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# WINDY HILL ROSALIE BAY CATCHMENT TRUST

EcoRAP Contract: ECO006 & ECO012
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## Bird Counts
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**INTRODUCTION**

The management of pests at the properties of Little Windy Hill Company Limited and Benthorn Farm have successfully reduced rat densities and captured cats since 2000. These ongoing activities resulted in higher bird densities, and several typical bird responses. What is more, many of these responses support theoretical ecological predictions. That in itself illustrates that the Windy Hill Rosalie Bay Catchment Trust is achieving their objectives originally envisioned.

The Trust's success and efficient pest-management have resulted in most of their properties now having had some form of treatment for some length of time. Hence, the Trust's own success required additional monitoring of sites not managed to clearly illustrate bird responses.

**Pest Management Objectives**

- Sustaining and enhancing biological diversity
- Increasing bird life
- Providing a new home for declining species such as robins and kiwis

Following the bird counts during June 2007, I re-evaluated responses of specific species. That evaluation illustrated that most common species have increased substantially in densities after pest-management compared to what these were before. Two anomalies were apparent then – 1) grey warblers were at slightly lower densities after pest densities were reduced, and 2) bird densities on newly established monitoring sites where no pest control has taken place was not much lower than pest-managed sites. However, variability in densities was lower even though only a few sites with no pest control can be compared.

Although, the Trust's continued activities clearly improved biodiversity in the southern part of Great Barrier Island as a result of sustained pest control over 230 ha at Little Windy Hill and 40 ha at Benthorn Farm, such anomalies as noted above raise concern. It also guides theoretical thinking about why such anomalies may persist. For instance, the wider range of densities on pest control sites may result from regional interactions. This is beneficial and is an insurance policy – if some sites experience temporary degradation like a reinvasion of rats, then the variety of densities suggests that at least some places may serve as sources from which individuals can re-colonise temporary degraded sites once the source of degradation has abated. If true, one should see at least some instances where declines at one

locality may be associated with increases in another.

The monitoring of bird communities forms an integral part and has played an important role in directing and evaluating some of the management actions of the Trust. I use the data here to check for some indications of regional movements of birds. The monitoring of the locations where robins established after reintroduction was also continued. Given that I previously noted that settlement of robins was in relatively species poor areas, I continue to revisit that observation.

**Characteristics of bird communities at Little Windy Hill and Benthorn Farm**

- Eight ecological guilds comprise the bird communities on both Great and Little Barrier Island.
- Non-native species replaces native species that is not present on Great Barrier Island.
- In some cases, species increased their densities to make up for missing species.
- The fraction of non-native species amongst birds is decreasing at Little Windy Hill.
- The densities of species may change when adding another species.
- It should lead to successful introduction of missing bird species here.
- Densities of species do not vary with each other at Little Windy Hill.
- Densities stabilized even in the presence of a newly introduced bird species.
- The relative density of non-native species decreased.
- Population growth of a species was low when densities were high and vice versa.
- There is a wider range of densities on treated areas than non-treated ones.
- Introduced robins established on sites with relatively few other native species.
- *Five common species increased in density after pests were managed.*
- *Grey warbler densities declined after pests were managed.*

## METHODS

### Study areas

The Trust applies pest management to the primary catchments of the study area. Monitoring of birds focus on these areas, but also include includes places where introduced robins settled and where no pest management has taken place.

**Data collection**

A total of 18 bird survey transects (150 m in length) comprise the Bird Monitoring Programme at present (three on ridges and three in valleys in an area pest-managed since 2000, and three on ridges and three in valleys in an area pest-managed since 2002 at Little Windy Hill; one on a ridge and one in a valley at Benthorn Farm pest-managed since 2002, two in areas where robins settled and two relatively newly established transects in an untreated area). Each transect has four sample points 50 m apart which the Trust's field workers survey at least once every six months. The survey technique is standardized, but observers vary. The survey of a transect is as follows:

- At each point, bird counts are made for 3 minutes.
- Individuals heard and seen are recorded separately.
- A bird heard and seen is identified on the data sheet as such to ensure recording of that individual only once.
- For each bird recorded, the distance from the point to the bird is estimated and classified into 5 distance classes: 0-5 m, <5-10 m, <10-15 m, <15-20 m and <20-25 m.
- No birds are recorded outside the 25 m radius.
- No birds are recorded when walking between points.

**Data analyses**

I used a modified distance sampling technique to address the repeated sampling and estimated the densities of the birds for each of these transects. In this way, I generated a data set containing the density for each species on each of the transects. For checking regional interactions I defined regions as follows: Windy Hill Treated Ridges and Windy Hill Treated Valleys for those areas where pest management started in 2000 at Little Windy Hill; Windy Hill Control Ridges and Windy Hill Control Valleys for those areas where pest-management started in 2002; Benthorn Ridge and Benthorn Valley for Benthron Farm where pest management started in 2002; the Robin Sites and New Control sites where bird monitoring started in 2006.

## RESULTS and DISCUSSION

### Comparison with New Control Sites

Densities of birds on New Control Sites continued to be similar to that recorded on pest-managed sites, but the variance was smaller (Fig. 1). This pattern is now consistent since June 2006. Three possibilities were put forward previously to explain this anomaly – theory suggests that densities should be consistently higher on pest-managed sites. The explanations for the anomaly included: 1) there is no difference, an unlikely result given the changes I noted before in species-specific densities; 2) the present time series is short; and 3) site-specific differences mask real differences. New Control Sites are within 500 m of pest managed areas from which overflow can affect the observations on these sites as has been noted elsewhere. Such overflow effects also may reflect regional interaction between different places. In this case one may observe a range of bird densities like that on pest-managed sites. If pests interfere with movements between places and establishment either because they reduce sources beyond where surplus individuals can move to other places, or because when an individual arrive at a new place pests kill it, then one expect low variability in densities. I evaluate this explanation in the next section. However, a longer time series of bird counts in comparison with other island-wide bird counts presently undertaken should help to shed light on the anomaly of control sites having similar densities than those where pests were managed, and in particular may clarify overflow effects.

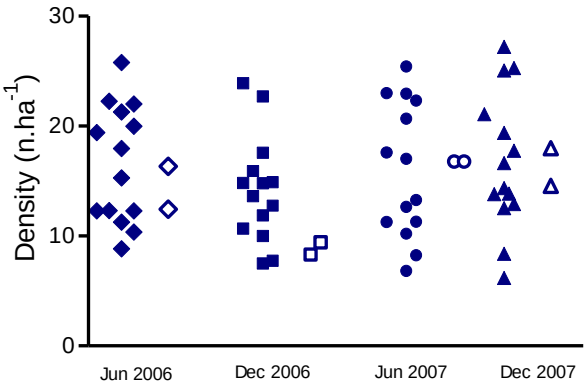


**Figure 1.** Comparison of total bird densities noted on the sites of the Trust that has received pest control (solid symbols) against two transects surveyed on a site that has not had any pest control (open symbols). I present data collected since June 2006. Robin sites are not included.

**Regional Interaction**

The regional interaction hypothesis put forward in the previous section predicts that some areas should increase in bird density when other areas are decreasing. When I checked this only weak patterns appeared (Fig. 2). Densities on the ridge sites that had pest management since 2000 at Windy Hill weakly increased simultaneously with decreases in densities on ridge sites that pest management since 2002 at Windy Hill. At best, there is some regional interaction, but this may be unpredictable and/or not detectable in the data.

Most notable was consistent opposite patterns *e.g.* density increases on one site was associated with density increases on other sites disregarding how long pest management have been applied. This suggests that large-scale regional factors may be hugely influential. It also suggests that the spatial scale of bird monitoring may constrain the detection of regional interactions. For instance, rainfall patterns could have widespread affect on food availability and survival of birds on Great Barrier Island. Alternatively, birds in the study area may interact with the rest of the island – the spatial scale over which I tried to evaluate regional interactions may be too small to validly detect any effects. The proposed comparison with other bird counts on Great Barrier Island will provide the opportunity to unravel some of these apparent regional effects.

These explanations have several potential consequences and implications. Noteworthy is the potential role that climatic variability and changes can play in the dynamics of birds. In addition, if birds on pest - managed areas interact over a large spatial scale, then external factors outside the control of pest managers or land owners may substantially influence the results of bird monitoring programs. Both these factors, climatic variability and large regional interactions, will challenge the pest management actions and limit achieving objectives of the project.

These results and implications do provide guidance suggesting that assessments of climatic variability such as patterns in rainfall and temperature should be explored in an attempt to explain some of the parallel patterns noted in bird densities on the various sites managed by the Trust. In addition, the results call for bird movement studies both within the sites of the Trust as well as beyond the property managed by the Trust.

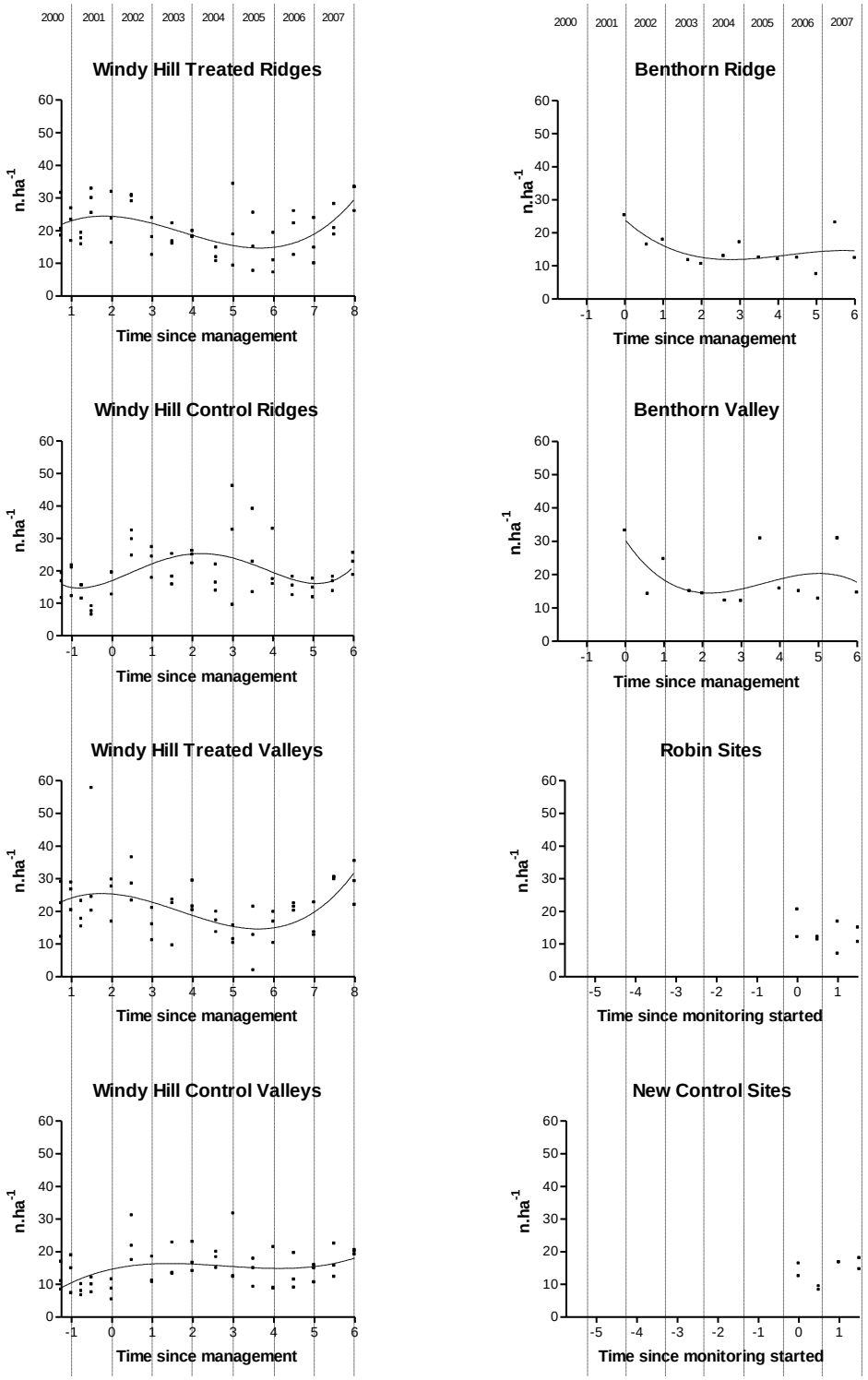


**Figure 2.** Regional patterns in bird densities noted since 2000. I illustrate densities for several areas. The Windy Hill Treat Ridge and Valleys refer to the original treatment sites on which pest management started in 2000. The Windy Hill Control Ridge and Valleys refer to the original control sites on which pest management started in 2002, which was also the case for the Benthorn Farm sites.

**Robin Sites**

I combined all sampling occasions of bird counts since June 2006 to compare sites that had robins with those that did not. Wood pigeons were absent while kaka, tui and silvereye densities were higher on general sites than on robin sites (Fig 3). This confirms that robins chose those places with the least amount of competitors.

I previously raised the concern that if potential competitors can affect robin persistence then source areas of those species close-by may pose a threat to robin persistence. I also illustrated that this threat is real since birds on pest-managed areas generally had higher densities after management started than before. However I suggested then that, with the exception of tui, potential competitor spill-over from pest-manage sites was minimal and unlikely to threaten the persistence of robins at least in the short term.

Two surprising results were noted. Kaka was recorded at both Robin Sites for the first time since monitoring started. At one of the Robin Sites, observers did not see any robins. This result should be checked against the robin-specific monitoring data to clarify whether this observation should be a concern.

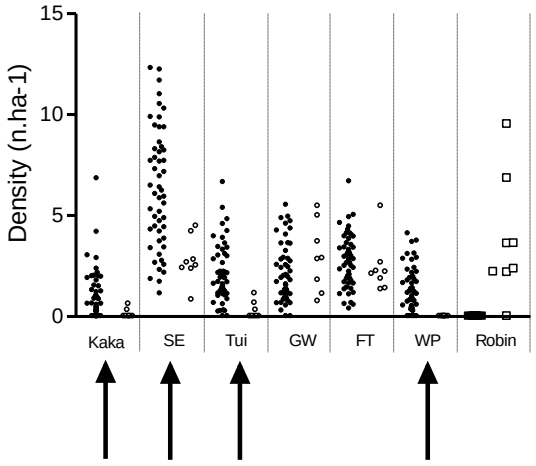


**Figure 3.** Comparison of bird densities for site with robins (open symbols) with those that did not have robins (closed symbols). I show densities for each transect sampled from June 2006 to December 2007. The arrows indicate species with lower densities at robin sites. Note that in the last survey one robin site had no robins. SE – silver eye, GW – grey warbler, FT – fantail, WP – wood pigeon.

## CONCLUSIONS

The comparison of pest-managed with newly established control sites continue to provide anomalous results even though long-term data clearly illustrate that bird densities are higher after pest-management started than before. Several factors may be the reason for this, most of which need additional investigation to clarify. The recent changes in bird densities on pest-managed sites suggest a regional increase. In this regard the Trust is continuing to improve bird life. However, climatic changes and large regional spatial interactions may mask successes. Although nourishing the dream of introducing robins has been realized when robins established well on species-poor sites, recent appearances of kaka and disappearance of robins from one monitoring site raise concern that some other species may threaten persistence of robins.

## RECOMMENDATIONS

The bird counts at Little Windy Hill and Benthorn Farm continue to contribute to understanding how small ecosystems here respond to management. Three key aspects need to be considered. In the first instance the Trust should consider investigating large scale spatial use of birds on Great Barrier Island to address the potential external affect on birds dynamics noted on its property. The Trust has already initiated an island-wide comparative study. Secondly, the Trust should consider reviewing rainfall and temperature patterns since 2000 to evaluate climatic influence of bird dynamics noted on its property. Thirdly, the trust should evaluate bird community composition at sites outside the monitoring sites where robins have established and use robin-specific monitoring to extract survival probabilities and productivity and establish whether these vary according to the presence or absence of other species, notably kaka, silvereye, tui and wood pigeons.

Even so, the value of the long-term data needs to be maintained – it has flagged several issues and thus fulfils the role of informing management. I suggest that counts continue and focus on how the interaction between introduced and native bird species influences bird densities. Counts will also support any new initiatives on how climatic changes alter interactions, and how spatial use may explain patterns noted in the data.

**Note:** Additional information and references are available from Sam Ferreira.