

Review of Bird Monitoring undertaken on the Mid Waimakariri River



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Introduction

Since 2008, Environment Canterbury has been monitoring braided river birds within the Mid Waimakariri River, within the Waimakariri River Regional Park (see below for geographical boundaries). The aim of this monitoring is to understand the impacts of conservation actions aimed at improving outcomes for braided river birds, specifically the control of Southern Black-backed Gull, mammalian predator control and public management and advocacy.

In a feedback loop, monitoring was intended to help inform management options and provide direction to conservation actions within the Waimakariri River Regional Park. In 2020 a Braided River Bird Management Plan for the Waimakariri River Regional Park was instigated, and this formalised both conservation actions, and braided river bird monitoring. Further in 2024 Environment Canterbury commissioned the *Waimakariri River control and monitoring plan for Karoro/Southern Black-backed Gull* (Bell 2024), to co-ordinate Karoro management on the river.

Initially bird monitoring focuses on Black-billed Gull, but over time developed to include Black-fronted Tern, and following the development of the Management Plan included Banded Dotterel and Wrybill. Different methodologies were used to monitor different species, largely due to varied breeding ecology (colonial vs individual breeders).

This report summarises a review of bird monitoring undertaken since 2008.

Objective

To assess the effectiveness of bird monitoring on the Mid Waimakariri River, Environment Canterbury has commissioned a review of their bird monitoring programme.

This was focused on a review of the current programme of bird monitoring to evaluate the learnings; in particular to:

- Where possible, assess trends in productivity of species monitored.
- Where possible, identify key threats and the most common cause of nest/colony failure.

- Where possible, establish if there are any geographic effects on breeding success (are sections of river more productive than others).
- Assess the effectiveness of past bird monitoring.

Then following this, in order to ensure value for money while maintaining strong conservation outcomes, the objectives of the review will aim to answer the following key questions in order to prioritise effort of future bird monitoring:

- Should we continue bird monitoring, and if so, should this include the current suite of species (Black-billed Gull, Black-fronted Tern, Wrybill, Banded Dotterel) and/or include other species?
- Which sections of the river should be prioritised (or deprioritised) for monitoring?
- How can the data be better used to inform management decisions?
- Can we track and demonstrate an increase in bird populations in this stretch of river over the next 10 years in line with the management actions, e.g. predator trapping, advocacy and in particular the Karoro/ Southern Black-backed Gull Management Plan and ongoing control work?

Background context

Bird monitoring started on the Waimakariri in 2008, initially with Black-billed Gulls, and progressively adding additional species. Since this time, Environment Canterbury have commissioned several key documents that have influenced bird monitoring on the river.

Braided River Bird Management Plan for the Waimakariri River Regional Park.

In 2020, Environment Canterbury commissioned a *Braided River Bird Management Plan for the Waimakariri River Regional Park* for the Mid Waimakariri River (Wildland Consultants Limited 2020). This plan outlined a recommended management regime to help improve outcomes for braided river birds; included weed control, pest control and education and advocacy. The Management Plan also outlines monitoring priorities, with the report outlining the highest priorities for monitoring as follows:

1. Continuation of the annual aerial Black-backed Gull counts.
2. Continued monitoring of the nesting success at colonies of Black-billed Gulls and Black-fronted Terns.
3. The addition of Banded Dotterel and Wrybill nest monitoring.
4. Monitoring of mammalian pests, which should be done in conjunction with the establishment of landscape-scale riparian trapping.

The development of the Management Plan was the catalyst that initiated Banded Dotterel and Wrybill nest monitoring from 2021. Mammalian pest monitoring has been carried out once in 2021, and as this review focuses on bird monitoring, no evaluation of mammalian pest monitoring is included in this report.

Protocol for best practice in monitoring braided river birds

In 2019 Environment Canterbury commissioned the *Protocol for best practice in monitoring braided river birds*. The primary aim of this document is to serve as a “best practise” guide for surveying and monitoring protocols of braided river birds (Mischler and Malony 2019). This document for the first time outlined recommended monitoring methods for bird species found on braided rivers; to avoid inconsistencies in methods, enable comparisons across site and time periods, and measure effectiveness of conservation actions.

Significantly, bird monitoring on the Mid Waimakariri started before the development of the *Protocol for Best Practice*. This review utilises the *Protocol for Best Practice* to help measure the effectiveness of monitoring, however, this is undertaken with the understanding that retrospectively assessing the effectiveness of monitoring to a “best practise” before they were established has some limitations.

Southern Black-backed Gull management plans

The braided rivers of Canterbury support large populations of Karoro/Southern Black-backed Gull, which are negatively impacting on braided river birds. In response to this, in 2019 Environment Canterbury commissioned the *Canterbury Southern Black-backed Gull/Karoro Management Strategy* (Bell & Harborne 2019), in which, a control regime was developed that aims to reduce the Canterbury Karoro population to 10% of its current level.

Further in 2024, to support conservation actions on the Mid Waimakariri River, Environment Canterbury commissioned the *Waimakariri River control and monitoring plan for Karoro/Southern Black-backed Gull* (Bell 2024). This plan highlighted that the Mid Waimakariri had c.5000 breeding pairs of Karoro. To reach the targets in the *Canterbury Karoro Management Strategy* of reducing the Waimakariri population to <10% of its current size, a control regime of culling 20% of adult birds and reducing productivity by 50% was recommended.

Both of these plans are linked to the Braided River Bird Management Plan, and Karoro control is a key conservation action carried out on the Waimakariri River.

Study site – Mid Waimakariri River

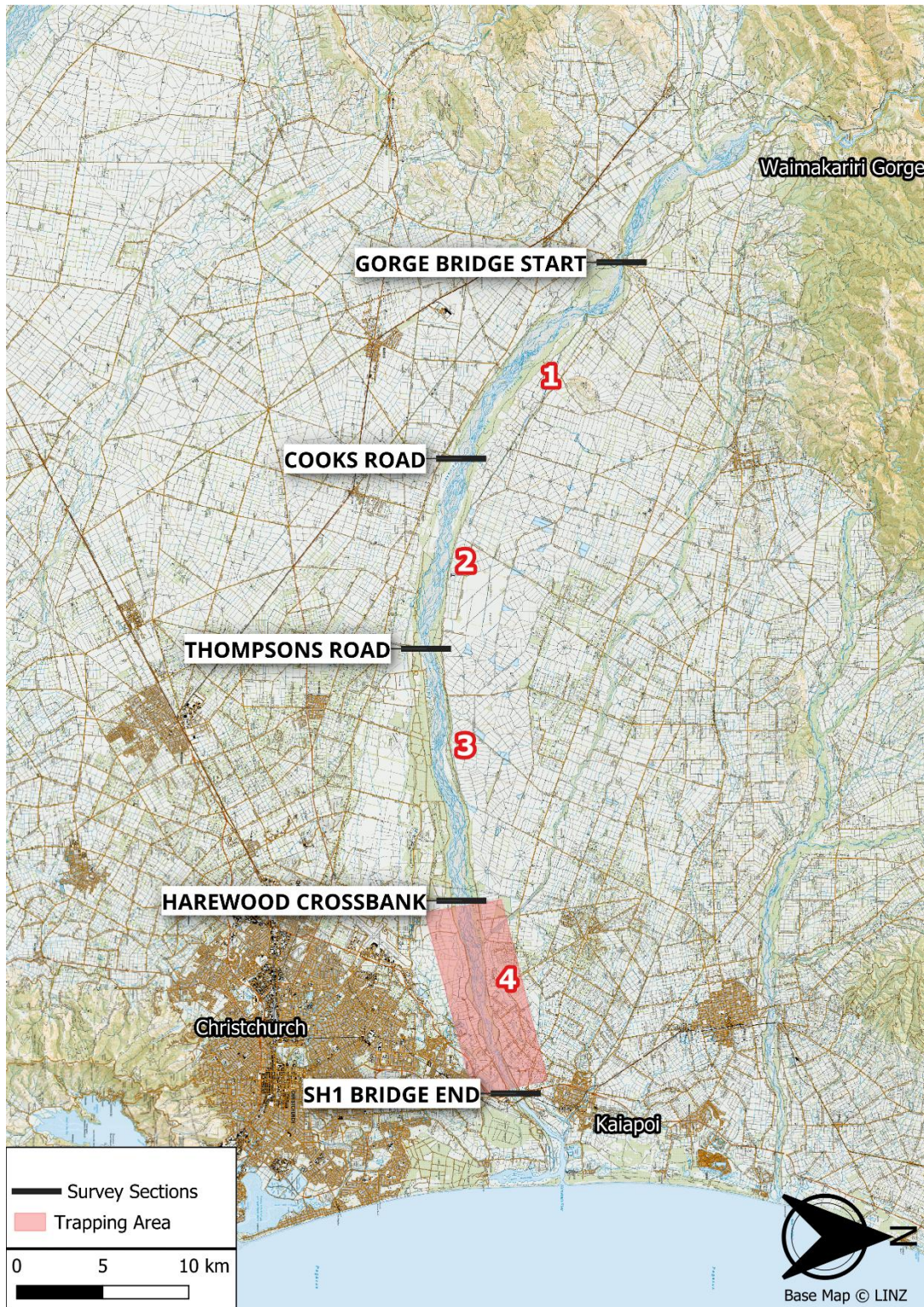
The Waimakariri River is a significant 151km braided river in Canterbury, from headwaters in the Southern Alps, it flows to the coast emptying into Brooklands Lagoon, near Kaiapoi. The average flow is c.75m³/s, but it can exceed 4,000m³/s during floods. It is a popular recreation river, with good fishing (sea-run salmon and trout), boating, biking and walking. Much of the river falls within the Waimakariri Regional Park, that provides and encourages access through a network of road and walking access points, tracks and public boat ramps. The Waimakariri is an important area for shorebirds, with a range of braided river dependent species breeding on the river.

Although Environment Canterbury has undertaken bird monitoring on much of the length of the Waimakariri River, this review focuses on the area typically called the Mid Waimakariri River. This is the part of the river from the Waimakariri Gorge Road bridge (near Sheffield) to the State Highway One bridge (Figure 1). This section of river has been divided into four count sections where walk-through bird surveys have been carried out periodically since the 1980's (see below).

For naming consistency, this report utilises the following terminology for naming various parts of the River -

- Mid Waimakariri River – Used to describe the entire study site area of this review, from the Waimakariri Gorge bridge to the State Highway One bridge. This remains consistent with most reports on the river's birdlife.
- Mid Waimakariri River bird count sections – The Mid Waimakariri is divided into four count sections, named Section 1 through 4. Section 1 starting at the Waimakariri Gorge bridge, with Section 4 ending at the State Highway One bridge (Figure 1).
- To investigate any geographical differences in bird distribution and breeding success this report further divides the Mid Waimakariri River into two areas. Combining Count Sections 1 and 2, called "Top Sections", and Sections 3 and 4 "Bottom Sections". This terminology is used to avoid confusion with other naming wider sections of the Waimakariri River utilised in other reports (i.e. upper Waimakariri River which generally refers to the braided river above the Gorge).

Figure 1. Area of focus of bird monitoring review, the Mid Waimakariri River. Braided river bird walk-through survey sections 1-4 highlighted, with section start and fish points indicated.



Methods

Environment Canterbury has been monitoring birds on key braided rivers for the past two decades. The Mid Waimakariri has a high level of bird monitoring, this includes:

- Braided river bird walk-through surveys - At regular intervals the Mid Waimakariri river is surveyed counting all birds encountered. These surveys are carried out successively for 3-4 years followed by a 6-7-year gap. As mentioned, the river is divided into 4 count sections, with a team of observers spreading out across the riverbed, walking downstream recording all birds encountered. Communication between observers reduces double counting, both individual birds seen, and colonies are counted to determine the number of each species present on the river. These surveys have been carried out since the 1980's, providing a valuable dataset on bird population trends.
- Breeding success outcome monitoring for specific species – Monitoring of select species breeding output has been occurring on the Mid Waimakariri since 2008. This initially started with Black-billed Gull, and over time also included Black-fronted Tern, Banded Dotterel and Wrybill. Monitoring is aimed at determining breeding success, productivity and causes of nest failure.
- Karoro/Southern Black-backed Gull aerial survey - Since 2016, annual aerial surveys to count the number of breeding Southern Black-backed Gull has been conducted. Once during mid-incubation observers fly up the Mid Waimakariri River recording the location and size of colonies to determine the annual breeding population.
- Region-wide, Black-billed Gull aerial surveys – Since 2014 there have been two regional wide aerial surveys to determine the numbers of Black-billed Gull breeding in Canterbury. Using a fixed wing aircraft all major rivers in Canterbury are flown each season for three years. Aerial photos are taken of each colony found, and then these are counted to determine their size.

This review has delved into these data sources, to provide a complete overview of bird monitoring on the Mid Waimakariri. Since 2008, breeding outcome monitoring of species has been collated in “End of Season Reports”, and these provide the bulk of information on breeding success and threats impacting breeding. Where needed to gather more information, when available I also went back to raw data.

Results

Tarāpuka/ Black-billed Gull

Endemic

Conservation threat status:
Declining

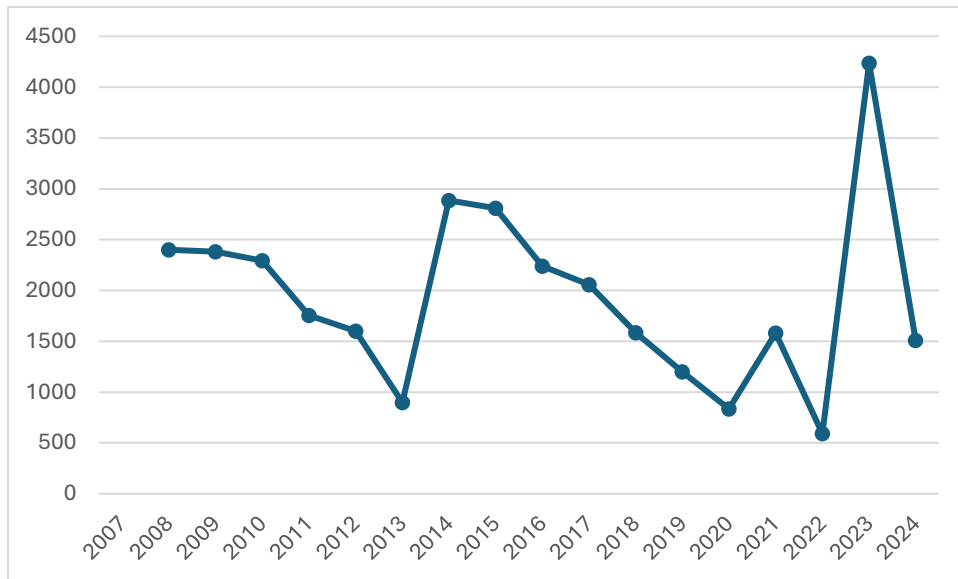


Population size and trends

The number of Tarāpuka/ Black-billed Gulls recorded breeding on the Mid Waimakariri has fluctuated since the start of systematic monitoring in 2008; with between 300-4,500 breeding pairs present. Interestingly, there appears to be a cyclic trend, with the number of breeding pairs peaking, followed by a gradual 5–6-year decline (Figure 2). As Black-billed Gulls are highly mobile, monitoring of single river systems does not produce reliable population trend data (Mischler 2017). Gulls often switch rivers both between, and within breeding seasons following flood events.

Region wide, Black-billed Gull censuses carried out throughout Canterbury show that the regional population has remained stable, with annual fluctuations between the relative importance of particular rivers. Unlike many rivers in Canterbury, each season the Mid Waimakariri does support breeding Black-billed Gulls. This matches national trends, which show that the national population has remained stable between 2014-16 and 2023-24 (Mischler *et. al* 2025).

Figure 2. The number of breeding pairs of Black-billed Gull recorded on the Mid Waimakariri River 2008-2024.

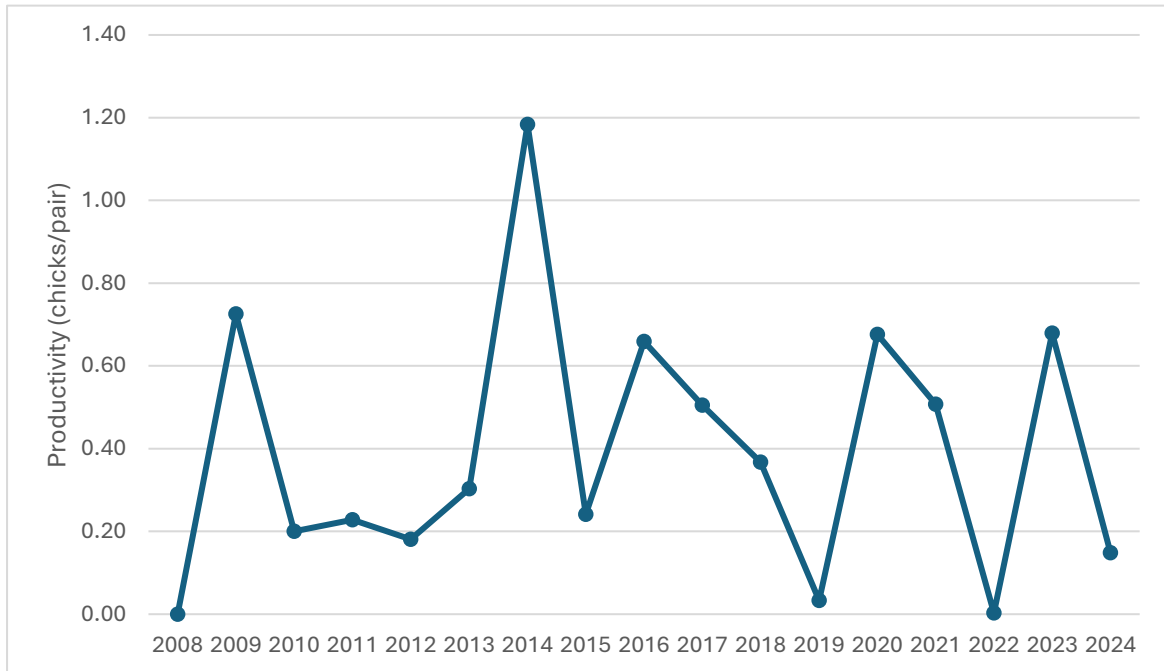


Productivity

Black-billed Gull breeding has been monitored annually on the Mid Waimakariri River since 2008. Black-billed Gulls are colonial breeders that form dense colonies, with nests exceptionally close together. Intense monitoring following the fate of individual nests is not feasible without causing significant disturbance, and as such, colony wide monitoring is recommended (Mischler and Maloney 2019). Although monitoring was established well before the development of *Best Practise Guidelines* monitoring has followed what was subsequently recommended (Mischler and Maloney 2019). Each season the number of breeding birds within colonies was determined, and the number of chicks fledging counted, enabling productivity to be calculated.

Productivity has varied annually from 0 – 1.18 chicks fledged/pair (average 0.39 chicks/pair) (Figure 3). The colony wide monitoring carried out, has provide good data on productivity for a significant time period, with a 17-year data set.

Figure 3. Annual productivity (chicks/pair) of Black-Billed Gull on the Mid Waimakariri River 2008-2024.



Black-billed Gull productivity is influenced by river flows, essentially the number and frequency of flood events throughout the breeding season (October-January).

There are two river flow gauges on the Mid Waimakariri River, one at the Old State Highway railway bridge, and one at the Waimakariri Gorge. The Old State Highway railway bridge gauge is influenced by the state of the tide, so the Waimakariri Gorge bridge gauge provides the best measure of the rivers state.

An annual flood of $>2.95\text{m}^3/\text{s}$ recorded at the Waimakariri Gorge bridge is a significant annual flood, that floods most areas of exposed gravels and likely significantly impacts breeding braided river birds that primarily nest on clean gravels. Some of the more consolidated, vegetated, higher islands and banks will survive a $>2.95\text{m}^3/\text{s}$ flood, but generally these areas are not utilised by Black-Billed Gulls.

To investigate the impacts of annual flood events on gull productivity, I compared annual productivity with the number of $>2.95\text{m}^3/\text{s}$ flood events each season, and the maximum number of days between $>2.95\text{m}^3/\text{s}$ flood events each season.

There is a positive relationship between productivity recorded on the Waimakariri River and the number of $>2.95\text{m}^3/\text{s}$ flood events during the breeding season, with productivity higher in seasons with fewer flood events (Figure 4). There is a strong positive relationship between productivity and the maximum number of days between $>2.95\text{m}^3/\text{s}$ flood events; with productivity increasing significantly in seasons with >95 days between flood events (Figure 5).

Figure 4. Black-billed Gull productivity (chicks/pair) in relation to the number of $>2.95\text{m}^3/\text{s}$ flood events each breeding season.

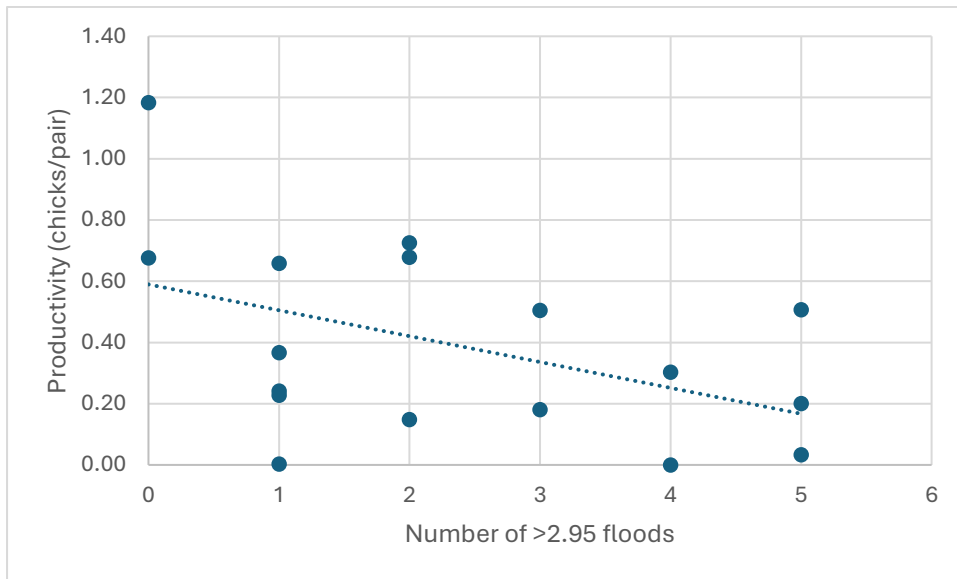
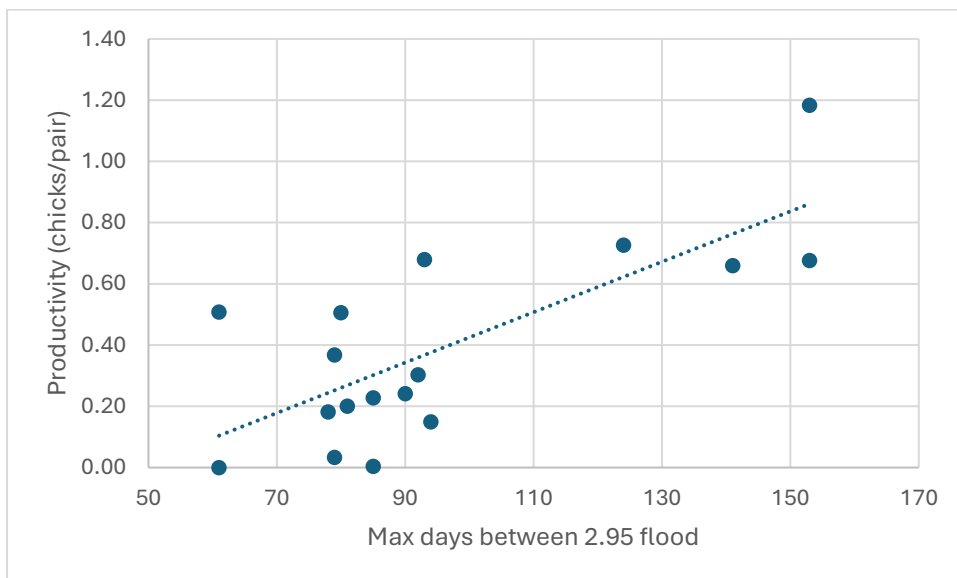


Figure 5. Black-billed Gull productivity (chicks/pair) in relation to the maximum number of days between $>2.95\text{m}^3/\text{s}$ flood events.



Cause of breeding failure

As stated above, it is impossible to follow individual nest fate without causing significant colony disturbance. So outside of complete colony failure events (i.e. flooding, significant human disturbance causing mass abandonment), it is impossible to determine the cause of individual nest failure and analytically assess the importance of individual threats to Black-billed Gull breeding. However, each year, when observed (or recorded from field sign) known causes of nest failure have been recorded.

Unsurprisingly flooding was the most recorded cause of nest failure, occurring in 13 of 17 seasons (Table 1). Predation was significant; however, observations were during day-time visits to colonies, or from field sign detected at colonies. This likely meant that the recording of predators was biased towards diurnally active predators (avian predators). Mammalian predation was recorded by field sign when found, and as such is likely under-estimated. No camera monitoring has been carried out on Black billed Gulls, and other projects have shown that this also likely under-estimates nocturnal predation events.

Human disturbance and persecution on the Mid Waimakariri were significant. Human Persecution is considered the wilful destruction of nest or killing of adult birds. This included driving through colonies, destruction of nests, allowing dogs into colonies, and shooting birds at colonies. Human disturbance is considered unwittingly disturbing breeding birds, often unintentionally, or without realising that harm was being caused. This includes walking dogs or fishing near, but not within, colonies that cause birds to leave nest and display territorial behaviour (dive, bomb or swarm) directed at the person/s causing disturbance. Although both behaviours are human induced impacts, I separate them in this report as they require different conservation actions.

Table 1. Cause of Black-billed Gull nest failure recorded on the Mid Waimakariri River, from direct observation or field sign recorded at colonies. Includes both mass colony failure (i.e. flooding, significant human disturbance causing mass abandonment), or where recorded individual nest failure (i.e. partial colony flooding, predation of some nests). Yes – direct observation or absolute field sign recorded; Pos – predation recorded and field sign considered highly likely to be from identified predator.

Cause of nest failure		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Flooding		Yes		Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes			13
Predation	SBBG	Yes	Yes	Yes	Yes		Yes		Yes			Yes		Yes				Yes	9
	Harrier				Yes		Yes					Yes						Yes	4
	Mammalian					Pos									Pos				2
	Stoat							Pos											1
	Feral cat							Pos											1
Human disturbance							Yes		Yes	Yes		Yes		Yes	Yes	Yes	Yes	Yes	9
Human persecution				Yes				Yes	Yes			Yes	Yes	Yes				Yes	7

Geographical effects

Although Black-billed Gull nest throughout the Mid Waimakariri River, there is a tendency for birds to nest in the bottom section of the river (Figure 6), with 80% of colonies occurring in the bottom reaches of the river (Count Sections 3-4). Few colonies have formed within the recently established trapping network. The clustering of colonies in the bottom reaches, meant that sample sizes are too low to assess any geographical influence on breeding success (i.e. did colonies higher up the river fare better than colonies in lower reaches). Unsurprisingly, likewise, a similar trend is seen in the river survey data, with, on average over 75% of gulls recorded in the bottom reaches of the river (Figure 7).

Figure 6. Location of monitored breeding colonies of Black-Billed Gull on the Mid Waimakariri River, 2008-2024. Purple lines indicate permanent trap lines established in 2021.

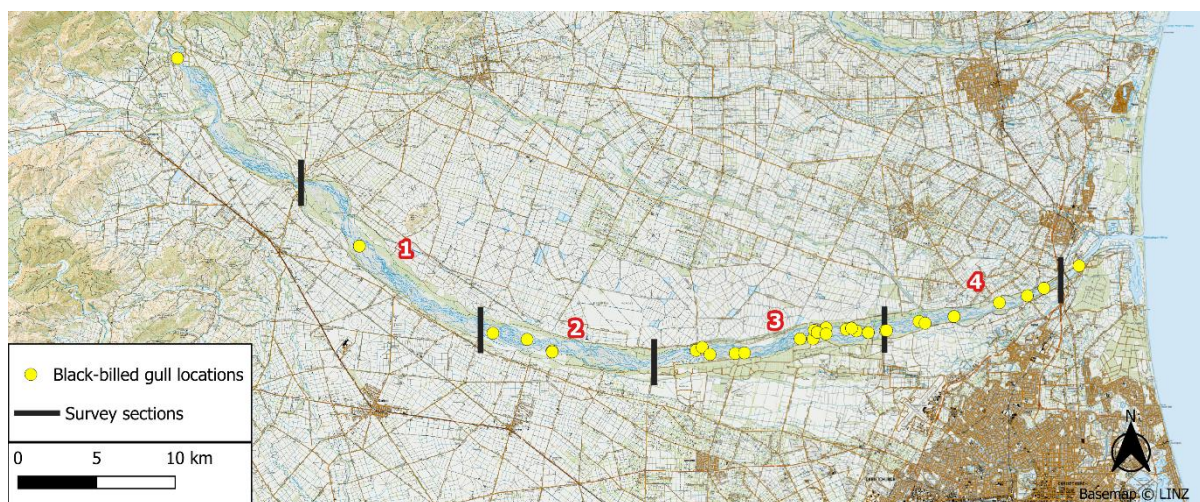
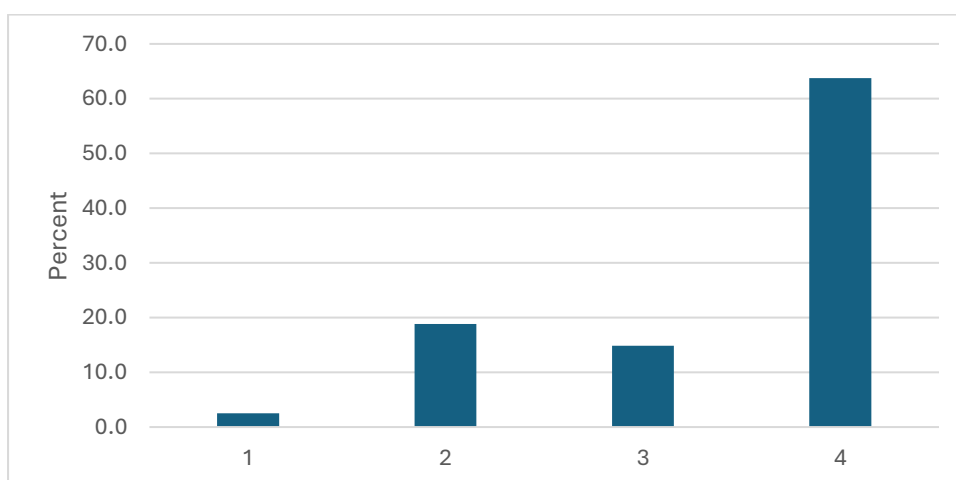


Figure 7. Average proportion of Black-billed Gull recorded in each count section of the Waimakariri River during river wide surveys.



Tarapirohe/ Black-fronted Tern

Endemic

Conservation threat status:
Nationally Endangered

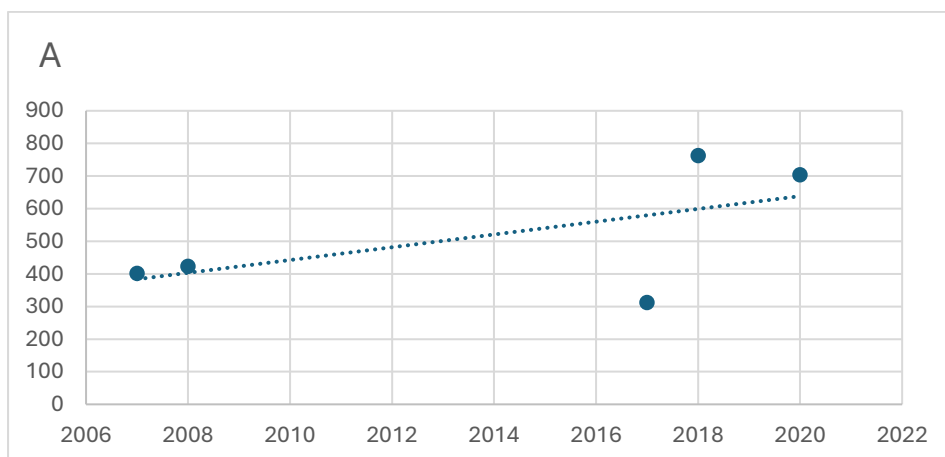


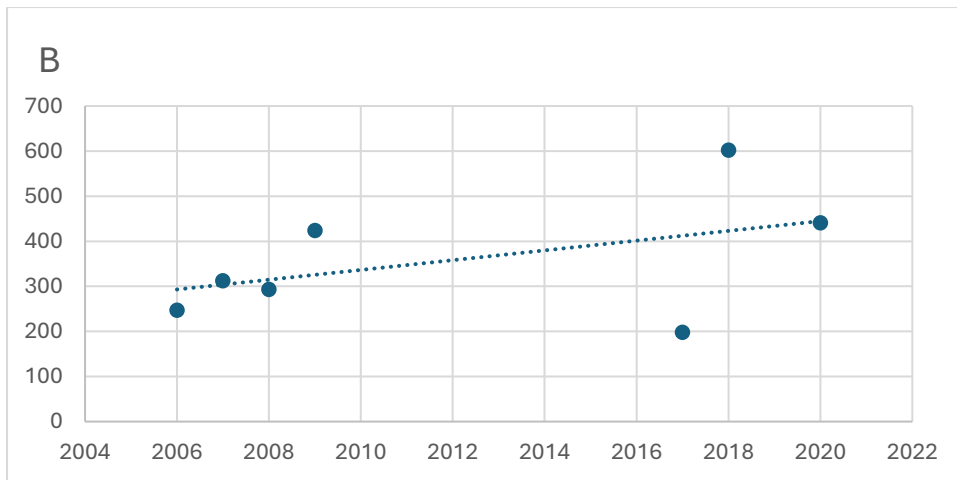
Population trends

The number of Black-fronted Terns counted during river surveys show an increase in numbers between the 2006-2009 survey period, and the 2017-2020 period (Figure 8). The trend is similar for both full surveys (Sections 1-4, n=5 years), but also for years when only partial surveys were completed (Sections 1-3, n=7 years).

This trend is surprising and is at odds with the National decline reported by O'Donnell and Monks (2011). The number of birds recorded on the Mid Waimakariri during the breeding season is nationally significant, representing 3.5-8% of the national population (Fink *et. al* 2025, O'Donnell and Monks 2011).

Figure 8. The number of Black-fronted Tern recorded on the Mid Waimakariri River during river surveys 2006-2020. A) Full surveys of all sections; B) Part surveys of section 1-3 to incorporate data from years when full surveys were no possible.





Productivity

Black-fronted Tern breeding has been monitored on the Mid Waimakariri River intermittently since 2010, with varying degrees of intensity. Prior to 2022, this breeding success monitoring has involved \geq weekly checks of colonies, to locate nests, determine hatching success, determine cause of nest failure from field sign at failed nests, and assess fledging success.

As *End of Season Reports* acknowledge, the low level of monitoring increases the uncertainty of monitoring results. Especially in determining the cause of nest failure, and fledging success. To help address this, since 2022 a sub-sample of nests have been monitored with cameras to follow the fate of individual nests.

Productivity from monitored nests on the Mid Waimakariri has been low, between 0.02-0.3 fledged chicks/pair annually. However, these figures should be treated with some caution, as monitoring intensity between years has varied, likely impacting on results, or at least increasing the margin of uncertainty around productivity results. However, like most braided rivers, Black-fronted Tern productivity is low. Given that walk-through surveys have detected a population increase, these results are at odds with that result.

Since 2022, 28 individual nests have been followed with cameras (5-18 nests annually). Overall productivity has been low, 0.18 chicks fledged/pair, however, there has been wide annual variation; two seasons saw productivity at 0 chicks/pair, with the third season 1 chick/pair was produced. To date only recorded cause of nest failure has been nest abandonment, likely caused by human disturbance.

Cause of nest failure

Across all years, flooding has been the most often recorded cause of nest loss, followed by human disturbance (Table 2). Predation, both Harrier, SBBG and probably mammalian predators is also impacting breeding success; again though, observations

are likely biased to diurnal predators, and monitoring frequency will mean field sign at nests is likely lost between visits and as such results underrepresent the impacts of mammalian predators. Again, as with Black-billed Gulls, quantitative data on nest loss has not been recorded, limiting the ability to assess the importance of individual threats.

Monitoring with cameras since 2022 has not added significantly to the knowledge of nest failure. No predation events at Black-fronted Tern nests have been recorded on camera, with all nest failure a result of abandonment, likely due to human disturbance (Table 3). However, sample sizes are low, and cameras deployed within single more easily accessible colonies (and often not true islands with wide and deep channels). Individual Black-fronted Tern colonies are often impacted by single events (predation or disturbance) causing widespread nest loss, so placing all cameras within single colonies potentially biases results.

Table 1. Cause of Black-fronted Tern nest failure recorded on the Mid Waimakariri River, from direct observation or field sign recorded at colonies. Includes both mass colony failure (i.e. flooding, significant human disturbance causing mass abandonment), or where recorded individual nest failure (i.e. partial colony flooding, predation of some nests). Yes – direct observation or absolute field sign recorded; Pos – predation recorded and field sign considered highly likely to be from identified predator or human disturbance.

Cause of nest failure		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Flooding				Yes	Yes			Yes			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	11
Predation	SBBG												Yes	Yes					2
	Harrier				Yes	Yes						Yes	Yes						4
	Mammalian							Pos				Pos			Pos	Pos			4
	Black-billed Gull											Yes							1
Human disturbance				Yes				Pos			Yes	Yes	Yes		Yes	Yes	Yes	Yes	9
Human persecution				Yes								Yes	Yes						3

Table 3. Results of camera monitoring at Black-fronted Tern nests on the Mid Waimakariri River, 2022-2004.

		2022	2023	2024	Total
Nests followed		5	18	5	28
Nest hatched >1 egg		2	8	0	10
Chicks fledged		5	0	0	5
Productivity (Chicks fledged/nest)		1	0	0	0.18
Number of nests that failed		3	18	5	26
Cause of failure	Abandoned and scavenged	3	18	5	26
	Human disturbance*		18	5	23

*based on field sign (vehicle tracks within colony area)

Geographical effects

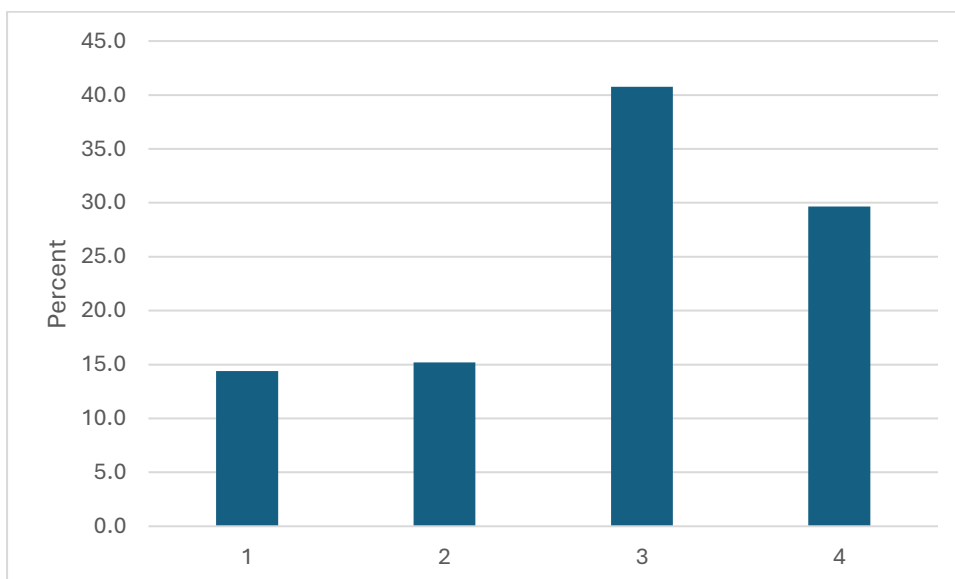
Colonies chosen for monitoring of Black-fronted Tern have been closely associated to Black-billed Gull colonies. To make efficient use of time, contractors have monitored Black-fronted Tern colonies adjacent to Black billed gull colonies. This means that most monitored colonies are in the bottom reaches of the river (Figure 9).

However, data from complete river surveys show that on average 70% of Black-Fronted Tern are found in the bottom reaches of the river (Figure 10).

Figure 9. Location of monitoring breeding colonies of Black-fronted Tern on the Mid Waimakariri River, 2008-2024. Purple lines indicate permanent trap lines established in 2021.



Figure 10. Average proportion of Black-fronted Tern recorded in each count section of the Mid Waimakariri River during river surveys.



Pohowera/ Banded Dotterel and Ngutu pare/ Wrybill



Endemic

Conservation threat status:
Declining



Endemic

Conservation threat status:
Nationally Increasing

Population trends

The number of Banded Dotterel counted during river surveys show a decrease in numbers between the 2006-2009 survey period, and the 2017-2020 period during full surveys (Sections 1-4, n=5 years), but a stable when only partial surveys were completed (Sections 1-3, n=7 years) (Figure 11).

Again, this is at odds with the reported national trend, with a meta-analysis of all braided river breeding season counts recording a 3.7% per annum decline (O'Donnell and Monks 2020). Similarly, using winter roost counts showed a decline of 27% between 1994 and 2019, however the authors acknowledged the difficulty in using winter counts to determine trends as a proportion of the population overwinters in Australia each year (Riegen and Sagar 2019).

The number of Wrybill recorded on the Mid Waimakariri has shown a significant increase between 2006-2009 and 2017-2022 survey periods (Figure 12). Again, consistent with national population assessments which show Wrybill up 33% between 1994 and 2019, attributed to conservation action on South Island braided rivers (Riegen and Sagar 2019).

Figure 11. The number of Banded Dotterel recorded on the Mid Waimakariri River during river surveys 2006-2020. A) Full surveys of all sections; B) Part surveys of section 1-3 to incorporate data from years when full surveys were no possible.

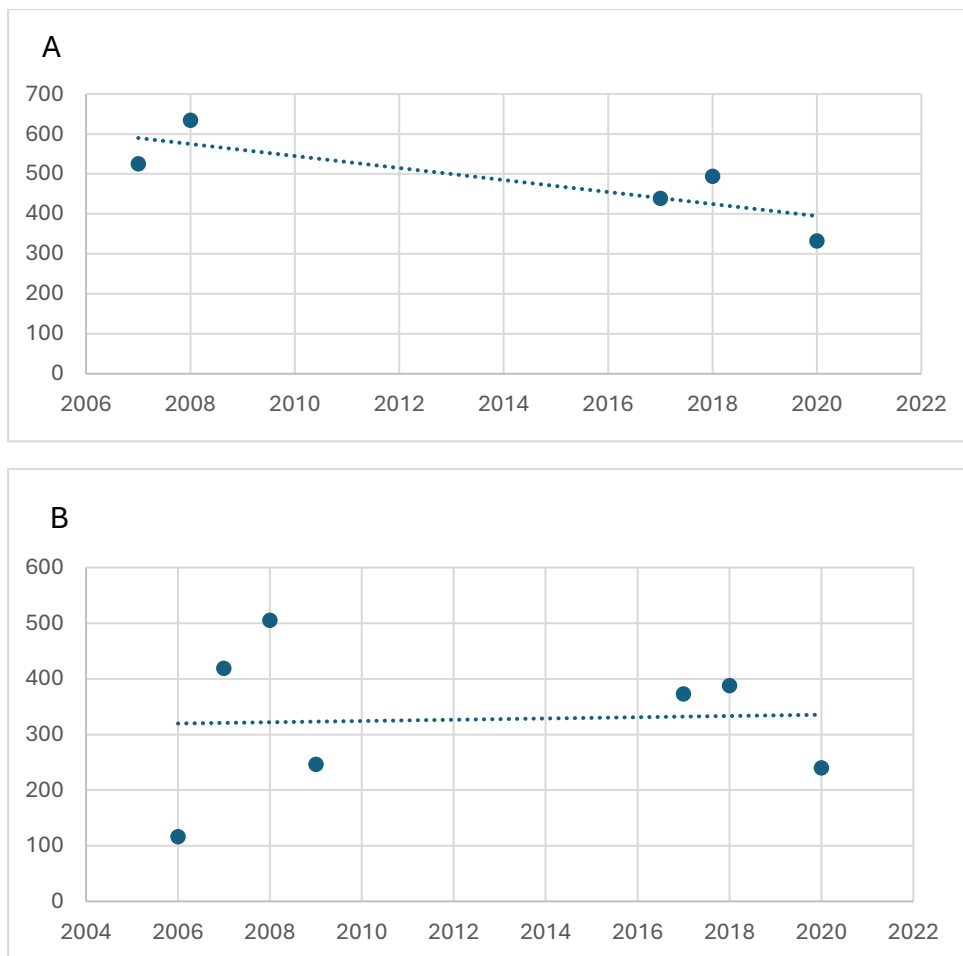
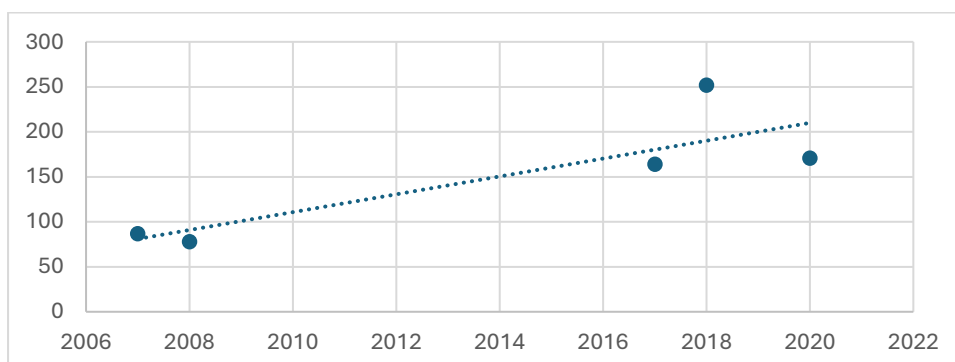


Figure 12. The number of Wrybill recorded on the Mid Waimakariri River during river surveys 2006-2020.



Productivity

Although comments were made of breeding Banded Dotterel and Wrybill in *End of Season Reports* since 2008, monitoring of individual nests did not start until 2021

utilising cameras at nests, starting with Banded Dotterel in 2021, and from the following season at Wrybill nests.

Both Banded Dotterel and Wrybill are solitary nesters, with nests often 100's of metres apart in areas of suitable habitat.

Across all years, a total of 29 Banded Dotterel nests has been followed, some with cameras; with productivity ranging from 0.16-0.83 fledged chicks/pair annually. Harrier predation has been recorded at 2 nests, but likely predation has been recorded at 9 nests. In these instances, the camera (if used) did not record the predation event, or the predation occurred during the chick phase, after the chick/s moved away from the nest and hence the camera. In these cases, recorded field sign suspected predation.

Table 4. Results from nest monitoring (including cameras at nests) at Banded Dotterel nest on the Mid Waimakariri River 2021-2024.

Banded Dotterel	2021	2022	2023	2024	Total
Nests followed	6	7	10	6	29
Nest hatched >1 egg	2	3	6	5	15
Chicks fledged	1	4	6	5	16
Productivity (chicks fledged/nest)	0.16	0.57	0.60	0.83	0.62
Number of nests that failed	4	4	4	2	14
Cause of failure -					
Flooded		1			1
Harrier predation		1	1		2
Unknown/likely predation*	4	2	2	1	9
Abandoned			1		1
Failed to hatch				1	1

*based on field sign

Across all years, a total of 13 Wrybill nests have been followed, some with cameras; with productivity ranging from 0.17-1 fledged chicks/pair annually (Table 5). Flooding, human persecution and likely predation has been the primary cause of nest failure.

Table 5. Results from nest monitoring (including cameras at nests) at Wrybill nest on the Mid Waimakariri River 2021-2024.

Wrybill	2022	2023	2024	Total
Nests followed	4	6	3	13
Nest hatched >1 egg	2	2	3	7
Chicks fledged	1	1	3	5
Productivity (chicks fledged/nest)	0.25	0.17	1	0.38
Number of nests that failed	2	5	0	7
Cause of failure -				
Flooded	1	1		2

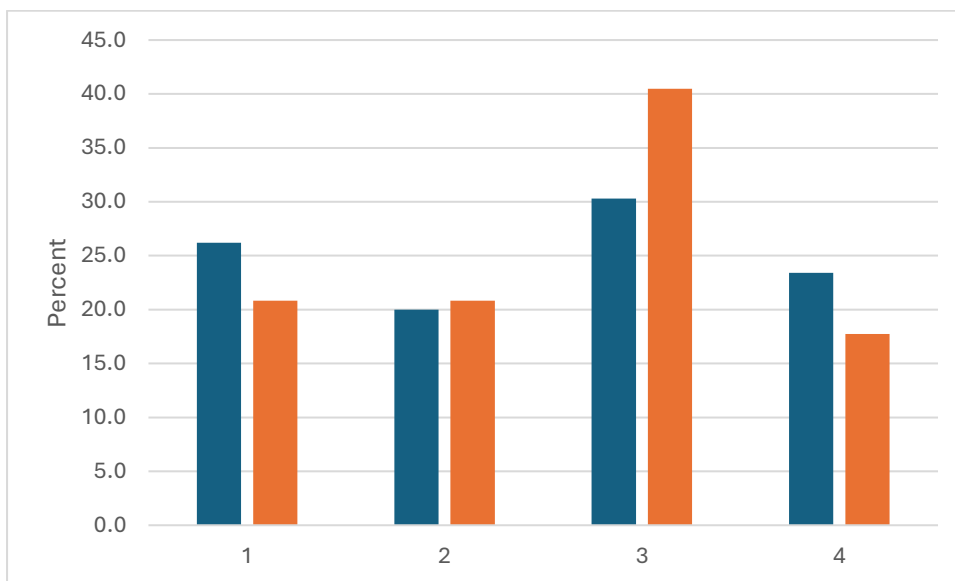
Unknown/likely predation*		2		2
Abandoned	1			1
Human persecution		2		2

*based on field sign (nest destroyed and camera stolen)

Geographical effects

Both Banded Dotterel and Wrybill are found more evenly distributed across the river, with numbers similar in upper and lower sections of the river (Figure 13).

Figure 13. Average proportion of Banded Dotterel (blue bars) and Wrybill (orange bars) recorded in each count section of the Mid Waimakariri River.



Poaka/ Pied Stilt

Native

Conservation threat status:

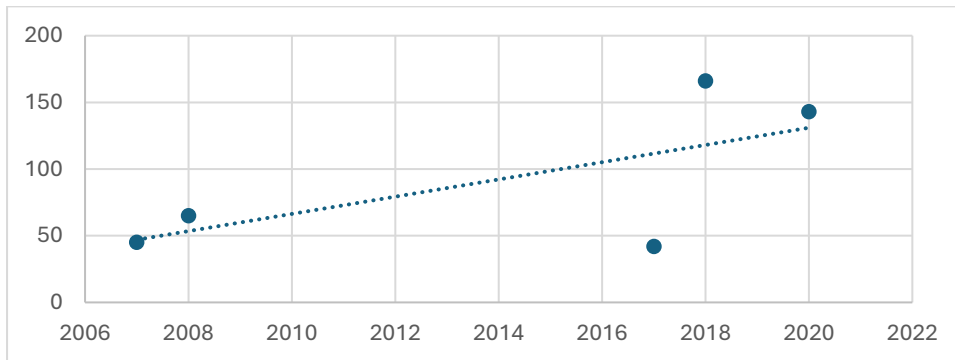
Not Threatened



Pied Stilt numbers on the Mid Waimakariri River show a significant increase between two full-river survey periods, 2006-2008 and 2017-2020 (Figure 14). This is the opposite

to national trends. Using winter count data, Reigen and Sagar (2020) estimated the national population at 24,00 birds, indicating a 14% decline since 1994. However, they acknowledge that not all birds may move to areas that are counted, so care should be taken in assessing trends.

Figure 14. The number of Pied Stilt recorded on the Mid Waimakariri River during river surveys 2006-2020.



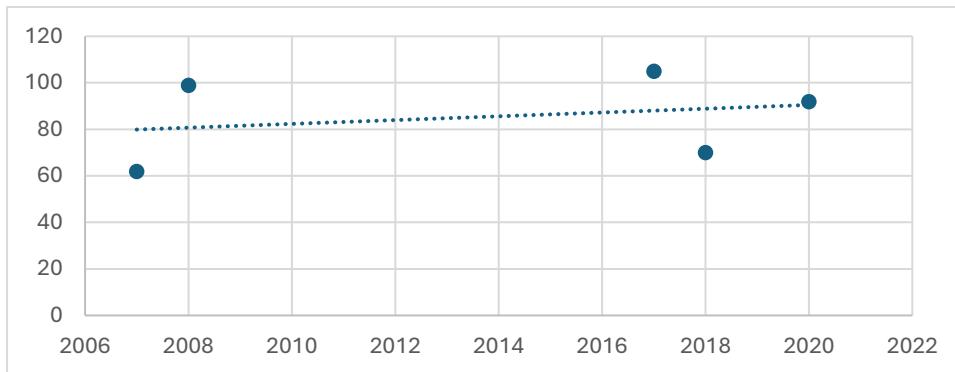
Tōrea/ South Island Pied Oystercatcher

Endemic
Conservation threat status:
Declining



The number of South Island Pied Oystercatcher (SIPO) recorded on the Mid Waimakariri has remained stable between survey periods (Figure 15). Somewhat reflecting national trends, where SIPO numbers increased spectacularly from 1940's to the early 2000's, from which time there has been a slow gradual population decline (Reigen and Sagar 2020).

Figure 15. The number of South Island Pied Oystercatcher recorded on the Mid Waimakariri River during river surveys 2006-2020.



Karoro/ Southern Black-backed Gull

Native

Conservation threat status:

Not Threatened



Southern Black-backed Gull are abundant on the Mid Waimakariri River and have been actively controlled by ECan and Christchurch international Airport since 2016 (Bell 2024). Counts from river surveys show the population increased between 2007-09 and 2017-2020 (Figure 16), with a similar pattern observed from species specific aerial surveys (Figure 17). The distribution of Karoro are not even across the river, with the lower reaches of the river having less Karoro than the upper reaches (Figure 18).

Figure 16. The number of Karoro recorded during Mid Waimakariri River surveys, 2007-2020.

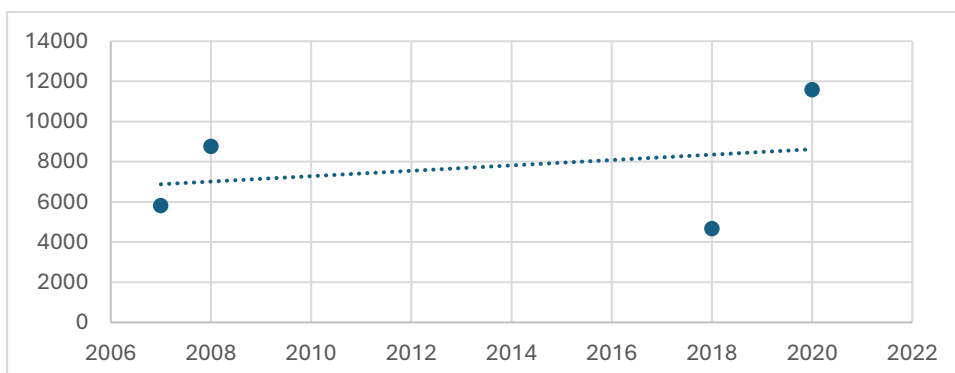


Figure 17. The number of breeding Karoro pairs recorded on the Mid Waimakariri River during annual helicopter aerial surveys 2016-2023 (data sourced from Environment Canterbury, reproduced from Bell 2024).

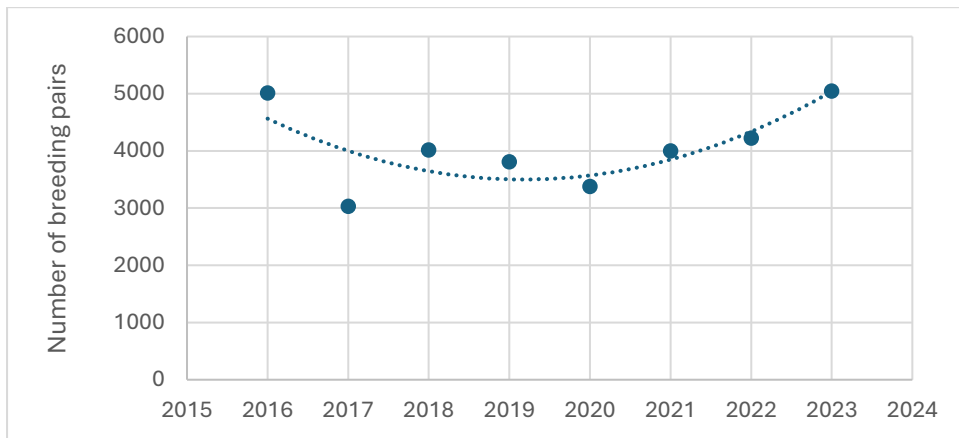
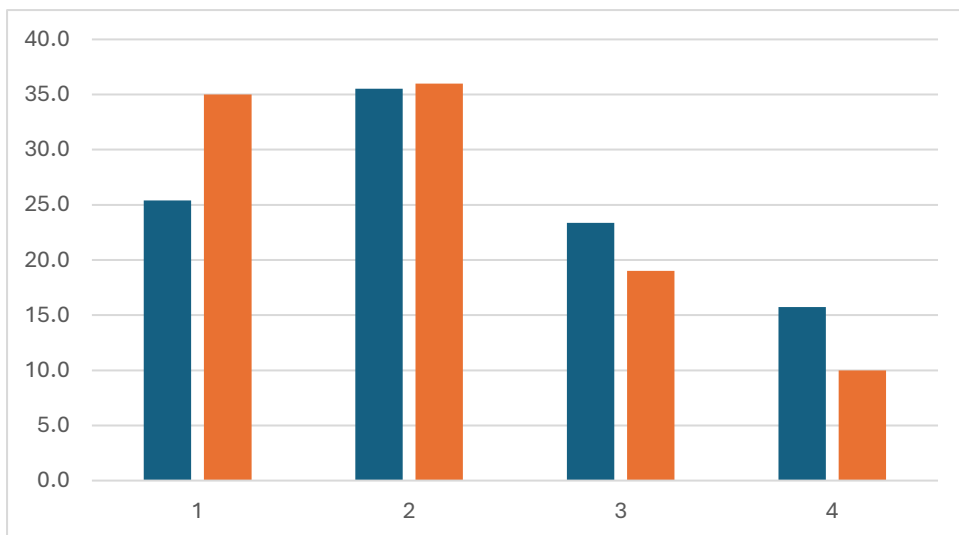


Figure 18. Proportion of Southern Black-backed Gull on each river section on the Mid Waimakariri River. Blue bars average from river surveys; Orange bars counts from 2023 aerial survey.



Discussion

Bird populations, trends and geographical influences

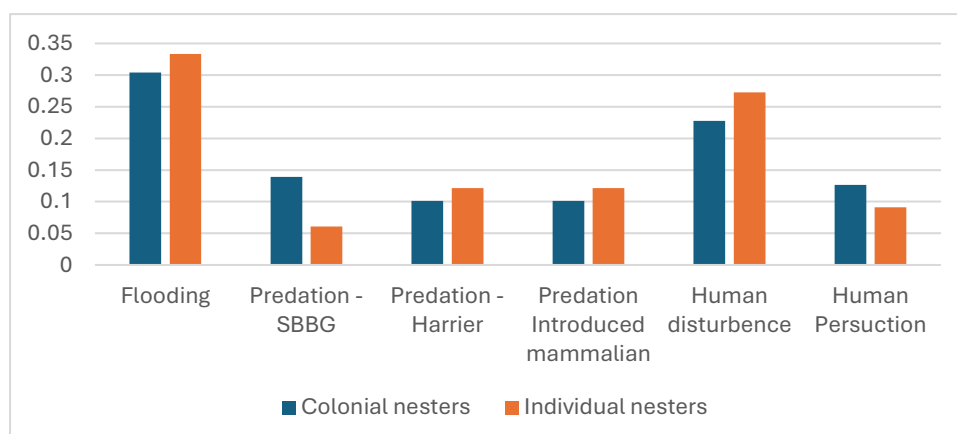
Monitoring has shown that the Mid Waimakariri River is a significant breeding habitat for braided river birds, with the river supporting 3-8% of the national breeding population of Black-billed Gull, Black-fronted Tern, Banded Dotterel and Wrybill. Many of these species have population trends at odds with national trends, with Black-fronted Tern, Banded Dotterel, Pied Stilt and SIPO having increasing or stable local populations whilst the national population is showing declines (Table 6).

Table 6. Percentage of national population of braided river birds on the Mid Waimakariri River, and local and national trends for these species. Green arrow – increasing, red arrow - decreasing, Orange bar – stable.

	% national population	Waimakariri trend	National trend
Black-billed Gull	4%	Orange bar	Orange bar
Black-fronted Tern	3.5-8%	Green arrow up	Red arrow down
Banded Dotterel	3%	Orange bar	Red arrow down
Wrybill	4%	Green arrow up	Green arrow up
Pied Stilt	<1%	Green arrow up	Red arrow down
SIPO	<1%	Orange bar	Red arrow down

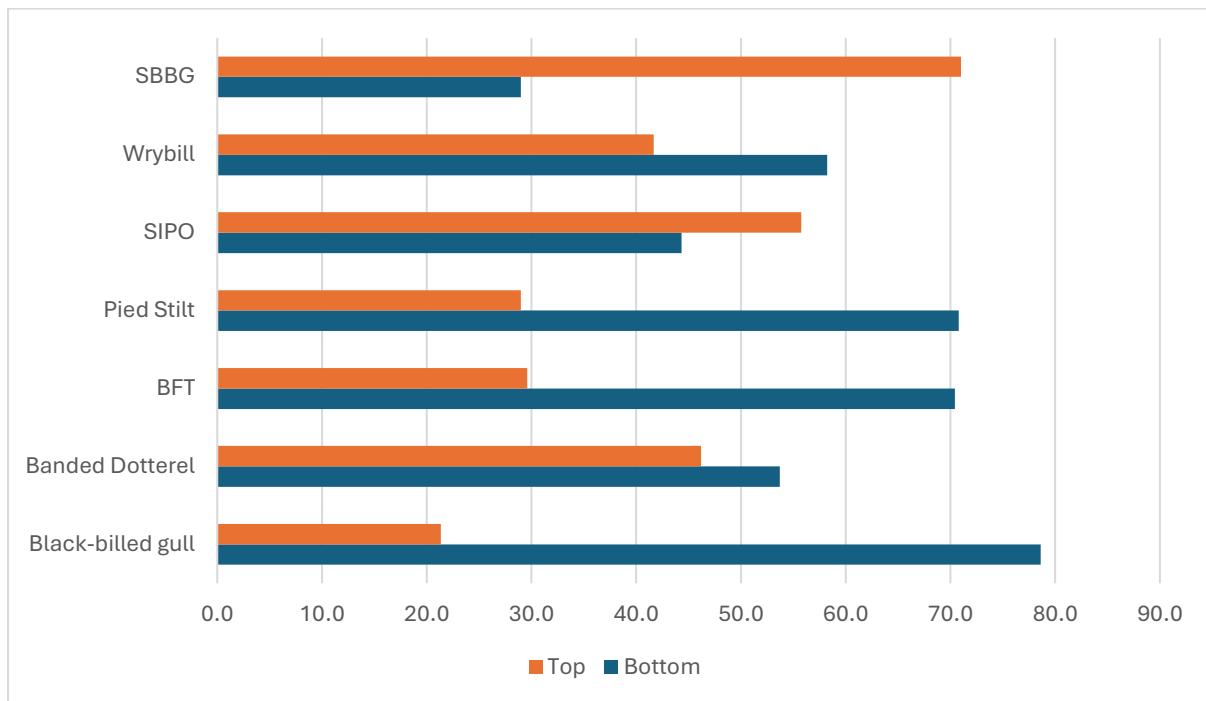
As typical of most braided rivers, in the Mid Waimakariri River a range of threats are impacting bird breeding success. With flooding and human interference being the most often recorded impacts. The impacts on colonial breeders monitored (Black-billed Gull and Black-fronted Tern) are similar to individual nesters (Banded Dotterel and Wrybill) although there is a higher recorded tendency of SBBG predation on colonial than individual breeders (Figure 19).

Figure 19. The proportion of recorded nest failure causes in colonial and individual breeding braided river nesting bird species on the Mid Waimakariri River.



Significantly more SBBG are found in the top half of the river; whereas Black-billed Gull, Black-fronted Tern and Pied Stilt have significantly more birds breeding in the bottom half of the river; whilst Banded Dotterel, Wrybill, and SIPO had similar numbers (Figure 20). Given that colonial breeders were recorded as more heavily impacted by SBBG, this may be a response to fewer SBBG present in the bottom section of the river.

Figure 20. Proportion of birds on the Mid Waimakariri River in the top, or bottom half of the river.



Effectiveness of bird monitoring

Walk through river surveys on the Mid Waimakariri have been carried out in 3–4-year periods for the past two decades, with the next cycle of counts currently due. These counts provide the best data available on population numbers and trends across the entire river, and show both declines, and increases for individual braided river bird species.

Braided river bird monitoring to determine breeding success has been carried out since 2008, with the species and intensity of monitoring varying over time; typically, in response to available resources.

Black-billed Gulls have been monitored every year since 2008, as a colonial breeder, monitoring has been at a level that has provided good data on annual breeding population size and productivity. This has enabled assessment of trends and various threats impacting breeding; although almost certainly under-estimating nocturnal predation and therefore the impacts of exotic mammalian predators.

Monitoring of Black-fronted Tern has been periodically carried out at the colony level and recently shifted to camera monitoring at the nest level. The low frequency of nest visits (typically once a week) has largely meant that monitoring has been less effective, with estimates of productivity less robust. Camera monitoring at nests has also not added significantly to the knowledge of nest failure, probably as a result of low sample size, and high nest failure due to human disturbance.

Camera monitoring of Banded Dotterel and Wrybill has been carried out from 2021 but again has not added conclusively to information on these species. Almost certainly an artefact of small sample sizes.

The threats to braided river birds recorded on the Mid Waimakariri are typical of braided rivers. With flooding, human disturbance and persecution, Karoro predation, Kahu predation and exotic mammalian mammal predation the most recorded. Recorded causes of nest loss is mostly not quantitative data, as typically it is recorded during colony visits, and only recently from cameras at individual nests. As previously stated, the impacts of exotic mammalian predation have likely been underestimated. Camera nest monitoring continues to highlight how significant both human disturbance and persecution is on the Mid Waimakariri.

Geographical spread of bird monitoring

Monitoring has historically been focused on Black-billed Gulls, with Black-fronted Tern colonies close to Black-billed Gull colonies being monitored to ensure cost effectiveness. With gulls mostly nesting in the lower reaches, by default most Black-fronted Tern monitoring has also been in lower reaches. Essentially the choice of nesting by Black-billed Gulls has influenced the location of Black-fronted Tern monitoring.

More recent camera monitoring of Banded Dotterel and Wrybill has been carried out in 2-3 areas of river with known high numbers of breeding pairs, typically with good river access. These are all situated in the lower reaches of the river.

Interestingly, as discussed above, Karoro density is less in the lower reaches of the river (with only 30% of breeding Karoro found in the lower reaches). Trapping is also only carried out in parts of the lower reaches.

Management plan objectives

In 2020 a Braided River Bird Management Plan was developed for the Mid Waimakariri River (Wildland Consultants 2020). As the key focus of monitoring is aimed at determining the results of this management plan it is important to understand the recommended conservation actions. The key management recommendations included-

- Control of introduced mammals – including extending landscape scale predator control and implementing targeted colony-specific trapping as colonies form.
- Karoro control – essentially implementing the Canterbury Karoro Strategy of reducing the population to 5% of its current level.
- Kahu control – targeted control of birds observed preying on colonies.
- Weed control – develop a weed management plan.
- Education – aim to reduce negative human bird interactions.
- Creation of raised island – to provide improved breeding habitat protected from mammalian predators by increased channels.

The Management Plan recommended monitoring both bird populations (annual river surveys) and breeding success (and cause of nest failure) of Black-billed Gulls, Black-fronted Terns, Banded Dotterel and Wrybill. Monitoring was largely recommended to determine the success of conservation actions described in the Management Plan.

To date, landscape scale predator control, Karoro control, and public engagement and education have been initiated or extended because of the Management Plan; along with extending bird monitoring to include Banded Dotterel and Wrybill. However, the selection of monitored nests has not been determined by any of the conservation actions carried out, and as such in no way can be used to measure the success, or otherwise of these conservation actions.

Conclusions

Braided river birds can be difficult to monitor and need high levels of resourcing to be monitored effectively. This review highlights that bird monitoring on the Mid Waimakariri has been under-resourced for what it is hoping to achieve, especially given the Mid Waimakariri's relative importance as significant nesting and breeding habitat for several species.

Periodic walk-through river surveys have been effective at determining population size and trends; but have been impacted by partial counts, where one section is missed due to logistical, or climatic events.

Breeding success monitoring has been effective for Black-billed Gull, with a 17-year data set providing good data to assess the variance of breeding success, and the most likely causal effects.

The monitoring of Black-fronted Tern, Banded Dotterel and Wrybill has been less effective. Almost certainly due to under-resourcing only enabling once weekly checks. This has resulted in less robust breeding success estimates and determining nest failure causes.

However, as discussed above, monitoring has provided insights into how braided river birds are faring on the Mid Waimakariri River. Unsurprisingly, as would be expected within a braided river environment, flooding is the major cause of nest failure, but human impacts are also significant on the Waimakariri. Both avian and mammalian predators are also an ongoing issue. Monitoring has also detected differences in the distribution of bird species, which is likely driven by Karoro distribution and density. All these findings can help inform future management actions and improve future monitoring focus.

Recommendations

Monitoring should align to measuring goals in the Waimakariri Braided River Bird Management Plan, and Karoro Control Plan; and be used in a feedback loop to inform conservation actions. Although this review was focused on bird monitoring, and revision of management plans was out of scope, the results here suggest a revision of the Braided River Bird Management Plan and Karoro Control Plan may be warranted soon.

The key recommendations following this review are -

1. Continue cyclic braided river walk-through surveys.

To continue to demonstrate any increase (or decrease) in bird populations over the next 10 years in line with the conservation actions in the Braided River Bird Management Plan and the Karoro Management Plan, river wide walk-through surveys should continue. It is vital that these are carried at regular periods, and that all sections of the river are surveyed each season. This data series provides accurate data on population trends for birds utilising the Mid Waimakariri River.

2. Incorporate best practise guidelines into breeding success monitoring methodology

To demonstrate any improvement in breeding success over the next 10 years in line with the conservation actions in the Braided River Bird Management Plan and the Karoro Management Plan, recommendations in the Protocol for best practice in monitoring braided river birds (Mischler and Maloney 2019) should be incorporated into the monitoring regime.

Importantly, a paired study should be carried out. With colonies/nests followed within areas with conservation actions (treatment zone), compared to colonies/nests followed outside these areas (non-treatment/control zone). Only by carrying out such a study can a true measure of effectiveness of conservation actions be determined.

To get statistically robust data, the number of nests followed annually should be >30 within each paired treatment/control zone, as recommended by Mischler and Maloney (2019).

To better determine breeding success and the cause of nest failure, the frequency of checks to colonies/nests should increase to every 2-4 days as recommended by Mischler and Maloney (2019).

3. Prioritise species for breeding success outcome monitoring

3a. Black-billed Gull

In practicality a pair study on Black-billed Gulls is unlikely to be achieved, as often this species only has a single colony on the river. The current level of monitoring of this species has provided the best data, and as such should continue as is. That is with all colonies followed annually at \leq weekly intervals to determine productivity.

3b. Banded Dotterel and Wrybill

Likewise, resourcing will not enable >60 nests a year to be monitored for Black-fronted Tern, Banded Dotterel and Wrybill (>30 nests for each treatment verse control zones). As such, choices on what species to monitor at meaningful levels will need to be made unless significant additional resourcing is forthcoming. As such, it is recommended to undertake monitoring of Banded Dotterel and Wrybill jointly to assess breeding and causal impacts of nest loss on solitary nesting species. With a combined total of >30 nests monitored within both treatment and control zones.

This would provide data on both a braided river colonial breeding species (Black-billed Gull), and solitary nesting species (Banded Dotterel and Wrybill), to measure effectiveness of conservation actions across a range of different braided river breeding strategies.

3c. Black-fronted Tern

As mentioned above, without significant increase in resources, it is unlikely that >60 Black-fronted Tern nests can be monitored each season. As such, at this time it is recommended to cease Black-fronted Tern monitoring to focus on Black-billed Gull, Banded Dotterel and Wrybill nest monitoring.

4. Braided River Bird Management Plan and the Karoro Management Plan review

The current cycle of walk-through surveys is timed to start on the Mid Waimakariri River in November this year and run for the next three years. Following the data collection period, the count data should be analysed as has recently been carried out for the previous two periods (Schlesselmann et al. 2026), to determine population trends. Combining this with further information collected on breeding success, would be timely

to review the Braided River Bird Management Plan and the Karoro Management Plan. This review would then use the most up to date information to assess the conservation actions undertaken recommended in each plan.

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References

Bell, M. 2024. Waimakariri River control and monitoring plan for Karoro/Southern Black-backed Gull. Unpublished Toroa Consulting Technical Report to Environment Canterbury.

Bell, M.D.; Harborne, P. 2018. Canterbury Southern Black-backed Gull/ Karoro Strategy. Unpublished Wildlife Management International Technical Report to Environment Canterbury.

Fink, D., T. Auer, A. Johnston, M. Strimas-Mackey, S. Ligocki, O. Robinson, W. Hochachka, L. Jaromczyk, C. Crowley, K. Dunham, A. Stillman, C. Davis, M. Stokowski, P. Sharma, V. Pantoja, D. Burgin, P. Crowe, M. Bell, S. Ray, I. Davies, V. Ruiz-Gutierrez, C. Wood, A. Rodewald. 2024. eBird Status and Trends, Data Version: 2023; Released: 2025. Cornell Lab of Ornithology, Ithaca, New York. <https://doi.org/10.2173/WZTW8903>

Mischler, C. and Maloney, R. 2019. *Protocol for best practice in monitoring braided river birds*. Department of Conservation. 42pp.

O'Donnell, C.F.J.; Monks, J.M. 2020. Distribution, long term population trends and conservation status of Banded Dotterels (*Charadrius bicinctus bicinctus*) on braided rivers in New Zealand. *Notornis* 67(4): 733–753.

O'Donnell, C. F. J., & Hoare, J. M. (2011). Meta-analysis of status and trends in breeding populations of Black-fronted Terns (*Chlidonias albostratus*) 1962–2008. *New Zealand Journal of Ecology*, 35(1), 30–43.

Riegen, A.C.; Sagar, P.M. 2020. Distribution and numbers of waders in New Zealand, 2005–2019. *Notornis* 67(4): 591–634.

Schlesselmann, A; Howard, S. Whitehead, A. 2026. Analysis of braided river bird count data from the Waiau Uwha and Waimakariri Rivers. Contract report to Environment Canterbury, Bioeconomy Science Institute Maianga Taiao.

Wildland Consultants Limited. 2020. *Braided River Bird Management Plan for the Waimakariri River Regional Park*. Contract report prepared for Environment Canterbury. 39pp.