BEFORE AN EXPERT PANEL **FTAA-2503-1035**
TEKAPO POWER SCHEME

Under the **FAST-TRACK APPROVALS ACT 2024**

In the matter of an application for replacement resource consents in relation to the Tekapo Power Scheme

By **GENESIS ENERGY LIMITED**
Applicant

STATEMENT OF EVIDENCE OF RACHEL KATHERINE MCCLELLAN
FRESHWATER BIRDS
25 August 2025

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Introduction

1. My full name is Rachel Katherine McClellan.

2. I have been asked by the Royal Forest and Bird Protection Society to provide expert evidence on the freshwater bird values that are potentially affected by the operation of Genesis Energy Limited's Tekapo Power Scheme, in particular, the proposed water permits that divert natural flows from the Takapō River.

Qualifications and experience

3. I am a self-employed consultant specialising in bird ecology.

4. I have the qualifications of PhD in Zoology from Otago University for research on the ecology and management of tarāpuka | black-billed gull in Southland (2009), a Master of Conservation Science from Victoria University for research on the breeding biology of toanui | flesh-footed shearwater on Karewa Island, Bay of Plenty (1996), and degrees in both plant and animal ecology (1994).

5. I have been a consultant since 2009. I was Office Manager and Senior Ecologist with Wildland Consultants in Christchurch, and later, Principal Ecologist based in Wellington. I have been self-employed since 2022. I have worked for BirdLife International, in Cambridge, UK, where I was a researcher, co-author, and sub-editor for the book 'Threatened Birds of the World', published in 2000. I have also worked for the Department of Conservation in Northland and the West Coast.

6. I have considerable experience with braided river and wetland birds. My doctoral research on black-billed gull examined population trends, the impacts of introduced and native predators, nesting habitat availability and the threat of weed infestation on gravel-bedded rivers, and the species' relationship with agricultural systems. I have presented evidence at the Oreti River and Ngaruroro River Conservation Order tribunals, and at the Environment Court hearing for Meridian Energy's North Bank Tunnel proposal for the Waitaki River. I had a guest advisory role with the Braided River Technical Advisory Group for a time and reviewed an early draft of the Department of Conservation publication "Management and research priorities for conserving biodiversity on New Zealand's braided rivers". I have co-authored a braided river management plan for the Waimakariri River Regional Park. I have also undertaken assessments of effects for development or management of rivers in the Waikato, Wairarapa, Kapiti Coast, and Central Otago. I co-authored an analysis of population trends of black-billed gulls in the South Island from 1962-2014. I was part of a team that developed ecological significance criteria for Canterbury indigenous biodiversity. I have presented evidence at over 20 council, Environment Court, and tribunal hearings. Most recently, I have provided evidence to the Environment Court hearing for Meridian Energy Limited's Waitaki Power Scheme.

7. I am a member the Ornithological Society of New Zealand (Birds New Zealand).

8. In preparing this statement of evidence I have considered the following documents:

    a. Genesis Energy Limited 2025: Tekapo Power Scheme – Fast-track application for resource consents and assessment of environmental effects.

    b. BlueGreen Ecology 2025: Tekapo Power Scheme Re-consenting: Assessment of Ecological Effects - Avifauna. Report prepared for Genesis Energy Ltd. (the Avifauna Assessment).

    c. Pattle Delamore Partners 2025: Tekapo Power Scheme – hydrological and hydrogeological analyses. Report prepared for Genesis Energy Ltd. (the Hydrological Assessment).

    d. Ecological Solutions 2023: Tekapo Power Scheme reconsenting: assessment of effects – vegetation. Report prepared for Genesis Energy Ltd. (the Vegetation Assessment).

    e. The evidence of Ms Kathryn McArthur on aquatic ecology and water quality.

    f. OIA document, Lewis D. and Maloney R. 2020: A costing assessment of potential mitigation actions for hydro-electric activity in the Waitaki River catchment. Department of Conservation. 25 p.

Code of Conduct

9. I understand that this is not a hearing under the Resource Management Act, however, I note that I have read the code of conduct for expert witnesses contained in the Environment Court's Practice Note 2023 (the Code). I have complied with the Code when preparing this written statement of evidence. The data, information, facts, and assumptions I have considered in forming my opinions are set out in my evidence. Unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope

10. I have been asked by the Royal Forest and Bird Protection Society to provide expert evidence on freshwater birds in response to the application by Meridian Energy Limited for water permits for operation of the Waitaki Power Scheme.

11. This evidence addresses:

    a. The effects of the operation of the Tekapo Power Scheme on indigenous freshwater bird species of the Takapō River.

b. The Indigenous Biodiversity Enhancement Programme and 'Kahu Ora' – the 10-year Strategic Plan for enhancing biodiversity related to both the Takapō and Waitaki Power Schemes.

12. I have not addressed the bird communities of Lake Takapō or associated wetlands as they are outside the scope of evidence.

Summary

13. The Takapō River was a large, braided river with a historical mean flow of approximately 80 cumecs. Since diversion of all flow, the uppermost reach remains mostly dry, and median flows below this point vary from approximately three to 10 cumecs. Despite diversion, the Takapō retains a relatively high diversity of freshwater bird species, including nine Nationally Threatened or At Risk species. The Takapō River is recognised as nationally significant for indigenous freshwater birds and supports a nationally significant population of black-fronted tern (Threatened-Nationally Endangered).

14. Project River Recovery has been funded by Meridian Energy since 1991, and has achieved significant conservation gains, particularly through weed control in the upper catchment rivers, but also in the affected mid-catchment areas. In 2004, the programme launched landscape-level predator control in the Tasman River Valley, specifically aimed at protecting braided river birds. In 2009, localised predator control was established to protect a black-fronted tern colony on 'Tern Island' in the Upper Ōhau River.

15. Kahu Ora's 10-year strategic plan continues these two programmes. In addition, for birds, new investment includes the clearance of vegetation from eight river island habitats for braided river bird species that require bare gravels for nesting in both the Takapō and Waitaki rivers. Management outcomes at Tern Island on the Upper Ōhau, where the minimum flow is 8 cumecs, indicate that nesting birds remain vulnerable to incursions across river channels by mammalian predators in some breeding seasons, despite intensive predator control. This indicates that birds nesting on the proposed cleared islands in the Takapō River will be even more vulnerable given the absence of terrestrial predator control and lower flows.

16. Wetlands associated with the Takapō River are not described by the Applicant's experts making it difficult to assess their importance for freshwater bird species. It is possible that some provide habitat for the Nationally Critical Australasian bittern. It is assumed that the weed control proposed for eight unspecified wetlands and the Grays River Wetland will improve these habitats for indigenous bird species including bittern.

17. The proposed compensation package lacks specific objectives that aim to achieve tangible improvements for river and wetland bird and bird habitat values. The ongoing declines of black-fronted tern, banded dotterel (At Risk-Declining), wrybill (Threatened-Nationally Increasing), and South Island pied oystercatcher (At Risk-Declining) on the Takapō River are not compensated by creation of nesting islands that are inherently vulnerable to incursions by mammalian predators due to very low flows.

18. Increased minimum flows will reduce access to nesting islands by terrestrial predators and combined with intensive black-backed gull | karoro control throughout the mid and upper Waitaki catchment, will better protect Threatened and At Risk freshwater bird species nesting on the Takapō River. Extension of the trapping network in the Godley and Cass rivers through the Mackenzie Basin will also help to protect bird populations and other biodiversity values. However, it is not clear if predator control alone will be sufficient to protect braided river bird populations given the very low flows in much of the Takapō River.

Takapō River and associated wetlands

19. The Takapō River originally flowed from Lake Takapō into the lower reaches of the Pūkaki River; at this point the river was known as the Waitaki. The mean historical flow of the river was approximately 80 cumecs. Modifications to the river's flow commenced in 1951 with the construction of Tekapo A Power Station, and the river was fully diverted in the 1970s via the Tekapo Canal.

20. The Takapō River is approximately 55 km in length, and enters Lake Benmore, creating the Takapō delta. The Pūkaki River confluence is approximately 4 km upstream from the delta. This river is also fully diverted so does not usually contribute to flows in the Lower Takapō.

21. Under the present regime, the upper 4 km of the Takapō between the outlet of the lake and Lake George Scott is usually dry, with flow in downstream reaches occurring from tributaries such as Fork Stream, Grays River and Mary Burn. The median flow is 3.1 cumecs approximately 7 km downstream from the outlet of the lake, below the Fork Stream tributary. A further 30 km downstream, Grays River and Mary Burn flow into the Takapō, increasing the median flow to 10.2 cumecs. The river flows for approximately 25 km beyond this point.

22. An unknown number of wetlands are associated with the Takapō River. Patterson's Ponds, a series of constructed open water wetlands, are fed by, and drain back into, the river and support freshwater bird populations.

Adequacy of information on bird populations and bird habitats

23. The Avifauna Assessment provides a combined list of freshwater bird species from Lake Takapō, Takapō River, and the surrounding environment (the Assessment's Table 1 and Appendix 3). However, details of the bird community of the Takapō River are only specifically provided in the Assessment's Figure 7. This compiles 60 years of survey data for 23 species into one graph, making it difficult to interpret. The graph indicates that the most abundant species on the river are tūturiwhatu | banded dotterel, karoro | southern black-backed gull (hereafter referred to as karoro), tarāpirohe | black-fronted tern, and Canada goose, with several hundred of each species often being present in recent years. Ngutuparore | wrybill and kakī | black stilt (including hybrids) are very rare, and it is not possible to determine from the graph if they are still present in later years. Tarāpuka | black-billed gulls appear to nest infrequently.

Table 1: Native and endemic freshwater bird species present on the Takapō River during recent bird surveys. Adapted from the Avifauna Assessment (Figure 7). 'Rare' – usually less than 10 birds, 'Common' – 10-99 birds, 'Abundant – 100+ birds. Note that mallards and grey duck have not been separated in the Assessment's Figure 7. Species and Te Reo Maori names are provided in Appendix 1.

Species	Threat Classification	Abundance
Waterfowl		
Black swan	Not Threatened	Rare
Mallard/grey duck	Not Threatened	Common
Grey teal	Not Threatened	Rare
Australasian shoveler	Not Threatened	Rare
Paradise shelduck	Not Threatened	Common
New Zealand scaup	Not Threatened	Rare
Shags		
Black shag	Relict	Rare
Little shag	Relict	Rare
Herons and spoonbills		
White-faced heron	Not Threatened	Rare
Waders		
Kakī	Nationally Critical	Rare
Hybrid kakī	Nationally Critical	Rare
Pied stilt	Not Threatened	Common
South Island pied oystercatcher	Declining	Common
Wrybill	Nationally Increasing	Rare
Banded dotterel	Declining	Abundant
Gulls and terns		
Karoro | black-backed gull	Not Threatened	Abundant
Black-billed gull	Declining	Common
Black-fronted tern	Nationally Endangered	Abundant
Caspian tern	Nationally Vulnerable	Rare
Total species		**19**
Threatened species		**4**
At Risk species		**5**

24. I have provided the threat classifications for 19 species in Table 1 (excluding the introduced Canada goose, the native spur-winged plover and kahu | Australasian harrier, and the threatened lake specialist kāmana | Australasian crested grebe) and have provided their approximate abundances based on the last four years of survey data provided in the Avifauna Assessment.

25. Table 1 shows that the Takapō River may support nine Nationally Threatened or At Risk freshwater bird species (noting that it is not possible to determine if kaki and wrybill have been recorded in recent years from the Assessment's Figure 7). This includes four species that are considered to have evolved on braided rivers – kakī, wrybill, black-fronted tern and black-billed gull, and two species for which braided rivers form a significant proportion of their breeding habitat – banded dotterel and tōrea | South Island pied oystercatcher. I refer to these six Nationally Threatened and At Risk bird species as braided river bird species in my evidence; I use the term freshwater bird species to refer to the wider bird community.

26. The applicant's experts do not provide sufficient information on wetlands with a hydrological connection to the Takapō River to be able to determine their importance for freshwater bird species:

    a. Information on wetland freshwater bird populations in the Avifauna Assessment are restricted to three point counts at two sites at Patterson's Ponds.

    b. The Hydrological Assessment describes the work undertaken to determine the hydraulic connections between the river and adjacent wetland areas (Section 5.2.2). Under the present regime, the report concludes that there may be some hydrological influence from the Takapō River for those wetlands within approximately 1 km. The wetlands appear to be mapped in Appendix E, Figure E12, but those within 1 km are not distinguished, and wetland extents are not provided.

    c. The Vegetation Assessment discusses wetlands adjacent to the river but does not map their distribution. It refers to the Hydrological Assessment but does not describe the wetlands identified in that report.

27. Table 6 in the Avifauna Assessment shows that black-fronted tern and kāruhiruhi | pied shag were observed during point counts at Patterson's Pond. The Avifauna Assessment has not made use of eBird data[1]. eBird data from the ponds are sparse

[1] eBird is an online global database of bird lists obtained by citizen scientists (both amateurs and environmental professionals alike) into which ~100 million bird sightings are uploaded annually. Over 800,000 checklists have now been submitted for New Zealand birds. The data are an immensely valuable resource that can be used to better understand distributions and abundances of many species. However, eBird data comes with biases and possible inaccuracies, and should be used with care.

but also include black-fronted terns and pied shag, as well as an observation of an adult and juvenile kakī.

28. The assessment notes the historical records of matuku hūrepo | Australasian bittern (Threatened - Nationally Critical) from "the wider environs around Lake Takapō, Pūkaki, Ōhau and Ahuriri catchments" (references within) and that recent targeted surveys by Project River Recovery did not detect bittern in those areas.

29. However, Project River Recovery has, in fact, recorded bittern using acoustic recording devices in multiple locations in 2019-2020 and 2020-2021: Mt Gerald Wetlands at the head of Lake Takapō, Temple Wetlands at the head of Lake Ōhau, Waterwheel Wetlands adjacent the Pūkaki Canal, Ben Avon Wetlands in the Ahuriri Valley, and the constructed Ruataniwha Wetlands, both above and below Lake Ruataniwha[2]. In addition, eBird has several sightings of bittern in the last 2-3 years, including four individuals at the Ōhau C Ponds, multiple sightings around the Lake Poaka and Waterwheel wetlands, and a very recent sighting (July 2025) at the Ahuriri River delta. The significance of these observations in reference to the Takapō River and associated wetlands is discussed later in my evidence.

Ecological significance assessments

30. The Avifauna Assessment provides information on Sites of Natural Significance (SNS) listed in the Mackenzie District Plan (2004). SNS 45 covers the Takapō and Pūkaki Rivers and notes the importance of the riverbeds and associated artificial ponds for bird species. The Assessment also refers to the Canterbury Regional Policy Statement (2021), noting that SNS 45 is also considered significant under Policy 9.3.1, particularly in relation to criteria relating to rarity/distinctiveness and ecological context.

31. In Section 8.3, the Assessment notes that the Takapō River has been identified as supporting more than 5% of the total national black-fronted tern population, indicating national significance, as part of an application of the River Values Assessment System (RiVAS) to indigenous birds on Canterbury rivers[3]. However, the Assessment does not provide further information from the results of this report, or results from an earlier region-wide assessment of Canterbury rivers and wetlands for indigenous freshwater bird populations.

32. The earlier report is the significance of river and open water habitats for indigenous birds in Canterbury[4]. A total of 272 sites in Canterbury was assessed where

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[2] Schori J., Gale S., Hines C. and Nelson D. 2021: Project River Recovery Annual Report 01 July 2020 to 30 June 2021. Department of Conservation, Twizel. Available online.

[3] Hughey K., O'Donnell C., Schmechel F. and Grant A. 2010: Native Birdlife: Application of the river significance assessment method to the Canterbury region. LEaP Report No.24B, Lincoln University.

[4] O'Donnell C.F.J. 2000: The significance of river and open water habitats for indigenous birds in Canterbury, New Zealand. Department of Conservation, Christchurch. 74p + spreadsheet.

indigenous waterbird values had been documented. Sites were evaluated using a numerical ranking system based on:

a. Representativeness – the number of guilds present, levels of endemism present, and the extent that the habitat types were represented elsewhere in New Zealand.

b. Life-supporting capacity – habitat size, number of waterbirds present, numbers of guilds using the habitat for breeding, for feeding, and for roosting.

c. Natural diversity – diversity within guilds, microhabitat diversity, number of threatened species recorded.

d. Distinctiveness – for example, if the site was one of few breeding locations for a species or was one of the largest breeding locations in the region, or was a significant moulting site, or was the only region that typically supports a particular species.

e. Intactness or naturalness.

f. Long term viability.

33. The Takapō River was one of 33 sites that were classified as 'High 1' or 'H1', or significant at a National and International level. Almost half the H1 sites were in the Waitaki catchment.

34. As mentioned above, the second assessment applied the River Values Assessment System (RiVAS) to birds in Canterbury rivers[5]. The RiVAS tool was developed in recognition of the need for regional councils to have an objective method for evaluating the relative importance of waterbodies. The assessment covered 34 rivers and provided a rank for each river.

35. The assessment also evaluated the attributes listed in paragraph 32 (a) to (f). An indicator was chosen for each attribute which allowed it to be specifically measured with existing data or expert knowledge. The level of each indicator was scored, and these were summed to provide a rank. The highest ranked rivers scored 1 and the lowest ranked river scored 36.

36. The results of the two assessments are summarised in Table 2. I have included eight of the upper catchment rivers which are largely unaffected by the Tekapo and Waitaki Power Schemes. Further information on the results of the RiVAS assessment is shown in the summary Table 3.

[5] Hughey K., O'Donnell C., Schmechel F. and Grant A. 2010: Native Birdlife: Application of the river significance assessment method to the Canterbury region. LEaP Report No.24B, Lincoln University.

Table 2: Results of two ecological significance assessments of rivers in the Waitaki Catchment for freshwater birds. The rivers managed as part of the Waitaki and Tekapo Power Schemes are shown below the bold line. The highest and lowest classifications or rank for each assessment are: O'Donnell (2000), 'High 1' or 'H1' and 'Medium 2' or 'M2'; and Hughey *et al.* (2010), a rank of 1 to a rank of 36. The Takapō River is highlighted.

River	O'Donnell (2000) rank	Hughey *et al*. (2010) rank
Godley	H1	11
Macaulay	H1	22
Cass	H1	14
Tasman	H1	7
Dobson	H1	16
Hopkins	H1	16
Ahuriri	H1	9
Twizel	H3	22
Waitaki - upper	-	1*
Takapō	**H1**	**11**
Pūkaki	H2	21
Upper Ōhau	H1	30
Lower Ōhau	H1	22
Waitaki	H1	1

* The RiVAS assessment (Hughey *et al.* 2010) also combined the results from the nine upper catchment rivers into a single assessment.

37. Table 2 shows that, of the 12 assessed rivers of the Waitaki catchment, the Takapō ranked fourth equal, despite the high level of modification. Table 3 shows that the Takapō River scored low for Distinctiveness, low for Area, moderate for Bird Numbers, high for Foraging Guilds, and High for Threatened and At Risk bird species, and nationally important given the size of the population of black-fronted tern.

Table 3: Waitaki catchment river results, taken from an assessment using the RiVAS for birdlife on Canterbury rivers (Hughey *et al.* 2010) showing estimates for the six measured attributes, and resulting rank. Rivers affected by the Waitaki and Takapō Power Schemes are shown below the black line. The Takapō River is highlighted.

River	Attribute						Rank
	Distinctiveness[1]	Area for braided river birds (hectares)[2]	Bird numbers[3]	Foraging guilds[4]	No. Threatened and At Risk species[5]	Species stronghold[6] (including % of national population)	
Godley	3	6,833	373	6	8 (7)	Wrybill (1%)	11
Macaulay	1	1,533	141	5	5 (4)	No	22
Cass	3	1,432	498	6	7 (6)	No	14
Tasman	3	6,897	1,588	6	8 (7)	Wrybill (1%) Black-fronted tern (1%) Kakī (>15%)	7
Dobson	3	2,007	187	6	5	No	16
Hopkins	3	3,548	126	6	7 (6)	No	16
Ahuriri	3	4,353	2,524	6	8 (7)	Kakī (>15%) Black-fronted tern (>5%)	9
Twizel	1	<1,000	115	6	4	No	22
Waitaki - upper	3	*c*.30,000	7,907	6	8 (7)	Kakī (100%) Black-fronted tern (15%) Wrybill (20%) Banded dotterel (>5%)	1
Takapō	**1**	**3,178**	**1,034**	**6**	**9 (8)**	**Black-fronted tern (>5%)**	**11**
Pūkaki	2	512	57	6	4 (3)	No	21
Upper Ōhau	1	111	149	4	2	Black-fronted tern (1%)	30
Lower Ōhau	1	322	182	6	6 (5)		22
Waitaki	3	8,104	6,136	6	5 (4)	Black-fronted tern (8%) Black-billed gull (1%) Banded dotterel (1%)	1

Each attribute is scored 1, 2, or 3, except 'Species stronghold' which can be scored 0. Scores are summed, then the rank applied. The description for the highest score of '3' for each attribute is provided below.

1 '3' = Habitat type or species assemblage not represented in other regions in New Zealand

2 '3' = >10,000 ha. Amount of habitat for braided rivers based on Wilson (2001)[6].

3 '3' = >5,000 individuals. Actual numbers of birds based on survey data, excluding karoro.

4 '3' = 7-8 guilds. Description of foraging guilds, based on O'Donnell (2000); refer to the Avifauna Assessment (Table 2) for details.

5 '3' = four or more species. Threat classifications for birds have been updated since the RiVAS assessment; pied stilt is now Not Threatened, and the number in brackets recognises this change where pied stilt have been recorded as present.

6 '3' = one or more species with >5% of the national population, or three or more species with 1-4.9% of the national population.

[6] Wilson G. 2001: National distribution of braided rivers and the extent of vegetation colonisation. Landcare Research Contract Report No. LC0001/068 (unpublished). Hamilton.

Assessment of effects

Takapō River

38. Hydrological management of the mid and lower Waitaki catchment over the last 90 years has resulted in the loss of the Pūkaki and Ōhau braided river systems, the significant deterioration of the Waitaki River, the largest braided river in the country by discharge, and the significant reduction in flow within the Takapō River.

39. The Avifauna Assessment avoids assessing the extent of the impact of the Tekapo Power Scheme on the freshwater bird community of the Takapō River, noting that "it is not possible to attribute or quantify the potential impacts of the TekPS [Tekapo Power Scheme] on the birds due to the inter-related nature of a number of ecosystem variables" (page 40). Dr Leigh Bull, the Assessment's author, took a different approach in her recent evidence to the Environment Court hearing for the Waitaki Power Scheme, where she determined the level of adverse effects of that scheme on the Pūkaki River, Upper and Lower Ōhau rivers, and the Waitaki River.

40. The Assessment does, however, set out the potential effects of reductions in flow on birds in Section 5.1.3, taken from the Department of Conservation's publication on the management of braided rivers[7]. These can be summarised as:

    a. Less feeding habitat, lower diversity of feeding habitat types (e.g. backwaters and riffles, leading to greater heterogeneity of habitats), and overall reduced food availability and quality.

    b. Increased weed encroachment leading to reduced availability and quality of nesting habitat, and increased cover for mammalian predators

    c. Increased access to islands within rivers by mammalian predators.

    The consequences of these potential effects are lower productivity (less chicks are fledged) and lower survival of eggs, chicks, and adults.

41. The diversion of flow from the Takapō River (and the associated effects on *Didymosphenia geminata*) also impact the composition of the macroinvertebrate and fish community, both sources of food for bird species (evidence of Ms McArthur).

42. Weed invasion of braided riverbeds reduces the availability of bare gravels which species such as black-fronted tern, wrybill, and black-billed gull require for nesting. Reduced and regulated flows allow weeds to spread and can lead to morphological changes to rivers. On the Waitaki River and Upper Ōhau River, weed invasion is an

[7] O'Donnell C.F.J., Sanders M., Woolmore C. and Maloney R.F. 2016: Management and research priorities for conserving biodiversity on New Zealand's braided rivers. Department of Conservation, Wellington, New Zealand. 46 p.

ongoing issue for braided river birds, and is actively managed on Tern Island on the Upper Ōhau for black-fronted terns.

43. Vegetation changes are not monitored in the Takapō River. Instead, the Avifauna Assessment has used the national landcover database to assess changes in vegetation from 1996 to 2018. This analysis showed no change in the percentage of bare gravels over this time, and very little change in other riverbed vegetation. It is not clear why invasive weeds do not appear to be affecting the availability of nesting habitat in contrast to other Waitaki catchment rivers.

44. Though the availability of gravels for nesting does not appear to be a limiting factor for braided river bird species, the low flows in the Takapō River will be leading to reduced productivity and survival.

45. Braided river birds that nest on islands within rivers have long been known to gain some level of protection from terrestrial predators which are less able, or willing, to cross channels to access nesting birds. My doctoral research and other research projects have shown that even very low flows in channels can reduce the impacts of mammalian predators. However, predators will still cross river channels to prey on birds, and this can be influenced by several factors including flow, distance from the bank, size of island, and predator species.

46. Furthermore, the significant reduction in flows, such as has occurred in the Takapō, may have reduced the overall availability of islands.

47. To illustrate the issue of predation that faces bird species attempting to breed on low flow rivers such as the Takapō, I have summarised the management of the black-fronted tern colony on 'Tern Island' in the Upper Ōhau River. Black-fronted terns have evolved to breed on braided rivers, and colony locations usually change from year to year. Their mobility is thought to be related to the changeability of their nesting habitat. Unusually, however, terns breed every year at Tern Island – almost certainly a result of the flow regime and resulting stability of the river and permanence of the island (which is maintained weed-free by Project River Recovery). Like the Takapō, the Ōhau River once had a much higher mean flow of 80 cumecs, and now has a minimum flow of 8 cumecs, and 12 cumecs during summer.

Figure 1: Aerial photograph of Tern Island showing relative flow sizes. Taken from Turner *et al*. (2023).[8]

48. The management and outcomes for Tern Island have not been published. Instead, I have taken what information is available online from six Project River Recovery annual reports, and three presentations given by staff to BRaid workshops[9].

49. Nesting on Tern Island should confer some benefit to nesting birds given the site is surrounded by a total flow of 8-12 cumecs. In comparison, the Takapō River is mostly dry from the Gate 16 to Lake George Scott, has a median flow of 3.1 cumecs downstream of the confluence with Fork Stream, and 10.2 cumecs downstream of Mary Burn and Grays River (Hydrology Assessment and evidence of Ms McArthur).

50. Management of Tern Island was initiated in 2009, with an intensive trapping operation targeting mustelids (stoats, ferrets and weasels), hedgehogs, and cats

[8] Turner S., Goodman T. and Schori 2023: A tern of events: outcomes from recent changes to management on Project River Recovery's Tern Island. Presentation given to a BRaid workshop by PRR staff.

[9] Available through the following websites: https://www.doc.govt.nz/our-work/freshwater-restoration/project-river-recovery/ and https://braidedrivers.org/

within a 1 km radius of the island. In addition, rabbits were controlled by night shooting and toxins[10]. This control regime was maintained throughout the year.

51. In 2016, the project underwent an external review. Subsequently, the management regime was downsized, with the aim of determining if similar results could be obtained for less cost and effort. The number of traps was reduced from 474 traps in a 1 km radius to 371 traps within a 500 m radius. Weekly trap checks were continued during the breeding season but were reduced from fortnightly to monthly checks for the remainder of the year. The number of bait stations for rats remained at 158, mostly along either side of the river. Possum bait stations were discontinued, as was rabbit control.

52. In addition, from 2016 to 2019, camera traps and tracking tunnels were used to detect the presence of predators. If detected, extra control was implemented. The colony largely failed during these four years.

53. From 2020 to 2022, the approach was changed from reactive to preventative; rodent and mustelid dogs were used to locate predators, and spotlighting was undertaken for cats, starting prior to commencement of the breeding season. Hatching success mostly improved. However, terrestrial predators continued to cause extensive losses on occasion.

54. Table 4 provides information on the management regime for the Tern Island colony and colony outcomes. Data have not been reported in a consistent manner in the annual reports, and the information in Table A is a best attempt at summary. The number of adults reported is generally the 'peak' or highest count made during the breeding season. In some instances, the reports note the species of predator responsible. Fledging success was not always reported[11].

[10] Rabbits are a key prey item for mammalian predators. Controlling rabbits near the colony was anticipated to lead to predators spending more time hunting away from the colony in areas with more rabbits.

[11] The number of chicks that reach an age where they can fly, often reported as a proportion of the number of nests.

Table 4: Predator control regime details and black-fronted tern outcomes, 2010-2022. Data summarised from six Project River Recovery annual reports and three Project Recovery presentations given to BRaid workshops.

Year	Control regime ***1 km trapping radius***	Outcome	Summary
2010	Cats, mustelids, hedgehogs, rabbits	>220 adults No eggs hatched*	Colony failed
2011	Cats, mustelids, hedgehogs, possums, rabbits	Up to 230 chicks fledged	
2012	As previous + bait stations for rats and possums	~500 adults Up to 267 chicks fledged	
2013	As previous	>670 adults At least 174 chicks fledged	
2014	As previous	Lower fledging success than previous three years (rats)	
2015	As previous	Abandoned (mustelids)	Colony failed
	500 m trapping radius		
2016, 2017, 2018, 2019	Cats, mustelids, hedgehogs, bait stations for rats only, reduced frequency of trap checks outside breeding season, no rabbit control. + Predators monitored with camera traps and tracking tunnels. Further control if detected = Reactive	No fledging in any year, hatching success also zero or low (rats and mustelids). Flooding in 2019 caused significant losses.	Colony failed for four consecutive years
2020	As previous + Rodent and mustelid dogs and cat spotlighting = Preventative	~330 adults, Hatching success ~50% of nests Estimated 111 fledglings	
2021	As previous	~522 adults Hatching success ~70% of nests Estimated 8-310 fledglings#	
2022	As previous	Rats and mustelids destroyed all nests in the first colony on Tern Island. Two smaller colonies established on banks, all nests destroyed by hedgehogs. Second colony established on Tern Island with 144 adults	First colony failed, second colony fledged chicks

* DNA testing of saliva residues on eggshells detected Norway rats, possums, and Australasian harrier. Analysis cannot identify if eggs were predated or scavenged. Based on results, possums and Norway rats were recommended to be added to target species.

\# The annual report states "A wide range of chicks were estimated to fledge (8-310) while at least 30 fledglings were seen in each nest check" – it is not entirely clear what this means.

55. The size of the potential predator population in the immediate surrounds of Tern Island is illustrated by the large number of captures from the trap network and hunting results. For example, year-round trapping for mammalian predators from July 2019 to June 2020 within the reduced 500 m radius removed:

    - 127 hedgehogs

- 38 cats
- 74 ferrets
- 6 stoats
- 8 weasels
- 24 Norway rats
- 14 possums.

In addition, 176 rabbits were shot, and rats were targeted with poison bait stations.

56. Some of the predators responsible – Norway rats, mustelids, and hedgehogs – have been able to be identified, but other species may be involved. These individuals have not only escaped being caught by the trapping network but have crossed the channels that surround Tern Island.

57. At least two studies in New Zealand have shown that predation rates do not necessarily relate to overall predator abundance, and that certain species, or certain individuals, can cause a disproportionate amount of mortality. It follows that benefits to bird species will be reduced if these individuals are not caught. This applies not only to mammalian predators such as cats, but also the predatory karoro, where only a small proportion of the population appear to specialise in preying on other bird species.

58. Further, research in the Tasman River specifically indicated that low flows facilitated predation on banded dotterel nests and wrybill chicks regardless of predator abundance[12].

59. Applying these findings to the Takapō River, which has flows that are generally comparable to the minimum environmental flow of the Upper Ōhau (8-12 cumecs), and no mammalian predator control, illustrates the vulnerability of braided river bird species that choose to nest there from year to year. The reduction in mean flow in the Takapō from approximately 80 cumecs prior to diversion to its present median flows of 0, 3.1, and 10.2 cumecs (depending on reach) has undoubtedly increased the rate of mammalian predation. Note that minimum flows in the Takapō are considerably lower again, at 0, 1.4, and 4.0 cumecs (Table 7, Hydrological Assessment).

60. Given the Takapō River in its present state has been assessed as nationally and internationally significant for freshwater bird species and supports a nationally significant population of black-fronted terns, this large reduction in flow and the resulting vulnerability to mammalian predation constitutes very high level of effect. This effect has been ongoing since the diversion of flow through the Tekapo Canal.

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[12] Cruz J., Pech R.P., Seddon P.J., Cleland S., Nelson D., Sanders M.D. and Maloney R.F. 2013: Species-specific responses by ground-nesting Charadriiformes to invasive predators and river flows in the braided Tasman River of New Zealand. *Biological Conservation 167*: 363-370.

Takapō River wetlands

61. Though targeted surveys by Project River Recovery within the MacKenze Basin did not detect bittern in wetlands associated with the Takapō River (only one wetland appears to have been surveyed), the presence of bittern in the wider area is relevant. This is because recent population estimates have suggested the population in Canterbury may be as low as 30-50 birds, and research shows that birds often use multiple wetlands within their home range and will fly considerable distances to forage. Few, if any, wetlands in the Mackenzie Basin are likely to support a permanent pair of bitterns. It is much more likely that birds will use multiple wetlands to forage. It follows that substantial networks of wetlands must be maintained to sustain even the smallest number of bittern.

62. It is not clear from the applicant's evidence if wetlands associated with the river are suitable for bittern foraging. The observations of bittern from the wider area indicate that individuals are using a variety of habitats including constructed wetlands and hydro structures. It is probable that birds are using Pattersons Ponds and other wetland habitats from time to time. The levels and trends of weed invasion in these habitats and consequently their long term sustainability have not been provided by the applicant.

Project River Recovery

63. Meridian Energy has funded the conservation programme Project River Recovery since 1991, joined by Genesis Energy in 2011, set up to compensate for the adverse effects of the power schemes on the biodiversity and ecosystems of the rivers, lakes, and associated habitats of the mid and lower Waitaki catchment.

64. Project River Recovery's focus for the first 15 or so years was weed control to protect and restore habitats of indigenous flora and fauna, primarily in the unmodified rivers of the upper Waitaki catchment. In 2004, an experimental landscape-level approach to predator control was established in the Tasman River valley. In 2009, the localised approach to predator control was initiated at 'Tern Island' on the Upper Ōhau River. In addition, areas of wetlands have been extended or constructed and maintained within the affected mid catchment. Project River Recovery has also produced many research publications.

65. Both the Avifauna Assessment and Whitehead *et al.* (2023)[13] have undertaken statistical analyses for freshwater bird species throughout the Waitaki catchment (Godley, Cass, Tasman, Ahuriri, Takapō, Pūkaki, Ōhau, and Waitaki rivers). The Avifauna Assessment used standard linear regression, whereas Whitehead *et al.* (2023) used quasi-poisson generalised linear regression models, which are usually

[13] Whitehead A., Hoyle J. Bind J. and Sykes J. 2023: Freshwater birds and riverbed vegetation in the Waitaki catchment – Current state of knowledge. NIWA Client Report No. 2020122CH. Prepared for Meridian Energy. 171p.

preferred for situations where counts can fluctuate significantly, such as braided river birds. The different statistical analysis methods mean the results of the two sets of analyses are different.

66. The Avifauna Assessment provides trend analyses for freshwater bird species since the first surveys in 1962, and from 1991 when the most recent consents were granted. Analyses of data since 1991 show that, for the six braided river bird species, black-fronted terns, South Island pied oystercatcher, wrybill, and banded dotterel have undergone significant decreases on the Takapō River. Black-billed gull numbers remain unchanged, and kakī have increased. Whitehead *et al.* (2023) only detected significant decreases for wrybill and banded dotterel but also detected the improvement in kakī abundance. It should be noted that the Nationally Critical classification of kakī is based on its small population; it is not considered to be in decline as its population is maintained through regular releases of young, captive-raised birds.

67. Whitehead *et al.* (2023) showed that the decline of wrybill on the Takapō River between 1991 and 2019 was the most marked of all the rivers analysed. This decline contrasts with the species' threat classification of Threatened-Nationally Increasing. However, the overall picture of declines and increases throughout the Waitaki catchment is difficult to unpick, including the present influence of river diversions and reduced flows. Threats beyond those of the hydroelectric schemes will be influencing the trends of multiple species, and the interrelating factors of flow, terrestrial predators, and weed encroachment complicate the assessments of threat. Nevertheless, wrybill have not increased on any of the eight rivers analysed, including on the Tasman River, where 20 years of predator control has been undertaken. The reasons for the continuing declines must be the focus of research.

68. A possible explanation is the high levels of mobility that has been detected in some braided river bird species. My research on black-billed gulls in Southland rivers showed that birds returning to the rivers for the first time mostly settled to nest in catchments different to the one where they hatched. Adults were likewise highly mobile, often breeding in a different river the following year, with a few adults being observed in multiple catchments before eventually nesting.

69. Recent research on black-fronted terns tagged in breeding colonies on the Upper Ōhau, Cass , and the Waiau Toa | Clarence rivers has identified previously unknown aspects of the species' ecology, including that individual birds often visit other colonies to roost, forage in multiple rivers, travel extensively at night, cover large distances to forage (up to 50 km from the colony), and often roost away from the breeding colony overnight – for example, at the Takapō delta. Also, a separate analysis of re-use of colony sites demonstrated low breeding site fidelity, with colonies rarely re-establishing at the same location the following year.

70. This high mobility suggests that benefits gained from predator control at one site might be diluted when juveniles and adults move elsewhere in subsequent years. If wrybill have a similar pattern of movements between seasons, this may explain the lack of gains in the Tasman River. Furthermore, black-fronted tern tracking suggests predator management limited to the location of the breeding colony may be insufficient given birds could be subjected to disturbance and predation at overnight roost sites.

Kahu Ora – Compensation

71. Kahu Ora is the 35-year Indigenous Biodiversity Enhancement Programme (IBEP) which is the compensation agreement between Meridian Energy, Genesis Energy and the Department of Conservation. The 10-year strategic plan states that the agreement does not seek to directly mitigate the impact of the two power schemes within the catchment.

72. Kahu Ora has a single objective: "to improve the condition, resilience, indigenous biodiversity, ecological processes and other values of the braided rivers and associated environments, including wetlands, within the Waitaki Catchment" (p8). This is a very broad objective and is not specific or measurable.

73. The IBEP includes the Takapō River in its remit. In my opinion, the actions set out in the 10-year strategic plan for the Takapō River and associated wetlands are more appropriately considered as compensation for the effects of the Tekapo Power Scheme on freshwater bird values rather than a component of compensation for the combined schemes. This provides a better relationship between effect and compensation. I understand that there are legal issues associated with this approach but, from an ecological perspective, I consider that Genesis can compensate appropriately for effects of the Tekapo Power Scheme on freshwater birds with actions specifically focused on the Takapō River and associated wetlands.

74. Key actions for birds within the first 10 years in the Takapō sub-catchment can be summarised as:

    a. Control of woody and herbaceous vegetation in the Upper Takapō River (this is assumed to refer to the river upstream of the confluence with the Pūkaki River, but it is not defined), Fork Stream, Gray River wetland, and eight wetlands in the Upper Takapō River.

    b. Control of karoro on the Takapō River (and on the Pūkaki and Upper and Lower Ōhau rivers).

c. Establishing eight islands to support bird nesting on the Takapō River (this is not described but is assumed to relate to vegetation clearance on existing islands to create bare gravel surfaces for breeding)[14].

d. Controlling mammalian predators at one biodiversity hot spot on the Takapō River (this site is not identified).

75. The lack of detail on the actions set out in the Kahu Ora strategic plan is not helpful.

76. The control of weeds in the Upper Takapō River and wetlands, and in the Grays River wetland, will presumably enhance freshwater bird habitats, potentially including habitats that Australasian bittern might use. However, I note that while the text states that weeds will be controlled in eight wetlands of the Upper Takapō, Table 3 indicates that no weed control will occur in Takapō River wetlands. As I have previously noted, the applicant's experts have not provided descriptions of associated wetlands, and the strategic plan provides no other detail.

77. The intention of Kahu Ora appears to be to control karoro throughout the Waitaki catchment as the strategic plan proposes control in each river from the Waitaki through to the upper catchment rivers such as the Godley. The numbers of the predatory gull are in their hundreds or less in rivers of the mid and upper Waitaki catchment. To date, control of karoro does not appear to have been consistent across rivers, but significant declines since 1991 have nevertheless been detected in the Tasman and the Takapō. However, increases have occurred in the Cass and Godley. Consistent, ongoing control needs to occur to avoid the possibility of gull numbers recovering and address the possible issue of individuals moving into the managed habitats from elsewhere due to the reduction in numbers.

78. The nesting islands are likely to improve the availability of bare gravels for the breeding of key species such as black-fronted tern, wrybill, and black-billed gull in the Takapō River. However, most of the river – between the Fork Stream and Mary Burn/Grays River confluences – has a lower median flow than the minimum flow in the Upper Ōhau River. Consequently, mammalian predators will have easier access to the cleared nesting islands than at Tern Island, where colonies still fail periodically despite intensive predator control.

79. Given the very low flows in much of the Takapō River, and the absence of mammalian predator control, the Takapō nesting islands are unlikely to protect nesting bird species from terrestrial predators. The nesting islands therefore provide insufficient compensation for the low flows in the Takapō River.

[14] For example, as per Schlesselmann A.K.V., O'Donnell C.F., Monks J.M. and Robertson B.C. 2018: Clearing islands as refugia for black-fronted tern (*Chlidonias albostriatus*) breeding colonies in braided rivers. *New Zealand Journal of Ecology 42*: 137-148.

80. Increasing flows in the river would reduce the frequency of terrestrial predator incursions on to the nesting islands (e.g. Options 1 and 2 as set out in the evidence of Kate McArthur), as well as managing periphyton mass which impacts food sources for birds.

81. Many studies have shown the potential benefits of islands for nesting birds, including my own doctoral research[15]. However, only Pierce (1987)[16] and Pickerell (2015)[17] attempted to define the flows required to deter predators. Pierce (1987) found increased breeding success on Takapō River islands surrounded by a minimum discharge of 1 cumec and stated that a discharge of 3 cumecs was sufficient to stop feral cats and ferrets from reaching an island. However, Pickerell (2015), using considerably improved technology, summarised that islands 1-3.5 ha, more than 20 m from the closest mainland, and with a total channel discharge of more than 6 cumecs, free from vegetation and rabbits, "should be of most benefit for breeding braided-river birds". She noted that no island could be considered truly free of mammalian predators.

82. The Tern Island project has been ongoing for 15 years, longer than any other similar study. Monitoring of the tern colony shows that the total channel discharge of 8 cumecs still allows some predators to reach the colony and cause its complete collapse, despite intensive predator control. Consequently, it is difficult to state what flows would be required to better protect bird species nesting on cleared islands in the Takapō River, but it is certainly higher than what presently exists. In my opinion, Ms McArthur's Options 1 and 2 would be very likely to provide much improved security for nesting birds, and Option 3 may not, as the new minimum flow through much of the Takapō would be relatively similar to that of the Upper Ōhau.

83. The strategic plan also proposes to control mammalian predators at one "hot spot" on the Takapō River. It is presumed that this will be similar to the Tern Island programme, which also protects populations of lizards and invertebrates. However, the absence of any detail on location, the species to be protected, and the size of any control area in the plan means it is not possible to specifically comment on its suitability for compensating for effects on braided river birds. If the area to be protected is within a reach with particularly low flow, braided river birds may not benefit. I note that a significant increase in flow in the Takapō would likely preclude the need for mammalian predator control for nesting birds as flows within channels would be considerably higher, reducing access for mammals.

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[15] McClellan R.K. 2009: The ecology and management of Southland's black-billed gulls. Unpublished PhD thesis, University of Otago, Dunedin, New Zealand. 264 p.

[16] Pierce R.J. 1987: Predators in the Mackenzie Basin: their diet, population dynamics, and impact on birds in relation to the abundance and availability of their main prey (rabbits). Unpublished report. Wellington, Department of Conservation. 109 p.

[17] Pickerell G.A. 2015: Braided-river islands as refuges from introduced mammalian predators: characteristics influencing predator presence, and consequences of reduced flow. Unpublished PhD thesis, University of Otago, Dunedin. 271 p.

84. Lastly, landscape level predator control in the Tasman River valley at the head of Lake Pūkaki is proving largely successful at improving the breeding success and population trends of multiple bird species (note that the Tasman is a vast, multi-channel braided river with a mean flow of approximately 80-90 cumecs[18]). Te Manahuna Aoraki now traps through the Godley River valley at the head of Lake Takapō, and down through the Cass River on the western side of the lake. The end of the trap lines is only a few kilometres from the start of the Takapō River. Extending the control programmes through the Mackenzie Basin and across the Takapō River will help to protect a range of indigenous biodiversity values, not just freshwater bird species. However, it may not be sufficient to significantly enhance breeding success of braided river birds on the Takapō given the very low mean flows in much of the river.

85. The Department of Conservation produced an internal document that identified the biodiversity values affected by hydroelectric generation in the Waitaki catchment and identified and costed a range of actions to mitigate effects as part of negotiations with Meridian Energy and Genesis Energy for reconsenting purposes. Wetland and braided river birds were an identified value. The authors described five scenarios from "all biodiversity values are fully managed at all places", to "a few key values are managed at a few key places". The latter scenario was costed at 2.1 million annually over 35 years. While it differs from the compensation package provided in Kahu Ora, it is clearly similar. The report summarised the approach of this last scenario: "Although a 'holding the line', or 'management only' approach is presented in this document, it is insufficient to fully mitigate the impacts of hydroelectric activity. This is because holding the line would be assuming that the current state of the rivers and their ecosystems is sufficient to sustain the species within them and act as a functioning ecosystem over the next 35 years. This is unlikely to be the case, especially when inevitable climate change impacts are included."

86. Kahu Ora should be a programme that achieves tangible improvements for key Threatened and At Risk braided river and wetland bird species throughout the catchment. The data and analyses provided in the Avifauna Assessment and Whitehead *et al.* (2023) show that banded dotterel, black-billed gull, black-fronted tern, South Island pied oystercatcher and wrybill are likely to be declining overall in Takapō, Ōhau, and Waitaki River, and braided river birds may have largely gone from the Pūkaki[19]. The Tasman River programme does not compensate for this ongoing loss of bird values throughout the catchment.

[18] Data taken from NIWA New Zealand River maps https://shiny.niwa.co.nz/nzrivermaps/ based on Booker D.J. and Woods R.A. 2014: Comparing and combining physically-based and empirically-based approaches for estimating the hydrology of ungauged catchments. *Journal of Hydrology 508*: 227-239.

[19] Kakī numbers are enhanced by a major Department of Conservation captive breeding programme.

Conditions

87. There are no conditions specifically relating to birds. Instead, conditions require the implementation of the Indigenous Biodiversity Enhancement Programme (IBEP) or Kahu Ora, and consecutive 10-year strategic plans that set out how Kahu Ora will be achieved. Kahu Ora and the initial strategic plan address bird and bird habitat values.

88. As I have noted previously in my evidence, the single, expansive objective of Kahu Ora lacks specificity and measurability, and the strategic plan lacks detail, explanation, and provides conflicting actions in at least one instance, making the programme difficult to evaluate.

89. Overall, the compensation offered for Takapō River braided river birds through the creation of nesting islands is inadequate. This is because it does not address the vulnerability of bird species to terrestrial predation, and the resulting impacts on productivity and survival, given ongoing low flows in the river.

Conclusions

90. The Takapō River has been assessed as a nationally and internationally significant river. This was not identified by the Applicant. It is also estimated to support more than 5% of the national population of the Nationally Endangered black-fronted tern, which is also considered nationally significant. This is despite the reduction in flow from a historical mean of approximately 80 cumecs to its present median flows of 0, 3.1, or 10.2 cumecs depending on reach.

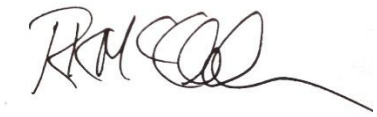
91. Kahu Ora's strategic plan provides scant and conflicting detail on the restoration of wetland habitats in the Takapō River. The Applicant's experts have likewise provided minimal description of wetlands associated with the river. However, it is assumed that eight wetlands as well as Grays River Wetland will be restored through weed control, and that several of these will provide habitats for freshwater birds, possibly including Australasian bittern. On this basis, this is adequate compensation for ongoing effects on wetland birds.

92. The Avifauna Assessment has undertaken a 'high level' analysis of land cover types on the river which suggests that the availability of bare gravel habitats for nesting have remained unchanged for the last ~30 years. This is positive, however, monitoring vegetation changes within the active riverbed (e.g. weed invasion) using robust methodology would be preferable.

93. Catchment-wide karoro control will likely address ongoing predation from this species, but predation by terrestrial mammals will remain a significant issue due to

very low flows in the Takapō River. Flows in much of the Takapō River are lower than Upper Ōhau where one of the largest colonies of black-fronted terns in New Zealand regularly nests. Despite intensive mammalian predator control, the Upper Ōhau Tern Island colony still fails to produce any fledglings in some years, with Norway rats, hedgehogs, mustelids, and possibly other predatory species, crossing the channels to prey on eggs, chicks, and adults. This indicates that the proposed nesting islands in the Takapō River, while increasing the availability of breeding habitat, will be even more accessible by predators given the very low flows, particularly in the absence of mammalian predator control. The nesting islands provide insufficient compensation for the ongoing effects of very low flows on braided river bird productivity and survival.

94. Compensation needs to achieve demonstrable improvements for braided river birds. The ongoing declines in braided river bird populations in the Takapō River are not addressed by the clearance of vegetation on river islands. In contrast, increases in flow would reduce the impacts of terrestrial predators. Extension of landscape-level predator control is also likely to provide benefits, but the very low flows in the Takapō may allow continuing incursions.



Rachel McClellan
25 August 2025

Appendix 1

Species names and threat classifications for birds mentioned in the text (Robertson *et al.* 2021)[20]

Species	Species Name	Threat Classification
Waterfowl		
Black swan	*Cygnus atratus*	Not Threatened
Grey duck	*Anas superciliosa*	Nationally Vulnerable
Mallard/grey duck	*Anas superciliosa x platyrhynchos*	Not Threatened
Grey teal	*Anas gracilis*	Not Threatened
Australasian shoveler	*Anas rhynchotis*	Not Threatened
Paradise shelduck	*Tadorna variegata*	Not Threatened
New Zealand scaup	*Aythya novaeseelandiae*	Not Threatened
Shags		
Black shag	*Phalacrocorax carbo novaehollandiae*	Relict
Little shag	*Phalacrocorax melanoleucos brevirostris*	Relict
Pied shag	*Phalacrocorax varius varius*	Recovering
Herons and spoonbills		
Australasian bittern	*Botaurus poiciloptilus*	Nationally Critical
White-faced heron	*Egretta novaehollandiae*	Not Threatened
Waders		
Kakī	*Himantopus novaezelandiae*	Nationally Critical
Hybrid kakī	*Himantopus novaezelandiae x himantopus*	Nationally Critical
Pied stilt	*Himantopus himantopus leucocephalus*	Not Threatened
South Island pied oystercatcher	*Haematopus finschi*	Declining
Variable oystercatcher	*Haematopus unicolor*	Recovering
Wrybill	*Anarhynchus frontalis*	Nationally Increasing
Banded dotterel	*Charadrius bicinctus bicinctus*	Declining
Gulls and terns		
Karoro | black-backed gull	*Larus dominicanus dominicanus*	Not Threatened
Black-billed gull	*Larus bulleri*	Declining
Red-billed gull	*Larus novaehollandiae scopulinus*	Declining
Black-fronted tern	*Chlidonias albostriatus*	Nationally Endangered
Caspian tern	*Hydroprogne caspia*	Nationally Vulnerable

[20] Robertson H.A., Baird K.A., Elliott G., Hitchmough R., McArthur N., Makan T., Miskelly C., O'Donnell C.F., Sagar P.M., Scofield R.P. and Michel P. 2021: *Conservation status of birds in Aotearoa New Zealand, 2021*. Wellington, New Zealand: Department of Conservation, Te Papa Atawhai.