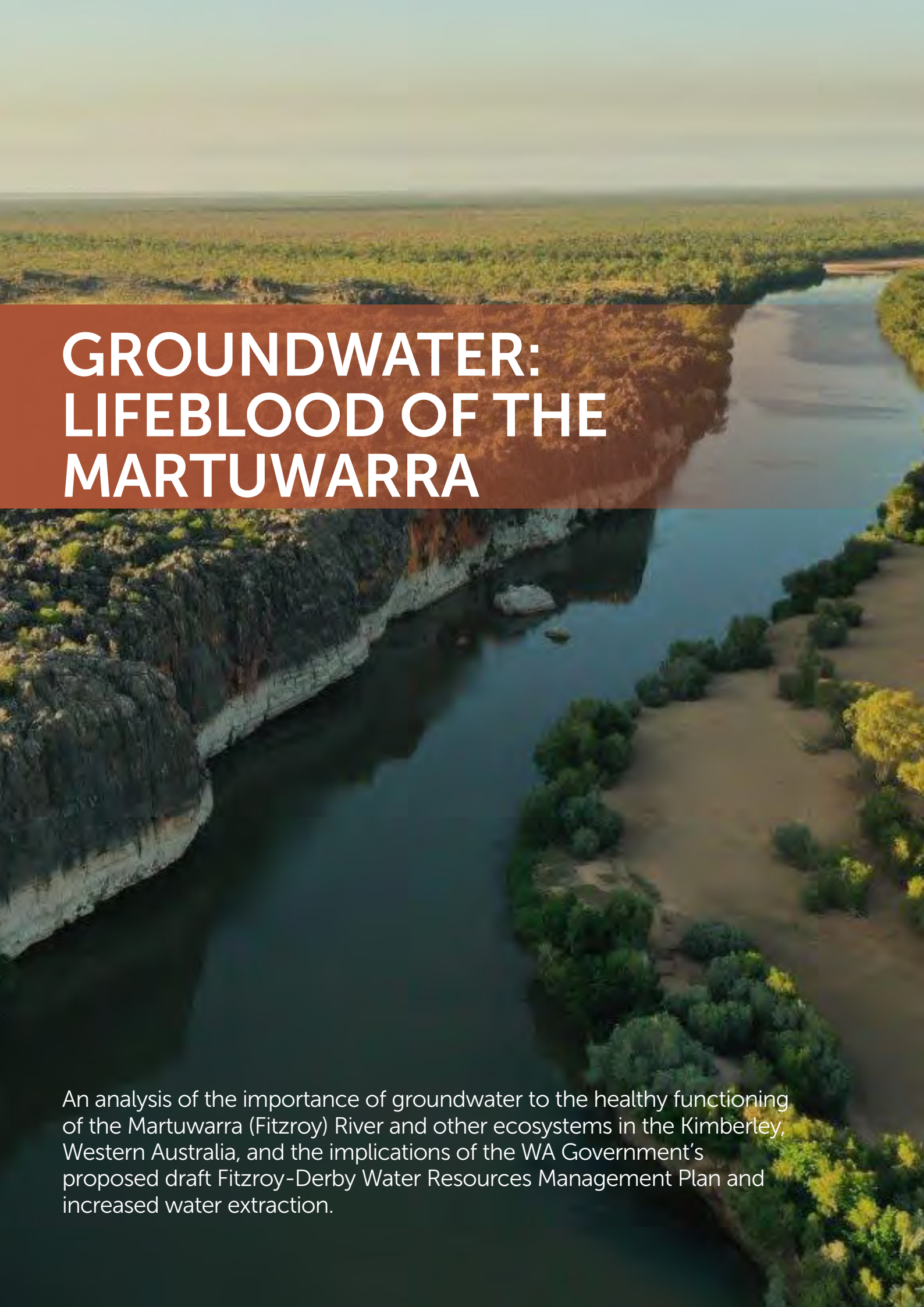


An aerial photograph of the Martuwarra (Fitzroy) River. The river flows from the top right towards the bottom left. On the left bank, there is a prominent, dark, rocky cliff face. The surrounding landscape is covered in dense green vegetation, likely mangroves or coastal scrub. The sky is a pale, hazy blue. A semi-transparent brown rectangular box is overlaid on the upper left portion of the image, containing the title text in white.

GROUNDWATER: LIFEBLOOD OF THE MARTUWARRA

An analysis of the importance of groundwater to the healthy functioning of the Martuwarra (Fitzroy) River and other ecosystems in the Kimberley, Western Australia, and the implications of the WA Government's proposed draft Fitzroy-Derby Water Resources Management Plan and increased water extraction.



The Kimberley Like Nowhere Else Alliance contracted Conservation Science Consultant Angela Pursey to conduct this analysis of the importance of groundwater to the healthy functioning of the Martuwarra (Fitzroy) River and other ecosystems in the Kimberley, Western Australia, and the implications of the WA Government's proposed draft Fitzroy-Derby Water Resources Management Plan and increased water extraction.

This report draws on a combination of technical review, spatial mapping, and synthesis of published scientific and government sources to assess groundwater's role in the Martuwarra (Fitzroy) River system and the risks posed by proposed extraction

Highlighted in this report is the crucial role of groundwater to the health of the whole river system, as well as likely risks to groundwater and other connected ecosystems within the draft Fitzroy-Derby Water Resources Management Plan area.

Executive Summary

- The healthy functioning of the Martuwarra (Fitzroy) River and many other Fitzroy ecosystems is highly dependent on groundwater. For example, the Grant Poole and Wallal aquifers play a central role in sustaining river flows, wetlands, springs, and riparian vegetation.
- The WA Government's draft Fitzroy-Derby plan proposes allowing industrial-scale groundwater extraction from both these aquifers, with up to 40% of estimated recharge to be taken each year. In simple terms, this means nearly half the water thought to refill these aquifers could be removed instead of supporting rivers, wetlands and other ecosystems.
- Impacts from pumping can extend tens of kilometres from bore sites. With the drawdown effects of industrial bores extending so far, there are very few potential pump locations in the lower Fitzroy that are far enough away to avoid threatening dry-season refugia pools, springs, and groundwater-dependent ecosystems.
- Both Grant Poole and Wallal aquifers are poorly understood, with significant data gaps in recharge, connectivity, and ecological requirements.
- Best practice water management requires ecological thresholds, robust baseline and long-term monitoring, spatially representative networks, public transparency of data, mandatory responses and enforceable adaptive triggers. The current draft Fitzroy-Derby plan falls short in all these areas.
- The draft Fitzroy-Derby plan does not meaningfully incorporate Traditional Owner representative organisations as decision-makers in groundwater planning and management, despite the deep cultural, ecological and intergenerational knowledge held by Traditional Owners, and their enduring custodial responsibilities for the Martuwarra and Country.
- Policy language in the draft Fitzroy-Derby plan is vague and discretionary, leaving key decisions about monitoring and enforcement to officer discretion rather than clear standards. This means how the rules are applied may vary in practice, with fewer enforceable safeguards to ensure consistent protection.
- The WA Auditor General's 2025 review of water licensing and regulation in Western Australia found persistent shortcomings in water licensing, monitoring, enforcement, and transparency, reinforcing the need for stronger safeguards and open data access.
- The magnitude of proposed groundwater extraction in the draft Fitzroy-Derby plan far exceeds current and historic use and community or pastoral requirements.
- A precautionary approach that significantly limits groundwater extraction, grounded in best practice water governance and genuine transparency, is essential to protect the Fitzroy region's ecological and cultural values.



Contents

Executive Summary 1

Context 3

The Martuwarra-Fitzroy System 5

Indigenous importance and cultural values 7

Groundwater Martuwarra interactions 7

Ecosystems that rely on groundwater 9

Riverine ecosystems 10

Wetlands and springs 10

Estuarine ecosystems 10

Riparian and terrestrial ecosystems 11

Groundwater extraction 13

Implications 14

Best practice in water planning and governance 19

Box 1 – Applying risk-based allocation planning process to the Fitzroy subarea 21

Demand for water 22

Conclusion 23

References 24

Figures

Figure 1. National and Aboriginal heritage in the Fitzroy water plan area. 4

Figure 2.

a) Cross section showing aquifer layers and interactions with river.

b) Water components of the Martuwarra Fitzroy River

c) Long term rainfall trends 5

Figure 3. Map of groundwater-surface water interactions in the lower Fitzroy 8

Figure 4. Dry season groundwater-surface water interactions in the Fitzroy 9

Figure 5. Implications on groundwater-surface water interactions in the Fitzroy under industrial scale groundwater extraction scenarios 12

Figure 6. Distance from mapped Grant Poole dependent aquatic ecosystem in the lower Fitzroy 13

Tables

Table 1. Major components of the Fitzroy Hydrological System 6

Table 2. Implications of changes in groundwater pressure for key ecosystems and species in the Fitzroy region 14

Context

The Fitzroy region in the Kimberley is the subject of a proposed industrial scale increase in groundwater extraction from the Grant Poole and Wallal aquifers. This paper outlines the hydrological system of the region and the implications for nature and culture of the proposal.

The draft Fitzroy-Derby Water Resources Management Plan (DWER, 2026b) proposes industrial-scale extraction from both the Grant Poole and Wallal aquifers, with allocation limits set at 40% of estimated average recharge. This proposed approach, based on the “safe yield” concept has been widely critiqued as inadequate for protecting ecological and cultural values.

A recent review of water regulation by the Western Australia’s Auditor General found persistent gaps in enforcement, monitoring and transparency in water licencing in WA, which are reflected in the current draft plan (Office of the Auditor General for Western Australia, 2025). The draft plan divides the catchment into 3 management subareas; Fitzroy, Greater Derby, and Derby Peninsula. The Derby subareas face their own challenges, with legacy overallocation and saltwater intrusion. This report focuses on the larger Fitzroy subarea, where larger developments are proposed that could lead to ecological and cultural impacts.

The Fitzroy is rich in natural and cultural heritage, with the Martuwarra (Fitzroy) River at its centre (Figure 1). For Kimberley Traditional Owners, the Martuwarra is a living ancestral river, essential to food systems, wellbeing and knowledge transmission (Douglas et al., 2019).

The Martuwarra (Fitzroy) River and many other ecosystems in the region depend on the natural groundwater system. Changes to the water regime as a result of industrial scale extraction could impact the integrity of the river and other important ecosystems, important species, cultural sites, Indigenous harvest, cultural practices, knowledge systems, and livelihoods (Carracher et al., 2024; Douglas et al., 2019; Jackson et al., 2011).

During the dry season (May – October), groundwater recharges the Martuwarra (Fitzroy) River, maintaining base flows and permanent waterholes. Groundwater from the Grant Poole aquifer enters the river south of Fitzroy Crossing and around Noonkanbah. The groundwater input maintains deep pools through the dry season, acting as essential refugia for healthy populations of freshwater sawfish, bony bream, barramundi, and cherabin. Groundwater also supports wetlands, springs and riparian vegetation. More than 20% of groundwater dependent floodplain wetlands in the region are mapped as reliant on Grant Poole.

The hydraulic properties of aquifers like Grant Poole cause groundwater changes over large distances when industrial scale extraction occurs. Industrial scale water extraction in the lower Fitzroy is likely to reduce groundwater availability for ecosystems within 20km or more of each bore site. This could lead to reduced flow to springs and wetlands, tree roots becoming unable to reach the water table, and reduction in functionality of dry season refugia pools along the Martuwarra (Fitzroy) River. A reduction in groundwater-surface water flow can in turn affect stream temperature, oxygen, salinity, sediment transport, and other water quality characteristics important to freshwater and marine ecosystems. There are very few potential pump locations in the lower Fitzroy that are far enough away to avoid impact on ecosystems mapped as dependent on Grant Poole groundwater.

The Fitzroy is a data-sparse region in relation to our understanding of its hydrological systems and ecological water needs (Dawes et al., 2018). Despite recent study efforts, we still do not have the means to accurately predict the impact that industrial scale groundwater extraction would have on the ecological integrity and cultural values of the region. A precautionary approach to water planning that keeps extraction limits low and uses environmental monitoring, trigger levels and clear response actions is needed to avoid damaging the ecological integrity and heritage values of the Kimberley.

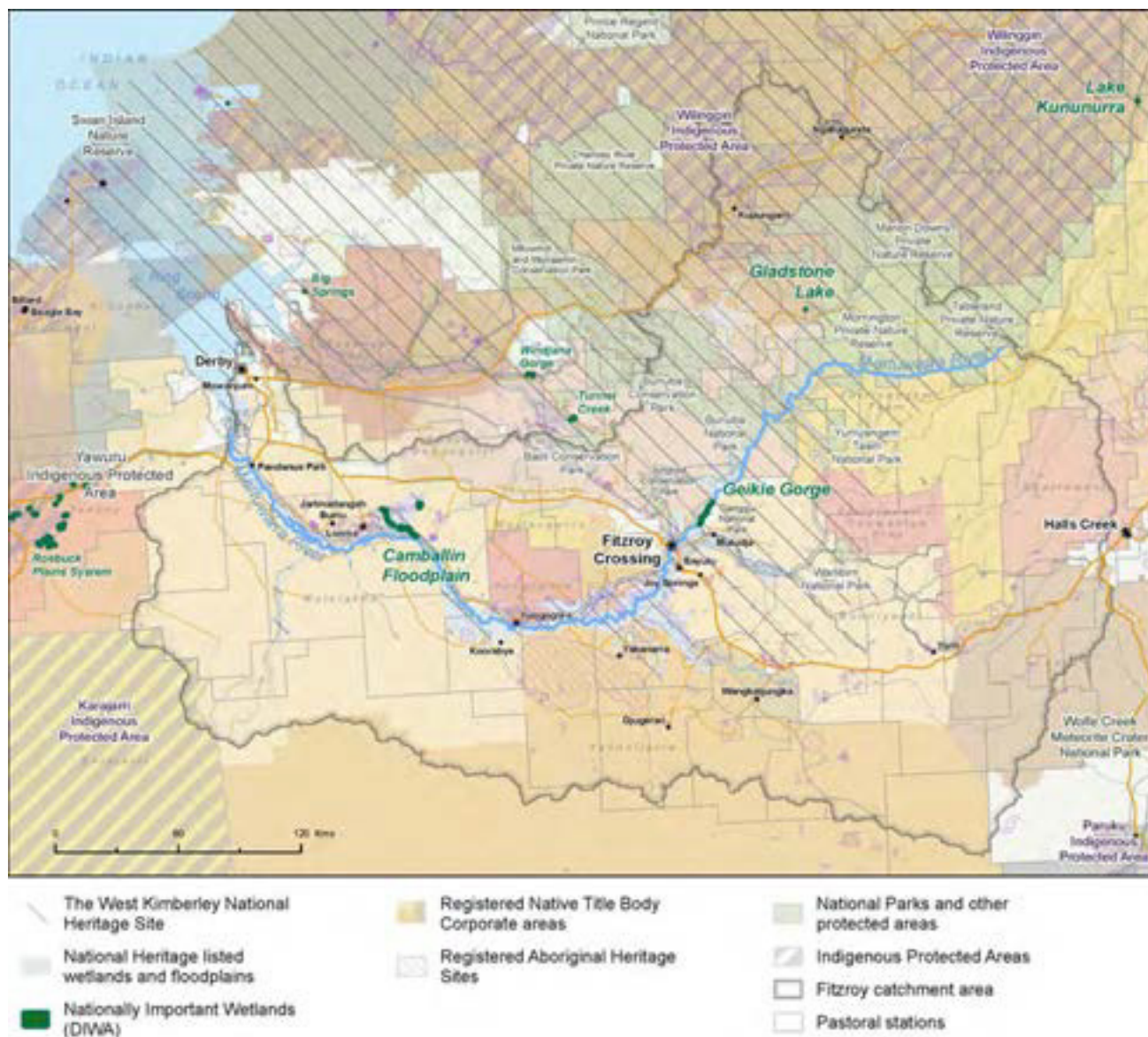


Figure 1. National and Aboriginal heritage in the Fitzroy water plan area.

The Martuwarra-Fitzroy system

The Fitzroy water system is made up of the Martuwarra (Fitzroy) River, wet season overland flow, and a series of interlinked belowground aquifers which store groundwater (Figure 1, Table 1). There are complex interactions between the above ground river and the below ground aquifers that we presently have limited quantitative understanding of (DWER, 2023c).

The semi-arid Kimberley experiences monsoonal wet seasons and long dry seasons, with the river experiencing highly seasonal flow. Interannually there is high variation in rainfall, with wet years experiencing 3 or 4 times more rain than dry years (Figure 2c)(Petheram et al., 2018).

In the wet season, above ground channels fill and then inundate the floodplains. This is followed by an extended dry period where the river is reduced to isolated waterholes (Figure 2b).

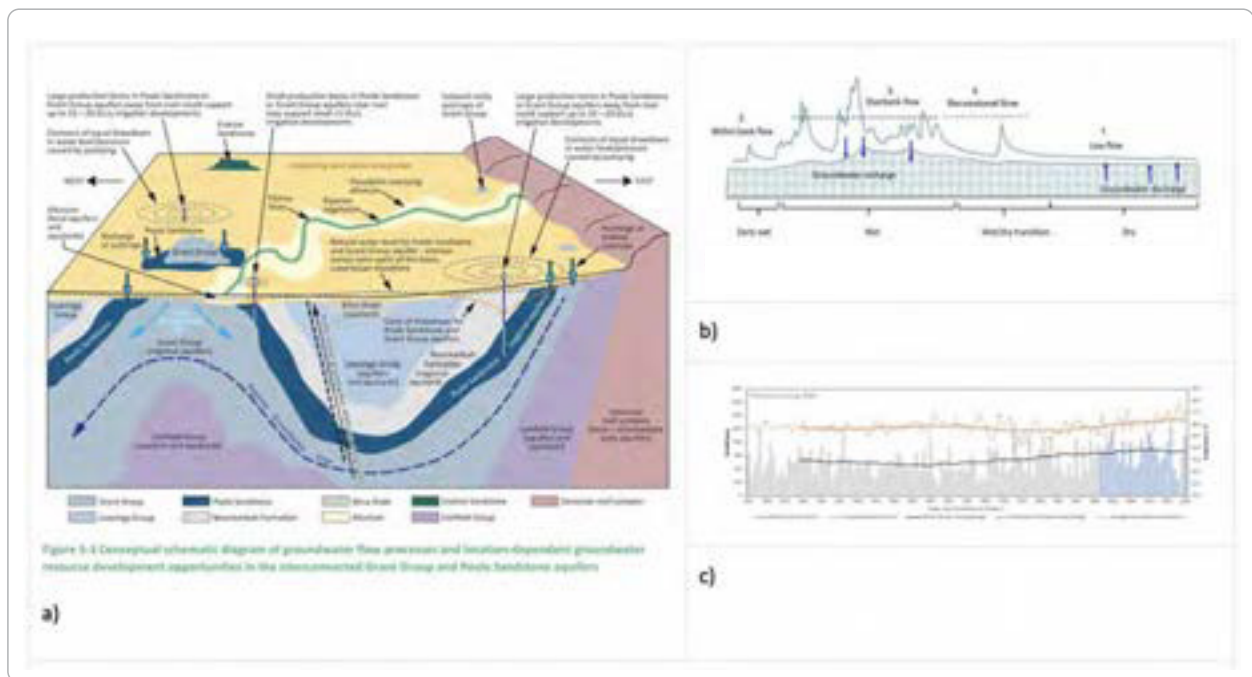


Figure 2. a) Cross section showing aquifer layers and interactions with river. Source (Petheram et al., 2018); b) Water components of the Martuwarra Fitzroy River (DWER, 2023a; adapted from Douglas et al., 2019); c) Long term rainfall trends (DWER, 2023c)

During the wet season, a small amount of the rainfall infiltrates the aquifers (recharge)¹ (Dawes et al., 2018). This groundwater slowly² seeps through the aquifer system³ and may stay there for tens of thousands of years⁴ (DWER, 2023c). In the dry season some groundwater from the aquifers leaks out to the surface (discharge), sustaining refugial waterholes, wetlands, and springs, where it supports ecosystems (Burrows et al., 2020). In natural systems, recharge and discharge are in long term equilibrium.

The Martuwarra (Fitzroy) River is highly dependent on this aquifer discharge, with measurements showing it gains water from groundwater sources over most of its length, rather than losing water to them (DWER, 2023c). All of the river downstream of Sir John Gorge has been found to have a high likelihood of dependence on groundwater, as well as many sections of tributaries and all springs (DWER, 2023d)(Figure 2).

1 Groundwater recharge in the Fitzroy estimated at a low 21mm/year (Dawes et al., 2018).

2 The flow direction of groundwater in the Fitzroy follows the same general trend of the river and the regional surface topology, flowing north-east to south-west, though groundwater moves much slower than surface water. The water in the Grant Poole aquifer has been estimated to move less than 20cm per day in the west of the aquifer system, and in the eastern part as slow as 1-2cm per day (Dawes et al., 2018).

3 Connectivity between the aquifers has been detected at some points but is not well understood (DWER, 2023c).

4 Some samples taken from Grant Poole have been dated as 40,400 years old (DWER, 2023c).

Table 1. Major components of the Fitzroy Hydrological System

Martuwarra River	Also known as the Fitzroy River, or Mardoowarra. 730km long, one of Australia's largest unregulated rivers. Flow is highly seasonal, 90% occurring from January-March, and reduction to disconnected pools in the dry season (DWER, 2023c). Receives discharge from alluvial and regional aquifers over most of its length in the dry season. Loses water to groundwater in some reaches.(DWER, 2023c). Cultural importance: For Traditional Owners, the Martuwarra is a living ancestral river, essential to food systems, wellbeing and knowledge transmission (Douglas et al., 2019)
Margaret river	Large tributary to the Martuwarra. Receives discharge from alluvial and regional aquifers.
Floodplain	Listed on the National Heritage List in recognition of outstanding Indigenous, cultural, historic, aesthetic and natural values (DWER, 2023b).
Alluvial aquifer	Also referred to as alluvium. A heterogenous shallow aquifer that underlies much of the floodplain. Has high hydraulic connectivity with the river and some hydraulic connectivity with the regional aquifers. Has been shown to receive some input from regional aquifers. Ranges from fresh to saline (DWER, 2023c).
Grant Poole aquifer	Generally, a deep, confined (lacking a surface connection) freshwater aquifer. The source layer for the proposed industrial development. Regional aquifer that occurs in the lower catchment, to the west and south of Fitzroy crossing at depths generally within the range of 20-500m. Grant Group and Poole Sandstone are distinct geological units with high hydraulic connection to each other and with broadly similar properties. For management and planning they are generally grouped as one water source. The draft plan sets a 40% recharge-based allocation limit for this aquifer in the Fitzroy subarea, which amounts to 22.8 GL/y.
Wallal aquifer	A large regional aquifer, poorly understood with minimal study. Extensive outcropping in the south-west of the catchment. Fresh water, with increasing salinity towards the coast. Comprised of Wallal Sandstone and Alexander Formation. Considered for industrial scale water take in Fitzroy and Derby plans. Hydraulic connectivity with the Martuwarra. Connectivity with other aquifers not well understood (DWER, 2023c). The draft plan sets a 40% recharge-based allocation limit for this aquifer in the Fitzroy subarea (33.2 GL/y). The section of Wallal underlying the Derby subareas is considered hydrologically disconnected from that in the Fitzroy. In the Derby Peninsula more water is abstracted from this aquifer than the annual throughflow and there are significant saline intrusion concerns.
Erskine aquifer	The Erskine aquifer is used for public water supply in Derby and surrounding communities. Due to historic and ongoing overallocation there is declining hydraulic heads and increasing risk of salinisation in this aquifer in the Derby subareas. Twice as much water is extracted from this aquifer in Derby peninsula than the annual throughflow.
Other regional aquifers	The Devonian reef complex, Fairfield Group, Liveringa Group. Not being considered for groundwater development. The specific hydrogeology of these are beyond the scope of this document.
Aquitards	Aquitards are geological layers that inhibit the movement of water. Noonkanbah Formation is generally an aquitard.

INDIGENOUS IMPORTANCE AND CULTURAL VALUES

The lower Martuwarra (Fitzroy) River, its floodplains and major tributaries are included in the National Heritage List in recognition of outstanding Indigenous, cultural, historic, aesthetic and natural values (Figure 2). The region also has around 1,000 registered Aboriginal heritage sites; locations of artefacts, paintings, camps and shelters, mythological, ceremonial, quarries and grinding patches (DWER, 2023b).

The Martuwarra (Fitzroy) River is central to local Indigenous law, identity, spirituality, livelihoods and governance (Douglas et al., 2019). The Martuwarra is considered a living ancestral being with a right to life, and for Kimberley Traditional Owners, caring for the river is a moral and cultural responsibility, not just an environmental one (Douglas et al., 2019; Fitzroy River Declaration., 2016). Songlines and cultural responsibilities follow the river's course, linking language groups and connecting places and people (Douglas et al., 2019).

Traditional knowledge holders use ecological cues, including natural flow cycles, as seasonal indicators that signal times to hunt, fish or collect certain species or hold ceremonies (Douglas et al., 2019).

Indigenous harvest in the region is closely linked with seasonal changes in river flows and is practiced by almost 75% of Indigenous adults in the region (Douglas et al., 2019). Bony bream, spangled perch, black bream, catfish and cherabin are the most commonly harvested species (Jackson et al., 2011). Barramundi and sawfish are caught less frequently but are valuable catches. Catches are generally widely shared with other households (Jackson et al., 2011).

Barramundi, freshwater sawfish, bony bream, fork-tailed catfish and cherabin all rely on persistent pools in the dry season, many of which are maintained by groundwater (DWER, 2023a).

Industrial scale extraction of groundwater could impact cultural sites and Indigenous harvest, compounding on the trend of degradation already being noted by local people (DWER, 2023a). Changes in the natural flow cycle could disrupt not just the ecosystems, but cultural practices, knowledge systems, and livelihoods (Douglas et al., 2019; Jackson et al., 2011).

GROUNDWATER MARTUWARRA INTERACTIONS

The Martuwarra (Fitzroy) River is dependent on groundwater. Research has found that all the major aquifers in the Fitzroy contribute to river flows, but the volume contributed by each aquifer has not been quantified (Figure 3) (DWER, 2023c).

Groundwater discharges to the river channel and other surface locations where the water table is high (such as in the unconfined alluvial aquifer), or where pathways like fault lines are available to facilitate deep-shallow flow (Figure 1).

In confined aquifers like the Grant Poole, water is held under pressure. Across much of the Lower Fitzroy, the pressure in this aquifer is high enough to push the water up to the ground surface or above if a pathway like a bore or fault line is available for it to flow through (artesian conditions). It is this high water pressure that brings the water up from deep below the ground to flow into the river and springs at the surface (Petheram et al., 2018).

Groundwater contributions to the Martuwarra (Fitzroy) River have been found to come from (DWER, 2023c):

- alluvial aquifers (especially on the floodplain and along the eastern boundary of Myroodah and Nerrima Stations)
- Grant Poole aquifer (South of Fitzroy Crossing and around Noonkanbah and via fault lines)
- Devonian Reef and Fairfield Group Aquifers (upstream from Fitzroy Crossing, near Fossil Downs and Brooking Springs Station)
- Liveringa Group aquifer (North-west of Gogo Station)
- Wallal Sandstone aquifer (near Willare)

Though it is generally understood that this input is occurring, the locations and volume of each aquifer's contributions are only vaguely known. In some cases, it is just known that within the hundred kilometres between monitoring stations there is inflow happening somewhere, though of an unknown amount, with a probable aquifer source named (DWER, 2023c).

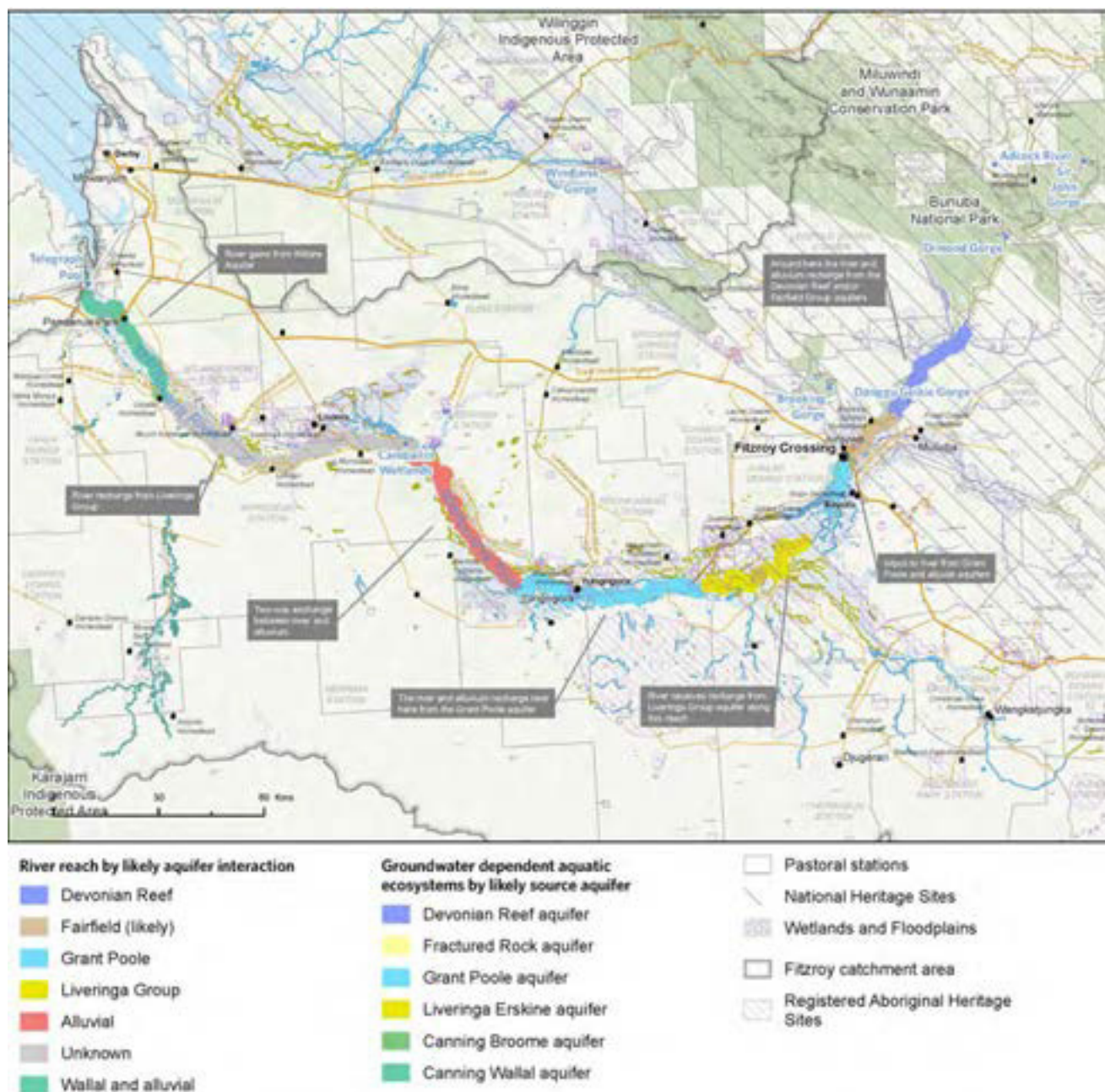


Figure 3. Map of groundwater-surface water interactions in the lower Fitzroy

Ecosystems that rely on groundwater

River, riparian, floodplain, terrestrial, spring, wetland, estuarine and even some marine ecosystems in the Fitzroy use groundwater to maintain flow and provide nutrients (Burrows et al., 2020)(Figure 4).

A 2023 DWER study found most riverine wetlands in the region had high or moderate likelihood of groundwater dependence, along with more than half of palustrine wetlands⁵, floodplain wetlands and riverine ecosystems. These likely groundwater dependent aquatic ecosystems cover 45,000 hectares in the Fitzroy, with more than half of the river area included⁶ (DWER, 2023d) (Figure 3).

The Grant Poole aquifer is attributed⁷ as the water source for 22%⁸ (10,000 hectares) of the aquatic ecosystems identified as highly or moderately likely to be groundwater dependent. (DWER, 2023d) This includes 21% of all palustrine wetlands in the Fitzroy and 7,000 hectares of riverine/riverine wetland ecosystems.

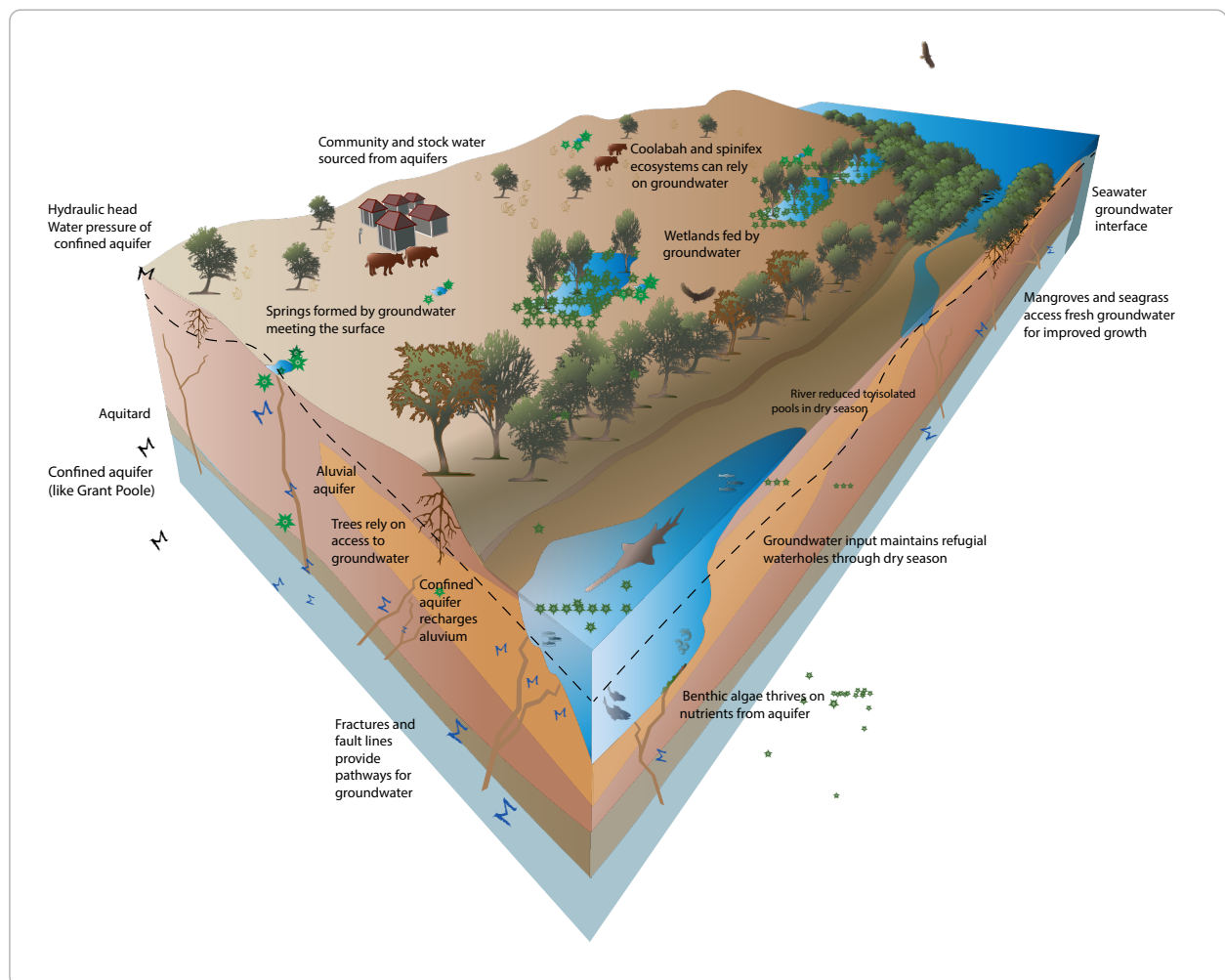


Figure 4. Dry season groundwater-surface water interactions in the Fitzroy

⁵ vegetated wetland systems not influenced significantly by tidal waters

⁶ 22,500 hectares riverine and 10,000 hectares of riverine wetland ecosystems.

⁷ Attributed based on simple vertical overlay with geology layers, not water sampling. The available Fitzroy geology layers are not high confidence, and groundwater can also move diagonally or horizontally through fault lines. Unless water chemistry and isotope analyses are undertaken, we cannot confidently match a dependent ecosystem with its groundwater source.

⁸ Percentage by area

Riverine ecosystems

Dryland rivers like the Martuwarra are adapted to the boom and bust of the episodic floods and long dry seasons (Sheldon et al., 2010). In the dry season the channels are reduced to a series of waterholes, creating important aquatic refugia in an otherwise terrestrial landscape. Groundwater is often what sustains these permanent pools (DWER, 2023d, 2023c). Refugial waterholes are highly heterogonous, supplying a range of conditions that accommodate to the range of needs of the diverse regional biota through the dry season (Sheldon et al., 2010).

Deep refugial pools are the main daytime habitat of endangered freshwater sawfish through the dry season (DWER, 2023a). The cool depths of the pools are thought to help the sawfish reduce their metabolic rate and energy needs (DWER, 2023a). Sufficient depth is necessary to maintain the cool temperature, as the upper water column heats during the day (DWER, 2023a). At night, sawfish move up to the shallows around the pools to forage (DWER, 2023a). Pool persistence is essential for juvenile freshwater survival and the depth of pools and connectivity to foraging habitat in the dry season is necessary to protect sawfish (DWER, 2023a; Whitty et al., 2017).

The permanent deep pools are also important dry season refugia for cherabin, bony bream and fork-tailed catfish and inferred to be critical habitat for other large-bodied fish, freshwater crocodile, saltwater crocodile and river sharks (Beesley et al., 2021; DWER, 2023a; Whitty et al., 2017)

Benthic algae – considered the base of the riverine food web – has been found to grow best in areas where groundwater upwelling occurs along the Martuwarra (Fitzroy) River. Groundwater supplies nutrients and ideal conditions for the algae to grow. In turn the algae are food for macroinvertebrates and fish (DWER, 2023a).

Wetlands and springs

Off-channel wetlands are also critical dry season habitat for flora and fauna (DWER, 2023b). The continuation of the natural depth and quality diversity of these pool and wetland habitats are important to maintain biodiversity (DWER, 2023a). Flora species composition is generally unique for each wetland, likely driven by the unique water regimes (Canham et al., 2023; DWER, 2023a).

There are over 400 mapped springs in the lower Fitzroy. Groundwater-fed springs are critically important water sources in the semi-arid Fitzroy, and support riparian and aquatic habitat as well as terrestrial flora and fauna. Many of the region's springs are important places to Traditional Owners. They are also an important water source for existing pastoral operations (DWER, 2023b).

Estuarine ecosystems

Estuarine plants and ecosystems also use groundwater. King Sound is one of the most species-rich tidal flat ecosystems in the world and contains 13 species of mangrove (Petheram et al., 2018). Groundwater inputs into the estuary and King Sound are not well understood but considered likely. It is not known where the seawater interfaces with fresh groundwater in most places in the Fitzroy, but stability of this location is important for maintaining the groundwater inputs to King Sound ecosystems (DWER, 2023a). Freshwater seeps on Derby Peninsula mudflats are already showing impacts from groundwater abstraction (DWER, 2026a). Ongoing overallocation of groundwater in the Derby subareas is likely to reduce freshwater discharge from Derby's aquifers to King Sound, making continued natural groundwater flows from the regions other aquifers, including Grant Poole, more important for maintaining estuarine ecosystem health (DWER, 2026a).

Mangroves, which provide crucial fish nursery habitat, carbon sink and coastline stabilisation, have been found to use groundwater and have increased growth when they have more access to fresh water (Hayes et al., 2019). Seagrass, important for sediment stabilisation, green turtles, dugongs, as a carbon sink, and fish nursery, has also been shown to use nutrients from groundwater. Ecosystem mapping suggests that the Grant Poole aquifer may provide inputs to estuarine and marine ecosystems in the North-West of the planning area (DWER, 2023a, 2023d).

Riparian and terrestrial ecosystems

Most, if not all of the woody vegetation in the Fitzroy is likely dependent on groundwater, as the rainfall is insufficient to sustain these trees throughout the dry season with annual evapotranspiration exceeding rainfall (DWER, 2023d).

The dominant riparian trees, silver-leafed melaleuca, green-leafed melaleuca, freshwater mangrove and river red gum only grow in areas where they have permanent access to either surface water or groundwater. Coolabah, the dominant floodplain tree also accesses shallow groundwater. As well as supporting mature trees, groundwater is also necessary for seedling establishment when rainfall and floodwater is not available (DWER, 2023a).

Grant Poole aquifer is the likely groundwater source for many of the Fitzroy's trees. A 2021 field study on riparian trees found sites of heavy dependence on groundwater from Grant Poole aquifer (Beesley et al., 2021). A 2012 national assessment by the Bureau of Meteorology identified around 31,000 hectares of terrestrial ecosystems in the region likely to be reliant on subsurface access to groundwater from GrantPoole⁹, with an additional 216,000 hectares possibly reliant on the same (BOM, 2012).

The areas of terrestrial ecosystems identified as highly or moderately likely to be dependent on groundwater from Grant-Poole are:

- 18,000 ha of grassland and savanna woodland with coolabah on Jubilee Downs and Gogo Station southwest of Fitzroy Crossing
- 5,000 hectares of grassland and floodplain ecosystems on Mt Anderson and Liveringa Stations around Looma
- 2,500 ha of grassland and floodplain ecosystems on Yeeda Station near Willare
- 6,000 hectares of hummock grassland towards the south of the catchment (BOM, 2012).

For the health of riparian and floodplain trees, groundwater needs to remain at a depth tree roots can access. The depths accessed by trees are up to 20 meters, with research pointing reduced groundwater dependence at depths below 10 meters (DWER, 2023a).

A decline/degradation of riparian vegetation structure would reduce habitat availability for priority species known to rely on these ecosystems such as the red goshawk, Gouldian finch and northern quoll and the purple-crowned fairy wren, which is a strict riparian specialist (DWER, 2023a; Skroblin & Legge, 2012)

Leaf litter from riparian trees is an important food source for fish in pools in the dry season (Beesley et al., 2021).

Many culturally and ecologically important species would see population declines from a reduction in groundwater availability. This includes freshwater sawfish, barramundi, and fork-tail catfish. Mangroves, seagrass, springs and riparian zones are also sensitive to changes in groundwater availability (Beesley et al., 2021; DWER, 2023a, 2023b; Milgin et al., 2020; Vogwill, 2015). With only limited understanding of the groundwater inputs required to maintain the conditions, a highly precautionary approach to water extraction is necessary to avoid ecosystem damage (Vogwill, 2015).

⁹ Ecosystems listed or moderately or highly likely to be groundwater dependent and listed as intermediate or regional aquifer source, overlying Grant Poole or Noonkanbah Formation.

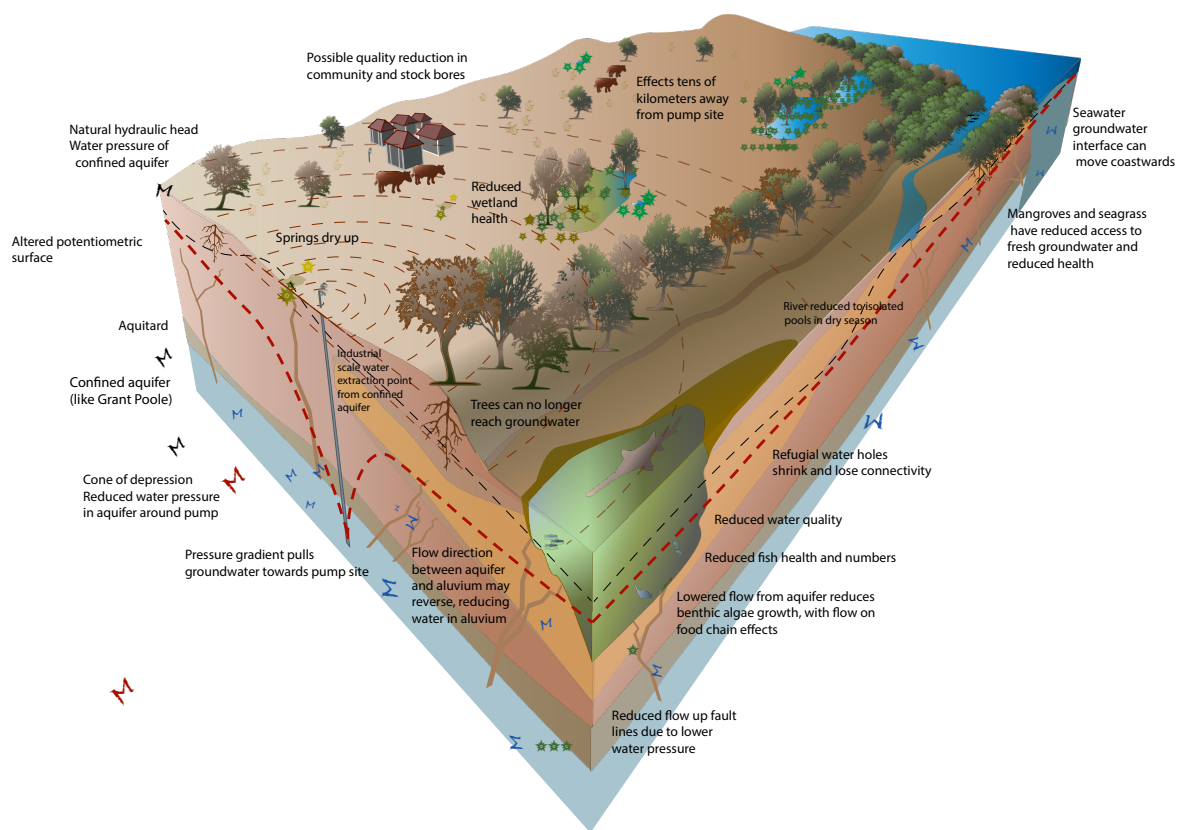


Figure 5. Implications on groundwater-surface water interactions in the Fitzroy under industrial scale groundwater extraction scenarios



Groundwater extraction

Groundwater extraction from a confined aquifer like the Grant Poole lowers the water pressure around the bore site (drawdown). In turn, the lower water pressure can reduce streamflow or available water in swamps, springs and waterholes that are hydraulically connected to the aquifer (Figure 5). That reduction in flow can in turn affect stream temperature, oxygen, salinity, sediment transport, and other water quality characteristics important to freshwater and marine ecosystems (DWER, 2023c).

The hydraulic properties of confined aquifers tend to cause drawdown effects that are subtle but widespread. In the Lower Fitzroy, drawdowns greater than 0.5 meters are likely to extend tens of kilometres from pumping locations. Modelling on the Lower Fitzroy conducted by CSIRO NAWRA estimated that areas 20km away from a bore are likely to be affected by a pump taking 5GL/y from the Grant Poole aquifer within 20 years. A bore extracting 20GL/y affected areas up to 36km away (Dawes et al., 2018).

Extracting water from the aquifer creates a cone of reduced water pressure around the bore site (cone of depression). The CSIRO NAWRA modelling showed some cone centres with depths up to 41.5m. In a 5GL/y take scenario the drawdown contour of 1.5m was up to 10km from all the hypothetical pump sites, and it extended further than 20km from half of the sites in the 20GL scenario. Most sites showed greater than 4 meter drawdowns at a distance of 10kms in the 20GL scenario (Dawes et al., 2018).

The authors stressed the scarcity of available data to calibrate the model, model sensitivity to changed input parameters and the resulting low confidence of these results (Dawes et al., 2018).

The draft plan proposes similar extraction limits for the Wallal aquifer, despite uncertainty about its hydraulic properties and lack of regional conceptual model.

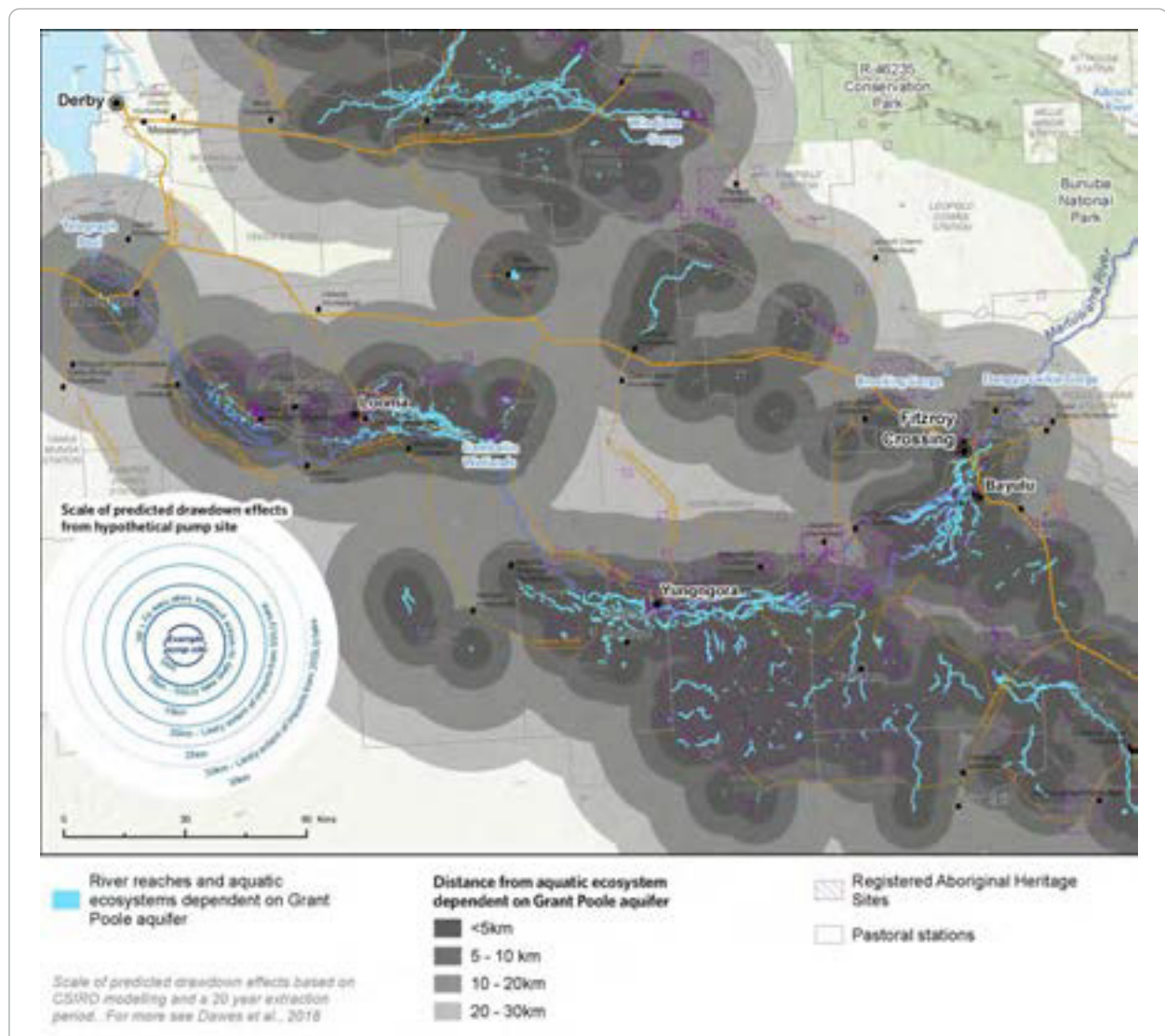


Figure 6. Distance from mapped Grant Poole dependent aquatic ecosystem in the lower Fitzroy

IMPLICATIONS

With the drawdown effects of industrial bores extending for tens of kilometres, there are very few potential pump locations in the lower Fitzroy that are far enough away to avoid impact on ecosystems mapped as dependent on Grant Poole groundwater, as illustrated in Figure 6. This means that wherever an industrial scale pump site is located, it will likely be in range to degrade groundwater dependent ecosystems.

In systems with low natural discharge, small changes in pressure or gradient can dramatically reduce flow. Even a modest drawdown is likely to significantly affect baseflow contributions from the aquifer to the Martuwarra (Fitzroy) River and reduce flow to other groundwater dependent ecosystems (Dawes et al., 2018; Vogwill, 2015).

Springs and other groundwater interaction sites are especially sensitive to changes in drawdown where the hydraulic head¹⁰ is close to ground level. Grant Poole has artesian or near artesian conditions where it interacts with surface ecology. This means the hydraulic head is within a few meters of the ground surface. For an artesian spring with a head of 1-3m, a 0.5 meter reduction in this head from drawdown would reduce flow by 16-50%¹¹.

There are more than 400 mapped springs in the Fitzroy. Despite the importance of these key features, and the importance of groundwater to their existence, aquifer input into them is not well researched or understood. There is no available evidence to determine the ecological water requirements of spring ecosystems and very scarce data to determine the aquifer source of each spring. The 112 page DWER Ecological water requirements report only contains 1.5 pages on springs, and states that to inform the risk of groundwater extraction proposals, further local studies would be required to establish the water regime of any individual spring (DWER, 2023a).

Data is also thin on the groundwater inputs to critically important refugial pools, though the studies to date point to majority of these being groundwater dependent, and many being supported by the Grant Poole aquifer. As exact discharge sites from the Grant Poole and Wallal to the river are unknown, it is not possible to determine whether a proposed bore site would be within range to affect the process.

Table 2. Implications of changes in groundwater pressure for key ecosystems and species in the Fitzroy region

Species/ecosystem	Study findings	Implications of groundwater extraction
The Martuwarra Fitzroy River The river and its floodplain were added to the National Heritage List in 2011. Ecological significance: Cultural significance: Central to local indigenous cultures for its place in dreamtime song line and the tradition of the Rainbow Serpent, connection with other spiritual entities, as well as for bush foods and cultural activities (Laborde & Jackson, 2021; Milgin et al., 2020). The whole river is a registered Aboriginal heritage site, as well as many sites on the floodplain and surrounds. The health of the Martuwarra is seen as intrinsically linked to the health and wellbeing of the Aboriginal people of the Martuwarra (Douglas et al., 2019).	The river is highly dependent on aquifer discharge and gains water from groundwater along most of its length, especially during the dry season (DWER, 2023c). All of the river downstream of Sir John Gorge has been found to have a high likelihood of dependence on groundwater, as well as many sections of tributaries and all springs (DWER, 2023d). Grant Poole discharges to the river in the reach south of Fitzroy Crossing and also around Noonkanbah (DWER, 2023c). Exact discharge points, amounts, and the hydrological conditions necessary to maintain the flows are unknown.	Reduction in hydraulic connectivity between the river and aquifers would reduce water in the river, especially during dry season. Reduction in flow can in turn affect water temperature, oxygen, salinity and other water quality characteristics important to riverine ecosystems (DWER, 2023a). As the exact discharge sites from the Grant Poole to the river are unknown, it is not possible to determine whether a proposed bore site would be within range to affect the process. As the hydraulic properties of discharge/connection points are unknown, it is not possible to determine how much impact a proposed bore site would have on the Martuwarra either in a localised scale or more broadly.

¹⁰ Hydraulic head is a measure of groundwater pressure expressed as the height to which water would rise in a well, relative to ground level. It represents the energy available to drive groundwater flow.

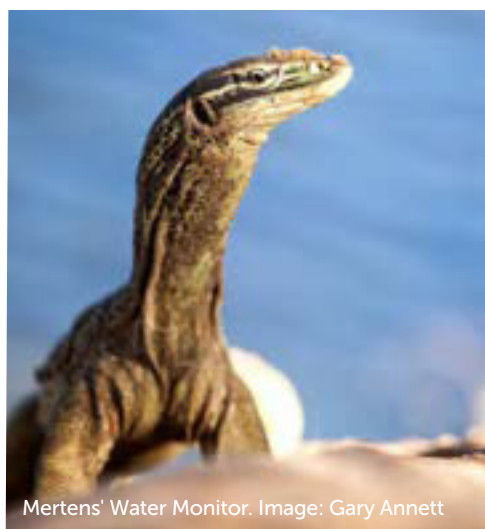
¹¹ New hydraulic head = hydraulic head - drawdown

Species/ecosystem	Study findings	Implications of groundwater extraction
Permanent/semi-permanent waterholes Ecological significance: essential dry season refuge for many biota	A mosaic of heterogenous waterholes must be permanent or semi-permanent to serve as refugia for aquatic organisms. The natural regime of changes in connectivity, fragmentation, and biophysical attributes of these pools is an important feature in local ecological processes (Sheldon et al., 2010). Grant-Poole has been mapped as the likely source for 24% of groundwater dependent riverine ecosystems in the region (by area) (DWER, 2023d).	Changes will threaten persistence and connectivity patterns, diminishing functional capacity as aquatic refugia.
Freshwater sawfish EPBC: Endangered IUCN: Critically endangered	Deep pools are the main dry season daytime habitat, with cooler pool temperatures at depth thought to aid in energy saving. Connected shallows important for foraging (DWER, 2023a; Whitty et al., 2017).	Reduction in groundwater input that results in refugial pools losing depth, connectivity or changes in pool temperature would decrease sawfish numbers
Barramundi Cultural significance: Culturally important to Traditional owners as well as recreational and commercial fishers (Beesley et al., 2021).	Individuals commonly return to the same refugial pools each dry season. Permanent deep pools are important habitat during the dry. Can inhabit shallower pools than Freshwater sawfish (DWER, 2023a)	The use of instinct rather than habitat assessment puts Barramundi at risk of settling for a dry season in an unsuitable pool if conditions are changed there from previous years (species lives 20 years). Sensitive to change could lead to reduced numbers if pool conditions change
Black bream Cultural significance: Important indigenous fish harvest, frequent target fish (Jackson et al., 2011)	Vulnerable to reduced dry season flow (Jackson et al., 2011)	
Fork-tail catfish Cultural significance: Important indigenous harvest fish (DWER, 2023a)	Catfish in larger dry season pools have been found to be in better condition than those in smaller pools (Beesley et al., 2021).	Smaller dry season pools will make fork-tail catfish more vulnerable and could reduce numbers (Beesley et al., 2021).
Bony bream Cultural significance: Important indigenous harvest fish (30% of Fitzroy catch) and prey species for larger fish (DWER, 2023a).	Found in river pools and off-channel wetlands (DWER, 2023a) Occupy persistent river pools during the dry season and forage at night on connected shallows (DWER, 2023a).	Reduction in groundwater input that results in refugial pools losing depth, connectivity or changes in pool temperature may decrease bony bream numbers
Cherabin Ecological significance: Important prey species for Freshwater sawfish and Barramundi (DWER, 2023a). Cultural significance: Important for Indigenous harvest and recreational fishing (DWER, 2023b)	Thought to follow same dry season day/night pattern as freshwater sawfish and may be reliant on similar conditions (Whitty et al., 2017)	Reduction in groundwater input that results in refugial pools losing depth, connectivity or changes in pool temperature may decrease cherabin numbers

Species/ecosystem	Study findings	Implications of groundwater extraction
Purple-crowned fairy wren (western subspecies) EPBC: Endangered	This strict riparian specialist is sensitive to changes in the riparian zone. Habitat loss is one of the main threats driving population declines (Skroblin & Legge, 2012)	Tree loss in the riparian zone leading to habitat degradation could reduce numbers.
Benthic algae Ecological significance: Base of riverine food webs. Food for macroinvertebrates and fish (Beesley et al., 2021; DWER, 2023a)	Found to grow best where groundwater upwelling occurs, as groundwater supplies nutrients and ideal conditions (Burrows et al., 2020; DWER, 2023a).	Reduced groundwater connectivity with surface water bodies likely to reduce benthic algae, with flow on effects through the food chain (Beesley et al., 2021; DWER, 2023a).
Floodplains Ecological significance: Plays important role in many riverine species lifecycle, including barramundi, cherabin. Important feeding ground for fish when in flood (Laborde & Jackson, 2021; Milgin et al., 2020) Cultural significance: Customary law restricts fish catch on floodplain until the 3rd flood peak of the wet season to allow fish to gain mass (Laborde & Jackson, 2021; Milgin et al., 2020).	Grant-Poole has been mapped as the likely source for 22% of groundwater dependent floodplain wetlands in the region (by area) (DWER, 2023d).	Reduction in water table or localized pressure reductions in confined aquifers could reduce groundwater access for floodplain trees, increasing stress and risk of tree die off (DWER, 2023a).
Riparian zone Ecological significance: Key habitat for terrestrial fauna including listed Red goshawk, Gouldian finch and Northern quoll and the Purple-crowned fairy wren, which is a strict riparian specialist (DWER, 2023a; Skroblin & Legge, 2012) Leaf litter from riparian trees is an important food source for fish in pools in the dry season (Beesley et al., 2021). Cultural significance: Riparian tree species including paperbarks are used as indicators of season by Traditional Owners (Laborde & Jackson, 2021; Milgin et al., 2020).	Most trees in region dependent on groundwater as evapotranspiration exceeds rainfall (DWER, 2023d). Dominant Fitzroy riparian trees only grown in areas where they have permanent access to surface water or shallow groundwater (DWER, 2023a) Grant-Poole identified as the major water source at one study site in late dry season (C. A. Canham et al., 2021). For the health of riparian and floodplain trees, groundwater needs to remain at a depth tree roots can access. Groundwater is also necessary for seedling establishment when rainfall and floodwater is not available. The depths accessed by trees are up to 20 meters, with research pointing to reduced groundwater dependence at depths below 10 meters. (DWER, 2023a).	Reduced depth to groundwater from groundwater abstraction may reduce water availability to trees, causing die off (Beesley et al., 2021; DWER, 2023a). This change in the riparian vegetation structure would reduce habitat availability for threatened/priority species known to rely on riparian ecosystems, likely reducing populations (Beesley et al., 2021). Reduced leaf litter from trees in key locations would reduce dry-season food availability for fish, which could reduce fish numbers (Beesley et al., 2021).

Species/ecosystem	Study findings	Implications of groundwater extraction
King Sound and estuary	Inputs from fresh groundwater sources to estuarine ecosystems have been found to improve growth of key flora, mangroves and seagrasses. Groundwater inputs into the estuary and King Sound are not well understood but considered likely. It is not known where the seawater interfaces with fresh groundwater in the Fitzroy, but stability of this location is important for maintaining the groundwater inputs to king sound ecosystems (DWER, 2023a). Fresh groundwater input can moderate salinity stress, maintain moisture availability and supply dissolved nutrients in intertidal and nearshore environments (DWER, 2023a). Ecosystem mapping suggests Grant-Poole may provide inputs to estuarine ecosystems in the North-West of the planning area.	Reduced groundwater pressure could reduce connection between marine and estuarine ecosystems and their source of fresh water, leading to declines in ecosystem health, ecosystem services and declines in key species numbers(DWER, 2023a) Groundwater extraction could shift patterns of local groundwater flow as water is pulled towards the lower pressure areas near pumping sights. This could potentially move the seawater-groundwater interface east, leaving an area with once fresh ground water saline, damaging estuarine or coastal ecosystems dependent on it (DWER, 2023a).
Mangroves (estuarine) Ecological significance: Crucial fish nursery habitat, carbon sink and coastline stabiliser.	Found to use fresh groundwater in preference to saline and have increased growth when they have more access to fresh water. (DWER, 2023a, 2023d; Hayes et al., 2019).	Reduced groundwater pressure could reduce connection with mangrove systems, leading to decreased mangrove growth and potential loss of existing trees (DWER, 2023a) In turn this would cause reduced stability of the coastline, reduced habitat from important species, reduced natural carbon sequestration.
Seagrass Ecological significance: important for sediment stabilisation, green turtles, dugongs, carbon sink, fish nursery.	Shown to use nutrients from fresh groundwater sources (DWER, 2023a, 2023d).	Reduced groundwater pressure could reduce connection with seagrass systems, decreasing nutrient input and seagrass growth (DWER, 2023a). In turn this would reduce available food for key species including green turtle and dugongs. It would also reduce sediment stability, water quality, natural carbon sequestration and fish nursery habitat, reduced fish recruitment.

Species/ecosystem	Study findings	Implications of groundwater extraction
Springs Ecological significance: critically important water source supporting riparian and aquatic habitat as well as terrestrial flora and fauna Cultural significance: Many are important places to Traditional Owners and connected with cultural health (Douglas et al., 2019). Also important water source for pastoralists.	Groundwater dependent and dependent on artesian or near artesian aquifer water pressure (DWER, 2023a). Specific aquifer input to springs poorly understood in the Fitzroy. No available evidence to determine ecological water requirements or groundwater source for each spring (DWER, 2023a). Grant-Poole has been mapped as the likely source for many spring ecosystems in the region (DWER, 2023d).	Reduced water pressure in aquifer could reduce or stop flow to a spring (DWER, 2023a). Information paucity makes it impossible to judge how a pump location would affect springs in 30km radius.
Wetlands Ecological significance: Critical dry season habitat for flora and fauna.	Flora species composition is generally unique for each wetland, likely driven by the unique water regimes (C. Canham et al., 2023; DWER, 2023a).	Reduced groundwater pressure could change water regime leading to ecosystem composition changes for individual wetlands. Reduced groundwater pressure could reduce health or expanse of wetlands.
Aquifer and subterranean ecosystems	Stygofauna live in aquifers up to 100m below ground. They are most abundant within 30m of the surface. Maintaining groundwater levels and pressure head is required to sustain habitat that supports these aquifer and subterranean ecosystems (DWER, 2023a).	Reduced groundwater level or pressure head could degrade habitat and alter nutrient, carbon and oxygen availability (DWER, 2023a). Groundwater abstraction may have non-local, delayed impacts on aquifer ecosystems due to hydraulic connectivity (DWER, 2023a).



Mertens' Water Monitor. Image: Gary Annett



Freshwater Sawfish. Image: David Clode



Pelicans on Martuwarra Fitzroy River. Image: Jason Fowler

Best practice in water planning and governance

The draft Fitzroy–Derby water plan proposes allowing more than 83GL per year¹² of groundwater to be extracted from the catchment, using a fixed percentage of aquifer recharge - up to 40% of annual average recharge for Wallal and Grant Poole aquifers (DWER, 2026a). This method, based on the old *safe yield* concept, is a blunt tool that has been widely critiqued as inadequate for protecting ecosystems, especially in highly variable climates like the Kimberley. Safe yield focuses on whether pumps will run dry, not on whether environmental or cultural values are sustained (Alley & Leake, 2004).

This approach fails to account for:

- High interannual variability
- Ecological water needs
- Cumulative drawdowns

The draft plan relies on a risk matrix approach to set allocation limits, defending this by stating that current groundwater use is low and that “in some areas, there is insufficient monitoring data and supporting information to assess the potential impacts of groundwater abstraction in more detail” (DWER, 2026a). A risk matrix approach is a reasonable starting point but has significant limitations, relying heavily on subjective judgments and broad categories, which can underestimate or mask real risks, especially where baseline data are missing or impacts are slow to emerge.

The justification that “groundwater use is currently low” does not guarantee future safety, particularly given the scale of proposed allocations and the rapid changes that can occur once development begins.

Absence of detailed monitoring data is not a reason to relax precaution - it should trigger a more conservative approach, with lower limits and stronger adaptive management.

A risk matrix is only as robust as the data and assumptions that underpin it. In the Fitzroy, the lack of spatially representative monitoring, ecological thresholds, and transparent reporting means that the matrix may fail to capture cumulative impacts, connectivity, or delayed effects on groundwater-dependent ecosystems.

Best practice water resource management for the Kimberley requires:

- **Baseline and long-term monitoring:** Robust pre-development datasets for groundwater levels, spring flows, river baseflows, and ecological asset health. Monitoring should be continuous, spatially representative, and extend well beyond pumping sites to capture regional drawdown and impacts at sensitive ecological assets (Office of the Auditor General for Western Australia, 2024; Petheram et al., 2018)
- **Transparency:** All monitoring data should be made publicly available in near real-time. This enables independent scrutiny, builds trust, and supports adaptive management (Office of the Auditor General for Western Australia, 2024)
- **Ecological thresholds:** Limits for groundwater depth beneath key ecosystems (e.g., maximum depth-to-water for riparian vegetation, minimum spring discharge, or dry-season pool depth at refugial waterholes), with triggers set based on ecological water requirements (Beesley et al., 2021; DWER, 2023a)
- **Adaptive response triggers:** Clear enforceable protocols for action if thresholds are breached, including reductions in pumping, alternative allocations, or suspension of abstraction, and mandatory review or adjustment of the plan itself when thresholds indicate emerging or systemic risk. Triggers must be predefined, linked to license conditions and not reliant on discretionary decision-making
- **Independent scientific oversight** of allocation reviews and trigger decisions
- **Genuine and ongoing involvement of Traditional Owners** through their representative organisations, in decision making on water planning, allocation limits, monitoring priorities, trigger thresholds and management responses

¹² This includes 75.7GL across all aquifers in the plan area where allocation limits have been set and the additional 7.5GL already used for licence exempt purposes from other aquifers

The draft Fitzroy–Derby water plan falls short of these standards. Monitoring commitments are limited to bores at or near pumping sites, with no requirement for regional monitoring at sensitive ecological assets or for public transparency of data. Explicit ecological thresholds should be identified and used as triggers to assure the integrity of Fitzroy environmental and cultural values is maintained.

Policy language in the draft plan is vague and discretionary, with frequent use of terms like “may require evidence” or “may impose conditions”, leaving critical decisions about monitoring, mitigation, and enforcement up to the discretion of individual officers at the time of licensing or assessment. Without mandatory triggers there is a risk that environmental safeguards will be inconsistently applied or not enforced at all.

The WA Auditor General’s 2025 review of water licensing and regulation in Western Australia highlighted exactly these shortcomings:

- Risk-based licensing often leads to inconsistent enforcement and weak follow-up, especially when policy language is vague and discretionary
- Monitoring is often inadequate and focused only on the point of extraction, not on ecological assets
- License conditions are poorly enforced, and ecological triggers rarely lead to timely or meaningful action
- There is little transparency, with monitoring data rarely made public, undermining accountability and stakeholder trust

Without robust, transparent, and spatially representative monitoring, adaptive response triggers, and clear, enforceable policy language, —there is no effective safeguard for the ecological and cultural values of the Fitzroy and the Martuwarra (Fitzroy) River. The plan’s reliance on outdated allocation methods and discretionary language risks repeating the failures identified by the Auditor General of Western Australia, rather than delivering best practice water governance.



Martuwarra Fitzroy River. Image: Gary Annett

Box 1 – Applying risk-based allocation planning process to the Fitzroy subarea

The draft Fitzroy–Derby water plan uses the risk matrix approach developed by the Department of Water in 2011 to set groundwater allocation limits, citing a lack of sufficient data to support more quantitative threshold-based approaches (Department of Water, 2011; DWER, 2026a).

While this approach has inherent limitations and relies on subjective judgments and broad categories, the draft plan does not consistently apply the intent or decision rules of the *Groundwater risk based allocation planning process* (Department of Water, 2011). It systematically understates risk to the environment and overstates risk to development.

Under the framework set out in the *Groundwater risk based allocation planning process* (Department of Water, 2011), ecosystem risk is classified based on the highest risk across:

- Groundwater-dependent ecosystems
- Aquifer properties
- Cultural and social values

Where any of these factors are high, as they all are in the Fitzroy, the overall risk is classified as 'high'.

Abstraction in confined aquifers like Grant Poole generally causes long response times, large cones of depression, impacts propagate over large distances and effects may manifest far from abstraction points. The framework explicitly treats this lag and uncertainty as a risk amplifier, further supporting a 'high' ecosystem risk classification.

The framework also requires a high ecosystem risk rating to apply where the resource boundary contains sites listed in the Directory of Important Wetlands in Australia (DIWA), conservation reserves, or ecosystems supporting threatened or priority species. The Fitzroy clearly meets these criteria. Under the *Groundwater risk-based allocation planning process*, the presence of either a DIWA listed wetland or threatened species is sufficient to classify ecosystem risk as high, without the need for further weighting or aggregation.

Accordingly, the appropriate ecosystem risk rating for all Fitzroy groundwater resources is 'high', and not 'medium' as classified in the draft plan. Classification of ecosystem risk as 'medium' is inconsistent with the explicit criteria set out in the framework and understates the environmental significance of the region and the risk characteristics of the target aquifers.

To use the *Groundwater risk-based allocation planning process*, this rating should be selected in the first axis of the allocation proportion decision matrix shown in Table 3 below (High in-situ risk).

Water user and development risk forms the second axis of the decision matrix. This reflects the risk to current and future productive uses if water is not abstracted, taking into account the importance of the resource for development, the availability of alternative water sources, and the significance of current and future use to the community. In the Fitzroy, current licensed abstraction is very low and there is no demonstrated reliance on groundwater to meet essential or high value development needs at a regional scale. Future demand remains speculative, and there is no evidence that constraining groundwater abstraction would cause serious socio-economic harm.

Consistent with the framework, where current use is minimal and future use is uncertain, the appropriate development risk rating is 'low'. The draft plan assigns a 'high' user risk rating, which conflicts with the criteria set out in the framework.

Table3. Risk matrix for determining the proportion of recharge for allocation (Department of Water, 2011)

	Proportion of recharge		
High insitu risk	5%	25%	50%
Medium insitu risk	25%	50%	60%
Low insitu risk	50%	60%	70%
	Low development risk	Medium development risk	High development risk

Correctly using the Department of Water's groundwater allocation planning process with the department's own risk ratings then gives a maximum proportion of recharge for an allocation limit as 5%. This would amount to the precautionary limits of 4.1 GL/y and 2.8 GL/y for the Grant Poole and Fitzroy – Wallal resources respectively.

Demand for water

The magnitude of the water allocation quota under current discussion far surpasses current and historic water use in the region.

In the Fitzroy subregion of the draft Fitzroy–Derby water plan, the proposed take from the Grant Poole aquifer of 22.8GL/y is more than triple the current usage, and for the Wallal aquifer the proposed 33.2GL/y allocation limit is more than 10 times the water currently drawn from the aquifer (DWER, 2026a).

Currently the total water usage in the Fitzroy and Derby regions is around 37.9GL/y, of which about 32GL comes from groundwater (DWER, 2026a). The main uses are town water, stock watering, irrigated agriculture, maintaining public assets and roads, and mining and resources use.

Groundwater in the Fitzroy is also crucial for communities (DWER, 2023c). The Water Corporation manages town water supply for Derby, Fitzroy Crossing, Camballin and Mowanjumb and Kurnangk Aboriginal communities with a licence of around 2.4 GL/y. Some communities manage their own groundwater supply, this is estimated to require around 1.86 GL/y (DWER, 2026a). Grant Poole aquifer is currently used mainly as a drinking water source for communities in Camballin, Fitzroy Crossing, Looma and Jarlmadangah (DWER, 2023c).

Around 15.7 GL/y of groundwater goes to stock watering (DWER, 2026a). There is interest from the Fitzroy pastoralism sector in an uptake of irrigated fodder cropping, which would significantly increase water usage.

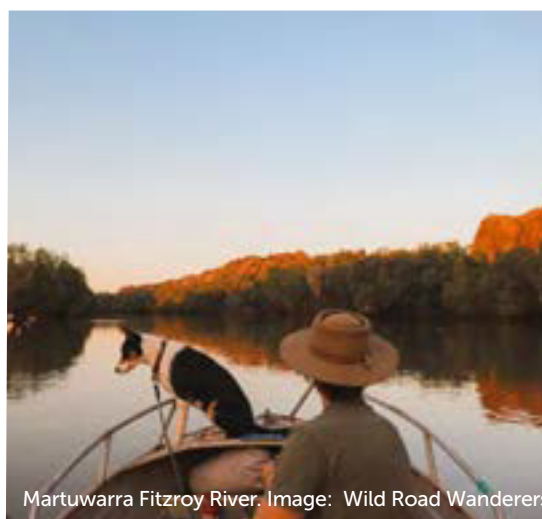
Studies into fodder cropping for the region have found that 50 GL/y would be enough water for growing forage sorghum for the entire Fitzroy herd of cattle, but that it is generally more profitable and viable for pastoralists to use fodder hay. To support hay production 7-12 GL/y is estimated sufficient for the entire catchment (Booth & Turner, 2021; Petheram et al., 2018)



Center pivot irrigation, Kimberley. Image: Matt Deakin



Telegraph Pool, Martuwarra Fitzroy River. Image: Matt Deakin



Martuwarra Fitzroy River. Image: Wild Road Wanderers



Martuwarra Fitzroy River. Image: Wild Road Wanderers

Conclusions

It is integral to fully understand complex hydrological systems before even considering large scale extraction projects. There is currently an insufficient scientific understanding of ecological groundwater requirements, hydrogeological properties of the region and surface-groundwater interactions to be able to predict the impacts of industrial pumping.

The Martuwarra (Fitzroy) River and many other ecosystems in the region depend on the natural groundwater system. Changes to the water regime resulting from industrial scale extraction could compromise the integrity of the river and other important ecosystems, important species, cultural sites, Indigenous harvest, cultural practices, knowledge systems, and livelihoods.

The draft Fitzroy-Derby water plan does not provide sufficiently strong safeguards to prevent irreversible environmental impacts to these values. The allocation limits proposed are substantially higher than those indicated as appropriate by the Department's own groundwater decision framework. Fixed recharge-percentage limits alone cannot be relied upon to avoid environmental damage, especially in poorly understood, data-scarce hydrological systems like the Fitzroy.

Traditional Owners hold deep cultural, ecological and intergenerational knowledge of the Martuwarra (Fitzroy) River and its groundwater systems, developed through long-standing custodianship and responsibility for Country. However, the draft plan does not provide meaningful roles for Traditional Owner representative organisations in decision-making on water allocation, monitoring priorities, or adaptive management, limiting their involvement largely to consultation rather than shared authority.

Effective protection of the Fitzroy's environmental and cultural values requires not only more conservative allocation limits, but stronger water governance. It depends on robust and transparent monitoring, including monitoring of ecological indicators, clearly defined thresholds, enforceable adaptive management responses, and genuine decision-making roles for Traditional Owners. Without these elements in place, there is no reliable mechanism to detect emerging impacts or to reduce abstraction before unacceptable damage occurs.

References

- Alley, W., & Leake, S. (2004). The Journey from Safe Yield to Sustainability. *Ground Water*, 42, 12–16. <https://doi.org/10.1111/j.1745-6584.2004.tb02446.x>
- Beesley, L., Canham, C., Douglas, M., Setterfield, S., Freestone, F., Keogh, C., Kennard, M. J., Loomes, R. C., Pusey, B., & Burrows, R. (2021). *Environmental water needs of Western Australia's Fitzroy River: Final report*. The University of Western Australia.
- BOM. (2012). *Australian Atlas of Groundwater Dependent Ecosystems(GDE)*. Commonwealth of Australia (Bureau of Meteorology).
- Booth, C., & Turner, J. (2021). *The mighty Martuwarra Fitzroy River – not just another resource. A response to proposals to allocate water for irrigated cropping*.
- Burrows, R. M., Beesley, L., Douglas, M. M., Pusey, B. J., & Kennard, M. J. (2020). Water velocity and groundwater upwelling influence benthic algal biomass in a sandy tropical river: Implications for water-resource development. *Hydrobiologia*, 847(5), 1207–1219.
- Canham, C., Freestone, F., Brauhart, D., Tayer, T., Setterfield, S., Beesley, L., & Douglas, M. (2023). *Germinable soil seedbank composition in floodplain wetlands of the lower Fitzroy River, WA: Freshwater Sciences*.
- Canham, C. A., Duvert, C., Beesley, L. S., Douglas, M. M., Setterfield, S. A., Freestone, F. L., Clohessy, S., & Loomes, R. C. (2021). The use of regional and alluvial groundwater by riparian trees in the wet-dry tropics of northern Australia. *Hydrological Processes*, 35(5). <https://doi.org/10.1002/hyp.14180>
- Carracher, L., RiverOfLife, M., Traditional Owners, W. K., Poelina, A., Ouzman, S., Coles Smith, M., Bool, I., Pérez-Hämmerle, K.-V., Ward, C., Torres, P., Wilinggin Aboriginal Corporation, Mayala Inninalang Aboriginal Corporation, Hawke, S., Williams, J., George, A., Long, J., O'Leary, M., Pusey, B., Robinson, N., ... State Library Western Australia. (2024). Story Map—Living Water: River, Land and Sea Country and Indigenous People of the West Kimberley (p. 0 Bytes). figshare. <https://doi.org/10.6084/M9.FIGSHARE.27212157>
- Dawes, W., Taylor AR, Harrington GA, & Davies PJ. (2018). Groundwater flow modelling of the Grant Group and Poole Sandstone aquifer – Fitzroy Trough, Western Australia. A technical report to the Australian Government from the CSIRO Northern Australia Water Resource Assessment, part of the National Water Infrastructure Development Fund: Water Resource Assessments. *CSIRO, Australia*. <https://doi.org/10.25919/5B86ED8EBC095>
- Department of Water. (2011). *Groundwater risk-based allocation planning process* (No. 45).
- Douglas, M. M., Jackson, S., Canham, C. A., Laborde, S., Beesley, L., Kennard, M. J., Pusey, B. J., Loomes, R., & Setterfield, S. A. (2019). Conceptualizing Hydro-socio-ecological Relationships to Enable More Integrated and Inclusive Water Allocation Planning. *One Earth*, 1(3), 361–373. <https://doi.org/10.1016/j.oneear.2019.10.021>
- DWER (with Loomes, R., & La Spina, K.). (2023a). *Ecological water requirements of water-dependent ecosystems in the Fitzroy water planning area* (No. 34; Environmental Water Report Series). Department of Water and Environmental Regulation, Government of Western Australia. <https://www.wa.gov.au/system/files/2023-10/ecological-water-requirements-fitzroy-water-planning-area.pdf>
- DWER (with Loomes, R., & La Spina, K.). (2023b). *Environmental and heritage values and the importance of water in the Fitzroy* (No. 33; Environmental Water Report Series). Department of Water and Environmental Regulation, Government of Western Australia. <https://www.wa.gov.au/government/publications/environmental-and-heritage-values-and-the-importance-of-water-the-fitzroy>
- DWER. (2023c). *Fitzroy Valley groundwater investigations 2015-2018* (Hydrogeological Record Series, Report No. HG69). Department of Water and Environmental Regulation, Government of Western Australia. <https://www.wa.gov.au/system/files/2023-10/fitzroy-valley-groundwater-investigations-2015-2018.pdf>
- DWER. (2023d). Mapping aquatic groundwater-dependent ecosystems in the Fitzroy water planning area. *Department of Water and Environmental Regulation, Government of Western Australia., Environmental Water Report Series No. 35*. <https://www.wa.gov.au/system/files/2023-10/mapping-aquatic-gde-in-the-fitzroy.pdf>

- DWER. (2026a). *Consultation draft – Fitzroy–Derby water resources management plan: Methods* (No. 81; Water Resource Allocation and Planning Report Series). Department of Water and Environmental Regulation, Government of Western Australia. <https://www.wa.gov.au/government/publications/consultation-draft-fitzroy-derby-water-resources-management-plan-methods>
- DWER. (2026b). *Consultation draft – Fitzroy–Derby water resources management plan: Policy and guidance* (No. 80; Water Resource Allocation and Planning Report Series). Department of Water and Environmental Regulation, Government of Western Australia. <https://www.wa.gov.au/government/publications/consultation-draft-fitzroy-derby-water-resources-management-plan-policy-and-guidance>
- Fitzroy River Declaration*. (2016). https://static1.squarespace.com/static/59fecece017db2ab70aa1874/t/5b286f2bf950b776fe5ead56/1529376561505/Fitzroy+River+Declaration._2016.pdf
- Hayes, M. A., Jesse, A., Welte, N., Tabet, B., Lockington, D., & Lovelock, C. E. (2019). Groundwater enhances aboveground growth in mangroves. *Journal of Ecology*, 107(3), 1120–1128. <https://doi.org/10.1111/1365-2745.13105>
- Jackson, S., Finn, M., Woodward, E., & Featherston, P. (2011). *Indigenous socio-economic values and river flows* (Tropical Rivers and Coastal Knowledge (TRaCK)). CSIRO Ecosystem Sciences. <https://nesplandscapes.edu.au/wpcontent/uploads/2018/05/TRaCK-2-2-Final-Report-December-2011.pdf>
- Laborde, S., & Jackson, S. (2021). *Indigenous water requirements in the Martuwarra/Fitzroy River catchment, Western Australia*. Griffith University, Brisbane.
- Milgin, A. N., Nardea, L., Grey, H., & Laborde, S. (2020). *Birr inmany jada Warloongaryi nganka Woonyoomboo-ni –A Nykina seasonal calendar*. Walalakoo Aboriginal Corporation in partnership with National Environmental Science Program.
- Office of the Auditor General for Western Australia. (2024). *Regulation of Water Licences* (Performance Audit No. 20). Office of the Auditor General for Western Australia.
- Petheram, C., Bruce, C., Chilcott, C., & Watson, I. (2018). Water resource assessment for the Fitzroy catchment. CSIRO, *Water Resource Assessment for the Fitzroy Catchment. A Report to the Aust Govt from the CSIRO Northern Australia Water Resource Assessment, Part of the National Water Infrastructure Development Fund, EP186908*, 462.
- Sheldon, F., Bunn, S. E., Hughes, J. M., Arthington, A. H., Balcombe, S. R., & Fellows, C. S. (2010). Ecological roles and threats to aquatic refugia in arid landscapes: Dryland river waterholes. *Marine and Freshwater Research*, 61(8), 885. <https://doi.org/10.1071/MF09239>
- Skroblin, A., & Legge, S. (2012). Influence of fine-scale habitat requirements and riparian degradation on the distribution of the purple-crowned fairy-wren (*Malurus coronatus coronatus*) in northern Australia. *Austral Ecology*, 37(8), 874–884.
- Vogwill, R. (2015). *Water Resources of the Mardoowarra (Fitzroy River) Catchment*. University of Western Australia.
- Whitty, J., Keleher, J., Ebner, B., Gleiss, A., Simpfendorfer, C., & Morgan, D. (2017). Habitat use of a Critically Endangered elasmobranch, the largetooth sawfish *Pristis pristis*, in an intermittently flowing riverine nursery. *Endangered Species Research*, 34, 211–227. <https://doi.org/10.3354/esr00837>

