Lachlan Long Term Water Plan
Part B: Lachlan planning units
Draft for exhibition

Cover photo: Sunrise over wetland, Mal Carnegie

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Office of Environment and Heritage
59 Goulburn Street, Sydney NSW 2000
PO Box A290, Sydney South NSW 1232
Phone: +61 2 9995 5000 (switchboard)
Phone: 1300 361 967 (OEH and national parks enquiries)
TTY users: phone 133 677, then ask for 1300 361 967
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967
Email: info@environment.nsw.gov.au
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Acknowledgement of Traditional Owners

The Office of Environment and Heritage pays its respect to the Traditional Owners and their Nations of the Murray-Darling Basin. The contributions of earlier generations, including the Elders, who have fought for their rights in natural resource management are valued and respected.

In relation to the Lachlan catchment, the Office of Environment and Heritage pays its respects to the Traditional Owners – the Nari Nari, Ngiyampaa, Wiradjuri and Yita Yita Nations – past, present and future. We look forward to building upon existing relationships to improve the health of our rivers, wetlands and floodplains, including in recognition of their traditional and ongoing cultural and spiritual significance.

Figure 1 Nardoo at Booligal Wetlands. Photo: V. Bucello/Midstate Video.

Abbreviations

AHIMS	Aboriginal Heritage Information Management System
ARI	Annual recurrence interval
ASL	Above Sea Level
Basin Plan	Murray-Darling Basin Plan 2012
BF	Baseflow
BK	Bankfull
BWS	Basin-wide environmental watering strategy
CAG	Customer Advisory Group
CAMBA	China-Australia Migratory Bird Agreement
CEWO	Commonwealth Environmental Water Office
CF	Cease-to-flow
DBH	Diameter at breast height
DO	Dissolved oxygen
DOC	Dissolved organic carbon
DOI–W	NSW Department of Industry – Lands and Water
DPIF	NSW Department of Primary Industries Fisheries
EEC	Endangered ecological community
EWAG	Environmental Water Advisory Group
EWR	Environmental water requirement
FFDI	Forest Fire Danger Index
GCM	Global Climate Model
GDE	Groundwater dependent ecosystem
GL/yr	gigalitres per year
ha	hectares
HEW	Held environmental water
JAMBA	Japan-Australia Migratory Bird Agreement
LF	Large fresh
LLS	Local Land Services (NSW)
LTWP	Long Term Water Plan
m/s	metres per second
MDBA	Murray-Darling Basin Authority
MER	Monitoring, evaluation and reporting
mg/L	milligrams per litre
ML	megalitre
NPWS	NSW National Parks and Wildlife Services
NRAR	Natural Resources Access Regulator
NSW	New South Wales

OB	Overbank
OEH	Office of Environment and Heritage
PCT	Plant community type
PEW	Planned environmental water
PU	Planning unit
RAS	Resource availability scenario
RCM	Regional Climate Model
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
SDL	Sustainable diversion limit
SF	Small fresh
VF	Very low flow
WAL	Water access licence
WL	Wetland inundating flow
WQA	Water quality allowance
WQMP	Water quality management plan
WRP	Water resource plan
WRPA	Water resource plan area
WSP	Water sharing plan

Glossary

Actively managed wetland / floodplain	The area of floodplains and wetlands that can be inundated by managed environmental water deliveries alone or in combination with other flows from regulated river systems (see 'Regulated river').
Adaptive management	A procedure for implementing management while learning about which management actions are most effective at achieving specified objectives.
Allocation	The volume of water made available to water access licence or environmental water accounts in a given year by DOI–W, which is determined within the context of demand, inflows, rainfall forecasts and stored water.
Allochthonous	Organic material (leaf litter, understory plants, trees) derived from outside rivers, including riparian zones, floodplains and wetlands.
Alluvial	Comprised of material deposited by water.
Annual recurrence interval (ARI)	The expected frequency (in years) between exceedances of a given flow rate (in ML/d).
Autochthonous	Organic material derived from photosynthetic organisms (algal and macrophyte growth) within rivers.
Bankfull flow (BK)	River flows at maximum channel capacity with little overflow to adjacent floodplains. These flows engage the riparian zone, anabranches, flood runners and wetlands located within the meander train. They inundate all in-channel habitats including benches, snags and backwaters.
Baseflow (BF)	Reliable background flow levels within a river channel that are generally maintained by seepage from groundwater storage, but also by surface inflows. They typically inundate geomorphic units such as pools and riffle areas.
Basin Plan	The Basin Plan as developed by the Murray-Darling Basin Authority under the *Water Act 2007*.
Biota	The organisms that occupy a geographic region.
Blackwater	Occurs when water moves across the floodplain and releases organic carbon from the soil and leaf litter. The water takes on a tea colour as tannins and other carbon compounds are released from the decaying leaf litter. The movement of blackwater plays an important role in transferring essential nutrients from wetlands into rivers and vice versa. Blackwater carries carbon which is the basic building block of the aquatic food web and an essential part of a healthy river system.
Carryover	Water allocated to water licences or environmental water accounts that remains un-used in storage at the end of the water year which, under some circumstances, may be held over and used in the following water year.
Catch per unit effort (CPUE)	An indirect measure of the abundance of a target species.
Cease-to-flow (CF)	The absence of flowing water in a river channel that leads to partial or total drying of the river channel. Streams contract to a series of isolated pools.

Cease-to-pump (access rule in WSP)	Pumping is not permitted: • from in-channel pools when the water level is lower than its full capacity • from natural off-river pools when the water level is lower than its full capacity • from pump sites when there is no visible flow. These rules apply unless there is a commence to pump access rule that specifies a higher flow rate that licence holders can begin pumping.
Cold water pollution	The artificial lowering of water temperature that occurs downstream of dams, particularly during warmer months when stratification is more likely to occur. The impact of cold water pollution can extend for hundreds of kilometres along the river from the point of release.
Constraints	The physical or operational constraints that affect the delivery of water from storages to extraction or diversion points. Constraints may include structures such as bridges that can be affected by higher flows, the volume of water that can be carried through the river channel, or scheduling of downstream water deliveries from storage.
Consumptive water	Water that is removed from available supplies without return to a water resource system (such as water removed from a river for agriculture).
Cultural water dependent asset	A place that has social, spiritual and cultural value based on its cultural significance to Aboriginal people. Related to the water resource.
Cultural water dependent value	An object, plant, animal, spiritual connection or use that is dependent on water and has value based on its cultural significance to Aboriginal people.
Discharge	The amount of water moving through a river system, most commonly expressed in megalitres per day (ML/d).
Dissolved Organic Carbon (DOC)	A measurement of the amount of carbon from organic matter that is soluble in water. DOC is transported by water from floodplains to river systems and is a basic building block available to bacteria and algae that are food for microscopic animals that are in turn consumed by fish larvae, small bodied fish species, yabbies and shrimp. DOC is essential for building the primary food webs in rivers and ultimately generates a food source for large bodied fish like Murray cod and golden perch and predators such as waterbirds.
Environmental asset	The physical features that make up an ecosystem and meet one or more of the assessment indicators for any of the five criteria specified in Schedule 8 of the Basin Plan.
Ecosystem function	The resources and services that sustain human, plant and animal communities and are provided by the processes and interactions occurring within and between ecosystems. Identified ecosystem functions must also meet one or more of the assessment indicators for any of the four criteria specified in Schedule 9 of the Basin Plan.
Ecological objective	Objective for the protection and/or restoration of an environmental asset or ecosystem function. Objectives are set for all priority environmental assets and priority ecosystem functions, and have regard to the outcomes described in the Basin-wide environmental watering strategy.
Ecological target	Level of measured performance that must be met to achieve the defined objective. The targets in this Long Term Water Plan are SMART (Specific/Measurable/Achievable/Realistic/Time-bound) and are able to demonstrate progress towards the objectives and the outcomes described in the Basin-wide environmental watering strategy.

Ecological value	An object, plant or animal which has value based on its ecological significance.
Ecosystem	A biological community of interacting organisms and their physical environment. It includes all the living things in that community, interacting with their non-living environment (weather, earth, sun, soil, climate and atmosphere) and with each other.
Environmental water	Water for the environment. It serves a multitude of benefits to not only the environment, but communities, industry and society. It includes water held in reservoirs (held environmental water) or protected from extraction from waterways (planned environmental water) for the purpose of meeting the water requirements of water dependent ecosystems.
Environmental water requirement (EWR)	The water required to support the completion of all elements of a lifecycle of an organism or group of organisms (taxonomic or spatial), consistent with the objective/target, measured at the most appropriate gauge. It includes all water in the system including natural inflows, held environmental water and planned environmental water.
Flow component	The type of flow in a river defined by its magnitude (e.g. bankfull).
Flow regime	The pattern of flows in a waterway over time that will influence the response and persistence of plants, animals and their ecosystems.
Freshes	Temporary in-channel increased flow in response to rainfall or release from water storages.
Groundwater	Water that is located below the earth's surface in soil pore spaces and in the fractures of rock formations. Groundwater is recharged from, and eventually flows to, the surface naturally.
Held environmental water	Water available under a water access right, a water delivery right, or an irrigation right for the purposes of achieving environmental outcomes (including water that is specified in a water access right to be for environmental use).
Hydrograph	A graph showing the rate of flow and/or water level over time past a specific point in a river. The rate of flow is typically expressed in megalitres per day (ML/d).
Hydrological connectivity	The link of natural aquatic environments.
Hydrology	The occurrence, distribution and movement of water.
Hypoxic Blackwater	Occurs when dissolved oxygen (DO) levels fall below the level needed to sustain native fish and other water dependent species. Bacteria that feed on dissolved organic carbon use oxygen in the water. When they multiply rapidly their rate of oxygen consumption can exceed the rate at which oxygen can be dissolved in the water. As a result, oxygen levels fall and a hypoxic (low oxygen) condition occurs. Dissolved oxygen is measured in milligrams per litre (mg/L). Generally native fish begin to stress when DO levels fall below 4 mg/L. Fish mortality occurs when DO levels are less than 2 mg/L.
Large fresh (LF)	High-magnitude flow pulse that remains in-channel. These flows may engage flood runners with the main channel and inundate low-lying wetlands. They connect most in-channel habitats and provide partial longitudinal connectivity, as some low-level weirs and other in-channel barriers may be drowned out.
Lateral connectivity	The flow linking rivers channels and the floodplain.

Longitudinal connectivity	The consistent downstream flow along the length of a river.
Long Term Water Plan (LTWP)	A component of the Murray–Darling Basin Plan. Long Term Water Plans give effect to the Basin-wide environmental watering strategy (MDBA 2014) relevant for each river system and will guide the management of water over the longer term. These plans will identify the environmental assets that are dependent on water for their persistence, and match that need to the water available to be managed for or delivered to them. The plan will set objectives, targets and watering requirements for key plants, waterbirds, fish and ecosystem functions. OEH is responsible for the development of nine plans for river catchments across NSW, with objectives for five, 10 and 20-year timeframes.
Montane	Relating to mountainous country.
Overbank flow (OB)	Flows that spill over the riverbank or extend to floodplain surface flows.
Planned environmental water	Water that is committed by the Basin Plan, a water resource plan or a plan made under state water management law to achieving environmental outcomes.
Planning Unit	A division of a water resource plan area based on water requirements (in catchment areas in which water is actively managed), or a sub-catchment boundary (all other areas).
Population structure	A healthy population structure has individuals in a range of age and size classes. These populations demonstrate regular recruitment and good numbers of sexually mature individuals.
Priority environmental asset	A place of particular ecological significance that is water dependent, meets one or more of the assessment indicators for any of the five criteria specified in Schedule 8 in the Basin Plan, and can be managed with environmental water. This includes planned and held environmental water.
Priority ecosystem function	Ecosystem functions that meets one or more of the assessment indicators for any of the four criteria specified in Schedule 9 of the Basin Plan and can be managed with environmental water.
Ramsar Convention	An international treaty to maintain the ecological character of key wetlands.
Recruitment	Successful development and growth of offspring; such that they can contribute to the next generation.
Refugium	An area in which a population of plants or animals can survive through a period of decreased water availability.
Registered cultural asset	A cultural water-dependent asset that is registered in the Aboriginal Heritage Information Management System (AHIMS).
Regulated river	A river that is gazetted under the *NSW Water Management Act 2000.* Flow is largely controlled by major dams, water storages and weirs. River regulation brings more reliability to water supplies but has interrupted the natural flow characteristics and regimes required by native fish and other plant and animal to breed, feed and grow.
Riffle	A rocky or shallow part of a river where river flow is rapid and broken.
Riparian	The part of the landscape adjoining rivers and streams that has a direct influence on the water and aquatic ecosystems within them.
Risk management strategy	A plan of management to overcome risks to achieving environmental outcomes.
Small fresh (SF)	Low-magnitude in-channel flow pulse. Unlikely to drown out any significant barriers but can provide limited connectivity and a biological trigger for animal movement.

Stochastic	Relating to or characterised by random chance.
Substrate	A habitat surface such as a stream bed.
Supplementary access	A category of water entitlement where water is made available to licence holder accounts during periods of high river flows that cannot otherwise be controlled by river operations. Water can be taken and debited from licence accounts during a declared period of high flow.
Surface water	Water that exists above the ground in rivers, streams creeks, lakes and reservoirs. Although separate from groundwater, they are interrelated and over extraction of either will impact on the other.
Sustainable diversion limit (SDL)	The grossed-up amount of water that can be extracted from Murray-Darling Basin rivers for human uses while leaving enough water in the system to achieve environmental outcomes.
Unregulated river	A waterway where flow is mostly uncontrolled by dams, weirs or other structures.
Very low flow (VF)	Small flow in the very-low flow class that joins river pools, thus providing partial or complete connectivity in a reach. These flows can improve DO saturation and reduce stratification in pools.
Water quality management plan (WQMP)	A document prepared by state authorities and accredited by the Commonwealth under the Basin Plan. It forms part of a water resource plan and aims to provide a framework to protect, enhance and restore water quality in each water resource plan area.
Water resource plan (WRP)	A document prepared by state authorities and accredited by the Commonwealth under the Basin Plan. The document describes how water will be managed and shared between users in an area.
Water resource plan area (WRPA)	Catchment-based divisions of the Murray–Darling Basin defined by a water resource plan.
Water sharing plan (WSP)	A plan made under the NSW *Water Management Act 2000* that sets out specific rules for sharing and trading water between the various water users and the environment in a specified water management area. It forms part of a water resource plan.
Water dependent system	An ecosystem or species that depends on periodic or sustained inundation, waterlogging or significant inputs of water for natural functioning and survival.
Wetland inundation flow (WL)	Flows that fill wetlands at flow rates below bankfull or via regulating structures over weeks or sometimes months (i.e. longer than a typical fresh/pulse), or flows that are required to inundate wetlands in areas where there are very shallow channels or no discernible channels exist (e.g. terminal wetlands).

Summary

Part B of the Lachlan Long Term Water Plan (LTWP), presents the LTWP at the local (planning unit) scale. For each of the 39 planning units in the Lachlan LTWP, information is provided on:

- the location of priority environmental assets identified as part of LTWP development
- the ecological values, including native fish, frogs and waterbird species, native vegetation communities and registered cultural water-dependant assets[1] that occur within the planning unit's priority environmental assets
- *For Zone A planning units (1-16)* - environmental water requirements (EWRs) to support ecological values and related LTWP objectives and targets - presented for representative gauge/s in the planning unit
- *For Zone B planning units (17-39)* - an evaluation of the hydrology and the impact of water resource development on local flows and potential management strategies for mitigating these changes to meet LTWP objectives and targets.

[1] It is acknowledged that other Aboriginal values such as sites, objects, landscapes, resources & beliefs that are important to Aboriginal people as part of their continuing culture may be present but not registered.

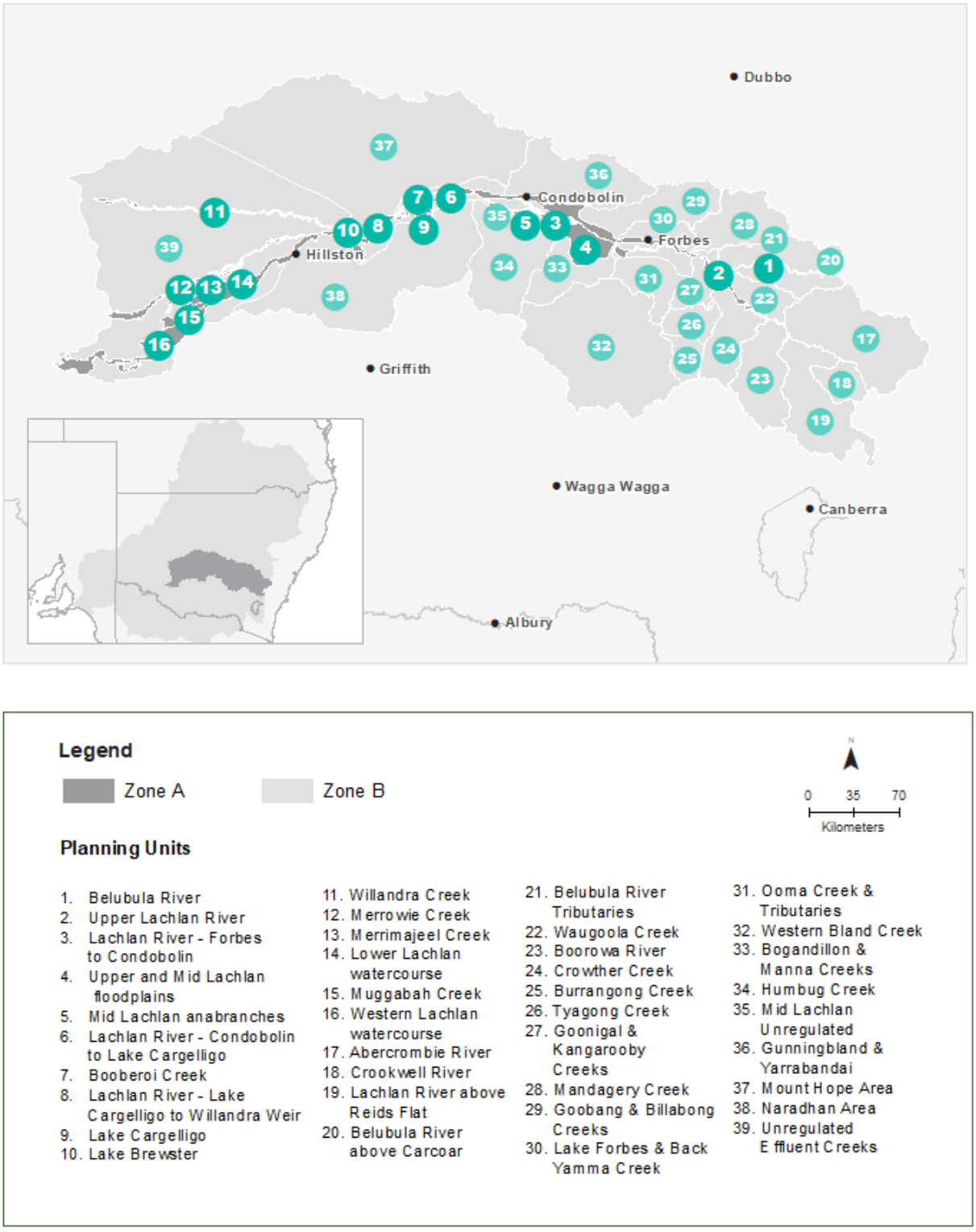


Figure 2 The Lachlan catchment showing the division of planning units into Zone A and Zone B in the Long Term Water Plan

1. Zone A planning units

Zone A planning units (PUs) are located downstream of Wyangala and Carcoar dams on either the Lachlan River or its distributary channels. Held environmental water released from Wyangala and Carcoar dams or Lake's Brewster and Cargelligo can be delivered to priority environmental assets in these PUs, together with planned environmental water and water delivered for consumptive use.

Bundaburra Creek, Lake Cowal and the Jemalong Wyldes Plain floodplain (Upper and Mid Lachlan floodplain planning unit) are included in the Zone A PUs. While PEW and HEW are not able to be delivered directly into this PU[2], they are reliant on flows that are delivered through the connected regulated system. Major flood flows down the regulated Lachlan River contribute water to the Upper and Mid Lachlan floodplain PU, which can then also contribute water back into the Mid Lachlan anabranches PU (which is also in Zone A).

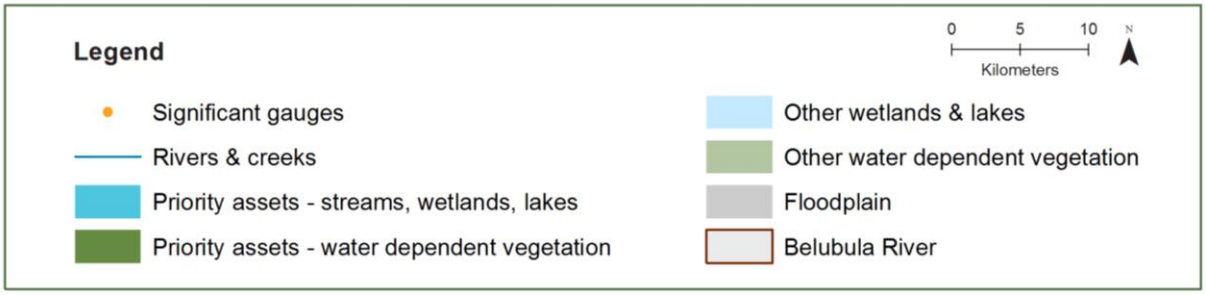
Although river regulation has typically had a greater influence on the hydrology of Zone A PUs compared to those in Zone B, the associated storage and diversion infrastructure in Zone A has increased the potential for river flows to be targeted and manipulated to meet the needs of the environment.

PUs in Zone A have been delineated in this LTWP based on how water is managed in each unit. This is primarily determined by the layout of the main watercourses, the lateral extent of the managed floodplain and groups of priority assets with similar water requirements.

The information in this section will help guide water management decision-making in the shorter-term and contribute to long-term objectives and targets at the regional, catchment and basin scale.

[2] with the current volumes of HEW available, under current constraints or with the amount of PEW available under the current WSP rules.

PU1: Belubula River



Priority environmental assets

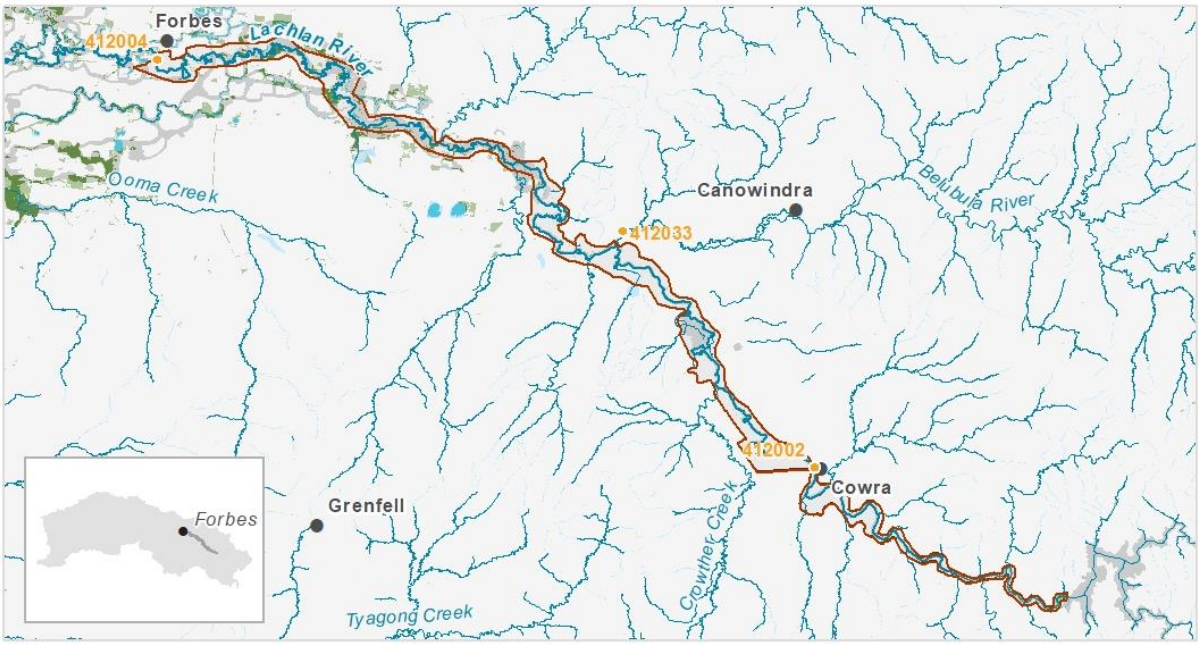
- Belubula River and its in-stream habitat and fringing vegetation communities

Native fish	• Southern purple-spotted gudgeon • Freshwater catfish • Northern river blackfish • Obscure galaxias	• Australian smelt • Freshwater shrimp • Yabby • Alpine crayfish • Suttons crayfish • Flathead gudgeon	• Freshwater prawn • Golden perch • Murray cod • Rieks crayfish • Carp gudgeon
Birds	1 water-dependent bird species recorded		
Native vegetation	2 water-dependent plant community types, including river red gum woodland		
Registered cultural assets	None registered		
Other species	-		

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Belubula River @ Helenshome (412033)	0 ML/d	N/A	In line with historical low flow season, typically December to April	Events should not persist longer than 100 days	Should occur in no more than 94% of years	There is no HEW in Carcoar dam, but these EWRs can be met with PEW under the current WSP rules.
Very-low flow	VF1	Belubula River @ Helenshome (412033)	>10 ML/d	1 year	Any time	265 days minimum (or 50 days minimum in very dry years)	100 days	
Baseflow	BF1	Belubula River @ Helenshome (412033)	>30 ML/d	1 year	Any time	224 days minimum (or 24 days minimum in very dry years)	167 days	These EWRs can be partially met by PEW under the current WSP rules for shorter durations. Natural flows from tributaries below Carcoar dam must be protected to meet these flows and contribute to achieving the ecological objectives.
	BF2	Belubula River @ Helenshome (412033)	>30 ML/d	2 years	September to March	139 days minimum (or 14 days minimum in very dry years)	5–10 years in 10	
Small fresh	SF1	Belubula River @ Helenshome (412033)	>70 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	
	SF2	Belubula River @ Helenshome (412033)	>70 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Large fresh	LF1	Belubula River @ Helenshome (412033)	>655 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	These EWRs cannot be met by PEW under the current WSP rules. Natural flows from tributaries below Carcoar dam must be protected to meet these flows and contribute to achieving the ecological objectives.
	LF2	Belubula River @ Helenshome (412033)	>655 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	
Bankfull	BK1	Belubula River @ Helenshome (412033)	5,000-6,000 ML/d	N/A	August to February (but can occur any time)	1 day minimum	4 years in 10	
Small overbank	OB3	Belubula River @ Helenshome (412033)	>6,000 ML/d	4 years	August to February (but can occur any time)	2 days minimum, 2-3 months of habitat inundation	3–5 years in 10	
Large overbank	OB4	Belubula River @ Helenshome (412033)	>8,000 ML/d	5 years	September to May (but can occur any time)	3 days minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Belubula River @ Helenshome (412033)	>14,000 ML/d	10 years	Any time	1 day minimum, 1–6 months of habitat inundation	1 year in 10	

PU2: Upper Lachlan River



Priority environmental assets

- Upper Lachlan River and its in-stream habitat and fringing vegetation communities

Native fish	• Southern purple-spotted gudgeon • Freshwater catfish • Olive perchlet • Flathead gudgeon • Silver perch • Flathead galaxias	• Unspecked hardyhead • Trout cod (historical) • Obscure galaxias • Carp gudgeon • Bony herring • Australian smelt	• Murray cod • Freshwater shrimp • Yabby • Freshwater prawn • Golden perch • Northern river blackfish
Birds	64 water-dependent bird species recorded, including: • Rainbow bee-eater • White-bellied sea-eagle		
Native vegetation	10 water-dependent plant community types, including: • River red gum woodland	• Wetland sedgeland	• Canegrass swamp grassland wetland
Registered cultural assets	• Burials	• Modified trees	• Ceremony and dreaming
Other species	-		

Flow component		Gauge	Flow rate / volume (event window)	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Lachlan River @ Cowra (412002)	0ML/d	N/A	In line with historical low flow season, typically December to May	Events should not persist longer than 18 days	Should occur in no more than 7% of years	These EWRs can be met with the current volumes of HEW under current constraints or with PEW under the current WSP rules. River operations, irrigation deliveries, and natural flows from tributaries will also contribute to these EWRs.
Very-low flow	VF1	Lachlan River @ Cowra (412002)	>50 ML/d	1 year	Any time	312 days minimum (or 173 days minimum in very dry years)	18 days	
Baseflow	BF1	Lachlan River @ Cowra (412002)	>160 ML/d	1 year	Any time	246 days minimum (or 110 days minimum in very dry years)	90 days	
	BF2	Lachlan River @ Cowra (412002)	>160 ML/d	2 years	September to March	147 days minimum (or 48 days minimum in very dry years)	5–10 years in 10	
Small fresh	SF1	Lachlan River @ Cowra (412002)	>420 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	
	SF2	Lachlan River @ Cowra (412002)	>420 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	

Flow component		Gauge	Flow rate / volume (event window)	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Large fresh	LF1	Lachlan River @ Cowra (412002)	>5,600 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	These EWRs can be met with PEW under the current WSP rules, and may be able to be met with current volumes of HEW under current constraints. The Hydro plant currently constrains regulated deliveries from Wyangala to <3,000 ML/d, if flows are to be passed through the plant and depends on the water level in Wyangala dam. Translucency flows, dam airspace releases and natural flows from tributaries are mainly responsible for supporting these EWRs.
	LF2	Lachlan River @ Cowra (412002)	>5,600 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	
Bankfull	BK1	Lachlan River @ Cowra (412002)	30,600-47,800 ML/d	N/A	August to February (but can occur any time)	2 days minimum	5 years in 10	These EWRs cannot be met with current volumes of HEW under current constraints or with PEW under the current WSP rules. This section of the Lachlan river is managed to mitigate flooding risks to protect towns and infrastructure. The minor flood level is recorded to be at 47,800 ML/d by BOM. Infrastructure needs to be upgraded (bridges, roads and crossings) and natural flows from tributaries need to be protected to meet these EWRs.
Small overbank	OB3	Lachlan River @ Cowra (412002)	>47,800 ML/d	4 years	August to February (but can occur any time)	2 days minimum, 2-3 months of habitat inundation	3–5 years in 10	
Large overbank	OB4	Lachlan River @ Cowra (412002)	>85,500 ML/d	5 years	September to May (but can occur any time)	1 day minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Lachlan River @ Cowra (412002)	>135,000 ML/d	10 years	Any time	1 day minimum, 1–6 months of habitat inundation	1 year in 10	

PU3: Lachlan River (Forbes to Condobolin)

Priority environmental assets

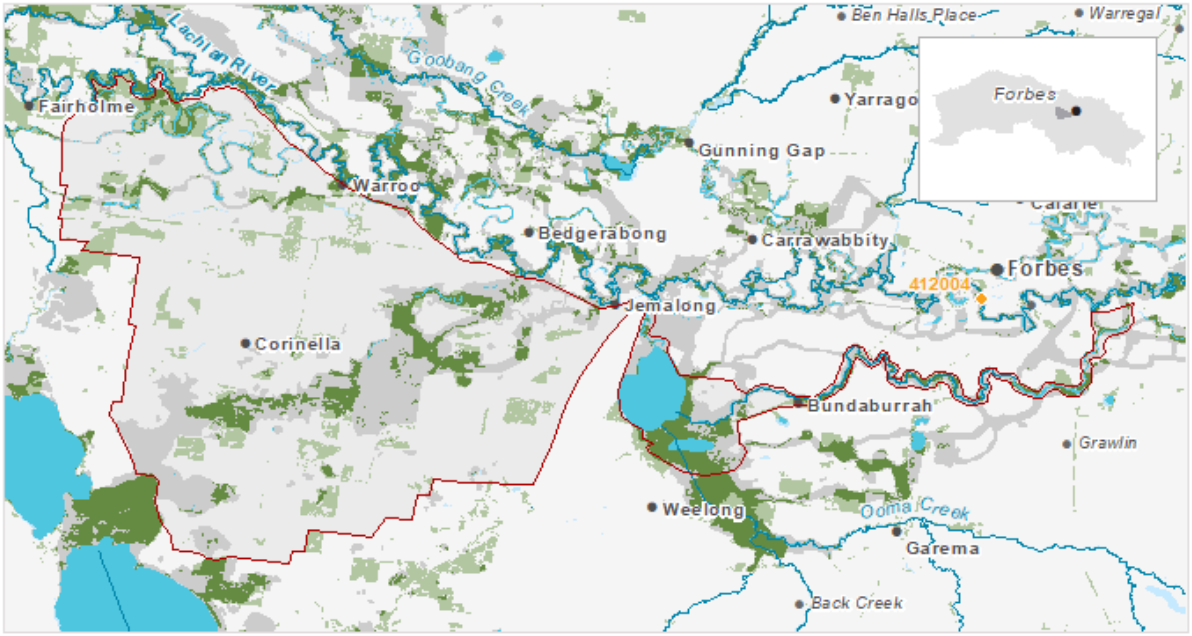
- Lachlan River and its in-stream habitat and fringing vegetation communities
- Horseshoe Lagoon
- Bumbuggan Creek

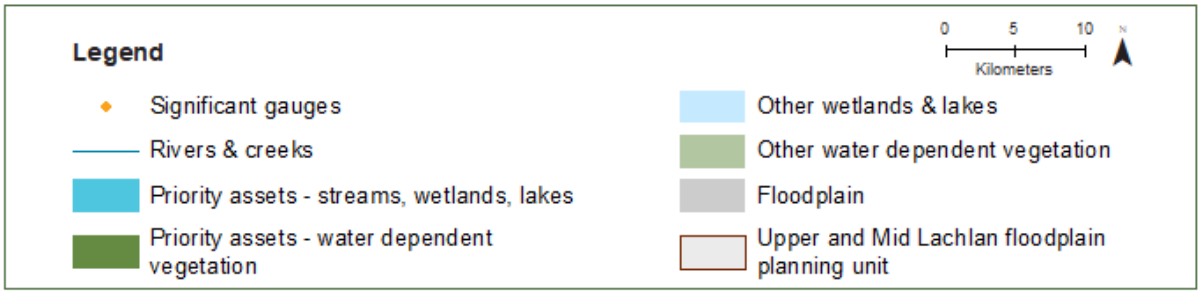
Native fish	• Freshwater catfish • Olive perchlet • Flathead galaxias • Unspecked hardyhead • Yabby	• Northern river blackfish • Carp gudgeon • Bony herring • Flathead gudgeon • Australian smelt	• Freshwater shrimp • Freshwater prawn • Golden perch • Murray cod • Silver perch
Birds	73 water-dependent bird species recorded, including: • Rainbow bee-eater • Blue-billed duck	• White-bellied sea-eagle	• Freckled duck • Magpie goose
Native vegetation	11 water-dependent plant community types, including • River red gum woodland	• Wetland sedgeland	• Cumbungi rushlands wetland
Registered cultural assets	• Modified trees		
Other species	• Peron's tree frog	• Eastern sign-bearing froglet	• Spotted grass frog

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Lachlan River @ Forbes (412004)	0 ML/d	N/A	In line with historical low flow season, typically December to May	Events should not persist longer than 4 days	Should occur in no more than 1% of years	These EWRs can be met with the current volumes of HEW under current constraints or with PEW under the current WSP rules. River operations, irrigation deliveries, and natural flows from tributaries will also contribute to these EWRs.
Very-low flow	VF1	Lachlan River @ Forbes (412004)	>50 ML/d	1 year	Any time	359 days minimum (or 220 days minimum in very dry years)	No more than 14 days without flows above threshold	
Baseflow	BF1	Lachlan River @ Forbes (412004)	>165 ML/d	1 year	Any time	289 days minimum (or 146 days minimum in very dry years)	No more than 77 days without flows above threshold	
	BF2	Lachlan River @ Forbes (412004)	>165 ML/d	2 years	September to March	176 days minimum (or 63 days minimum in very dry years)	5–10 years in 10	
Small fresh	SF1	Lachlan River @ Forbes (412004)	>600 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	
	SF2	Lachlan River @ Forbes (412004)	>600 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	
	SF3	Lachlan River @ Forbes (412004)	>3,000 ML/d	2 years	August to February (but can occur any time)	6 days minimum	5-10 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Large fresh	LF1	Lachlan River @ Forbes (412004)	>8,500 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	PEW under current WSP rules and HEW may be able to contribute to this EWR with current volumes and under current constraints if delivered in combination with consumptive water deliveries or natural flows.
	LF2	Lachlan River @ Forbes (412004)	>8,500 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	
	LF3	Lachlan River @ Forbes (412004)	>9,250 ML/d	4 years	August to February (but can occur any time)	7 days minimum	3–5 years in 10	
Bankfull	BK1	Lachlan River @ Forbes (412004)	13,000-13,900 ML/d	N/A	August to February (but can occur any time)	4 days minimum	5-7 years in 10	
Small overbank	OB2	Lachlan River @ Forbes (412004)	>13,900 ML/d	3 years	October to April (but can occur any time)	10 days minimum, 2–6 months of habitat inundation	4–7 years in 10	These EWRs cannot be met with the current volumes of HEW under current conditions or with PEW under current WSP rules. Channel capacity, as defined in the WSP, constrains flows >13,900 ML/d Natural flows need to be protected to meet these EWRs
	OB3	Lachlan River @ Forbes (412004)	>21,600 ML/d	4 years	August to February (but can occur any time)	5 days minimum, 2-3 months of habitat inundation	3–5 years in 10	
Large overbank	OB4	Lachlan River @ Forbes (412004)	>45,000 ML/d	5 years	September to May (but can occur any time)	1 days minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Lachlan River @ Forbes (412004)	>65,000 ML/d	10 years	Any time	1 days minimum, 1–6 months of habitat inundation	1 year in 10	

PU4: Upper and Mid Lachlan floodplain





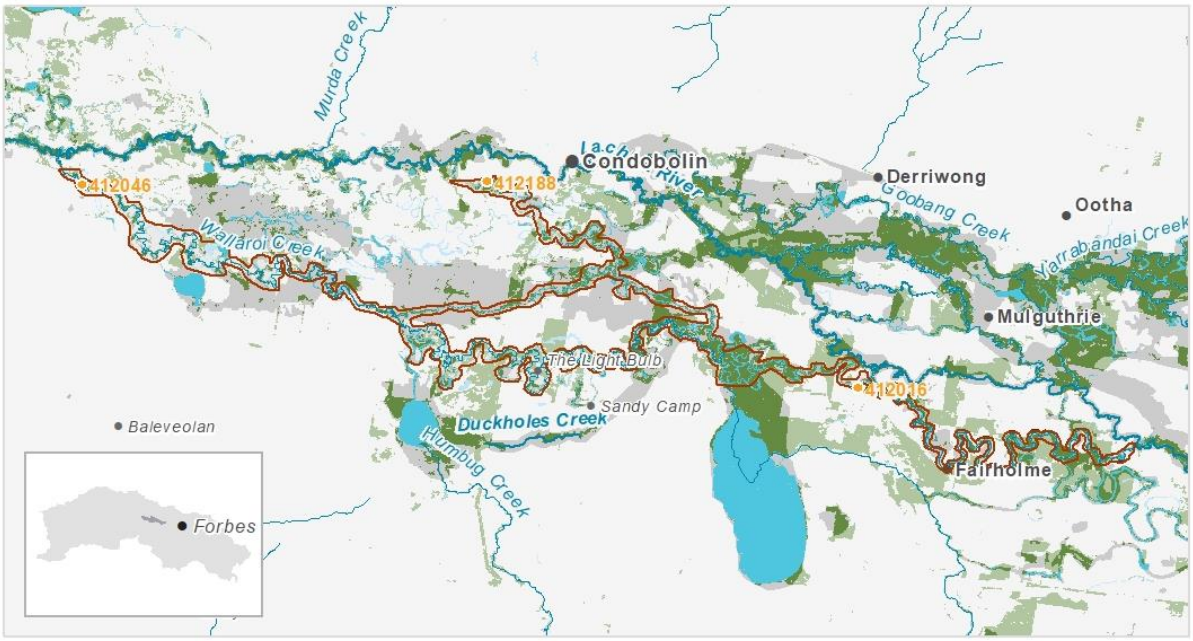
Priority environmental assets

- Thurumbidgee Lagoon
- Lake Cowal
- Bundaburra Creek and its in-stream habitat and fringing vegetation communities

Native fish	• Olive perchlet • Silver perch • Bony herring • Yabby • Murray cod • Golden perch	• Flathead galaxias • Flathead gudgeon • Unspecked hardyhead • Dwarf flat-headed gudgeon • Murray-darling rainbowfish	• Australian smelt • Freshwater shrimp • Freshwater prawn • Carp gudgeon • Freshwater catfish
Birds	65 water-dependent bird species recorded, including • Latham's snipe • Brolga	• Rainbow bee-eater • Blue-billed duck	• Glossy ibis • Australasian bittern
Native vegetation	10 water-dependent plant community types, including • Wetland sedgeland	• River red gum woodland	• Canegrass swamp grassland wetland
Registered cultural assets	• Modified trees	• Hearth	
Other species	• Peron's tree frog	• Spotted grass frog	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Large wetland inundation	WL3	Lachlan River @ Jemalong weir (412036)	>15,000 ML/d	4 years	August to February (but can occur any time)	5 days minimum, 2-3 months of habitat inundation	3-5 years in 10	These EWRs cannot be met with the current volumes of HEW under current conditions or with PEW under current WSP rules. Channel capacity, as defined in the WSP, constrains flows >13,900 ML/d These EWRs can only be met by natural flows or pre-flood airspace releases from Wyangala Dam. Natural flows need to be protected to meet these EWRs.
Small overbank	OB3	Lachlan River @ Forbes (412004)	>21,600 ML/d	4 years	August to February (but can occur any time)	5 days minimum, 2-3 months of habitat inundation	3–5 years in 10	
Large overbank	OB4	Lachlan River @ Forbes (412004)	>45,000 ML/d	5 years	September to May (but can occur any time)	1 days minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Lachlan River @ Forbes (412004)	>65,000 ML/d	10 years	Any time	1 days minimum, 1–6 months of habitat inundation	1 year in 10	

PU5: Mid Lachlan anabranches



Priority environmental assets

	• Island Creek • Narrathong Creek	• Wallamundry Creek	• Wallaroi Creek
Native fish	• Freshwater catfish • Freshwater prawn • Freshwater shrimp • Unspecked hardyhead	• Flathead gudgeon • Australian smelt • Yabby • Olive perchlet • Silver perch	• Golden perch • Murray cod • Flathead galaxias • Carp gudgeon • Bony herring
Birds	29 water-dependent bird species recorded, including: • Brolga	• Rainbow bee-eater	
Native vegetation	9 water-dependent plant community types, including: • River red gum woodland	• Wetland sedgeland	• Black box - lignum woodland
Registered cultural assets	None registered		
Other species	• Peron's tree frog	• Eastern sign-bearing froglet	• Spotted grass frog

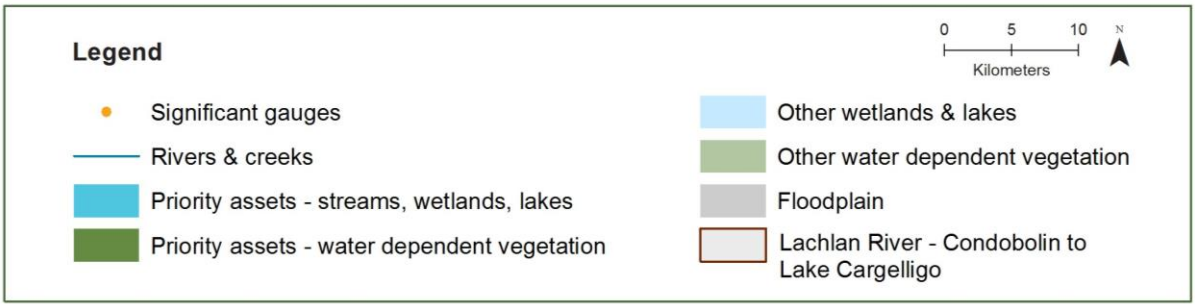
Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Nerathong Creek @ Nerathong (412188)	0 ML/d	N/A	In line with historical low flow season, typically December to May	N/A	N/A	These EWRs can be met with the current volumes of HEW under current constraints or with PEW under the current WSP rules. River operations, irrigation deliveries, and natural flows from tributaries will also contribute to these EWRs.
		Wallaroi Creek US Worrongorra Weir (412046)	0 ML/d			Events should not persist longer than 139 days	Should occur in no more than 50% of years	
		Wallamundry Creek @ O/T Island Creek (412016)	0 ML/d			Events should not persist longer than 108 days	Should occur in no more than 93% of years	
Baseflow	BF1	Nerathong Creek @ Nerathong (412188)	>10 ML/d	1 year	Any time	N/A	N/A	These EWRs can be met or enhanced with the current volumes of HEW under current constraints or with PEW under the current WSP rules. Current volumes of HEW may not be sufficient to provide flows for the entire duration of these EWRs. River operations, irrigation deliveries, and natural flows from tributaries are also needed to contribute to these EWRs. Can only occur as a component of other environmental flows in the Lachlan River (SF1-3 in Lachlan River Forbes to Condo).
		Wallaroi Creek US Worrongorra Weir (412046)	>40 ML/d			181 days minimum (or 45 days minimum in very dry years)	105 days	
		Wallamundry Creek @ O/T Island Creek (412016)	>10 ML/d			250 days minimum (or 130 days minimum in very dry years)	106 days	
	BF2	Nerathong Creek @ Nerathong (412188)	>10 ML/d	2 years	September to March	N/A	5–10 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
		Wallaroi Creek US Worrongorra Weir (412046)	>40 ML/d			108 days minimum (or 9 days minimum in very dry years)		
		Wallamundry Creek @ O/T Island Creek (412016)	>10 ML/d			153 days minimum (or 50 days minimum in very dry years)		
Small fresh	SF1	Nerathong Creek @ Nerathong (412188)	>30 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	
		Wallaroi Creek US Worrongorra Weir (412046)	>70 ML/d					
		Wallamundry Creek @ O/T Island Creek (412016)	>30 ML/d					
	SF2	Nerathong Creek @ Nerathong (412188)	>30 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	
		Wallaroi Creek US Worrongorra Weir (412046)	>70 ML/d					

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
		Wallamundry Creek @ O/T Island Creek (412016)	>30 ML/d					
Large fresh	LF1	Wallaroi Creek US Worrongorra Weir (412046)	>120 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	
		Wallamundry Creek @ O/T Island Creek (412016)	>200 ML/d					
	LF2	Wallaroi Creek US Worrongorra Weir (412046)	>120 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	
		Wallamundry Creek @ O/T Island Creek (412016)	>200 ML/d					
Bankfull	BK1	Nerathong Creek @ Nerathong (412188)	80-100 ML/d	N/A	August to February (but can occur any time)	N/A	5 years in 10	
		Wallaroi Creek US Worrongorra Weir (412046)	200-250 ML/d			7 days minimum		
		Wallamundry Creek @ O/T Island Creek (412016)	300-350 ML/d			9 days minimum	7 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Small overbank	OB2	Lachlan River @ Forbes (412004)	>13,900 ML/d	3 years	October to April (but can occur any time)	10 days minimum, 2–6 months of habitat inundation	4–7 years in 10	These EWRs cannot be met with the current volumes of HEW under current conditions or with PEW under current WSP rules. Natural flows must be protected to meet these EWRs.
	OB3	Lachlan River @ Forbes (412004)	>21,600 ML/d	4 years	August to February (but can occur any time)	5 days minimum, 2-3 months of habitat inundation	3–5 years in 10	
Large overbank	OB4	Lachlan River @ Forbes (412004)	>45,000 ML/d	5 years	September to May (but can occur any time)	1 days minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Lachlan River @ Forbes (412004)	>65,000 ML/d	10 years	Any time	1 days minimum, 1–6 months of habitat inundation	1 year in 10	

PU6: Lachlan River (Condobolin to Lake Cargelligo)

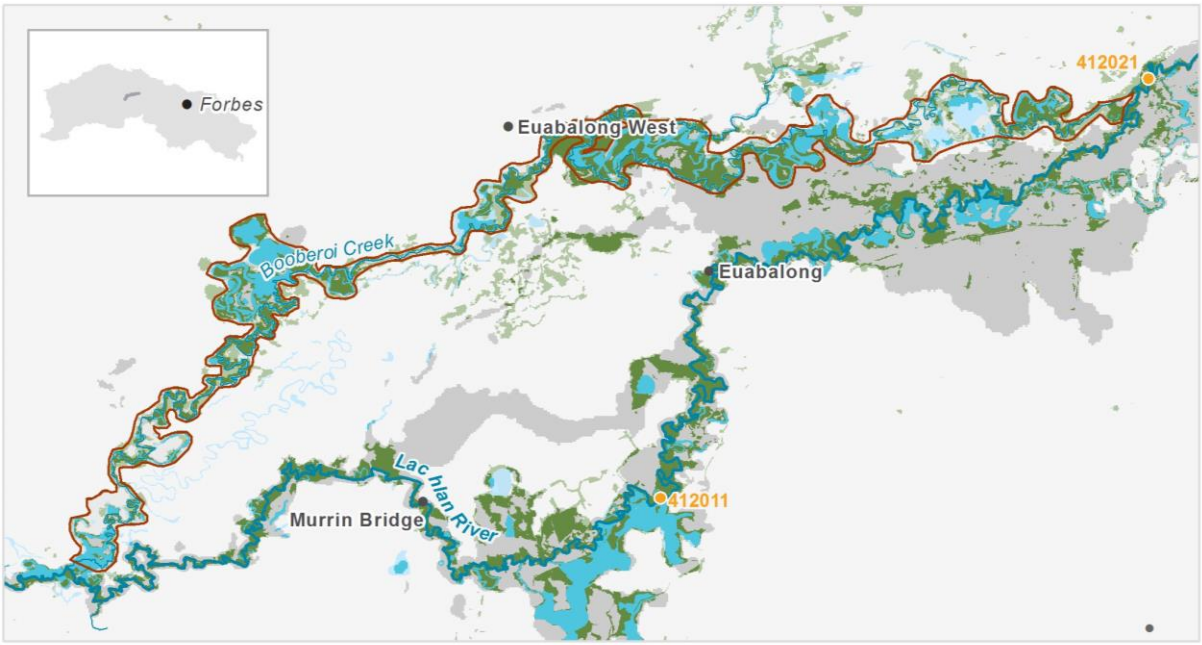


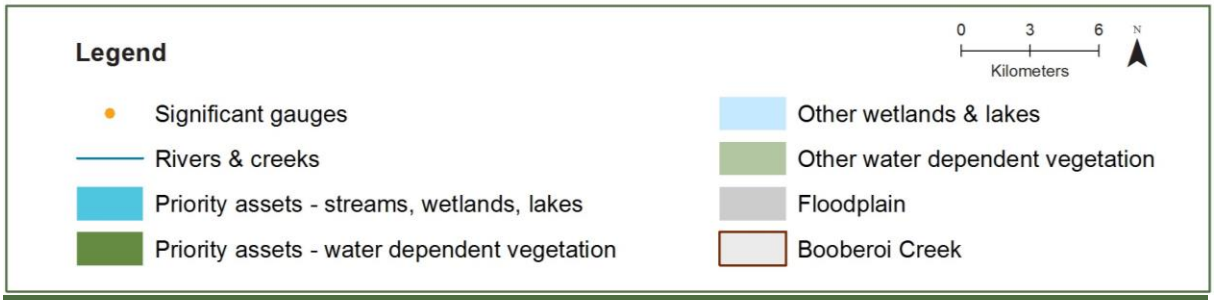
Priority environmental assets			
• Borapine Creek • Lachlan River and its in-stream habitat and fringing vegetation communities	• Kiagathur Creek	• Lachlan River • Yarnel Lagoon	
Native fish	• Freshwater catfish • Murray-Darling rainbowfish • Freshwater shrimp • Spangled perch • Silver perch	• Olive perchlet • Yabby • Bony herring • Flathead gudgeon • Unspecked hardyhead	• Carp gudgeon • Freshwater prawn • Golden perch • Murray cod • Flathead galaxias • Australian smelt
Birds	65 water-dependent bird species recorded, including: • Glossy ibis • Cattle egret	• Rainbow bee-eater • Brolga	• Sharp-tailed sandpiper
Native vegetation	13 water-dependent plant community types, including • River red gum woodland	• Lignum shrubland wetland	• Black box – lignum woodland
Registered cultural assets	• Ceremony and Dreaming	• Hearths • Artefacts	• Modified trees
Other species	• Peron's tree frog	• Eastern sign-bearing froglet	• Spotted grass frog

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Lachlan River @ Cargelligo (412011)	0 ML/d	N/A	In line with historical low flow season, typically January to May	Events should not persist longer than 22 days	Should occur in no more than 6% of years	These EWRs can be met with the current volumes of HEW under current constraints or with PEW under the current WSP rules. River operations, irrigation deliveries, and natural flows from tributaries will also contribute to these EWRs.
Very-low flow	VF1	Lachlan River @ Cargelligo (412011)	>10 ML/d	1 year	Any time	359 days minimum (or 241 days minimum in very dry years)	23 days	
Baseflow	BF1	Lachlan River @ Cargelligo (412011)	>30 ML/d	1 year	Any time	334 days minimum (or 199 days minimum in very dry years)	94 days	
	BF2	Lachlan River @ Cargelligo (412011)	>30 ML/d	2 years	September to March	205 days minimum (or 114 days minimum in very dry years)	5–10 years in 10	
Small fresh	SF1	Lachlan River @ Cargelligo (412011)	>165 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	
	SF2	Lachlan River @ Cargelligo (412011)	>165 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	
Large fresh	LF1	Lachlan River @ Cargelligo (412011)	>6,300 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	These EWRs can be met with PEW under current WSP rules, but may be constrained after November when the TLF is shut off. These EWRs may be able to be met with current volumes of

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
	LF2	Lachlan River @ Cargelligo (412011)	>6,300 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	HEW under current constraints if delivered in combination with other flows. River operations, irrigation deliveries, and natural flows from tributaries are required to contribute to these EWRs.
Bankfull	BK1	Lachlan River @ Cargelligo (412011)	8,600 ML/d	N/A	August to February (but can occur any time)	4 days minimum	5-7 years in 10	
Small overbank	OB2	Lachlan River @ Cargelligo (412011)	>8,600 ML/d	3 years	October to April (but can occur any time)	11 days minimum, 2–6 months of habitat inundation	4–7 years in 10	
	OB3	Lachlan River @ Cargelligo (412011)	>11,000 ML/d	4 years	August to February (but can occur any time)	6 days minimum, 2-3 months of habitat inundation	3–5 years in 10	These EWRs cannot be met with the current volumes of HEW under current conditions or with PEW under current WSP rules. Channel capacity, as defined in the WSP, constrains flows >13,900 ML:/d Natural flows need to be protected to meet these EWRs.
Large overbank	OB4	Lachlan River @ Cargelligo (412011)	>15,000 ML/d	5 years	September to May (but can occur any time)	5 days minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Lachlan River @ Cargelligo (412011)	>23,000 ML/d	10 years	Any time	5 days minimum, 1–6 months of habitat inundation	1 year in 10	

PU7: Booberoi Creek





Priority environmental assets

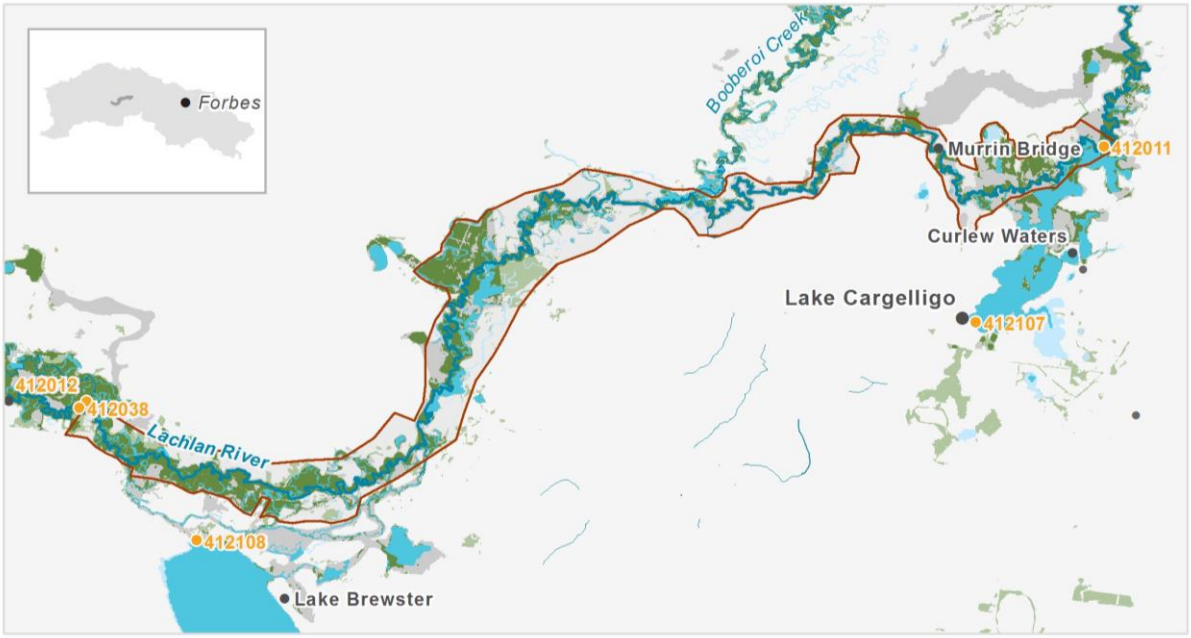
- Booberoi Creek and its in-stream habitat and fringing vegetation communities

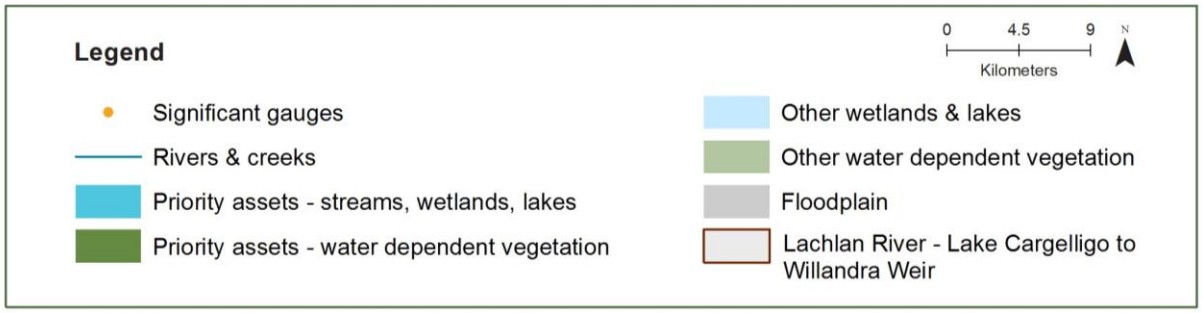
Native fish	• Freshwater catfish • Unspecked hardyhead	• Murray-darling rainbowfish • Bony herring	• Australian smelt • Freshwater shrimp • Carp gudgeon
Birds	25 water-dependent bird species recorded, including rainbow bee-eater		
Native vegetation	9 water-dependent plant community types, including: • Black box woodland	• Lignum shrubland wetland	• Wetland sedgeland
Registered cultural assets	None registered		
Other species	• Peron's tree frog	• Spotted grass frog	• Eastern sign-bearing froglet

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Baseflow	BF1	Booberoi Creek @ Offtake (412189)	>30 ML/d	1 year	Any time	365 days minimum (or 173 days minimum in very dry years)		These EWRs are currently met through operational water deliveries under current WSP rules. They cannot be met with the current volumes of HEW or PEW under the current WSP rules alone for the entire ideal duration of flows required.
Small fresh	SF1	Booberoi Creek @ Offtake (412189)	>60 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	These EWRs are currently met through operational water deliveries under current WSP rules. They can be met with current volumes of HEW under current constraints or with PEW under current WSP rules.
	SF2	Booberoi Creek @ Offtake (412189)	>60 ML/day	2 years	October to April	14 days minimum	5–10 years in 10	
Large fresh	LF1	Booberoi Creek @ Offtake (412189)	>120 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	These EWRs may be partially met through operational water deliveries under current WSP rules. They can be met with current volumes of HEW under current constraints or with PEW under current WSP rules if delivered in combination with operational water or natural flows.
	LF2	Booberoi Creek @ Offtake (412189)	>120 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	
Bankfull	BK1	Booberoi Creek @ Offtake (412189)	175-200 ML/day	N/A	August to February (but can occur any time)	In line with natural	5-7 years in 10	This EWR is predominantly met when there are higher flows in the Lachlan River. This EWR can be met by PEW under current WSP rules. It can be met by current volumes of HEW under current constraints, but involves greater flows in river than is cost-effective except under bigger flow objectives for elsewhere.

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
		Lachlan River @ Cargelligo (412011)	8,000-9,000 ML/d			10 days minimum		These EWRs cannot be met with current volumes of HEW under current constraints, or with PEW under current WSP rules. They are reliant on the protection of natural flows through this system.
Small overbank	OB3	Booberoi Creek @ Offtake (412189)	>200 ML/d	4 years	August to February (but can occur any time)	5 days minimum, 2-3 months of habitat inundation	3–5 years in 10	
		Lachlan River @ Cargelligo (412011)	>11,000 ML/d					
Large overbank	OB4	Lachlan River @ Cargelligo (412011)	>15,000 ML/d	5 years	September to May (but can occur any time)	5 days minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Lachlan River @ Cargelligo (412011)	>23,000 ML/d	10 years	Any time	5 days minimum, 1–6 months of habitat inundation	1 year in 10	

PU8: Lachlan River (Lake Cargelligo to Willandra Weir)





Priority environmental assets

- Lachlan River and its in-stream habitat and fringing vegetation communities
- Box Creek

Native fish	• Freshwater catfish • Freshwater prawn • Flathead gudgeon • Unspecked hardyhead	• Olive perchlet • Silver perch • Australian smelt • Freshwater shrimp • Yabby	• Golden perch • Murray cod • Flathead galaxias • Bony herring • Carp gudgeon
Birds	48 water-dependent bird species recorded, including:		
	• Caspian tern	• Australasian bittern	• Rainbow bee-eater
Native vegetation	9 water-dependent plant community types, including		
	• River red gum woodland	• Lignum shrubland wetland	• Cumbungi rushlands wetland
Registered cultural assets	• Ceremony and Dreaming	• Hearths • Artefacts	• Modified trees
Other species	-		

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Lachlan River @ Willandra (412038)	0 ML/d	N/A	In line with historical low flow season, typically January to May	Events should not persist longer than 15 days	Should occur in no more than 4% of years	These EWRs can be met with the current volumes of HEW under current constraints or with PEW under the current WSP rules. River operations, irrigation deliveries, and natural flows from tributaries will also contribute to these EWRs.
Very-low flow	VF1	Lachlan River @ Willandra (412038)	>30 ML/d	1 year	Any time	340 days minimum (or 211 days minimum in very dry years)	77 days	
Baseflow	BF1	Lachlan River @ Willandra (412038)	>115 ML/d	1 year	Any time	279 days minimum (or 148 days minimum in very dry years)	93 days	
	BF2	Lachlan River @ Willandra (412038)	>115 ML/d	2 years	September to March	173 days minimum (or 67 days minimum in very dry years)	5–10 years in 10	
Small fresh	SF1	Lachlan River @ Willandra (412038)	>280 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	
	SF2	Lachlan River @ Willandra (412038)	>280 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	
Large fresh	LF1	Lachlan River @ Willandra (412038)	>2,200 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	
	LF2	Lachlan River @ Willandra (412038)	>2,200 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Bankfull	BK1	Lachlan River @ Willandra (412038)	3,500 ML/d	N/A	August to February (but can occur any time)	8 days minimum	7 years in 10	
Small overbank	OB1	Lachlan River @ Willandra (412038)	>3,500 ML/d	2 years	September to March (but can occur any time)	8 days minimum, 2–8 months of habitat inundation	7-8 years in 10	
	OB2	Lachlan River @ Willandra (412038)	>5,200 ML/d	3 years	October to April	10 days minimum, 2–6 months of habitat inundation	4–7 years in 10	This EWR is unlikely to be met with current volumes of HEW under current constraints. PEW can meet this EWR, but is constrained by the November cut-off date for TLF in the WSP. At flow rates >2,800 ML/d, a component of flows in the Lachlan (approx. 10%) will enter Willandra Creek.
	OB3	Lachlan River @ Willandra (412038)	>8,000 ML/d	4 years	August to February (but can occur any time)	5 days minimum, 2-3 months of habitat inundation	3–5 years in 10	This EWR cannot be met with current volumes of HEW under current constraints and PEW is only able to contribute to flows up to 8,000 ML in this PU. Natural flows must be protected to meet this EWR.
Large overbank	OB4	Lachlan River @ Willandra (412038)	>11,300 ML/d	5 years	September to May (but can occur any time)	5 days minimum, 3–8 months of habitat inundation	2–3 years in 10	These EWRs cannot be met with the current volumes of HEW under current conditions or with PEW under current WSP rules. Natural flows need to be protected to meet these EWRs.
	OB5	Lachlan River @ Willandra (412038)	>20,000 ML/d	10 years	Any time	1 day minimum, 1–6 months of habitat inundation	1 year in 10	

PU9: Lake Cargelligo

Priority environmental assets

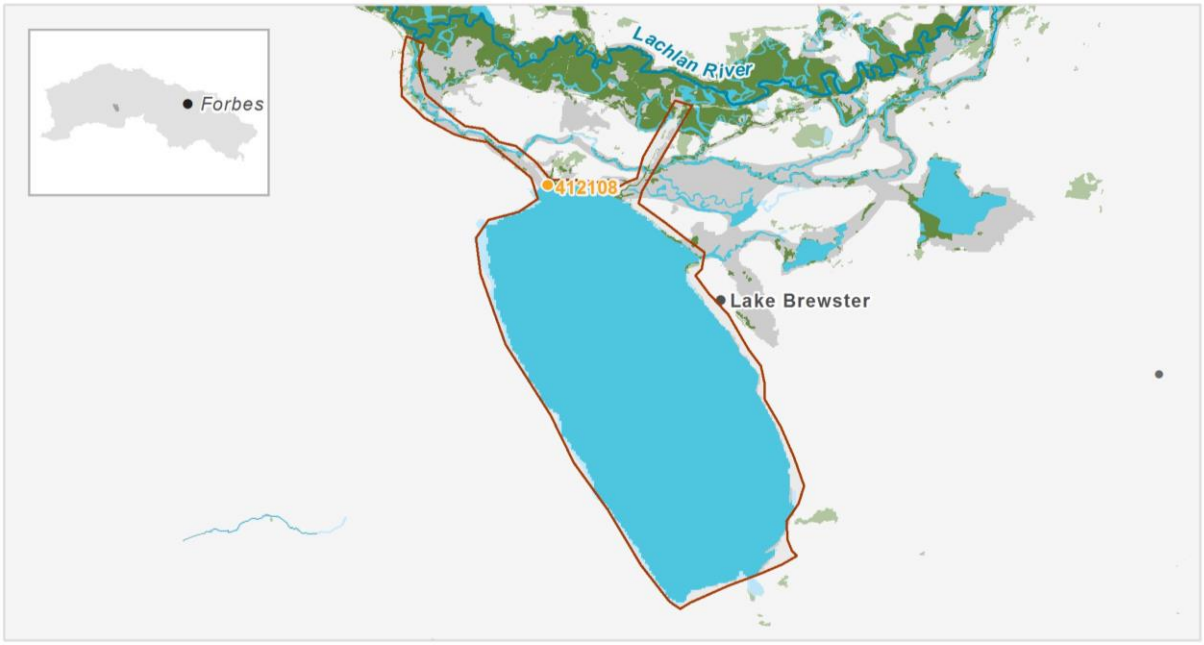
- Lake Cargelligo

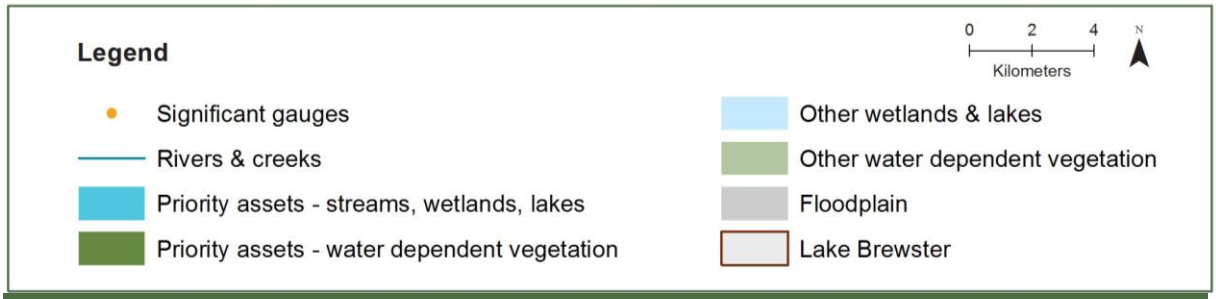
Native fish	• Carp-gudgeon species	• Bony herring • Murray cod	• Golden perch • Australian smelt
Birds	91 water-dependent bird species recorded, including:		
	• White-bellied sea-eagle • Sharp-tailed sandpiper • Eastern great egret	• Freckled duck • Marsh sandpiper • Gull-billed tern • Glossy ibis	• Red-necked stint • Blue-billed duck • Common greenshank • Brolga
Native vegetation	8 water-dependent plant community types, including:		
	• Black box - lignum woodland	• River red gum woodland	• Canegrass swamp grassland wetland
Registered cultural assets	• Resources, gathering	• Artefacts	• Shell
Other species	-		

Flow component		Gauge	Storage level	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Large wetland inundation	WL3	Lake Cargelligo @ Storage (412107)	>65% full	3 years	September to March (can occur anytime)	2–6 months of habitat inundation	5–7 years in 10	If colonial waterbirds are nesting and water levels are >65%, then the following must be supported until successful completion of the breeding event[3] • Water levels should be maintained above 65% if possible • Rapid rises in water level should be avoided • Water levels should not drop more than natural rates of evaporation

[3] Successful breeding relates to completion of nests where fledglings and juvenile birds are observed at the end of each breeding event.

PU10: Lake Brewster



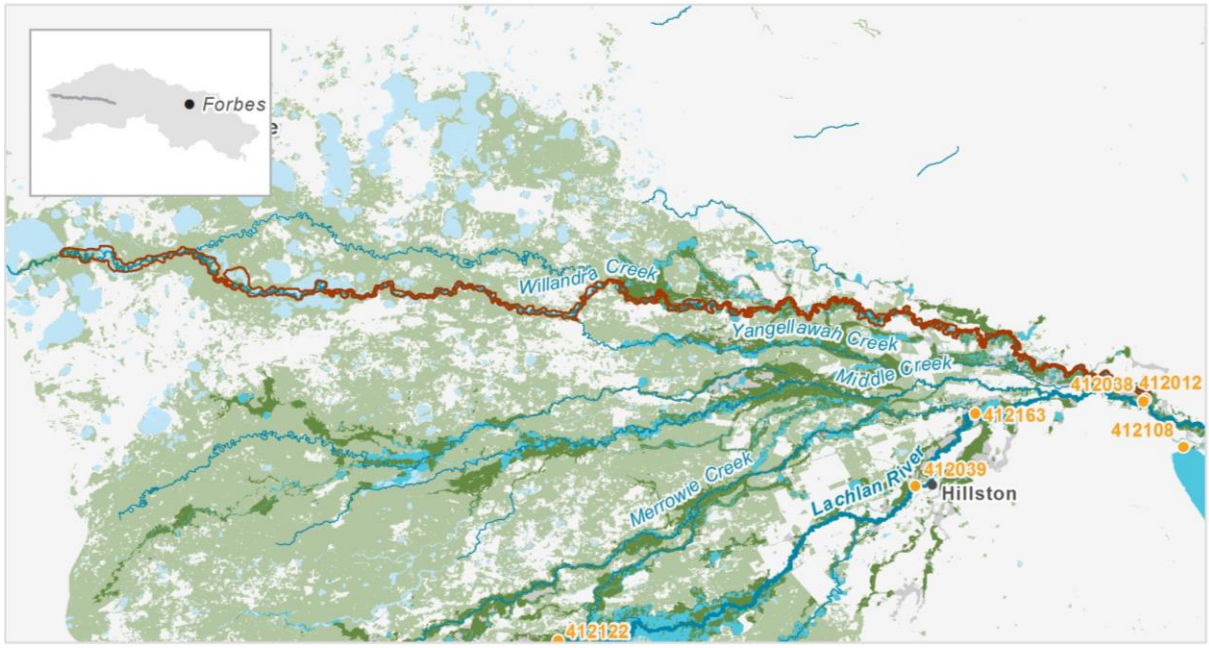


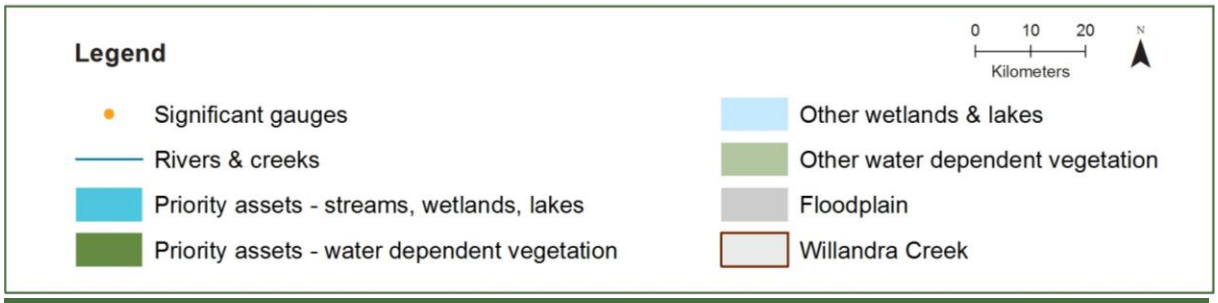
Priority environmental assets

- Lake Ballyrogan
- Lake Brewster

Native fish	• Olive perchlet • Silver perch • Unspecked hardyhead • Carp gudgeon • Flathead gudgeon	• Australian smelt • Yabby • Freshwater prawn • Freshwater catfish	• Golden perch • Murray cod • Freshwater shrimp • Bony herring
Birds	75 water-dependent bird species recorded, including: • Common greenshank • Glossy ibis • Blue-billed duck • Brolga	• Common sandpiper • White-bellied sea-eagle	• Marsh sandpiper • Freckled duck • Eastern great egret
Native vegetation	7 water-dependent plant community types, including • Lignum shrubland wetland	• Wetland sedgeland	• Black box - lignum woodland
Registered cultural assets	• Resources, gathering • Artefacts	• Hearths	• Modified trees
Other species	• Spotted grass frog		

PU11: Willandra Creek





Priority environmental assets

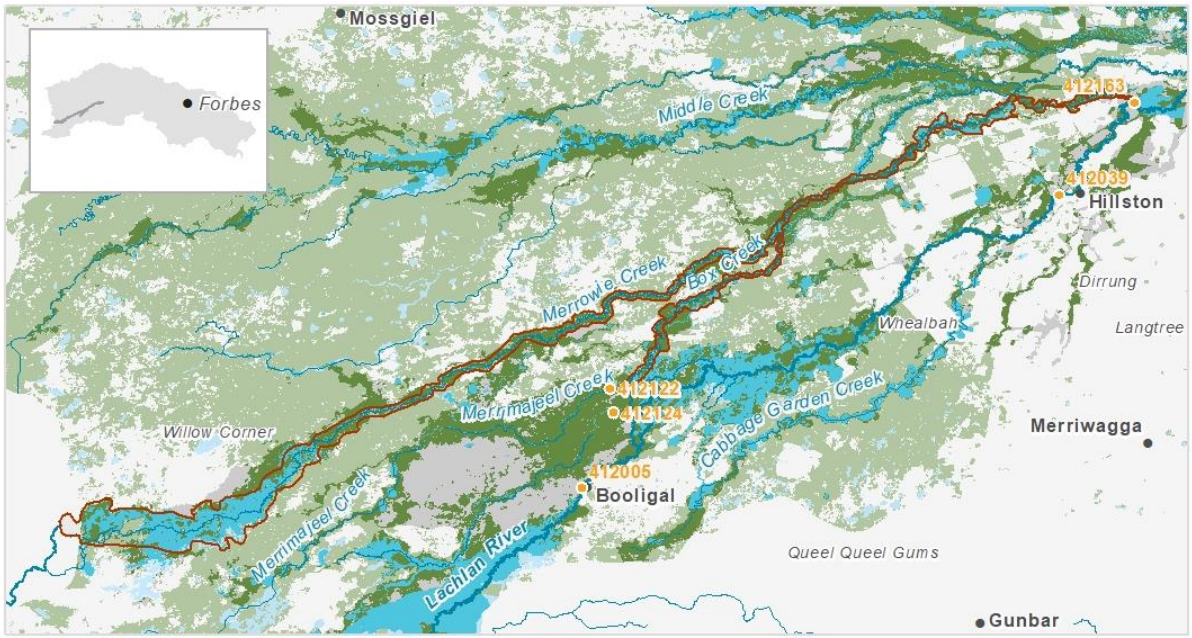
- Willandra Creek and its in-stream habitat and fringing vegetation communities

Native fish	• Olive perchlet • Silver perch • Flathead galaxias • Carp gudgeon • Murray-Darling rainbowfish	• Bony herring • Flathead gudgeon • Yabby • Dwarf flat-headed gudgeon • Australian smelt	• Freshwater shrimp • Freshwater prawn • Golden perch • Murray cod • Unspecked hardyhead
Birds	71 water-dependent bird species recorded, including:		
	• Rainbow bee-eater	• Blue-billed duck	• Glossy ibis
Native vegetation	9 water-dependent plant community types, including		
	• Black box - lignum woodland	• Lignum shrubland wetland	• River red gum woodland
Registered cultural assets	• Artefacts	• Hearth	• Modified trees
Other species	• Spotted grass frog • Giant banjo frog	• Eastern sign-bearing froglet	• Peron's tree frog

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Willandra @ Road Bridge (412012)	0 ML/d	N/A	In line with historical low flow season, typically January to May	Events should not persist longer than 52 days	Should occur in no more than 44% of years	These EWRs are currently met through operational and consumptive water deliveries under current WSP rules. They can be met with current volumes of HEW under current constraints or with PEW under current WSP rules.
Baseflow	BF1	Willandra @ Road Bridge (412012)	>30 ML/d	1 year	Any time	303 days minimum (or 64 days minimum in very dry years)	51 days	
	BF2	Willandra @ Road Bridge (412012)	>30 ML/d	2 years	September to March	174 days minimum (or 31 days minimum in very dry years)	5–10 years in 10	
Small fresh	SF1	Willandra @ Road Bridge (412012)	>70 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	
	SF2	Willandra @ Road Bridge (412012)	>70 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	
Large fresh	LF1	Willandra @ Road Bridge (412012)	>250 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	This EWR can be met with PEW under current WSP rules, and HEW may be able to contribute to flows with current volumes and under current constraints if delivered in combination with consumptive water deliveries or natural flows. Natural flows must be protected to consistently meet this EWR.
	LF2	Willandra @ Road Bridge (412012)	>250 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	
Bankfull	BK1	Willandra @ Road Bridge (412012)	>300-500 ML/d	N/A	August to February (but can occur any time)	10 days minimum	5-7 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Small wetland inundation	WL2	Willandra Creek @ Willandra Homestead (412042)	>150 ML/d	2 years	September to March (but can occur any time)	30 days minimum	7-8 years in 10	These EWRs are currently mostly met through operational and consumptive water deliveries under current WSP rules. HEW may be able to contribute to flows with current volumes and under current constraints if delivered in combination with consumptive water deliveries or natural flows. This EWR may also be partially met with PEW under current WSP rules.
Large wetland inundation	WL3	Willandra Creek @ Willandra Homestead (412042)	>150 ML/d	4 years	August to February (but can occur any time)	50 days minimum, 2-3 months of habitat inundation	3-5 years in 10	
Small overbank	OB2	Willandra @ Road Bridge (412012)	>500 ML/d	3 years	October to April (but can occur any time)	14 days minimum, 2–6 months of habitat inundation	4–7 years in 10	This EWR can be met with PEW under current WSP rules, but cannot be met with current volumes of HEW under current constraints. Natural flows must be protected to consistently meet this EWR.
	OB3	Willandra @ Road Bridge (412012)	>1000 ML/d	4 years	August to February (but can occur any time)	16 days minimum, 2-3 months of habitat inundation	3–5 years in 10	These EWRs cannot be met with current volumes of HEW under current constraints and is only rarely partially met with PEW under current WSP rules. They are reliant on the protection of natural flows through this system.
Large overbank	OB4	Willandra @ Road Bridge (412012)	>1,500 ML/d	5 years	September to May (but can occur any time)	9 days minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Willandra @ Road Bridge (412012)	>2,500 ML/d	10 years	Any time	6 days minimum, 1–6 months of habitat inundation	1 year in 10	

PU12: Merrowie Creek



Priority environmental assets

- Cuba Dam
- Chillichil swamp
- Merrowie Creek wetlands
- Merrowie Creek and its in-stream habitat and fringing vegetation communities
- Box Creek and its in-stream habitat and fringing vegetation communities

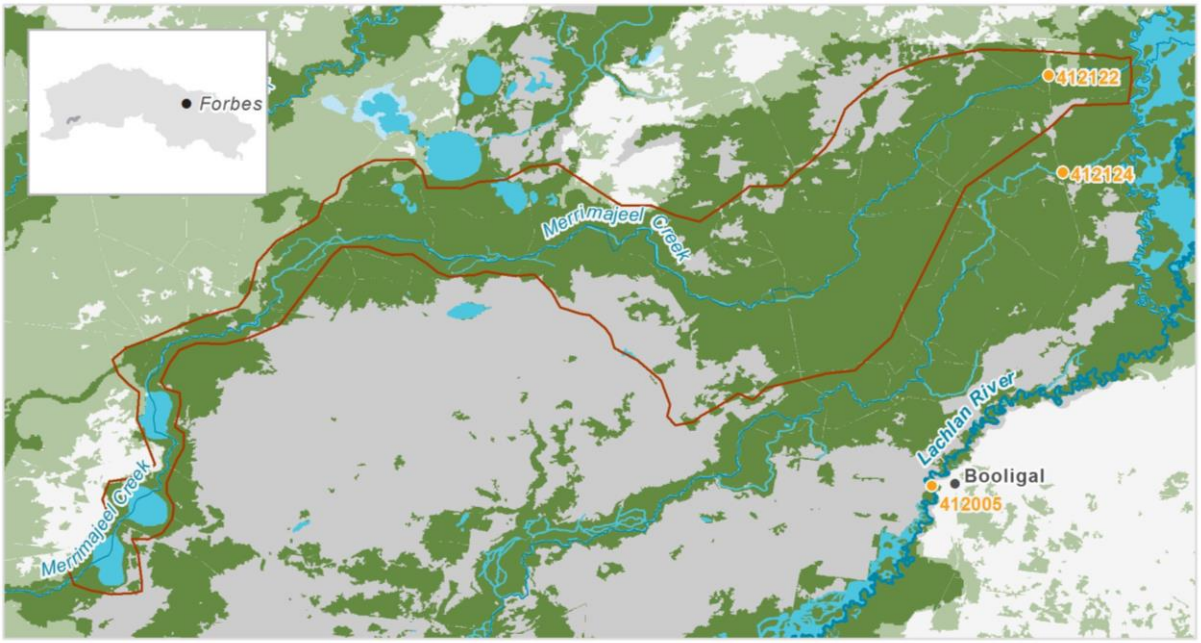
Native fish	• Olive perchlet • Australian smelt • Murray-darling rainbowfish • Dwarf flat-headed gudgeon • Unspecked hardyhead	• Carp gudgeon • Bony herring • Flathead gudgeon • Flathead galaxias • Freshwater shrimp	• Freshwater prawn • Golden perch • Yabby • Murray cod • Silver perch
Birds	64 water-dependent bird species recorded, including • Glossy ibis • Australasian bittern	• Gull-billed tern • Eastern great egret	• Blue-billed duck • Freckled duck
Native vegetation	10 water-dependent plant community types, including • Black box - lignum woodland • Black box woodland	• Canegrass swamp grassland wetland	• Lignum shrubland wetland
Registered cultural assets	• Modified tree		
Other species	• Spotted grass frog		

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Merrowie Ck @ Offtake (412163)	0 ML/d	N/A	In line with historical low flow season, typically January to May	Events should not persist longer than 182 days	Should occur in no more than 93% of years	These EWRs can currently be met through operational and consumptive water deliveries under current WSP rules. They can also be met with current volumes of HEW under current constraints or with PEW under current WSP rules.
Small fresh	SF1	Merrowie Ck @ Offtake (412163)	>120 ML/d	1 year	October to April (can occur any time)	10 days minimum	Annual	
	SF2	Merrowie Ck @ Offtake (412163)	>120 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	
	SF3	Merrowie Ck @ Offtake (412163)	>160 ML/d	3 years	July to December (but can occur any time)	30 days	5-7 years in 10	These EWRs can currently be met through operational and consumptive water deliveries under current WSP rules. Because of the longer duration, they may be partially met with current volumes of HEW under current constraints or with PEW under current WSP rules if they occur in combination with natural flows or consumptive water deliveries.
Large fresh	LF1	Merrowie Ck @ Offtake (412163)	>200 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	These EWRs can currently be met through operational and consumptive water deliveries under current WSP rules. They can also be met with current volumes of HEW under current constraints or with PEW under current WSP rules.
	LF2	Merrowie Ck @ Offtake (412163)	>200 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Bankfull	BK1	Merrowie Ck @ Offtake (412163)	250-400 ML/d	N/A	August to February (but can occur any time)	In line with natural	5-7 years in 10	This EWR may be met with PEW under current WSP, depending on the time of year. HEW may be able to contribute to this EWR with current volumes and under current constraints if delivered in combination with consumptive water deliveries or natural flows.
Small wetland inundation	WL1	Merrowie Ck @ Offtake (412163)	>150 ML/d	2 years	September to March (but can occur any time)	30 days minimum, 2–8 months of habitat inundation	7-8 years in 10	These EWRs can currently be met through operational and consumptive water deliveries under current WSP rules. They can also be met or enhanced with current volumes of HEW under current constraints or with PEW under current WSP rules.
	WL2	Merrowie Ck @ Offtake (412163)	>150 ML/d	3 years	October to April (but can occur any time)	45 days minimum, 2–6 months of habitat inundation	5-7 years in 10	
Large wetland inundation	WL3	Merrowie Ck @ Offtake (412163)	>150 ML/d	4 years	August to February (but can occur any time)	60 days minimum, 2-3 months of habitat inundation	3-5 years in 10	
Small overbank	OB1	Lachlan US Willandra Weir (412038)	>3,000 ML/d	2 years	September to March (but can occur any time)	4 days minimum, 2–8 months of habitat inundation	7-8 years in 10	If the Merrowie Creek regulator is open, this EWR can be met by PEW under current WSP rules. It can be partially met with current volumes of HEW under current constraints, if delivered in combination with consumptive water deliveries or natural flows. Natural flows need to be protected to consistently meet this EWR.

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
	OB2	Lachlan US Willandra Weir (412038)	>5,000 ML/d	3 years	October to April	8 days minimum, 2–6 months of habitat inundation	4–7 years in 10	These EWRs cannot be met with current volumes of HEW under current constraints, and can be met with PEW under current WSP rules, depending on the time of year. These EWRs are mainly reliant on the protection of natural flows through this system.
	OB3	Lachlan US Willandra Weir (412038)	>6,000 ML/d	4 years	August to February (but can occur any time)	10 days minimum, 2-3 months of habitat inundation	3–5 years in 10	
Large overbank	OB4	Lachlan US Willandra Weir (412038)	>8,000 ML/d	5 years	September to May (but can occur any time)	8 days minimum, 3–8 months of habitat inundation	2–3 years in 10	This EWR cannot be met with current volumes of HEW under current constraints or with PEW under current WSP rules. It is reliant on the protection of natural flows through this system.
	OB5	Lachlan US Willandra Weir (412038)	>10,000 ML/d	10 years	Any time	16 days minimum, 1–6 months of habitat inundation	1 year in 10	

PU13: Merrimajeel Creek

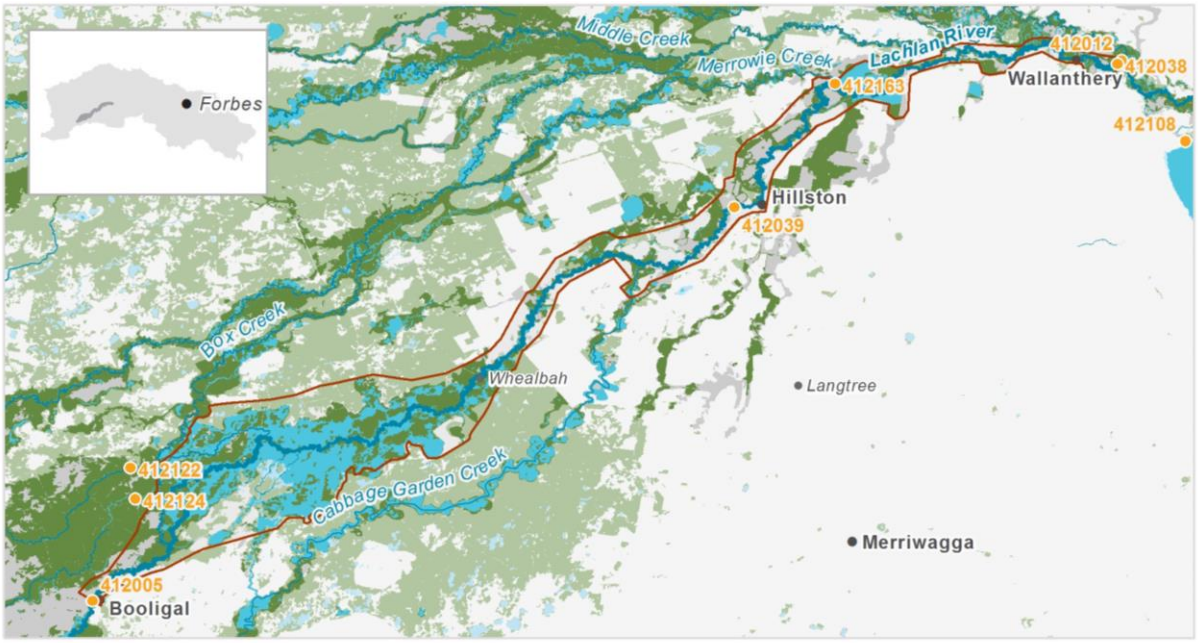


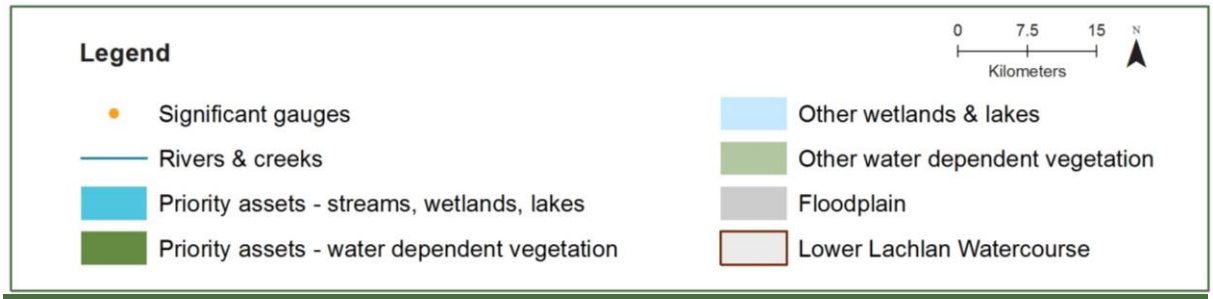
Priority environmental assets			
• Booligal Wetlands • Lake Merrimajeel	• Merrimajeel Creek and its in-stream habitat and fringing vegetation communities • Murrumbidgil Swamp		
Native fish	• Olive perchlet • Silver perch • Unspecked hardyhead • Carp gudgeon	• Flathead gudgeon • Australian smelt • Freshwater shrimp • Yabby • Bony herring	• Freshwater prawn • Golden perch • Murray cod • Flathead galaxias
Birds	68 water-dependent bird species recorded, including: • Glossy ibis • Blue-billed duck	• Freckled duck • Eastern great egret	• Australasian bittern • Gull-billed tern
Native vegetation	9 water-dependent plant community types, including • Lignum shrubland wetland	• Black box - lignum woodland	• Black box woodland
Registered cultural assets	• Habitation structure	• Modified tree	
Other species	• Eastern sign-bearing froglet	• Giant banjo frog • Peron's tree frog	• Spotted grass frog

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Merrimajeel Creek @ Cobb Hwy (412122)	0 ML/d	N/A	In line with historical low flow season, typically January to May	Events should not persist longer than 565 days	Should occur in no more than 100% of years	These EWRs can be met with the current volumes of HEW under current constraints or with PEW under the current WSP rules.
Small wetland inundation	WL1	Lachlan River @ Booligal (412005)	>300 ML/d	2 years	September to March (but can occur any time)	30 days minimum	7-8 years in 10	
	WL2	Lachlan River @ Booligal (412005)	>650 ML/d	3 years	October to April (but can occur any time)	30 days minimum, 2–8 months of habitat inundation	5-7 years in 10	
Large wetland inundation	WL3	Lachlan River @ Booligal (412005)	>850 ML/d	4 years	August to February (but can occur any time)	60 days minimum, 2–6 months of habitat inundation	3-5 years in 10	PEW under the current WSP rules or HEW can partially contribute to this EWR with current volumes and under current constraints if delivered in combination with consumptive water deliveries or natural flows. Natural flows should be protected to ensure these EWRs are being met.
	WL4	Lachlan River @ Booligal (412005)	>1,200 ML/d	5 years	any time	60 days minimum, 2-3 months of habitat inundation	2–3 years in 10	
Small overbank	OB2	Lachlan River @ Booligal (412005)	>2,700 ML/d	3 years	October to April	5 days minimum, 2–6 months of habitat inundation	4–7 years in 10	These EWRs cannot be met with current volumes of HEW under current constraints. Flows >1,800 ML/d are reliant on a wet system or natural events. PEW may be able to meet these EWRs, depending on the time of year.
	OB3	Lachlan River @ Booligal (412005)	>3,500 ML/d	4 years	August to February (but can occur any time)	6 days minimum, 2-3 months of habitat inundation	3–5 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Large overbank	OB4	Lachlan River @ Booligal (412005)	>4,000 ML/d	5 years	September to May (but can occur any time)	2 days minimum, 3–8 months of habitat inundation	2–3 years in 10	These EWRs are mainly reliant on the protection of natural flows through this system. Natural flows should be protected to ensure these EWRs are being met.
	OB5	Lachlan River @ Booligal (412005)	>5,000 ML/d	10 years	Any time	1 days minimum, 1–6 months of habitat inundation	1 year in 10	This EWR cannot be met with current volumes of HEW under current constraints, or with PEW under current WSP rules. It is reliant on the protection of natural flood flows through this system.

PU14: Lower Lachlan watercourse





Priority environmental assets

- Lachlan River and its in-stream and wetland habitat and fringing and wetland vegetation communities
- Moon Moon Lake

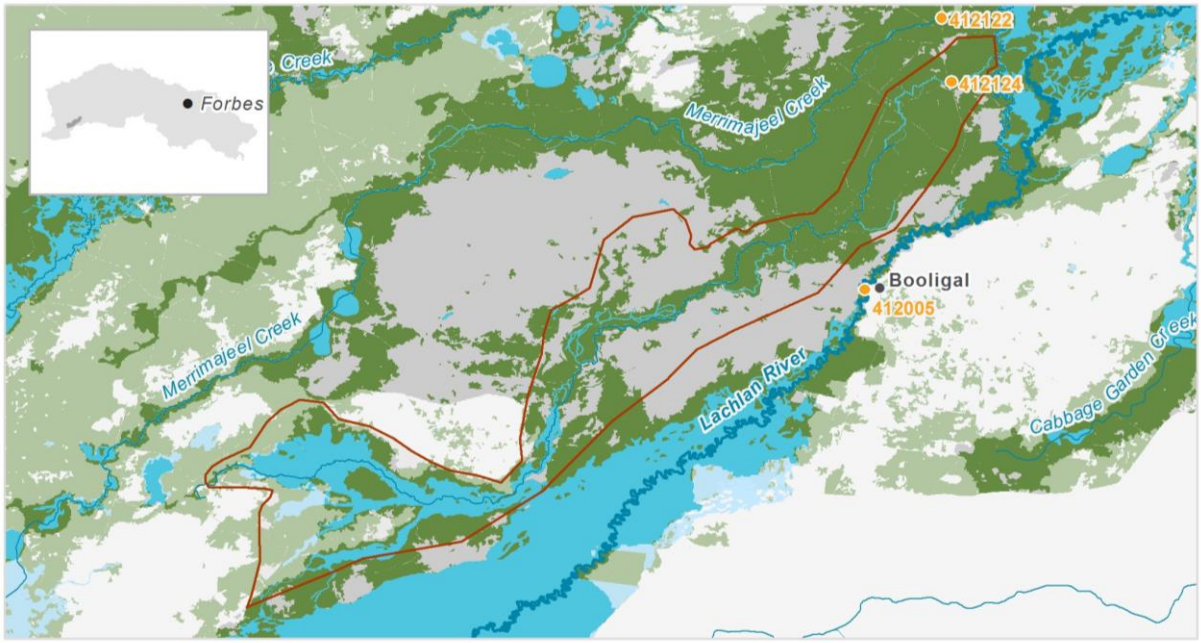
Native fish	• Unspecked hardyhead • Dwarf flat-headed gudgeon • Murray-Darling rainbowfish • Olive perchlet	• Australian smelt • Flathead gudgeon • Bony herring • Flathead galaxias • Freshwater shrimp • Freshwater catfish	• Yabby • Freshwater prawn • Golden perch • Murray cod • Silver perch • Carp gudgeon
Birds	69 water-dependent bird species recorded, including:		
	• Glossy ibis • Blue-billed duck	• Gull-billed tern • Brolga	• Rainbow bee-eater
Native vegetation	11 water-dependent plant community types, including		
	• Black box - lignum woodland	• Black box woodland	• Canegrass swamp grassland wetland
Registered cultural assets	• Artefacts • Hearth	• Modified trees	• Burials
Other species	• Eastern sign-bearing froglet	• Giant banjo frog • Peron's tree frog	• Spotted grass frog

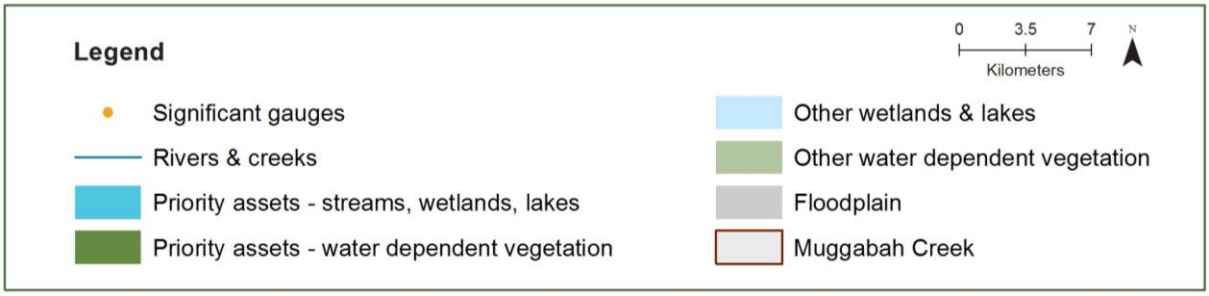
Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Lachlan River @ Hillston Weir (412039)	0 ML/d	N/A	In line with historical low flow season, typically January to May	Events should not persist longer than 77 days	Should occur in no more than 73% of years	
Very-low flow	VF1	Lachlan River @ Hillston Weir (412039)	>20 ML/d	1 year	Any time	312 days minimum (or 179 days minimum in very dry years)	80 days	These EWRs are currently mostly met through operational and consumptive water deliveries under current WSP rules. These EWRs can enhanced with the current volumes of HEW under current constraints or with PEW under the current WSP rules, depending on the time of year.
Baseflow	BF1	Lachlan River @ Hillston Weir (412039)	>100 ML/d	1 year	Any time	260 days minimum (or 136 days minimum in very dry years)	94 days	
	BF2	Lachlan River @ Hillston Weir (412039)	>100 ML/d	2 years	September to March	168 days minimum (or 61 days minimum in very dry years)	5–10 years in 10	
Small fresh	SF1	Lachlan River @ Hillston Weir (412039)	>280 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	
	SF2	Lachlan River @ Hillston Weir (412039)	>280 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	
Large fresh	LF1	Lachlan River @ Hillston Weir (412039)	>1,600 ML/d	2 years	July to September (but can occur any time)	15 days minimum	5–10 years in 10	These EWRs can be met with PEW under the current WSP rules, and may be able to be met with the current volumes of HEW under current

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
	LF2	Lachlan River @ Hillston Weir (412039)	>1,600 ML/d	4 years	October to April	15 days minimum	3–5 years in 10	constraints if delivered in combination with river operations, irrigation deliveries, and natural flows from tributaries.
Bankfull	BK1	Lachlan River @ Hillston Weir (412039)	4,000-5,000 ML/d	N/A	May to December	10 days minimum	5-7 years in 10	These EWRs may be able to be met with PEW under the current WSP rules (depending on the time of year). HEW may be able to contribute to this EWR with the current volumes available and under current constraints, if delivered in combination with river operations, irrigation deliveries, and natural flows from tributaries. Natural flows need to be protected and a regulator at Willandra Creek is required to prevent unwanted flows down Willandra Creek and ensure these EWRs are met.
Small wetland inundation	WL1	Lachlan River @ Hillston Weir (412039)	>2,800 ML/d	2 years	September to March (but can occur any time)	10 days minimum, 2–8 months of habitat inundation	7-8 years in 10	
Large wetland inundation	WL2	Lachlan River @ Hillston Weir (412039)	>2,800 ML/D	3 years	October to April (but can occur any time)	15 days minimum, 2–6 months of habitat inundation	5-7 years in 10	
	WL3	Lachlan River @ Hillston Weir (412039)	>2,800 ML/d	4 years	August to February (but can occur any time)	30 days minimum, 2-3 months of habitat inundation	3-5 years in 10	
Small overbank	OB2	Lachlan River @ Hillston Weir (412039)	>5,000 ML/d	3 years	October to April	10 days minimum, 2–6 months of habitat inundation	4–7 years in 10	They are reliant on the protection of natural flows through this system. PEW possibly (depends on Translucent flows occurring within the window), HEW no/unlikely
	OB3	Lachlan River @ Hillston Weir (412039)	>6,000 ML/d	4 years	August to February (but can occur any time)	5 days minimum, 2-3 months of habitat inundation	3–5 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Large overbank	OB4	Lachlan River @ Hillston Weir (412039)	>7,000 ML/d	5 years	September to May (but can occur any time)	1 day minimum, 3–8 months of habitat inundation	2–3 years in 10	These EWRs cannot be met with current volumes of HEW under current constraints, or with PEW under current WSP rules. They are reliant on the protection of natural flows through this system.
	OB5	Lachlan River @ Hillston Weir (412039)	>8000 ML/d	10 years	Any time	1 day minimum, 1–6 months of habitat inundation	1 year in 10	

PU15: Muggabah Creek





Priority environmental assets

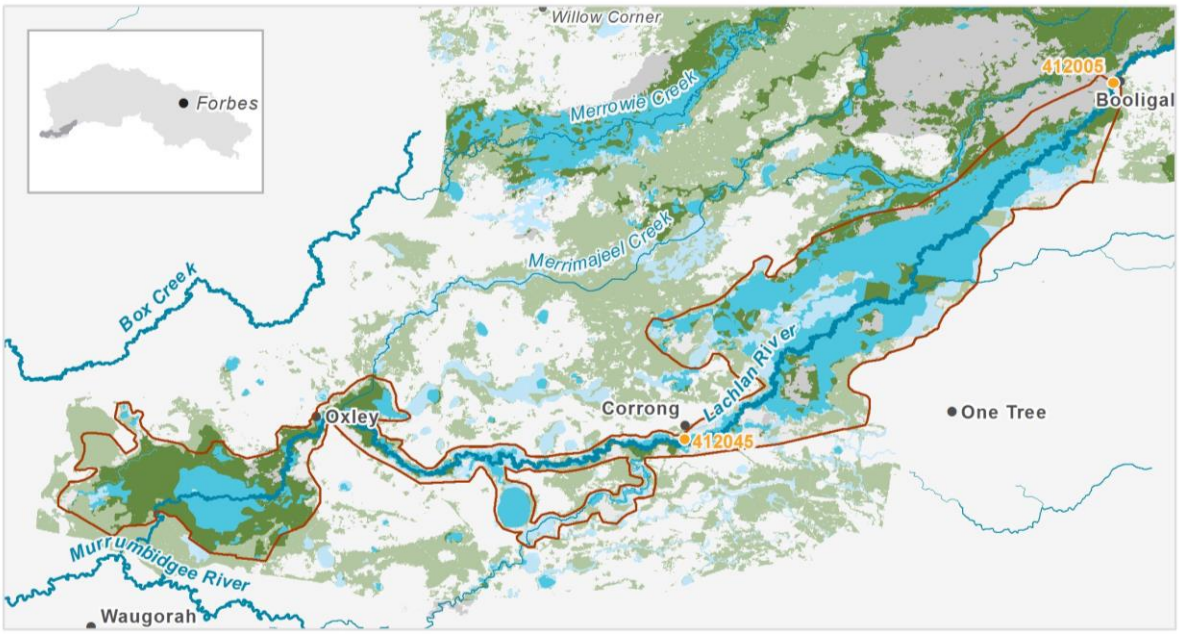
- Muggabah Creek and its in-stream habitat and fringing vegetation communities

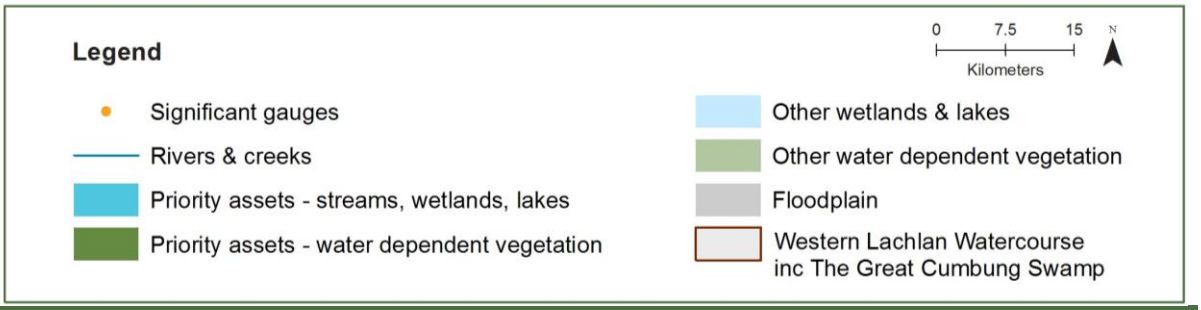
Native fish	• Olive perchlet • Silver perch • Unspecked hardyhead • Yabby	• Carp gudgeon • Australian smelt • Freshwater shrimp • Freshwater prawn	• Flathead gudgeon • Golden perch • Murray cod • Flathead galaxias
Birds	51 water-dependent bird species recorded, including:		
	• Cattle egret	• Glossy ibis	• Blue-billed duck
Native vegetation	8 water-dependent plant community types, including		
	• Lignum shrubland wetland	• River red gum woodland	• Black box - lignum woodland
Registered cultural assets	• Modified trees		
Other species	• Giant banjo frog	• Spotted grass frog	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Muggabah Creek @ Cobb Hwy (412124)		N/A	In line with historical low flow season, typically January to May	Events should not persist longer than 370 days	Should occur in no more than 100% of years	These EWRs can be met with the current volumes of HEW under current constraints or with PEW under the current WSP rules.
Small wetland inundation	WL1	Lachlan River @ Booligal (412005)	>300 ML/d	2 years	September to March (but can occur any time)	30 days minimum	7-8 years in 10	
Large wetland inundation	WL2	Lachlan River @ Booligal (412005)	>650 ML/d	3 years	October to April (but can occur any time)	30 days minimum, 2–8 months of habitat inundation	5-7 years in 10	
	WL3	Lachlan River @ Booligal (412005)	>850 ML/d	4 years	August to February (but can occur any time)	60 days minimum, 2–6 months of habitat inundation	3-5 years in 10	PEW under the current WSP rules or HEW can partially contribute to this EWR with current volumes and under current constraints if delivered in combination with consumptive water deliveries or natural flows. Natural flows should be protected to ensure these EWRs are being met.
	WL4	Lachlan River @ Booligal (412005)	>1,200 ML/d	5 years	Any time	60 days minimum, 2-3 months of habitat inundation	2–3 years in 10	
Small overbank	OB2	Lachlan River @ Booligal (412005)	>2,700 ML/d	3 years	October to April	5 days minimum, 2–6 months of habitat inundation	4–7 years in 10	These EWRs cannot be met with current volumes of HEW under current constraints. Flows >1,800 ML/d are reliant on a wet system or natural events. PEW may be able to meet these EWRs, depending on the time of year. These EWRs are mainly reliant on the protection of natural flows through this system.
	OB3	Lachlan River @ Booligal (412005)	>3,500 ML/d	4 years	August to February (but can occur any time)	6 days minimum, 2-3 months of habitat inundation	3–5 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Large overbank	OB4	Lachlan River @ Booligal (412005)	>4,000 ML/d	5 years	September to May (but can occur any time)	2 days minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Lachlan River @ Booligal (412005)	>5,000 ML/d	10 years	Any time	1 days minimum, 1–6 months of habitat inundation	1 year in 10	This EWR cannot be met with current volumes of HEW under current constraints, or with PEW under current WSP rules. It is reliant on the protection of natural flows through this system.

PU16: Western Lachlan watercourse (inc. The Great Cumbung Swamp)





Priority environmental assets

- Great Cumbung Swamp
- Lachlan swamp
- Lake Waljeers
- Baconian swamp
- Pimpara Creek
- Like Ita
- Lachlan River and its in-stream habitat and fringing vegetation communities

Native fish	• Unspecked hardyhead • Freshwater shrimp • Murray-Darling rainbowfish • Dwarf flat-headed gudgeon • Flathead gudgeon	• Olive perchlet • Australian smelt • Yabby • Carp gudgeon • Murray cod	• Silver perch • Freshwater prawn • Golden perch • Flathead galaxias • Bony herring
Birds	79 water-dependent bird species recorded, including • Glossy ibis • Blue-billed duck • Cattle egret	• Magpie goose • Freckled duck • Australasian bittern	• Sharp-tailed sandpiper • Eastern great egret • Latham's snipe
Native vegetation	14 water-dependent plant community types, including • River red gum woodland	• Black box - lignum woodland wetland	• Black box open woodland
Registered cultural assets	• Ceremony and Dreaming • Burials	• Resources, gathering • Earth mound • Hearth	• Modified tree • Shell • Artefacts
Other species	• Spotted grass frog	• Peron's tree frog	• Giant banjo frog

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Cease-to-flow	CF1	Lachlan River @ Booligal (412005)	0 ML/d	N/A	In line with historical low flow season, typically January to May	Events should not persist longer than 15 days	Should occur in no more than 44% of years	These EWRs are currently mostly met through operational and consumptive water deliveries under current WSP rules. These EWRs can enhanced with the current volumes of HEW under current constraints or with PEW under the current WSP rules, depending on the time of year.
Very-low flow	VF1	Lachlan River @ Booligal (412005)	>10 ML/d	1 year	Any time	322 days minimum (or 194 days minimum in very dry years)	No more than 22 days without flows above threshold	
Baseflow	BF1	Lachlan River @ Booligal (412005)	>50 ML/d	1 year	Any time	275 days minimum (or 140 days minimum in very dry years)	No more than 92 days without flows above threshold	
	BF2	Lachlan River @ Booligal (412005)	>50 ML/d	2 years	September to March	177 days minimum (or 74 days minimum in very dry years)	5–10 years in 10	
Small fresh	SF1	Lachlan River @ Booligal (412005)	>150 ML/d	1 year	October to April (but can occur any time)	10 days minimum	Annual	These EWRs are currently partially met through operational and consumptive water deliveries under current WSP rules. These EWRs can potentially be enhanced with the current volumes of HEW under current constraints, or with PEW under the current WSP rules, depending on the time of year.
	SF2	Lachlan River @ Booligal (412005)	>150 ML/d	2 years	October to April	14 days minimum	5–10 years in 10	
Large fresh	LF1	Lachlan River @ Booligal (412005)	>650 ML/d	2 years	July to September (but can occur any time)	5 days minimum	5–10 years in 10	These EWRs can be met with the current volumes of HEW under current constraints or with PEW under the current WSP rules.

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
	LF2	Lachlan River @ Booligal (412005)	>650 ML/d	4 years	October to April	5 days minimum	3–5 years in 10	
Bankfull	BK1	Lachlan River @ Booligal (412005)	2,000-2,700 ML/d	N/A	August to February (but can occur any time)	15 days minimum	5-7 years in 10	These EWRs can be met with PEW under the current WSP rules but may not be met with HEW due to current constraints. Flows >1,800 ML/d are reliant on a wet system or natural events. Natural flows need to be protected and constraints need to be relaxed to reliably meet these EWRs.
Small wetland inundation	WL1	Lachlan River @ Booligal (412005)	>650 ML/d	2 years	September to March (but can occur any time)	30 days minimum, 2–8 months of habitat inundation	7-8 years in 10	These EWRs can be met with the current volumes of HEW under current constraints or with PEW under the current WSP rules.
	WL2	Lachlan River @ Booligal (412005)	>850 ML/d	3 years	October to April (but can occur any time)	60 days minimum, 2–6 months of habitat inundation	5-7 years in 10	
Large wetland inundation	WL3	Lachlan River @ Booligal (412005)	>1,200 ML/d	4 years	August to February (but can occur any time)	60 days minimum, 2-3 months of habitat inundation	3-5 years in 10	PEW under the current WSP rules or HEW can partially contribute to this EWR with current volumes and under current constraints if delivered in combination with consumptive water deliveries or natural flows. Natural flows should be protected to ensure these EWRs are being met.
	WL4	Lachlan River @ Booligal (412005)	>1,200 ML/d	5 years	Any time	60 days minimum, 2-3 months of habitat inundation	2–3 years in 10	

Flow component		Gauge	Flow rate / volume	Maximum inter-event period	Timing	Duration	Frequency	Additional water requirement descriptions and current management limitations
Small overbank	OB2	Lachlan River @ Booligal (412005)	>2,700 ML/d	3 years	October to April	30 days minimum, 2–6 months of habitat inundation	4–7 years in 10	These EWRs cannot be met with current volumes of HEW under current constraints. Flows >1,800 ML/d are reliant on a wet system or natural events. PEW may be able to meet these EWRs, depending on the time of year. These EWRs are mainly reliant on the protection of natural flows through this system.
	OB3	Lachlan River @ Booligal (412005)	>3,500 ML/d	4 years	August to February (but can occur any time)	6 days minimum, 2-3 months of habitat inundation	3–5 years in 10	
Large overbank	OB4	Lachlan River @ Booligal (412005)	>4,000 ML/d	5 years	September to May (but can occur any time)	2 days minimum, 3–8 months of habitat inundation	2–3 years in 10	
	OB5	Lachlan River @ Booligal (412005)	>5,000 ML/d	10 years	Any time	1 days minimum, 1–6 months of habitat inundation	1 year in 10	This EWR cannot be met with current volumes of HEW under current constraints, or with PEW under current WSP rules. It is reliant on the protection of natural flows through this system.

2. Zone B planning units

Zone B PUs are mostly located upstream of Zone A PUs and cannot be managed with held environmental water. Instead, they rely on natural inflows and planned environmental water from upstream PUs to meet the water needs of the priority assets and functions they support. Some regulated flows can influence the hydrology of the Zone B PUs that are located downstream of Zone A Pus.

Rules in the Lachlan WSP that govern access to water for consumptive use are the primary mode of environmental water management in in Zone B PUs. To accommodate for this policy-based approach to environmental water management, Zone B PU boundaries are based on the water source boundaries described in the *Lachlan Water Resource Plan Risk Assessment*. This means that the water requirements of priority assets and functions in Zone B can be more easily managed through the policy mechanisms that govern water in these areas. Recommendations have been suggested for each PU[4] to ensure important ecological flows are protected to maintain or improve priority assets and functions.[5]

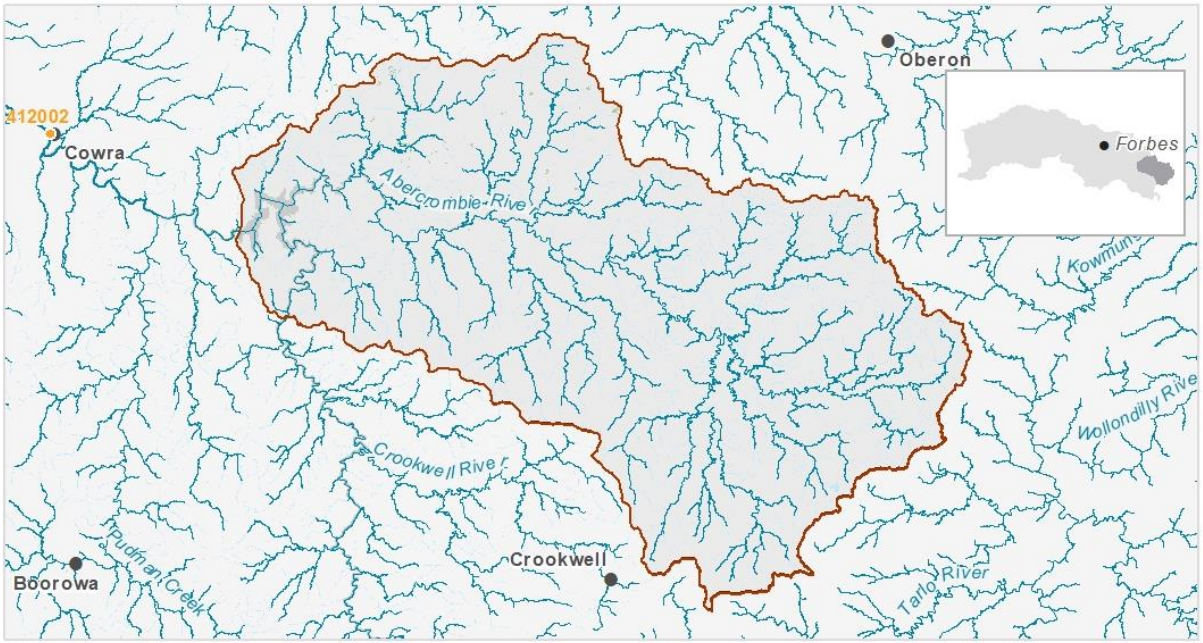
For each Zone B PU, information is presented on the hydrology[6] and the degree of alteration, as determined by the *Lachlan Water Resource Plan Risk Assessment* (DOI–W in prep), by comparing flows under modelled pre-development conditions (with no dams or water extractions) and flows under modelled current conditions. Table 1 describes how the hydrology changes are presented for each PU.

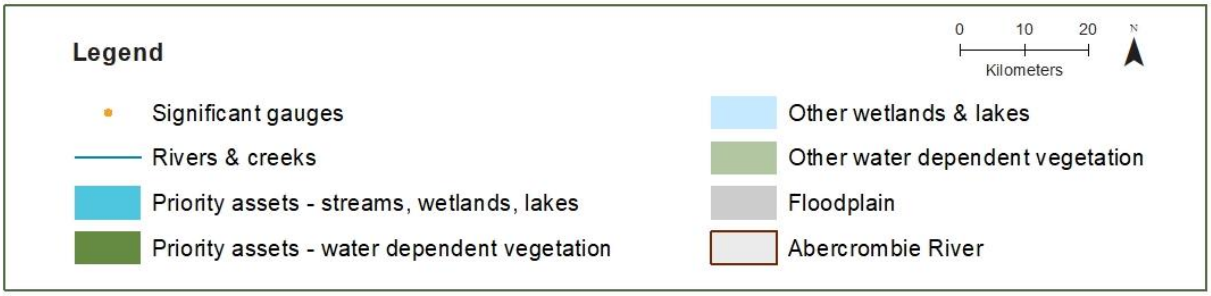
Table 1 Key to hydrological alteration used in this document

Key to hydrological alteration from *Lachlan Water Resource Plan Risk Assessment* (NSW DOI-W, in prep)
L= Low: less than 20% departure (+/-) from the base case for each hydrologic metric
M = Medium: 20-50% departure (+/-); from the base case for each hydrologic metric
H = High: greater than 50% departure (+/-) from the base case for each hydrologic metric
N/A = no risk outcome or modelling available due to no hydrological data available
$^{+}$ increase near-natural condition
$^{-}$ decrease near-natural condition
^{0} no change from near-natural condition

[4] Recommendations are based on the local hydrology, the degree of hydrological change, the water-dependent values and assets present, the relevant LTWP objectives, and the number, size and location of WALs in the water source.
[5] To improve the specificity of rule change recommendations, a better understanding of the actual total amount of take and the individual water access licence conditions is often required.
[6] The hydrology is presented as percentiles and ARIs as determined by modelling.

PU17: Abercrombie River water source





Priority environmental assets

- Bald Ridge Creek
- Bolong River
- Burra Burra Creek
- Lake Wyangala
- Copperhannia Creek
- Grove Creek
- Isabella River
- Meglo Creek
- Mulgunnia Creek
- Peelwood Creek
- Thompsons Creek
- Tuena Creek
- Abercrombie River, its tributaries, in-channel habitat, and fringing vegetation communities

Native fish	• Southern purple spotted gudgeon • Dwarf flat-headed gudgeon • Macquarie perch • Southern pygmy perch • Northern river blackfish • Yabby	• Obscure galaxias • Golden perch • Carp gudgeon • Flathead gudgeon • Australian smelt • Freshwater shrimp • Freshwater catfish	• Euastacus claytoni • Alpine crayfish • Rieks crayfish • Suttons crayfish • Freshwater prawn • Silver perch • Trout cod (historical) • Murray cod
Birds	65 water-dependent bird species recorded, including • Glossy ibis • Blue-billed duck	• Latham's snipe	• Freckled duck
Native vegetation	Four water-dependent plant community types, including river red gum woodland		
Registered cultural assets	• Artefacts, hearth	• Modified trees	

Other species	• Booroolong frog • Stuttering frog	• Sloanes froglet • Spotted grass frog	• Yellow-spotted tree frog • Peron's tree frog

Hydrology

Gauge: 412028 *Abercrombie River at Abercrombie*	**80th percentile**: 49.53 ML/d	**50th percentile**: 234.31 ML/d	**20th percentile**: 1,061.82 ML/d
	1.5 ARI: 19,246 ML/d	**2.5 ARI**: 27,417 ML/d	**5 ARI**: 55,011 ML/d

Flows do not seem to be altered by more than 20% compared to the 'without development' model scenario as assessed by the Lachlan WRPA Risk Assessment.

The total volume of unregulated entitlements in the planning unit is 1,003 ML, which is made up of 32 WALs <250ML that are distributed across the planning unit.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L	L^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment Cease to pump at 7 ML/day at gauge 412028					

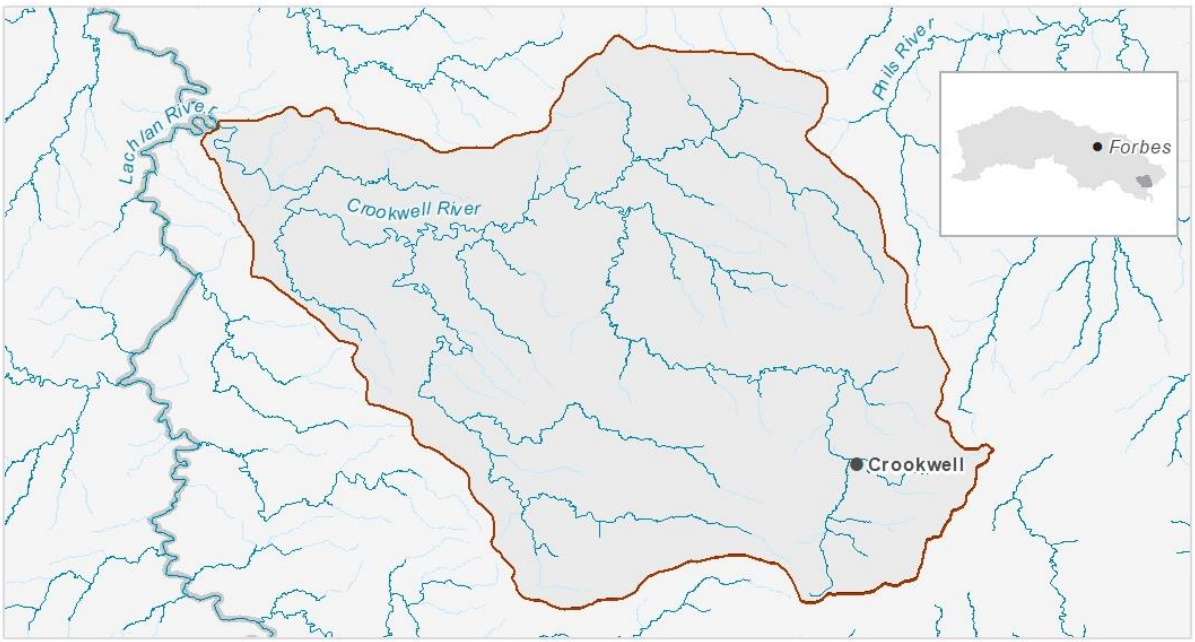
Recommended management strategies

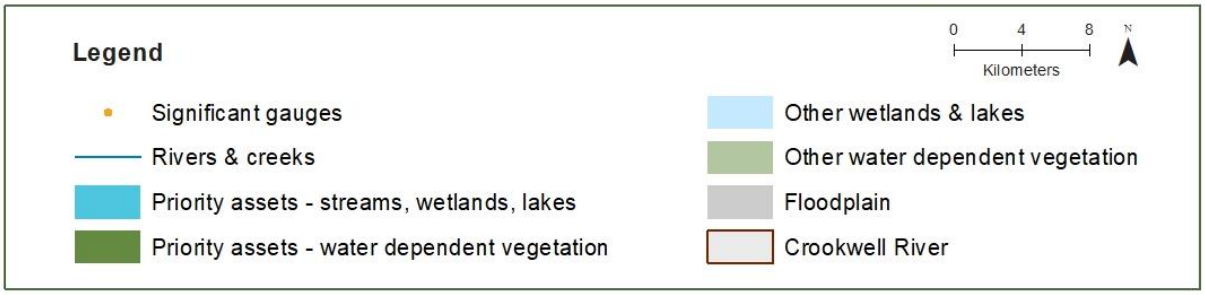
Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU18: Crookwell River water source





Priority environmental assets

- Crookwell River, its tributaries, in-channel habitat and fringing vegetation communities

Native fish	• Macquarie perch • Rieks crayfish • Northern river blackfish	• Obscure galaxias • Yabby • Flathead gudgeon • Carp gudgeon	• Australian smelt • Alpine crayfish • Southern pygmy perch
Birds	61 water-dependent bird species recorded.		
Native vegetation	Two water-dependent plant community types, including river red gum woodland		
Registered cultural assets	None registered		
Other species	• Booroolong frog	• Sloanes froglet	• Eastern sign-bearing froglet

Hydrology

Gauge: 412050 *Crookwell River at Narrawa North*	**80th percentile**: 11.39 ML/d	**50th percentile**: 43.50 ML/d	**20th percentile**: 199.87 ML/d
	1.5 ARI: 4,603 ML/d	**2.5 ARI**: 7,765 ML/d	**5 ARI**: 14,833 ML/d

Low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Low flows currently occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements in the planning unit is 1,695 ML, which is made up of 37 WALs <250ML and one WAL between 250-500 ML. The WALs are mainly distributed across the upper part of the PU.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L	H^{-}	L^{-}	L^{-}	L^{0}	L^{0}
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment Cease to pump at 2 ML/day at gauge 412050 (Crookwell River at Narrawa North)					

Recommended management strategies

Investigate opportunities to reduce the length of cease-to-flow periods and extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

- Consider rostering landholder water access during low flow months.
- Consider implementing a no visible flow rule at pump locations to protect pools and important refuge sites.
- Consider reviewing cease-to-pump rules to better protect low flows.
- Consider implementing total and/or individual daily extraction limits.

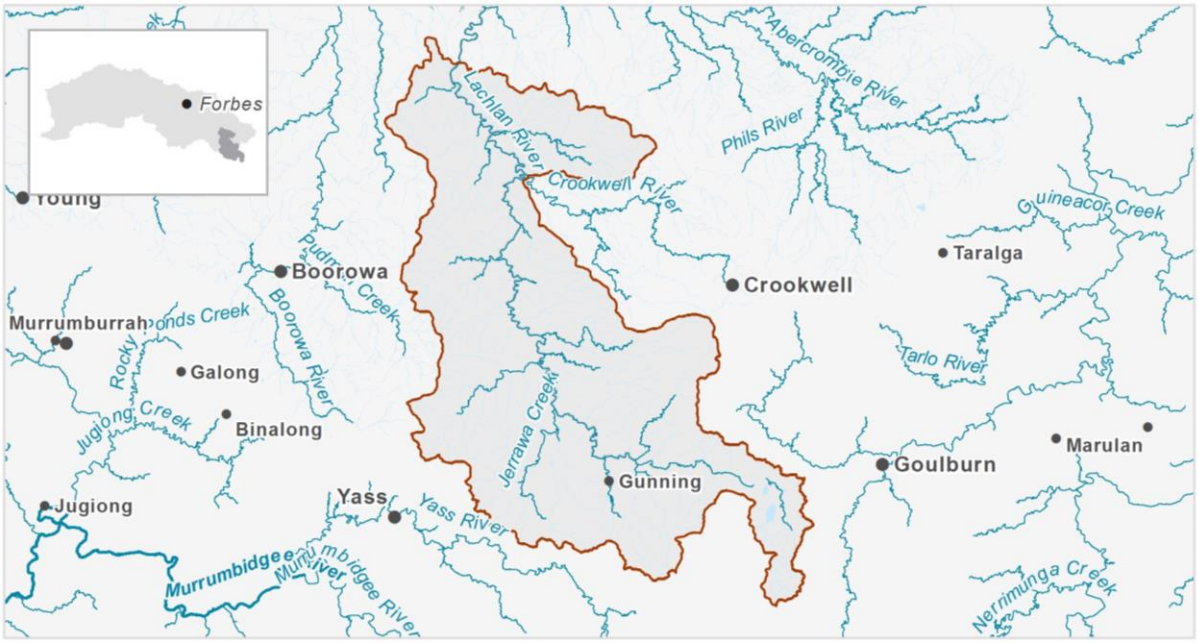
Consider targeted water access licence purchases from willing sellers if the opportunity arises.

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU19: Lachlan River above Reids Flat water source



Priority environmental assets			
• Blakney Creek • Tributaries to the Lachlan river and their in-channel habitat and fringing vegetation communities		• Jarrawa Creek	
Native fish	• Macquarie perch • Southern pygmy perch • Northern river blackfish	• Rieks crayfish • Australian smelt • Yabby alpine crayfish • Carp gudgeon flathead gudgeon	• Freshwater prawn • Silver perch • Golden perch • Murray cod • Obscure galaxias
Birds	66 water-dependent bird species recorded, including: • Australian painted snipe	• Common sandpiper • Glossy ibis	• Latham's snipe
Native vegetation	Two water-dependent plant community types, including river red gum woodland		
Registered cultural assets	• Modified trees		
Other species	• Booroolong frog • Peron's tree frog	• Eastern sign-bearing froglet • Giant banjo frog	• Spotted grass frog • Sloanes froglet

Hydrology

Gauge: 412027 *Lachlan River at Reids Flat*	**80th percentile**: 22.62 ML/d	**50th percentile**: 144.05 ML/d	**20th percentile**: 1,030.56 ML/d
	1.5 ARI: 21,680 ML/d	**2.5 ARI**: 43,693 ML/d	**5 ARI**: 53,437 ML/d

Cease-to-flow periods are highly altered (>50% departure from base case) and low flows are moderately altered (20-50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 2,014.5 ML, which is made up of 30 WALs <250 ML and one WAL between 250-500 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	H^+	M^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the length of cease-to-flow periods and extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

- Consider rostering landholder water access during low flow months.
- Consider reviewing cease-to-pump rules to better protect low flows.
- Consider protecting freshes at ecologically relevant times to help relieve unnaturally long cease-to-flow periods.
- Consider implementing total and/or individual daily extraction limits.

Consider targeted water access licence purchases from willing sellers, if the opportunity arises.

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU20: Belubula River above Carcoar Dam water source

Priority environmental assets

- Belubula River, its tributaries and in-channel habitat

Native fish	• Obscure galaxias	• Yabby	• Alpine crayfish
Birds	67 water-dependent bird species recorded, including:		
	• Blue-billed duck	• Latham's snipe	• Glossy ibis
Native vegetation	-		
Registered cultural assets	None registered		
Other species	• Booroolong frog		

Hydrology

Gauge: 412092 *Coombing Creek at Near Neville*	**80th percentile**: 0.63 ML/d	**50th percentile**: 10.48 ML/d	**20th percentile**: 81.45 ML/d
	1.5 ARI: 1,833 ML/d	**2.5 ARI**: 2,769 ML/d	**5 ARI**: 3,796 ML/d

Cease-to-flow periods and low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the planning unit is 268 ML, which is made up to three WALs <250 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	H^+	H^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

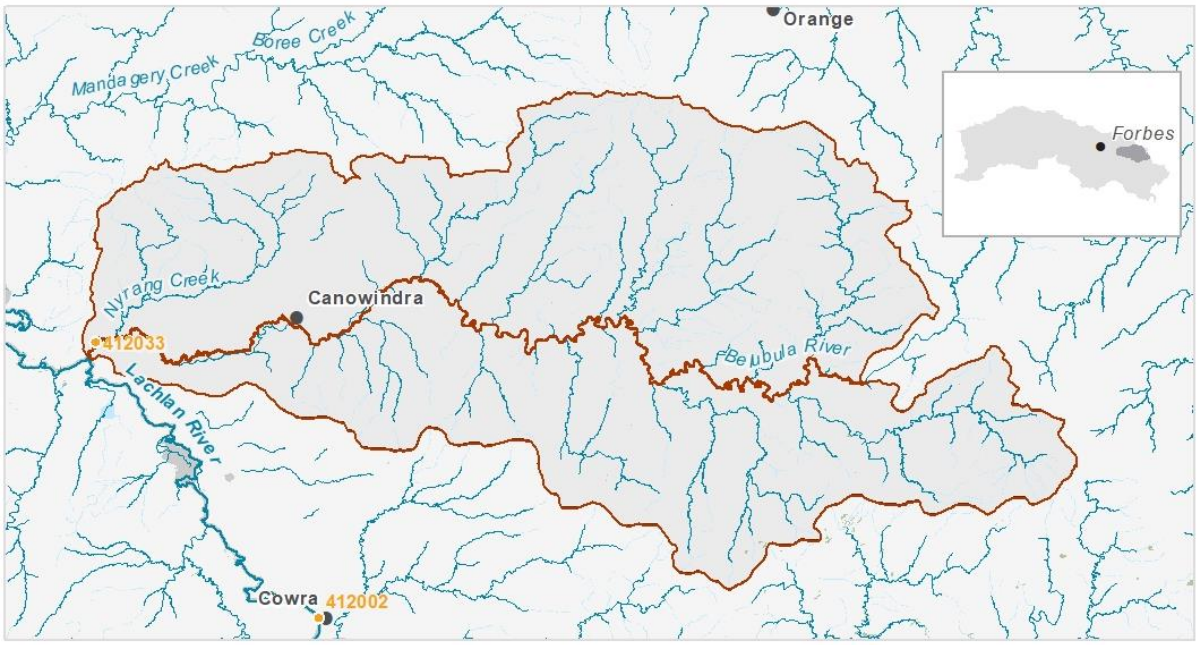
Recommended management strategies

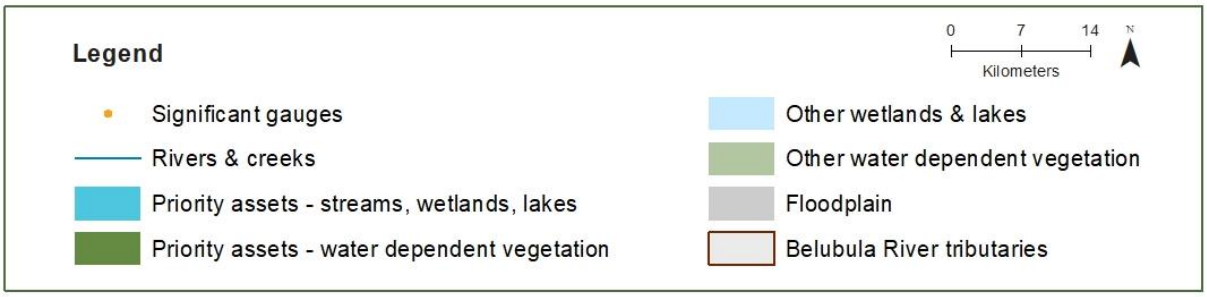
Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU21: Belubula Tributaries below Carcoar Dam water source





Priority environmental assets			
• Tributaries to the Belubula River and their in-channel habitat and fringing vegetation communities			
Native fish	• Southern purple spotted gudgeon • Freshwater catfish • Obscure galaxias • Carp gudgeon • Flathead gudgeon	• Australian smelt • Freshwater shrimp • Yabby • Alpine crayfish • Suttons crayfish	• Freshwater prawn • Golden perch • Murray cod • Northern river blackfish • Rieks crayfish
Birds	78 water-dependent bird species recorded, including: • Latham's snipe	• Rainbow bee-eater	• Sharp-tailed sandpiper
Native vegetation	2 water-dependent plant community types, including river red gum woodland		
Registered cultural assets	None registered		
Other species	• Booroolong frog	• Stuttering frog	• Sloanes froglet

Hydrology

Cease-to-flow periods and low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the planning unit is 9,580 ML, which is made up of 44 WALs <250 ML, two WALs between 251-500 ML, and two WALs >2,500 ML distributed across the planning unit.

EWRs in the Belubula PU (Zone A) are reliant on water contributions from this PU so that the LTWP objectives can be met.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	H^+	H^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the length of cease-to-flow periods and extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

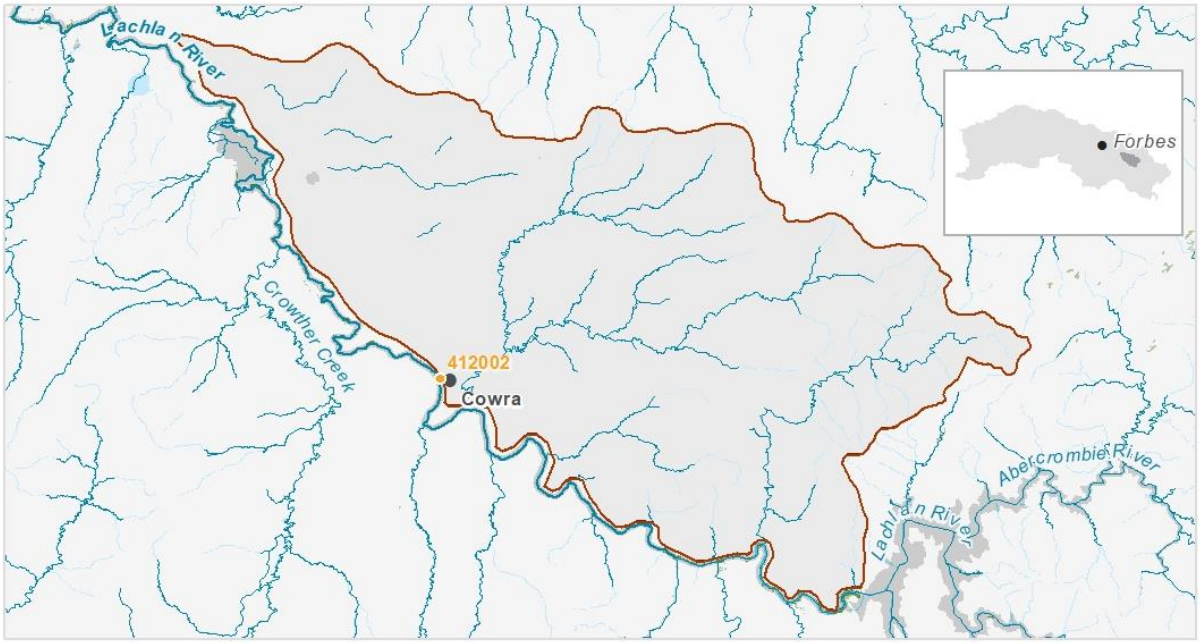
- Consider rostering landholder water access during low flow months.
- Consider reviewing cease-to-pump rules to better protect low flows.
    - Investigate increasing cease-to-pump to 30 ML/d at Belubula River at Helenshome gauge (412033) or 40 ML/d at Belubula River at Lyndon gauge (412195) to protect baseflows in this PU and the Belubula River PU (Zone A).
- Consider protecting freshes at ecologically relevant times to help relieve unnaturally long cease-to-flow periods.
    - Investigate implementing a first flush rule to protect freshes above 70 ML/d at Belubula River at Helenshome gauge (412033) or 130 ML/d at Belubula River at Lyndon gauge (412195).
- Consider implementing total and/or individual daily extraction limits.

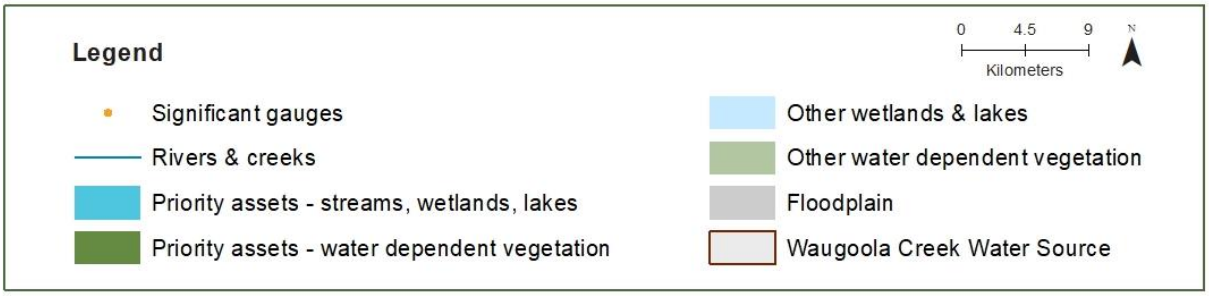
Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU22: Waugoola Creek water source





Priority environmental assets

- Waugoola Creek, its tributaries, in-channel habitat and fringing vegetation communities

Native fish	• Southern purple spotted gudgeon • Northern river blackfish	• Australian smelt • Yabby • Carp gudgeon	• Alpine crayfish • Obscure galaxias • Flathead gudgeon
Birds	69 water-dependent bird species recorded, including: • Cattle egret • Sharp-tailed sandpiper	• Marsh sandpiper • Australasian bittern	• Freckled duck • Latham's snipe
Native vegetation	Two water-dependent plant community types, including river red gum woodland		
Registered cultural assets	• Modified trees		
Other species	• Sloanes froglet • Peron's tree frog	• Eastern sign-bearing froglet	• Spotted grass frog

Hydrology

Gauge – 412091 *Waugoola Creek U/S Cowra*	**80th percentile**: 0.37 ML/d	**50th percentile**: 7.03 ML/d	**20th percentile**: 26.50 ML/d
	1.5 ARI: 857 ML/d	**2.5 ARI**: 1,259 ML/d	**5 ARI**: 1,552 ML/d

Cease-to-flow periods and low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 359 ML, which is made up of 17 WALs <250 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	H^+	H^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the length of cease-to-flow periods and extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

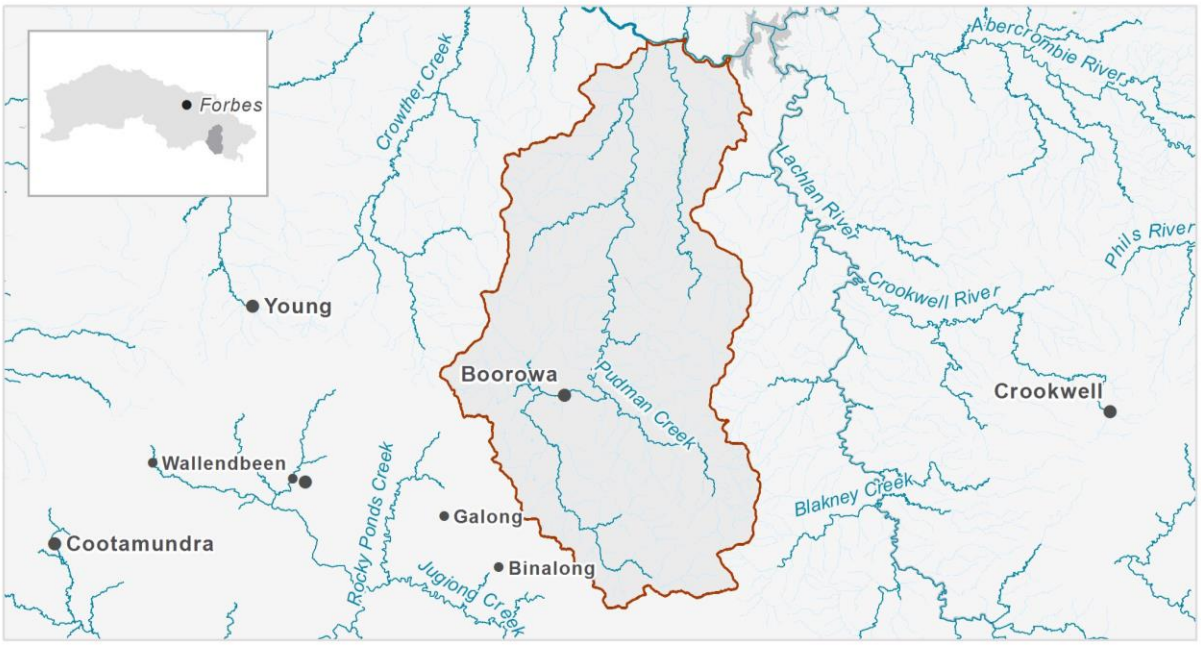
- Consider rostering landholder water access during low flow months.
- Consider reviewing cease-to-pump rules to better protect low flows.
- Consider protecting freshes at ecologically relevant times to help relieve unnaturally long cease-to-flow periods.
- Consider implementing total and/or individual daily extraction limits.

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU23: Boorowa River water source



Priority environmental assets

- Boorowa River and its tributaries, in-channel habitat, and fringing vegetation communities

Native fish	• Northern river blackfish • Obscure galaxias • Carp gudgeon • Flathead gudgeon	• Australian smelt • Alpine crayfish • Freshwater prawn • Yabby	• Murray cod • Golden perch • Southern pygmy perch
Birds	61 water-dependent bird species recorded, including cattle egret.		
Native vegetation	Three water-dependent plant community types, including river red gum woodland		
Registered cultural assets	• Modified tree		
Other species	• Eastern sign-bearing froglet	• Sloanes froglet • Spotted grass frog	• Peron's tree frog • Booroolong frog

Hydrology

Gauge: 412029 *Boorowa River at Prossers Creek*	**80th percentile**: 4.13 ML/d	**50th percentile**: 40.13 ML/d	**20th percentile**: 211.97 ML/d
	1.5 ARI: 6,763 ML/d	**2.5 ARI**: 13,961 ML/d	**5 ARI**: 19,098 ML/d

Cease-to-flow periods and low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the planning unit is 1,187 ML, which is made up of 36 WALs <250 ML that are distributed across the planning unit.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	H^+	H^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment Cease to pump when there is no flow at Boorowa River at Prossers Crossing gauge 412029					

Recommended management strategies

Investigate opportunities to reduce the length of cease-to-flow periods and extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

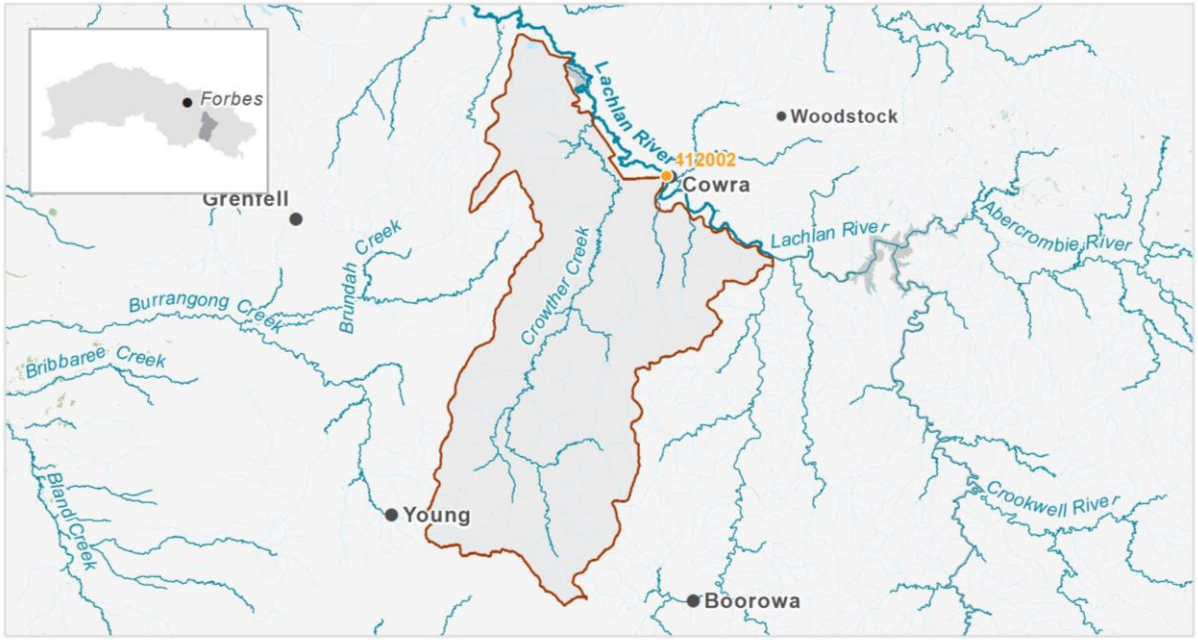
- Consider rostering landholder water access during low flow months.
- Consider reviewing cease-to-pump rules to better protect low flows.
- Consider protecting freshes at ecologically relevant times to help relieve unnaturally long cease-to-flow periods.
- Consider implementing total and/or individual daily extraction limits.

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU24: Crowther Creek water source



Priority environmental assets

- Crowther Creek and its tributaries, in-channel habitat, and fringing vegetation communities

Native fish	• Southern purple spotted gudgeon • Northern river blackfish • Golden perch	• Flathead gudgeon • Australian smelt • Freshwater shrimp • Yabby	• Alpine crayfish • Freshwater prawn • Carp gudgeon • Obscure galaxias
Birds	73 water-dependent bird species recorded, including: • Cattle egret • Brolga	• Lanthams snipe • Australasian bittern	• Sharp-tailed sandpiper
Native vegetation	Three water-dependent plant community types, including river red gum woodland		
Registered cultural assets	• Modified Trees	• Artefacts	
Other species	• Soanes froglet • Peron's tree frog	• Spotted grass frog • Giant banjo frog	• Eastern sign-bearing froglet

Hydrology

Gauge: 412072 *Back Creek at Koorawatha*	**80th percentile**: 0 ML/d	**50th percentile**: 3.12 ML/d	**20th percentile**: 73.87 ML/d
	1.5 ARI: 2,691 ML/d	**2.5 ARI**: 5,935 ML/d	**5 ARI**: 12,413 ML/d

Low flows are highly altered (>50% departure from base case) and cease-to-flow periods are moderately altered (20-50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the planning unit is 1,404 ML, which is made up of 24 WALs <250 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	M^+	H^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the length of cease-to-flow periods and extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

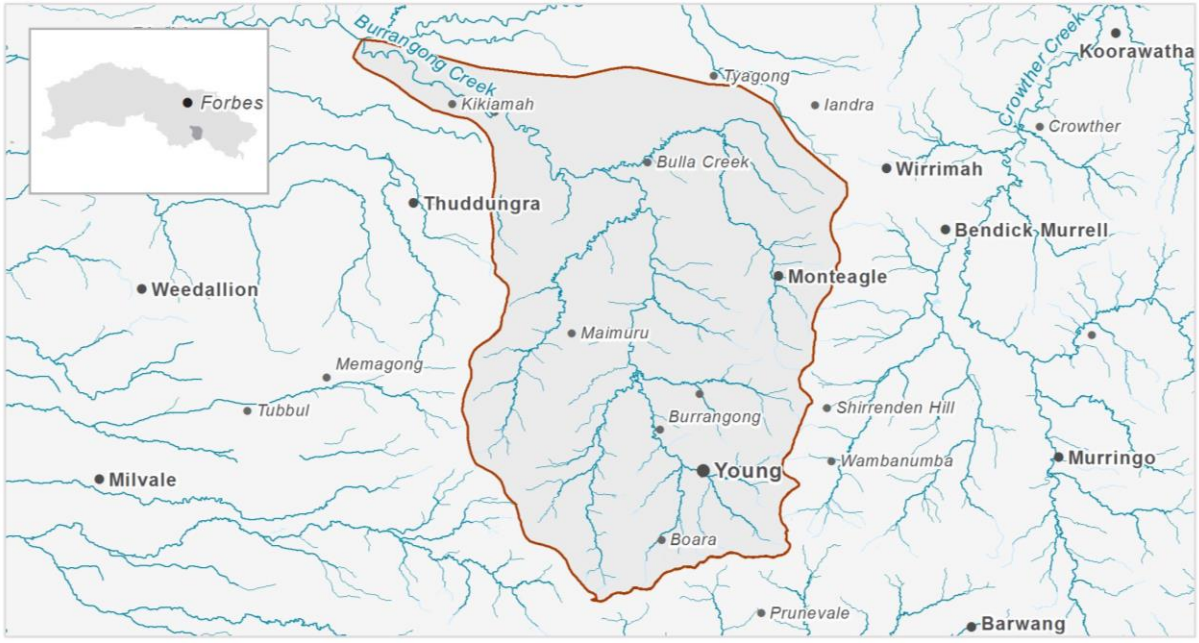
- Consider rostering landholder water access during low flow months.
- Consider reviewing cease-to-pump rules to better protect low flows, especially during dry times or ecologically important months.
- Consider protecting freshes at ecologically relevant times to help relieve unnaturally long cease-to-flow periods.
- Consider implementing total and/or individual daily extraction limits.

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU25: Burrangong Creek water source



Priority environmental assets			
• Burrangong Creek and its tributaries, in-channel habitat, and fringing vegetation communities			
Native fish	• Northern river blackfish • Obscure galaxias	• Flathead gudgeon • Australian smelt • Carp gudgeon	• Yabby • Freshwater prawn
Birds	39 water-dependent bird species recorded		
Native vegetation	Two water-dependent plant community types, including river red gum woodland		
Registered cultural assets	• Modified tree		
Other species	• Sloanes froglet	• Peron's tree frog	• Spotted grass frog

Hydrology			
Gauge: 412072 *Back Creek at Koorawatha*	**80th percentile**: 0 ML/d	**50th percentile**: 1.14 ML/d	**20th percentile**: 26.91 ML/d
	1.5 ARI: 980 ML/d	**2.5 ARI**: 2,162 ML/d	**5 ARI**: 4,522 ML/d

Cease-to-flow periods and low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the planning unit is 2,590.5 ML, which is made up of 52 WALs <250 ML, one WAL between 250-500 ML, and one WAL between 500-1000 ML. The WALs are mainly distributed across the top of the planning unit.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	H^+	H^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the length of cease-to-flow periods and extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

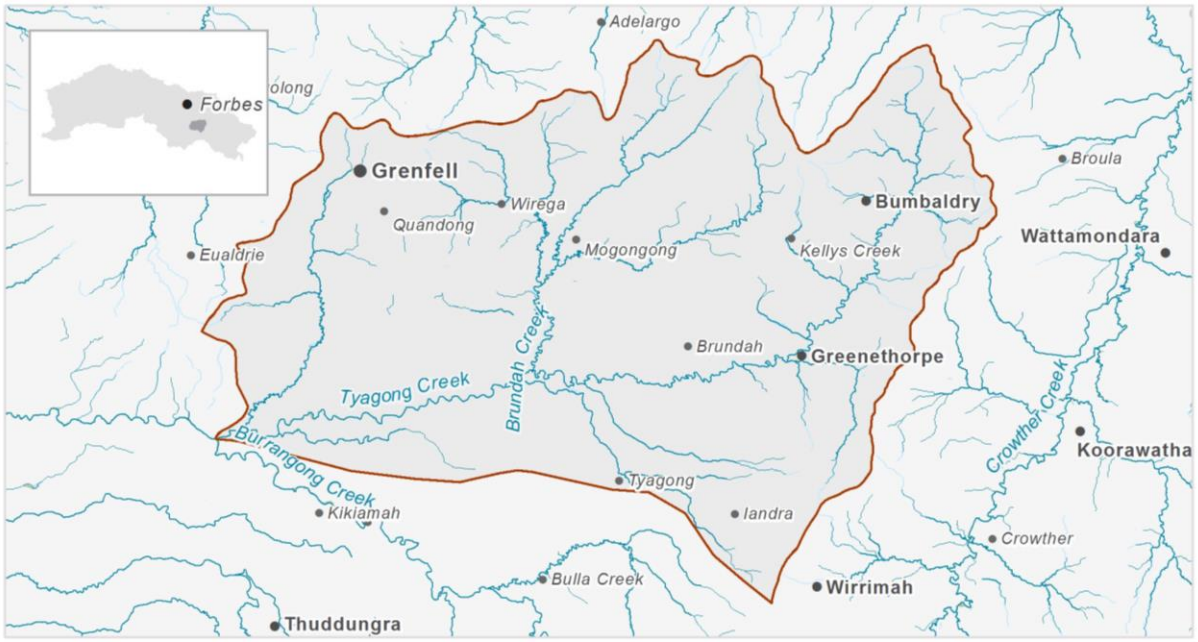
- Consider rostering landholder water access during low flow months.
- Consider reviewing cease-to-pump rules to better protect low flows, especially during dry times or ecologically important months.

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU26: Tyagong Creek water source



Priority environmental assets

- Tyagong Creek and its tributaries, in-channel habitat, and fringing vegetation communities

Native fish	• Southern purple spotted gudgeon • Carp gudgeon • Obscure galaxias	• Golden perch • Australian smelt • Freshwater shrimp • Flathead gudgeon	• Yabby • Freshwater prawn • Northern river blackfish
Birds	55 water-dependent bird species recorded, including Latham's snipe		
Native vegetation	Four water-dependent plant community types, including • River red gum woodland	• Wetland sedgeland	
Registered cultural assets	• Modified Trees		
Other species	• Booroolong frog • Peron's tree frog	• Giant banjo frog • Spotted grass frog	• Sloanes froglet

Hydrology

Gauge: 412072 *Back Creek at Koorawatha*	**80th percentile**: 0 ML/d	**50th percentile**: 1.49 ML/d	**20th percentile**: 35.42 ML/d
	1.5 ARI: 1,290 ML/d	**2.5 ARI**: 2,845 ML/d	**5 ARI**: 5,951 ML/d

Low flows are highly altered (>50% departure from base case) and cease-to-flow periods are moderately altered (20-50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 184 ML, which is made up of four WALs <250 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	M^+	H^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

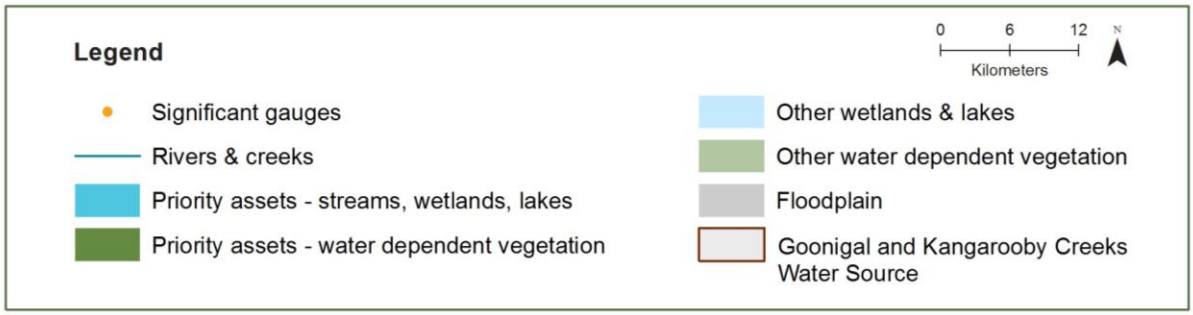
Recommended management strategies

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU27: Goonigal & Kangarooby Creeks water source



Priority environmental assets			
• Goonigal and Kangarooby Creeks, and their tributaries, in-channel habitat, and fringing vegetation communities			
Native fish	• Southern purple spotted gudgeon • Obscure galaxias	• Northern river blackfish • Carp gudgeon	• Yabby • Flathead galaxias • Australian smelt
Birds	60 water-dependent bird species recorded, including glossy ibis		
Native vegetation	Nine water-dependent plant community types, including: • Wetland sedgeland	• River red gum woodland	
Registered cultural assets	• Modified tree		
Other species	• Sloanes froglet	• Spotted grass frog	

Hydrology			
Gauge: 412068 *Goonigal Creek at Gooloogong*	**80th percentile**: 0 ML/d	**50th percentile**: 0 ML/d	**20th percentile**: 36.18 ML/d
	1.5 ARI: 1,682 ML/d	**2.5 ARI**: 2,982 ML/d	**5 ARI**: 4,253 ML/d

Low flows and freshes are highly altered (>50% departure from base case) and cease-to-flow periods are moderately altered (20-50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows and freshes occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 1,107 ML, which is made up of four WALs <250 ML and two WALs between 250-500 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	M^+	H^-	H^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the length of cease-to-flow periods and extraction pressure on low flows and baseflows and freshes in the WSP for the Lachlan Unregulated Water Sources within five years.

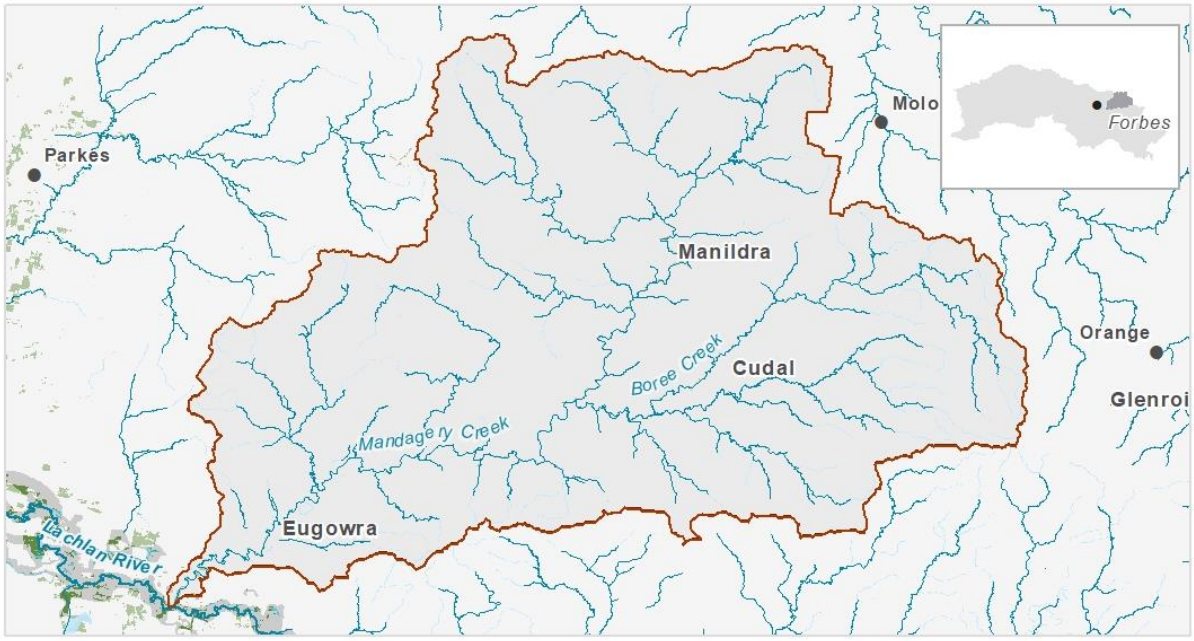
- Consider reviewing cease-to-pump rules to better protect low flows.
- Consider protecting freshes at ecologically relevant times to support native fish species spawning, movement, distribution and condition, and help relieve unnaturally long cease-to-flow periods.
- Consider implementing total and/or individual daily extraction limits.

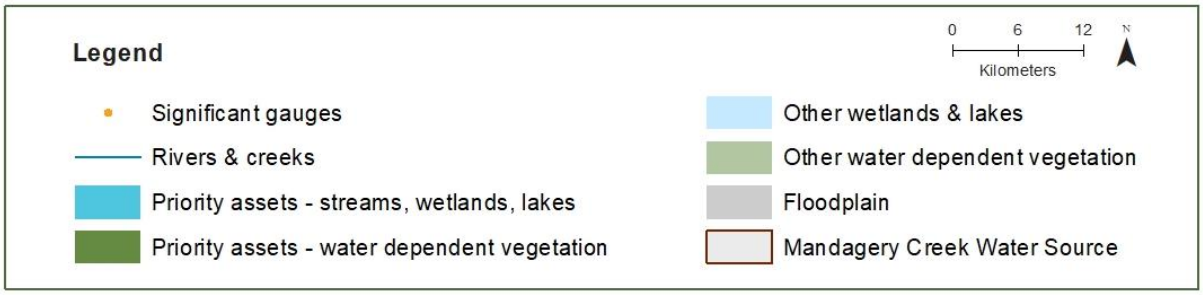
Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing trade rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU28: Mandagery Creek water source





Priority environmental assets

- Mandagery Creek and its tributaries, in-channel habitat, and fringing vegetation communities

Native fish	• Southern purple spotted gudgeon • Freshwater shrimp • Obscure galaxias • Carp gudgeon	• Murray cod • Australian smelt • Freshwater catfish • Yabby	• Alpine crayfish • Freshwater prawn • Golden perch • Northern river blackfish
Birds	81 water-dependent bird species recorded, including: • Glossy ibis • Cattle egret	• Sharp tailed sandpiper • Latham's snipe	• Australian painted snipe • Blue-billed duck
Native vegetation	Six water-dependent plant community types, including river red gum woodland		
Registered cultural assets	• Modified Trees		
Other species	• Booroolong frog • Peron's tree frog	• Eastern sign-bearing froglet	• Spotted grass frog • Sloanes froglet

Hydrology

Gauge: 412030 *Mandagery Creek U/S Eugowra*	**80th percentile**: 2.41 ML/d	**50th percentile**: 33.35 ML/d	**20th percentile**: 182.40 ML/d
	1.5 ARI: 4,863 ML/d	**2.5 ARI**: 9,609 ML/d	**5 ARI**: 15,499 ML/d

Low flows are highly altered (>50% departure from base case) and freshes are moderately altered (20-50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Low flows and freshes occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 8,148 ML, which is made up of 97 WALs <250ML, one WAL between 250-500 ML, and three WALs between 500-1000 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^+	H^-	M^-	L^-	L^-	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce extraction pressure on low flows and baseflows and freshes in the WSP for the Mandagery Creek Water Source within five years.

- Consider reviewing cease-to-pump rules to better protect low flows, especially during low flow months.
    - Investigate increasing cease-to-pump to 25 ML/d at Mandagery Creek upstream Eugowra gauge (412030).
- Consider protecting freshes at ecologically relevant times to support native fish species spawning, movement, distribution and condition.
    - Investigate implementing a first flush rule to protect freshes at 130 ML/d at Mandagery Creek upstream Eugowra gauge (412030).
- Consider reviewing total daily extraction limits, especially for A and B flow classes.
- Consider implementing total individual daily extraction limits on larger WALs.

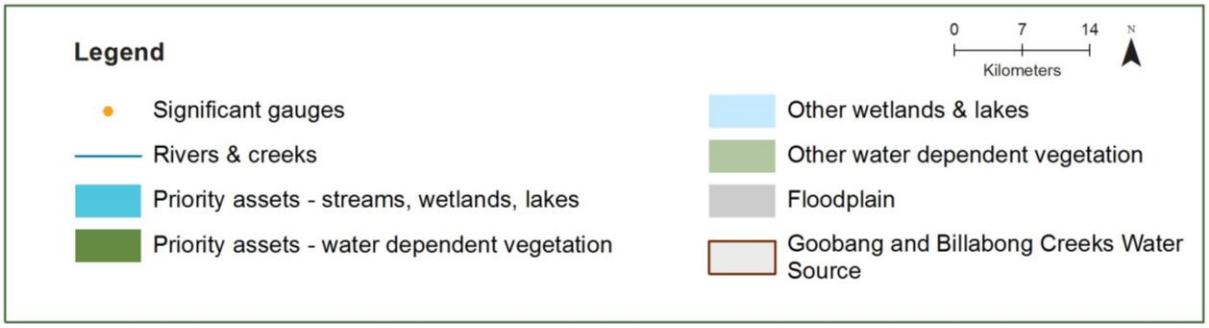
Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Consider improving the gauging network to better capture the distribution of flows, the behaviour of take and the typical annual extraction.

Maintain existing trade rules in the WSP for the Mandagery Creek Water Source.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU29: Goobang & Billabong Creeks water source



Priority environmental assets

- Goobang and Billabong Creeks, and their tributaries, in-channel habitat and fringing vegetation communities
- Ramsays Lagoon

Native fish	• Southern purple spotted gudgeon • Unspecked hardyhead • Northern river blackfish • Carp gudgeon	• Obscure galaxias • Murray-darling rainbowfish • Bony herring dwarf flat-headed gudgeon	• Yabby • Flathead galaxias • Australian smelt • Freshwater prawn • Freshwater catfish
Birds	99 water-dependent bird species recorded, including		
	• Glossy ibis • Curlew sandpiper • Freckled duck	• Latham's snipe • Cattle egret • Australasian bittern	• Sharp-tailed sandpiper • Marsh sandpiper • Australian painted snipe
Native vegetation	Ten water-dependent plant community types, including		
	• Canegrass swamp grassland wetland	• River red gum woodland	• Shallow marsh wetland

Registered cultural assets	• Artefacts	• Modified trees	• Resources, gathering
Other species	• Sloanes froglet • Peron's tree frog	• Eastern sign-bearing froglet	• Giant banjo frog • Spotted grass frog

Hydrology

Gauge: 412043 *Goobang Creek at Darby S Dam*	**80th percentile**: 0 ML/d	**50th percentile**: 3.39 ML/d	**20th percentile**: 144.24 ML/d
	1.5 ARI: 1,925 ML/d	**2.5 ARI**: 2,745 ML/d	**5 ARI**: 3,985 ML/d

Cease-to-flow periods and low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Cease-to-flow periods currently occur more frequently and low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 3,718 ML, which is made up of 14 WALs <250 ML, three WALs between 250-500 ML, one WAL between 500-1,000 ML, and one WAL >2,500 ML

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	H^+	H^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the length of cease-to-flow periods and extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

- Consider rostering landholder water access during low flow months.
- Consider reviewing cease-to-pump rules to better protect low flows.
- Consider protecting freshes at ecologically relevant times to help relieve unnaturally long cease-to-flow periods.
- Consider implementing total and/or individual daily extraction limits.

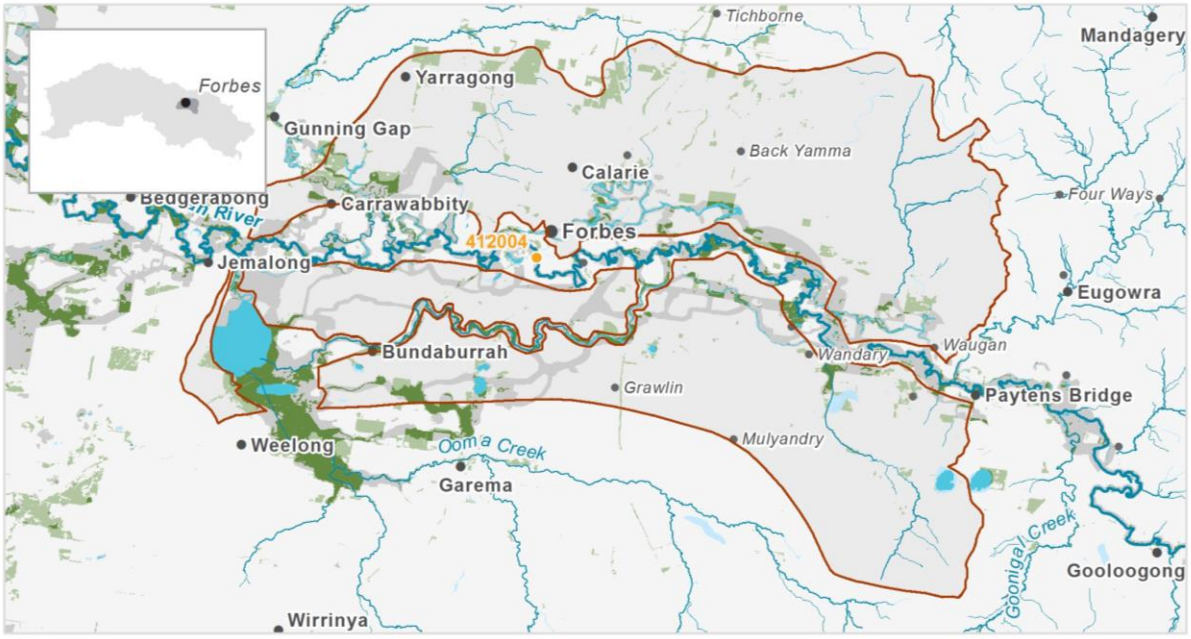
Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Consider improving the gauging network to better capture the distribution of flows and the amount and behaviour of take.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU30: Lake Forbes & Back Yamma Creek water source



Priority environmental assets

- Back Yamma Creek and its in-channel habitat, and fringing vegetation communities
- Lake Forbes

Native fish	• Southern purple spotted gudgeon	• Unspecked hardyhead • Carp gudgeon	• Australian smelt • Bony herring
Birds	77 water-dependent bird species recorded, including:		
	• Glossy ibis • Blue-billed duck	• Latham's snipe • Freckled duck	• Australian painted snipe
Native vegetation	Eleven water-dependent plant community types, including:		
	• Black box woodland	• River red gum woodland	• Wetland sedgeland
Registered cultural assets	• Modified Trees		
Other species	• Sloanes froglet	• Eastern sign-bearing froglet	• Spotted grass frog

Hydrology

Flows do not seem to be altered by more than 20% compared to the 'without development' model scenario as assessed by the Lachlan WRPA Risk Assessment.

The total volume of unregulated entitlements for the water source is 170 ML, which is made up of five WALs <250 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^+	L^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

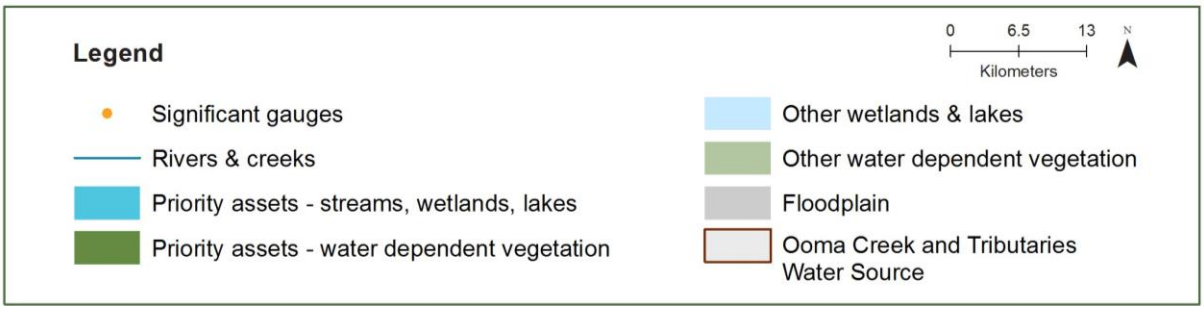
Recommended management strategies

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU31: Ooma Creek & tributaries water source



Priority environmental assets

- Ooma Creek and its tributaries, in-channel habitat and fringing vegetation communities

Native fish	• Southern purple spotted gudgeon • Obscure galaxias	• Golden perch • Yabby • Australian smelt	• Murray cod • Flathead galaxias • Carp gudgeon
Birds	60 water-dependent bird species recorded		
Native vegetation	Eight water-dependent plant community types, including: • Wetland sedgeland	• River red gum woodland	• Canegrass swamp grassland wetland
Registered cultural assets	• Modified trees		
Other species	• Sloanes froglet • Peron's tree frog	• Giant banjo frog	• Spotted grass frog

Hydrology

Gauge: 412068 *Goonigal Creek at Gooloogong*	**80th percentile**: 0 ML/d	**50th percentile**: 0 ML/d	**20th percentile**: 16.17 ML/d
	1.5 ARI: 752 ML/d	**2.5 ARI**: 1,332 ML/d	**5 ARI**: 1,901 ML/d

Low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 216 ML, which is made up of three WALs <250ML.

EWRs in the Upper and Mid Lachlan floodplain PU (Zone A) are reliant on water contributions from this PU so that the LTWP objectives can be met.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^+	H^-	L^-	L^-	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the extraction pressure on low flows and baseflows in the *WSP for the Lachlan Unregulated Water Sources* within five years.

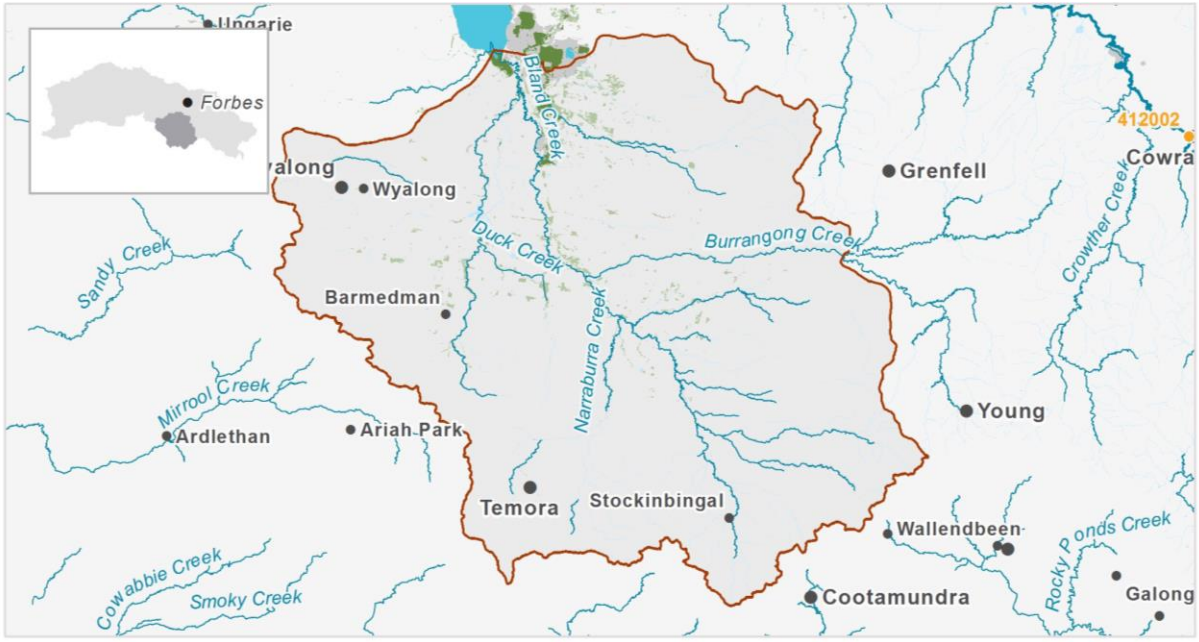
Investigate opportunities to protect flows that provide connectivity between Ooma Creek and tributaries PU and Upper and Mid Lachlan floodplain PU in the *WSP for the Lachlan Unregulated Water Sources* within next five years

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU32: Western Bland Creek water source



Priority environmental assets

- Bland Creek and its tributaries, in-channel habitat, and fringing vegetation communities

Native fish	• Southern purple spotted gudgeon • Dwarf flat-headed gudgeon • Northern river blackfish • Unspecked hardyhead	• Murray-darling rainbowfish • Bony herring • Flathead gudgeon • Australian smelt • Freshwater shrimp • Freshwater catfish • Flathead galaxias	• Yabby • Suttons crayfish • Freshwater prawn • Golden perch • Murray cod • Olive perchlet • Obscure galaxias • Carp gudgeon
Birds	83 water-dependent bird species recorded, including: • Glossy ibis • Latham's snipe	• Freckled duck	• Brolga
Native vegetation	13 water-dependent plant community types, including • Cumbungi rushlands wetland • Wetland sedgeland	• River red gum woodland	• Canegrass swamp grassland wetland

Registered cultural assets	• Artefacts	• Modified Trees	• Hearth
Other species	• Sloanes froglet • Peron's tree frog	• Eastern sign-bearing froglet	• Giant banjo frog • Spotted grass frog

Hydrology

Gauge: 412103 *Bland Creek at Morangarell*	**80th percentile**: 0 ML/d	**50th percentile**: 0 ML/d	**20th percentile**: 60.21 ML/d
	1.5 ARI: 10,631 ML/d	**2.5 ARI**: 17,529 ML/d	**5 ARI**: 27,956 ML/d

Low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 2,192 ML, which is made up of 25 WALs <250 ML, one WAL between 250-500 ML, and two WALs between 1000-2500 ML.

EWRs in the Upper and Mid Lachlan floodplain PU (Zone A) are reliant on water contributions from this PU so that the LTWP objectives can be met.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^+	H^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

- Consider rostering landholder water access during low flow months.
- Consider reviewing cease-to-pump rules to better protect low flows, especially during dry times or ecologically important months.
- Consider implementing total and/or individual daily extraction limits.

Investigate opportunities to protect flows that provide connectivity between Western Bland Creek PU and Upper and Mid Lachlan floodplain PU in the WSP for the Lachlan Unregulated Water Sources within next five years

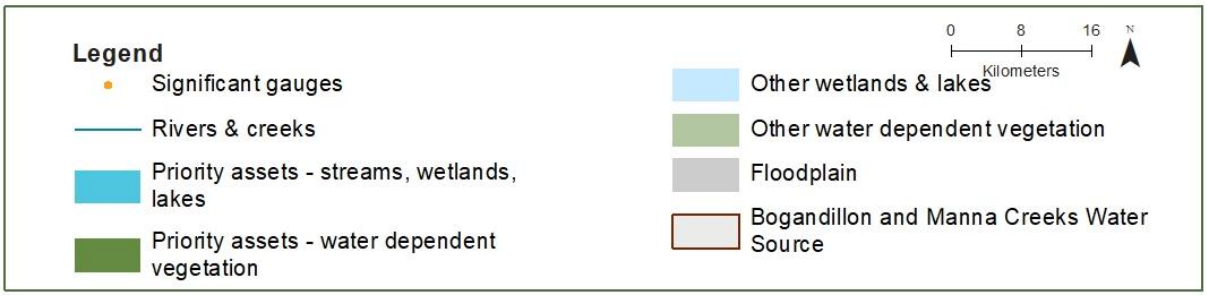
Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU33: Bogandillon & Manna Creeks water source

See heading immediately above and surrounding text for details of the map.



Priority environmental assets

- Bogandillon Swamp
- Lake Cowal
- Nerang Cowal
- Sandy Creek
- Manna Creek and its tributaries, in-channel habitat and fringing vegetation communities

Native fish	• Southern purple spotted gudgeon • Flathead galaxias • Flathead gudgeon • Unspecked hardyhead • Bony herring	• Murray-darling rainbowfish • Australian smelt • Freshwater shrimp • Carp gudgeon • Freshwater prawn	• Yabby • Golden perch • Murray cod • Olive perchlet • Spangled perch
Birds	108 water-dependent bird species recorded, including:		
	• Freckled duck • Glossy ibis • Sharp-tailed sandpiper • Curlew sandpiper	• Magpie goose • Brolga • Cattle egret • Latham's snipe	• Australian painted snipe • Australasian bittern • Eastern great egret • Blue-billed duck
Native vegetation	15 water-dependent plant community types, including		
	• Canegrass swamp grassland wetland	• River red gum woodland	• Wetland sedgeland

Registered cultural assets	None registered
Other species	• Sloanes froglet

Hydrology

Gauge: 412103 *Bland Creek at Morangarell*	**80th percentile**: 0 ML/d	**50th percentile**: 0 ML/d	**20th percentile**: 361.94 ML/d
	1.5 ARI: 63,903 ML/d	**2.5 ARI**: 105,372 ML/d	**5 ARI**: 168,052 ML/d

Low flows are highly altered (>50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the planning unit is 2,766 ML, which is made up of four WALs <250 ML, one WAL between 250-500 ML, and one WAL between 500-1000 ML.

EWRs in the Upper and Mid Lachlan floodplain PU (Zone A) are reliant on water contributions from this PU so that the LTWP objectives can be met.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^{+}	H^{-}	L^{-}	L^{0}	L^{0}	L^{0}
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce extraction pressure on baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

- Consider reviewing cease-to-pump rules to better protect low flows, especially during low flow months.
- Consider implementing total and/or individual daily extraction limits.

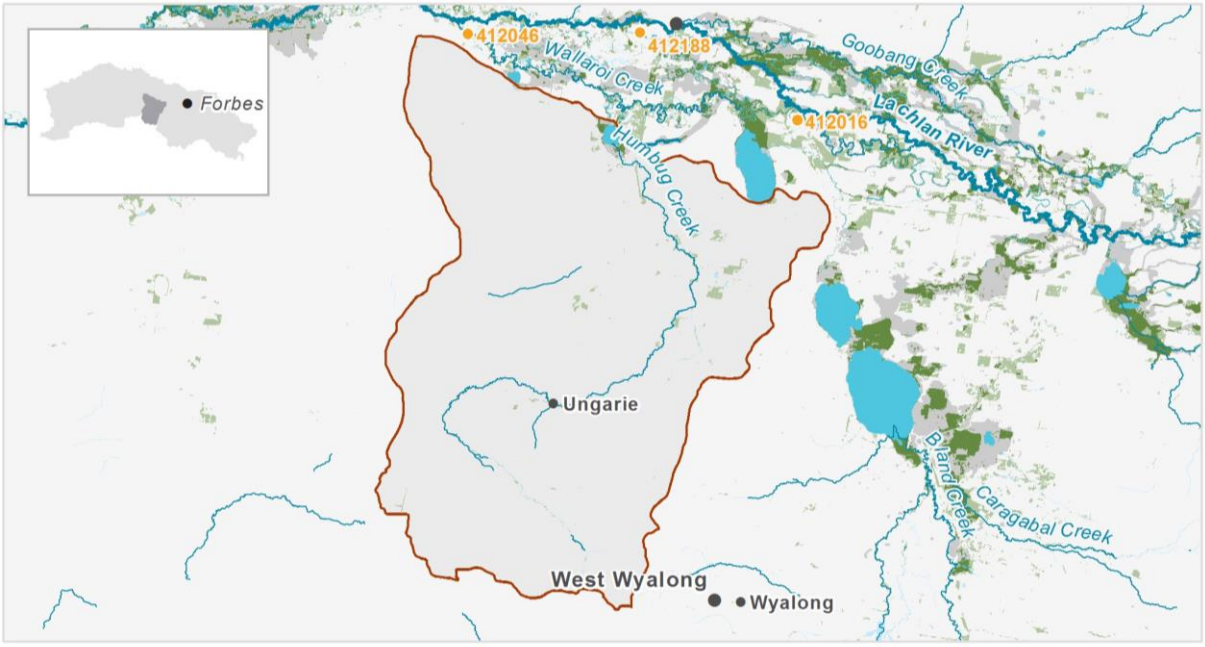
Investigate opportunities to protect flows that provide connectivity between Bogandillon & Manna Creek PU and Upper and Mid Lachlan floodplain PU in the WSP for the Lachlan Unregulated Water Sources within next five years

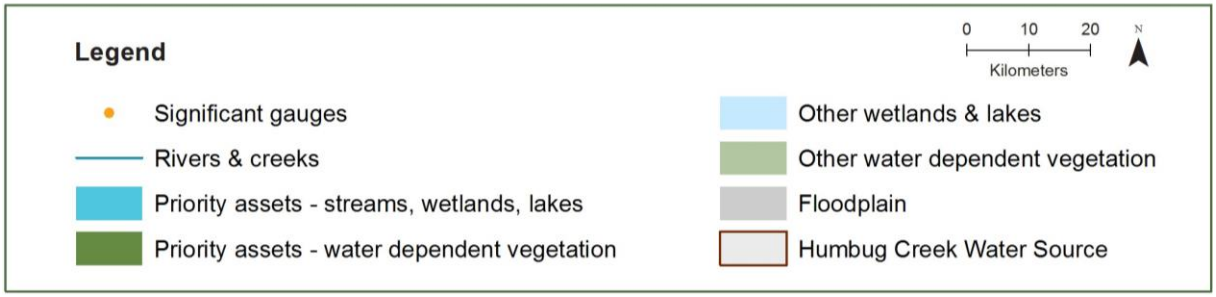
Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU34: Humbug Creek water source





Priority environmental assets

- Humbug Creek and its tributaries, in-channel habitat and fringing vegetation communities
- Banar Lake

Native fish	• Southern purple spotted gudgeon • Unspecked hardyhead	• Bony herring • Australian smelt • Yabby	• Flathead galaxias • Golden perch • Carp gudgeon
Birds	67 water-dependent bird species recorded, including		
	• Freckled duck • Glossy ibis	• Latham's snipe • Australian painted snipe	• Magpie goose • Brolga
Native vegetation	14 water-dependent plant community types, including		
	• Black box - Lignum woodland • Wetland sedgeland	• River red gum woodland	• Canegrass swamp grassland wetland
Registered cultural assets	None registered		
Other species	• Southern bell frog • Giant banjo frog	• Spotted grass frog	• Sloanes froglet

Hydrology

Flows do not seem to be altered by more than 20% compared to the 'without development' model scenario as assessed by the Lachlan WRPA Risk Assessment.

The total volume of unregulated entitlements for the water source is 9 ML, which is made up of two WALs <250 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^+	L^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

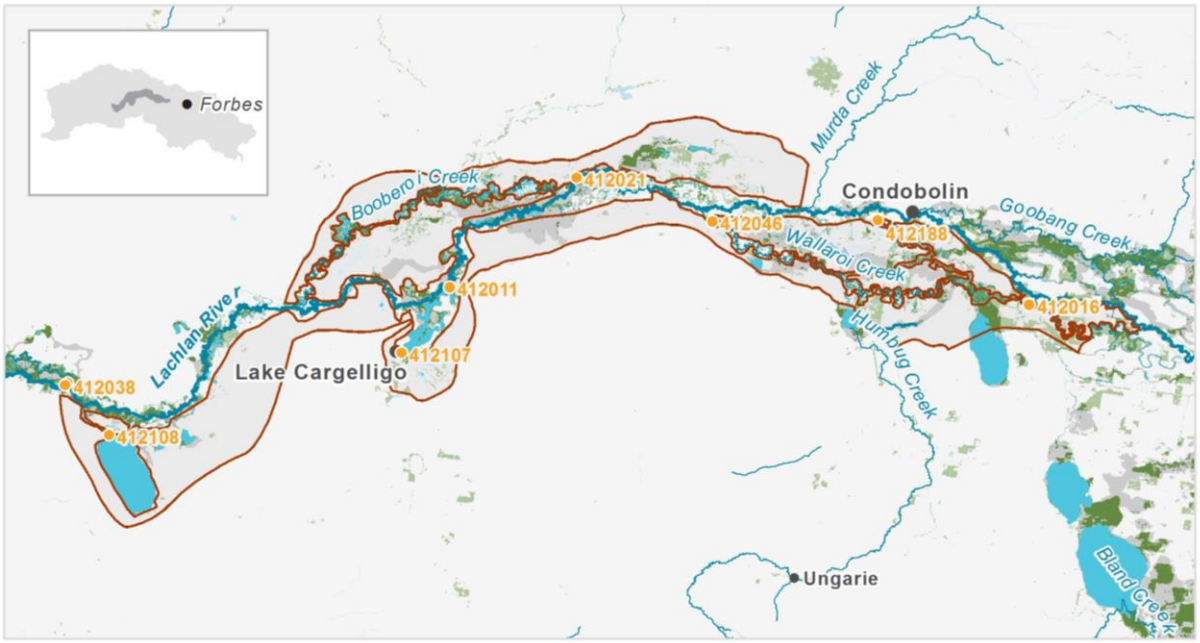
Recommended management strategies

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU35: Mid Lachlan unregulated water source



Priority environmental assets

- Mountain Creek

Native fish	• Flathead galaxias • Unspecked hardyhead • Northern river blackfish • Murray-Darling rainbowfish	• Bony herring • Flathead gudgeon • Australian smelt • Freshwater shrimp • Carp gudgeon • Freshwater catfish	• Yabby • Freshwater prawn • Golden perch • Murray cod • Olive perchlet • Silver perch
Birds	89 water-dependent bird species recorded, including • Freckled duck • Glossy Ibis • Common sandpiper	• Sharp-tailed sandpiper • Latham's snipe • Marsh sandpiper	• Curlew sandpiper • Eastern great egret • Brolga
Native vegetation	13 water-dependent plant community types, including • Black box - Lignum woodland • River red gum woodland	• Black box woodland • Wetland sedgeland	• Canegrass swamp grassland wetland • River cooba
Registered cultural assets	• Artefacts • Modified Trees	• Resources, gathering	• Hearth
Other species	• Sloanes froglet • Spotted grass frog	• Peron's tree frog	• Eastern sign-bearing froglet

Hydrology

Low flows are moderately altered (20-50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Low flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 12,821 ML, which is made up of seven WALs <250ML, one WAL between 250-500 ML, two WALs between 500-1000 ML, one WAL between 1000-2500 ML, and two WALs >2500 ML.

EWRs in the Booberoi, the Mid Lachlan anabranches, and the Lachlan River (Condobolin to Lake Cargelligo) PUs (Zone A) are reliant on water contributions from this PU so that the LTWP objectives can be met.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^+	M^-	L^-	L^-	L^-	L^-
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce extraction pressure on low flows and baseflows in the WSP for the Lachlan Unregulated Water Sources within five years.

- Consider implementing total and/or individual daily extraction limits.

Protect environmental flows from the Lachlan River (Condobolin to Lake Cargelligo) PU into the Mid Lachlan unregulated PU in the WSP for the Lachlan Unregulated Water Sources.

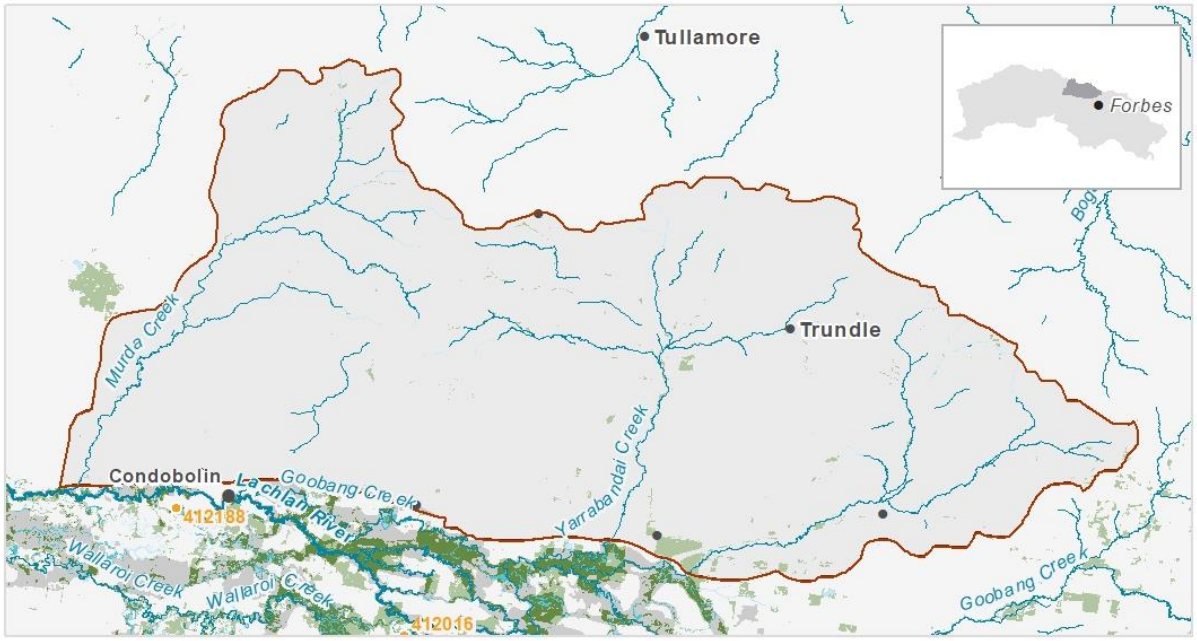
Consider improving the gauging network and/or pump metering to better capture the distribution of flows and the amount and behaviour of take.

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU36: Gunningbland & Yarrabandai water source



Priority environmental assets

- Gunningbland and Yarrabandai Creeks and their tributaries, in-channel habitat and fringing vegetation communities

Native fish	• Unspecked hardyhead • Freshwater catfish • Flathead galaxias	• Murray-darling rainbowfish • Dwarf flat-headed gudgeon • Carp gudgeon	• Australian smelt • Freshwater shrimp • Bony herring • Spangled perch
Birds	63 water-dependent bird species recorded, including glossy ibis and brolga.		
Native vegetation	Ten water-dependent plant community types, including: • Canegrass swamp grassland wetland	• River red gum woodland	• wetland sedgeland
Registered cultural assets	• Artefacts	• Modified trees	• Hearth
Other species	• Sloanes froglet • Peron's tree frog	• Eastern sign-bearing froglet	• Spotted grass frog • Giant banjo frog

Hydrology

Flows do not seem to be altered by more than 20% compared to the 'without development' model scenario as assessed by the Lachlan WRPA Risk Assessment.

The total volume of unregulated entitlements for the water source is 233 ML, which is made up of 4 WALs <250 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^+	L^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

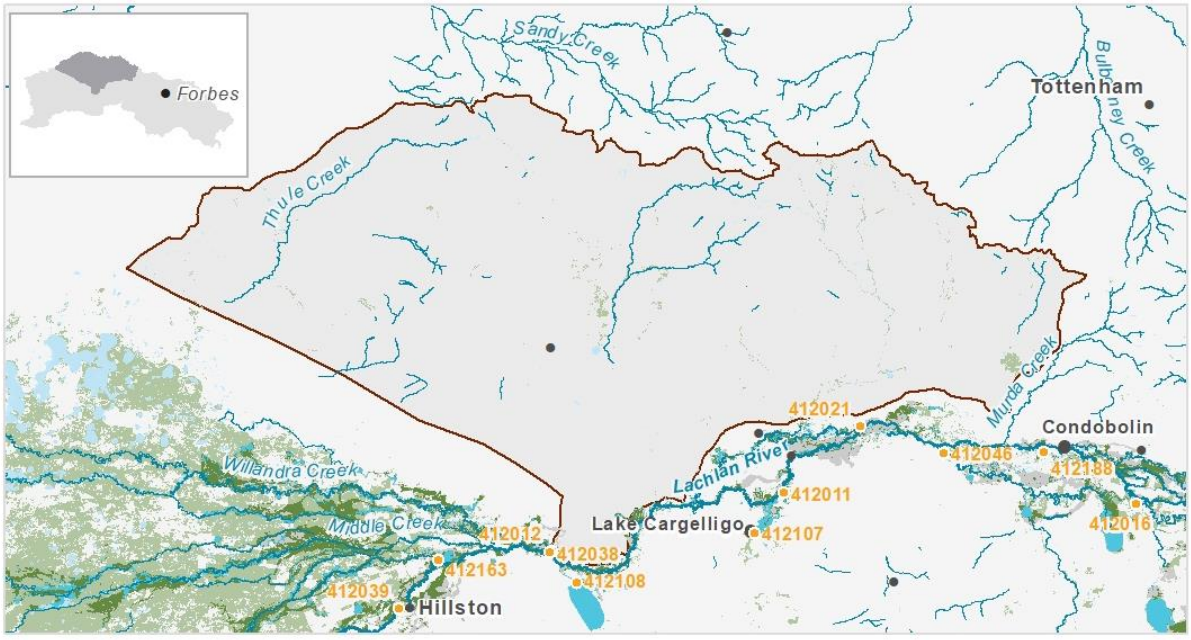
Recommended management strategies

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU37: Mount Hope area water source



Priority environmental assets

No priority environmental assets in this PU

Important environmental assets listed below

Native fish	• Unspecked hardyhead • Murray-Darling rainbowfish • Yabby	• Flathead gudgeon • Carp gudgeon • Spangled perch • Bony herring	• Freshwater shrimp • Australian smelt • Dwarf flat-headed gudgeon
Birds	82 water-dependent bird species recorded, including • Glossy Ibis • Blue-billed duck • Sharp-tailed sandpiper	• Latham's snipe • Cattle egret • Brolga	• Freckled duck • Australian painted snipe
Native vegetation	14 water-dependent plant community types, including • Black box - Lignum woodland • River red gum woodland	• Lignum shrubland wetland • Wetland sedgeland	• Canegrass swamp grassland wetland • Black box woodland
Registered cultural assets	• Artefacts	• Modified Trees	
Other species	• Sloanes froglet	• Giant banjo frog	• Spotted grass frog

Hydrology

Flows do not seem to be altered by more than 20% compared to the 'without development' model scenario as assessed by the Lachlan WRPA Risk Assessment.

The total volume of unregulated entitlements for the water source is 27 ML, which is made up of two WALs <250 ML.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^+	L^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

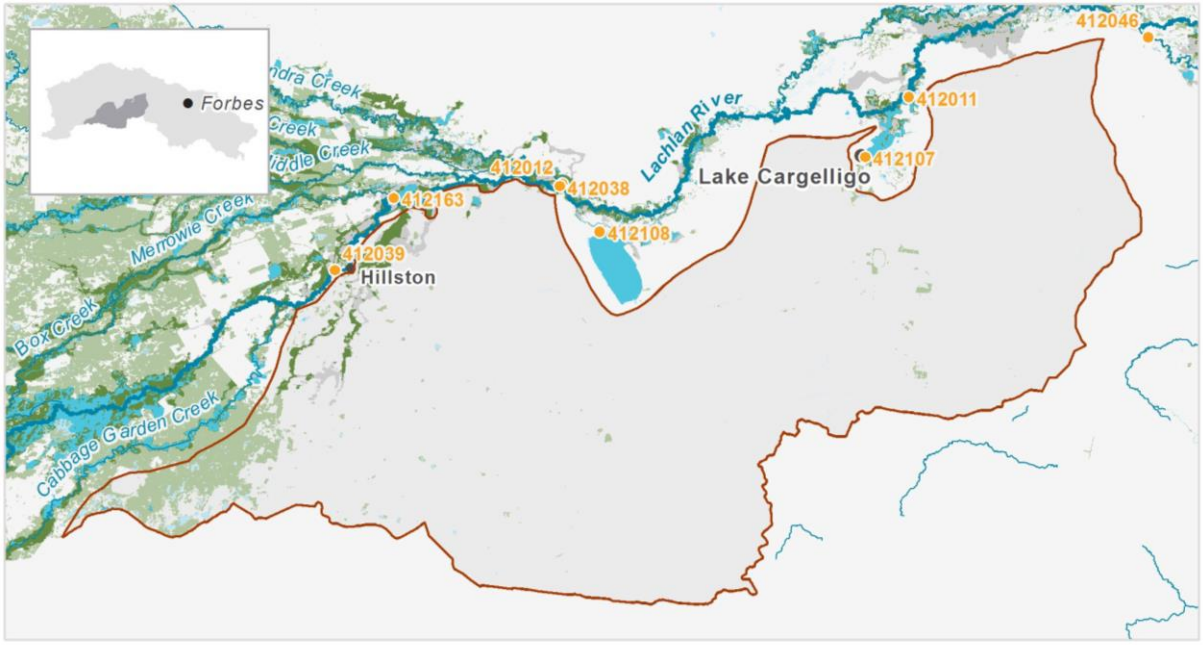
Recommended management strategies

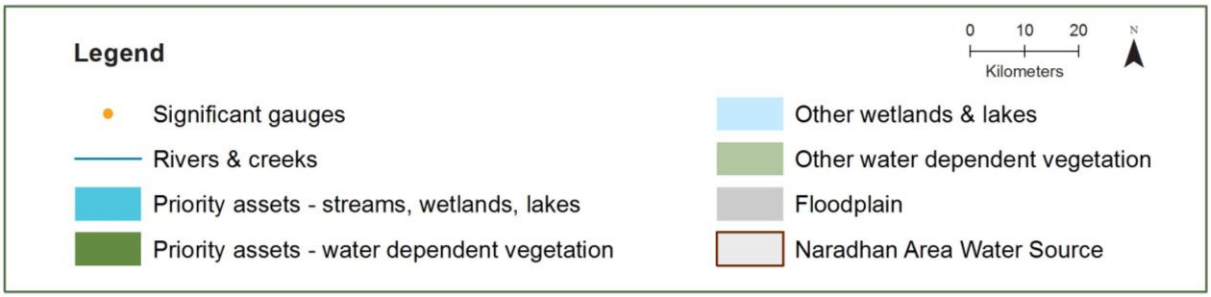
Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU38: Naradhan area water source





Priority environmental assets

- Naradhan Creek and its in-channel habitat and fringing vegetation communities

Native fish	-		
Birds	78 water-dependent bird species recorded, including		
	• Glossy Ibis • Sharp-tailed sandpiper	• Blue-billed duck • Black-necked stork	• Freckled duck
Native vegetation	14 water-dependent plant community types, including		
	• Canegrass swamp grassland wetland • Black box - Lignum woodland	• Canegrass swamp grassland wetland • River red gum woodland	• Lignum shrubland wetland • Black box woodland • Wetland sedgeland
Registered cultural assets	• Modified trees		
Other species	• Southern bell frog • Sloanes froglet	• Eastern sign-bearing froglet	• Spotted grass frog • Giant banjo frog

Hydrology

Flows do not seem to be altered by more than 20% compared to the 'without development' model scenario as assessed by the Lachlan WRPA Risk Assessment.

There are no extraction licences in this planning unit.

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^+	L^-	L^-	L^0	L^0	L^0
Relevant rules	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

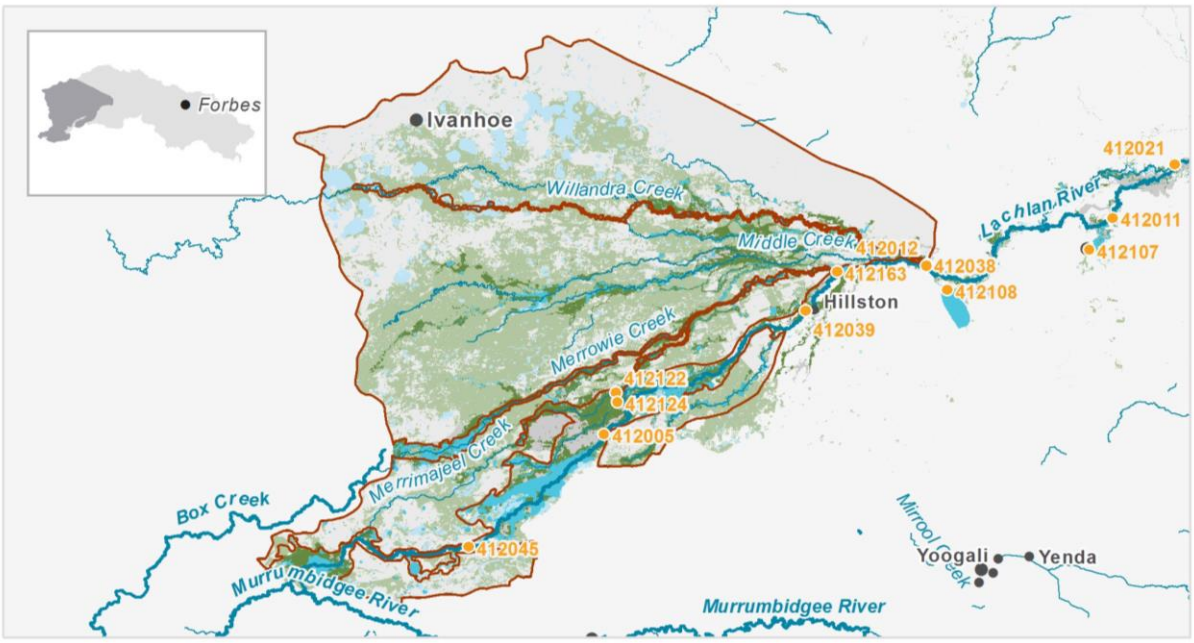
Recommended management strategies

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

PU39: Unregulated effluent creeks water source



Priority environmental assets

- Canegrass Swamp
- Conoble Creek
- Kilarney Swamp
- Reedy Lake
- Saltbush Swamp
- Toopuntal Swamp
- Waverley Creek
- Yangellawah Creek
- Lachlan River distributary channels and their in-channel habitat and fringing vegetation communities

Native fish	• Olive perchlet • Silver perch • Flathead galaxias • Unspecked hardyhead • Carp gudgeon	• Murray-darling rainbowfish • Bony herring • Flathead gudgeon • Dwarf flat-headed gudgeon	• Freshwater shrimp • Yabby • Freshwater prawn • Golden perch • Murray cod • Australian smelt
Birds	90 water-dependent bird species recorded, including • Glossy ibis • Cattle egret • Sharp-tailed sandpiper • Marsh sandpiper	• Australasian bittern • Australian painted snipe • Eastern great egret	• Blue-billed duck • Freckled duck • Latham's snipe
Native vegetation	14 water-dependent plant community types, including: • Black box - lignum woodland	• Black box woodland	• Canegrass swamp grassland wetland

	• River red gum woodland	• Wetland sedgeland	• Lignum shrubland wetland
Registered cultural assets	• Artefacts • Modified trees	• Hearths • Resources, gathering	• Habitation structure • Earth mound
Other species	• Eastern sign-bearing froglet • Peron's tree frog	• Sloanes froglet • Southern bell frog	• Giant banjo frog • Spotted grass frog

Hydrology

Low flows are highly altered (>50% departure from base case) and freshes and high and infrequent flows are moderately altered (20-50% departure from base case) as assessed by the Lachlan WRPA Risk Assessment. Low flows currently occur more frequently and freshes and High and infrequent flows occur less frequently compared to the 'without development' model scenario.

The total volume of unregulated entitlements for the water source is 3,219.5 ML, which is made up of 18 WALs <250ML, two WALs between 250-300 ML, and one WAL between 1000-2500 ML.

Flows in the Unregulated effluent creeks PU are reliant on water contributions from Willandra Creek, Merrowie Creek, Merrimajeel Creek, Box Creek, Muggabah Creek, Lower Lachlan watercourse and Western Lachlan watercourse PUs (Zone A).

	Cease-to-flow	Low flows and Baseflow	Freshes	High and infrequent flows		
				1.5 ARI	2.5 ARI	5 ARI
Hydrological alteration	L^0	H^+	M^-	M^-	M^-	M^-
Relevant rule	Trade not permitted into the water source Trade within the water source is permitted, subject to assessment No pool drawdown					

Recommended management strategies

Investigate opportunities to reduce the extraction pressure on baseflows and freshes in the WSP for the Lachlan Unregulated Water Sources within five years.

- Consider rostering landholder water access during low flow months.
- Consider reviewing cease-to-pump rules to better protect low flows, especially during dry times or ecologically important months.
    - Investigate increasing cease-to-pump to 30 ML/d at Willandra Creek @ Willandra Homestead gauge (412042).

Investigate opportunities to protect flows that provide connectivity between Willandra Creek, Merrowie Creek, Merrimajeel Creek, Box Creek, Muggabah Creek, Lower Lachlan watercourse and Western Lachlan watercourse PUs into the unregulated effluent creeks water source PU in the WSP for the Lachlan Unregulated Water Sources within next five years.

- Consider implementing total and/or individual daily extraction limits to improve connectivity during ecologically important months.
- Protect water for the environment that originates from held water entitlements.[7]

Ensure compliance with water access licence conditions including through metering of all licensed extraction.

Maintain existing rules in the WSP for the Lachlan Unregulated Water Sources.

Monitor for changes in water demand and review access rules if current usage is high or if the pattern of use changes.

[7] Refer to EWR tables for relevant Zone A PUs listed.