



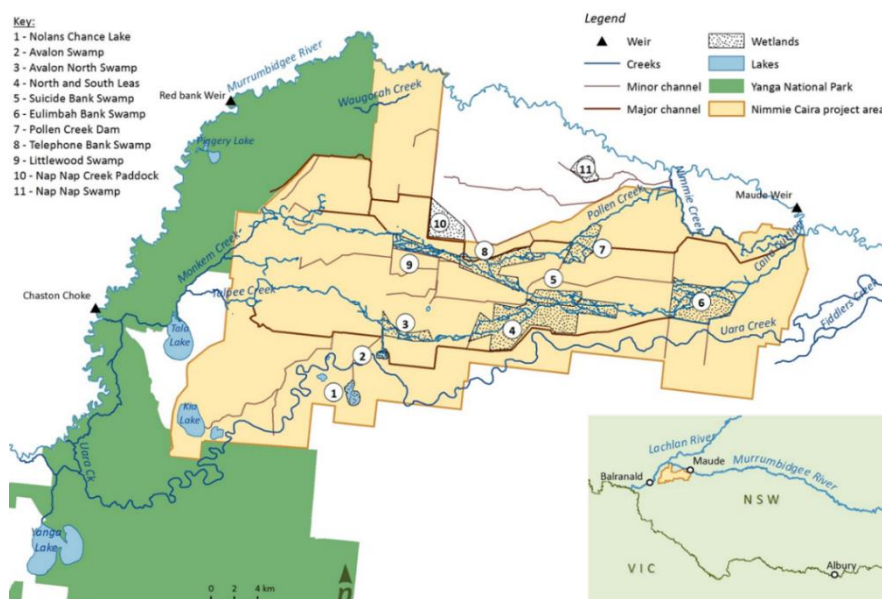
## Eco Hydrology planning and infrastructure design in the Nimmie Caira

The Nimmie-Caira forms part of the lower Murrumbidgee River system located north west of Balranald in southern NSW. The Nimmie-Caira comprises the southern floodplain for the Murrumbidgee River near the confluence with the Lachlan River. The floodplain area is dominated by lignum shrubland that supports significant colonial nesting bird rookeries

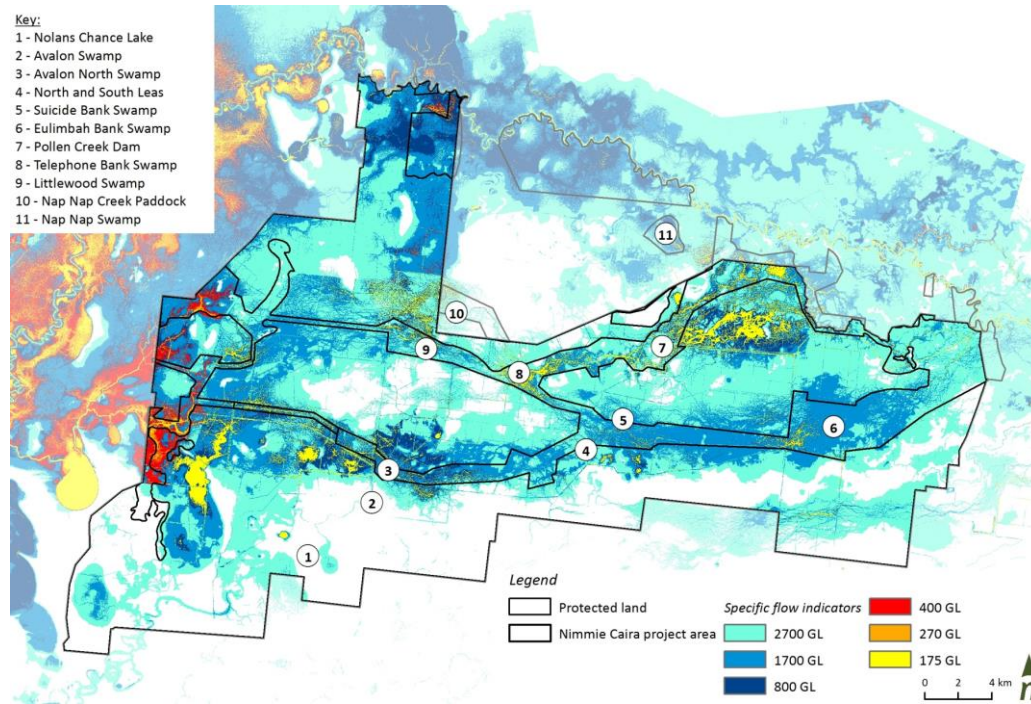
Prior to European settlement, the lignum shrublands were inundated as a result of regular natural flooding along the lower Murrumbidgee system. Following settlement and up to the 1970's the land was increasingly used for grazing. From the 1970s the area was developed for irrigated agriculture and land use intensified significantly. Developments included clearing of floodplain vegetation, and the construction of irrigation canals, regulators, levees, and embayments for the storage of water and flood irrigation of crops.

In 2012, the NSW and Commonwealth Governments entered into an agreement to purchase the land and water associated with the Nimmie-Caira irrigation area, returning the water to the system for ecological outcomes, and the land for both productive use and ecological outcomes. This venture involved the purchase of 84,417 ha and 173GL of supplementary water (Lowbidgee) entitlement.

The changes to the environment and water dependant ecosystems were complex. The way water moved through the 85,000 ha site was extraordinarily complicated to understand and one of the key challenges for was a number of the key ecological values were actually related to the irrigation land use – such as Ibis rookeries were sustained by foregoing in the irrigation bays.



Alluvium was engaged by the NSW Government to re-configure the Nimmie-Caira water delivery system and landscape to service the ecological requirements of the area. Working with Biosis we developed a deep understanding of how water moves through the landscape and the eco-hydrological relationships associated with high value ecological assets and functions.



### Inundation patterns and extents for Lower Murrumbidgee River Floodplain site-specific flow indicators (SFIs)

We derived a solution which comprises a conversion of the existing floodway-wetland-channel operations into a low maintenance, low operational requirements, fill and spill arrangement. Under this proposed arrangement water will be delivered to ecological assets via the natural flow paths (creeks and floodways) that occupy the lowest elevations across the landscape. In so doing, it is proposed that the watering requirements of these creeks and floodways will be achieved via their operation as the delivery mechanism for the wetland assets. In essence, the project seeks to return the watering of the system back to the lowest lying elements of the landscape.

The proposed arrangement provides for the effective and efficient watering of ecological assets and values, by retaining levees that constrain the lateral extent of the floodways and wetlands, where appropriate. Existing embankments that have been built to store water in the floodways, which have resulted in the formation of the major wetlands (rookeries) at the site, will be re-engineered. This re-engineering will include the lowering of the embankments and the installation of overtopping spillways that are engaged as a component of a fill and spill operation of the wetlands.

A concept design of the engineering works required was undertaken and a budget of \$8M was identified as capital costs required to achieve the new water management regime.

The NSW Government has now started the process of tending the Nimmie Caira to the market to find a long term solution that blends the environmental objectives with commercial opportunity. Alluvium continues to play a key role in advancing the strategy and planning for this landscape as it moves to the tendering phase.

For the more eco-hydrological minded, the solution set developed delivered the following watering regimes.

Event	Occurrence of flow event		Water demand for minimum watering requirement (GL/year)	Watering regime
	Maximum occurrence	Minimum Occurrence		
Southern Bell Frog and small bodied fish annual maintenance flows	100% (every year)	95% (almost every year)	Maude weir: 3 GL <b>Total: 3 GL</b> <b>(Additional 2 GL for offline ground tanks)</b>	12 days of 100 ML/day from the Nimmie-Creek regulator 15 days of 100 ML/day from the South Caira regulator  Additional 2 GL for offline ground tanks could potentially be supplied by either groundwater or from Maude Weir via stock domestic system.
Rookery Lignum health events	75% (3 in every 4 years)	50% (every 2 <sup>nd</sup> year)	Maude weir: 46 GL <b>Total: 46 GL</b>	35 days of 600 ML/day from the Nimmie-Creek regulator 42 days of 600 ML/day from the South Caira regulator
Bird breeding, lignum watering and red gum inundation events	75% (3 in every 4 years)	40% (2 out of every 5 years)	Maude weir: 82 GL Waugorah creek regulator: 12 GL <b>Total: 94 GL</b>	22 days of 1,500 ML/day followed by 66 days of 100 ML/day from the Nimmie-Creek regulator 24 days of 1,500 ML/day followed by 66 days of 100 ML/day from the South Caira regulator
Black box inundation events	33% (1 in every 3 years)	14% (once every 7 years)	Maude weir 175 GL Waugorah creek regulator: 72 GL <b>Total: 247 GL</b>	34 days of 1,500 ML/day followed by 56 days of 600 ML/day from the Nimmie-Creek regulator 40 days of 1,500 ML/day followed by 50 days of 600 ML/day from the South Caira regulator
<b>Watering including optional rehabilitation areas</b> Bird breeding, lignum watering and red gum inundation events	75% (3 in every 4 years)	40% (2 out of every 5 years)	Maude weir: 154 GL Waugorah creek regulator: 12 GL <b>Total: 166 GL</b>	48 days of 1,500 ML/day followed by 42 days of 100 ML/day from the Nimmie-Creek regulator 49 days of 1,500 ML/day followed by 41 days of 100 ML/day from the South Caira regulator

Event	Occurrence of flow event		Water demand for minimum watering requirement (GL/year)	Watering regime
	Maximum occurrence	Minimum Occurrence		
<b>Watering including optional rehabilitation areas</b>	33% (1 in every 3 years)	14% (once every 7 years)	Maude weir 222 GL	55 days of 1,500 ML/day followed by 35 days of 600 ML/day from the Nimmie-Creek regulator
Black box and rehabilitation area inundation events			Waugorah creek regulator: 72 GL	73 days of 1,500 ML/day followed by 17 days of 600 ML/day from the South Cairra regulator
			<b>Total: 295 GL</b>	