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Te Pane Matua Taiao

# How well do riverbed-nesting shorebirds tolerate machinery?

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# Contents

## Executive summary

This report summarises the results of a trial which was conducted during spring of 2019 to test the effectiveness and practicality of implementing vehicle exclusion zones around identified shorebird nests on two rivers in the Wairarapa Region. Exclusion zones are part of Greater Wellington Regional Council's Flood Protection Department (GWRC, FP) Code of Practice (CoP) and were determined with the aim of best-practice in mind and to satisfy the requirements in the Resource Management Act 1991 (RMA) which council must adhere to in their operations.

The target shorebird species for this trial were:

- Banded dotterel (*Charadrius bicinctus*) Conservation status: Nationally vulnerable
- Black-fronted dotterel (*Elseyornis melanops*) Conservation status: Naturally uncommon
- Pied stilt (*Himantopus himantopus*) Conservation status: Not threatened

The trial was able to determine the flight initiation zones of riverbed-nesting birds in the presence of a perceived threat (vehicle or human) and thus make recommendations as to the suitability and effectiveness of the exclusion-zone distances as set out in the CoP (V21) for Flood Protection.

It was recommended that the current exclusion zone of 100m from banded dotterel nests could be reduced to 50m, but that the 50m distance from chicks should be maintained, as should the 25m distance for passing a nest. It is also recommended that operators undergo annual field-based training in relation to alighting from the vehicles near nesting birds, but that pre-survey nesting hot-spots are identified by suitably qualified or trained people with shorebird monitoring experience.

# 1. Introduction

Many shorebird species have declined in New Zealand. The key factors in the decline are likely to be introduced mammalian predators which prey on most eggs that are laid and many chicks, juveniles and adults. Invasive predators known to seriously impact on shorebirds are hedgehogs, rats, cats and mustelids (ferrets, stoats and weasels). Habitat loss (including woody-weed incursion) and human activities have also contributed to displacement of birds at some sites, particularly at breeding sites.

Human disturbance is an issue affecting many of our bird species and this is especially so for ground-nesting shorebirds. Birds perceive humans and vehicles as predators, so any disturbance (and thus stress) caused may lead to an increase in energetic costs and reduced breeding-success (Woodley 2012).

Currently, the Greater Wellington Regional Council (GWRC) Flood Protection Department (FP) has implemented practices which have benefits to riverbed-nesting shorebirds. Field Supervisors undertake pre-work surveys in work areas to try to locate nests and chicks so that avoidance measures can be implemented, river-works help to clear woody weeds from gravel beaches thus improving nesting habitat (shorebirds preferentially nest on gravels and with clear line of sight, as fleeing from danger is their only defence), and contractors and operators are made aware of their obligations to avoid or minimise disturbance to birds.

The result of disturbance to nesting birds is that the eggs and/or chicks are exposed which makes them vulnerable to overheating or being chilled as well as to predation. Very young chicks have a “freeze-response” to perceived danger. They will lie motionless in the substrate until the parent birds give the “all-clear”, which may be for an extended time if the threat remains. The high degree of camouflage of both eggs and chicks makes them very difficult to see with the human eye and impossible to see from a vehicle.

Managing human/vehicle disturbance in sensitive areas can be achieved through establishment of exclusion zones around nesting areas or individual nests, inside which machinery or vehicles may not be driven or operated, nor humans on foot. These exclusion zones are best determined by ascertaining flight initiation distance (FID) i.e. the distance at which birds respond and react to the approach of vehicles and/or people and flush from the nest.

GWRC FP Code of Practice (v21) has determined exclusion zones around nesting shorebirds and chicks but importantly, to our knowledge, these exclusion distances have not been tested on shorebirds in New Zealand by any other regional council. They have instead been based on “best guess” as to what may be appropriate. This trial has been initiated to test the appropriateness of the exclusion zones in the CoP with these aims in mind:

- are they effective in minimising disturbance to nesting birds and chicks?
- does the time and required skills involved in applying these rules result in a lessened impact on shorebirds in the areas of FP operations?
- Is the application of the exclusion zones feasible?

## 2. Background

Under the RMA every person has a duty to avoid, remedy, or mitigate any adverse effect on the environment arising from an activity. In order to avoid any adverse effects on nesting shorebirds in areas of riverbed operation, FP has drafted exclusion zones of different sizes according to the type of operation; 100m from nests and 50m from chicks during activities causing continuous disturbance to habitat (such as gravel extraction or beach-contouring). Prior to work starting, the FP Area Supervisor undertakes a pre-work inspection at the worksite to locate and nests and/or chicks present.

Nests are marked on nearby rocks with “dazzle” paint and sometimes a rock cairn is built alongside. An access track across the beach or island is planned. The contractors or machinery operators are advised of this and reminded of their obligations to adhere to best-practice (to avoid disturbing nests or chicks) by staying on the determined track.

# 3. Objectives

The aim of this trial was to determine the range of FID observed over different nests and across the three species chosen to study (banded dotterel, pied stilt and black-fronted dotterel), (Appendix 1). This data could then be used to evaluate the appropriateness of the vehicle exclusion zones (as set out in FP CoP) in minimising disturbance to nesting shorebirds and/or chicks. Additionally it was a trial to examine whether the exclusion zones, when implemented, were feasible for FP field operations.

The goal was to test the practicality of implementing the exclusion zones for FP, while at the same time achieving the best possible outcomes for shorebirds that could be impacted.

The intention was to have a range of each of the target species to be able to determine the species-specific exclusion zones. Once sufficient data has been gathered, the exclusion zone could be determined, taking the upper quartile as the appropriate exclusion distance which should be applied in the CoP.

# 4. Methodology

The shorebird species which were the focus of this trial were banded dotterel, pied stilt and black-fronted dotterel, all of which nest on the braided rivers in the Wairarapa and Wellington regions. This trial was conducted in fine weather during the breeding season (spring and early summer) on reaches of the Waingawa and Ruamahanga Rivers known to be favoured by shorebirds. Two people, each equipped with a two-way radio, walked the riverbeds to observe the behaviour of shorebirds and thereby locate their nests, which were then marked by GPS (Appendix 2). A marker showing the distance of 100m from the nest was made with a small cairn of stones.

Person A hid ~80m from the nest to observe reactions to the approach-stimuli. Person B (in a vehicle) drove towards the nest head-on from 100m away, moving steadily as a pace normal to vehicles operating on gravel beaches. When Person A observed the incubating bird flush from the nest they gave the command “stop” via radio. At that point the distance from the front of the vehicle or person on foot to the nest was measured and recorded by Person A. The experiment was repeated after half an hour had elapsed (if the incubating bird had not been disturbed again by other stimuli). A total of fifteen tests on nine nests were carried out using a mix of heavy machinery, utility vehicle and person on foot. As well as vehicles being driven straight towards the nest, some trials were completed with vehicles being driven obliquely i.e. going past the nest, without stopping.

# 5. Results

The FID we recorded in the presence of vehicles ranged from 5.8 m to 40m (Table 5.1). The FID between the larger category of vehicles (dump-truck, bulldozer and tractor) showed no significant difference. As well as being larger, this group of machinery was also noisier than the smaller and quieter utility vehicles. It was observed that incubating birds were more tolerant of moving vehicles than ones which stopped near to a nest. A human alighting from a stationary vehicle was more likely to elicit a disturbance reaction than a stationary vehicle alone.

The small sample-size achieved in this trial constrained any significant statistical analysis being done on the data, but importantly the observations led to some clear understanding of how FP operates in the presence of nesting shorebirds as well as how the birds react to the different types of operations in progress. This in turn enabled some valid conclusions to be made based more on behavioural observation than statistics.

Tolerance testing was carried out on banded dotterels only. This was due to the absence of other species' nests being found on the targeted Ruamahanga and Waingawa River reaches. Pied stilt nests were observed in the study reaches, but they were on islands, thus inaccessible for this study. No black-fronted dotterel nests were found.

Unfortunately only three heavy machinery tests were able to be carried out as it was hard to achieve the coincidence of nesting birds at an active worksite. Some tests were carried out in a farmer's paddock (Southey's) adjacent to the Waingawa River, where five pairs of banded dotterels were nesting. At this site we were able to test the FID elicited by a tractor towing a set of harrows, as well as tests using our own utility vehicle.

Regular freshes also thwarted attempts to carry out more tolerance tests, with some located nests being washed out before trials could be conducted. Of the thirteen sites inspected, active nests in areas suitable for the trial were found at only six of these, with the other sites having no birds present or the substrate and terrain was unsuitable for conducting a trial in our own vehicle.

## Table 5.1: Flight initiation distance (tolerance) testing August – December 2019

| | 100m | 50m | 25m | Oblique | Direct | Comments | Date |
|---|---|---|---|---|---|---|---|
|  | | | 20m flush | √ | | Early in season | 8/08/2019 |
|  | | | 16m flush | √ | | Tractor drilling adjacent paddock | 18/09/2019 |
|  | | | 19m flush | | √ | Stopped dozer at 25m and two people walked another six metres toward the nest before the bird flushed | 3/12/2019 |
|  | | | 18m flush | | √ | Nest 2 drive straight at nest | 18/09/2019 |
| | | 40m flush | | | √ | Nest 1 drive straight at nest | |
|  | | 30m flush | | | √ | Tests carried out within 10 minutes of each other, drive straight at nest | 19/09/2019 |
| | | 33m flush | | | √ | | |
| | | 32m flush | | | √ | Test carried out within 15 minutes of each other, drive straight at nest | 31/10/2019 |
| | | 27m flush | | | √ | | |
|  | | 30m flush | | | √ | Drive straight at nest | 18/09/2019 |
|  | | | 5.8m flush | √ | | First time stopped opposite nest and and person alighted from vehicle; bird flushed. | 15/11/2019 |
| | | | 5.8m flush | √ | | Second time drive straight past nest, bird alert but did not flush | |
|  | | | 12m flush | | √ | Early in season | 8/08/2019 |
|  | | | 16m flush | √ | | Bird facing away, wind covering approach | 16/09/2019 |
| | | 41m flush | | | √ | Walk straight at nest | |

**Draft Code of Practice**
75m from nests during activities causing continuous disturbance
50m from chicks during activities causing continuous disturbance

**Current Code of Practice (V21 October 2019)**
100m from nests
50m from chicks during activities causing continuous disturbance to hab
25m vehicles must not be operated within 25m of any nests and chicks

# 6. Discussion

Nesting banded dotterels demonstrated a greater degree of tolerance to machinery than people walking. Large vehicles (which were also noisier) appeared to be perceived by the birds as less threatening than the smaller and quieter utilities. One utility vehicle test eliciting a FID of 5.8m is an outlier; explanations could be that this could have been an older bird which was habituated to vehicle movements and/or the nest was close to hatching. The tolerance which birds have towards disturbance changes over the incubation period. Those in early stages of incubation will flush more quickly; incubating parents will sit more determinedly on eggs which are close to hatching, as a greater investment in time and energy has been made, thus the potential loss is greater (McArthur *pers comm*).

People walking were of greater concern to the nesting birds. It would appear that a human presence is perceived as more predator-like than any sort of moving machinery. This has implications for the risk imposed by machinery-operators alighting from their vehicles (such as for meal-breaks) in close proximity to nests and thus inadvertently exposing the eggs or chicks to stress such as heat, cold or predation (Ledgard and Davey 2018).

Some birds may exhibit a certain degree of habituation to human and vehicle presence but this may not alleviate the negative effects entirely. Studies show that different bird species can differ in their response to disturbance and this influences their reaction to the stressor (Wallace 2016). Accepting the fact that human presence can be detrimental to birds, the management of human (including vehicle) access into nesting areas is important. The establishment of exclusion zones is expected to reduce disturbance by vehicles and people and thus contribute to nesting success.

Given that nesting birds were not disturbed by vehicles until the vehicles were as close as 40m, the > 100m exclusion zone detailed in the FP CoP for activities causing continuous disturbance to habitat seems an overly cautious distance to be required as an exclusion zone. There is a need however to make contractors aware of the need to maintain as much distance from the nest as possible if they alight from their vehicle, as human presence can have a significant impact on the nesting birds. In general, it has been found that **if** machine operators follow the CoP, early indications are that FP can adequately mitigate the threat they pose to nesting shorebirds.

# 7. Recommendations

Our recommendations as a result of this trial are:

- Consider reducing the exclusion zone around banded dotterel nests to 50m but maintain the 50m from chicks (as young chicks are actually more vulnerable than nests due to their mobility plus the "freeze" response). Maintain the 25m distance if passing a nest.

- Require operators to undergo annual field-based training where the consequences for nesting birds of going off-track or alighting from vehicles in nest areas is explained.

- Identify nesting "hot-spots" within the mid-Ruamahanga and Waingawa Rivers where pre-work surveys can be concentrated by using a suitably qualified or trained person with shorebird monitoring experience.

## Acknowledgements

The idea for this project originated from the many bird-oriented discussions we have had over the years with Nikki McArthur (ecologist) and he was inspirational and encouraged the idea that we should test the exclusion-zones implemented in GW CoP.

We are grateful to Dr Philippa Crisp (Environmental Science Dept, GWRC) for backing us and making it possible for us to do this work with the GW Flood Protection team. Also to Roger Uys (in the same team) who was supportive and helpful with ideas and advice.

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All photos (unless credited) are courtesy of NZBirdsOnline: http://nzbirdsonline.org.nz/

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# Appendix 1: Images of river nesting birds targeted for study in this trial


Figure 1: Banded dotterel (adult female with chick)

Figure 2: Banded dotterel (adult male showing distraction display)

Figure 3: Banded dotterel chick showing freeze-mode defence

Figure 4: Banded dotterel chick in freeze-mode defence with eggs

PHOTO: AILSA HOWARD

Figure 5: Black-fronted dotterel

Figure 6: Pied stilt

## Appendix 2: Aerial photo of GPSed nest locations


Waingawa and Ruamahanga Rivers

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Date: 4/02/2020