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Murray– Darling Basin Authority

> Margooya Lagoon

> > Tati Tati Purinya Kaiejin Marnmarnepu (Tati Tati Cultural Water Futures)

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Margooya Lagoon Purinya Kaiejin Marnmarnepu (Tati Tati Cultural Water Futures) was produced as a collaboration between Tati Tati Kaiejin and the Murray–Darling Basin Authority.

The views expressed in this report are those held by Tati Tati Nation members.

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### Acknowledgement of the Traditional Owners of the Murray–Darling Basin

We acknowledge the Traditional Owners and Custodians of Country throughout the Murray–Darling Basin and their continuing connection to land, waters and community. We offer our respects to the people, the cultures and the Elders past, present and emerging.

Aboriginal people should be aware that this publication may contain images, names or quotations of deceased persons.





"Tati Tati people belong to this Country. If our Country isn't healthy, we are not healthy "

> Rebecca Kennedy, with support of Tati Tati Nation members



# Declaration of sovereignty

Tati Tati Wadi Wadi kulingurra thangurra kaiejin parram parram tyalingi wangu warripa tharrayamu thangi nga thiti thalekatha kulingi kungatha delki thangi.

We, the Tati Tati Wadi Wadi, are the sovereign nation that carry the responsibilities of caring for our Country, including all waterways, landscapes, wildlife, ancestral sites, totemic species, and cultural heritage, as well as language, lore, song, dance, ceremony, and customs. This is our inherent right as Traditional Owners – our connection to place, land and animals dating back over 2000 generations.

We, the Tati Tati Wadi Wadi, state we have never ceded sovereignty, nor ever relinquished, given or traded our inherent right to Country and culture to any foreign individuals, parties, or governments. Tati Tati Wadi Wadi do not consent to any foreign individuals, parties, or governments to act on our behalf in managing Country. Our involvement in any capacity does not, and should not, be misinterpreted as Tati Tati Wadi Wadi consent for decision making or management on our behalf.

We are, and will forever be, the rightful people to care for our Country.

Through the attainment and continuation of Cultural Flows, we aspire to achieve sovereign control of water management on Country to uphold our responsibilities of caring for Country.

Data sovereignty

Tati Tati Kaiejin and the Murray–Darling Basin Authority worked together to produce an Indigenous Cultural and Intellectual Property (ICIP) agreement to ensure that all Tati Tati peoples' data sovereignty is acknowledged and protected.

The agreement respects Tati Tati people's traditional knowledge and their right to protect it in line with traditional laws and customary obligations.

### Tati Tati data sovereignty declaration\*

It is our right to protect our traditional knowledge and sacred cultural material.

It is our right to ensure traditional laws and customary obligations are being respected.

Indigenous Cultural Intellectual Property (ICIP) includes: Songs, language, stories, history, skills, beliefs, art, artefacts, sacred sites, written work, recorded language, genetic material, traditional ecological knowledge, ceremony, traditions, practices, photos and videos.

\*© Tati Tati Kaiejin Ltd 2023

### We control the WHY

We decide what story is being told and why. Our priorities are central to what data is being captured.

### We control the HOW

We determine how data is captured, stored, and shared. It is our decision who is involved in capturing and using our data.

### We control the DATA

It is our right to govern the collection, ownership, and application of our data. We have the power to withdraw consent or permissions over our ICIP at any and all times.



# Tati Tati Cultural Water Futures

The Tati Tati Cultural Water Futures project was established to provide climate risk information in relation to Tati Tati cultural objectives and priorities for Margooya Lagoon, a culturally significant wetland on the Murray River floodplain near Bumbang, the town now known as Robinvale, Victoria.

Tati Tati Kaiejin, an Indigenous-owned and operated not-for-profit organisation whose aim is to reconnect First Nations people to waterways and Country, coled this project in partnership with the Murray–Darling Basin Authority.

Tati Tati Kaiejin held 3 workshops over several months bringing together approximately 30 Tati Tati representatives, including Elders and children, to design and refine the project. The workshops were tailored to combine Tati Tati Traditional Ecological Knowledge with the Murray–Darling Basin Authority's hydrological analysis, including climate change projections.

This project is a pilot study. It is hoped that the co-led approach and concept is adapted and extended for other Traditional Owner groups within the region, and across the Murray–Darling Basin, to meet their unique priorities and cultural objectives for their riverine sites of significance. In 2020, Murray Lower Darling Rivers Indigenous Nations (MLDRIN) published their 2020-2025 Strategic Plan. One strategy in the plan was to:

"Map the likely cultural impacts of Climate Change on Basin waterways and Collaborate with partners, to scope options for improving community resilience."

Tati Tati Kaiejin partnered with the Murray–Darling Basin Authority to work towards a goal of understanding climate risk at Margooya Lagoon.

The workshops and codesign process enabled a two-way learning process for both Murray–Darling Basin Authority participants and Tati Tati representatives. Tati Tati people's substantial body of Traditional Ecological Knowledge and the extensive time series of ecohydrological observations at a local and regional scale highlighted the need to further refine and adapt the Murray– Darling Basin Authority's approach to river management, science to policy, and Traditional Owner engagement.

Greater outcomes were achieved for the project and participants with the two-way learning process, allowing climate change and climate adaption needs to be viewed more holistically. This provided a greater understanding of Margooya Lagoon's environmental and cultural values and the larger system it supports. This project showed that through collaboration, and combining traditional and hydrological knowledge, useful cultural climate risk information could be produced. The Tati Tati Cultural Water Futures project is just one case study at one site, but as a pilot project it provides a pathway to support reform. This co-led approach and concept can be adapted and extended for other Traditional Owner groups across the Murray–Darling Basin to meet their unique priorities and cultural objectives.



Margooya Lagoon is a culturally significant place making up part of a larger cultural land and waterscape known as Tol Tol for the Tati Tati Traditional Owners. For generations, Margooya Lagoon has provided Traditional Owners resources and shelter as well as a place to conduct ceremony, maintaining cultural practices and lore.





Today, Margooya Lagoon continues to be a place for Traditional Owners to connect with Country and each other. Significant ancestral sites are evident throughout the landscape including middens, occupation sites, ceremonial sites, earth ovens, scar trees, birthing trees and ring trees. For Tati Tati, these sites are an important connection to their ancestors and are places to come together to practice culture.

Since European colonisation, Tati Tati people's ability to access, care for and manage Margooya Lagoon has been restricted. Dam construction through the 20th century led to significant changes in the flow regime, reducing the frequency and extent of small to medium floods. The construction of Euston Weir in 1936 disrupted the natural flows, causing permanent inundation of Margooya Lagoon. In 2009 a regulator was installed to help manage the water levels in Margooya Lagoon, however the Tati Tati people's view is that the regulator has led to negative cultural outcomes. There have been lasting impacts from these changes in land management, river operations, over extraction and the absence of Tati Tati knowledge from management.

These impacts are contributing to a loss of resilience of Tol Tol, which is likely to be made worse by climate change.



Water pump, used to pump water from the River Murray into Margooya lagoon when overbank flows are not occuring

Water regulator, used to control water flowing in to, and out of Margooya Lagoon Margooya Lagoon

Robinvale

New South Wales

Victoria

Margooya Lagoon —

River Murray—

Tol Tol

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For generations, Traditional Owners have experienced first-hand the impacts of river regulation. For Tati Tati people, their connection to Margooya Lagoon has direct impacts on the health and wellbeing of their community.

Tati Tati people have expressed that for many of the younger generation, the declining health of Margooya Lagoon, as well as the fight for access and water, is all they've known growing up through the new wave of water colonisation and seeing the separation of water from land, over extraction and human-induced drought. One important way to combat this is for there to be opportunities for Tati Tati Elders to work on Country with the younger generation to share stories, information, lore and Traditional Ecological Knowledge. Teaching the younger generation traditional land and water practices and preparing as a community for future challenges is one form of climate adaptation. Tati Tati Traditional Owners are involved in a range of programs and initiatives aiming to incorporate their expertise and land management practices to support cultural and environmental values at Margooya Lagoon and more broadly. Some examples include:

- advocating for cultural water
- cultural burning
- Kaiejin Nursery
- flood recovery programs
- Kirby Flats Wetland revegetation project
- planning for a Kaiejin community centre from which to organise caring for Country initiatives.

This work highlights the need for Traditional Ecological Knowledge in climate adaptation. The holistic approach and incorporation of knowledge systems ensures mutually beneficial outcomes are achieved while providing resilience to reduce impacts from climate change. This requires Country and its people are at the forefront of decision making.

> "We grew up in a new wave of colonisation of our waterways"

> > Melissa Kennedy



### Tati Tati generational knowledge and observations

Margooya Lagoon has provided Tati Tati people with abundant resources used for tools, food, art, and medicine, as well as being a place that has helped sustain Tati Tati's complex cultural and social structures for generations.

Being on Country can include hunting, fishing, collecting tucker, teaching culture, burning and visiting sacred sites, rely on traditional knowledge, and carrying out traditional practices. When and where these activities can occur is important, as is ensuring that this knowledge is passed on to future generations.

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### Impacts through time

Over recent generations, observed changes in water management and climate have resulted in major impacts on the cultural and environmental character of Tol Tol.

Changes in the natural flow regime have caused seasonal shifts in the environment that impact on the timing and duration of cultural and environmental events. As a result, there has been a reduction of species, including plants and animals for bush tucker and culturally significant totemic species. Unseasonal flooding from river regulation impacts Tati Tati's access to Country to carry out cultural traditions, gatherings and land management in the required seasons. The interconnected relationship of Tati Tati people to Margooya Lagoon means when Margooya Lagoon is sick, so too are its people. No access to clean water, traditional medicine, bush tucker and Country has lasting impacts on human physical and mental health.

### Visualising changes

The hydrograph on this page combines real flow data from the Boundary Bend gauge on the River Murray with Tati Tati oral histories to help tell the story of people's lived experience.





# Overbank flows

Wetlands and floodplains like Margooya Lagoon are an important feature of the Murray–Darling Basin that provide valuable environmental, cultural and economic benefits. These ecosystems evolved with the seasonal rise and fall of rivers. The timing, duration and size of floods and dry periods is critical for triggering natural events and cultural events.

Gathering on Country, conducting ceremony and other cultural traditions, as well as natural fish movement, bird nesting, and nutrient cycling, rely on natural flow and flooding regimes that connect floodplains and wetlands to the river. Overbank flows are one type of flow that is important every now and then for watering floodplains and filling wetlands. Overbank flows occur when the river raises higher than its banks. These flows help to improve soil and water quality, provide food and shelter for fish, bugs and birds, and protect important cultural heritage sites such as culturally modified trees, and other significant places.

trees and other significant cultural heritage sites. The flows recharge floodplains, cycle nutrients improving water and soil quality while providing food and habitat for animals. Overbank flows naturally occurred 10 in 20 years prior to river regulation, Margooya Lagoon over extraction and removal of will only fill without Tati Tati Traditional Owners from intervention 3 times Margooya Lagoon. in 20 years under the median climate scenario. Margooya Lagoon >> Overbank flow (above 55,000 ML/d) **Murray River** Occurring only 3 of 20 years under a medium climate scenario. This is a reduction from the 10 over bank events expected over 20 years prior to river regulation Large fresh

Overbank flows help to protect important culturally modified

Overbank flows

### **River regulation**

River regulation and extraction of water is one major factor in the decline of Margooya Lagoon's cultural and environmental values. Prior to river regulation, Margooya Lagoon filled seasonally when the Murray River rose high enough to produce an overbank flow connecting the flood plain and wetland with the river.

The construction of dams and weirs, such as Euston weir in 1936, impacted this connectivity reducing the number, frequency and timing of overbank flows. When paired with the likely effects of climate change, the health and connectivity of rivers, wetlands and floodplains will face further challenges.

In some cases, beneficial environmental outcomes can be achieved through the delivery of water at the right time and place through use of regulators or pumping. This can help replicate natural river connectivity, triggering the right conditions for fish recruitment, and supporting vegetation growth higher on the floodplain. While a regulator at Margooya Lagoon helps replicate the wetting and drying regime of the lagoon, it does not provide the necessary outcomes required to achieve Tati Tati Cultural Flow objectives.

At Margooya Lagoon, some of the specific benefits observed in the time after an overbank event include bush medicine growing on the riverbanks, an increase in yam daisies, and an increase in yabbies and cod.

When water is not frequently received by the culturally modified trees and sacred sites that are located higher on the floodplain, it impacts their health and condition. Major changes in the natural flows caused by river regulation include:

- Change in seasonality impacting natural cues of animals (i.e. high flows triggering yellow belly and Murray cod to migrate and spawn).
- Reduced variability of flows resulting in fewer low water periods allowing Country to dry out, and fewer high flows to reconnect parts of Country to the river.
- Reduced frequency of floods decreasing the number of times that floodplains and wetland habitat are inundated (important for River Redgum regeneration and health).





Overbank flows

## Tati Tati Cultural objectives and analysis

To understand what flow rate water started flowing into Margooya Lagoon's natural inlets, Tati Tati man Brendan Kennedy undertook real-time on-theground observations in late September and early October 2022. The Murray– Darling Basin Authority were able to use this information to determine the relevant flow rate was 55,000 ML/day at Boundary Bend (a site just upstream of Margooya Lagoon).

In the workshops, a month (30-day consecutive duration) was discussed as the minimum amount of time that an overbank flow rate was needed for a positive outcome for Margooya Lagoon, as that duration allowed water to travel through the landscape.

While timing of the event was also discussed, it wasn't specifically included

in the following analysis. Ideally the water should be on Country late winter to spring. Tati Tati have published a seasonal calendar with more information on Tati Tati seasons. <u>https://www.kaiejin.org.au/</u> land#heroLand

The Murray–Darling Basin Authority used guidelines developed by Victoria ("Guidelines for Assessing the Impact of Climate Change on Water Availability in Victoria") to model the Murray River under different conditions, including near natural and current conditions. Outputs produced by this method represent the Murray River under different conditions, including near natural and current conditions.

For more information on the model scenarios used, please see the report *Constraints under a Future Climate*, Table 3: Source Murray Model (SMM) model scenarios, MDBA. <u>https://www.mdba.gov.</u> <u>au/publications-and-data/publications/</u> <u>constraints-under-future-climate</u> On top of current conditions, the Murray– Darling Basin Authority is also able to model the impact of climate change on river flow rates across a range of scenarios including Wet, Medium and Dry. The analysis used future flow rates for Boundary Bend projected for the year 2045 to understand the impacts of climate change at Margooya Lagoon.

Using the Tati Tati Cultural objectives for overbank flows, the analysis then determined the likelihood of achieving Tati Tati objectives under past, current and possible future river conditions.

The Murray–Darling Basin Authority's analysis highlights a worrying trend in naturally occurring overbank events (without pumping or other infrastructure management) for Margooya Lagoon. Long-term average rates of overbank flows will reduce under likely future climate scenarios. Prior to river regulation, Margooya Lagoon filled naturally through natural inlets when river levels in the Murray River were high enough to produce overbank flows 10 times in 20 years on averag

As a result of the impacts of r regulation and climate change that by 2045 Margooya Lagoon will on average receive flows through its natural inlets only 3 times in 20 years (Table 1).

Basin States have water plans which guide the management of water for environmental outcomes over the longer term. The requirements for cultural outcomes can be expressed in a similar way. Based on Tati Tati Cultural objectives shared over 3 workshops, the below table represents one cultural watering objective at Margooya Lagoon framed in a format that is familiar to policy makers and water managers.

Before river regulation and the impacts of climate change, Margooya Lagoon would have been filling on average once every second year (50% frequency) (Table 2).

| iver<br>, it is likely<br>will on | Past river conditions (near natural)     | 10 years in 20 (51.8%) |  |  |
|-----------------------------------|--|------------------------|--|--|
|                                   | Current River conditions (Basin Plan)    | 6 years in 20 (29.8%)  |  |  |
|                                   | Future Wet 2045 climate                  | 6 years in 20 (31.6%)  |  |  |
|                                   | Future Medium 2045 climate (most likely) | 3 years in 20 (15.8%)  |  |  |
|                                   | Future Dry 2045 climate                  | 1 year in 20 (6.1%)    |  |  |

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Model scenario

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Table 1: Changes to overbank flow under different climate scenarios

Table 2: Tati Tati Cultural Watering objectives

| Flow     | Cultural objectives       | Location | Flow Rate | Timing  | Duration | Frequency |
|----------|---------------------------|----------|-----------|---------|----------|-----------|
| category |                           |          | (ML/d)    |         |          |           |
| Overbank | Increased bush            | Measured | More than | Late    | 30 days  | 50%       |
|          | medicine, daisy yams      | at       | 55,000    | winter- | minimum  |           |
|          | growth on the floodplain, | Boundary |           | spring  |          |           |
|          | abundance of yabbies      | Bend     |           |         |          |           |
|          | and cod, improve          |          |           |         |          |           |
|          | condition of culturally   |          |           |         |          |           |
|          | modified trees.           |          |           |         |          |           |
|          |                           |          |           |         |          |           |

flow occur?

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How many years in 20 will an overbank



Link to seasonal calendar: https://www.kaiejin.org.au/land#heroLand



# The bigger picture

The workshops highlighted that changes in the frequency of overbank flows is just one part of a much bigger story.

The changes expected in rainfall patterns under the most likely climate scenario, as well as increased frequency and severity of extreme events, will put further stress on Margooya Lagoon's cultural and environmental values:



### **Reduced flows**

Reduced flows mean fewer overbank flows naturally connecting Margooya Lagoon's significant cultural sites.

Less water on Country will impact access to Country and important sites, resulting in further impacts to physical, mental and spiritual health outcomes.

Interventions to manage and adapt to reduced flows are needed to achieve Tati Tati Cultural objectives.



### Water quality

Margooya Lagoon functions as a wetland, filtering water and providing refuge for plants and animals.

This important role helps to support the larger system maintain resilience in tougher, drier times.

Without adequate protection these functions will decline further as extreme events and water quality issues persist.

Occurrences of blue-green algae outbreaks and blackwater events will increase as the climate warms, impacting fish communities such as cod, catfish, yellowbelly and yabby.

Trees, plants and macrophytes will continue to deteriorate without their natural wetting and drying cycles.



### Seasonal impacts

The resources and tucker Tati Tati rely on are impacted as the natural cues that trigger life cycle events in nature are disrupted.

Natural cues or environmental requirements such as water flows and temperatures don't align to fish breeding events, bird migrations are impacted resulting in nest abandonment and the fruiting and flowering of plants is impacted.

These seasonal changes due to both river regulation and climate change have significant impacts on Country and environmental values as the ecosystem fails to provide the food and resources to support itself.

