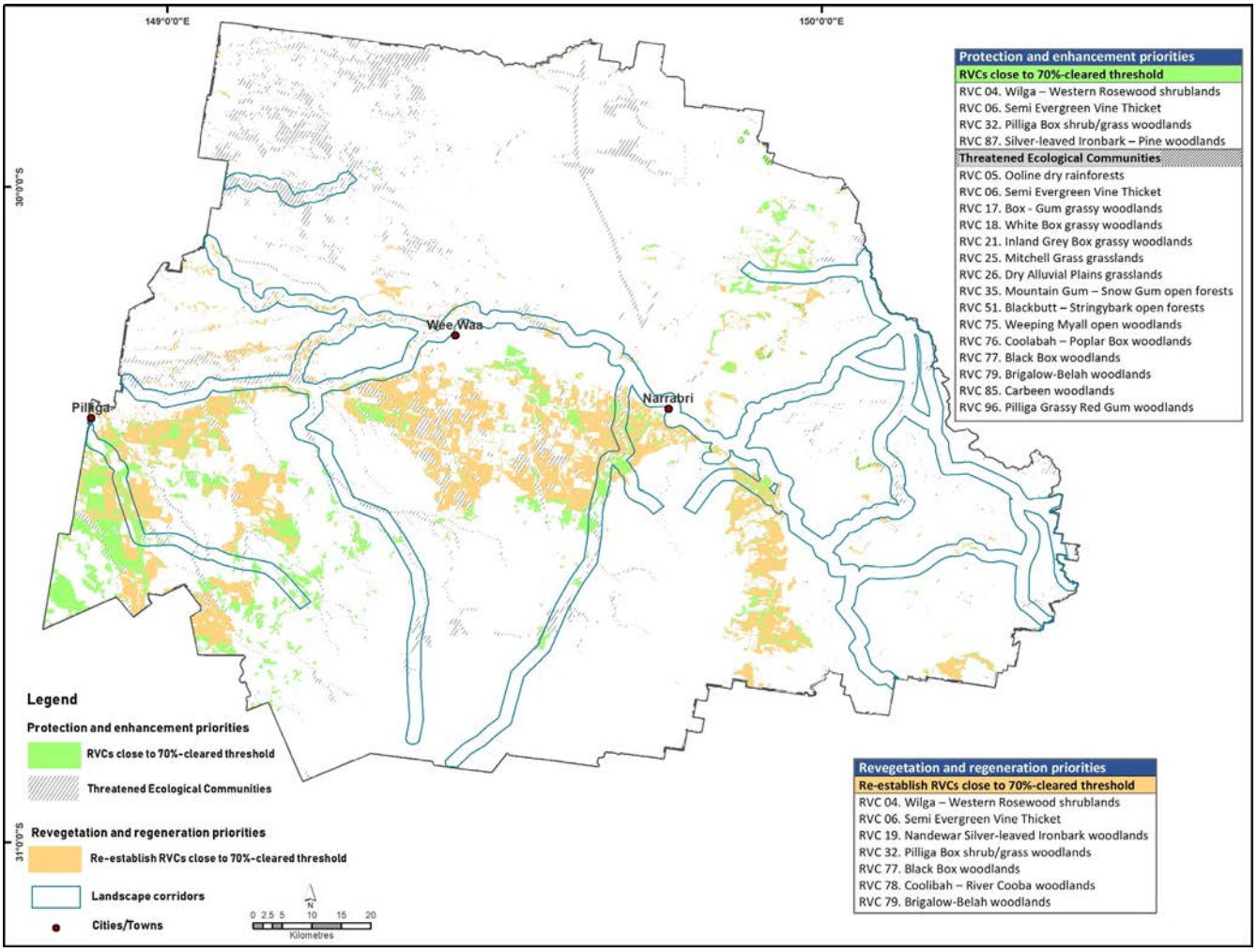



**Figure 082 Vegetation Priorities in the Narrabri Subregion (green areas representing areas for protection and enhancement, orange areas are areas prioritised for revegetation works)**

## 8.2.2 LAND USE AND SOIL CAPABILITY

The north and central floodplains of the Narrabri Subregion comprises land and soil capability class 2-4 (**Figure 083**) and are regarded as highly valuable agricultural land, with fertile black soil and access to the Lower Namoi Alluvium and Namoi River water sources. The Pilliga outwash to the south and the Mount Kaputar areas have much lower soil and land use capability and are retained as native bushland. Land use conflict arises between highly productive agricultural land and coal and coal seam gas mining and exploration that are occurring or planned in adjacent forests, including the Pilliga forest and Leard State Forest.

### Land Use & Land Soil Capability (LSC) within Narrabri LGA

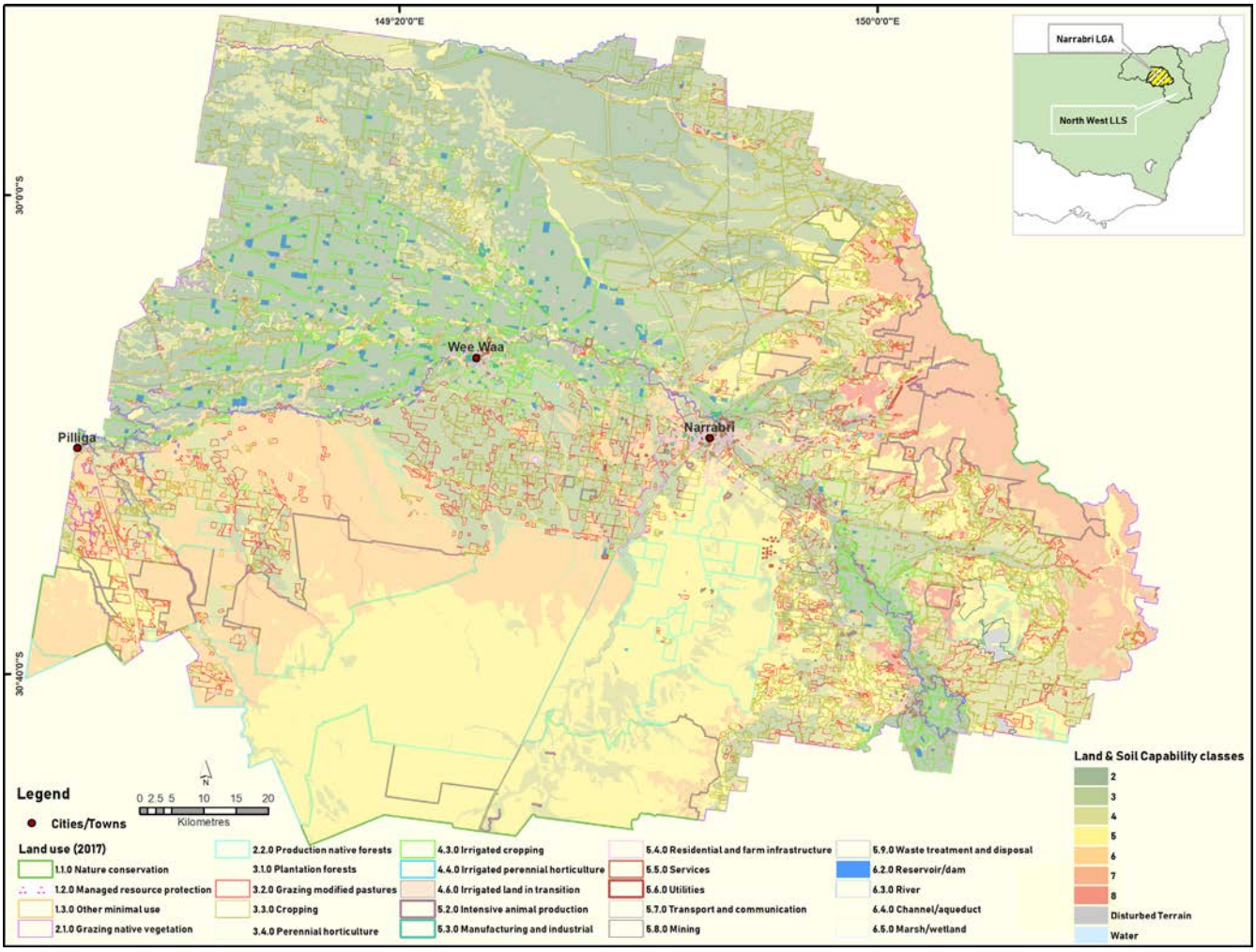



**Figure 083 Soil, Land Capability and Land Use in the Narrabri Subregion**

## 8.2.3 WATER

Narrabri Subregion contains 16 major rivers with a combined length of 811 km, including the Namoi River. About 71 % of areas immediately adjacent to these rivers are vegetated. The subregion also contains 6,224 km of minor creeks 65% of which are vegetated.

There are no regionally important nor Ramsar-listed wetlands in the Narrabri Subregion, however, there are 136 km2 of mapped wetlands, largely on the Namoi floodplain, that provide important habitat for various species. The distribution of wetlands and major rivers in the region is shown in **Figure 084**.

Groundwater resources associated with the Lower Namoi Alluvium and the Great Artesian Basin are also important for both agriculture and domestic use. Conflict around competing uses of groundwater often arise between townships, the irrigation industry and mining.

### Water Resources within Narrabri LGA

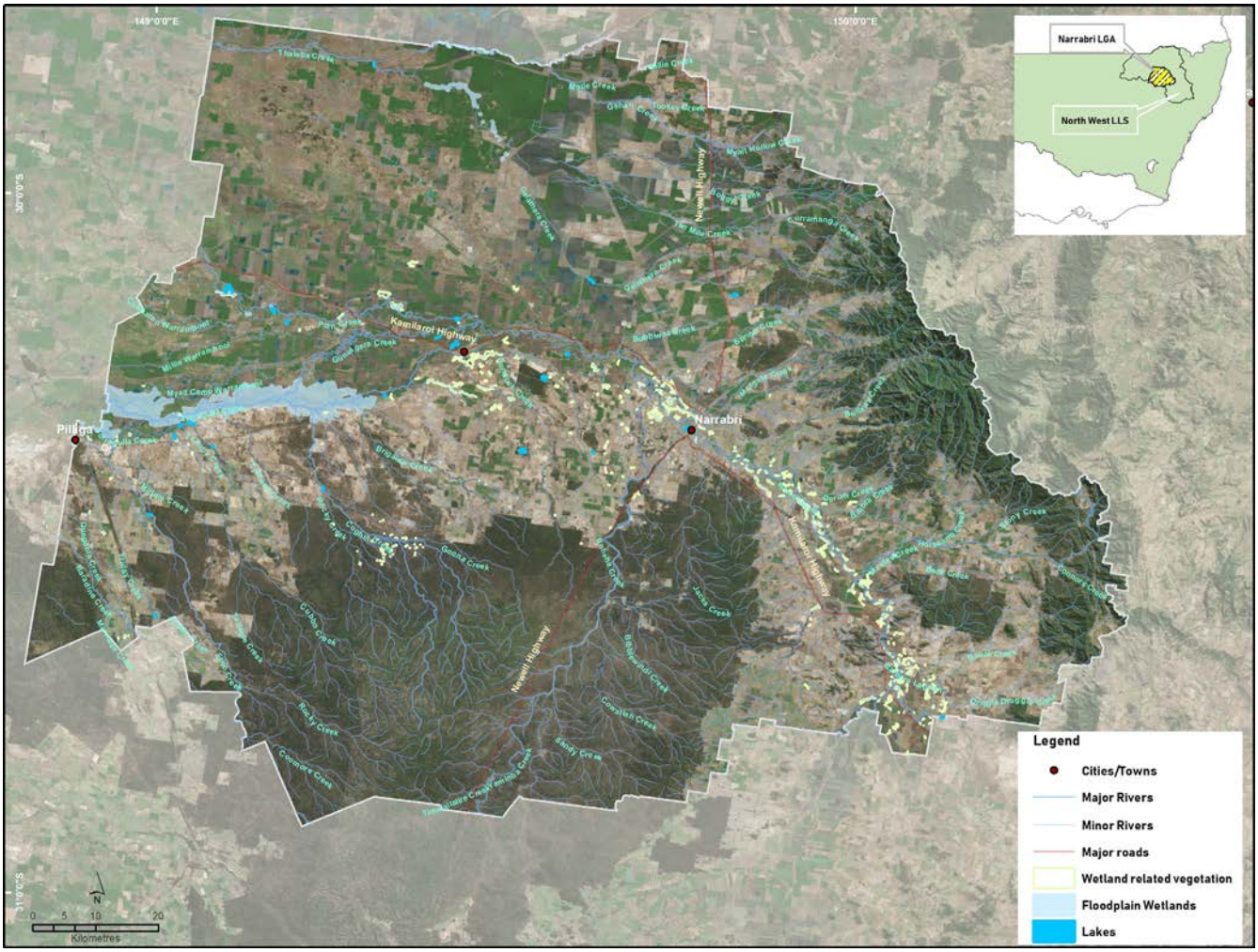



**Figure 084 Water Resource Assets in the Narrabri Subregion**

## 8.3 Goals, Targets and Actions

Review of draft whole-of-region goals, targets and actions was undertaken via a community consultation workshop on 22nd May 2019 in Narrabri. At this workshop, community participants chose the following targets as priorities for the Narrabri Subregion (**Table 081**).

The actions for each of these prioritised targets can be found in **Table 021, Table 022 and Table 023.**

# Table 081: Priority Goals and Targets for the Narrabri Subregion

| |
|---|
| **GOAL: Healthy and resilient landscapes sustaining our unique flora and fauna for future generations** |
| **Target 1:** By 2024, there is an increase in native vegetation extent across the North West and in the Narrabri Subregion |
| **Target 5:** By 2024, there is an improvement in landscape scale connectivity of native vegetation through targeted revegetation and enhancement to improve resilience in a changing climate |
| **Target 6:** By 2024, no new invasive species are established in the region and the spread of key emerging invasive plants and animals is limited |
| **Target 7:** By 2024, groundcover is maintained at 70% in the Narrabri Subregion |
| **GOAL: Healthy and resilient aquifers, waterways and wetlands** |
| **Target 9:** By 2024, there is an improvement in riparian condition by protecting waterways through improved livestock and vegetation management |
| **Target 10:** By 2024, there is increased support provided to communities to operate within water policy settings to achieve sustainable and efficient water use |
| **GOAL: A region that is healthy, resilient and adaptable to a changing climate** |
| **Target 12:** By 2024, there is an increase in the community's adaptive capacity and social wellbeing across the region to prepare for shocks and threats such those associated with as climate change |
| **GOAL: Aboriginal people connected to country, culture and heritage** |
| **Target 14:** By 2024, there is an increase in support for Aboriginal people to connect to country and share traditional ecological knowledge with their communities through partnerships and participation in natural resource management |

9

# WALGETT SUBREGION

# 9.1 Description of Walgett Subregion

Walgett Subregion is coincident with Walgett LGA and incorporates the Lower Namoi floodplain. The regional centre, Walgett, is located 520 km north-west of Sydney and 560 km south-west of Brisbane. An overview map is presented in **Figure 091**.

Walgett Subregion covers an area of about 22,000 km2. It comprises several towns and villages including Walgett, Lightning Ridge, Collarenebri, Burren Junction, Carinda, Rowena, Pokataroo, Cumborah, Cryon, Come-by-Chance, Grawin, Glengarry and Sheepyards. The total population is 6,369, including 27% Indigenous residents.

The Walgett Subregion is divided between the agricultural areas (producing wool, cattle, and wheat) on the Barwon and Namoi floodplains, and the outback country north-west of the Barwon River, including the black opal mining and fossicking town of Lightning Ridge. Land is held under a mixture of freehold and Western Land Leasehold arrangements across the sub-region. There are two main landscapes in the region, flat open floodplains of the Namoi and Barwon Rivers in the south and the low vegetated red hills in the north.

Soils are very fertile along the floodplain, consisting of grey and brown cracking clays, but less fertile in the ridge country where the soils are described as sandy red earths. The Pilliga sand complex occurs in the south-eastern corner of the region and is relatively flat (Walgett Shire Council 2011). There are significant waterways in the subregion. Some are merely drainage depressions and only flow periodically after rains, while others like the Barwon and Namoi Rivers flow most of the time and possess many permanent waterholes. There is one wetland of international significance in the shire, Narran Lake.

Sectors for employment in the Walgett region are mining, agriculture, community services, retail, financial and business services, public administration and communications. The town of Lightning Ridge relies on opal-based tourism and is home to people from approximately 50 nationalities. The biggest above-ground grain silos in the southern hemisphere are situated approximately 3 kms from Walgett. Harvest periods bring an influx of contract harvesters into the region that contribute to the local economy. Narran Lake Nature Reserve and Pilliga West Community Conservation Area are major areas of habitat and refuge for local biodiversity.

## SUBREGION PROFILE

**Regional Centre Location:**

520km north-west of Sydney
560km south-west of Brisbane

**Size:**

22, 000 km2

**Population:**

6, 369

# 9.2 Assets

## 9.2.1 NATIVE VEGETATION

Walgett is the least cleared of the subregions in the North West, with about 53% of the original native vegetation extent cleared since European settlement, mainly for agricultural purposes. However, large intact areas of semi-arid woodland north of the Barwon River interspersed with many small local remnants provide a variegated landscape within which many species can live and disperse. South of the Barwon River, the floodplain has been heavily cleared in the past such that any remnant vegetation (including the network of TSRs and riverine corridors) are critical for protection and enhancement. Location of the various reserves in Walgett Subregion is illustrated in **Figure 091**.

### Walgett Local Government Area (LGA)

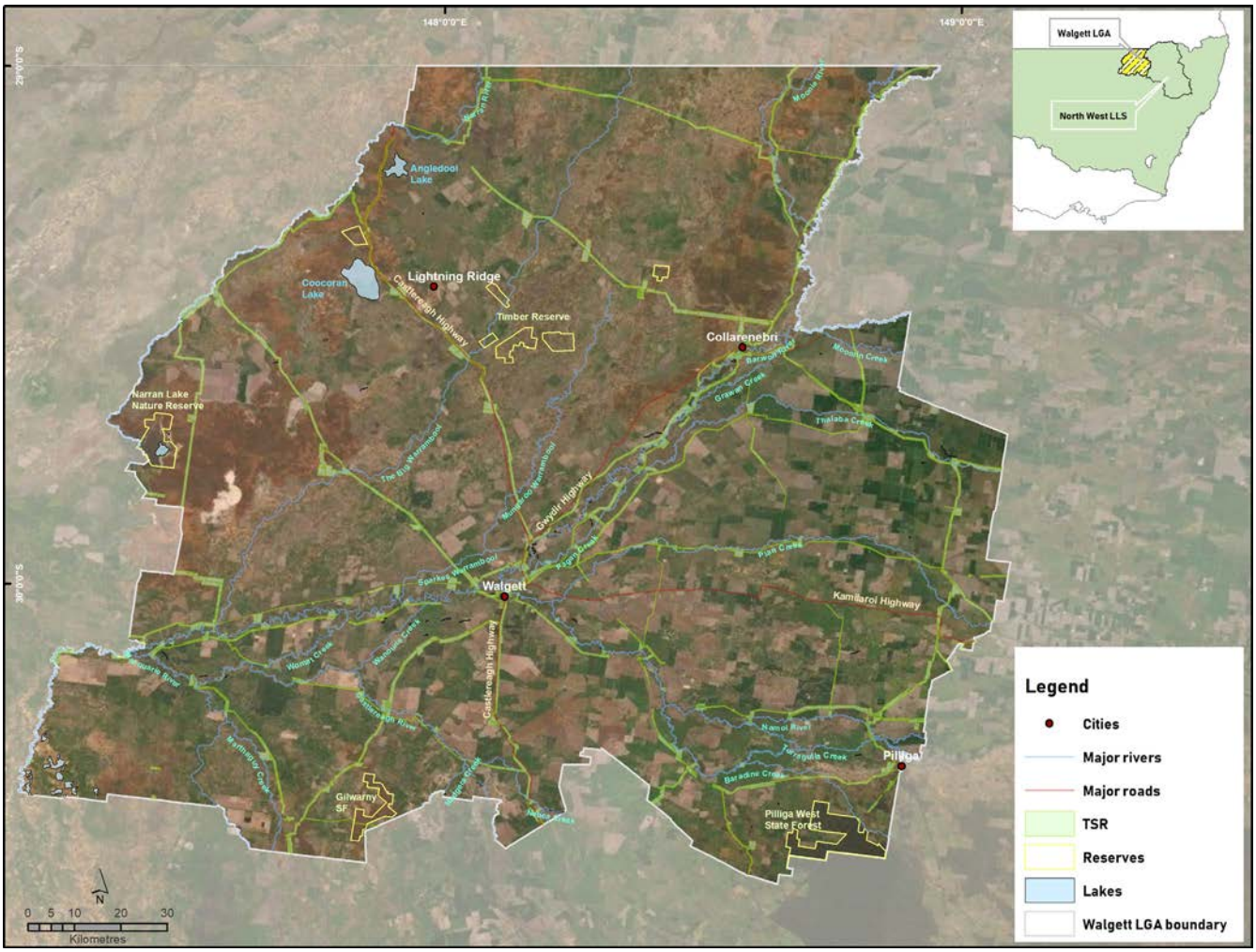



Figure 091 Map of the Walgett Subregion

Regional vegetation communities that are either close to the 70%-cleared threshold or are equivalent to a threatened ecological community are identified as priorities for protection and enhancement in the Walgett Subregion under this Plan. There are several TECs in the region that may be targeted for action, including native grasslands, Coolibah - Black Box woodlands, Brigalow woodlands, and Weeping Myall woodlands. There are a number of significant landscape corridors in the subregion which are recognised as priorities for protection, enhancement and targeted revegetation under this Plan. **Figure 092** shows the extent of priority areas within the Walgett Subregion. While these areas may provide a strategic focus for actions and achievement of targets under this Plan, actions can be undertaken elsewhere in the subregion if opportunities arise, as long as those actions are consistent with the Plan and represent good investment value.

**Priority areas in Walgett LGA for ecosystem protection & enhancement and revegetation**

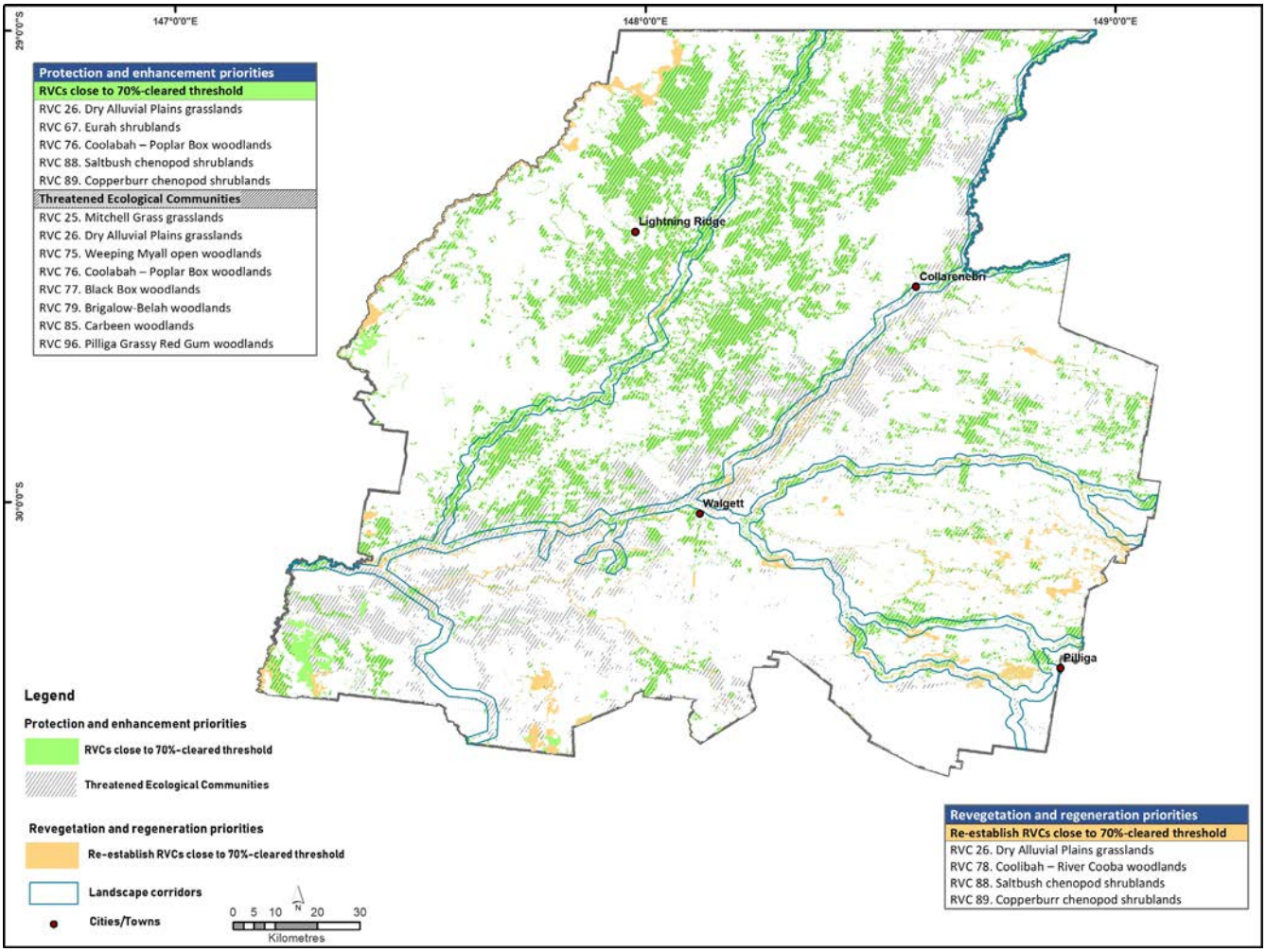



**Figure 092 Vegetation Priorities in the Walgett Subregion (green areas representing areas for protection and enhancement, orange areas are areas prioritised for revegetation works)**

### 9.2.2 LAND USE AND SOIL CAPABILITY

The Walgett Subregion comprises a large proportion of high quality agricultural land (Class 2-4) associated with alluvial floodplains of the Namoi and Barwon Rivers (**Figure 093**). However, low annual rainfall (less than 450 mm/yr) means that land is relatively vulnerable to degradation from erosion, as multiple years of fallow with zero groundcover is common place in crop management. Class 4-6 land that typically occur off the floodplains are even more susceptible to degradation as grazing pressure can result in very low groundcover across successive years. Groundcover maintenance, including litter and dead vegetation matter, is a priority for this subregion given its vulnerability to erosion from wind and extreme rainfall events.

**Land Use & Land Soil Capability (LSC) within Walgett LGA**

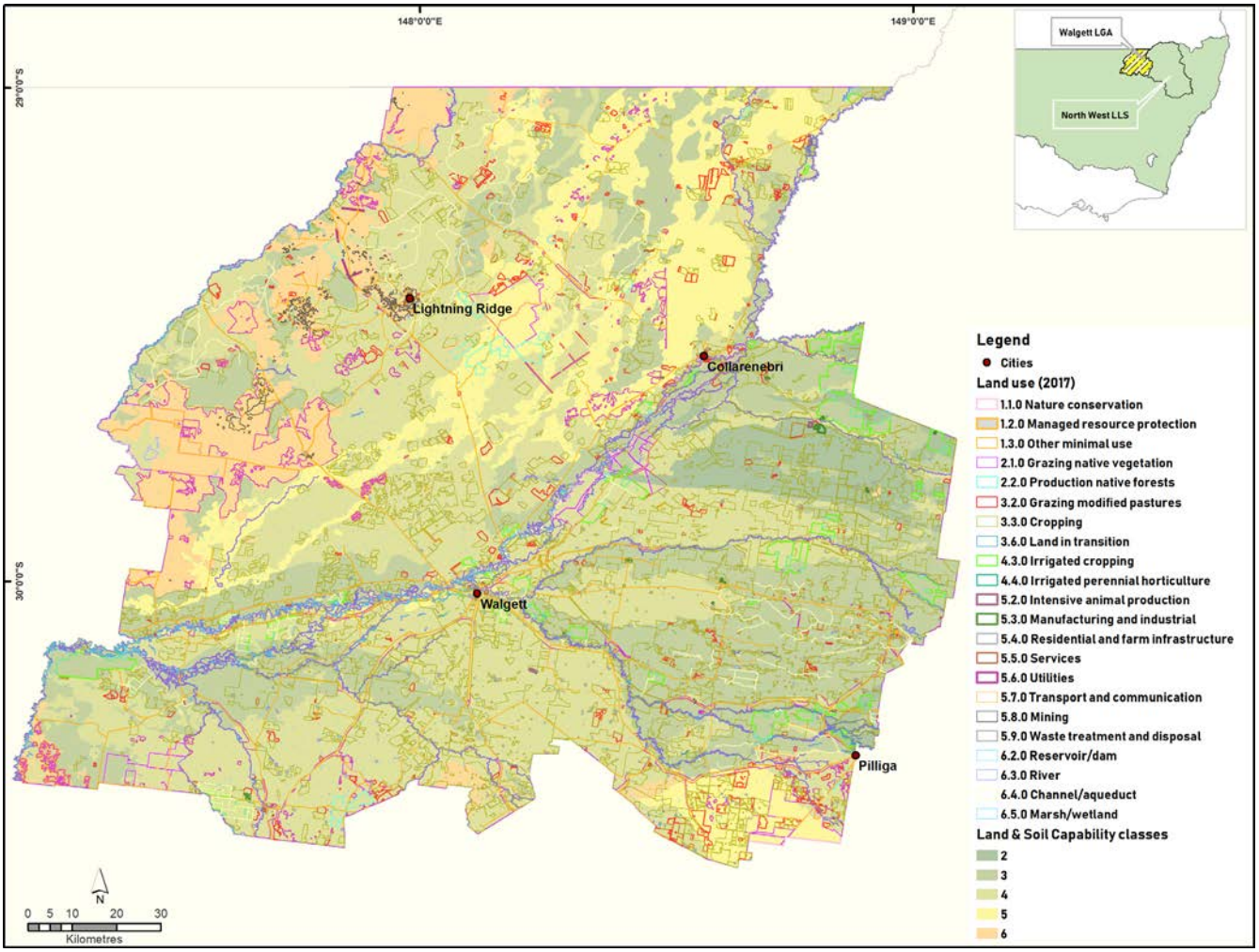



**Figure 093 Soil, Land Capability and Land Use in the Walgett Subregion**

### 9.2.3 WATER

The Walgett Subregion includes the headwaters of the Narran Lake Reserve, a Ramsar-listed wetland totalling 54 km2 the region. In addition, the Angledool and Corcoran Lakes and other minor wetlands spread across a total wetland area of 3,255 km2, mostly coincident with extensive floodplain wetlands that only fill intermittently (and infrequently). There are also 26 named rivers in the subregion including the Namoi, Barwon, Castlereagh, Mehi, and Narran Rivers. These have a total combined length of 1,951 km, of which 80% are vegetated. A further 3,046 km of minor watercourses occur in the region, with vegetation remaining in 72% of the riparian zone. The location of rivers, watercourses and wetlands in the subregion is shown in **Figure 094**.

#### Water Resources within Walgett LGA

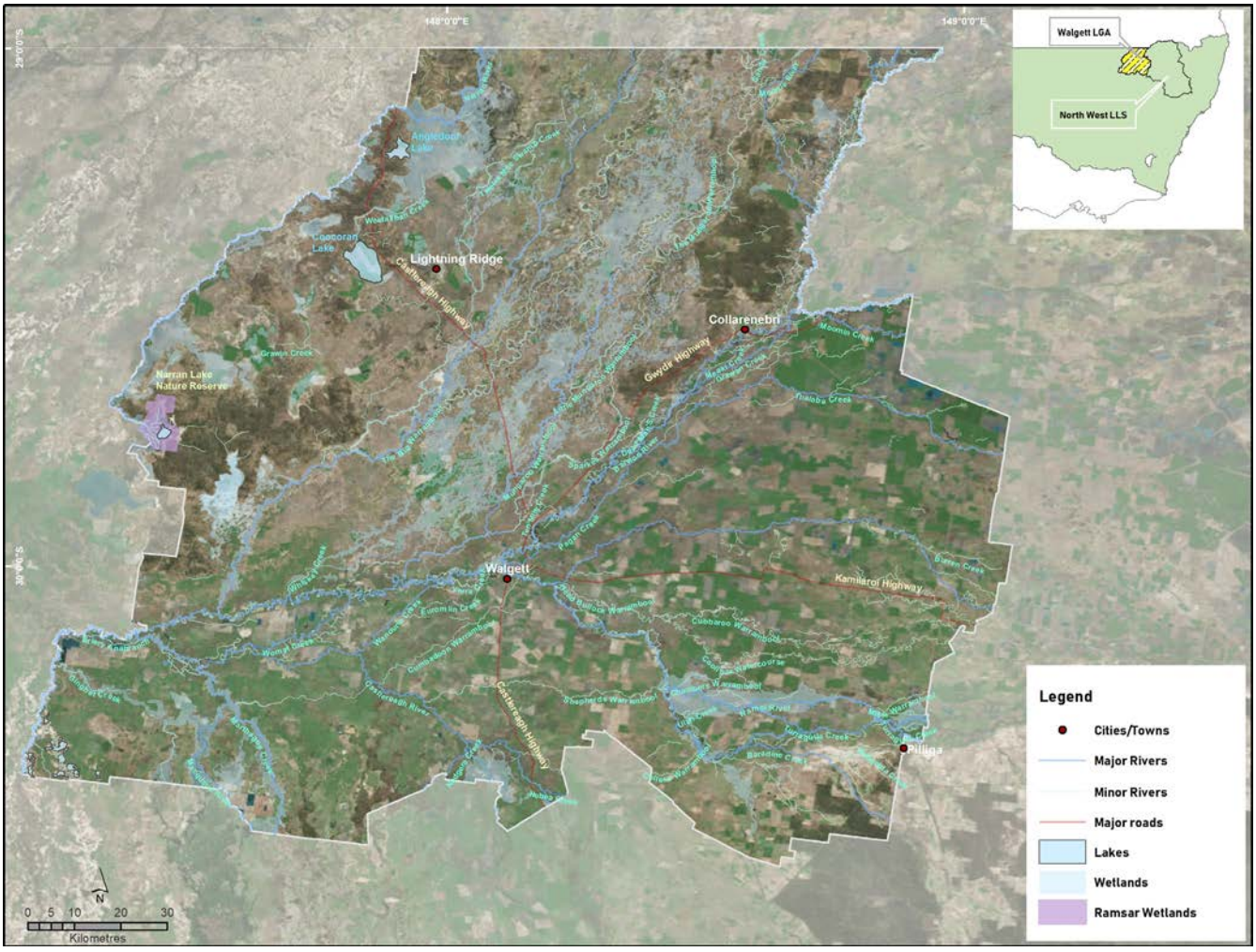



**Figure 094 Water Resource Assets in the Walgett Subregion**

## 9.3 Goals, Targets and Actions

Review of draft whole-of-region goals, targets and actions was undertaken via a community consultation workshop on 21st May 2019 in Walgett. At this workshop, community participants chose the following targets as priorities for the Walgett Subregion (**Table 091**).

The actions for each of these prioritised targets can be found in **Table 021, Table 022 and Table 023.**

# Table 091: Priority Goals and Targets for the Walgett Subregion

| |
|---|
| **GOAL: Healthy and resilient landscapes sustaining our unique flora and fauna for future generations** |
| **Target 1:** By 2024, there is an increase in native vegetation extent across the North West and in the Walgett Subregion |
| **Target 5:** By 2024, there is an improvement in landscape scale connectivity of native vegetation through targeted revegetation and enhancement to improve resilience in a changing climate |
| **Target 6:** By 2024, no new invasive species are established in the region and the spread of key emerging invasive plants and animals is limited |
| **Target 7:** By 2024, groundcover is maintained to a minimum of 40%, with an aim for 70% in the Walgett Subregion |
| **GOAL: Healthy and resilient aquifers, waterways and wetlands** |
| **Target 8:** By 2024, there is an improvement in the condition of RAMSAR and regionally important wetlands and the extent of those wetlands is maintained |
| **Target 9:** By 2024, there is an improvement in riparian condition by protecting waterways through improved livestock and vegetation management |
| **Target 10:** By 2024, there is increased support provided to communities to operate within water policy settings to achieve sustainable and efficient water use |
| **GOAL: A region that is healthy, resilient and adaptable to a changing climate** |
| **Target 12:** By 2024, there is an increase in the community's adaptive capacity and social wellbeing across the region to prepare for shocks and threats such those associated with as climate change |
| **GOAL: Sustainable, productive, profitable and progressive agriculture** |
| **Target 13:** By 2024, there is an increase in the number of community members undertaking practice change to improve natural resource management and achieve sustainable, productive, profitable and progressive agriculture |
| **GOAL: Aboriginal people connected to country, culture and heritage** |
| **Target 14:** By 2024, there is an increase in support for Aboriginal people to connect to country and share traditional ecological knowledge with their communities through partnerships and participation in natural resource management |

10

# IMPLEMENTATION AND ADAPTIVE MANAGEMENT

# 10.1 Collaborative Implementation

Actions to achieve regional targets and priority subregional targets under this Plan will have a positive flow-through to state and national targets for profitable agriculture, resilient communities and sustainable natural resources. A whole-of-government and whole-of-community approach will be used to implement the Plan. North West LLS will work with individuals and organisations in the community, agencies and industry to achieve the goals and targets in this Plan.

A collaborative and partnership-based approach will be used to fill any knowledge gaps and track progress toward the targets and will continue to provide further evidence for adaptive management (**Section 10.2**) and decision making. Community engagement using existing LLS governance structures (Community Advisory Group and the Board) and partnerships, particularly with Landcare will underpin all approaches over the five year period of the NRM Plan. It will involve increasing community adaptive capacity through education and communication, and through sharing collective knowledge and expertise.

Actions by landholders, communities, agencies and industries will be undertaken in the context of contributing towards each of the goals and targets across the region. On-ground actions for projects with land managers and other partners will commence from year one, with a focus on identified priorities for each subregion. Education and extension will be a key activity over the duration of the Plan. Key partners will include the Department of Planning, Industry and Environment, DPI Crown Lands and Water, Department of Planning, Industry and Environment - Energy, Environment and Science, DPI Fisheries, local government, LALCs, research institutions, Landcare, landholders, local mines and industry groups.

Federal and state government funding and other sources will contribute a substantial amount towards implementing this NRM Plan. Most funding will be distributed across a range of contracts with farmers and other partners who will achieve collectively more than North West LLS alone in labour and in-kind contributions. By improving coordination between agencies, industry bodies and organisations, and by implementing collaborative governance, funds can be leveraged further. Opportunities for collaboration and partnerships include across government agencies such as NSW Department of Primary Industries, Crown Lands, Office of Environment and Heritage, and Local Councils. Collaborations with partner agencies responsible for research, for example Universities and Research and Development Corporations is also important to continue to build an evidence base and access available monitoring data to inform the progress of this Plan. The result will be substantial investment, both financially and in-kind, for progressive, productive and profitable agriculture and natural resource management across the region.

To enable greater coordination of effort, this plan has been written in light of other government planning instruments for investment so that they are aligned with key partners, their plans, policies and strategies, particularly local, state and the Australian governments. Shared outcomes can be achieved when collaboration with key stakeholders and their respective policies, plans and strategies are promoted. Aligning the Plan with these plans and strategies has helped to inform where and how North West LLS can work more closely with stakeholders and partners to achieve these shared targets.

Cross sectoral collaboration in agriculture and extractive industries will help to build human and biophysical resilience and to promote community, industry and land manager understanding of the connections of land use and community resilience. Partnerships with regional planning and development committees (Regional Development Australia's Northern Inland - RDANI), LALCs, Landcare, rural counsellors, education and health sectors will help achieve shared goals. Further opportunities for leveraging resources through collaboration will be assessed and developed during project planning and implementation.

## 10.2 Adaptive Management

Adaptive management is an important part of this five year NRM Plan. It involves the re-testing and checking of results and assumptions as new information comes to light. It also involves tracking progress against targets and thresholds and reviewing interventions if they are proving ineffective or changing thresholds if they require change. Monitoring and evaluation are the building blocks of adaptive management, providing the data and evidence to inform improved practice and management.

This NRM Plan will be reviewed annually in line with LLS Annual Report development, providing a report on the implementation and adaptive management to the North West LLS Senior Management Team each year. This annual review will:

- Provide an opportunity to review and include the results of various studies and analysis tasks outlined as actions;
- Quantify the achievements against the targets (**Table 101**)
- Include the outcomes of ongoing monitoring and evaluation activities; and
- Contribute to improved understanding and knowledge as projects are implemented.

The recommendations emerging from evaluations, research and audits will be tracked in a register, and organisational responses and changes to plans and policies will be documented to provide a clear and concise evidence base for ongoing adaptive management of the Plan and the programs resulting from its implementation.

As new plans or policies are developed that affect the region and the implementation of this Plan, they will be reviewed with the aim of achieving ongoing alignment and collaboration, particularly in light of ongoing improvements in our understanding of the catchment and the appropriateness of targets and actions contained within the Plan. Examples of new plans and policies include the Sustainable Land Management Regulations and Water Sharing Plan reviews.

North West LLS intends to fund its involvement in the actions listed in this NRM Plan through the successful development of investment plans for NSW and Australian Government funding bids. Other investors will also be sought to supplement government investment. This involvement includes on-ground projects, community engagement, knowledge development, agricultural extension, and monitoring and evaluation.

Annual funding is variable, and the amount of on-ground investment that North West LLS can deliver will depend on the size of the funding allocation and investment in any given financial year. Investor preferences, NSW and Commonwealth Government funding priorities and opportunities for each subregion are balanced against each other to provide a comprehensive, targeted priority-focused delivery package for North West LLS based on subregional priorities.

Every year, a process of deciding on the priorities for investment plans is carried out by the North West LLS NRM team for subsequent Senior Management Team approval and ultimately Board endorsement. All staff are actively involved in developing annual investment plans as part of an agreed development process. Targets are analysed against funding body preferences and feasibility. Equity of program access is also taken into account and a final recommendation made to Senior Management, who then recommends changes and approves the annual investment plan.

Project priorities are decided through a comprehensive assessment of spatial data, decision-support tools and cost–benefit analyses, and are based on evaluations and feedback from previous annual investment program achievements. Mid-year and end-of-year program evaluations are undertaken to inform future planning on an ongoing basis, as part of adaptive management.

# 10.3 Monitoring and Evaluation

North West LLS will adopt a collaborative approach to monitoring, to demonstrate how progress toward target achievement is occurring. Monitoring information that is harnessed through partnerships and collaborations will be used in evaluation and reporting so that progress on the targets is communicated with the community as well as funding investors and stakeholders. These potential partners will be identified so that data can be accessed to measure progress.

North West LLS currently uses the principles of the Commonwealth Government's NRM Monitoring, Evaluation, Reporting and Improvement (MERI) Framework (2009) to ensure:

- MERI is integrated into all programs and projects;
- Monitoring data and evaluation results are integrated into adaptive management as described above;
- Baseline monitoring is installed on each on-ground project site so that longer term monitoring and evaluation can be undertaken across time, rather than relying just on short term output reporting;
- Where possible, use of remote sensing and other relevant data that are already collected by partners and collaborations to be used for measuring progress; and
- Multiple lines of evidence are used to evaluate progress and to inform decisions.

For North West LLS to measure progress toward the outcomes of this program, a Project Logic approach will be employed to detail the specifics of monitoring and evaluation for the Plan. In addition to this approach there are a few key publicly available or easily accessed broad datasets that have been identified for the effective tracking of progress of the targets and outcomes of this Plan (**Table 101**).

# Table 101: Available baselines and data streams for measuring Plan progress and outcomes

| Target | Monitoring Dataset | Notes |
|---|---|---|
| **Target 1: By 2024, there is an increase in native vegetation extent across the North West and in each Local Government Area** | NSW Woody Vegetation Change 2017-18 OEH, data derived from analysis of satellite images using the Statewide Landcover and Tree Survey (SLATS) Methodology. Project areas invested in over the 5 year program will also assist with analysis of progress across this outcome. | Woody native cover does not consider regrowth or replanting's, the figures do not distinguish between approved, permitted, exempt or illegal clearing under the repealed Native Vegetation Act 2003, since clearing authorised in one year may not happen in that year, clearing rates and approval data cannot be aligned. Data may or may not be available for the undertaking of a outcome evaluation against this target in 2024 across the whole 5 years of the program but may cover part of the program. Since the data doesn't distinguish between illegal or permitted clearing a comparison to project areas invested in under this plan will also need to be evaluated. |
| **Target 2: By 2024, no further regional vegetation community decreases to less than 30% extent as identified by the 2017 baseline** | NSW Woody Vegetation Change 2017-18 OEH, data derived from analysis of satellite images using the Statewide Landcover and Tree Survey (SLATS) Methodology. This dataset can be compared to the existing datasets held by North West LLS- RVCs of the North West and Pre-European vegetation extent maps to calculate native vegetation loss and prioritise areas of RVCs close to thresholds. Project areas invested in over the 5 year program will also assist with analysis of progress across this outcome. | See notes above. Analysis must also include North West and available information on stakeholder investment in protection of RVCs and revegetation projects. |
| **Target 3: By 2024, contribute to the recovery of priority Threatened Ecological Communities** | Current extent of TEC can be accessed from the NSW Woody Vegetation Change 2017-18 OEH, ongoing SLATS analysis and comparison of North West LLS vegetation datasets. Total project area invested in over the 5 year program (output) will assist with analysis of progress across this outcome. | Contribution to TEC outcomes is effectively measured through the area of projects that have been invested in to improve TEC condition. Additionally, project monitoring ensuring that the condition of TECs is improving on investment sites. This target is measured at the output level as it is a contribution to a broader (national effort) to improve the trajectory of the TEC. |

| Target | Monitoring Dataset | Notes |
|---|---|---|
| **Target 4: By 2024, contribute to the recovery of priority threatened species populations** | Total project area invested in over the 5 year program (output) will assist with analysis of progress across this outcome. Where available new information on threatened species population numbers will also be used if they arise during the 5 year program. | Contribution to threatened species outcomes is effectively measured through the area of projects that have been invested in to improve TS habitat and threat abatement. Additionally, project monitoring will ensure that the TS habitat is improving, or threats are abated on investment sites. This target is measured at the output level as it is a contribution to a broader (national effort) to improve the trajectory of the threatened species. |
| **Target 5: By 2024, there is an improvement in landscape scale connectivity of native vegetation through targeted revegetation and enhancement to improve resilience in a changing climate** | Connectivity and landscape connections data is derived from total woody extent data as from Targets 1-2. Analysis would require comparison of the landscape connections with woody native vegetation loss in these areas. Total project area investment in over the program would also allow analysis of contribution to this target. | |
| **Target 6: By 2024, no new invasive species are established in the region and the spread of key emerging invasive plants and animals is limited** | The outcome- no new invasive species established in the region is monitored in line with the NSW Invasive Species Plan and State of the Environment Reporting undertaken by LGA. The local NW Regional Strategic Weed Management Plan (2017-22) & NW Regional Strategic Pest Animal Management Plan (2018-23) will also measure and report on key emerging invasive plants. | Analysis against this target relies on data collected under other plans that are monitored across varying timescales, which may or may not allow for an evaluation of this target for a total of 5 years. Additional analysis would therefore be required. |
| **Target 7: By 2024, groundcover is maintained at 90% in the eastern LGAs, 70% in the central LGAs and 40% in the west** | Remote sensing data that is freely available through the GEOCLAM RAPP (Rangeland and Pasture Productivity) Map. This is an online spatial tool providing access to information about the state and condition of global rangelands including time-series data on indicators such as bare soil. This data will be an important part of monitoring progress toward this target at the subregional level. | Investigation into the best way to analyse this data to generate a standard measure for comparison of groundcover condition across years is required. |

| Target | Monitoring Dataset | Notes |
|---|---|---|
| **Target 8: By 2024, by 2024, there is an improvement in the condition of Ramsar sites ad regionally important wetlands and the extent of those wetlands in maintained** | Vegetation monitoring particularly looking at the wetland vegetation types to determine wetland extent will both assist the monitoring against this target. Moreover, for the Ramsar listed and Gwydir wetlands, the Long Term Monitoring (now MER) program for the Commonwealth Government and NSW Sate Government environmental watering program provides regular (annual) updates of wetland condition. | The datasets feeding into the evaluation of this target will provide an overview of wetland extent and condition, regardless of who has contributed to the outcomes. To attribute wetland condition changes to activities undertaken under this plan, an assessment of the project areas invested in over the 5 years by NW LLS and its partners would be beneficial. |
| **Target 9: By 2024, there is an improvement in riparian condition by protecting waterways through improved livestock and vegetation management** | Riparian vegetation extent data elicited from the OEH SLATS data and RVC vegetation extent mapping can be used as a surrogate for riparian condition. That is, if the extent of riparian vegetation improves, particularly the proximity of vegetation to riparian zones, then progress against this target can be interpolated. | Given the expense of geomorphic condition is prohibitive, a surrogate approach is advisable. Remote sensing of geomorphic condition is another option that could be investigated. |
| **Target 10: By 2024, there is increased support provided to communities to operate within water policy settings to achieve sustainable and efficient water use** | Contribution to this target can be provided at the output level e.g. number of people attending education and awareness events, and number of such events and opportunities provided by NWLLS and other stakeholders. | To measure a quantifiable understanding of water policy settings and water use, collaboration with the relevant departments is recommended and a quantitative survey undertaken. |
| **Target 11: By 2024, the ability of groundwater aquifers to support groundwater dependent ecosystems and designated beneficial uses is maintained** | GDE: some RVCs are known to be groundwater dependent, these could be monitored using the extent of these RVCs as a cause surrogate.<br>Beneficial uses: Monitoring under the Water Sharing Plans is the responsibility of the NSW water department (currently DPI Water). Maintenance of beneficial uses for the aquifers across the North West would be accessible for evaluation. | GDE extent required further investigation. MODIS data and NDVI analysis can be used to identify potential GDEs in times of dry. Loss of populations of RVCs or tree types that usually persist during dry times can be seen suffering and dying in extreme dry events. Overall this target needs further investigation for appropriate monitoring and baselines. |

| Target | Monitoring Dataset | Notes |
|---|---|---|
| **Target 12: By 2024, there is an increase in the community's adaptive capacity and social wellbeing across the region to prepare for shocks and threats such as those associated with climate change** | A baseline for Adaptive Capacity in a part of the North West region (Namoi) was undertaken in 2012 (Hogan, Donnelley and Wu 2012). This could be used as a partial baseline, albeit an old one. A survey of a statistically viable number of land managers across the region is recommended early in the program and another at the end of the program to measure progress. | The study was a survey assessing a number of performance indicators including those that measure health and wellbeing, self-efficacy, community-efficacy, environment, employment and work life balance and segmentation. The survey was designed and assessed using "choice modelling" Further investigation for appropriate and cost effective monitoring for this target is required. |
| **Target 13: By 2024, there is an increase in the number of community members undertaking practices change to improve natural resource management and achieve sustainable, productive, profitable and progressive agriculture.** | North West LLS is currently developing a Benchmarking Scorecard for farming businesses that has a focus on the adoption of practice change. This tool could be developed in collaboration with this target so that the data collected can be used to monitor progress and report on outcomes after 5 years and into the future. Other potential data sources at the LGA scale includes ABS and ABARES, that require further investigation for ongoing monitoring and synergies. | Further investigation for appropriate and cost effective monitoring for this target is required as is the establishment of a baseline. |
| **Target 14: By 2024, there is an increase in support for Aboriginal people to connect to country and share traditional ecological knowledge with their communities through partnerships and participation in natural resource management** | The only effective way to measure progress across this target is through survey of the LALCS across the North West to elicit any notice of progress. This may be undertaken as part of monitoring implemented to measure progress against the North West Reconciliation Action Plan (RAP). At the output level, data is being regularly recorded to maintain a database of activity against the RAP. | Further investigation for appropriate and cost effective monitoring for this target is required, particularly looking into the monitoring in place against the RAP and checking for synergies with this target and appropriateness and fitness to collect data for multiple uses. |

## 10.4 Knowledge Gaps

Whilst the best available knowledge has been used to inform this Plan, a number of gaps have been identified, including:

- Access to documented traditional ecological knowledge;
- Approval from local Aboriginal people to access or use any traditional ecological knowledge;
- Updated adaptive capacity and general resilience of the communities across the North West;
- Locations of known drought refugia;
- Access to continuous monitoring of climate change impacts on the region;
- Proximity to a number of thresholds, for example a current remote sensed condition of groundcover; and
- Accurate knowledge of the thresholds at which irreversible change or damage occurs across assets.

As time and funds permit, the North West LLS will work in partnership with agencies, stakeholders, and partners to fill these gaps. As new information emerges this plan will be reviewed to ensure it reflects the latest information.

## 10.5 Review of this Plan

As described in Section 10.2 this Plan will be reviewed annually in line with LLS Annual Reporting. To ensure that the Plan stays current and relevant, some other triggers to review this Plan exist, including:

- Major policy changes;
- Feedback from community consultation that indicate a new and significant pressure requiring change;
- Crossing a major threshold;
- Changes in funding that result in North West LLS not being able to fund the targets in this Plan;
- Any changes to regional boundaries; and
- Any other new information that significantly changes scientific understanding of systems.

Outcome reporting for the NLP Regional Land Partnership Program will be undertaken in June 2021 using the monitoring data and annual review results. The next formal review of this Plan will be undertaken towards the end of the Plan in early 2024.

## 10.6 Continual Community Consultation

Community awareness and buy-in will underpin the success of this Plan. As human and biophysical systems change, these new directions and resulting priorities need to be incorporated, thus the Plan needs to be adaptable to changed community needs and expectations. North West LLS maintains contact with community in many ways, and for the purpose of keeping this plan up to date, the following stakeholders will be regularly consulted, and their views incorporated as a component of the annual review:

- North West Community Advisory Group, a group with representatives from across each LGA including two Aboriginal Community representatives that meet quarterly to discuss LLS business, including NRM;
- Regular (monthly) contact with the 14 LALCs across the region;
- Board Meetings (every 2 months) with the six Board members of North West LLS;
- Landcare consultation at their quarterly meetings; and
- Contact with industry bodies, research institutions and landholders across the region through day to day business.

Towards the end of this Plan (2023) an evaluation of its achievements will be undertaken. This will include further community consultation in preparation for developing the next five year NRM Plan for the North West Region.

11

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# RESILIENCE THINKING:

## Critical thresholds for the North West

## BIODIVERSITY

- Woody vegetation cover (% remaining of original extent) – 30%
- Regional Vegetation Communities – maintain over 30% extent
- Population size of individual species (generic- not currently specified for individual species)
- Habitat area for individual species or populations (generic- not currently specified for individual species or populations)
- Area of threatened ecological community (generic- not currently specified for individual communities)
- Presence of individual invasive species (presence/absence is the threshold)
- Population extent of individual invasive species

## LAND

- Groundcover is at least 90% in the eastern LGAs, 70% in the central LGAs, and 40% in the western LGAs

## WATER

- Surface water flow quantity is at 66% of natural (pre-development) condition with a sensitivity to natural frequency and duration
- River geomorphic condition is good (against benchmark condition)
- Recruitment of riparian vegetation is higher than attrition of individual trees
- Agricultural and urban supply aquifers do not cross into lower levels of beneficial use
- Alluvial aquifers are not drawn down below historical maximum drawdown levels
- Groundwater is within 10m surface where there are identified groundwater dependant ecosystems
- Wetlands are not drained, dammed or otherwise physically modified

## PEOPLE

- Assets in key areas of wellbeing and adaptive capacity

Note: This is an updated list for the 2019 NRM Plan and differs slightly from previous thresholds. For example, vegetation extent in the North West indicated that none of the subregions are near the 70% vegetation extent threshold (the other major threshold for vegetation extent indicated in the literature), thus the 70% threshold was not used.