Before the	**MACKENZIE DISTRICT COUNCIL**
IN THE MATTER	**of the Resource Management Act 1991**
AND	
IN THE MATTER	**of Plan Change 19 to the Mackenzie District Plan**

EVIDENCE OF ANDREW DONALD GRANT

FOR DIRECTOR-GENERAL OF CONSERVATION

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20 November 2018

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STATEMENT OF EVIDENCE OF ANDREW DONALD GRANT

INTRODUCTION

Qualifications and Experience

1. My full name is Andrew Donald Grant

2. I am employed as a Technical Advisor (Ecosystems) with the Department of Conservation Ecosystems and Species Unit.

3. I have a BSc in Zoology from Otago University (1978) and a post graduate Diploma in Wildlife Management from Otago University (1980)

4. I have worked with wildlife and conservation for 38 years, initially with the NZ Wildlife Service Research Section then, with the Department of Conservation. My experience includes: managing a waterfowl research field station; all aspects of endangered species management from recovery planning through to running field programmes (direct involvement with at least 10 critically endangered bird species and their recovery programmes); extensive field experience in wildlife management, monitoring and survey in a wide variety of locations from remote islands to large mainland habitats; producing recovery plans, operational plans, strategies and other similar planning documents for species and ecosystem management; coordinating and managing conservancy science planning and implementation, and national development of best practice, audit and performance measurement.

5. I have read the Environment Court's Code of Conduct for Expert Witnesses. Although this evidence is not being presented to the Environment Court, I have complied with the code of conduct in its preparation. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

SCOPE OF EVIDENCE

6. My evidence will deal with the following:

a. Bird species recorded on the Godley, Cass, Tasman and Dobson Rivers;
b. The importance of the Godley, Cass, Tasman and Dobson Rivers to kakī/black stilt;
c. The ecological value of the Godley, Cass, Tasman and Dobson Rivers;
d. Effects of motorised boats on the bird species of these rivers

BIRD SPECIES RECORDED ON THE GODLEY, CASS, TASMAN AND DOBSON RIVERS

7. The Cass River is an alpine river with its source in the Hall range and the Huxley Glacier. After dropping 600m very rapidly from its sources it becomes a typical braided river along a flat-bottomed valley for 25 Kms and terminates through a gravel delta into the west side of Lake Tekapo. The Cass is categorised as a Medium flow braided river with a mean flow[1] of 11.27 cubic metres per second (cumecs or m3sec-1) and a mean annual low flow (MALF)[2] of 4.2 cumecs at lake Tekapo. At its start as a braided river it has a mean flow of 2.3 cumecs and a MALF of 0.77 cumecs (Booker 2015).

8. The Tasman River is an alpine braided river with its source in the Aoraki/Mt Cook National Park's proglacial Tasman Lake, the Murchison River from Murchison Glacier and the Hooker River from the Hooker and Mueller Glaciers. The Tasman River is a wide typical braided river which flows 25 Kms through the wide-flat bottomed Tasman Valley and terminates through a gravel delta into Lake Pukakī. It is classified as a High flow braided river with a mean flow of 95.3 cumecs and MALF of 23.5 cumecs at Lake Pukakī, and a mean flow of 51.3 and MALF of 10 cumecs at its beginning (Booker 2015).

9. The Dobson River is an alpine braided river with its source east of Mt Hopkins in the Southern Alps. The Hopkins is a typical braided river which flows south for 45 Kms and terminates in the Hopkins River close to where the Hopkins River flows into the northern end of Lake Ohau. The Dobson river is classified as a Medium flow braided river with a mean flow of 18.7 cumecs and a MALF of 6.25 at its termination and a mean of 3.07 cumecs and a MALF of 0.87 at its beginning (Booker 2015).

[1] Mean flow is calculated from mean daily flows for a water year (July – June)
[2] MALF is the 7-day mean annual low flow

10. The Godley river is an alpine braided river with its source in the Aoraki/Mt Cook National Park's Grey, Maud, Godley and Classen glaciers and their associated glacial lakes. The Godley is a wide braided river flowing through 25 Kms of a wide flat-bottomed valley before terminating through a wide delta at the top of Lake Tekapo. The Godley is classified as a High flow braided river with a mean flow of 50.9 cumecs and a MALF of 16.1 cumecs at its termination and at its beginning a mean flow of 12.6 cumecs and a MALF of 2.5 cumecs (Brooker 2015).

11. Braided rivers support a variety of specialist braided river bird species. These bird species utilise the vegetation-free gravel and sand substrates associated with a braided river. In an analysis of suitable available habitat on braided rivers in New Zealand the Tasman, Godley, and Dobson Rivers ranked within the top five of all braided rivers for habitat suitability (Wilson 2001). That analysis measured mean patch size of open or vegetated patches and their abundance (number of patches per river) within each braided river system. The mean open patch sizes (MPS) for the Tasman, Godley and Dobson were: Tasman - 1232ha; Godley - 471ha; and Dobson - 215ha.

12. In Table 1 below I have compiled a list of birds recorded on the Godley, Tasman, Cass and Dobson Rivers.

Table 1: Birds recorded on the Cass, Dobson, Godley and Tasman rivers presented in their water bird guild groupings

Guild	Species	Scientific Name	Threat category	Qualifiers	Status	River			
						Cass	Tasman	Dobson	Godley
aerial hunting gulls and terns	Black-billed gull	*Larus bulleri*	Nationally Critical	C, DP,RF	endemic	X	X		X
	Black-fronted tern	*Chlidonias albostriatus*	Nationally Endangered	C(1/1), CD,DP,RF	endemic	X	X	X	X
	Caspian tern	*Hydroprogne caspia*	Nationally Vulnerable	C(1/1), SO,Sp	native	X	X	X	X
	Southern black-backed gull	*Larus dominicanus*			endemic	X	X	X	X
dabbling waterfowl	Black swan	*Cygnus atratus*			introduced	X	X		X
	Canada goose	*Branta canadensis*			introduced	X	X	X	X
	Duck species					X	X	X	X
	Grey duck	*Anas superciliosa*	Nationally Critical	B(1/1), DP, SO	native	X	X	X	X
	Grey teal	*Anas gracilis*			native	X	X		X
	Mallard duck	*Anas platyrhynchos*			introduced	X	X	X	X
	New Zealand shoveler	*Anas rhynchotis*			endemic	X	X		X
	Paradise shelduck	*Tadorna variegata*			endemic	X	X	X	X
deep water waders	Black stilt	*Himantopus novaezelandiae*	Nationally Critical	A1, CD,RR,St	endemic	X	X		X
	Hybrid black stilt					X	X	X	X
	Pied stilt	*Himantopus himantopus*			native	X	X	X	X
	South Island pied oystercatcher	*Haematopus finschi*	Declining	B(1/1)	native	X	X	X	X
	White-faced heron	*Egretta novaehollandiae*			native	X	X		X
open water divers	Australasian crested grebe	*Podiceps cristatus australis*	Nationally Vulnerable	A(1/1), SO	native	X	X		X
	Black shag	*Phalacrocorax carbo*	Naturally Uncommon,		native	X	X	X	X
	Little shag	*Phalacrocorax melanoleucos*			native	X	X		X
	New Zealand scaup	*Aythya novaeseelandiae*			endemic	X	X		X
riparian wetland species	Swamp harrier	*Circus approximans*			native	X	X	X	X
shallow water waders	Banded dotterel	*Charadrius bicinctus*	Nationally Vulnerable	D(1/1), DP	native	X	X	X	X
	Spur-winged plover	*Vanellus miles*			native	X	X	X	X
	Wrybill	*Anarhynchus frontalis*	Nationally Vulnerable	B(1/1),DP, RR	endemic	X	X	X	X

13. The list in Table 1 is organised according to wetland guilds that have been identified by O' Donnell (2000). The guilds are listed in Table 2 below. Guilds are communities of birds with similar foraging and nesting requirements (Verner (1984)). They are identified, primarily, by characterising the main microhabitats and the depth of water that species use for feeding, then grouping the species with similar characteristics. These groupings of species tend to share other similar preferences for roosting and breeding.

Table 2. Describe water bird guilds (from O'Donnell 2000)

Open water divers	Grebes, shags and cormorants, and diving waterfowl that usually forage in open, deep waters. Most hunt by diving for fish, though some consume invertebrates and waterweed from lake bottoms. Grebes and diving waterfowl nest in vegetation overhanging the water's edge at water level. Cormorants usually nest high in overhanging trees (especially willows) and overhanging rock outcrops.
Deep water waders	Waders with medium-long legs that allow them to forage in water depths of > 200 mm as well as shallow water (e.g., stilts, oystercatchers). They breed on the ground in open areas, especially shingle or sand, free of emergent vegetation. They usually roost in flocks in similar habitats. This guild includes species that breed in New Zealand and arctic migrant waders. Arctic migrants (e.g., godwits) do not breed in New Zealand but use habitats here as their wintering ground. By far the majority only occur in Canterbury in summer and are concentrated on coastal water bodies. However, they use microhabitats and water depths similar to those of resident waders.
Shallow water waders	Waders with short legs that restrict them to feeding in water <80 mm, and most use is of water < 40 mm deep (e.g. plovers, sandpipers). They breed on the ground in open areas, especially shingle, wetland turf, or sand, free of emergent vegetation. They usually roost in flocks in similar habitats. This guild includes species that breed in New Zealand and arctic migrant waders.
Dabbling waterfowl	Ducks and swans (e.g., NZ shoveler, paridise shelduck) that predominately feed by dabbling while floating on open water or graze on wetland turf and saltmarsh. Most species nest within dense cover in swamps or riparian vegetation and roost by floating on open water
Aerial hunting gulls and terns	Generally aerial hunters, flying over open water or river channels and diving for invertebrates and small fish. They nest on open shingle bars and islands.
Swamp specialists	Rails and bittern that dwell in dense swamp vegetation associated with wetlands. Their diet consists of seeds and invertebrates gleaned from swamp vegetation or surface water with good vegetative cover They also consume vegetation itself, and, in the case of bittern, fish and amphibians. They generally nest within Carex secta or Typha orientalis and other rushes.
Riparian wetland specialist	Species that are generally considered either terrestrial or aquatic (e.g., swallows, pipits, kingfishers). They do not depend on wetlands though are often associated with them as much as any other habitat for either breeding and feeding.

14. In the tables the **Status** identifies the species' origin. Terms that are used to present more detailed information about species' origin include the following:

Endemic – breeds only in New Zealand
Native – breeds in New Zealand and elsewhere but is self-introduced and naturalised
Introduced – introduced by human agency and naturalised
Migrant – species which visit New Zealand every year as part of their life history
Straggler – an irregular visitor
Vagrant – transitory unexpected species

15. Of the 23 species recorded, 10 (43%) are classified as threatened in the New Zealand Threat Ranking Classification System.

16. The New Zealand Threat Ranking Classification System (Townsend *et al* (2007), Miskelly *et al* (2008), Robertson *et al* (2012) and Robertson et al (2017)) is a system whereby all species in New Zealand have been assigned a threat ranking dependant on their origin (endemic, native or introduced), and an assessment based on population size, population trend, the number of populations and the size of habitat occupied by the populations. Depending on the criteria a species is then assigned to one of the following categories (given in the order of greatest threat to the least threat);

Threatened	Nationally Critical Nationally Endangered Nationally Vulnerable;
At Risk	Declining Recovering Relict Naturally Uncommon;
Not threatened	Migrant; Vagrant or Coloniser.

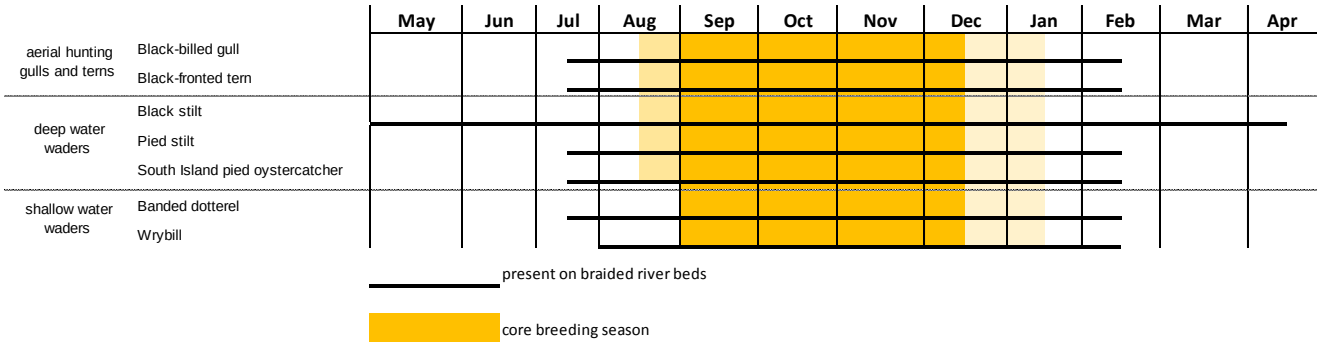
17. When a threat category is assigned it is accompanied by some criteria and qualifiers. These provide the reasons for that species' threat category. More detail of the ranking system, categories and qualifiers are provided in Appendix 1.

18. Four endemic bird species, the wrybill, kakī/black stilt, black-billed gull and black-fronted tern have evolved on braided rivers, and virtually all individuals of those species only breed on braided rivers. Two further endemic species, the banded dotterel and South Island pied oystercatcher use braided rivers as their major breeding habitats.

19. The kakī /black stilt, wrybill, banded dotterel and black-fronted tern are all classed as threatened species (Robertson *et al* (2017)). These species are migratory. They begin arriving on the rivers in numbers in late July and August, with peak nesting occurring between August and December, then most have left by February.

20. Figure 1 below illustrates seasonal use for the migratory species. Wrybill and banded dotterels disperse to coastal estuarine areas, black-fronted terns and black-backed gulls to coastal areas and kakī to the river deltas.

Figure 1. Seasonal use of riverbed by braided river specialist species



21. Specific adaptations for living on rivers include migratory patterns, specialised morphological features (such as the wrybill's curved bill), specialised foraging behaviours, narrowly defined ranges of preferred habitats, and the ability to breed in the unstable river environment (with rapid re-nesting, and short inter-lay intervals). These micro habitats have been categorised by O'Donnell (2000) into five categories typical of a braided river

R1. Riparian areas. Terrestrial habitat adjacent to rivers and lakes that are used by water birds. Includes fields, riparian willows (*Salix* spp.) and river banks.

R2. River terraces. Raised level areas immediately adjacent to the river floodplain resulting from successive down-cuttings by the river. Younger, low level terraces may have developed in mid-channel.

R3. Shingle bars and flats. Areas of sand, mud, cobbles or shingle on the active river bed. May be surrounded by water.

R4. Major channels. Runs and riffles of major channels, which carry a high proportion of the river flow. Generally > 160 mm deep, and may be slow or swift, with broken or unbroken water. This category includes single channel rivers such as the Avon and Heathcote Rivers.

R5. Shallow channels, backwaters and seeps. Runs and riffles of minor channels, which carry a small proportion of the river flow (generally <5%). Less than 160 mm deep, and often < 80 mm. Usually slow or moderate water speeds. These sometimes arise from, or shrink into seeps where water level becomes shallower until

22. How species utilise these micro habitats for feeding is indicated in Table 3 and for breeding in Table 4 (O'Donnell (2000)).

Table 3: Key feeding microhabitats for species using rivers

	Key Feeding Microhabitats				
	R1	R2	R3	R4	R5
Open water divers					
crested grebe					
black shag				✔	
little shag				✔	✔
pied shag				✔	
Deep water waders					
black stilt		✔	✔	✔	✔
pied stilt (S)	✔	✔	✔	✔	✔
pied oystercatcher (S)	✔	✔	✔	✔	✔
Shallow water waders					
wrybill (S)			✔	✔	✔
banded dotterel (S)	✔	✔	✔	✔	✔
banded dotterel (W)	✔		✔		✔
Dabbling waterfowl					
paradise shelduck	✔	✔	✔		✔
grey duck				✔	✔
Aerial gulls and terns					
black-fronted tern (S)	✔	✔		✔	✔
caspian tern			✔	✔	✔
black-billed gull (S)	✔	✔	✔	✔	✔
black-billed gull (W)	✔				
Swamp specialists					
Australasian bittern	✔				✔

S = summer W = Winter ✔ = habitat use for >10% of time

Table 4: Key breeding microhabitats for species using rivers

	Key Breeding Microhabitats				
	R1	R2	R3	R4	R5
Open water divers					
crested grebe					
black shag	✔	✔			
little shag	✔	✔			
Deep water waders					
white-faced heron	✔	✔			
black stilt		✔	✔		✔
pied stilt	✔	✔	✔		✔
pied oystercatcher	✔	✔	✔		
Shallow water waders					
wrybill			✔		
banded dotterel	✔	✔	✔		
Dabbling waterfowl					
paradise shelduck	✔	✔			
grey duck	✔	✔			
NZ shoveler		✔			
grey teal		✔			
Aerial gulls and terns					
black-fronted tern		✔	✔		
caspian tern			✔		
black-billed gull			✔		

✔ = habitat use for >10% of time

23. The Godley, Dobson, Tasman and Cass Rivers support all 23 species typical of braided rivers (Appendices 2,3,4,5). Some key threatened shallow-water and deep-water wading species such as wrybill, kakī and banded dotterel have significant proportions of their total populations on these rivers: Table 5.

Table 5: Mean counts and highest count from all river bed surveys of the Godley, Dobson, Tasman and Cass Rivers for key threatened braided river specialist species**.**

	Total species popln. estimate range		Godly		Dobson		Tasman		Cass	
Species	low	high	mean all yrs	highest count all yrs	mean all yrs	highest count all yrs	mean all yrs	highest count all yrs	mean all yrs	highest count all yrs
Counts										
Wrybill		5000	116	300	14	20	108	242	55	123
Black-fronted tern	5000 -	20000	114	364	54	76	190	393	123	446
Black-backed gull		90000	60	152			74	393	61	146
Kaki/Black stilt		150	10	25			14	68	3	8
Banded dotterel	5000 -	20000	404	786	95	126	603	1329	366	770
Count as percent of high end of the population estimates										
Wrybill		5000	2.32	6	0.28	0.4	2.16	4.84	1.1	2.46
Black-fronted tern		20000	0.57	1.82	0.27	0.38	0.95	1.965	0.615	2.23
Black-backed gull		90000	0.07	0.17			0.08	0.44	0.07	0.16
Kaki/Black stilt		150	6.67	16.67			9.33	45.33	2.00	5.33
Banded dotterel		20000	2.02	3.93	0.475	0.63	3.015	6.645	1.83	3.85

The importance of the Godley, Cass, Tasman and Dobson Rivers to kakī/black stilt

24. The Godley, Tasman and Cass Rivers are critical habitat areas for the endangered kakī. In the following section of my evidence I highlight just how important these rivers are by providing some 2017 - 2018 population data for this species.

25. Kakī are spread over a wide area and they are highly mobile, and observers concentrate on small areas at any one time. Those factors mean there is a somewhat complex method of calculating the kakī population.

26. The annual kakī population for a year is determined from the number of individually identified kakī seen between 1 March and 31 August. In effect this means the 'official' population for 2018 are those birds known to exist between 1 March 2017 and 31 August 2017. However, the period between 1 September 2017 to 28 February 2018 has far more birds as it is the breeding season and there will be juveniles which are not counted as part of the 'official' population. Many of the juveniles do not survive to adulthood.

27. Braided river surveys are a snapshot of birds using a stretch of braided river on that survey day and give an indication of bird diversity and numbers but not a population estimate of any particular species.

28. Kakī as a species are currently dependent on human intervention. That intervention includes captive breeding, captive rearing of wild sourced eggs, and the release of juveniles from captive pairs and wild sourced eggs incubated in captivity to increase the wild population and ensure persistence of the species. The vast majority of wild birds are a product of the captive rearing and release programme.

29. The Cass, Tasman and Godley rivers are sites currently utilised for release of sub-adult birds from the captive population. Every kakī has been individually banded so information on kakī numbers is well understood and accurate.

30. The current 'official' kakī population is 146 (1 March 2017 - 31 August 2017). The current actual 2018 population of kakī is 314, made up of 152 captive-released birds (juveniles), the current 'official' wild population of 146 adults and sub-adults, and 16 birds in captivity.

31. In the period between 1 March 2017 and 31 August 2017, 137 of the official total of 146 kakī (93.8%) were seen on either the Godley, Cass or the Tasman River. For the current breeding season population, 294 of the 314 kakī were recorded on either the Godley, Cass or Tasman River (93.6%). These counts confirm that the Godley, Cass and Tasman Rivers support over 90% of the entire kakī population.

32. Kakī use of individual rivers is illustrated in Table 6. Unlike other braided river species which leave the riverbeds following breeding kakī stay on them all year round.

Table 6: current proportion of wild kakī population using the Cass, Tasman and Godley river

River	All		Young kakī		Adult kakī	
Cass	8.9%	(28)			8.9%	(28)
Godley	32.5%	(102	20.1%	(63)	12.4%	(39)
Tasman	52.2%	(102)	28.0%	(88)	24.2%	(76)
Total	93.6%		48.1%		45.5%	

33. There has been considerable investment in kakī recovery over the past 40 years. Currently, the Department of Conservation spends about $500,000 per annum on kakī. This includes kakī captive breeding and protection of key kakī habitats including the Tasman, Cass, Godley and Dobson Rivers. In addition to this annual spend two new aviaries have been built in the last 5 years. The most recently built aviary and brooder will cost around $700,000.

THE VALUE OF THE CASS, DOBSON, GODLEY AND TASMAN AS BIRD HABITAT

34. There are many ways to assess the importance of habitats to wildlife. In New Zealand there are three established ways we use to undertake this assessment.
    - **i**. The Sites of Special Wildlife Interest (SSWI) was used during the 1970s and 1980s and is still referred to today;
    - **ii**. The Ramsar Convention and associated criteria for defining Wetlands of International Importance (WII)
    - **iii**. O'Donnell's (2000) ranking for Environment Canterbury of rivers and open water habitat.

35. The following is a summary of each of the above assessment systems as they apply to the Dobson, Cass, Tasman and Godley Rivers:

Sites of Special Wildlife Interest (SSWI)

- **a.** During the late 1970s and early 1980s the New Zealand Wildlife Service (Department of Internal Affairs) undertook the first national inventory of habitats of significance to wildlife, termed Sites of Special Wildlife Interest (SSWIs). Habitats were rated as being of "Outstanding", "High", "Moderate-High", "Moderate", or "Potential" value for species protected under the Wildlife Act 1953. Sites were assessed according to 16 criteria (which I have listed in Appendix 6, from Imboden (1978)).
- **b.** The Dobson, Cass, Tasman and Godley Rivers are all classified as OUTSTANDING with SSWI criteria.

The Ramsar Convention (www.Ramsar.org) and associated criteria for defining Wetlands of International Importance (WII)

- **c.** The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an inter-governmental treaty which provides the framework for national action and

international co-operation for the conservation and wise use of wetlands and their resources.

d. Ramsar criteria are provided in Appendix 7. Under the Ramsar criteria the Tasman, Godley and Cass rivers qualify as Wetlands of International Importance (WII). However, as yet, none are formally listed as WII.

e. Notably, all four rivers meet Criteria 2, 4, and 6. They meet Criterion 2 as they support vulnerable, endangered or critically endangered species. They meet Criterion 4 as they support animal species at a critical stage in their life cycles or provide refuge during adverse conditions. They meet Criterion 6 as they support 1% of the individuals of a population of one species or subspecies of water bird.

O'Donnell's (2000) ranking for Environment Canterbury of rivers and open water habitat

f. This report establishes a ranking system for all the rivers and open water habitats in Canterbury according to their significance, in the context of the Resource Management Act 1991 (RMA). Significance was determined according to the diversity and size of the water bird populations present, representativeness of the community, life supporting capacity (for breeding and roosting) of the habitat, distinctiveness, long term viability and importance for threatened species. O'Donnell's approach was to provide an overall habitat ranking and to address any quirkiness associated with the use of an area by a threatened species. For each area, two rankings are provided: one for habitat, and another for threatened species. The habitat ranking does take into consideration threatened species as well (see Appendix 8).

g. The Godley, Cass, Dobson and Tasman Rivers were all ranked, as a habitat, H1 of NATIONAL–INTERNATIONAL significance (Appendix 8) based on the good representation of species in all the wetland species guilds and the presence of threatened species, and its importance to some of them. In addition, for threatened species, all four rivers were ranked H1.

h. At HI (or High 1) habitats, Category A threatened species breed or feed regularly at the site. Appendix 8 provides the other categories.

i. When the O'Donnell report was written the species were ranked according to Molloy *et al* (1994). The current ranking, (as described in this evidence)

follows Robertson *et al* (2017). Therefore, the Category A and Category B referred to in O'Donnell (2000) equates to current rankings (Robertson *et al* (2017)) in the following way:

Category A (Molloy *et al* (1994)) = Nationally Critical (Robertson *et al* (2012), Robertson *et al* (2017))

Category B (Molloy *et al* (1994)) = Nationally Endangered and Nationally Vulnerable (Robertson *et al* (2012), Robertson *et al* (2017)).

EFFECTS OF MOTORISED BOATS ON THE BIRDLIFE OF THE TASMAN, GODLEY, CASS AND DOBSON RIVERS

36. There is very little independent information on the effects of motorised craft on braided river birds. McKinlay and Smale (2001), reported on a study on the Dart River and determined that banded dotterel, wrybill, black-fronted terns and black-billed gulls all fed in areas effected by jet boat wash. They also showed that wrybill and banded dotterels were feeding in a zone adjacent to the braids which were well inundated with jet boat wash following jet boat passage. The study did not demonstrate any definitive adverse effect. However, it did show that birds' behaviours were affected as they were retreating from the oncoming wake and then returning with the receding wake. Consequently, feeding was disrupted every time a jet boast passed by. Only adult birds were available during this study.

37. The study concluded that it is incorrect to assume that braided river birds are not affected by jet boats, because jet boat wake changed their behaviour. The authors proposed that more work was required to understand the effects of jet boat wash on individuals and populations, particularly of threatened species.

38. Two other reports produced for the N.Z. Jet Boating Association and Jet Boat New Zealand (Hughey (2011) and Hudson (2004) have indicated that jet boats are not a significant threat to riverbed birds. Hudson (2004) reports on studies of jet boating in the Queenstown area in which aquatic birds do not appear to be greatly disturbed by frequent jet boat travel in close proximity to their nesting, roosting and feeding areas. The review also indicated that there is no evidence to suggest wakes have caused loss of chicks being washed away nor that wakes reach their nests unless these nests are in close proximity to river.

39. Hughey (2011) undertook a comparative risk assessment and concluded that walking and 4-wheel driving are of much more concern than jet boating. However, he also stated that there is very little quantitative research in this area.

40. The water-gravel/sand interface and the shallow waters of braided river braids are used by a number of bird species for feeding and breeding (Tables 3 and 4, Photos 1 and 4). Motorised craft effects on them include noise and visual disturbance and may also create a wake which sends a rapid wave crest onto the dry substrates adjoining the braid (Photo 2).

41. The size and frequency of wave propagation is influenced by the craft's speed and size (displacement in the water). The passing of the craft effects all the microhabitats described above in paragraph 21 and logically any of the species in those microhabitats (Tables 3 and 4) at that time. Other possible effects are through creating turbidity (stirring up the braid's substrate) and crushing nests and chicks, and disturbing nesting adults during conveyance of craft across the dry riverbeds to launch areas.

42. The photograph (Photo 1) below is an example of the type of habitat affected.

Photo 1. Three wrybill in typical habitat alongside river channel (Photo Anita Spencer)

43. The cumulative effects of jet boat noise and the visual effects of passing jet boats is unknown. The effects of frequency of disturbance are also unknown. In other studies of noise and visual effects indications are that over time some changes in behaviour and habitat use may occur, but these changes are very subtle and are very difficult to measure.

44. In my opinion, the effects of jet boats are unlikely to be a significant issue in the short term, but in the longer term they may influence species' behaviour and occupancy. This will be very difficult to determine. It would also be almost impossible to carry out successful research to determine what the effects are or if they are indeed a problem.

45. An example of how ongoing disturbance can subtly effect birds' behaviour over time is the effect of the observation and tourist centre on Taiaora Head on nesting Northern royal albatross. Over time, the albatross have changed their nesting locations to be away from the sight of people moving around behind the glass. That was a very gradual change over many years.

46. Of more concern is the effect of wake generated by passing craft, such as that illustrated in Photo 2 below. In my opinion the effect of wake on very small wrybill

and kakī chicks (Photo 3) which feed along the shallow water's edge (Photo 4) is particularly concerning. Other small chicks such as South Island pied oystercatcher, black-billed gull or black-fronted tern are also vulnerable. Wake from jet boats is likely to wash these small chicks into the river, separating them from their parents. That will inevitably lead to their death. Chicks will be most vulnerable in the first 2-3 weeks after hatching whilst they are very small and downy and are very dependent on their parents.

Photo 2. Examples of jet boat wash – the waves propagated as a boat passes through the water which inundates the water gravel/substrate interface

Photo 3. A Newly hatched wrybill chick in nest with an unhatched egg, and a captive kakī/black stilt chick – 10 cent coin has been added in approximately the right proportion to indicate the size of these chicks

Photo 4. Wrybill chick feeding in shallow waters edge (photo Craig McKenzie)

47. Passing craft stirring up the sediment and generating turbidity may also cause adverse effects for braided river bird species, but once again this has not been well studied. If there is an issue, it is likely to involve effects on the behaviour of aquatic invertebrates upon which birds feed (Table 3) and also on how the birds locate them.

48. A related effect from the use of motorised craft is during their conveyance to and from launching areas. Crushing of river bird nests and chicks is well documented and has been frequently observed (Walls (1999), O'Donnell *et al* (2016), Spurr and Ledgard (2016)). Inadvertent crushing is a result of the very cryptic nature of

riverbed birds' nests and chicks as well as the strategy of young chicks to 'freeze' and hide when threatened. Photos 3 and 5 illustrate how difficult it is to locate and avoid nests and chicks.

Photo 5. The nest of a wrybill showing how well it and the wrybill's eggs blend in with the riverbed substrate – so much so they are extremely difficult to see (Photo N. Allen)

49. The Dobson, Godley, Tasman and Cass Rivers are nationally significant because of their use by specific endangered birds, the variety of species using them, the number of endangered species relying on them for breeding and feeding, and the overall representative suite and number of braided river birds which use them. The rivers are key habitats for a number of endangered species.

50. Most significantly, the Tasman, Godley and Cass Rivers are pivotal to the survival of kakī. Even though the effects of water craft are not clearly understood, in my opinion it is logical to assume there will be some adverse effects on kakī, albeit those effects may be subtle and difficult to measure.

51. Given how important these rivers are to these species, and how rare these species are, it is necessary to take a precautionary approach to ensure additional pressures are not added to the already large threat burden the species are subjected to. All threats are cumulative and, if possible, we need to avoid adding additional threats to the survival of such rare species.

SUMMARY

52. It is my opinion that motorised craft should not be permitted to access the Dobson, Cass, Tasman, and Godley Rivers. Those rivers are important habitat for a number of threatened species. The Tasman, Godley and Cass are pivotal for the survival of kakī and are the release sites for captive reared birds. The rivers themselves are nationally important wildlife habitats, as assessed under various systems and criteria used to evaluate significant wildlife habitats.

53. Even though we don't understand the potential effects motorised craft have on braided river birds we can deduce from:
    - the nature of the physical changes these craft have on the water and the propagation of waves which rapidly inundate the adjacent dry riverbed;
    - the way braided river bird species use the various micro habitats along the shallow water's edge and immediate dry riverbed along the water edge, and;
    - the vulnerability of small nidifugous[3] chicks feeding and moving around the water's edge;

    that motorised craft have the potential to cause significant mortality of chicks during their first few days.

54. Other adverse effects on braided river birds may result from noise, disturbance and crushing. These effects are not well understood and even more difficult to deduce. The rarity and precarious nature of many of the endangered species suggest it is prudent to take a precautionary approach until at least more research has been done to understand the impacts of motorised craft.

[3] Shortly after hatching are able to leave their nests and are capable of independent locomotion – a feature of all the wader and tern species on the riverbed.

55. I acknowledge that for most of the species using the riverbed, jet boat use during the period from February to August is unlikely to have any effect at all.

37. However, for kakī which use the riverbed and river deltas all year round there is no period during which it is safe to conclude that jet boat use will not have adverse effects.

Andrew Donald Grant

20 November 2018

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APPENDICES

Appendix 1. The New Zealand Threat Ranking Classification System

The New Zealand Threat Ranking Classification System Townsend *et al* (2007), Miskelly *et al* (2008) and Robertson *et al* (2012) and currently Robertson *et al* (2017) is a system whereby all species in New Zealand have been assigned a threat ranking dependant on their origin (native or introduced), and one or more of the following criteria, depending on the category:

- Total number of mature individuals
- Ongoing or predicted population trend (due to existing threats)
- Total number of populations
- Number of mature individuals in the largest population
- Area of occupancy of the total population

The following table shows the primary criteria for "Threatened", "At Risk" and "Not Threatened" taxa. Note that population changes are calculated over 10 years or 3 generations, whichever is the longer.

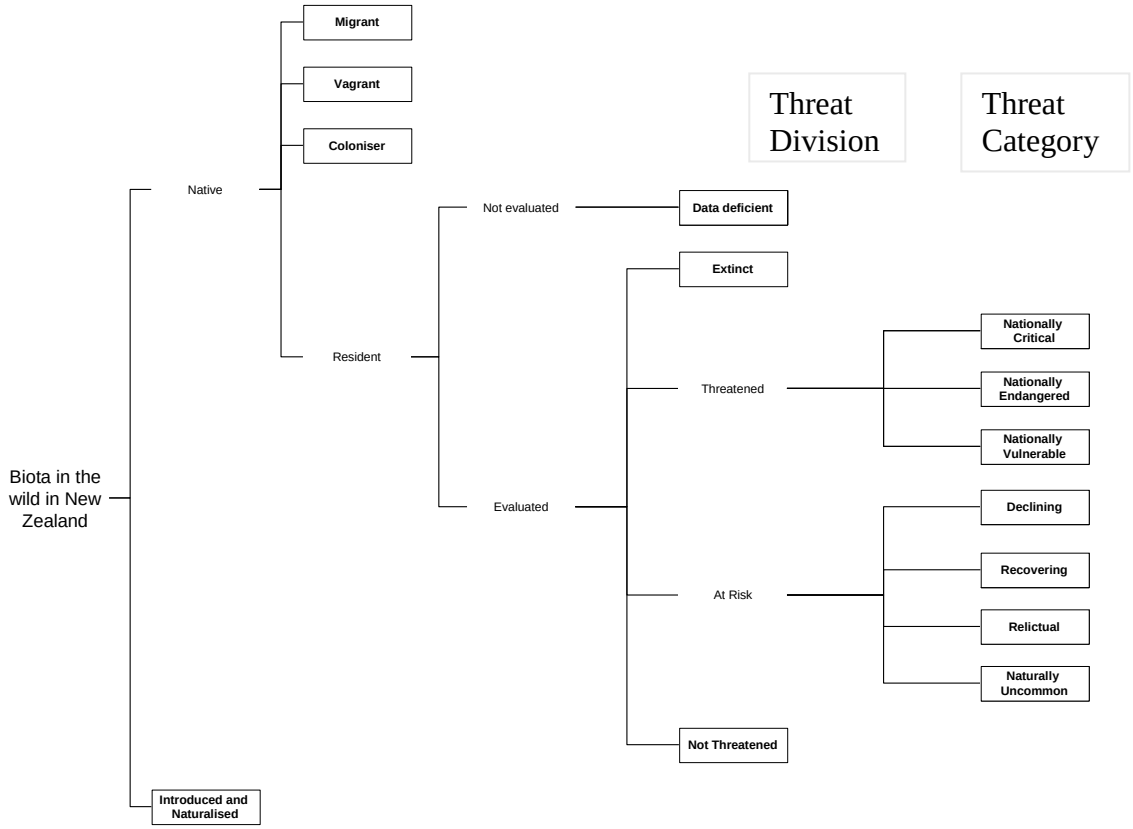
<table>
<tr><td></td><td colspan="7">Total Number of Mature Individuals</td></tr>
<tr><td rowspan="7">Total population trend - (predicted and ongoing due to existing threats)</td><td></td><td><250</td><td>250 - 1000</td><td>1000 - 5000</td><td>5000 – 20,000</td><td>20,000 – 100,000</td><td>>100,000</td></tr>
<tr><td>> 10% increase</td><td rowspan="6">NC</td><td>NV
NU</td><td>NU
Rec</td><td>NU
Rec</td><td colspan="2" rowspan="2">NT
NU_{RR}
Rel</td></tr>
<tr><td>± 10 % stable</td><td>NE
NU</td><td>NV
NU</td><td>NU
Rel</td></tr>
<tr><td>10 – 30% decline</td><td rowspan="3">NE</td><td rowspan="2">NV</td><td colspan="3" rowspan="2">Dec</td></tr>
<tr><td>30 – 50% decline</td><td colspan="2" rowspan="2">Dec</td></tr>
<tr><td>50 – 70% decline</td><td>NE</td><td colspan="2">NV</td><td rowspan="2">Dec</td></tr>
<tr><td>≥ 70% decline</td><td colspan="4">NC</td></tr>
</table>

Key to Abbreviations

NC	Nationally Critical
NE	Nationally Endangered
NV	Nationally Vulnerable
Dec	Declining
NU	Naturally Uncommon
Rec	Recovering
Rel	Relictual
RR	Range Restricted (Qualifier)

NT Not threatened

Based on these species are assigned one of the following categories



In addition to these threat categories, species may have one or more of the following 'qualifiers' as part of their classification

Qualifiers

Qualifiers are an integral part of this classification system and must be cited in publications referring to the threat status of taxa listed under this system. Qualifiers provide critical additional information about a taxon's listing, status, and management. When a taxon is listed, all of the qualifiers that apply to it are recorded alphabetically. For the purposes of listing, qualifiers are listed in sub-script after the taxon name, thus:

Anzybas carsei "Nationally Critical $_{CD, EF, OL, RF}$"

Conservation Dependant (CD)

The taxon is likely to move to a higher threat category if current management ceases.

Data Poor (DP)

Confidence in the listing is low due to there being poor data available for assessment.

Designated (De)

A taxon that does not fit within the criteria provided, and the Expert Panel has designated the taxon to the most appropriate listing without full application of the criteria. For example, a commercial fish stock that is being fished down to Biomass Maximum Sustainable Yield (B_{MSY}) may meet criteria for "Declining", but could be designated as "Not Threatened" if the Expert Panel believes that this better describes the taxon's risk of extinction.

Extinct in the Wild (EW)

The taxon is known only in cultivation or captivity.

Extreme Fluctuations (EF)

The taxon experiences extreme unnatural population fluctuations, or natural fluctuations overlaying human-induced declines, that increase the threat of extinction.

When ranking taxa with extreme fluctuations, as a precautionary measure the lowest number of mature individuals should be used for determining population size.

Increasing (Inc)

There is an ongoing or, predicted increase of > 10 % in the total population, taken over the next ten years or three generations, whichever is the longer. Note that this qualifier is redundant for taxa ranked as Recovering.

Island Endemic (IE)

A taxon whose natural distribution is restricted to one island archipelago (e.g., Auckland Islands) and not part of the North, South, or Stewart Islands.

One Location (OL)

Found at one location (geographically or ecologically distinct area) in which a single event (e.g., a predator irruption) could soon affect all individuals of the taxon.

Partial Decline (PD)

Taxa undergoing decline over the majority of their range, but with one or more secure populations (such as on offshore islands).

Range Restricted (RR)

Taxa confined to specific substrates, habitats or geographic areas, of less than 1,000 km^2 (100,000 ha); assessed by taking into account the area of occupied habitat of all sub-populations (and summing the areas of habitat, if there is more than one sub-population).

Recruitment Failure (RF)

The taxon's current population may appear stable, but the age structure is such that catastrophic declines are likely in the future.

Secure Overseas (SO)

The taxon is secure in other parts of its natural range outside New Zealand.

Sparse (Sp)

Taxa which occur within typically small and widely scattered populations.

Stable (St)

The total population is stable (± 10 %), taken over the last ten years or three generations, whichever is the longer.

Threatened Overseas (TO)

The taxon is threatened in those parts of its natural range outside New Zealand.

CRITERIA

THREATENED

Taxa with populations that are small (<250 mature individuals) are considered highly suseptable to stochastic events and are listed as 'Nationally Critical' regardless of whether their small population size is due to human-induced or natural causes.

'Threatened' taxa are grouped into three categories

Nationally Critical

Criteria for Nationally Critical:

A—very small population (natural or unnatural)

A(1) < 250 mature individuals, regardless of cause

A(2) ≤ 2 subpopulations, ≤ 200 mature individuals in the larger subpopulation

A(3) Total area of occupancy ≤ 1 ha (0.01 km2)

B—small population (natural or unnatural) with a high ongoing or predicted decline

B(1/1) 250–1000 mature individuals, predicted decline 50–70%

B(2/1) ≤ 5 sub-populations, ≤ 300 mature individuals in the largest sub-population, predicted decline 50–70%

B(3/1) Total area of occupancy ≤ 10 ha (0.1 km2), predicted decline 50–70%

C—population (irrespective of size or number of sub-populations) with a very high ongoing or predicted decline (> 70%).

C Predicted decline > 70%

Nationally Endangered

Criteria for Nationally Endangered:

A—small population (natural or unnatural) that has a low to high ongoing or predicted decline

A(1/1) 250–1000 mature individuals, predicted decline 10–50%

A(2/1) ≤ 5 sub-populations, ≤ 300 mature individuals in the largest subpopulation, predicted decline 10–50%

A(3/1) Total area of occupancy ≤ 10 ha (0.1 km2), predicted decline 10–50%

B—small stable population (unnatural)

B(1/1) 250–1000 mature individuals, stable population

B(2/1) ≤ 5 sub-populations, ≤ 300 mature individuals in the largest subpopulation, stable population

B(3/1) Total area of occupancy ≤ 10 ha (0.1 km2), stable population

C—moderate population and high ongoing or predicted decline.

C(1/1) 1000–5000 mature individuals, predicted decline 50–70%

C(2/1) ≤ 15 sub-populations, ≤ 500 mature individuals in the largest subpopulation, predicted decline 50–70%

C(3/1) Total area of occupancy ≤ 100 ha (1 km2), predicted decline 50–70%

Nationally Vulnerable

Criteria for Nationally Vulnerable:

A—small, increasing population (unnatural)

A(1/1) 250–1000 mature individuals, predicted increase > 10%

A(2/1) ≤ 5 subpopulations, ≤ 300 mature individuals in the largest subpopulation,

predicted increase > 10%
A(3/1) Total area of occupancy ≤ 10 ha (0.1 km2), predicted increase > 10%
B—moderate, stable population (unnatural)
B(1/1) 1000–5000 mature individuals, stable population
B(2/1) ≤ 15 subpopulations, ≤ 500 mature individuals in the largest subpopulation, stable population
B(3/1) Total area of occupancy ≤ 100 ha (1 km2), stable population
C—moderate population, with population trend that is declining
C(1/1) 1000–5000 mature individuals, predicted decline 10–50%
C(2/1) ≤ 15 sub-populations, ≤ 500 mature individuals in the largest subpopulation, predicted decline 10–50%
C(3/1) Total area of occupancy ≤ 100 ha (1 km2), predicted decline 10–50%
D—moderate to large population, and moderate to high ongoing or predicted decline.
D(1/1) 5000–20 000 mature individuals, predicted decline 30–70%
D(2/1) ≤ 15 subpopulations and ≤ 1000 mature individuals in the largest sub-population, predicted decline 30–70%
D(3/1) Total area of occupancy ≤ 1000 ha (10 km2), predicted decline 30–70%
E—large population, and high ongoing or predicted decline.
E(1/1) 20 000–100 000 mature individuals, predicted decline 50–70%
E(2/1) Total area of occupancy ≤ 10 000 ha (100 km2), predicted decline 50–70%

AT RISK

Taxa that qualify as 'At Risk' do not meet the criteria for any of the 'Threatened' categories. However, they are declining (though buffered by a large total population size and/or a slow decline rate), biologically scarce, recovering from a previously threatened status, or survive only in relictual populations

At Risk taxa fall into four categories

Declining

Taxa that do not qualify as 'Threatened' because they are buffered by large population size and/or
a slower rate of decline than the trigger points.
Criteria for Declining:
A—moderate to large population and low ongoing or predicted decline
A(1/1) 5000–20 000 mature individuals, predicted decline 10–30%
A(2/1) Total area of occupancy ≤ 1000 ha (10 km2), predicted decline 10–30%
B—large population and low to moderate ongoing or predicted decline
B(1/1) 20 000–100 000 mature individuals, predicted decline 10–50%
B(2/1) Total area of occupancy ≤ 10 000 ha (100 km2), predicted decline 10–50%
C—very large population and low to high ongoing or predicted decline.
C(1/1) > 100 000 mature individuals, predicted decline 10–70%
C(2/1) Total area of occupancy > 10 000 ha (100 km2), predicted decline 10–70%

Recovering

Taxa that have undergone a documented decline within the last 1000 years and now have an ongoing or predicted increase of > 10% in the total population or area of occupancy, taken over the
next 10 years or three generations, whichever is longer. Note that such taxa that are increasing but have a population size of < 1000 mature individuals (or total area of occupancy of < 10 ha) are
listed in one of the Threatened categories, depending on their population size (for more details see Townsend et al. (2008)).
Criteria for Recovering:

A 1000–5000 mature individuals or total area of occupancy ≤ 100 ha (1 km2),
and predicted increase > 10%
B 5000–20 000 mature individuals or total area of occupancy ≤ 1000 ha
(10 km2), and predicted increase > 10%

Relict
Taxa that have undergone a documented decline within the last 1000 years, and now occupy < 10% of their former range and meet one of the following criteria:
Criteria for Relict:
A 5000–20 000 mature individuals; population stable (±10%)
B > 20 000 mature individuals; population stable or increasing at > 10%. The range of a relictual taxon takes into account the area currently occupied as a ratio of its former extent. Relict can also include taxa that exist as reintroduced and self-sustaining populations within or outside their former known range

NATURALLY UNCOMMON
Taxa whose distribution is confined to a specific geographical area or which occur within naturally small and widely scattered populations, where this distribution is not the result of human disturbance. Taxa with > 20 000 mature individuals are not considered naturally uncommon unless they occupy an area of < 1000 km2.

MIGRANT
Taxa that predictably and cyclically visit New Zealand as part of their normal life cycle (a minimum of 15 individuals known or presumed to visit per annum) but do not breed here. Where > 25% of the taxon relies on New Zealand for greater than 50% of its life-cycle (e.g. pre-breeding
years plus each austral summer), they have been considered as part of the native avifauna.

VAGRANT
Taxa whose occurrences, though natural, are sporadic and typically transitory, or migrants with fewer than 15 individuals visiting New Zealand per annum.

COLONISER
Taxa that otherwise trigger Threatened categories because of small population size, but have arrived in New Zealand without direct or indirect help from humans and have been successfully reproducing in the wild only since 1950.

NOT THREATENED
Resident native taxa that have large, stable populations.

Appendix 2. Bird Counts for Tasman River

Species	1962	1965	1968	1992	1993	1994	1995	1996	2004	2005	2006	2007	2008	2009	2010	2012	2013	2014	2015	2016	2017
Australasian crested grebe	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Banded dotterel	134	153	0	599	1329	1283	408	178	836	517	782	853	882	743	402	541	570	538	729	652	539
Black shag	6	0	0	1	36	61	25	50	2	14	2	2	0	2	0	0	0	3	4	0	2
Black stilt	1	0	0	5	68	32	23	18	2	10	10	1	13	32	2	5	3	29	19	10	10
Black swan	17	14	0	0	1	2	0	0	0	0	0	2	0	0	0	0	2	0	0	11	6
Black-billed gull	116	41	0	25	417	212	50	16	40	7	46	31	5	20	12	83	6	97	45	165	138
Black-fronted tern	134	98	0	110	393	265	86	181	217	123	47	92	97	135	165	216	198	188	296	318	641
Canada goose	44	118	0	193	2441	1389	942	847	487	52	202	580	265	234	116	213	225	252	202	98	179
Caspian tern	0	0	0	2	9	5	3	2	0	3	0	0	0	6	0	1	1	2	2	4	2
Duck species	22	6	0	10	1923	588	402	720	47	102	2	15	0	0	3	0	2	32	0	0	4
Grey duck	32	28	0	3	4	1	0	0	0	0	2	0	2	0	2	0	2	2	0	0	0
Grey teal	0	0	0	0	58	183	202	247	0	0	0	0	0	0	0	0	0	0	0	0	0
Hybrid black stilt	5	13	0	9	53	28	30	29	8	9	4	10	5	2	0	0	2	4	0	2	0
Little shag	0	0	0	0	7	3	2	3	0	0	0	0	1	0	0	0	0	0	0	0	0
Mallard duck	49	49	0	13	3	0	0	0	8	2	3	47	15	22	5	5	15	35	45	18	14
New Zealand scaup	2	0	0	0	7	37	13	76	0	0	0	0	0	0	0	0	0	0	0	3	0
New Zealand shoveler	24	12	0	0	5	12	48	9	1	0	14	0	0	0	0	0	0	0	0	2	0
Paradise shelduck	92	111	34	137	564	416	74	177	155	210	83	146	85	70	82	95	71	94	96	78	105
Pied stilt	29	18	0	21	134	72	29	40	17	54	12	9	2	7	1	2	3	11	4	13	1
South Island pied oystercatcher	16	33	0	76	69	53	13	15	100	48	86	66	67	47	65	60	109	65	59	71	81
Southern black-backed gull	86	48	0	537	959	1090	198	73	258	141	59	154	127	209	239	479	363	378	242	160	102
Spur-winged plover	0	0	0	23	45	128	69	28	19	31	21	42	23	15	5	7	23	19	13	12	6
Swamp harrier	0	0	0	11	3	2	2	1	7	3	1	9	7	1	1	2	1	3	3	2	0
White-faced heron	2	2	0	1	20	23	3	18	1	3	2	0	0	2	1	3	0	3	5	1	0
Wrybill	126	47	0	151	242	187	66	4	84	96	32	109	131	154	99	132	165	135	103	85	126

Appendix 3. Bird Counts for Godley River

Species	1962	1965	1968	1992	1993	1994	1995	1996	2013	2015	2016
Australasian crested grebe	0	0	0	0	0	0	1	0	0	0	0
Banded dotterel	48	117	119	496	786	646	392	65	424	646	705
Black shag	2	1	8	7	30	84	84	57	36	2	2
Black stilt	0	4	2	0	22	25	11	5	22	14	6
Black swan	0	0	2	0	23	72	224	29	0	1	4
Black-billed gull	43	114	38	18	152	109	47	5	10	91	33
Black-fronted tern	72	53	45	174	97	74	48	6	114	364	207
Canada goose	42	78	35	733	2579	3840	4043	702	432	344	310
Caspian tern	0	0	2	4	5	5	16	4	8	2	8
Duck species	0	0	0	0	42	11	8	0	30	21	0
Grey duck	13	44	33	2	0	0	0	0	0	0	0
Grey teal	0	0	8	2	209	809	760	298	0	2	0
Hybrid black stilt	2	0	0	0	3	11	6	5	0	2	0
Little shag	0	0	0	1	4	5	8	0	0	0	0
Mallard duck	6	31	21	61	0	0	0	0	0	0	6
New Zealand scaup	11	23	22	0	15	248	518	39	0	0	0
New Zealand shoveler	5	14	7	0	6	63	86	19	0	0	0
Paradise shelduck	17	22	43	47	429	365	196	194	28	73	59
Pied stilt	5	6	1	0	22	53	81	21	3	6	6
South Island pied oystercatcher	14	72	24	53	71	63	24	0	69	110	130
Southern black-backed gull	45	29	76	79	117	59	74	10	212	166	147
Spur-winged plover	0	0	2	14	42	94	116	46	17	11	63
Swamp harrier	0	0	0	2	2	2	23	4	1	0	2
White-faced heron	1	0	0	0	0	13	8	4	0	0	1
Wrybill	42	52	33	202	300	128	18	1	116	233	151

Appendix 4. Bird Counts for Cass River

Species	1962	1965	1968	1979	1982	1986	1991	1992	1993	1994	1995	2013	2014	2015
Australasian crested grebe	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Banded dotterel	49	100	113	770	919	110	323	318	563	425	527	297	203	412
Black shag	0	2	1	0	0	3	0	2	3	7	32	1	1	1
Black stilt	0	1	1	0	0	3	2	2	6	8	8	4	7	1
Black swan	0	0	0	0	0	13	0	2	47	73	110	2	0	0
Black-billed gull	4	13	13	10	127	4	0	114	110	96	146	79	75	66
Black-fronted tern	38	21	9	217	446	8	16	236	93	49	136	187	201	77
Canada goose	3	4	0	0	0	0	19	48	355	3457	4126	21	21	4
Caspian tern	0	0	0	2	0	0	2	4	2	12	36	0	0	0
Duck species	0	0	0	0	0	0	0	8	0	34	419	0	3	0
Grey duck	5	2	4	1	0	0	0	3	14	5	16	0	0	0
Grey teal	0	0	0	0	0	3	0	0	1	158	307	0	0	0
Hybrid black stilt	0	0	0	0	0	1	2	1	6	5	5	0	1	0
Little shag	0	0	0	0	0	0	0	0	0	1	5	0	0	1
Mallard duck	0	0	0	0	0	17	18	4	24	88	94	1	0	2
New Zealand scaup	0	0	0	0	0	2	0	0	0	2	162	0	0	0
New Zealand shoveler	0	0	2	0	0	0	0	0	2	41	133	0	0	0
Paradise shelduck	5	6	4	0	0	4	128	44	42	41	743	37	17	15
Pied stilt	2	11	3	38	70	15	6	30	27	78	78	17	5	11
South Island pied oystercatcher	12	12	23	87	100	1	22	62	54	81	42	57	55	60
Southern black-backed gull	7	2	4	128	0	5	131	89	172	219	112	209	234	230
Spur-winged plover	0	0	0	12	54	2	31	33	40	42	212	6	7	13
Swamp harrier	0	0	0	0	0	5	1	2	2	0	5	4	0	2
White-faced heron	1	0	2	0	0	0	4	2	0	6	5	0	1	3
Wrybill	15	17	26	93	123	43	73	64	99	80	55	36	30	23

Appendix 5. Bird Counts for Dobson River

Species	1992	1993	1994
Australasian crested grebe	0	0	0
Banded dotterel	126	114	46
Black shag	0	1	0
Black stilt	0	0	0
Black swan	0	0	0
Black-billed gull	0	0	0
Black-fronted tern	33	76	53
Canada goose	63	75	46
Caspian tern	0	0	2
Duck species	0	5	0
Grey duck	2	4	3
Grey teal	0	0	0
Hybrid black stilt	1	0	0
Little shag	0	0	0
Mallard duck	6	0	3
New Zealand scaup	0	0	0
New Zealand shoveler	0	0	0
Paradise shelduck	70	45	19
Pied stilt	3	2	0
South Island pied oystercatcher	37	22	23
Southern black-backed gull	49	99	98
Spur-winged plover	14	7	28
Swamp harrier	3	0	0
White-faced heron	0	0	0
Wrybill	14	20	10

Appendix 6. Wildlife Service criteria for rating habitats for Sites of Special Wildlife Interest.

Outstanding	a) Presence of a breeding population of a highly endangered or rare endemic species. b) Presence of a population of an endemic species of very restricted distribution and which could become endangered. c) Areas essential to species from (a) and (b) for purposes other than breeding. d) Areas of vital importance to internationally uncommon species (breeding and/or migratory). e) Areas of vital importance to internally migratory species with very limited distribution or abundance. f) Largely unmodified ecosystem or example of original habitat type not represented elsewhere in the country, of large size and containing viable populations of all or almost all species which are typical of the ecosystem or habitat type.
High	a) Habitat containing an indigenous species which has declined significantly because of man's influence. b) One of few or the only breeding area for a non-endemic indigenous species of limited abundance. c) Habitat of an uncommon, discontinuously distributed species not adequately represented in the ecological region or only represented in a particular ecological region. d) Example of a largely unmodified habitat which is not represented to the same extent elsewhere in the ecological region and is used by most species which are typical of that habitat type for the region. e) Presence of a species of an endemic family which is of limited abundance throughout the country although adequately represented in one ecological region but whose habitat is at some risk.
Moderate-High	a) Presence of a species which is still quite widely distributed but whose habitat has been and still is being significantly reduced or modified because of man's influence. b) Areas containing high numbers of breeding or moulting birds or where breeding or moulting areas are of inter-regional significance to wildlife. c) A large and fairly unmodified habitat or ecosystem which is represented elsewhere in the ecological region and contains all or almost all species typical of that habitat type for a particular region. d) An area where any particular species is exceptional in terms of, say, abundance or behaviour but which is otherwise widespread.
Moderate	a) All habitats supporting good numbers of species which are typical of that particular habitat within an ecological region and which have not been heavily modified by man's influence.
Potential	a) All areas of some wildlife significance which are limited by size, heavy modification or other reasons, but are of potential wildlife value if left to generate or are managed or developed for wildlife. (May include habitat which functions as a corridor or is sub-optimal habitat which is necessary for maintaining genetic diversity.

Appendix 7. Ramsar criteria for rating habitats for conservation values**.**

Group A of the Criteria. Sites containing representative, rare or unique wetland types

Criterion 1: A wetland should be considered internationally important if it contains a representative, rare, or unique example of a natural or near-natural wetland type found within the appropriate biogeographic region.

Group B of the Criteria. Sites of international importance for conserving biological diversity

Criteria based on species and ecological communities

Criterion 2: A wetland should be considered internationally important if it supports vulnerable, endangered, or critically endangered species or threatened ecological communities.

Criterion 3: A wetland should be considered internationally important if it supports populations of plant and/or animal species important for maintaining the biological diversity of a particular biogeographic region.

Criterion 4: A wetland should be considered internationally important if it supports plant and/or animal species at a critical stage in their life cycles, or provides refuge during adverse conditions.

Specific criteria based on waterbirds

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals

Specific criteria based on waterbirds

Criterion 5: A wetland should be considered internationally important if it regularly supports 20,000 or more waterbirds.

Criterion 6: A wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird.

Appendix 8. Summary of criteria used by O'Donnell (2000)

a. For habitats

Primary Attributes	Indicator	Significance thresholds
A. Representativeness	Quality of representation of habitat	1= Habitat type widely represented elsewhere in NZ; 2= Habitat type rarely represented elsewhere in NZ; 3= Habitat type not represented in other regions in NZ
B. Life supporting capacity	Habitat size	1=<10ha; 2= 10-99ha; 3=100-999ha; 4= >1000ha
	Numbers	1= generally <100 birds present; 2= 100-999 individuals; 3= 1000-4999 individuals; 4= >5000 individuals
	Breeding guilds	Ranges from 0-7
C. Natural diversity	Microhabitat diversity	Number of key microhabitats recorded as being used = 1-10
	Number threatened species	0-7
D. Distinctiveness	Significant breeding site	No or yes in terms of significant = 0-1
	Only region typically supporting a particular species	No or yes in terms of significant = 0-1
	Habitat for species with special diet or foraging behaviour	No or yes in terms of significant = 0-1
E. Intactness/ naturalness	Level of modification	1= highly modified; 2= modified remnant of formerly more extensive habitat; 3= largely unmodified except for one particular impact; 4= substantially unmodified

Summary of habitat significance scores

Rank	Score	Habitat Significance
High 1.	>50	National-International
H2	40-49	National
H3	30-39	Regional
Medium 1	20-29	Low
M2	<20	Local

b. For threatened species

The following criteria provide a means of ranking the relative significance for threatened species:

High 1 (H1)
Category A threatened species breed or feed regularly at the site.

High 2 (H2)
>10% of the population of a Category B species breeds or feeds annually at the site.

High 3 (H3)
< 10% of the population of a Category B species breeds or feeds annually at the site.
or
Category A species breed or feed intermittently (some years) at the site.

High 4 (H4)
>10% of the population of declining Category O species breeds or feeds annually at the site.

High 5 (H5)
> 10% of the population of a Category C species breeds or feeds annually at the site.

High 6 (H6)
< 10% of the population of a Category C or O species breeds or feeds annually at the site.

High 7 (H7)
Category B, C or O species breed intermittently (some years) at the site.

High 8 (H8)
Category B, C or O species feed intermittently (some years) at the site.

High Unknown (HUK)
Threatened species recorded but the relative importance of the habitat for breeding or feeding is unknown.

Not significant (NS) for threatened species
No threatened species occur.
or
Threatened species have been recorded as incidental vagrants.

(Note when this was published the Ranking system was Malloy *et al* (1994) and the threat categories were:

- Category A (urgent need of recovery of endemic species);
- Category B (time frames for recovery are urgent, but less so than for A species because declines are at a slower rate);
- Category C (still less urgent priority); and
- Category O (native species rare or declining in New Zealand but also occurring overseas).

These rankings relate to the current rankings (Appendix 1) roughly in the following way:

Category A = Nationally Critical

Category B = Nationally Endangered and Nationally Vulnerable

Category C = for Endemic species Declining, Recovering, Relictual, Naturally Uncommon
Category O = for Native species Declining, Recovering, Relictual, Naturally Uncommon