

## Section 3

### Looking after the rivers

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## Sustainable management of the Lake Eyre Basin rivers – regulate, educate or open the gate?

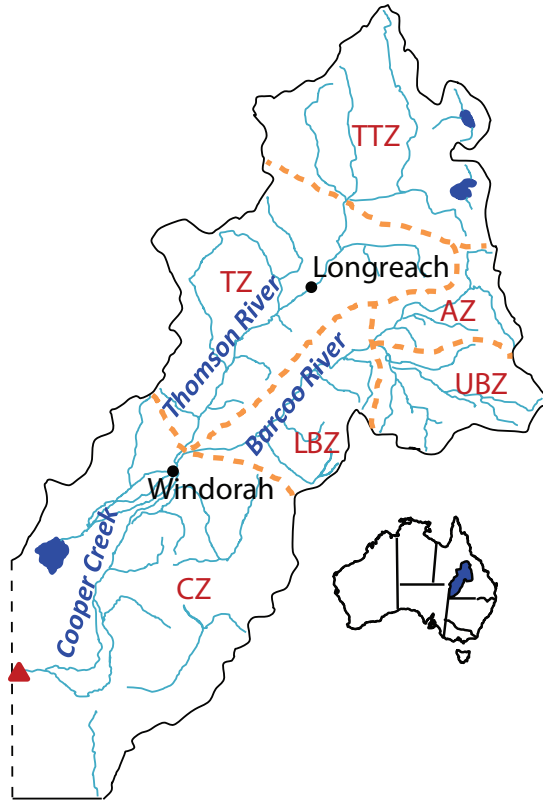
*Tom Crothers*

### Introduction

The Lake Eyre Basin covers about one-seventh of Australia, more than 1 million km<sup>2</sup> across Queensland, New South Wales, South Australia and the Northern Territory (see Chapter 1). It is of international and national environmental significance and includes areas of high economic, social and cultural heritage values. The significance of the Basin as an international and national asset is reflected in the Lake Eyre Basin Intergovernmental Agreement, established in 2001, to protect the rivers and related natural resources and signed by the Australian, Queensland, South Australia and the Northern Territory governments (see Chapter 7). The Lake Eyre Basin is one of the world's largest internally draining river basins, with many ecosystems, people and processes dependent on the rivers (Kingsford *et al.* 2014). Most of the water that flows into Lake Eyre originates in the upstream Georgina and Diamantina Rivers and Cooper Creek, two iconic dryland river systems with near natural and highly variable flow regimes (Puckridge 1999; Kingsford *et al.* 2014).

Cooper Creek flows beyond the Queensland border into South Australia, and covers an area of 296 000 km<sup>2</sup>, ~26% of the Lake Eyre Basin. It includes the Thomson, Barcoo and Cooper subcatchments in Queensland (Fig. 20.1). The major tributaries of Cooper Creek are the Barcoo, Thomson, Darr, Alice and Wilson Rivers, and Landsborough, Towerhill, Torrens and Kyabra Creeks. Cooper Creek forms a network of channels, waterholes, lakes and extensive floodplains, predominantly in the lower part of the catchment, known as the Channel Country. These wetlands and waterholes connect during floods, and progressively disconnect as the system dries, the predominant condition. Some waterholes are permanent, providing important refuges for waterbirds, fish, other animals and plants (Silcock 2009; Silcock 2010; Kerezsy *et al.* 2014; Kingsford *et al.* 2014). Cooper Creek has an extensive floodplain, south of Windorah, divided into two major sections, one in Queensland and the other in South Australia, separated by the 'Innaminka choke', a narrow channel and floodplain constricted by stony hills near the border. Above this, the Queensland floodplain can be up to 80 km wide, with flows connecting large swamps and the large temporary Lake Yamma Yamma. The South Australian section has numerous, widely distributed, shallow, ephemeral freshwater and saline lakes, intersected by parallel dunes.

The Georgina and Diamantina River catchments form the other iconic western river system flowing from Queensland to Kati Thanda-Lake Eyre (Fig. 20.2). Their catchments cover ~365 000 km<sup>2</sup>, ~32% of the Lake Eyre Basin. The Georgina River starts on the Barkly



**Fig. 20.1.** Queensland part of the Cooper Creek catchment of the Lake Eyre Basin, showing major rivers and creeks (blue), lakes (filled blue), towns and the Nappa Merrie flow gauge (triangle) and water planning zones (orange dashed lines): Alice Zone (AZ), Cooper Zone (CZ), Longreach Waterhole Relocation Zone (LBZ), Thomson Zone (TZ), Torrens Towerhill Zone (TTZ) and Upper Barcoo Zone (UBZ).

Tablelands of the Northern Territory before flowing through a complex system of rivers, creeks and floodplain wetlands. These include the Burke and Hamilton Rivers, near Boulia, and King Creek. The Georgina River becomes Eyre Creek immediately south of the confluence of the Eyre and King Creeks, some of the flow enters the short Cuttaburra Creek distributary which discharges water to Lake Machattie to the east and Lakes Mipia and Koolivoo to the west, while Eyre Creek continues westward through the Simpson Desert sandhills and then south, joining the Mulligan River and eventually turning east again to join the Diamantina River in Goyder's Lagoon (see Chapter 1). The combined Diamantina River and Eyre Creek flows can then move into Kati Thanda-Lake Eyre through the Warburton Creek outflow from Goyder's Lagoon. The Diamantina River's tributaries include the Western River, the Mayne River and Farrars Creek above Birdsville. The Hay River is a separate subcatchment on the western side of the Georgina–Diamantina Basin, rarely contributing flow to the Georgina–Diamantina Basin or Kati Thanda-Lake Eyre.

There is a long and ongoing history of pressure to develop the rivers of the Lake Eyre Basin (see Chapter 1). Initially, this primarily focused on pastoral development, followed by



**Fig. 20.2.** The floodplains of the Georgina and Diamantina Rivers are extensive, reliant on river flows from many different rivers: the Burke River, Hamilton River, Eyre Creek, King Creek, Mulligan River, Western River, Mayne River and Farrars Creek (photo, R. T. Kingsford). They can be particularly affected by upstream diversions for irrigation development, as well as petroleum and gas and mining exploration and development.

water resource development and mining. There is considerable potential for exploration and development of the Lake Eyre Basin's natural resources. Mineral tenements cover ~42.8% of the Queensland part of the Basin, including considerable focus on development of the eastern part for coal, particularly the Galilee Basin (see Chapter 19). The Lake Eyre Basin also has the most significant onshore petroleum resources in Australia, with 76% of the Queensland part of the Basin covered by petroleum tenements (Queensland Department of Natural Resources and Mines 2012). There are already existing commercial oil and conventional gas production tenements in the Eromanga part of the Basin. The Cooper geological basin is also the most productive and commercially viable shale gas region in Australia. The Georgina, Cooper and Galilee geological basins have potential for 'tight gas' resources. This natural gas is produced from rock strata with low permeability, requiring hydraulic fracturing to produce gas at economic rates. Coal seam gas exploration is already underway in the northern part of the Cooper Creek catchment. There are also uranium deposits in the northern section of the Georgina–Diamantina Basin. Many of these developments require water and their activities can interfere with surface and groundwater hydrology and dependent aquatic ecosystems.

Much of what is decided in Queensland on water policy and management ultimately determines the future of the Lake Eyre Basin river systems. I overview the legislative and

**Table 20.1.** Synopsis of the purpose and application of nine legislative instruments (Acts) underpinning Queensland’s regulatory frameworks in the Lake Eyre Basin, affecting environmental protection, natural resource management and custodianship of its rivers and groundwater systems.

Areas	Legislative instrument	Description	Status and relevance to the Lake Eyre Basin rivers
Environmental protection	<i>Water Act 2000</i> Qld <i>Water Legislation Amendment Act 2016</i> (Qld)	This regulatory framework provides for the allocation and management of Queensland’s water resources for consumptive purposes, with provisions for the management of environmental flows. However, the 2012–15 Liberal National Government’s <i>Water Reform and Other Legislative Amendment Bill 2014</i> changed the <i>Water Act</i> ’s purpose to ‘providing for the responsible and productive management, allocation and use of water, and balances social, economic and environmental values for the benefit of Queenslanders’. The principles of ecologically sustainable development were also removed from the legislation. The proclamation of a new <i>Water Act</i> was put on hold by the new Australian Labor Government in 2015. The <i>Water Legislation Amendment Act 2016</i> was implemented by the Labor Government (2015–present) election pledge to reinstate the principles of ecologically sustainable development to the purpose of the <i>Water Act 2000</i> .	This is the most important and powerful legislation for managing water resources in Queensland. It regulates the take of water from rivers and groundwater ecosystems, including effects on overland flows and trading of water entitlements. It has provided strong protection for natural flows of the Lake Eyre Basin rivers. The principles of ecologically sustainable development are now able to be applied to the management of the surface and groundwater resources of the Lake Eyre Basin.
	<i>Wild Rivers Act 2005</i> (Qld)	This Act provided protection for the natural intact values of rivers. It was also the first piece of legislation to place additional controls over resources industries (e.g. mining). It could not be overridden by the Queensland Coordinator- General, invoking the powers of the <i>State Development and Public Works Organisation Act 1971</i> for ‘coordinated projects’ or projects of State significance.	In 2010, the <i>Wild Rivers Act</i> was amended to include the preservation of the natural values of Lake Eyre Basin rivers in Queensland. In 2013, the Liberal National Government (2012–15) repealed the <i>Wild Rivers Act</i> and the Wild Rivers declarations for Cooper Creek and the Georgina and Diamantina Rivers were revoked in the passage of the <i>State Development and Infrastructure Planning (Red Tape Reduction) Act</i> on 5 August 2014.

Areas	Legislative instrument	Description	Status and relevance to the Lake Eyre Basin rivers
Environmental protection (continued)	<i>Regional Planning Interests Act 2014</i> (Qld)	This provided a new legislative framework for dealing with 'good quality agricultural land' and areas of environmental significance.	It defines a 'Strategic Environmental Area' (SEA) on either a map in a Regional Plan or as prescribed under a regulation. The 'Channel Country of western Queensland' is cited in the Act as an example of a Strategic Environmental Area. This Act allows for the resources industries to secure a 'Regional Interests Development Approval' (RIDA) for development in an SEA. It provides much weaker environmental protection than the repealed <i>Wild Rivers Act</i> .
	<i>Environmental Protection Act 1994</i> (Qld)	This legislation is for the protection of Queensland's environment, allowing development that improves current and future quality of life, while maintaining critical ecological processes. It promotes ecologically sustainable development. It specifies details and requirements for environmental impact statements and development approval conditions. An amendment in 2016 requires the impacts of a petroleum and gas or mining operations to be assessed as part of the granting of an environmental authority before granting tenure. New mining and petroleum and gas projects must apply for a tenement under this legislation.	Generally weak environmental legislation, unless there are major developments. It does not adequately deal with the cumulative impacts of development and small developments. It is not clear how well the new amendment will protect environmental values, including water.
	<i>Sustainable Planning Act 2009</i> (Qld) replaced by <i>Planning Act 2016</i> (Qld)	This legislative instrument aims to integrate planning and development assessment for ecologically sustainable development. It does not constrain the functions and powers of the Coordinator-General, under the <i>State Development and Public Works Organisation Act</i> , which allows the Coordinator-General to manage and 'fast track' environmental assessment of projects, designated as 'coordinated projects' or projects of state significance.	Reasonably weak coordinating legislation which may not effectively protect the environment. Amendments by the Liberal National Government (2012–15) refocused this legislation to allow development rather than managing the impacts of development on the environment. The development assessment provisions of the <i>Sustainable Planning Act 2009</i> were carried over. The new legislation is intended to regulate efficient and effective land use planning and development assessment, while achieving ecological sustainability.

Table 20.1. (continued)

Areas	Legislative instrument	Description	Status and relevance to the Lake Eyre Basin rivers
Environmental protection (continued)	<i>Vegetation Management Act 1999</i> (Qld)	This controls management of vegetation, regulating the clearing of remnant vegetation, identified as endangered, of concern or at least concern regional ecosystem. It also seeks to prevent the loss of biodiversity, maintain ecological processes and ensure that clearing does not cause land degradation.	The Liberal National Government (2012–15) passed amendments allowing the clearing of natural vegetation for new agricultural development; creating a self-assessment process for landholders to clear vegetation without a development permit; simplifying state-wide vegetation maps; and changing enforcement and compliance provisions. There is pressure from the environmental movement to reinstate provisions in the original vegetation management legislation. Efforts by the Labor Government (2015–present) to introduce improved protection of native vegetation were defeated in the Queensland Parliament.
	<i>Fisheries Act 1994</i>	This legislation regulates the management, use, development and protection of fisheries, including aquaculture and their habitats. It is underpinned by principles of ecologically sustainable development. It regulates construction of fishways which allow for fish movement over instream barriers (e.g. weirs).	This legislation is strong in protecting fish movement in rivers and dealing with any impacts that ‘in stream’ structures may impose on fish movement.
	<i>Mineral and Energy Resources (Common Provisions) Act 2014</i> (Qld)	The <i>Mineral and Energy Resources (Common Provisions) Act</i> was the first step to modernise Queensland’s resources Acts, standardising resources legislation in Queensland, establishing the objection and appeals process for the granting of environmental authorities for mining and, petroleum and gas tenures.	This legislation established that, where the Coordinator-General has included conditions in an environmental authority, these are final and objections cannot be lodged in the Land Court. This Act restricted the rights and grounds of objection to a mining lease to landowners of adjoining properties. It prevented third parties such as a local authority, community group or conservation organisation from lodging objections. These rights to object were reinstated by the Labor Government (2015–present) through the <i>Mineral and Other Legislation Amendment Bill 2016</i> . The Act also allows the Land Court to strike out frivolous or vexatious objections or those outside the court’s jurisdiction.



Areas	Legislative instrument	Description	Status and relevance to the Lake Eyre Basin rivers
Environmental protection (continued)	<i>Environmental Protection and Biodiversity Conservation Act 1999</i> (Cth)	This Commonwealth legislation may be triggered when a development proposal could have significant impact on matters of national environmental significance. This includes Coongie Lakes in South Australia, a Ramsar-listed wetland.	This legislation has limited powers to deal with and control small cumulative developments or water planning processes.
Resource development	<i>Water Act 2000</i> (Qld)	This legislation focuses on sustainable management of water and other resources, through legal and policy frameworks, water resource plans and resource operations plans. These plans determine the allocation and management of water for consumptive purposes and may provide reserves of unallocated water for future development. It also establishes the responsibilities of water service providers, including Local Authorities.	This is the most important and powerful legislation, usually overriding most other legislative instruments in relation to the allocation and management of Queensland water resources.
	<i>Mineral Resources Act 1989</i> (Qld)	This legislation allows assessment for the development of mineral resources, consistent with sound economic and land use management. Any new mining project must apply for a mining tenement under the <i>Mineral Resources Act</i> . All environmental assessments and authorities for mines are dealt with under the <i>Environmental Protection Act</i> .	This is strong legislation which the Liberal National Government (2012–15) strengthened by granting a statutory right to take or interfere with underground water associated with mining operations, without a <i>Water Act</i> authorisation. Amendments made under the <i>Environmental Protection (Underground Water Management) and Other Legislation Amendment Act 2016</i> introduced an associated water licencing process to the <i>Water Act 2000</i> . This provided for more transparency and more of a focus on unacceptable environmental impacts, as well as process for objection by third parties. This process applies to petroleum and gas and mining operations.

Table 20.1. (continued)

Areas	Legislative instrument	Description	Status and relevance to the Lake Eyre Basin rivers
Resource development (continued)	<i>Petroleum and Gas (Production and Safety) Act 2004</i> (and the <i>Petroleum Act 1923</i> ) (Qld)	This Act assists safe and efficient exploration, development and transport of petroleum and fuel gas by pipeline. Development should be ecologically sustainable. It also controls water rights for petroleum tenures, allowing interference and unlimited take of water when drilling petroleum wells or observation bores. Petroleum tenure holders have to meet 'make good' provisions if their extraction of water impacts on landholder's bores. All environmental assessments and authorities for petroleum and gas wells are dealt with under the <i>Environmental Protection Act</i> but these activities are exempt from the <i>Sustainable Planning Act</i> and local authorities planning schemes.	This is strong legislation, outside the control of the statutory groundwater allocation and management plans. The petroleum and gas industries have a statutory right to take or interfere with underground water associated with their operations. For un-conventional gas industries (i.e. CSG and shale gas), the Queensland Government has adopted an 'adaptive management' approach, changing management frameworks, as risks are identified or impacts occur. Cumulative impacts of CSG operations are managed under a Cumulative Management Area framework in the Surat Basin.
Custodianship	<i>Aboriginal Cultural Heritage Act 2003</i> (Qld)	This Act controls the recognition, protection and conservation of Aboriginal cultural heritage, and is underpinned by respect for Aboriginal knowledge, culture and traditional practices.	While this legislation recognises Aboriginal cultural heritage, it lacks appropriate powers compared to other legislative instruments. Nothing in the Act makes the state liable to be prosecuted for an offence against Aboriginal cultural heritage values. It takes an 'all care and no responsibility' approach.
	<i>Land Act 1994</i> (Qld)	This legislation governs the administration and management of non-freehold land and land held under a deed of grant in trust. It also sets out and manages the process for creating freehold land. The Act embraces the principle of sustainable resource use and development and requires lessees of leasehold to demonstrate a 'duty of care' for the land during development.	This Act is moderately strong for use and management of leasehold lands, the predominant land tenure in Queensland's Lake Eyre Basin. Initiatives to link sustainable land management to leasehold lands during renewal and extensions (Delbessie agreements) were significantly rolled back by the Liberal National Government (2012–15).

water policy frameworks in Queensland that could protect these rivers and their unique landscapes from irreversible damage and destruction.

### Legislative and policy instruments relevant to water management in Queensland

There are currently nine relevant Queensland legislative instruments that impact on the use and management of natural resources in the Lake Eyre Basin (Table 20.1). These can potentially protect its rivers. They relate to environmental protection, resource access and custodianship of the resource. The *Water Act*, the *Wild Rivers Act* (now repealed), the *Regional Planning Interests Act*, the *Environmental Protection Act*, the *Sustainable Planning Act*, the *Vegetation Management Act*, the *Fisheries Act* and the *Mineral and Energy Resources (Common Provisions) Act* all affect environmental protection of the rivers of the Lake Eyre Basin in Queensland. They can all be overridden by the power of the Coordinator-General under the *State Development and Public Works Organisation Act* to promote development approvals under the provisions of ‘coordinated projects’ or ‘projects of State significance’.

Legislative instruments for resource access in Queensland include the *Water Act*, the *Mineral Resources Act* and the *Petroleum and Gas (Production and Safety) Act* (and the *Petroleum Act*). While the *Water Act* legislates the sustainable allocation and management of the Basin’s water resources, the *Mineral Resources Act* and the *Petroleum and Gas Act* can significantly and perversely affect the rivers and particularly groundwater resources, including the internationally iconic Great Artesian Basin. The *Aboriginal Cultural Heritage Act* and the *Land Act* promote custodianship of the cultural values of the water, but offer low-level protection to cultural heritage sites and values, and limited protection to the sustainable use and development of leasehold lands.

Many regulatory mechanisms can affect access and management of the rivers and groundwater systems in Queensland’s Lake Eyre Basin. Their effectiveness in environmental protection, particularly in constraining degrading natural resource development, depends considerably on the views and policies of the government of the time.

### Water regulation in the Lake Eyre Basin

In the mid-1990s, an entrepreneur proposed a large irrigated cotton development on two properties, adjacent to Cooper Creek and upstream of Windorah (see Chapter 1). This proposal was strongly rejected by the local community, the Australian public and scientists (see Chapter 17). The proposal was the catalyst for the development of the initial statutory water plans for the Georgina and Diamantina Rivers and the Cooper Creek, the dawn of a new approach to water resource regulation in the Lake Eyre Basin.

The first statutory water plan in the Lake Eyre Basin, the Water Resource Plan (WRP), was developed for Cooper Creek (approved 7/2/00), followed by the Georgina and Diamantina WRP (Queensland Department of Natural Resources and Mines 2004). These are implemented by resource operations plans (ROPs). The initial Cooper Creek water plan included a strategic and an operational focus and so a ROP was deemed unnecessary. All subsequent WRPs had accompanying ROPs. WRPs are based on the best available science, with extensive and transparent public consultation. They are required to be reviewed every

10 years, triggering finalisation of the second iteration of the Cooper Creek WRP (Queensland Department of Natural Resources and Mines 2011), followed by the Cooper Creek ROP (Queensland Department of Natural Resources and Mines 2013).

### **Water access – river management plans**

Regulations in WRPs and their accompanying ROPs include consideration of downstream impacts on communities and the river systems, but the devil is in the detail. The second generation Cooper Creek plans allowed transfer of all or part of the entitlement of original water licences issued for irrigation, within or between the Longreach Waterhole Relocation Zone and the Cooper Creek Zone (Fig. 20.1). These water licences can now be permanently traded and transferred (i.e. sold), if conditions on potential impacts are met. There is currently ~62 ha of irrigation, using an estimated 1000 ML each year. Water licences may also be upgraded to specify purpose, rate of take, daily volumetric pumping limit, annual volumetric limit of take, pumping thresholds and maximum storage limits. Importantly, pumping of water into large off-river storages for irrigation is not permitted, a critical protection measure (see Chapter 22). The maximum storage capacity allowable is 30 ML.

There is also opportunity to extract increased volumes of consumptive water from the river, including 700 ML (General Reserve), 200 ML (Indigenous Reserve) and 1300 ML (Strategic Reserve for projects of state significance): a total of 2200 ML of additional water extraction. Significantly, there is no additional water for expansion of irrigation in the Cooper Creek catchment. The Cooper Creek ROP (Queensland Department of Natural Resources and Mines 2013) allows up to 19 984 ML of water to be legally taken each year from Cooper Creek in Queensland. This includes unallocated water and 10 000 ML of existing ‘sleeper licences’ (currently not used). The Queensland Government has used a hydrological model to assess the potential impacts of water extraction on cross-border flows (see Chapter 2), using 118 years of simulated data at Nappa Merrie gauging station. If all allowable water were taken, an estimated 99.6% and 99.3% of the mean and the median annual flow respectively would still reach Nappa Merrie flow gauge on the border with South Australia. There are inevitable uncertainties in such models, which mean that not all of the environmental impacts can be measured (Ren and Kingsford 2011).

There is no equivalent hydrological model for the Georgina and Diamantina catchments. Instead, the Queensland Government has estimated the impacts of water extraction by using data from isolated stream gauging stations. The Queensland Government’s 2010–11 annual report on water plans for the Georgina and Diamantina Rivers (Queensland Water Commission 2011) identified that a total of 6108 ML (includes ‘sleeper licences’) could be taken each year for irrigation, with authorised licences with another 60 ML authorised for diversion to town water supply. There were unpublished government reports that ~250 ha of irrigation uses an estimated 4000 ML each year, with more than 6000 ML of water entitlement held in ‘sleeper licences’. The Georgina–Diamantina WRP identified that 1500 ML of unallocated water could be accessed for ‘Projects of State Significance’ and 12 000 ML could be accessed for any purpose (Queensland Department of Natural Resources and Mines 2004). There are restrictions for new water licences from significant waterholes

and wetlands listed in Attachment 5 of the Georgina–Diamantina ROP (Queensland Department of Natural Resources and Mines 2006a). Further, overland flow can also be harvested and stored for irrigation or town water supply, but not within listed protected watercourses (Section 108, Queensland Department of Natural Resources and Mines 2006a). The total take of overland flow is limited to 8800 ML (Category A) and 3200 ML (Category B), with limits for different management areas. The Georgina–Diamantina WRP (Queensland Department of Natural Resources and Mines 2006a) also stipulates that the Chief Executive of the water agency must consider the impacts on waterholes and wetlands and their connectivity in times of low flow. In total, 19 608 ML of water may be legally diverted each year. Currently, there is little interest in additional water for irrigation, with no take up of available reserves of unallocated water.

### **Water access – the Great Artesian Basin**

The Lake Eyre Basin also overlays much of the Great Artesian Basin (see Chapter 1). Its water was the essential lifeblood for the settlement and development of pastoral industries in western Queensland. In this region, water access is regulated by the WRP for the Great Artesian Basin (Queensland Department of Natural Resources and Mines 2006b) and its ROP (Queensland Department of Natural Resources and Mines 2007). The Queensland part of the Great Artesian Basin is split into 25 management areas, including 10 in the Lake Eyre Basin. Within the Cooper Creek WRP area, water can be used to irrigate up to 10 ha of land for fodder production and up to 2 ha for horticulture, allowing up to 3900 ML of water to be extracted (27 licences) each year to irrigate ~130 ha of land. There is another 9500 ML of unallocated water (General Reserve, including for irrigation) and up to 10 000 ML a year forms a State Reserve for special projects, which could also be diverted each year. Currently, only 937 ML of this unallocated water (the State Reserve) is accessed. The plan is currently under review, with a new draft plan released in January 2017 (Queensland Department of Natural Resources and Mines 2017). This draft plan changes the existing number of Management Areas and Units from 120 to 16 Groundwater Units and 91 Geological Formations. It will allow for all aquifers to be managed in their entirety. It will not manage the take of water from the Great Artesian Basin by the petroleum, gas and mining sectors. It also proposes to provide for 35 000 ML of additional unallocated water for new development: 80% of this water is State Reserve for major projects (gas, mining or geothermal power projects). The new plan also provides for the capping of all 189 remaining uncapped bores by 2017, although there will be discretionary powers for extensions or exemptions under special circumstances.

### **Wild Rivers declarations**

In 2009, the Queensland Labor Government announced that the natural values of the Lake Eyre Basin river systems would be protected by Wild Rivers declarations under the *Wild Rivers Act 2005* (Table 20.1). This announcement precipitated the convening of two science forums to assess natural values, hydrology and ecological processes of Lake Eyre Basin rivers. The forums and wide-ranging stakeholder consultations across the Queensland part of the basin shaped the detailed amendments to the Wild Rivers legislation, affecting Lake Eyre



**Fig. 20.3.** The boom in food and nutrients provided by floods is critical to the animals, including waterbirds, plants and other organisms of the rivers of the Lake Eyre Basin. Protection of these floods is critical to the future viability of the unique rivers of the Lake Eyre Basin, the people and environments that depend on them (photo, A. Emmott).

Basin rivers. The *Wild Rivers Act* was amended in 2010 to restrict development on the floodplains of Queensland's Lake Eyre Basin river systems. Wild Rivers declarations were subsequently approved for the Cooper Creek and the Georgina and Diamantina Wild Rivers (16 December 2011), imposing specific statutory measures to protect five key factors: hydrological processes, geomorphic processes, riparian function, wildlife corridor function, and water quality (Fig. 20.3). As well, parts of the rivers were spatially identified on maps as High Preservation Areas (HPAs) and Special Floodplain Management Areas (SFMAs), requiring special management. The declarations and specific statutory measures protected Cooper Creek and the Georgina and Diamantina Rivers, from their headwaters to the South Australian border.

Other controls regulated removal of quarry materials and forest products; taking or interfering with water in a watercourse, lake or spring, or floodplain (overland flow); and construction of in-stream structures. There were also controls on aquaculture, agriculture and animal husbandry and restrictions on the clearing of native vegetation. The declarations also prohibited surface mining in designated areas. In addition, they regulated 'setback' distances for certain works and operations, controlled under the *Transport Infrastructure, Mineral Resources, Petroleum and Gas* and *Petroleum* Acts (Table 20.1). The declarations also specified requirements for environment impact statements and environmental management with development approval. These controls did not apply to existing activities or works, or residential, commercial or industrial development in urban areas.

Wild Rivers declarations had the 'head of power' to significantly constrain exploration and development by the mining and gas industries where impacts to rivers and river systems were likely. These industries constantly lobbied Queensland governments to remove these development constraints by repealing the *Wild Rivers Act* and revoking Wild Rivers declarations, arguing that they made investment uncertain (Queensland Resources Council 2010). The Liberal National Party Government (2012–15) amended the legislation, allowing increases in the size of workforce accommodation, the size for multi-well sites, fuel storage



capacity, compression facilities and pipelines within HPAs and SFMAs, arguing that it improved safety for remote workers and improved efficiency of the petroleum and gas industry. The Labor Government (elected in 2015) made an election commitment to reinstate the protective provisions of the Wild Rivers legislation to the rivers and ecosystems of the Queensland part of the Lake Eyre Basin but there is no progress on this commitment.

### **The 2012–15 political regime of the Liberal National Party**

During the 2012 Queensland election campaign, the Liberal National Party foreshadowed revocation of all Wild Rivers declarations in Queensland. Once in government, Premier Newman appointed the Honourable Andrew Cripps as Minister for Natural Resources and Mines, directing him to find alternative strategies to protect Western Rivers, while allowing sustainable development (Western Rivers Advisory Panel 2013). Minister Cripps established the Western Rivers Advisory Panel (WRAP), representing local government, AgForce (the peak agricultural stakeholder group in Queensland), the resources sector, an Indigenous representative, a scientific representative from the Lake Eyre Basin Scientific Panel, and natural resource management groups including the Cooper Creek Catchment Committee, the Georgina/Diamantina Catchment Committee and Desert Channels Queensland, the natural resource management group (Western Rivers Advisory Panel 2013).

Minister Cripps proclaimed at the first Western Rivers Advisory Panel meeting that he would replace the Lake Eyre Basin Wild Rivers declarations with alternative strategies for river protection. The Western Rivers Advisory Panel was asked to provide advice on the important natural values of the Lake Eyre Basin and the option for expanding ‘small scale’ irrigation. The Queensland Department of Natural Resources and Mines surveyed Western Rivers Advisory Panel members about these values and assets, the focus and level of their protection and the greatest threats to the health and sustainability of the region’s rivers. The highest 10 assets or values were: a weed- and pest-free environment; access to groundwater; maintenance of natural flows; groundwater quality; protection of wetlands and lakes; protection of artesian springs; health of aquatic fauna, health of riparian terrestrial fauna, health of native pastures; and surface water quality (Western Rivers Advisory Panel 2013).

Western Rivers Advisory Panel members ranked developments most likely to affect the rivers’ ecological sustainability. Invasive species were ranked first, then large-scale mining, followed by unconventional petroleum and gas extraction, out of 33 types of development (Western Rivers Advisory Panel 2013). Irrigated agriculture ranked sixth and conventional petroleum and gas extraction ranked eighth. These rankings were consistent with similar results from the members’ survey done by AgForce (AgForce, unpublished survey, January 2013). It was ironic that those high value assets, identified as most needing protection from ‘high concern development activities’, were well protected under the agreed water plans and Wild Rivers declarations.

The government agency also consulted Western Rivers Advisory Panel members on the scale of ‘small scale irrigation’ appropriate for the rivers, given the directive from the government. There was no consensus, with stakeholders ranging from an irrigated area of 10 ha (160 ML/year water entitlement) to 100 ha for a commercial operation (1600 ML/year water entitlement). A ‘no irrigation’ option was not provided. Surprisingly, Ag Force advised

**Table 20.2.** Issues regulated by specific protection measures within the *Wild Rivers Act 2005* which protected the values of the Lake Eyre Basin rivers and their floodplains from deleterious developments, and consequences following revocation of this legislation.

Issues or development threats	Wild Rivers declaration protection measures	Consequences of revocation
Mining and petroleum and gas exploration and development	Special Floodplain Management Areas (SFMAs) and High Preservation Areas (HPAs)	Potentially high-impact mining and petroleum & gas exploration and development is no longer prohibited or regulated along the rivers or adjacent floodplains. This could result in: <ul style="list-style-type: none"> <li>• interference with overland flow water and beneficial flooding on floodplains</li> <li>• reduced controls on open cut mining, including mining of 'sensitive areas' of rivers</li> <li>• mining exploration and development having access to secure water supplies for operations outside of the water management framework</li> <li>• water supplies required for mining being met from surface water in the rivers or through access to groundwater, such as the Great Artesian Basin. This could compromise the Commonwealth, state and landholder's investment in the Great Artesian Basin Sustainability Initiative.</li> </ul>
Expansion of irrigation		The Cooper Creek water plans have been amended to allow for existing water authorisations to be transferred and traded, subject to some conditions on volumes traded.
Overland flows and floodplain connectivity		The alteration of overland flows on the floodplains is no longer regulated and this could result in changes to flow patterns of beneficial flooding of the Channel Country.
Instream structures		No prohibition on the construction of instream structures (weirs and dams) affecting flows. These structures were prohibited under a Wild Rivers declaration, whereas the <i>Water Act</i> manages the take of water for weirs and dams and the <i>Sustainable Planning Act</i> manages the assessment and approval process for these works.
New cropping and irrigation development		Any new irrigation and cropping developments are not excluded from floodplain areas adjacent to the major rivers. These developments can affect natural overland flow waters and beneficial flooding to downstream landholders.
Feedlots		Small-scale feedlots will no longer be prohibited in key parts of the riverine area, including those areas that experience overland flooding. Levees to protect these areas may divert water flows and impact on beneficial flooding downstream.
All developments		Riverine protection permits for any potential developments are not required to comply with the Wild Rivers Code provisions to protect the values of the river. Landholder's aspirations of a 'rigid regulation of the resources industry' will not be able to be delivered.



that the government should regulate feedlots, dryland cropping, small- and large-scale irrigation, vegetation clearing and timber harvesting, but not livestock grazing, road or fence construction, fodder harvesting or vegetation thinning. There was a strong desire to prohibit ‘large scale irrigation’, with most AgForce constituents also strongly supporting regulation of mining exploration and development on the floodplains and in watercourses. Support for regulation of agriculture away from watercourses and on the adjoining floodplains was significantly lower. Paradoxically, some respondents also called for the removal or replacement of the *Wild Rivers Act*, because it was not sympathetic to people living on these rivers, even though this was clearly the most effective legislative instrument to protect the values and control the threats of most concern to AgForce members.

The Liberal National Party Government (2012–15) revoked the Wild Rivers declarations for Cooper Creek and the Georgina and Diamantina Rivers with the *State Development and Infrastructure Planning (Red Tape Reduction) Act* (5 August 2014; Table 20.1). Expansion of ‘small scale’ irrigation was also encouraged by amending the Cooper Creek Resource Operations Plan at the last minute, to allow trade and transfer of the large ‘sleepers’ entitlements’ near Windorah (Fig. 20.1). There were clear legislative, policy and management consequences affecting the values of the Lake Eyre Basin rivers. The highly effective framework for protecting Queensland’s Lake Eyre Basin rivers and regulation of development were removed, replaced by currently ineffectual legislation. High-impact surface mining and petroleum and gas activities would not be prohibited or regulated along the rivers, including in the Channel Country (Table 20.2).

Further, expansion of petroleum and gas industries was promoted into the Channel Country, through the release of the Cooper Basin Industry Development Strategy (Queensland Department of Natural Resources and Mines 2015). This strategy proposed accelerated development of the deep gas and oil industry, as well as the development of a Cooper Basin Water Strategy to stimulate deep gas extraction (‘fracking’).

### **The future – regulate, educate or open the gate?**

Governments will need to meet community expectations in Australia and internationally, for the protection of the Lake Eyre Basin’s natural and cultural values. However, there are clear inequities. Many agricultural people want to reduce regulations on their industry, but insist that the mining, petroleum and gas industries be rigidly regulated. This contradicts principles of natural justice, procedural fairness and equitable application of legislative provisions where regulation is required in the public interest. It is also not sufficient to argue that ‘small scale’ irrigation can occur without considering the ramifications (see Chapter 22). History has shown that without appropriate control and protection, many of Australia’s irrigation areas have significantly affected the ecological health of rivers. Many started as ‘small scale’ property drought-proofing schemes, ratcheting up into major irrigation areas taking considerable quantities of water river and groundwater reserves (see Chapters 14 and 15). This has had a considerable impact on the long-term health of riverine ecosystems (Kingsford 2000; Arthington and Pusey 2003; Bino *et al.* 2016), the integrity of natural flows on floodplains and many of the communities

dependent on these flows. It would be a tragedy to see history repeated on the Lake Eyre Basin's rivers.

Protection of the Lake Eyre Basin's rivers and their floodplains, including their natural and cultural values, requires reinstatement of statutory controls to protect the natural river processes from inappropriate development, through either the *Wild Rivers Act*, an amendment of the *Environmental Protection Act* or *Water Act*. Or there could be separate legislation, such as a *Lake Eyre Basin – Natural Rivers Management Act*, with similar protection measures. The future protective framework for the Lake Eyre Basin rivers should retain the most important protective measures of the Wild Rivers legislation for 'sensitive areas', such as HPAs and SFMAs. For the water legislation, a reduction in trading options for the current 'sleeper licences' in the Basin's rivers would also protect the river's values (see Chapter 22). It is critical that pumping thresholds and the 'no storage' provision be retained for all water licences so that large amounts of water cannot be diverted during high river flows. Given current low interest in purchasing existing unallocated water for 'small scale' irrigation, the water plans in the catchments should not be reviewed or altered until all existing entitlements and reserves of water are fully utilised or potentially the current unused entitlements are extinguished through a 'buy back' process (see Chapter 22).

Predicted end-of-system flow percentages for Cooper Creek (99.6% of mean annual flow and 99.3% of median annual flow) are some of the best in Queensland but they would be expected to decrease with additional water extraction, if 'small scale' irrigation or mining took more water. Reductions on the extent and frequency of flooding of the Channel Country from mid and high flows would be inevitable.

## Conclusion

Future Queensland governments may have different views and change the policies of their predecessors in the future protection and management of the rivers and wetlands of the Lake Eyre Basin. The arguments over water resource development will probably wax and wane with the changing political will and agendas. However, there remains a strong coalition of landholders, scientists, Traditional Owners and many other educated and connected community members, within and outside the Basin, committed to the protection of these rivers (see Chapter 7) and their dynamic ecology. Protection and regulation of rivers by governments to deliver on the community's expectations is critical. Considerable long-term ecological degradation and social impacts can occur if governments 'open the gate' to further development of the Lake Eyre Basin's rivers or exploitation of its groundwater, particularly when existing regulations on protecting sensitive areas are removed or new regulations are not sufficiently powerful to constrain resource exploitation that damages the environment. Future generations will judge decision-makers harshly if they fail to adequately protect these unique rivers.

## References

- Arthington AH, Pusey BJ (2003) Flow restoration and protection in Australian rivers. *River Research and Applications* **19**, 377–395. doi:10.1002/rra.745
- Bino G, Kingsford RT, Brandis K (2016) Australia's wetlands: learning from the past to manage for the future. *Pacific Conservation Biology* **22**, 116–129. doi:10.1071/PC15047

- Kerezsy A, Arthington AH, Balcombe SR (2014) Fish distribution in far western Queensland, Australia: the importance of habitat, connectivity and natural flows. *Diversity (Basel)* **6**, 380–395. doi:10.3390/d6020380
- Kingsford RT (2000) Review: Ecological impacts of dams, water diversions and river management on floodplain wetlands in Australia. *Austral Ecology* **25**, 109–127. doi:10.1046/j.1442-9993.2000.01036.x
- Kingsford RT, Costelloe J, Sheldon F (2014) Lake Eyre Basin – challenges for managing the world’s most variable river system. In *River Basin Management in the Twenty-first Century*. (Eds VR Squires, HM Milner and KA Daniell) pp. 346–367. CRC Press, Boca Raton.
- Puckridge JT (1999) The role of hydrology in the ecology of Cooper Creek, Central Australia: implications for the flood pulse concept. PhD thesis. The University of Adelaide, Australia.
- Queensland Department of Natural Resources and Mines (2007) *Great Artesian Basin Resource Operation Plan*. Queensland Department of Natural Resources and Mines, Brisbane, <[https://www.dnrm.qld.gov.au/\\_\\_data/assets/pdf\\_file/0011/106031/gab-rop.pdf](https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0011/106031/gab-rop.pdf)>.
- Queensland Department of Natural Resources and Mines (2004) *Water Plan (Georgina and Diamantina) 2004*. Queensland Department of Natural Resources and Mines, Brisbane, <<http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WaterReGeP04.pdf>>.
- Queensland Department of Natural Resources and Mines (2006a) *Georgina and Diamantina Resource Operations Plan*. Queensland Department of Natural Resources and Mines, Brisbane, <[https://www.dnrm.qld.gov.au/\\_\\_data/assets/pdf\\_file/0016/106045/gd-rop.pdf](https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0016/106045/gd-rop.pdf)>.
- Queensland Department of Natural Resources and Mines (2006b) *Water Resource (Great Artesian Basin) Plan 2006*. Queensland Department of Natural Resources and Mines, Brisbane, <<https://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WaterReGABP06.pdf>>.
- Queensland Department of Natural Resources and Mines (2011) *Water Plan (Cooper Creek) 2011*. Queensland Department of Natural Resources and Mines, Brisbane, <<http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WaterReCCPI11.pdf>>.
- Queensland Department of Natural Resources and Mines (2012) ‘Queensland’s Western Rivers – the Lake Eyre Basin – an overview. Report to the Western Rivers Advisory Panel’. Department of Natural Resources and Mines, Brisbane.
- Queensland Department of Natural Resources and Mines (2013) *Cooper Creek Resource Operations Plan*. Queensland Department of Natural Resources and Mines, Brisbane, <[https://www.dnrm.qld.gov.au/\\_\\_data/assets/pdf\\_file/0006/110787/cooper-creek-resource-operations-plan.pdf](https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0006/110787/cooper-creek-resource-operations-plan.pdf)>.
- Queensland Department of Natural Resources and Mines (2015) *Resources Cooper Basin Industry Development Strategy*. Department of Natural Resources and Mines, Brisbane, <[https://www.dnrm.qld.gov.au/\\_\\_data/assets/pdf\\_file/0006/234825/cooper-basin-industry-strategy.pdf](https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0006/234825/cooper-basin-industry-strategy.pdf)>.
- Queensland Department of Natural Resources and Mines (2017) *Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017*. Queensland Department of Natural Resources and Mines, Brisbane, <[https://www.dnrm.qld.gov.au/\\_\\_data/assets/pdf\\_file/0003/1039413/draft-gabora-water-plan.pdf](https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0003/1039413/draft-gabora-water-plan.pdf)>.
- Queensland Resources Council (2010) Cooper Creek Wild River proposal extends blanket of uncertainty. Media release, <[https://www.qrc.org.au/01\\_cms/details.asp?ID=2617](https://www.qrc.org.au/01_cms/details.asp?ID=2617)>.
- Queensland Water Commission (2011) ‘Annual report, 2010–2011’. Queensland Water Commission Brisbane, <[https://www.dews.qld.gov.au/\\_\\_data/assets/pdf\\_file/0016/31471/qwc-annual-report-1011.pdf](https://www.dews.qld.gov.au/__data/assets/pdf_file/0016/31471/qwc-annual-report-1011.pdf)>.
- Ren S, Kingsford R (2011) Statistically integrated flow and flood modelling compared to hydrologically integrated quantity and quality model for annual flows in the regulated Macquarie River in arid Australia. *Environmental Management* **48**, 177–188. doi:10.1007/s00267-011-9673-9
- Silcock J (2009) ‘Identification of permanent refuge waterbodies in the Cooper Creek and Georgina-Diamantina River catchments for Queensland and South Australia, Final report’. South Australian Arid Lands Board, Longreach.
- Silcock JL (2010) Experiencing waterholes in an arid environment, with particular reference to the Lake Eyre Basin, Australia: a review. *Geographical Research* **48**, 386–397. doi:10.1111/j.1745-5871.2010.00642.x
- Western Rivers Advisory Panel (2013) ‘Western Rivers Advisory Panel report’. Queensland Department of Natural Resources and Mines, Brisbane, <[https://www.dnrm.qld.gov.au/\\_\\_data/assets/pdf\\_file/0015/82500/wrap-report.pdf](https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0015/82500/wrap-report.pdf)>.

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## Water governance in Queensland – implications for Wild Rivers declarations in the Lake Eyre Basin

*Poh-Ling Tan*

### Introduction

Governance is often mistaken to mean decision-making solely by governments. Today, water governance refers to transparency of processes, clearly defined responsibilities and accountabilities, and multi-level and multi-party participation in decision-making. Internationally, it is accepted that the process of making decisions needs to be broadly inclusive of public institutions but also the private sector, stakeholders, the general community and marginalised groups. Good governance stresses the importance of hearing many voices, particularly those often not previously heard.

This emphasis on effective public participation is not new – it is an internationally accepted principle for management of natural resources. At its core, those directly affected by decisions or development initiatives (stakeholders) should have the opportunity to influence and meaningfully contribute to decisions. Australia's National Water Initiative 2004 endorsed public participation as a priority principle in water planning (Council of Australian Governments 2004a). While the type of engagement under the National Water Initiative was open to interpretation, the objectives of public participation are undisputed: it provides confidence in reform processes and ensures openness and transparency. Public participation constrains arbitrary decision-making by requiring the decision-maker, the executive or the Minister or his or her delegate, to consider the views of the community. In Queensland, the *Water Act 2000* and *Wild Rivers Act 2005* (now repealed) both contain processes to implement public participation in water governance and management.

Three principles of governance relate to the current debate over the Lake Eyre Basin rivers (Fig. 21.1). The first is getting the voices of the community heard, particularly those of the Aboriginal community, the Traditional Owners of the land (see Chapters 8 and 9). The second is the principle of transparency – how decisions get made, the data used, the information underpinning the decision, the 'trade offs' made (see Chapter 18), effective documentation, and public availability of the reasons for the decision. The third principle, not often talked about in Australia because we often take it for granted, is the upholding of the rule of law. A key aspect is that law should not change at someone's whim or fancy. There should be a stable legal framework that citizens understand and can utilise to plan the community's affairs, while allowing for adaptive management. Such change should be managed well and based on transparent reasons that are acceptable to the broad community.



**Fig. 21.1.** Concern over the future of rivers of the Lake Eyre Basin, including their waterholes (such as Pulchera waterhole here on the Mulligan River in the Georgina River catchment) and floodplains has an ongoing presence, particularly in relation to water resource management and most recently, mining development and exploration (photo, A. Emmott).

I address the legal context of the debate over the Wild Rivers declarations over the three main river systems in the Lake Eyre Basin: Cooper Creek, the Georgina River and Diamantina River (the Western Rivers; Fig. 21.1). I examine the main strengths and weaknesses of their management regimes in relation to land and water. I also review how the views communicated by people were considered, and examine some of the options available. I contrast this with the lack of transparency in water management decisions in the Lower Balonne system, Queensland in the 1980s and 1990s, which have affected environmental health and livelihoods in that region (see Chapters 14 and 15).

### Significant legislative and policy documents

Important water law and policy developments have occurred at the national and state levels, over the last 25 years: 1989–2014 (Table 21.1; see Chapters 7 and 20). This has paralleled the initiatives of the Lake Eyre Basin community to manage and protect the Basin's land and water resources. The Queensland department responsible for water management has changed many times over this period. In 1989, it was the Queensland Water Commission, but the water portfolio came under the authority of the Department of Environment and Resource Management in 2012. After the 2012 state election, river management responsibilities changed – wild rivers and environmental protection responsibilities went to the Department of Environmental and Heritage Protection while water planning, including environmental flow responsibilities were with the newly formed Department of Natural Resources and Mines. For simplicity, I refer to the relevant water agency as 'the Department'.



**Table 21.1.** Chronology of significant legislation, policy documents, and community action events in the Lake Eyre Basin.

Year	Legislation, policy documents and community action
1989	<i>Water Resources Act</i> (Qld) enacted.
1994	Council of Australian Governments (COAG) Water Reform Framework provided national policy support for ecologically sustainable development in water, including environmental allocations, and tradeable water entitlements. Proposal to list South Australian parts of the Lake Eyre Basin for World Heritage status.
1995	A consortium of cotton growers proposed to irrigate from Currareva on Cooper Creek in the Channel Country, requiring an average of 42 000 ML per year. The newly formed Cooper's Creek Protection Group and the Barcoo Shire Council opposed this proposal.
1996	Locals and scientists held scientific workshop at Windorah; other scientific conferences at Perth, Western Australia and Berri, South Australia recommend against irrigation.
1998	The Lake Eyre Basin Coordinating Group integrated partnership approach adopted, with two cross-border catchment committees in the Cooper Creek and Georgina–Diamantina catchment committees.  Draft Water Management Plan for Cooper Creek proposed allocation of 22 500 ML per annum from the Thomson and Barcoo Rivers, allowing for irrigation. This was again opposed by sections of the local community.
2000	Cooper Creek Water Management Plan prohibited irrigation under 1989 <i>Water Resources Act</i> . This prohibition continued under a new <i>Water Act 2000</i> (Qld). Litigation commenced by Currareva consortium against Queensland Government was dismissed: <i>Currareva Partnership v Welford</i> (2000).
2001	<i>Lake Eyre Basin Intergovernmental Agreement Act 2001</i> passed and provided for Lake Eyre Basin Ministerial Forum, Secretariat, the Scientific Assessment Panel, and the Community Advisory Committee. Biennial Aboriginal forums planned (see Chapter 7).
2004	National Water Initiative continued nationwide reform agenda. For the first time jurisdictions had to consider Indigenous interests in water planning, and environmental allocations were to receive similar security as consumptive entitlements. <i>Water Resource Plan (Georgina-Diamantina) (2004)</i> finalised (Queensland Department of Natural Resources and Mines 2004).
2005	Queensland enacted <i>Wild Rivers Act 2005</i> to provide preservation of natural features and ecological functions of rivers in natural or near natural condition. The enactment of this Act resulted from an election promise by the Beattie Labor Government (1998–2007) and has been controversial, disputed by some Aboriginal communities in the Cape York Peninsula.
2009–2010	Queensland Government discussed wild river issues for Lake Eyre Basin in response to community interest. Stakeholder forum organised by local community. Consultation paper released 2010, and Lake Eyre Basin Wild Rivers Advisory Panel formed to provide stakeholder input to Minister and the Department.
2011	Six meetings of Wild Rivers Advisory Panel held in 2011. Widespread support for Wild River declarations in Cooper Creek and Georgina and Diamantina catchments. Tibooburra Declaration at the 4th LEB Aboriginal Forum attended by 40 Aboriginal participants, 35 non-Aboriginal invitees (scientists, historians, officers from government and non-government organisations) resoundingly supported Lake Eyre Basin Wild River declarations (see Chapter 8). Wild Rivers declarations for Cooper Creek and Georgina–Diamantina in December 2011 prohibited development of large-scale irrigation and open cut mining close to major creeks and rivers. <i>Water Resource Plan (Cooper Creek) 2011</i> finalised (Queensland Department of Natural Resources and Mines 2011).
2012	Liberal National Government (2012–15), under Premier Newman, elected with substantial majority. An election promise was to abolish the <i>Wild Rivers Act 2005</i> for all of Queensland, while for the Queensland Lake Eyre Basin rivers systems (referred to as Western Rivers by the Newman Government), the intention was to develop an alternative management framework for better balance.
2014	<i>Wild Rivers Act 2005</i> abolished.

A range of relevant legislative enactments, policy documents and significant community responses were pivotal for the management of the Lake Eyre Basin rivers (Table 21.1), including the 1994–95 proposal to list for World Heritage status (see Chapter 7); a proposal to grow cotton in the Channel Country that triggered strong community opposition (see Chapter 17); growing recognition of Indigenous interests and rights in land and water (see Chapter 8); protection of environmental water through new legislation in 2000 and 2005; and specific protection of floodplains and rivers of the Channel Country in 2011. There were key events relevant to environmental protection of the rivers in the Queensland part of the Lake Eyre Basin over more than two decades (Table 21.1). For many years water legislation in Queensland did not explicitly consider ecosystem needs (Grant and Papadakis 2004), until the state government responded to water policy reform by the Council of Australian Governments (COAG).

Strong opposition during 1995–98 to a proposal for large-scale irrigation in the Cooper Creek area by cotton farmers (see Chapter 17), known as the Currareva Partnership, played a significant role in highlighting community concern regarding ecosystem protection and environmental flows (see Chapter 7). Realising the strength of the concern, the state government prohibited large-scale irrigation in the region when it finalised the Cooper Creek Water Management Plan in 2000 (see Chapter 17). The proponents filed an application in the Supreme Court for judicial review of the decision of the Minister for Natural Resources to make the *Water Management Plan (Cooper Creek) 2000*. The court dismissed the application for judicial review, as the decision under challenge was a legislative matter and did not fall within the scope of section 20, *Judicial Review Act 1991* (Qld), the plan determined the law in a binding manner and was of general application (*Currareva Partnership v Welford 2000*).

At a high level, the states of Queensland and South Australia, together with the Commonwealth Government, entered into a Heads of Agreement in 1997 to protect the national and international values of the Lake Eyre Basin. All three jurisdictions passed legislation in 2001 (Table 21.1; see Chapter 7), forming new collaborative institutions to manage transboundary decision-making in the Basin.

While many laws apply to land, water and the natural environment, I focus on the two most important management regimes in Queensland relevant to the Western Rivers catchments: (1) the water planning regime under the *Water Act 2000*, and (2) the Wild Rivers declarations under the *Wild Rivers Act 2005*. Unless otherwise specified, my analysis of policy and law is current to 1 January 2017. Until 2000, the primary focus of Queensland's water legislation was the development of the state's water resources (Grant and Papadakis 2004). In response to the 1994 COAG agreement to a National Water Reform Framework (Council of Australian Governments 2004b), the *Water Resources Act 1989* (Qld) was replaced by the *Water Act 2000* (Qld), which changed the focus to how water was allocated and managed in the state. Since 2000, water resource plans provide for sustainable use, mainly through clearly defining the consumptive take of water, specifying water users' entitlements, identifying the ecological assets in a catchment and their water needs to maintain them in a healthy state, and providing for the management of environmental flows.

Water plans, formerly called Water Resource Plans, specify general and environmental outcomes. For example, the *Cooper Creek Water Resource Plan 2011* (Queensland Department



**Table 21.2.** Strengths and weaknesses of water planning under the *Water Resources Act 2000* and wild river declarations under the *Wild Rivers Act 2005*.

	Water planning	Wild River declarations
Strengths	<p>Water plans are binding on government, water users and the broad community. Under the <i>Water Act 2000</i> (Qld), plans have a 10-year life, and are required to be reviewed.</p> <p>The statutory planning process initially allowed for participation of the community through mandatory reference panels. However, these provisions have been diluted and the participatory process is now at the discretion of the Minister.</p> <p>Plans must provide for environmental flows and water security objectives. This can provide for quite detailed rules on the management of stream flows when water is most needed for ecosystems.</p> <p>Plans must be based on the best available science.</p>	<p>They were statutory instruments that did not lapse after 10 years. However, there was a five-year reporting period when legislation could be amended.</p> <p>One of the few pieces of legislation that could actually take precedence over and limit mining and petroleum and gas legislation. Other laws, including the <i>Water Act 2000</i>, were generally subordinate to the <i>State Development and Public Works Organisation Act 1971</i> (Qld).</p> <p>Declarations provided for very targeted protection. The boundaries could be drawn around High Preservation Areas and Specialised Floodplain Areas.</p>
Weaknesses	<p>May just entrench the status quo of water resource development.</p> <p>Does not adequately include wetlands, and floodplains, specific environmental assets, or wider catchment issues, such as water quality and clearing, other than to provide water.</p>	<p>Lack of statutory provisions for participation of the public in the process; therefore participation was at administrative discretion.</p> <p>Perceived as 'locking up' resources' because it could stop water and floodplain development.</p> <p>The level of detail could be daunting for the general public.</p>

of Natural Resources and Mines 2011) provides for outcomes, including the maintenance of ecological integrity and natural function of the riverine systems, and maintaining connectivity of waterholes. Even so, beyond limiting take and providing water to an environmental asset, there are limited specific catchment-wide protection mechanisms available under the water planning framework for environmental protection.

In contrast, the focus of *Wild Rivers Act 2005* and Wild River declarations was on the preservation of natural values, including natural ecosystem values, as well as assets (floodplains, wetlands and the river) on rivers assessed to have natural values worthy of protection (see Chapter 20). The water planning and wild river management frameworks have relative strengths and weaknesses (Table 21.2). Both Acts may be overridden or amended by later legislation to provide for infrastructure or for any other purpose.

### The *Wild Rivers Act 2005*

Now repealed, the *Wild Rivers Act 2005* (Qld) was a significant improvement for the protection of riverine landscapes. Although its introduction was met with controversy in the Cape York Peninsula in the Lake Eyre Basin, implementation of the Act was welcomed by the Lake Eyre Basin community (Table 21.1; see Chapter 8).

The responsible Minister could propose any part of Queensland for consideration as a wild river area. A Wild Rivers declaration was a statutory instrument that described the wild river and its catchment area, wild river requirements, and circumstances in which parts of the Wild Rivers Code or other development assessment code apply.

The natural values that Wild Rivers declarations sought to protect were:

- hydrological processes, meaning unimpeded runoff, stream flow, aquifer and spring recharge
- geomorphic processes, meaning free movement of sediments along the river system to allow for stable beds and banks and sediment delivery to estuaries and floodplains
- water of sufficient physical, chemical and biological quality to meet human and ecological needs
- intact riparian function along stream banks, for food and habitat for native animals, and
- areas of sufficient natural habitat within and along river systems for wildlife corridors.

The formal declaration process began with a notice of intent, accompanied by a moratorium on any application for water entitlements or licences or new works on the river or the floodplain that could interfere with the natural flow of water. This was followed by a period of community consultation. There were no specific statutory provisions as to how consultation would occur. In 2011 amendments, the Minister was given the power to establish an Indigenous reference group to advise on matters relating to the declaration, or the management of the wild river area. Matters of advice could include proposals for development in the wild river area, or proposed wild river area (*Wild Rivers Act 2005*, section 47A). The Minister would consider the results of community consultation, all properly made public submissions, and if an Indigenous reference group was established, advice from that group. Although mining tenures would generally not operate in High Preservation Areas and Special Floodplain Areas, under the Wild Rivers declarations, the protection of the Wild Rivers areas did not extend to mining leases issued under or any projects declared as significant under the *State Development and Public Works Organisation Act 1971* (Qld).

Declarations could be amended through a legislative process defined in the *Wild Rivers Act 2005*. For example, the declaration for the Cooper Creek was amended in May 2013 to provide for safety and efficiency for petroleum and gas operations. Operational works are now allowed in a flood channel, or below or at bed level of the flood channel, if considered reasonable. Among the amendments, this included increasing temporary accommodation for workforce from 2240 m<sup>2</sup> to 1 ha and 30 to 60 people. Also, the size of multi-well sites could increase from 3 to up to 5 ha, with no restriction on the number of well heads on the one site, fuel storage and compression facilities. Further, pipelines could be built in High Preservation Areas, after assessment under the *Environmental Protection Act 1994*, and operational works allowed within a flood channel provided no barriers to flood flows are created.

Although much of the protection of the *Wild Rivers Act 2005* and the declaration in the Cooper Creek remained, the changes passed by the Liberal National Government (2012–15) appeared to provide more for operational efficiency and less for operational safety of gas and

oil operators, and may have significant ecological impacts on the flood channels in terms of affecting flows (see Chapter 22).

### Regulating floodplain flows in the Lower Balonne River, Queensland

Much of the concern about the future of the Lake Eyre Basin rivers stems from the experiences of rapid development in the Murray–Darling Basin, affecting livelihoods (see Chapters 14–16) and ecosystems (Kingsford 2000), including the most recent development on the Condamine–Balonne river catchment. The Condamine River flows into the Balonne River to supply the Lower Balonne water management area, a braided network of rivers (Bokhara, Birrie, Culgoa and Narran Rivers; see Chapter 14). Small flows stay in defined channels, but medium to large flows spill out of channels to flood large areas of the floodplain. From 1989 to 2004, there were significant tensions over the harvesting of floodplain flows for consumptive use (see Chapter 15).

Irrigation in the St George area started around 1956 with water supply from the Jack Taylor Weir. The irrigation scheme was extended by the construction of the Beardmore Dam and associated works (1968–72, 81 800 ML capacity). The earliest water licences were granted to graziers to ‘drought proof’ their properties with small areas of irrigated pasture. In 1967, there was little actual irrigation downstream of St George, with numbers of surface water licences for water harvesting sharply increasing by 1989–90 across the state, with most coming from this region. These water harvesting licences allowed users to pump water from the river once the river reached a certain pumping threshold. There were no volumetric limits on these licences and neither was the volume of water measured or paid for beyond a nominal administration fee. This water was often pumped using a large group of pumps, capable of rapid extraction of water, and then stored in large off-river storages on the floodplain (Fig. 21.2).

The Queensland Water Commission wrote to water users in the Lower Balonne area, in about June 1989, referring to ministerial approval of applications, backdated to 1982. The Honourable Don Neal from the National Party was the Member for Balonne in the Legislative Assembly and the Minister for Water Resources and Maritime Services at the time. There was also an increase in allocations (now called ‘water entitlements’) granted out of regulated storage from Beardmore Dam and Jack Taylor Weir, at St George around 1989. In 1989, the National Party lost power, after 30 years in government.

Significant discretionary power to issue licences was available for the Department under the *Water Resources Act 1989* (Qld). Downstream graziers were alarmed at the increase in the approval of water licence applications because this was the water they relied on for their livelihoods (see Chapters 14 and 15). They agitated for limits on water harvesting from the Lower Balonne and, from 1991, a moratorium was placed on the issuing of further water licences in the Lower Balonne. Though the *Water Resources Act 1989* did not allow the Department authority to control access to or allocate flood water, the Department could, by *designating* the floodplain, control works that obstructed, diverted or reduced the flow of water or floodwater. In other words, the Queensland Government had the ability to control works that interfered with flows on the floodplain, once the process of designation was



**Fig. 21.2.** Flows in the Condamine–Balonne and associated rivers could be pumped with large water harvesting licences into extremely large off river storages, such as this on Cubbie Station with 538 800 ML of storage, enough to fill Sydney Harbour (Sydney Morning Herald 2009).

complied with. Local government also had power to control works on a floodplain under now-superseded legislation, but the Balonne Shire Council declined to do so (Tan 2000). The concept of designation was adopted from New South Wales where there had been 13 successful designations of floodplain areas. In Queensland, the object of designation was to beneficially manage floodplain flow by ensuring authorisation of only those works that had a minimum impact on other landholders.

One attempt was made to designate part of the floodplain of the Lower Balonne but, on the basis of 39 objections, the Department approved the designation with smaller boundaries than originally proposed. Stevenson, one of the owners of Cubbie Station (see Chapter 14; Fig. 21.2), applied to the Supreme Court for a declaration that the designation was invalid. In *Re Stevenson v Wenk* (1992) 1 Queensland Review 44, the court ruled that as the designation occurred without re-advertising the redrawn boundaries of the affected floodplain, the designation was invalid. The Department could have restarted the process in compliance with the court order but did not. As a result there was no effective control of floodplain works. The Department's own records over the five years 1994–99 showed that combined off-stream dam storage in the Condamine–Balonne grew fourfold from 247 000 ML in 1993–94 to 827 000 ML in mid-1999 (Queensland Department of Natural Resources 2000, p. 16).

There were two other significant court cases (1994–96) relating to resource security during Cubbie Station's development in the Lower Balonne. Cubbie held at least two licences for diversion channels from the Balonne and Culgoa Rivers, and other water harvesting licences. It also had extensive irrigation works that were not licensed. Expecting the

Queensland Government to restart the designation process, Cubbie Station sought a declaration from the Supreme Court that its unlicensed works were ‘authorised’ by the *Water Resources Act 1989* (*Re Stevenson Finance Corporation* (1994)). The Department resisted the declaration because it was concerned that if the works were declared ‘authorised’, then they would remain lawful, even if the area was successfully designated. Both parties agreed that the works in question were not then licensed, and did not require a licence under the 1989 Act. The Supreme Court refused Cubbie’s application, but granted a narrower order that the unlicensed works did not contravene the law.

While litigation was proceeding for the first and second matters, Cubbie applied for and was granted a licence to build a large dam between 4.6 and 8 m high to hold ~100 000 ML of water (Fig. 21.2). At that time, a moratorium existed for licences on taking water from the Balonne river system, but it did not apply to such dams, away from the watercourse. Nearby graziers appealed the grant of a licence to the Land Court, and this was granted on the basis that the Chief Executive under the *Water Resources Act 1989* was required to hold an inquiry into environmental issues and floodplain flows before granting the licence, and this had not occurred. Stevenson, the applicant for the dam licence, filed an application under the *Judicial Review Act 1991* to quash the decision of Judge Wenck of the Land Court. Stevenson’s argument followed the Department’s own argument in the Land Court: that the Chief Executive had wide powers to look into matters as he or she thought fit, and there was no express duty to consider environmental issues nor was a public enquiry needed. Decisions at both the Supreme Court, and later the Court of Appeal, did not accept this: *Stevenson v Wenck* (1995). Essentially, the courts ruled that the Department had not carried out its duty to hold an inquiry into the availability and sufficiency of water, before issuing Cubbie a licence for a referable dam. This was a pyrrhic victory for objectors. Cubbie went on to build a 4.5 m dam, so that it would not fall within the height restriction for a referable dam (Tan 2000).

These landmark cases show a chequered departmental record on environmental protection. Several other factors escalated water use, including property sales, subsequent activation of ‘sleeper’ licences, subdivision of land resulting in splitting of licences and an increase in use, and inadequate pricing of water. The growth in consumptive use of water in the Lower Balonne area had significant adverse environmental impacts. It was estimated that the average period between floods and volume, reaching the nationally important Narran Lakes, an internationally listed wetland under the Ramsar Convention, had respectively increased and decreased by 24%, significantly reducing optimal waterbird breeding and feeding habitat by more than 50% (CSIRO 2008). Significant ecological damage to floodplains, downstream natural assets and landholders dependent on flooding are increasingly occurring (Brandis *et al.* 2011). With hindsight, the administration of water by the Department was not transparent. It had difficulty regulating and protecting floodplain ecosystems and services because the legislation did not support relevant regulations. Powerful commercial interests (i.e. the irrigation industry) resorted to litigation to delay or overturn reforms that were against their interests.

The present Queensland water planning framework was designed to redress many of these matters (see Table 21.1). Control of water use in the Lower Balonne was effectively introduced in the 2000–04 period, through the finalisation of the *Water Resource (Condamine*



and Balonne) Plan 2004 (Queensland Government 2004). However, from 1989 to 2004 the number of irrigation licences had grown and have become highly valuable assets as tradable water entitlements. The *Condamine (Lower Balonne) Resource Operation Plan 2008* (Queensland Department of Natural Resources and Mines 2008), amended in 2010 to include the Lower Balonne, now authorises water entitlements of 94 655 ML of water a year. The term ‘entitlements’ includes water harvesting. This example provides a powerful story of how irrigation can quickly develop, impacting on downstream environments and dependent landholders and communities (see Chapters 14 and 15). The strong support for protection of the Lake Eyre Basin rivers by communities (see Chapter 7) is widely informed by examples such as the development of the Lower Balonne.

### **Lake Eyre Basin communities strongly support river and floodplain protection**

There have been consistent calls for the protection of the rivers of the Lake Eyre Basin by local communities, including Aboriginal communities, graziers, tour operators and environmental scientists (see Chapter 7). The Tibooburra declaration in 2011 (Table 21.1; see Chapter 8) demonstrated similar unequivocal support for the protection of the rivers of the Lake Eyre Basin by Traditional Owners, reinforced in later years.

There was widespread support from farmers and graziers for the importance and need for high-level protection of land and water in the Lake Eyre Basin, when surveyed in late 2012 by AgForce, Queensland’s peak organisation for graziers and farmers (see Chapter 20). Within the Lake Eyre Basin, there was apprehension at the impacts of large-scale commercial irrigation and mineral, petroleum and gas resource exploration and extraction. AgForce called for no further ‘take’ of water for irrigation above that identified in the current water management plans, until a more efficient use of current allocations was investigated. Furthermore, AgForce supported a moratorium on coal seam gas development in regions where there was inadequate scientific understanding of the associated risks. The AgForce organisation broadly supported replacement of wild rivers legislation while voicing a clear desire ‘for transparent and rigorous delivery of a high level of protection for the environment’ (AgForce 2013).

The Western Rivers Advisory Panel, established in 2013 by the Minister for Natural Resources and Mines, sent the same message to the Minister calling for strong environmental protection for the Lake Eyre Basin rivers (Western Rivers Advisory Panel 2013). Established by Minister Cripps in 2012, the Western Rivers Advisory Panel was to give stakeholder advice on alternative strategies in respect of the three main rivers of the Lake Eyre Basin. While it had a similar range of stakeholders as the Lake Eyre Basin Wild Rivers Advisory Panel, its membership was different. Members of the Lake Eyre Basin Wild Rivers Advisory Panel who were strong advocates of Wild Rivers declaration were left off the Western Rivers Advisory Panel (see Chapter 8) and there was no environment or South Australian representative. Aboriginal members were reduced from four to two. Under the terms of reference, the Western Rivers Advisory Panel was directed not to consider an option of retaining the Wild Rivers declaration; instead the panel had to primarily identify ‘values or assets of the Basin which were the most important, where protection of these values should be focused and the level of protection that is required’ (Western Rivers Advisory Panel 2013, p. 4).

Unsurprisingly, this panel reported that the natural assets identified through this process were ‘nearly identical to the Wild Rivers values’ previously identified (Western Rivers Advisory Panel 2013). The majority of the panel largely reinforced earlier strong messages that natural flows in the Channel Country must not be reduced, or interfered with, and must be protected from activities such as irrigation, overland flow capture for any purpose, and mining, petroleum and gas operations (Western Rivers Advisory Panel 2013). About a third of the recommendations related to mining including: prohibition on floodplains of major rivers, major tributaries and lakes; no powers by the state Coordinator-General to override protective strategies; and the prevention of contamination of surface and groundwater systems by petroleum and gas operations. The report presented views from five sectors – resources (e.g. mining), natural resource management, local government, Agforce and science – with no record of an Aboriginal view. One of the panel’s Aboriginal members issued a media statement soon after the publication of the report to the effect that Aboriginal people in the Channel Country had not been fully consulted, and that all Aboriginal people had strong views on the protection of natural river systems and supported the Wild Rivers declarations (Lloyd 2013).

Because of the gap in recording an Aboriginal view opposing the abolishment of wild rivers protection of the Western Rivers, an Aboriginal forum was organised in November 2013. Attended by over 30 Aboriginal community people, including a large contingent from the Channel Country of the Lake Eyre Basin, Traditional Owners in Queensland expressed the view that their voices are often not captured in reports to relevant ministers (see Chapter 8). As custodians of the land for centuries, they have the longest term human stake in this country (Queensland Aboriginal Forum 2013). They recognise values in the country that are not apparent to many others, and these values are antithetical to those whose interests are mainly commercial. The 2013 forum strongly endorsed the 2011 Tibooburra declaration (Table 21.1; see Chapter 8) and called on the Minister for Natural Resources and Mines, the Honourable Andrew Cripps, to retain Wild Rivers declarations over the Western Rivers.

### **High-level collaborative protection of Lake Eyre Basin rivers required**

It was reasonable to assume that the Queensland Liberal National Government (2012–15) would be open to Aboriginal views from the Channel Country, when their 2012’s election promise to abolish the Wild Rivers declarations was based on the opposition from some of Cape York Aboriginal leaders to those declarations. Some Aboriginal leaders in Cape York applied to the Federal Court to annul Wild Rivers declarations over three of the four wild rivers in the Cape: the Archer, Lockhart and Stewart Rivers. In 2014, the Federal Court ruled that these three declarations were invalid on the grounds that the Minister for the Environment, the Honourable Steven Robertson, had to satisfy the statutory preconditions to the exercise of power, as required under the *Wild Rivers Act 2005* (*Koowarta v State of Queensland* (2014)). Under section 13 of the *Wild Rivers Act 2005*, matters that were mandatory for consideration before ministerial exercise of power included the results of community consultation and all properly made submissions. There was evidence that the Minister did not sight the required material accompanying the ministerial brief on the declarations, until after he had made a decision to declare these three rivers (*Koowarta v State*

of Queensland (2014), para. 214). There was also evidence that the ministerial briefing note and the accompanying material did not incorporate any maps showing the boundaries of the Wild Rivers areas (*Koowarta v State of Queensland* (2014), para. 50).

There was no appeal by the state as the *Wild Rivers Act 2005* was repealed by the *State Development, Infrastructure and Planning (Red Tape Reduction) and Other Legislation Amendment Act 2014*, soon after the *Koowarta* decision. The *Regional Planning Interests Act 2014* now provides that the river systems in the Cape York and other regions, previously subject to Wild Rivers declarations, are rolled into the Regional Planning Interests framework as Strategic Environmental Areas (SEAs). While Cape York has a new regional plan, finalised in 2014 by the Department of Infrastructure, Local Government and Planning, the regional plans for the Channel Country (Central West and South West regions) date from 2009. For information on the protection of floodplains on Western Rivers, we refer to the *Regional Planning Regulation 2014* and its guidelines (Queensland Government 2016).

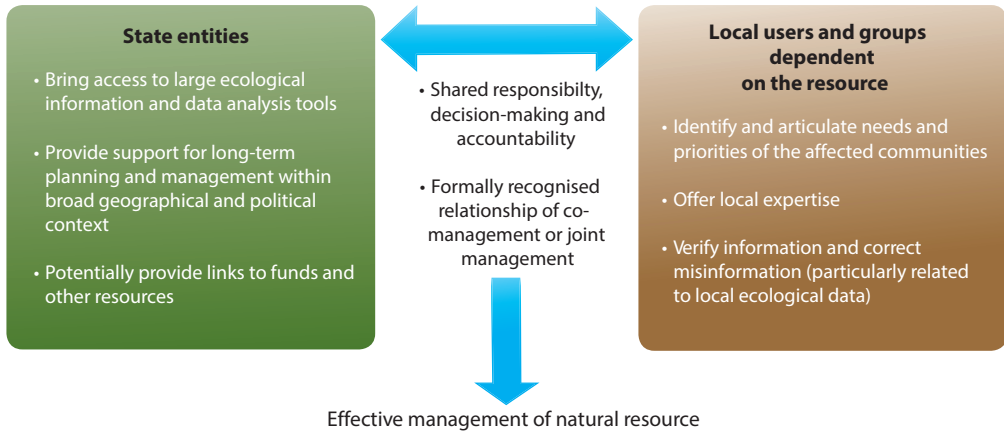
Under the Regional Planning Interests framework, there is protection of high value or preservation areas in the Channel Country of the Lake Eyre Basin, with a 500 m buffer either side of major tributaries and floodplain wetlands and defined riparian vegetation zones, prohibiting open cut mining, intensive agriculture and dams. There are other preservation areas outside these areas, including floodplain management areas connected to the rivers. However, environmental groups express grave concerns over the repeal of the *Wild Rivers Act 2005*, saying that the *Regional Planning Interests Act 2014* does not provide similar high levels of protection for natural values, as it allows for other types of mining and other agricultural development (Environmental Defenders' Office Queensland 2014).

The *Regional Planning Interests Act 2014* and its regulations have not built on the long and strong partnership among community, scientific and government organisations within the Lake Eyre Basin. At a transboundary level, this aspect of governance has continued to mature under the Lake Eyre Basin Agreement, which provides for collaborative management at the Basin level with the Ministerial Forum and strong input from the Scientific Advisory Panel and the Community Advisory Committee (see Chapter 7). However, this bottom-up input is not replicated at the state level, and certainly not in Queensland, which is the largest of the states constituting the Lake Eyre Basin. For the extensive river systems of the Lake Eyre Basin, a catchment which is sparsely populated, most day-to-day land management is done by graziers, Aboriginal groups, towns and some mining companies. It would be a strategic approach to formally recognise and nurture this relationship where local users and Aboriginal groups co-managed the land and resources of each of the states and the Northern Territory, consistent with the basin-level arrangements (Fig. 21.3), conferring advantages of a formal co-management relationship between state and the local community (Tan 2016).

## Conclusion

Open, inclusive and transparent processes inspire confidence by communities in decisions of governments. While past water allocation processes, not only in Queensland, have conferred wide discretionary powers in the hands of decision-makers, present water planning frameworks seek to limit discretion in favour of sustainable management. Similarly, Wild Rivers declarations have aimed to limit deleterious development in parts of natural and near





**Fig. 21.3.** The collaborative structure proposed for Queensland's policy and management of the rivers of the Lake Eyre Basin (adapted from Hoverman *et al.* 2012).

natural river systems. When such controls are either not in place or are relaxed, significant ecological damage can occur, as exemplified by developments in the Lower Balonne river system which had rapid growth in water access, without appropriate regulation of floodplain works, detrimentally affecting floodplains downstream.

In the fragile environments of Lake Eyre Basin rivers, interference in flood flows would cause similar severe detrimental impacts. In the minds of local communities and Traditional Owners, uppermost concerns are impacts not only of large-scale irrigation but also mining on the floodplains. Almost every sector supports the continued strong protection of environmental assets for the rivers of the Lake Eyre Basin, saying that natural flows must not be reduced or interfered with, and must be protected from development or mining infrastructure. The Liberal National Party's (2012–15) Minister of Natural Resources and Mines' own advisory panel devoted nearly a third of their recommendations to address potential threats from mining. This continues to be a strong message to governments of whichever political persuasion.

While local communities in the three Western River catchments in Queensland, particularly Traditional Owners, found that the engagement processes of Wild River declarations enabled them, over a period of nearly a year, to give voice to their concerns, the Aboriginal communities in particular have been disenfranchised by the decision to repeal the Wild Rivers declarations in the Lake Eyre Basin. There was a semblance of consulting with communities over this issue, but the terms of reference of consultation excluded the very option that Aboriginal communities preferred.

Governance processes relating to the protection of natural river landscapes in Queensland would do well to build collaborative structures that engage multiple parties in decision-making – not only powerful interests but also the local community and marginalised groups.

## References

AgForce (2013) *WRAP Report a Good Start to Rivers Management*. AgForce, <<http://www.agforceqld.org.au/index.php?tgtPage=news&cid=view,333%20accessed%209%20May%20201>>.

- Brandis KJ, Kingsford RT, Ren S, Ramp D (2011) Crisis water management and ibis breeding at Narran Lakes in arid Australia. *Environmental Management* **48**, 489–498. doi:10.1007/s00267-011-9705-5
- Council of Australian Governments (2004a) *Intergovernmental Agreement on a National Water Initiative*. Department of Agriculture, Canberra, <<http://www.agriculture.gov.au/SiteCollectionDocuments/water/Intergovernmental-Agreement-on-a-national-water-initiative.pdf>>.
- Council of Australian Governments (2004b) *The Council of Australian Governments' water reform framework*, <<https://www.environment.gov.au/system/files/resources/6caa5879-8ebc-46ab-8f97-4219b8ffdd98/files/policyframework.pdf>>.
- CSIRO (2008) 'Water availability in the Condamine-Balonne. A report to the Australian Government from the CSIRO Murray-Darling Basin Sustainable Yields Project'. CSIRO, Canberra.
- Currareva Partnership v Welford (2000) QSC 098, <<http://www.austlii.edu.au/cgi-bin/sinodisp/au/cases/qld/QSC/2000/98.html>>.
- Environmental Defenders' Office Queensland (2014) EDO Qld submission on the State Development, Infrastructure and Planning (Red Tape Reduction) and Other Legislation Amendment Bill 2014. Queensland Environmental Defenders Office, Brisbane, <<https://www.parliament.qld.gov.au/documents/committees/SDIIC/2014/22-StatDevIPRTROLAB/submissions/082.pdf>>.
- Grant R, Papadakis E (2004) Transforming environmental governance in a 'laggard' state. *Environmental and Planning Law Journal* **21**, 144–160.
- Hoverman S, Delfau K, Tan P (2012) 'Sub-Project 3: Developing alternative management models for Indigenous water plans and strategies in Australia's north. Final report'. Department of Environment and Energy, Canberra.
- Kingsford RT (2000) Review: Ecological impacts of dams, water diversions and river management on floodplain wetlands in Australia. *Austral Ecology* **25**, 109–127. doi:10.1046/j.1442-9993.2000.01036.x
- Koowarta v State of Queensland (2014) FCA 627, <<http://www.austlii.edu.au/au/cases/cth/FCA/2014/627.html>>.
- Lloyd G (2013) Fears for channel country. *The Australian*, 30 July 2013, <<http://www.theaustralian.com.au/national-affairs/fears-for-channel-country/news-story/f166eeea21d80f577b4a0025cc554137>>.
- Queensland Aboriginal Forum (2013) 'Putting Aboriginal people in the driver's seat: protecting land and water in Queensland'. Brisbane.
- Queensland Department of Natural Resources (2000) *Draft Water Allocation and Management Plan (Condamine Balonne Basin)*. Queensland Department of Natural Resources, Brisbane, <<https://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WaterReCoP04.pdf>>.
- Queensland Department of Natural Resources and Mines (2004) *Water Plan (Georgina and Diamantina) 2004*. Queensland Department of Natural Resources and Mines, Brisbane, <<http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WaterReGeP04.pdf>>.
- Queensland Department of Natural Resources and Mines (2008) *Condamine and Balonne Resource Operations Plan*. Queensland Department of Natural Resources and Mines, Brisbane, <[https://www.dnrm.qld.gov.au/\\_data/assets/pdf\\_file/0005/281534/condamine-balonne-amendment-2015.pdf](https://www.dnrm.qld.gov.au/_data/assets/pdf_file/0005/281534/condamine-balonne-amendment-2015.pdf)>.
- Queensland Department of Natural Resources and Mines (2011) *Water Plan (Cooper Creek) 2011*. Queensland Department of Natural Resources and Mines, Brisbane, <<http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WaterReCCP11.pdf>>.
- Queensland Government (2004) *Water Plan (Condamine and Balonne) 2004*. Queensland Government, Brisbane, <<https://www.legislation.qld.gov.au/LEGISLTN/CURRENT/W/WaterReCoP04.pdf>>.
- Queensland Government (2016) RPI Act Guideline 05/14: Carrying out resource activities and regulated activities in a Strategic Environmental Area. Department of Infrastructure, Local Government and Planning, Brisbane, <<https://www.dilgp.qld.gov.au/resources/guideline/rpi-guideline-11-16-dilgp-companion-guide.pdf>>.

- Stevenson v Wenck (1995) QCA 186, <<http://www.austlii.edu.au/au/cases/qld/QCA/1995/186.html>>.
- Sydney Morning Herald (2009) Wong won't force Cubbie to sell water. *Sydney Morning Herald*, <<http://www.smh.com.au/environment/water-issues/wong-wont-force-cubbie-to-sell-water-20090817-emw0.html>>.
- Tan P (2000) Conflict over water resources in Queensland: all eyes on the Lower Balonne. *Environmental and Planning Law Journal* **17**, 545–568.
- Tan PL (2016) Contests over 'wild' rivers in Queensland: implications for trans-jurisdictional water governance. In *Transjurisdictional Water Law and Governance*. (Eds J Gray, C Holley and R Rayfuse) pp. 260–281. Routledge, Oxon and New York.
- Western Rivers Advisory Panel (2013) 'Western Rivers Advisory Panel report'. Queensland Department of Natural Resources and Mines, Brisbane, <[https://www.dnrm.qld.gov.au/\\_\\_data/assets/pdf\\_file/0015/82500/wrap-report.pdf](https://www.dnrm.qld.gov.au/__data/assets/pdf_file/0015/82500/wrap-report.pdf)>.

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## Sustainability for the rivers of the Lake Eyre Basin

*Richard T. Kingsford*

### Introduction

The Lake Eyre Basin and its rivers are globally unique. Known for millennia in the minds of its many inhabitants as a place of magnificent booms and equally prodigious busts, the Basin's rivers are the most variable large rivers in the world (Puckridge *et al.* 1998). Its truly unique ecology thrives with this variability, where organisms continue to surprise us, with their astonishing adaptations. Given our desire to control water for human use, the future of all rivers across the world is precarious. The Lake Eyre Basin shares this uncertain future, which must impress upon us our responsibility to safeguard it as the last and best of its kind in the world.

So, what is the path for sustainability of Lake Eyre Basin rivers? Where will the communities and the rivers of the Lake Eyre Basin be in 20, 50 or 100 years? Or even, if we were brave – thousands or tens of thousands of years? The Lake Eyre Basin's unpredictability and remoteness have shaped and governed the way humans use water in this landscape, through the millennia by Aboriginal Australians and today's regional centres, mining operations and pastoral stations. Despite its resilience during the Anthropocene, this great wonder of the natural world remains under pressure to contribute to food, fibre and energy security for our ever-increasing global population. Long-term sustainability of this amazing environmental system ultimately depends on us, more so now than at any other time in the Basin's history.

This final chapter integrates the other 21 chapters of this book by projecting the future of the Lake Eyre Basin against a global backdrop, incorporating its social, economic and environmental dimensions. It focuses on the threats, clearly identified in the chapters of this book, and also on solutions for a future, built on the successful partnerships that have so far protected, shaped and sustainably managed this unique environment (see Chapter 7). This synthesis is informed by local, Traditional Owner and scientific knowledge and community gatherings of people from different disciplines and all walks of life (e.g. the conference, 'Spotlight on Lake Eyre Basin' at Longreach – the basis for this book (Fig. 22.1)). They have all provided strong support for the widely accepted vision developed by the Lake Eyre Basin community: *Lake Eyre Basin – Australia's unique, natural, desert river system: healthy environments, sustainable industries, vibrant communities, adaptive cultures.*

### Threats to the rivers of the Lake Eyre Basin

We know much about threats to rivers, not just in Australia but around the world, and how much damage can be done directly and indirectly by people, in a relatively short period



**Fig. 22.1.** Lively discussion of the future of the Lake Eyre Basin rivers involving people of the Basin who attended the 2013 conference, ‘Spotlight on the Lake Eyre Basin’, held in Longreach (photo, M. Turner).

(Lemly *et al.* 2000; Dudgeon *et al.* 2006). Threats to rivers of the world are ubiquitous, with those potentially affecting sustainability of Lake Eyre Basin rivers including water resource development, other habitat degradation, invasive species, pollution and climate change (see Chapter 1). Most chapters in this book focus on the potential impacts of water resource development for obvious reasons: known widespread ecological and socio-economic impacts, a history of attempts to develop Lake Eyre Basin rivers, and the ever-present potential for further development. This has local, regional and global dimensions because the political and economic rationale for the development of water resources often relates to water supply and food security for expanding global populations. Current national policy is to develop natural resources of northern Australia, including water (Australian Government 2015). There are ~7.5 billion people in the world, with about two people added every second, leading to a projected total of ~9.7 billion by 2050. We all need water. Not only is water essential for drinking, but also the damming of rivers and diversion of water for irrigation enables much of our food and clothing production. The dilemma is that water resource development degrades rivers and affects water security for people and communities (Vörösmarty *et al.* 2010).

Humanity seriously ‘injures’ rivers and their ecosystems by building dams and developing floodplains (Kingsford 2015; Kingsford *et al.* 2016). Dams allow river flows to be controlled and diverted, mainly for irrigation (Lemly *et al.* 2000), while irrigation and cropping on fertile floodplain can destroy a river’s most productive areas of biodiversity (Kingsford 2015). These two impacts often go together: once river flows are controlled, it no longer floods as extensively or frequently, allowing intensive cropping on the floodplain. For the rivers of the Lake Eyre Basin, the spectre of mining exploration and development on floodplains is also a serious concern (see Chapters 19 and 20). This pressure to develop remains pervasive, despite a vibrant history of community opposition to such interventions (see Chapter 17).

The debate about sustainability has become nuanced by discussions about small-scale versus large-scale irrigation, leading to the misguided assumption that ‘small is good but large is bad’. Any diversion of water, big or small, impacts on the people who depend on these rivers – Aboriginal communities (see Chapters 8 and 9), long-term residents with deep connections to the river (see Chapter 12), those whose livelihoods depend on well-managed floodplain grazing (see Chapters 10 and 11) and others involved in tourism (see Chapter 13). The environment is also particularly sensitive to water diversions, with predictable negative impacts on native fish (see Chapters 3 and 4), turtles (see Chapter 5), terrestrial animals (see Chapter 6) and the many other forms of life (see Chapter 1). Simply, some part of the environment and people will always be affected when we develop the water resources of a river.

Three factors are clear in the ongoing discussion about water resource development. First, the environmental impacts are always underestimated because they occur over an entire river system and take decades to manifest (Kingsford 1999; Kingsford *et al.* 2011). Second, no governments have adequately been able to regulate water resource development, once started. The most recent example is runaway overdevelopment of the Condamine–Balonne river system in the Murray–Darling Basin (see Chapter 21), wreaking immeasurable social and environmental impacts (see Chapters 14 and 15). Indeed, many rivers in the Murray–Darling Basin exhibit a similar trajectory, where governments have failed to adequately manage development and prevent widespread environmental degradation (Kingsford *et al.* 2015). Finally, the economic costs of such development are rarely transparent. More often than not, private gain is underpinned by public cost. For example, governments often invest taxes in expensive dam construction (Kingsford 1999). Users of this water pay a licence fee, meant to cover costs of delivery, but it does not cover the capital or maintenance costs of infrastructure. As a consequence, a high proportion of the cost of ‘running’ the rivers (e.g. policies, water delivery, monitoring and restoration costs) is borne by government and communities, and is seldom accounted for. Restoration activities are particularly expensive. For example, Australian Government investment in the rehabilitation of the Murray–Darling Basin will cost Australian taxpayers more than \$13 billion, and even this poorly accounts for substantial use and non-use economic values of the environment (see Chapter 18).

History shows that water development challenges lie ahead for achieving sustainability of the rivers of the Lake Eyre Basin. Twice, governments in Queensland have tried to stimulate or ‘open up’ the rivers for major water resource development (see Chapter 17). The legacy of the first attempt in 1995 persists in ‘sleepers’ (i.e. not activated) licences in both the Cooper Creek and the Georgina–Diamantina River catchments (see Chapter 20). Governments have tried to buy back the relatively large (10 000 ML total) licences in the Cooper Creek catchment, mostly near Windorah, but owners have resisted, presumably because of speculative economic value. Actual economic value is difficult to determine, given the absence of a market, inviting inevitable and inequitable comparison with active irrigation licences in the Murray–Darling Basin. For example, a 1000 ML general security licence in the northern Murray–Darling Basin varied in value in 2016 from \$1 million (Macquarie) to \$2.1 million (New South Wales Border Rivers) (Marsden Jacobs Associates 2016). However, water supply is more dependable and primarily regulated by large dams in the Murray–



Darling Basin. In 2014, the Liberal National Party (2012–15) changed the water legislation to allow the sleeper licences in the Cooper Creek plan area in Queensland to be traded up the river, with adjustments depending on potential impacts (see Chapter 20).

Unallocated water in the Diamantina catchment could also be developed for irrigation. A current barrier to development is the prohibition of any large dams (off-river or on-farm storages) adjacent to the river, as well as limits on pump size and daily pumping volume (see Chapter 20). This means that water cannot be pumped from the main river channel (or flooded areas) into large off-river storages (e.g. Murray–Darling Basin; Kingsford 2004). Any relaxation of this policy could trigger large-scale water resource development, particularly now that irrigation licences can be traded.

Circuitously, this development potential returns the debate to the fundamental question: how much is too much development of the rivers or, as canvassed by the Queensland Liberal National Party Government (2012–15), small-scale *v* large-scale development? The implicit assumption is that small-scale development will have relatively minor ecological or socio-economic consequences. This assumption is flawed on two counts. First, many small-scale developments combined can have the same impact as a large-scale development in terms of the amount of water diverted from the river. Second, it is clear that small to medium floods are as critical to the ecological resilience of the rivers as large, episodic floods (Hamilton *et al.* 2005; Bunn *et al.* 2006). Minor river flows ensure that waterholes – the key refuges for many dependent animals – remain viable and carry through to the next flood period (see Chapters 4 and 5). Diversion of even small amounts of this water for small-scale irrigation could have dire ecological consequences, including causing death of fish and turtle populations in waterholes. The sensitivity of waterholes to minor hydrological changes will also be exacerbated by climate change, in particular by the projected higher temperatures and associated evaporation rates (Reisinger *et al.* 2014).

In addition, floodplain developments can change the course of distributary creek networks and the hydraulics of flow over the floodplain (Fig. 22.2), with potentially serious ecological and socio-economic consequences. Changes to flows in the myriad channels that criss-cross the floodplains may be caused by roads, farming or mining exploration and development. Up to now, the oil and petroleum industry has existed in reasonable harmony with the rivers of the Lake Eyre Basin (although there are examples on the Cooper Creek floodplain where roads or levees severed the floodplain from its water supply). Although there is an increased understanding and sensitivity to this potential problem, intensification of oil and gas mining on the floodplains of Cooper Creek is clearly possible, with gas wells on platforms serviced by road networks (e.g. Chinchilla, Queensland), potentially affecting flow paths (see Chapter 19).

Also, wherever there is mining exploration and development, pollution of rivers remains a potential lethal threat. The graphic example of the Lady Annie copper mine spillage in 2009, and the subsequent acidification and heavy metal pollution of the Buckley River (headwaters of the Lake Eyre Basin) remains a potent reminder (see Chapter 19). If the coal seam gas industry establishes in the Lake Eyre Basin, polluted water generated as a by-product of gas extraction may also pose a serious threat to the rivers of the Lake Eyre Basin (see Chapter 19).





**Fig. 22.2.** Networks of complex channel systems that criss-cross the Channel Country of the rivers of the Lake Eyre Basin could be seriously affected by pastoral, farming, mining or road developments.

Floodplains can be degraded by intensive grazing of livestock. Large grazing animals can change the structure and composition of vegetation communities, with known impacts on some small mammals around the world (Schielz and Rubenstein 2016). Our understanding of grazing impacts on floodplain environments remains relatively poor, but they are likely to be fairly minor (Silcock *et al.* 2013), compared with the impacts of water resource development (Lemly *et al.* 2000).

Other threats continually affect the sustainability of the rivers and their organisms. Climate change, particularly increasing temperatures (Reisinger *et al.* 2014), is already affecting socio-economic, cultural and environmental dimensions of the Lake Eyre Basin rivers. Increasing temperatures will increase evaporation, narrowing the window for the animals and plants to complete their life cycles as well as increasing the risk of premature drying of waterhole refuges. Further, Channel Country pastures on floodplains are likely to have a decreased duration of productivity while access to water for livestock may be problematic as the persistence of waterholes decreases. This may be partly offset by some evidence for increasing and more intense rainfall (Greenville *et al.* 2012).

Finally, the presence of numerous invasive species threatens the environmental and socio-economic values of the Lake Eyre Basin and demands considerable expenditure by governments and communities (Firn *et al.* 2015a; Firn *et al.* 2015b). Invasive or alien species include four fish species (see Chapter 3), cane toads (*Rhinella marina*), the introduced red claw crayfish (*Cherax quadricarinatus*) from the Australian tropics and various plant species, such as prickly acacia (*Vachellia nilotica*). One introduced plant species, buffel grass (*Cenchrus*

*ciliaris*), favoured by some graziers, appears to have negative impacts on biodiversity and alters fire regimes, exacerbated by climate change (Fensham *et al.* 2015; Martin *et al.* 2015). Many introduced mammals (e.g. pigs, goats and rabbits) affect the sustainability of the rivers of the Lake Eyre Basin, and large animals such as camels can damage, drain or destroy waterholes during dry periods. Last, tourists can cause considerable damage to waterholes, sites of high attraction (Silcock 2010), through littering and collection of firewood (Schmiechen 2004), although this needs to be balanced against the local scale of this impact, the opportunities for education of the values of the rivers, engagement and tourism's contribution to the economy.

### Policy, legislation and practice for sustainability

Much of this book has focused on the threat of water resource development and its associated demonstrated costs, as well as options for controlling deleterious development. Despite these known costs to Australians and our environments, governments continue to pursue water resource development, reflecting our history (Gibbs 2009). This is most clearly demonstrated by the current Australian Government's policy to develop northern Australia (Australian Government 2015), including expenditure of more than half a billion dollars (<http://www.agriculture.gov.au/water/national/national-water-infrastructure-development-fund>) and concessional loans of \$2 billion. The Flinders River, just north of the Thomson River catchment in the Lake Eyre Basin, is a clear target for development, with cotton irrigation already established and a plan for a \$200 million development of 15 000 ha of cotton near Normanton, pumping 150 000 ML of water from the Flinders River (Zonca 2015). These developments are in desert regions, similar to those previously proposed on the rivers of the Lake Eyre Basin. There is little discussion of long-term costs: development is driven by current policy and legislation. Unfortunately, environmental legislation, policy and political will are weak in the face of counterpart development instruments (see Chapters 20 and 21).

Ambition to develop water resources of the rivers of the Lake Eyre Basin has primarily originated in Queensland, the state with the most dependable supply of river water (see Chapter 20). Access to this water is governed by Queensland policy and legislation, principally water and mining legislation. Strong environmental protection was enacted through the Wild Rivers legislation and its associated policies and regulations, but was subsequently revoked, despite overwhelming support for the controls to remain in place (see Chapter 21). Current legislation and policy in Queensland leave the rivers and their sustainability highly vulnerable to development pressure. The community, its champions and partnerships continue to offer the most promising path to sustainable solutions, influencing legislation, policy and practice (see Chapter 7).

Institutionally, the Intergovernmental Agreement over the Lake Eyre Basin remains critically important, but is relatively weak on enforcing provisions for enforcement of sustainable river management (see Chapter 21). This legislative framework provides a high-level platform for sustainability discussions between participating states of Queensland and South Australia, the Northern Territory and the Australian Government. It makes sense to build on this legislation and policy for the Lake Eyre Basin as it aims, commendably, to

protect the volume and variability of river flows, with a focus on environmental values (see Chapter 21). Better integration of cultural and socio-economic values could improve the agreement (Gibbs 2006). However, with an upcoming review in 2018, the agreement is vulnerable to any potential policy shift towards water resource or mining development.

The intergovernmental framework could be more strongly supported by specific water legislation in Queensland, South Australia and the Northern Territory, which protects both the volume of flows (allowing for development of water supplies for towns and communities) and the floodplain networks. This was briefly achieved in Queensland through Wild Rivers legislation, before its revocation (see Chapter 21). Other options could include a stronger role for the Australian Government, which developed the water management framework for the Murray–Darling Basin under the *Water Act 2007*, providing the framework for the Murray–Darling Basin Plan. A potential '*Lake Eyre Basin Act*', with an associated plan, would differ in that it would fundamentally protect the river basin and its cultural, environmental and socio-economic values. Such legislation could have limited power but have a degree of public commitment and potentially incorporate the Lake Eyre Basin rivers as a National Heritage River (Kingsford *et al.* 2005a; Kingsford *et al.* 2005b). This would recognise the intertwined environmental and cultural heritage values which support the Basin's adaptive communities. Legislation that protects the rivers must also be supported by policies that protect their values and foster appropriate practices for long-term sustainability. Currently development is linked to environmental degradation. Decoupling this relationship is essential: we need developments that are environmentally sustainable. Further, in terms of practice, decadal reviews of water resource plans in the Lake Eyre Basin potentially stimulate speculation and interest in water resource development and cause ongoing concern about sustainability. This could be replaced by assessing potential developments against the objectives of policy and legislation to protect the rivers of the Lake Eyre Basin.

In the absence of strong legislation and supporting policies that protect the rivers, the status quo remains: strong partnerships influencing current legislation, which tends to favour water and mining developments. Inevitably, pressure to develop deleterious water resources or establish mining developments will continue, either as single site developments or wide-ranging development policies. Signatory governments to the Lake Eyre Basin Intergovernmental Agreement could apply pressure, but this will largely depend on political will. Community organisations and champions can quickly alert the broad community to potential concerns and foster a debate that can exert pressure on governments, occasionally successfully (see Chapter 7). This remains an *ad hoc* approach which leads to less preferable, confrontational interactions between community and decision-makers.

Above this, development proposals should be objectively assessed against rigorous and transparent analyses of hydrological, ecosystem and socio-economic costs and benefits. Inherent uncertainties of such analyses need to also be transparently reported. Currently, there are relatively rudimentary hydrological models used to assess impacts on flow and ecosystems for Cooper Creek but not for the Georgina–Diamantina, largely because of the paucity of data and lack of development in this catchment (see Chapter 2). These hydrological models underestimate hydrological and ecological impacts, particularly on floodplains (Ren

and Kingsford 2011). There also needs to be adequate assessment of the costs and benefits to economic environmental values of the Lake Eyre Basin, relative to the benefits of development (see Chapter 18). This includes direct costs to less ephemeral, stable industries, such as livestock grazing and tourism. Socio-economic analyses should also expose the largely invisible subsidies that underpin many large irrigation developments and extend over decades, as well as incorporate the long-term costs of rehabilitation.

Inevitably, this discussion sidesteps the consequences of 'sleeper' licence activation and the development of unallocated water in the Cooper Creek and Georgina–Diamantina catchments. Although there are considerable financial impediments to development (e.g. costs of infrastructure development, limitations of water access, proximity to markets and transport costs), the possibility remains that these licences may one day become activated when economic conditions are favourable. If the maxim for human health that 'prevention is better than the cure' is equally applicable to the environment, there remains a good case to resume the sleeper licences and remove unallocated water from the Queensland water plans in the Lake Eyre Basin, recognising and protecting its outstanding values. This would require compensation for irrigation licences, provided either by governments to current users, or through the purchase of licences by a third party (e.g. a non-government organisation), coupled with agreements that would prevent future development of the river basin. One criticism of this approach is that 'closing-off' such a river basin to water resource development abrogates our local, regional and global responsibility to provide for the food and fibre needs of the world. It is time that governments focus more on the demand side of the equation for food and fibre and improve the efficiency of existing water developments and systems in order to increase production. This includes the potential for urban centres, consumers of most food and fibre, to also engage in agricultural production within their footprint (Barthel and Isendahl 2013). Critically, the current policy instruments preventing construction of large off-river storages, increases in pump size or volume on floodplains are the most important barrier to rapid large scale development of irrigation and must remain in place.

Of the other threats to the sustainability of the rivers of the Lake Eyre Basin, climate change is potentially the most significant, although current understanding of the effects will depend on knowledge of changes to rainfall patterns and temperature. Temperature is increasing (Reisinger *et al.* 2014), which will mean increasing evaporation, partly offset by increasing rainfall (Greenville *et al.* 2012). Communities and governments should continue to develop policies that limit greenhouse gas emissions and stabilise temperatures. At a local scale, there may be a need for active policies to enhance the persistence of key refuge waterholes, with significant biodiversity value.

Solutions to avoid pollution disasters, such as spillage from Lady Annie copper mine (see Chapter 19), must involve rigorous assessment of the proximity of such mines to rivers and the risk of pollution. Further, if development proceeds, a realistic bond which adequately provides for restoration, must be negotiated.

Ubiquitous plant and animal invaders continue to wreak damage to industries and the ecosystems. Although there is generally a strong commitment to mitigating their impacts, levels of accountability and measurements of success or failure are often inadequate. Systems of strategic adaptive management can provide a more transparent and rigorous framework

for implementation (see Chapter 7). If tourism continues to increase in popularity, it will need to be actively managed to protect the cultural and environmental values of the Lake Eyre Basin and its rivers (Schmiechen 2004).

## Conclusion

The Lake Eyre Basin and its rivers have outstanding cultural and environmental values, enriched by Traditional Owner, local and scientific knowledge. It was no accident that the Lake Eyre Basin Partnership received the Australian Riverprize in 2014 and the International Riverprize in 2015. It is admirable that there is a Lake Eyre Basin community of formal and informal partnerships, developed over more than 20 years, which has brought together disparate stakeholders, all primarily committed to the sustainability of the Lake Eyre Basin rivers. Despite this track record, the sustainability of the rivers of the Lake Eyre Basin remains vulnerable to many current and future pressures.

Some state, national and international factors will inevitably drive lobbyists to call for development of water resources in the Lake Eyre Basin. This is most likely to manifest as irrigation or mining exploration and development on the floodplains. Current legislative protection measures, policy and practice would be relatively ineffective in preventing deleterious impacts to environmental and cultural resources, if water resource development escalated. The current Lake Eyre Basin Intergovernmental Agreement needs fresh affirmation from the member governments, through strong jurisdictional water legislation which takes a more protective, rather than the traditional exploitative approach to the rivers of the Lake Eyre Basin. This legislation needs to protect the variability of the river flows, including their volume and quality at natural levels. Vigilance at the more local scale is also critical to prevent deleterious cumulative impacts. Most of all, we need to considerably improve our cost benefit analyses by assessing risk on appropriate time scales, so communities and governments do not shoulder long-term costs of environmental, cultural and social damage. It is no longer an excuse to say we don't know if these will occur. The evidence is plain to see.

Sustainability for Lake Eyre Basin rivers is achievable, but it will be challenging. It will require considerable political and community will. It will require a change in attitudes to water and its function in Australia from development to protection. This might seem ambitious, but there are promising signs of support and, importantly, fundamental recognition of the unique values of the rivers of the Lake Eyre Basin by governments and communities. The historical record is filled with Basin champions and hard-won battles over the future of the rivers. Australia's profoundly ancient tectonic and geological journey, together with our most idiosyncratic of ecological trajectories, leave us as unlikely champions for a global icon that knows no equal. The sustainability of the Lake Eyre Basin's rivers is more than ever our responsibility and it must be shouldered, by current and future champions, with appropriate conviction and action.

## References

Australian Government (2015) Our north, our future: white paper on developing northern Australia. Australian Government, Canberra, <<http://northernaustralia.gov.au/files/files/NAWP-FullReport.pdf>>.



- Barthel S, Isendahl C (2013) Urban gardens, agriculture, and water management: sources of resilience for long-term food security in cities. *Ecological Economics* **86**, 224–234. doi:10.1016/j.ecolecon.2012.06.018
- Bunn SE, Thoms MC, Hamilton SK, Capon SJ (2006) Flow variability in dryland rivers: boom, bust and the bits in between. *River Research and Applications* **22**, 179–186. doi:10.1002/rra.904
- Dudgeon D, Arthington AH, Gessner MO, Kawabata ZI, Knowler DJ, Leveque C, Naiman RJ, Prieur-Richard AH, Soto D, Stiassny MLJ, Sullivan CA (2006) Freshwater biodiversity: importance, threats, status and conservation challenges. *Biological Reviews of the Cambridge Philosophical Society* **81**, 163–182. doi:10.1017/S1464793105006950
- Fensham RJ, Wang J, Kilgour C (2015) The relative impacts of grazing, fire and invasion by buffel grass (*Cenchrus ciliaris*) on the floristic composition of a rangeland savanna ecosystem. *The Rangeland Journal* **37**, 227–237. doi:10.1071/RJ14097
- Firn J, Maggini R, Chades I, Nicol S, Walters B, Reeson A, Martin TG, Possingham HP, Pichancourt JB, Ponce-Reyes R, Carwardine J (2015a) Priority threat management of invasive animals to protect biodiversity under climate change. *Global Change Biology* **21**, 3917–3930. doi:10.1111/gcb.13034
- Firn J, Martin TG, Chades I, Walters B, Hayes J, Nicol S, Carwardine J (2015b) Priority threat management of non-native plants to maintain ecosystem integrity across heterogeneous landscapes. *Journal of Applied Ecology* **52**, 1135–1144. doi:10.1111/1365-2664.12500
- Gibbs LM (2006) Valuing water: variability and the Lake Eyre Basin, Central Australia. *The Australian Geographer* **37**, 73–85. doi:10.1080/00049180500511988
- Gibbs LM (2009) Just add water: colonisation, water governance, and the Australian inland. *Environment & Planning A* **41**, 2964–2983. doi:10.1068/a41214
- Greenville AC, Wardle GM, Dickman CR (2012) Extreme climatic events drive mammal irruptions: regression analysis of 100-year trends in desert rainfall and temperature. *Ecology and Evolution* **2**, 2645–2658. doi:10.1002/ece3.377
- Hamilton SK, Bunn SE, Thoms MC, Marshall JC (2005) Persistence of aquatic refugia between flow pulses in a dryland river system (Cooper Creek, Australia). *Limnology and Oceanography* **50**, 743–754. doi:10.4319/lo.2005.50.3.0743
- Kingsford RT (1999) Managing the water of the Border Rivers in Australia: irrigation, government and the wetland environment. *Wetlands Ecology and Management* **7**, 25–35. doi:10.1023/A:1008452423586
- Kingsford RT (2004) Wetlands and waterbirds of the Darling River. In *The Darling*. (Eds R Breckwolft, R Boden and J Andrew) pp. 234–259. Murray-Darling Basin Commission, Canberra.
- Kingsford RT (2015) Conservation of floodplain wetlands – out of sight, out of mind? *Aquatic Conservation* **25**, 727–732. doi:10.1002/aqc.2610
- Kingsford RT, Dunn H, Love D, Nevill J, Stein J, Tait J (2005a) *Protecting Australia's Rivers, Wetlands and Estuaries of High Conservation Value*. Department of the Environment and Heritage, Canberra, <<https://www.environment.gov.au/system/files/resources/606b8121-90e4-41de-a7f3-acc645b232c8/files/protecting-rivers.pdf>>.
- Kingsford RT, Dunn H, Love D, Nevill J, Stein J, Tait J (2005b) River protection in Australia – Holy Grail or Fool's gold? In *Proceedings of the 4th Australian Stream Management Conference: Linking Rivers to Landscapes*. Hobart, Tasmania. (Eds ID Rutherford, I Wiszniewski, M Askey-Doran and R Glaznik) pp. 344–349. Department of Primary Industries, Water and Environment.
- Kingsford RT, Walker KF, Lester RE, Young WJ, Fairweather PG, Sammut J, Geddes MC (2011) A Ramsar wetland in crisis – the Coorong, Lower Lakes and Murray Mouth, Australia. *Marine and Freshwater Research* **62**, 255–265. doi:10.1071/MF09315
- Kingsford RT, Mac Nally R, King A, Walker KF, Bino G, Thompson R, Wassens S, Humphries P (2015) A commentary on 'Long-term ecological trends of flow-dependent ecosystems in a major regulated river basin', by Matthew J. Colloff, Peter Caley, Neil Saintilan, Carmel A. Pollino and Neville D. Crossman. *Marine and Freshwater Research* **66**, 970–980. doi:10.1071/MF15185
- Kingsford RT, Bassett A, Jackson L (2016) Wetlands: conservation's poor cousins. *Aquatic Conservation* **26**, 892–916. doi:10.1002/aqc.2709



- Lemly AD, Kingsford RT, Thompson JR (2000) Irrigated agriculture and wildlife conservation: conflict on a global scale. *Environmental Management* **25**, 485–512. doi:10.1007/s002679910039
- Marsden Jacobs Associates (2016) ‘Water entitlement market prices across the Murray-Darling Basin, summary report’, <<http://www.agriculture.gov.au/SiteCollectionDocuments/water/market-price/market-prices-sum-oct-2016.pdf>>.
- Martin TG, Murphy H, Liedloff A, Thomas C, Chades I, Cook G, Fensham R, Mcivor J, Van Klinken RD (2015) Buffel grass and climate change: a framework for projecting invasive species distributions when data are scarce. *Biological Invasions* **17**, 3197–3210. doi:10.1007/s10530-015-0945-9
- Puckridge JT, Sheldon F, Walker KF, Boulton AJ (1998) Flow variability and the ecology of large rivers. *Marine and Freshwater Research* **49**, 55–72. doi:10.1071/MF94161
- Reisinger A, Kitching RL, Chiew F, Hughes L, Newton PCD, Schuster SS, Tait A, Whetton P (2014) Australasia. In *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. (Eds VR Barros, CB Field, DJ Dokken, MD Mastrandrea, KJ Mach, TE Bilir, M Chatterjee, KL Ebi, YO Estrada, RC Genova, B Girma, ES Kissel, AN Levy, S MacCracken, PR Mastrandrea and LL White) pp. 1371–1438. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- Ren S, Kingsford R (2011) Statistically integrated flow and flood modelling compared to hydrologically integrated quantity and quality model for annual flows in the regulated Macquarie River in arid Australia. *Environmental Management* **48**, 177–188. doi:10.1007/s00267-011-9673-9
- Schieltz JM, Rubenstein DI (2016) Evidence based review: positive versus negative effects of livestock grazing on wildlife. What do we really know? *Environmental Research Letters* **11**, 1–18.
- Schmiechen J (2004) *Lake Eyre Basin Heritage Tourism – Future Directions*. Lake Eyre Basin Coordinating Group, Adelaide, <[http://pandora.nla.gov.au/pan/59515/20140605-1214/www.lakeeyrebasin.org.au/archive/media/future\\_directions.pdf](http://pandora.nla.gov.au/pan/59515/20140605-1214/www.lakeeyrebasin.org.au/archive/media/future_directions.pdf)>.
- Silcock JL (2010) Experiencing waterholes in an arid environment, with particular reference to the Lake Eyre Basin, Australia: a review. *Geographical Research* **48**, 386–397. doi:10.1111/j.1745-5871.2010.00642.x
- Silcock JL, Piddocke TP, Fensham RJ (2013) Illuminating the dawn of pastoralism: evaluating the record of European explorers to inform landscape change. *Biological Conservation* **159**, 321–331. doi:10.1016/j.biocon.2012.11.030
- Vörösmarty CJ, McIntyre PB, Gessner MO, Dudgeon D, Prusevich A, Green P, Glidden S, Bunn SE, Sullivan CA, Liermann CR, Davies PM (2010) Global threats to human water security and river biodiversity. *Nature* **467**, 555–561. doi:10.1038/nature09440
- Zonca C (2015) Stanbroke cattle company wants to add cotton to its portfolio with \$200m Flinders River development. ABC Queensland Country Hour, <<http://www.abc.net.au/news/2015-07-06/stanbroke-wants-to-add-cotton-to-its-cattle-portfolio/6598520>>.