ENVIRONMENTAL STATEMENT
VOLUME 4 - A9.4 A REVIEW OF THE STATUS AND HABITAT OF THE ST HELENA WIREBIRD CHARADRIUS SANCTAEHELENAE, INCLUDING AN ASSESSMENT OF THE POTENTIAL IMPACT OF CONSTRUCTION OF THE PROPOSED ST HELENA AIRPORT, FEBRUARY 2006

A review of the status and habitat of the St Helena Wirebird *Charadrius sanctaehelenae*, including an assessment of the potential impact of construction of the proposed St Helena Airport

Neil McCulloch
Environment & Heritage Service
Commonwealth House
35 Castle Street
Belfast
BT1 1GU
UK

February 2006

Executive Summary

1. The Wirebird, or St Helena Plover, *Charadrius sanctaehelenae* is confined to the South Atlantic island of St Helena where it is the last surviving endemic bird. The species has been little studied and its numbers have declined since the late 1980s. It also has the smallest range of any of its family. The Wirebird is currently classified as endangered.

2. The proposal to construct an airport and associated infrastructure at Prosperous Bay Plain and adjacent areas on the island of St Helena has the potential, in the absence of mitigation measures, to have a significant negative impact on indigenous biodiversity in general and the Wirebird in particular.

3. Airport construction is likely to impact on two major areas of Wirebird habitat: Prosperous Bay Plain (runway and infrastructure) and Deadwood Plain (haul route and access road).

4. A census of the 31 Wirebird sites first identified in 1988 recorded a total of 208 adults. This represents a decline of 43% from a previous survey in 2000/2001 and suggests a current adult population of 200-220 individuals.

5. The decline in Wirebird numbers is likely to be associated with the large-scale degradation of habitat within grazing lands caused by reduction of livestock numbers and lack of control of invasive plant species. All but two of the grassland Wirebird sites showed signs of habitat degradation.

6. The rate of population decline was similar across all habitat types.

7. There are indications that numbers of predators, especially feral cats and Common Mynahs, may be increasing. The amount of effort put into cat trapping and the neutering of domestic pets is currently substantially less than in previous years.

8. Prosperous Bay Plain was found to support 19-25 adult Wirebirds, a decline of 21% from the previous study. The habitat at the site was largely unchanged, though there was a significant increase in grass cover. Wirebird distribution was concentrated in peripheral areas, with relatively little activity in the sandy central basin.

8. Nine Wirebird territories were identified at Prosperous Bay Plain. The habitat characteristics within these showed little difference from average values for the site, though the impression gained was that substrates tended to be stonier than in unused areas. Breeding activity was observed in only three territories. One chick fledged successfully, two further chicks hatched and incubation of two eggs was ongoing in one other territory at the end of the project.

9. Only one of the territories at Prosperous Bay Plain was likely to avoid significant impact from airport construction. Four (possibly five) would be lost entirely and the remainder would suffer habitat reduction or significant disturbance during construction.

10. Deadwood Plain, one of the most important sites for the Wirebird, held 35-39 adult Wirebirds, a decline of 62%. The habitat showed serious degradation with a significant increase in sward height to sub-optimal levels and a large increase in the extent of scrub and other invasive plant species. No decline in prey abundance was detected. Cattle numbers have been reduced by approximately 70% overall since 1998.

11. Fourteen Wirebird territories were identified at Deadwood Plain. These were located in areas of shorter grass, contained a smaller proportion of introduced rush ("Bull Grass") and avoided areas of scrub encroachment. All territories were located in the lower half of the Plain, the upper part having been almost deserted by Wirebirds. Breeding activity was observed in nine territories. Two chicks fledged successfully. Six clutches totalling 11 eggs were laid, of which five failed due to predation. At the end of the project two chicks had recently hatched, incubation was ongoing in one territory and copulation had been observed between a previously failed pair in another.

12. Three of the territories at Deadwood Plain would be impacted by construction of a haul route from Rupert's Bay via the route initially proposed. Two of these would be encroached upon directly. Establishment of an access road through the centre of this site would impact upon an additional four territories, causing permanent habitat loss and fragmentation. The revised route from Rupert's Bay via Longwood Gate would involve no habitat loss at Deadwood Plain and depending where placed only temporary disturbance to a maximum of six territories.

13. Construction of haul routes to the airport site from either Prosperous Bay or Turk's Cap Bay would have the least effect on the Wirebird population. The former would affect no territories in addition to those impacted by runway and terminal construction and no territories have been confirmed on the latter route. In addition to those on Deadwood Plain, the route from Rupert's Bay would also affect two territories at Bottom Woods if the upper option were adopted, or one territory (indirectly) if the lower route were chosen. Bottom Woods would be avoided by the revised route from Rupert's Bay to Longwood Gate.

14. Of the options for a permanent access road, those from either Hutt's Gate or Longwood Gate via Fisher's Valley are, equally, the least disruptive. No current territories outside Prosperous Bay Plain would be affected and there would be little if any impact on potential habitat in Fisher's Valley. The option from Woody Ridge has the potential to affect (indirectly) at least four additional territories.

15. Selection of the Prosperous Bay haul route and one of the access road options entering the site via Fisher's Valley would minimize disturbance to Wirebirds additional to that caused by construction of the runway and terminal. Further mitigation could be achieved by habitat restoration involving the re-planting of vegetation comprising mainly *Eragrostis*, *Suaeda* and *Atriplex* on mainly gravel substrates on the runway apron and embankments and on the western ridge carrying the access route. Extensive creeper mats could also be removed from the latter. The access route should be aligned along the eastern edge of the ridge to maximize unbroken habitat.

16. If no alternative haul route is possible, any construction at Deadwood Plain should be limited to a temporary haul route to minimize habitat loss, fragmentation and long-term disturbance. No permanent access route should be built for the above reasons and to minimize physical danger posed to Wirebirds by vehicles. The construction footprint for the haul route should be as small as possible and should facilitate the greatest possible extent of grazing during construction. If possible, construction should be carried out between March and September when Wirebird breeding activity is at a minimum.

17. The most favourable combination of airport development components for the Wirebird would be the runway and terminal, as planned, at Prosperous Bay Plain, with a haul route from Prosperous Bay and an access road via Fisher's Valley. This would affect a total of seven territories.

18. The most effective general mitigation measure would be restoration of habitat to a suitable condition for Wirebirds at important, and formerly important, sites near the airport. These would include Deadwood Plain, Longwood Farm pastures and Bottom Woods. Measures required would include scrub clearance, partial re-seeding and maintenance by sufficiently heavy grazing, or possibly mowing.

19. Deadwood Plain is considered a key site for the future survival of the Wirebird. Past studies have shown that it has the potential to support over 100 individuals. A management programme for this site is urgently required and should involve increased stocking, rotational grazing and control of invasive plants. Payment of subsidies to local graziers to allow implementation of these measures should be considered. Alternatively, the site could be managed independently of, but on behalf of, the graziers.

20. Predator control should be intensified and increased in extent, particularly in respect of trapping of feral cats and neutering of domestic pets. Consideration should also be given to substantially reducing the numbers of Common Mynahs.

Table 1: Summary of impact of various options for construction of airport and haul/access routes on the Wirebird population. Territories lost include those entirely or mostly eradicated by construction and those in which the core area is crossed by a road. Affected territories include those potentially subject to significant disturbance from construction work within 100m and those in which road construction is confined to the margins. Territories in area includes all territories within 200m of route, excluding those at the airport site. Territories lost/affected at airport site comprises Prosperous Bay territories T2-T8 (see Section 5). Figures in parentheses exclude territories impacted by construction of the airport (runway and terminal).

Development component	**Territories in area**	**Territories lost**	**Territories affected**	**Territories lost/affected at airport site**	**Total territories impacted**
Haul Route from Rupert's Bay (upper)	8	3	3	7	13 (6)
Haul Route from Rupert's Bay (lower)	8	2	3	7	12 (5)
Haul route from Prosperous Bay	0	0	0	7	7 (0)
Haul Route from Turk's Cap Bay	2	0	1	7	8 (1)
Haul/access route from Rupert's Bay via Longwood	10	2	6	7	15 (8)
As above (avoiding Deadwood Plain, see Appendix 1)	10	0	(6) Depending on where the haul route is situated	7	7/13 (0/6)
Access Route from Hutt's Gate	2	0	1	7	8 (1)
Access route from Longwood Gate	2	0	1	7	8 (1)
Access route from Woody Ridge	6	1	4	7	12 (5)

Contents

1. Introduction

1.1 Context:
The Wirebird, or St Helena Plover, *Charadrius sanctaehelenae* is confined to the South Atlantic island of St Helena where it is the last surviving endemic bird. The species has been little studied and its numbers have declined since the late 1980s. It also has the smallest range of any of its family.

The proposal to construct an airport and associated infrastructure at Prosperous Bay Plain and adjacent areas on the island of St Helena has the potential to have a significant negative impact on indigenous biodiversity in general and the Wirebird in particular. This report seeks to clarify the current status and distribution of the species within the affected sites and identify the major areas of impact by the development on Wirebird ecology with a view to assisting the development of mitigation strategies.

1.2 Background:
As a result of its extreme isolation, the island of St Helena has given rise to a surprising number of unique endemic animals and plants (Brown 1982, Cronk 1987). This biodiversity has been dramatically reduced, directly and indirectly, by human agency since the island's discovery in 1502. St Helena's natural vegetation has been almost entirely destroyed by over-grazing, deliberate removal and inappropriate agricultural practices. This has resulted in extensive erosion and land degradation (Cronk 1983, 1986a,b, 1989). Such large-scale habitat disruption, and the introduction of a range of alien predators and invasive plant has led to the reduction of most of the indigenous flora and fauna of the island to very small relict populations.

Indigenous birds have fared particularly badly. Of at least nine endemic bird species known to have existed on the island only one species, the Wirebird, survives (Ashmole 1963, Olson 1975).

It is unlikely that the Wirebird has ever been an abundant species. The total population was estimated at around 450 individuals in 1988/89 (McCulloch 1991). Since then, the species appears to have been in constant decline, though the rate may have varied. The most recent census prior to the present study found around 350 adults during the period 1998 - 2001 (Collar *et al* 1994, McCulloch & Norris 2002). Current work indicates an acceleration of the decline over the last five years (see Section 3). The reasons for this decline are not fully understood but habitat degradation, particularly within the grasslands, appears to have been a significant factor (McCulloch & Norris 2001). The Wirebird is currently classified as "*Endangered*" by IUCN and BirdLife International (Collar *et al* 1994). This category includes species that are "facing a high risk of extinction in the wild in the near future". The Wirebird is included on the basis of its small population size, extremely restricted range and recent rate of decline. In view of the unfavourable recent trend, this may well be upgraded to "*Critically Endangered*" in the near future.

Despite recent interest, the Wirebird remains a relatively poorly known species. Only three studies of its ecology (none exceeding 18 months) have been carried out to date (Alexander 1985, McCulloch 1991, 1992, McCulloch & Norris 2002). Data are

therefore lacking on a number of aspects of Wirebird behaviour, breeding biology and, in particular, demography.

2. Wirebird ecology – a summary

The Wirebird is most closely related to Kittlitz's Sand Plover *Charadrius pecuarius* of Africa with which it probably shares common ancestry. Some behavioural traits suggest that the species may have diverged from ancestral stock relatively recently, though this remains conjectural.

Nothing is known of the biology of the Wirebird prior to the enormous ecological changes wrought on St Helena as a consequence of human colonization. It seems likely, however, that the species, in common with all other members of its genus, has always been a bird of open habitats. If this is so then the Wirebird's population must always have been small, since early records suggest that the island was originally extensively wooded (Cronk 1989). It may be that the Wirebird has in fact benefited to some degree from deforestation. Cronk (1989) has suggested that the Wirebird may have inhabited the open floor of native Gumwood *Commidendrum robustum* woodland. This habitat once covered much of the island at middle altitudes, including Deadwood Plain. The behaviour of the present day Wirebird population lends little support to this theory, but more light may be shed on this as the extensive Gumwood plantings of the Millennium Forest project adjacent to Wirebird habitat at Horse Point Plain mature.

The majority of Wirebirds today inhabit dry, middle altitude pastureland and the semi-desert environment of the Crown Wastes. During the 1988/89 survey the average Wirebird density on pasture was almost three times higher than in semi-desert, with the largest number of individuals being found on Deadwood Plain (McCulloch 1991). This ratio has since narrowed.

The areas most favoured by Wirebirds can be categorized as having grass swards less than 5cm tall (typically dominated by Kikuyu Grass *Pennisetum clandestinum*), of relatively low stem density and mixed with broad-leaved herbs and patches of bare earth. High-density Wirebird sites generally have shallow gradients and annual rainfall within the range 300-500mm.

Sites with the above characteristics hold the greatest abundance of the Wirebird's invertebrate prey. Beetles and caterpillars appear to be particularly important components of the species diet. Foraging typically accounts for around 60% of daytime activity and is most intensive in the early morning and late afternoon. Wirebirds will occasionally continue to feed after dark, at least on bright moonlit nights.

Wirebirds appear to be monogamous. Adults are territorial and all evidence suggests that they are highly sedentary. In common with many other island endemic species world-wide, Wirebirds show a disinclination to fly. They are, however, fully proficient flyers when the necessity arises. Most flights tend to be of short duration, normally reaching a height of less than 50m. A large proportion of Wirebird flight activity appears to be associated with display, though some individuals have been observed to regularly fly over a kilometre to favoured drinking and bathing sites (McCulloch 1992).

Wirebirds nest throughout the year but there is a distinct dry season peak in breeding activity from October to February. The nest is a simple scrape in the soil with a thin lining of dry grass stems and rootlets. This lining is used to cover the eggs when an incubating adult leaves the nest in response to disturbance, thus making the nest extremely difficult to find. The clutch is most frequently of two eggs and both sexes share incubation. The incubation period is approximately four weeks. Chicks normally leave the nest within 36 hours of hatching and are led to feeding areas by the parents. Young Wirebirds fledge when 4-5 weeks old, but may stay within their natal territory for some time afterwards. Wirebirds in their first year tend to range much more widely than adults and may form small flocks.

Knowledge of rates of breeding success in the Wirebird is limited. To date detailed monitoring of productivity has been restricted to two seasons at Deadwood Plain (McCulloch & Norris 2002). During the 1999/2000 and 2000/2001 seasons 61% of known nesting attempts resulted in at least one chick being hatched. Chick mortality during the two seasons was estimated to be 77%, with survival from egg to fledging at 14%. These rates are likely to differ between years and between sites and habitats, however. It is known that Wirebirds may nest more than once in a year but there is no information on what proportion of the population do so, neither is it known how frequently lost clutches are replaced, though it has been established that this occurs.

Insufficient information has been collected to allow survival rates of adult Wirebirds to be estimated. Feral cats are probably the only potentially significant predators of full-grown birds. A number of mammal predators undoubtedly take chicks. Common Mynahs *Acridotheres tristis* have also been observed attacking hatchlings and may also take eggs. No evidence of serious predation of adults was found during the 1988/89 or 1998/2001 surveys, however. In the absence of a major predation problem mortality could be expected to be low and adult Wirebirds to be relatively long-lived. One ringed individual observed in 2005 was at least five years old.

3. Current Status of the Wirebird

The Wirebird has, until recently, been a little-studied species. As a result few historical observations on population size exist. Patterns and magnitude of past fluctuations in numbers are therefore unknown. Prior to the work of Alexander in 1984, estimation of Wirebird numbers tended to be based on subjective impressions rather than on systematic counts. Even Alexander's figure was based partly on extrapolation because of incomplete coverage. This has resulted in a disparity of estimates from which it is difficult to discern any recent trends.

Published comments on population size include:

"considerable numbers" Beatson (1816)

"not very numerous" Baker (1868)

"scarce without being rare" Huckle (1924)

"holding its own and breeding all over the island" Moreau (1931)

"not more than 100 pairs" Haydock (1954)

"just under 1000" A. Loveridge (in Pitman 1965)

"now relatively common" Basilewsky (1970)

"quite common" Q.C.B. Cronk (in Collar and Stuart 1985)

"at least a few hundred individuals" den Hartog (1984)

"likely to be 200-300 birds, maximum" Alexander (1985)

In 1988/89 the first full censuses were carried out and the three counts undertaken in 1989 produced a mean of 425 adult individuals (McCulloch 1992). During the early 1990s, surveys by St Helena's Agriculture and Natural Resources Department (ANRD) indicated a substantial decline. By 2000/01 numbers appeared to be stabilising and a mean of 362 adults was recorded (McCulloch & Norris 2002). Surveys of the 11 most important Wirebird sites by ANRD in early 2005 suggested that the species was again declining and that the rate of decline had increased. The results of all full censuses of the Wirebird population since 1989 are presented in Figure 3.1.

All 31 Wirebird sites identified during the 1988/89 study were re-censused during the present project between 21 November 2005 and 16 January 2006 using identical methods to those of 1988/89 and 1998/2001. (see Figure 3.2 for site locations)

3.1 Census Methods:
The territoriality of adult Wirebirds, the species' relative tameness and reluctance to fly and high visibility within open habitats have previously allowed direct counts to

be made with a good level of accuracy. Sites were delimited on the basis of habitat discontinuities or major physical features. The sub-set of sites covered here can be classified into two habitat categories: dry pasture and semi-desert. These were defined on the basis of altitude, rainfall and vegetation communities. Dry pasture typically lies between 400-600m a.s.l., receives less than 600mm rain annually and has a moderately dense sward, well mixed with broad-leaved herbs and interspersed with patches of bare earth. In cases where large grassland sites extended over a wide altitudinal range (e.g. Broad Bottom), classification was weighted by the nature of the vegetation, particularly in those areas of the site most heavily used by Wirebirds.

At each site birds were counted along a standard route that brought the observer within 25m of all points within the site boundary. Birds were allocated to three age classes: adult, juvenile and chick. Juveniles included all fledged birds not yet in full adult plumage; chicks included those in down and those feathered but not yet fledged. Birds only seen in flight were excluded, as were those that flew in and landed from the direction of areas of the site already surveyed. Multiple counts obtained using This method in 1988/89 and 1998/2001 have produced a high degree of consistency within seasons (McCulloch 1991, McCulloch & Norris 2002).

3.2 Results:

The results of the census are presented in Table 3.1 below. A total of 235 individual Wirebirds of all ages were found. The age structure of the population was compared with that observed in December 2000 and October/November 1999 using contingency tests. The latter census is probably the more appropriate comparator, given that the present survey was carried out almost entirely in November and no significant difference was found ($G = 1.29$, 1df).

Nineteen of the 31 sites show declines in adult Wirebird numbers (Table 3.2). Only three sites, Francis Plain, Banks' Ridge and Woody Ridge, showed an increase. Of these, Woody Ridge was the only site where the increase was at a level greater than might be expected from chance fluctuations, with numbers there almost tripling. Declines (excluding sites where numbers are known to vary frequently due to intermittent foraging by non-residents) ranged from 13% (Man and Horse) to 87% (Longwood Farm Pastures). The sites principally affected by the airport development, Prosperous Bay Plain and Deadwood Plain, showed declines of 21% and 62% respectively. When compared with the mean adult counts for all sites in 1989 the current figures represent an overall decline of 43%. The greatest loss in absolute terms was 57 birds from Deadwood Plain, with the next highest being 17 from Upper Prosperous Bay.

Table 3.1: Results, by age class, of the census of 31 Wirebird sites carried out between November 2005 and January 2006. Total numbers within age classes are presented below as percentages of the overall total, with comparative figures for December 2000 and October/November 1999 censuses. Underlined sites indicate confirmed or likely breeding.

Site	Adults	Juveniles	Chicks	Total
Cow Path/High Knoll	0	0	0	0
Donkey Plain	7	0	0	7
Cleugh's Plain	0	0	0	0
Rosemary Plain	0	0	0	0
Francis Plain	4	0	0	4
Barren Hill	2	0	0	2
The Dungeon	0	0	0	0
Prospect Pastures	1	0	0	1
Sane Valley	0	0	0	0
Deadwood Plain	35	0	2	37
Banks' Ridge	2	0	2	4
Longwood Farm	2	0	0	2
Longwood Golf Course	1	2	0	3
Bottom Woods	5	1	0	6
Longwood Erosion Zone	1	6	0	7
Weather Station Ridge	2	1	0	3
Horse Point Plain	11	1	1	13
Prosperous Bay North	2	0	0	2
Fisher's Valley Pastures	2	1	0	3
Prosperous Bay Plain	15	0	0	15
Upper Prosperous Bay	22	1	0	23
Woody Ridge	24	1	0	25
Stone Top Ridge	2	0	0	2
Central Pastures	0	0	0	0
Pouncey's	6	0	0	6
Oaklands Pastures	0	0	0	0
Broad Bottom	21	1	1	23
Horse Pasture	1	0	0	1
Blue Hill/Head o' Wain	4	0	2	6
Southern Pastures	10	1	0	11
Man and Horse	26	1	2	29
	208	**17**	**10**	**235**

Irregular sightings of Wirebirds were also reported from Plantation House, Sapper Way, Ebony Plain Sandy Bay Valley, Lower House Plain and Castle Rock Plain.

Table 3.2: Results of the census of 31 Wirebird sites carried out between November 2005 and January 2006 (adult figures only) compared with the corresponding means of two censuses from 2000/01 and three censuses from 1989. Percentage changes from the 2000/01 season to 2005 are also given.

	Mean	Mean		% Change
Site	**1989**	**2000/01**	**2005/06**	**2000/01 - 2005/06**
Cow Path/High Knoll	1	3	0	-100
Donkey Plain	4	8	7	-12.5
Cleugh's Plain	0	0	0	0
Rosemary Plain	2	0	0	0
Francis Plain	3	2	4	+100
Barren Hill	6	2	2	0
The Dungeon	0	0	0	0
Prospect Pastures	2	1	1	0
Sane Valley	14	8	0	-100
Deadwood Plain	124	92	35	-61
Banks' Ridge	7	1	2	+100
Longwood Farm	16	15	2	-87
Longwood Golf Course	6	15	1	-93
Bottom Woods	44	12	5	-58
Longwood Erosion Zone	6	1	1	0
Weather Station Ridge	4	4	2	-50
Horse Point Plain	17	26	11	-58
Prosperous Bay North	14	9	2	-78
Fisher's Valley Pastures	2	2	2	0
Prosperous Bay Plain	19	19	15	-21
Upper Prosperous Bay	20	39	22	-44
Woody Ridge	5	9	24	+167
Stone Top Ridge	4	4	2	-50
Central Pastures	0	0	0	0
Pouncey's	2	6	6	0
Oaklands Pastures	5	1	0	-100
Broad Bottom	35	27	21	-22
Horse Pasture	7	2	1	-50
Blue Hill/Head o' Wain	4	10	4	-60
Southern Pastures	16	22	10	-55
Man and Horse	36	30	26	-13
	425	**362**	**208**	**-43**

The 31 sites surveyed fall into four habitat classes: dry grassland (Rosemary Plain, Francis Plain, Sane Valley, Deadwood Plain, Longwood Farm Pastures, Longwood Golf Course, Bottom Woods, Fisher's Valley Pastures, Woody Ridge, Broad Bottom, Southern Pastures, Man and Horse) wet grassland (Barren Hill, The Dungeon, Prospect Pastures, Central Pastures, Pouncey's, Oaklands Pastures, Blue Hill/Head o' Wain), semi-desert (Bank's Ridge, Longwood Erosion Zone, Weather Station Ridge, Horse Point Plain, Prosperous Bay North, Prosperous Bay Plain, Upper Prosperous Bay, Stone Top Ridge) and "other" (High Knoll/Cowpath, Donkey Plain, Cleugh's Plain, Horse Pasture). The sites classified or other comprise mixed habitat types and/or are affected by unusually high levels of human activity and development.

Losses of adult Wirebirds from 2000/01 to 2005 were compared among these habitats and were found not to differ significantly (Table 3.3).

Table 3.3: Habitat-specific declines in the numbers of adult Wirebirds at 31 sites from 2000/01 (mean of two censuses) to 2005/06. Sample sizes in parentheses.

Habitat	Adult Mean 2000/01	Adults 2005	No. Lost	% Decline
Dry Grassland (12)	231	130	101	44
Wet Grassland (7)	20	13	7	35
Semi-desert (8)	101	57	44	44
Other (4)	13	8	5	39

3.3 Conclusions:

The recent dramatic decline in Wirebird numbers has coincided with a general reduction in the numbers of grazing livestock on St Helena as a result of both economic factors and agricultural policy aimed at reducing over-grazing on seasonally marginal pastures. Unfortunately, the pasture conditions prevailing under heavy grazing are those that are most suitable for the Wirebird, i.e. a very short, low-density sward which facilitates foraging, with many bare patches to provide nest sites. It is also possible that dung from livestock is an important element in the ecology of some of the invertebrates that form the Wirebird's diet. Removal or reduction of livestock rapidly results in the growth of grasses and herbaceous species above optimal levels and encroachment by invasive woody species and, in drier areas, creeper *Carpobrotus edulis* and Prickly Pear *Opuntia* sp. A subjective assessment of vegetation changes at all sites is given in Section 4. Detailed comparisons of current plant communities and vegetation structure with those in 1998 are presented for Prosperous Bay Plain and Deadwood Plain in Section 5.

Reduction in grazing pressure within grassland habitats has previously been implicated in the decline of the Wirebird population between 1989 and 1998, with much of this decline being associated with agricultural changes at Deadwood Plain, Bottom Woods and Broad Bottom (McCulloch & Norris 2001). Further evidence for the influence of grazing comes from the results of the present census. The grassland sites that have maintained grazing at roughly similar levels to those pertaining in 1998-2001, or have undergone only a small reduction (Broad Bottom and Man & Horse) show the smallest declines in Wirebird numbers, while at Woody Ridge a substantial increase in grazing pressure has coincided with a relatively large influx of Wirebirds.

The current situation, however, differs markedly from that encountered in 1998 in that Wirebird populations at semi-desert sites have also declined. This suggests that factors other than grassland degradation may be affecting the species. The most obvious candidate would appear to be predation. Changes in predator numbers or behaviour are difficult to quantify and no baseline predation rates have ever been estimated for the Wirebird. Cats are the only likely predators of full-grown Wirebirds and it is probable that the take a significant number of chicks in some areas. Many islanders believe that the number of feral cats on the island is increasing and signs of their presence were evident at a number of sites, especially in semi-desert areas. No Wirebird carcasses or other indications of predation by cats have been found during

the course of this study, however. Common Mynahs also appear to be increasing. This species has been observed to attack Wirebird chicks and may also be a significant predator of eggs, though direct evidence is lacking. There is an urgent need for research into predation on the Wirebird.

It is possible, however, that reduction in Wirebird numbers on pastureland through the deterioration of habitat might also affect the semi-desert populations if the latter were previously supplemented by an influx of young birds produced on the grasslands where productivity has, in the past, appeared to be higher. Young birds ringed on Deadwood Plain have been later sighted on Prosperous Bay Plain and adjacent sites but whether such movements are of importance to the dynamics of the semi-desert populations is cannot be adequately assessed at the current state of knowledge.

Figure 3.1: Wirebird population estimates 1989 – 2005/06. Figures include all age-classes, as these were not differentiated during the 1991-1993 censuses.

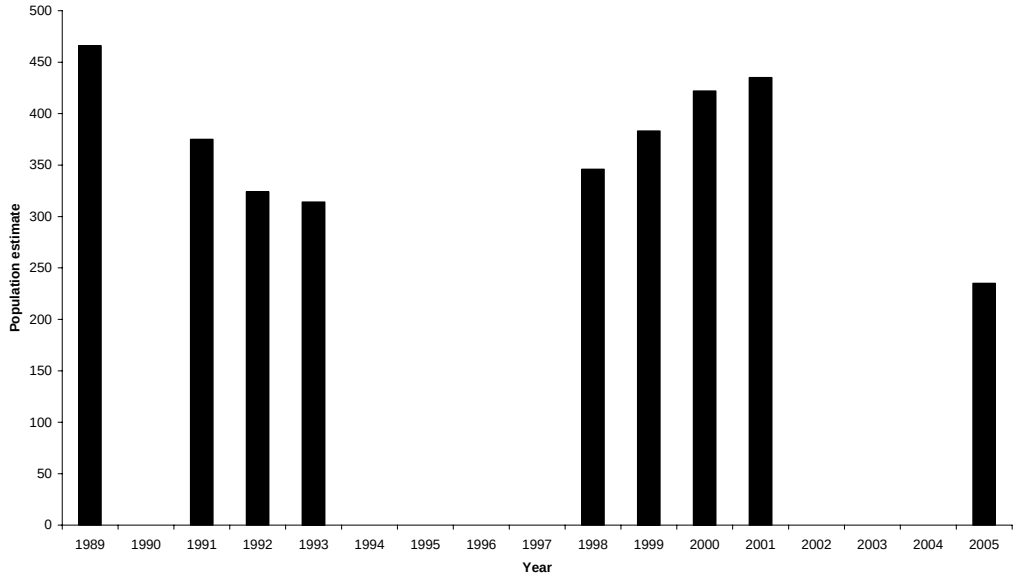
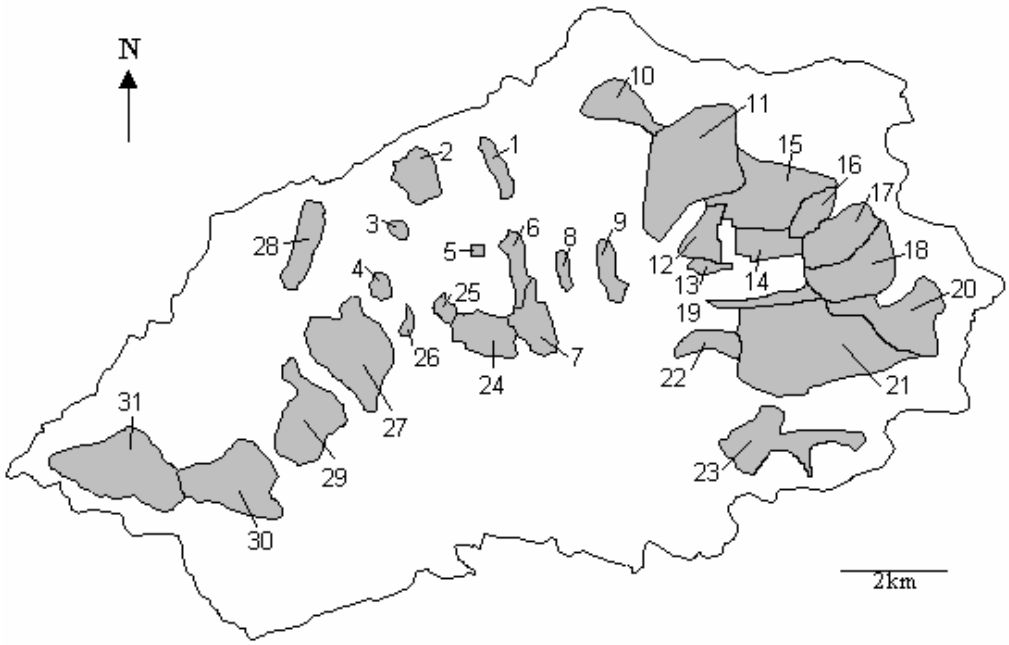


Figure 3.2 Map of St Helena showing Wirebird census areas (numbered). Sites were classified as dry pasture (DP), wet pasture (WP), semi-desert (SD) or other (O) (see Estimation of Wirebird numbers for details). Areas lacking a specific local name have been given names of convenience and are indicated by an asterisk. **Key:** 1. Cow Path/High Knoll (O); 2. Donkey Plain (O); 3. Cleugh's Plain (O); 4. Rosemary Plain (DP); 5. Francis Plain (DP); 6. Barren Hill (WP); 7. The Dungeon (WP); 8. Prospect Pastures (WP); 9. Sane Valley (DP); 10. Banks' Ridge (SD); 11. Deadwood Plain (DP); 12. Longwood Farm (DP); 13. Longwood Golf Course (DP); 14. Bottom Woods (DP); 15. *Longwood Erosion Zone (SD); 16. *Weather Station Ridge (SD); 17. Horse Point Plain (SD); 18. *Prosperous Bay North (SD); 19. Fisher's Valley Pastures (DP); 20. Prosperous Bay Plain (SD); 21. *Upper Prosperous Bay (SD); 22. Woody Ridge (DP); 23. Stone Top Ridge (SD); 24. *Central Pastures (WP); 25. Pouncey's (WP); 26. Oaklands Pastures (WP); 27. Broad Bottom (DP); 28. Horse Pasture (O); 29. Blue Hill/Head o' Wain (WP); 30. *Southern Pastures (DP); 31. Man and Horse (DP).



4. Status of Wirebird Habitat

Habitat change since 2000/01

Substantial land use changes occurred on St Helena between the Wirebird surveys of 1988-89 and 1998-2001. These processes have continued during the five years preceding the present study. As a consequence of the limited time available, it was not possible to carry out a quantitative analysis of many aspects of habitat change since 2001 at most Wirebird sites. This is particularly true of changes relating to development and disturbance. In the absence of hard data for these aspects, a subjective sit-by-site review of habitat change is given below. The relative impact of the various categories of change is summarized in Table 4.1. Changes at Prosperous Bay Plain and Deadwood Plain are addressed in detail in Section 5.

Habitat change by site
See Section 3 for definitions of habitat types.

High Knoll/Cowpath
Area (approx.): 20ha **Habitat Type:** "Other"
Site Description: This site is an area of sparse, rough grassland and scrub running from High Knoll Fort to Ladder Hill around the periphery of the Cowpath area of Half-Tree Hollow. Small numbers of Wirebirds occasionally feed around Cowpath, particularly in the extensive area of open *Opuntia* scrub below the New Apostolic Church. These birds appear mainly to be recently fledged juveniles and floating adults. In recent years a pair has held a territory within High Knoll Fort and chicks have occasionally been produced. This is the only evidence of recent breeding by Wirebirds in the area. The habitat within the fort remains suitable but no Wirebirds were observed there during the census.

Habitat Change: By 2001 housing development had removed much of the habitat previously available to Wirebirds in Cowpath. There has been additional loss of habitat to building projects in the last five years and this effect has been compounded by the maturation and expansion of scrub on the lower slopes of High Knoll. The increase in human habitation in the area has been accompanied by an increase in the number of domestic pets, particularly cats.

Donkey Plain
Area (approx.): 85ha **Habitat Type:** "Other"
Site Description: The habitat at Donkey Plain is comprised mainly of open scrub with extensive areas of exposed rock. The site is bounded by sea-cliffs at its lower extremity and by housing above. This is a heavily disturbed site containing a quarry and stone-crushing plant. Wirebirds were most frequently encountered on the lower parts of the plain, below the quarry, and have been seen to fly across Breakneck Valley to feed around the former rifle ranges at Ladder Hill.

Habitat Change: Since 1989 the former rubbish dump on the site has closed but, by 2001, there had been substantial expansion of the quarry and this has continued in the intervening years. A small explosives store has been constructed below the quarry since

2001. Increased use of the stone crusher to provide building materials in recent times has produced an extensive area of dust fall-out down-wind. This almost certainly acts as a deterrent to nesting by Wirebirds in the affected parts of the south-west quarter of the plain, though birds still forage there. Construction of a new headquarters complex for the Public Works and Services Department has removed a substantial area of relatively open grassland habitat on the upper margin of the plain and this has been compounded by recent housing developments. There is no evidence that this part of the site has been extensively used by Wirebirds in recent times, however. There appears to have been an increase in the use of Donkey Plain by off-road motorcyclists since 1989 and this may pose a minor danger to Wirebird nests. Despite these changes there has been no significant decline in the Wirebird population at Donkey Plain.

Cleugh's Plain
Area (approx.): 10ha **Habitat Type:** "Other"
Site Description: Already marginal Wirebird habitat in 1989, this area has since been almost completely developed for housing and gardens. Although a few undeveloped plots currently remain, these tend to be heavily overgrown for the most part and the area is no longer a viable breeding site for the species. It is known, however, that Wirebirds continue to visit some of the larger gardens irregularly.

Habitat Change: Most of the undeveloped, relatively flat land still present in 2001 has been, or is in the process of being, built on.

Rosemary Plain
Area (approx.): 15ha **Habitat Type:** Dry grassland
Site Description: This relatively small site contains both pasture and arable land, with an area of grassland used as a picnic site. Since 1989 the pastures at Mackintosh's, above the plain itself, have been improved and extended. These were added to the Rosemary Plain census area during the 1998-2001 survey. Despite the increase in pasture area, grazing pressure at Mackintosh's has been generally light and the sward is consequently taller than is ideal for Wirebirds. No Wirebirds were seen at Rosemary Plain during the census, but local reports indicate the species still occasionally forages on the Plain and in surrounding gardens.

Habitat Change: Grazing levels on the plain itself were significantly reduced from those observed in 1989. There was no evidence during this study of recent grazing of the Plain's central field, in which tussock-forming Cow Grass *Paspalum scrobiculatum* and the invasive rush "Bull Grass" *Juncus capillaceus* had increased substantially. The sward was of sub-optimal height throughout. The peripheral vegetable plots were mostly lying fallow and overgrown, thus reducing the available foraging area for Wirebirds. Several feral cats were observed around the neighbouring Farm Buildings complex and there were also signs of the presence of rats. It is difficult to compare human usage of the picnic site between studies, but the impression gained from the improved facilities was that disturbance has probably increased.

Francis Plain
Area (approx.): 3ha **Habitat Type:** Dry grassland
Site Description: Francis Plain is a school and public recreation ground in almost daily use. Prince Andrew School opened during the 1988-89 study. Intensive use of the plain throughout the week was, therefore, a new development at that time. The level of disturbance on the plain has increased steadily during the intervening years. Although use of the site by Wirebirds has continued it is unlikely that any of these birds are now truly resident. The sites greatest significance appears to be as an evening foraging site for non-territorial birds from throughout the St Paul's district. Up to 12 individuals were recorded at the site during the period of this study, though only four were present during the census. Additional opportunistic feeding also occurs in quiet periods during the day. Nesting attempts occasionally occur, one was in progress during the latter part of this study, but it is likely that few, if any, result in fledged chicks.

Habitat Change: The site has remained essentially unchanged since 2001.

Barren Hill
Area (approx.): 35ha **Habitat Type:** Wet grassland
Site Description: The census area includes Barren Hill and Lemon Tree Gut. Wirebird activity is now almost entirely confined to the regularly grazed pastures above Woodcot house. Individual Wirebirds were also irregularly encountered in Lemon Tree Gut. Breeding occurred on the lower, Peak Hill, pastures in 1988 but cessation of grazing there had resulted in severe habitat degradation by December 1989 and this area had been entirely lost to forestry by 1998. Wirebird numbers at Barren Hill have declined substantially since 1989 and only one pair held a territory at the site during this study.

Habitat Change: The suitability of the upper pastures for Wirebirds has been significantly reduced by the general spread of Bull Grass and reduction of grazing frequency on the fields to the east of the Woodcot track and below Dungeon Cemetery. A house has been built in the field most frequently used by Wirebirds but this is in an area largely avoided by the birds in the past and therefore resulting habitat loss has been minimal.

The Dungeon
Area (approx.): 55ha **Habitat Type:** Wet grassland
Site Description: This is a steeply sloping area of upland pastures with relatively high rainfall in the centre of the island between Halley's Mount and the Dungeon Cemetery. There now appears to be no resident Wirebird population in this area, the species having been absent during every census since November 1988, when their presence may have been atypical.

Habitat Change: There has been little habitat change within the site since 1989. Numbers of cattle have perhaps declined slightly. Some higher areas above Hallam's have been given over to forestry, but it is unlikely that these ever provided significant suitable habitat for Wirebirds. There has probably been a small net gain in gorse cover since 2001 but this invasive species is generally effectively controlled at this site

Prospect Pastures
Area (approx.): 7ha **Habitat Type:** Wet grassland
Site Description: The census area consists of a small area of upland pasture surrounded by woodland on the east side of Rural Retreat Gut. Always a minor Wirebird site, the population observed during 1998-2001 never exceeded a single pair and only a single individual was recorded during the present study.

Habitat Change: Habitat quality has declined since 2001, with a reduction in grazing pressure resulting in sub-optimal sward height, especially in the southern half of the site. Bull grass has also increased.

Sane Valley
Area (approx.): 40ha **Habitat Type:** Dry grassland
Site Description: Sane Valley is an area of very steep pasture and partially cleared flax land. Wirebirds have previously been observed throughout the area, with the majority being found on a relatively flat shelf at around 400m on the west side of the valley. No birds were detected at this site during the present study, however.

Habitat Change: The site has suffered severely from reduced grazing since 2001. The sward height was over-long throughout. Bull Grass has increased, particularly on the "shelf" area, as have tall grass species such as Cow Grass and Thatching Grass. Scrub encroachment, especially by Gorse *Ulex europaeus*, *Lantana camara* and "Cedar" *Juniperus bermudiana*, is also widespread. Housing developments at neighbouring Alarm Forest and Bunker's Hill may have resulted in an increased predation risk from domestic pets, especially cats.

Banks' Ridge
Area (approx.): 75ha **Habitat Type:** Semi-desert
Site Description: Banks' Ridge is an arid, eroded area of low scrub and *Carpobrotus* mat on the northern fringe of Deadwood plain. Wirebirds tend to be found below the 440m contour. Thick *Opuntia* scrub forms the lower boundary of available habitat.

Habitat Change: Since 1989 Eucalypts and other scrub species planted as an erosion control measure have increased in area and density and the uppermost parts of the ridge may now be classified as woodland. This may at least partially account for the decline of Wirebirds at this site between 1989 and 1998. The habitat has, however, always been marginal and the reduction in numbers here may simply reflect the smaller size of the population as a whole. Since 1998 Wirebird numbers have remained stable.

Deadwood Plain
Area (approx.): 200ha **Habitat Type:** Dry grassland
Site Description: This has traditionally been the Wirebird's most important breeding area, and has held around 25% of the adult population. The census area includes the main plain, the Little Deadwood, Pillow Field and Mile and a Half pastures and the peripheral grazings of Flagstaff Hill, Netley Gut and Sheep Pound Gut to its junction with Mulberry Gut. The lower paddocks bordered by Deadwood village are subject to

heavy disturbance but are still used by Wirebirds. The site contains a small windfarm of three turbines.

Habitat Change: By 2001 Deadwood Plain was showing signs of habitat degradation resulting from reduced grazing. These effects have increased dramatically in the last five years and are assessed in detail in Section 5.2. The trend of increasing vehicle use within the census area, noted in 1998-2001, has continued but as this is, at present, mostly confined to the central track the risk posed to Wirebird nests and chicks is probably small.

Longwood Farm
Area (approx.): 52ha **Habitat Type:** Dry grassland
Site Description: The Longwood Farm census area includes all grassland and adjacent tilled land between Longwood and Middle Point in the area bounded by Mulberry Gut and Bilberry Field Gut. Current and former pasture accounts for approximately 35ha.

Habitat Change: Current grazing of the Middle Point pastures is infrequent and occurs at very low density. Sward height has consequently shown a large increase since 2001 and potential Wirebird foraging habitat is now confined to a few remaining bare patches (see Section 5.3.1). Since the lowest pasture at Middle Point was used as a dumping site for spoil from reservoir excavation in 1988 it has remained ungrazed. The soil heaps, formerly favoured as nesting sites by Wirebirds have become overgrown. Trees have been planted on approximately a quarter of this area and vegetation has become tall and rank over the remainder, resulting in its abandonment by Wirebirds. Scrub invasion is also becoming very serious in the easternmost of the remaining Middle Point paddocks. During the present study much of the arable land at Longwood Farm was fallow and overgrown, restricting its utility for foraging.

Longwood Golf Course
Area (approx.): 15ha **Habitat Type:** Dry grassland
Site Description: Longwood Golf Course is a small, level area of managed grassland extending from Longwood House to the lower end of Ropery Field. The site is crossed by a main road and is extensively used by golfers at weekends and public holidays. At other times it is relatively quiet. Management levels are low compared to European golf courses. Wirebird numbers on the course are very variable (0-15 recorded during this study), mainly because this site is a favoured feeding area for non-resident immature birds. No evidence or reports of recent nesting were obtained. This may still occur sporadically on the course itself, but success is likely to be low, especially in view of the large number of domestic cats associated with Longwood village.

Habitat Change: The golf course is currently more heavily used than in 1988-89. The intensity of management increased between 1989 and 1998 but appears to have declined since 2001. Sward height and herb cover have increased outside from the fairways and greens and the grazing of domestic animals (mainly goats) on the course is again frequent. Sward height remains favourable for Wirebirds throughout the site, however. The peripheral scrub has increased in density, probably resulting in the loss of Wirebird nesting sites available in 1988/89.

Bottom Woods
Area (approx.): 45ha **Habitat Type:** Dry grassland
Site Description: Bottom Woods, a transitional site between semi-desert and grassland, was formerly an area of very dry pasture with relatively sparse vegetation containing a high proportion of broad-leaved weeds. This has been the Wirebird site worst affected by habitat degradation since 1989. Livestock reduction and lack of maintenance has resulted in large scale encroachment by scrub and tall herbs.

Habitat Change: Although scrub clearance has been attempted in the lower half of the site, a lack of resources has meant that regular maintenance could not be carried out. The overall state of the site is therefore largely unchanged since 2001 and the Wirebird decline here has continued (see Section 5.3.1).

Longwood Erosion Zone
Area (approx.): 125ha **Habitat Type:** Semi-desert
Site Description: This site comprises an extensive area of heavily eroded slopes and ridges lying between the pasturelands of Longwood Farm and Bottom Woods and Turk's Cap Valley. Nesting occurred at very low density, mainly above 350m, during 1988-89 but has not been recorded during any subsequent survey. Sporadic breeding is likely, however.

Habitat Change: Recent expansion of scrub and dense *Carpobrotus* mats on the slopes and the shrub *Suaeda helenae* in the lower valley has rendered many former nesting areas unsuitable. A road into the area was constructed to service a small quarry during the 1990s, increasing levels of disturbance. The quarry has now ceased operation and the road has fallen into disuse.

Weather Station Ridge
Area (approx.): 55ha **Habitat Type:** Semi-desert
Site Description: Weather Station Ridge is a relatively shallow slope running east from the meteorological station at Bottom Woods. Although sharing the same vegetation type and climate with the Longwood Erosion Zone the ridge has previously a greater density of Wirebirds, probably because it is, on average, less steep.

Habitat Change: This site has also been affected by the construction of the quarry access road mentioned above. A more recently constructed track now also runs to the seaward end of the ridge and beyond. This appears to have been constructed to facilitate collection of building stone. The track is in regular use and disturbance associated with stone gathering may be a contributory factor to the recent decline in Wirebird numbers at the site. This may, however, also be related to the spread of scrub and *Carpobrotus* on the upper half of the ridge since 2001. Much of this originates from earlier plantings for erosion control.

Horse Point Plain
Area (approx.): 80ha **Habitat Type:** Semi-desert
Site Description: A broad, flat ridge dominated by *Carpobrotus* mats and fringed by dense *Opuntia* scrub on its northern margin. The amount of exposed rock increases from west to east and varies inversely with Wirebird density. The western end of the plain contains a landfill site for refuse disposal and is therefore subject to regular disturbance.

Habitat Change: The landfill site has recently been extended but any benefits to the Wirebird population associated with flattening of the peripheral areas are likely to have been countered by increased disturbance and the establishment of substantial predator populations in the area, including feral cats, mynahs and rats. Landscaping work carried out as part of the Millennium Gumwood Forest project has increased the site's attractiveness to Wirebird. During the present study half the Wirebirds on the Plain were found within the Millennium Forest. In the longer term, it is uncertain whether Wirebirds will adapt to the forest environment after the canopy closes, though it has been suggested that this was the species' original habitat. It is, however, intended to establish grassy margins and embayments on the periphery of the forest as potential Wirebird habitat. The use of vehicles on that part of the plain beyond the dump has increased substantially since 1989. In 2005 a track was established on the outer plain for stock car racing. This undoubtedly caused substantial disturbance and habitat disruption. Only one race was held and it has been decided that this will not be repeated.

Prosperous Bay North
Area (approx.): 110ha **Habitat Type:** Semi-desert
Site Description: Similar in vegetation to Horse Point Plain, this site is lower in altitude and more heavily gullied. The vegetation is dominated by *Carpobrotus*, *Suaeda* and *Opuntia*. Wirebirds were previously evenly distributed throughout the area on broad ridges and shallow slopes but have declined significantly since 2001.

Habitat Change: There has probably been a small increase in the extent of *Carpobrotus* and *Opuntia* since 2001, though any expansion of the latter species is more through the growth of existing plants rather than invasion of new areas. The grass *Eragrostis cilianensis* has become widespread in recent years but sward height remains favourable for Wirebirds. A motocross circuit was established in 2001 in a part of the site little used by Wirebirds. Sage of the circuit appears to have been infrequent and is unlikely to have contributed significantly to the decline of the Wirebird in the area.

Fisher's Valley Pastures
Area (approx.): 14ha (120) **Habitat Type:** Dry grassland
Site Description: Fisher's Valley is bordered to the north by an area (c100ha) of severely eroded hillsides with extensive gully systems amongst which a few Wirebirds occasionally feed, though no evidence of nesting has been found. The census area is, however, confined to the valley bottom which has a narrow strip of pasture on which Wirebirds have held territories in the past, the paddocks in the central (widest) part of the valley being most frequently occupied.

Habitat Change: Scrub encroachment has increased since 2001 in the lower pastures adjacent to Cook's Bridge. During 1988-89 small pools at Cook's Bridge provided a bathing and drinking site, which was heavily used, predominantly by non-resident juvenile Wirebirds. By 1998 these had dried up completely, apparently as a result of increased water abstraction higher up the valley. There are plans for their re-establishment. Water abstraction has also resulted in conditions within the pastures themselves, particularly those lower in the valley, becoming drier. It is not known if this has affected the Wirebird population in any way.

Prosperous Bay Plain
Area (approx.): 150ha **Habitat Type:** Semi-desert
Site Description: Prosperous Bay Plain is an area of low-lying, predominantly flat semi-desert with sparse xerophytic/halophytic vegetation (see Section 5.1) lying between Fisher's Valley and Dry Gut. Most Wirebirds are found in the southern half of the site and are mainly associated with the *Suaeda*/*Atriplex* vegetation community.

Habitat Change: The vegetation at this site has remained little changed at this site since 2001 with the exception of a substantial increase in the grass *Eragrostis* (see Section 5.1). Recent restrictions on vehicle access to the site have probably reduced the level of disturbance. Prosperous Bay Plain has been selected as the site for an airport on St Helena. The runway and terminal layout will impinge both on this and the following site.

Upper Prosperous Bay
Area (approx.): 360ha **Habitat Type:** Semi-desert
Site Description: This large, *Carpobrotus*-dominated arid area lies to the south-west of Prosperous Bay Plain, between Fisher's Valley and Shark's Valley. The lower limit of the census area is approximated by the 320m contour and the upper limit by scrub at around 450m. The majority of Wirebirds occur on the ridge forming the southern side of Fisher's Valley and in the upper parts of Dry Gut.

Habitat Change: The site shows little change in habitat since 2001 other than a slight increase in extent and density of exotic scrub at the upper margin, *Suaeda* in the lower reaches of Dry Gut and *Opuntia* on the lowest part of the northern ridge leading from Woody Ridge. Some new plantings for erosion control have taken place on the ridge bordering Shark's Valley. Grazing by feral donkeys has been almost eradicated. The terminal buildings and part of the runway of the proposed St Helena airport would be located the narrow ridge that forms the boundary between this census area and Prosperous Bay Plain.

Woody Ridge
Area (approx.): 25ha **Habitat Type:** Dry grassland
Site Description: This site comprises a narrow strip of pasture extending for approximately 1.5km below Woody Ridge Mill. Wirebirds are found mainly around the eastern, dryer, end of the ridge.

Habitat Change: Grazing pressure by cattle has been substantially increased since 2001, resulting in a reduction in sward height and a general improvement in conditions for Wirebirds (see Section 5.3.2). This has been reflected in a three-fold increase in Wirebird numbers.

Stone Top Ridge
Area (approx.): 145ha **Habitat Type:** Semi-desert
Site Description: The Stone Top Ridge census area extends from approximately the 400m contour, below the Bellstone track, to Great Stone Top and is bounded by Shark's Valley and Deep Valley. The habitat is very similar to that of the previous site. The few Wirebirds at this site tend to be concentrated on the shallower slopes around Boxwood Hill, none having ever been observed on either of the Stone Tops during census work.

Habitat Change: Scrub has increased in extent and density around the Bellstone track since 2001 and now occurs around the western margin of the most frequented Wirebird area. No significant encroachment into Wirebird habitat has taken place as yet, however, and numbers, though small, remain stable.

Central Pastures
Area (approx.): 80ha **Habitat Type:** Wet grassland
Site Description: The Central Pastures census area is an extensive tract of upland pasture sometimes referred to in part as Oakbank Upper Lands. It includes Bull Post, Smith's Spring, Alexander's, Crawford's, Beck Doveton's, Blisses and Swampy Gut pastures. Rising to 680m at Sandy Bay Ridge this area is characterised by extremely steep slopes and lush grass throughout and appears to provide suitable Wirebird habitat only on narrow ridge crests. Only two single Wirebirds birds were observed at the site during the 1988-89 study and no evidence of breeding was found. Wirebirds were entirely absent during this and the 1998-2001 censuses but are still occasionally reported from the area.

Habitat Change: Bull Grass and Cow Grass have increased noticeably on the upper pastures since 2001. Conditions elsewhere within the site remain essentially unchanged.

Pouncey's
Area (approx.): 15ha **Habitat Type:** Wet grassland
Site Description: This is small area of upland pasture adjoining Pounceys settlement. At 600m-680m it is amongst the highest regular Wirebird breeding sites. Wirebirds occur most frequently on the southernmost of the three parallel paddocks adjacent to the settlement and on the plateau immediately above these paddocks. The highest pastures, at Mount Nelson, are rarely used. Wirebirds also occasionally forage on the neighbouring school playing field.

Habitat Change: Grazing pressure at Pouncey's appeared to be similar to that encountered in 2001. The habitat has remained generally little changed in the areas favoured by Wirebirds, though a small increase in Bull Grass was evident. Cow Grass has also increased, particularly in the central of the three lower paddocks.

Oaklands Pastures
Area (approx.): 15ha **Habitat Type:** Wet grassland
Site Description: Oaklands Pastures consist of a horseshoe-shaped area of grassland, mostly reclaimed flax land, lying between Oaklands house and the Clifford Arboretum.

Habitat Change: Grazing has declined substantially at this site since 1989 and the area was not being actively grazed at the time of the current census. This has resulted in an increase in sward height, particularly on the south-west side of String Gut, and extensive invasion by Gorse above Oaklands in the area previously favoured by Wirebirds. Some clearance of Gorse has occurred since 2001 and an area of 2-3ha now appears suitable for Wirebirds, though none were observed there. There was evidence of increased vehicular activity at the site since 2001. This site regularly held 2-3 pairs of Wirebirds during 1988-89 but there appeared to be no resident population during this or the previous study. It is likely, however, that the better areas of the site are occasionally used for foraging by Wirebirds from neighbouring Pouncey's.

Broad Bottom
Area (approx.): 190ha **Habitat Type:** Dry grassland
Site Description: Broad Bottom is a major Wirebird site. In addition to Broad Bottom itself, the census area covers the High Peak, Thompson's Hill, Goldmine Gate and Woodlands areas including the French's Gut, Wirebird, Little Broad Bottom, Lemon Valley Head, Cason's, Sebastopol and Myrtle Grove pastures. The area mainly consists of a series of steep ridges and valleys sloping down to relatively flat areas around Broad Bottom Mill and at Woodlands. The site's broad altitudinal range (440m-760m) is reflected in both climate and vegetation and is thus a transitional area between upland (wet) grassland and the drier pastures of middle altitudes. Most of the area is typical of the former but the majority of Wirebirds are found on the flatter, drier parts of the site.

Habitat Change: Although the site is predominantly pastureland, substantial areas of cultivation existed north of Broad Bottom Mill and at Woodlands during 1988-89. These were taken out of production and reverted to grassland during the 1990s. The former area was restored in 1999 but has again reverted to pasture since 2001 and now supports a substantial proportion of the site's Wirebird population. Other changes since 2001 include continued expansion of Gorse on the north-eastern slopes and low density planting of conifers within the upper part of the Thomson's Hill pasture. Low-density grazing by sheep resumed at Thompson's Hill in 2001. Sheep numbers have been increased since then but are still insufficient to reduce sward height to that suitable for Wirebirds except in small, favoured areas. Cattle numbers appear to have remained stable throughout the site. Sward height and density at Woodlands has increased over the last five years but, at present, it is still within the tolerance limits of Wirebirds. Proposals to establish a golf course and hotel/chalet accommodation at Broad Bottom have been submitted by a potential developer.

Horse Pasture
Area (approx.): 60ha **Habitat Type:** "Other"
Site Description: Wirebirds in the Horse Pasture area have previously utilized a strip of open *Lantana*/*Opuntia* scrub and grassland 300m-400m wide along the southern rim of Lemon Valley. Grassland is confined to the public picnic site at the south-eastern end and comprises only some 10% of the total area. As at Longwood Golf Course this site has, in recent times, mostly been an intermittent foraging area for Wirebirds, with numbers present being highly variable. During the present study only a single Wirebird was found at the picnic area and none at all in the scrub zone.

Habitat Change: By 1998 scrub density on the valley edge had increased substantially. This process has continued since 2001, causing this section of the site to be abandoned by Wirebirds as a regular foraging area. Further habitat loss in the peripheral zone has been caused by the extension dump site for garden refuse and by small-scale quarrying. It is uncertain whether the quarry site is still active. Public use of the picnic site has increased substantially, particularly at weekends, causing severe disturbance. Increased vehicle use has caused soil compaction throughout the grassed area and it appears likely that this has had a detrimental effect on prey availability for Wirebirds. No evidence or reports of recent nesting at Horse Pasture were obtained during this study.

Blue Hill - Head o' Wain
Area (approx.): 125ha **Habitat Type:** Wet grassland
Site Description: This is a large area of grazing land, often referred to as the Western Pastures. The site is steeply sloping throughout and rises to 720m. Despite the apparent suitability of the vegetation, the unfavourable topography results in a very low Wirebird density. A narrow band of woodland and scrub divides the site into two sections. The upper section extends from Head o' Wain to West Lodge. Wirebirds in this section have rarely been encountered outside the relatively flat area between West Lodge and St Helena and the Cross church. The lower section includes the pastures lying between West Lodge and the Blue Hill Community Centre. Wirebirds are sparsely distributed throughout this area but are most frequently found on the lower slopes below Windy Point.

Habitat Change: Little habitat change has occurred in this area other than a substantial increase in Bull Grass around West Lodge, particularly at the former cricket pitch, and the loss of marginal habitat at in the pastures below Half Moon to scrub encroachment and reduced grazing. Some minor encroachment by Gorse was observed on the north and east slopes of the lower section. Cattle numbers appeared similar to those encountered in 2001.

Southern Pastures
Area (approx.): 160ha **Habitat Type:** Dry grassland
Site Description: The Southern Pastures are comprised of an extensive area of grazing land between Thompson's Wood and White Point including Botley's Lay, Wild Cattle Pound (Fitzstevens' Estate) and the Churchyard. Botley's Lay and Wild Cattle Pound are sheep commonages, while Thompson's Wood is grazed by cattle. The majority of Wirebirds in this area occur on the shallowest slopes of the sheep pasture around Wild

Cattle Pound and Botley's Point while the steep slopes on above Manati Bay are very infrequently used.

Habitat Change: Since 1989 sheep numbers at this site have been substantially reduced and the area sub-divided to facilitate rotational grazing. This has resulted in a general increase in sward density and height and associated loss of many areas of bare earth previously favoured for nesting. A portion of area known as the Churchyard, which was ungrazed in 1998-2001 has been re-fenced and returned to sheep pasture but stocking density appears to be too low to reduce the sward to a height suitable for Wirebirds. There has been severe encroachment by "Cedar" in the Botley's and Wild Cattle Pound areas. The sward height in these areas also shows the greatest increase and Wild Cattle Pound has been subject to a large increase in Bull Grass. Gorse is beginning to spread onto the slopes around Botley's Lay. At Thompson's Wood the sward is of satisfactory height but, especially on the camping site pasture, contains a high proportion of Mat Grass *Stenotaphrum secundatum* which appears to be unattractive to Wirebirds. The Wirebird population at this site has halved since 2001.

Man and Horse
Area (approx.): 145ha **Habitat Type:** Dry grassland
Site Description: This important Wirebird site is a dry sheep pasture in the extreme south-west extending from the west side of White Point to around the 360m contour above South-West Point, below which there is thick *Opuntia* scrub, and bounded on the north by Thompson's Valley. Wirebirds are found throughout the census area, the highest density occurring around Joan Hill and West Point.

Habitat Change: As at the adjacent Southern Pastures, modification of the sheep-grazing regime at this site since 1989 with a view to reducing erosion has led increased sward density, particularly in the central valley, Water Gut and the intervening ridge. The spread of *Lantana* and Bull Grass noted in 2001, particularly in the Joan Hill area, has continued and gives increasing cause for concern. Wirebird numbers are declining in the under-grazed areas, leaving the population increasingly concentrated in a relatively small area on the lower slopes of Joan Hill.

Table 4.1 Summary of major components of habitat change at Wirebird sites between 2001 and 2006.
Key: *** = severe impact; ** = significant impact; * = minor impact

Site	Scrub Invasion	Bull Grass	Reduced Grazing	*Forestry*	Development	Increased Vehicles
Cow Path/High Knoll	**				***	*
Donkey Plain					**	*
Cleugh's Plain	**				***	
Rosemary Plain		**	***			*
Francis Plain						*
Barren Hill		***	**	*		
The Dungeon		**	*	*		
Prospect Pastures		**	**			
Sane Valley	**	***	***			
Banks' Ridge	**					
Deadwood Plain	**	***	***		*	**
Longwood Farm	***	***	***	*		
Longwood Golf Course		*				*
Bottom Woods	***		***		**	**
Longwood Erosion Zone	*					
Weather Station Ridge	**				**	**
Horse Point Plain	*			*	**	**
Prosperous Bay North	*					**
Fisher's Valley	**	*				
Prosperous Bay Plain						*
Upper Prosperous Bay	*					*
Woody Ridge	*	*				
Stone Top Ridge	*					*
Central Pastures		**				
Pouncey's		**	*			
Oaklands Pastures	***		***			
Broad Bottom	**	*	*	*		
Horse Pasture	***					**
Blue Hill/Head o' Wain	*	**	*			
Southern Pastures	***	***	***			*
Man & Horse	**	**	**			*

5. Wirebird status and distribution at principal sites impacted by airport development

5.1 Prosperous Bay Plain

5.1.1 Proposed development components:

Runway and embanked apron, passenger terminal and ancillary buildings, access road, haul route (two options).

5.1.2 Site description:

Prosperous Bay Plain, as defined in previous studies of the Wirebird (McCulloch 1992, McCulloch & Norris 2002), comprises 150ha (including the stony plateaux below the ruined signal station) of low-lying, predominantly flat semi-desert with sparse xerophytic/halophytic vegetation at an altitude of approximately 280-320m, in the east of the island. The plain receives an annual rainfall of considerably less than 300mm. The habitat on the eastern half of the plain proper consists mainly of a mosaic of loose rock and *Carpobrotus* mat. The western half is sandier and the dominant vegetation is fairly open *Suaeda* scrub with patchy *Atriplex semibaccata*. During the wet season substantial areas may be covered by the low-growing succulents *Mesembryanthemum crystallinum* and *Hydrodea cryptantha*.

The proposed airport development would also encompass parts of the ridge that forms the western boundary of the plain and separates it from Dry Gut. The terminal, access road and the southern end of the runway would all be located on the ridge. This ridge, covering 30-40ha, has formerly been included in the Upper Prosperous Bay census area. It is predominantly rocky at its southern end where vegetation is sparse and consists mainly of isolated clumps of *Suaeda* and *Atriplex* with occasional, relatively small, patches of *Carpobrotus*. The substrates of the ridge become gradually sandier to the north and the vegetation is dominated by extensive *Carpobrotus* mats.

Despite the presence of several introduced plant species, it is thought that this site is probably closer than any other to the nature of the Wirebird's original habitat. The grassland areas elsewhere on the island currently occupied by Wirebirds did not, for the most part, exist prior to forest clearance by human colonists. Prosperous Bay Plain is designated as part of the Crown Wastes, therefore grazing of domestic stock is prohibited. The only regular human activity at the site in recent times has been collection of loose building stone and small-scale quarrying.

5.1.3. Habitat change since 1998:

Both of the previous extensive Wirebird studies have included surveys of the vegetation of Prosperous Bay Plain, which sought to characterise the plant community in terms of percentage ground cover by the main component species and taxonomic groups. This was repeated during the present study and a comparison made with the results of the December 1998 survey. The vegetation at Prosperous Bay Plain is extremely sensitive to seasonal and annual variations in rainfall. The cover of, for example, succulent species such as *M. crystallinum* can increase enormously in wet conditions. For this reason, no comparison was made with the 1989 data, which was obtained during the wet season.

Methods

The vegetation cover of Prosperous Bay Plain was sampled during December 2005 using quadrats of 0.25m area. As in previous surveys, quadrats allocated were laid at a ratio of one quadrat/ha (i.e. 150 quadrats for the Plain proper + 30 for the ridge). Quadrats were laid in sub-sets of 10 to 20, which were distributed so as to ensure a representative coverage of the whole area. Where more than one well-defined vegetation-type occurred within a census site quadrats were allocated to each type in proportion to its area. The position of each quadrat within each sub-set was randomised. The direction taken and distance moved between individual quadrats were determined using computer-generated random numbers. Two series of numbers were used. The first, varying between 1 and 12, determined direction from the starting point in terms of a clock-face. The second series, ranging from 1 to 100, indicated the number of paces to be moved. All species present within each quadrat were listed and the percentage of the total area covered by each species, or by bare earth, rock or dung was recorded. "Rock" includes bedrock, boulders and gravel/scree of 10cm diameter or larger. Finer gravels were recorded separately. The mean percentage cover was calculated for each species at all sites sampled. The data were further grouped into broad summary groups: grasses, herbs, shrubs (woody species) and "minor vegetation", the latter including bryophytes and lichens. Percentage coverage by each of these classes was also calculated for each quadrat.

Results

a) *General impressions*

Upon the first visit to Prosperous Bay Plain during this study the general impression gained was that the vegetation was relatively little changed since the end of the previous project. *Suaeda* in the centre of the basin was, on average, slightly more dense and taller and *Carpobrotus* showed a small increase in extent east of the main track across the basin. The most striking change, however, was the increase in the grass *Eragrostis* which, although still covering a relatively small area overall, had been a very minor component of the plant community in 1998. This increase in *Eragrostis* appears to be general at semi-desert Wirebird sites. A substantial decline in *Mesembryanthemum* could be attributed to the 1998 abundance being due to an atypically wet year

b) *Survey*

The results of the quadrat survey are presented in Table 5.1 with comparative data from 1998. Other than the scarce endemic *Hydrodea*, only those components averaging at least 0.5% cover overall are included.

The quadrat survey largely confirmed general impressions. Comparison of cover of major components by ANOVA identified only two significant changes. Cover by Eragrostis increased from 0.9% to 7.5%, while *Mesembryanthemum* declined from 2.4% to less than 0.1%. The significant increase in all grasses is wholly an artefact of the *Eragrostis* increase. The results also suggested slight increases in *Suaeda* and *Carpobrotus* but neither of these changes was statistically significant.

Table 5.1: Mean percentage cover by major vegetation components at Prosperous Bay Plain in December 1998 and December 2005, with results of comparison by single-classification ANOVA.

	1998		2005		
Species/Group	**Mean %**	**s.d.**	**Mean %**	**s.d.**	**Diff.**
Sand Grass *Eragrostis cilianensis*	**0.91**	3.15	**7.47**	15.57	*P<0.001*
Atriplex semibaccata	**3.32**	9.14	**3.01**	10.95	*ns*
Ice Plant *Mesembryanthemum crystallinum*	**2.39**	8.14	**0.07**	0.43	*P<0.001*
Baby's Toes *Hydrodea cryptantha*	**0.01**	0.08	**0.29**	2.40	*ns*
Samphire *Suaeda helenae*	**4.21**	11.98	**5.07**	12.76	*ns*
Prickly Pear *Opuntia* sp.	**0.83**	6.86	**0.16**	1.80	*ns*
All Grasses	**1.04**	3.70	**7.47**	15.57	*P<0.001*
All Herbs	**4.56**	9.35	**6.33**	14.07	*ns*
Creeper *Carpobrotus edulis**	**8.42**	22.24	**10.59**	22.12	*ns*
Unvegetated	**78.52**	26.13	**73.23**	26.94	*ns*

* includes both live plants and dead material

5.1.4 Wirebird population

A thorough census of Prosperous Bay Plain, including the western ridge, was carried out on 23 November 2005 using the methods described in Section 3.3.1. This produced a total of 20 adults, and 1 chick. Seven further surveys were carried out up to 19 December in association with investigations of territories. These produced a maximum of 25 adults, 2 juveniles and 1 chick, and a minimum of 19 adults and 1 chick. The current population of territorial adults appears to consist of nine pairs (see Section 4.1.5). The census figure represents a decline of 21% in the adult population of the Plain proper from the mean figure of the two censuses carried out in season 2000/2001. Figures for the western ridge from previous years cannot now be extracted from the totals for the larger Upper Prosperous Bay census area.

The maximum number of Wirebirds ever recorded at Prosperous Bay Plain was 43 individuals in June 1989 (McCulloch 1992). This appeared to be associated with a very large hatch of caterpillars on the *Suaeda* bushes and it is not known if this is a regular seasonal occurrence. The 1988/89 study suggested movement of part of the Wirebird population from Prosperous Bay Plain to grassland sites during the driest part of the year, but it is not known if this occurs in all years.

5.1.5 Wirebird distribution

General distribution

During previous surveys, most Wirebirds have been found in the southern half of the Prosperous Bay Plain. The *Suaeda*/*Atriplex* habitat appears to be preferred to *Carpobrotus*-dominated areas. Wirebird numbers have, however, declined in the *Suaeda* zone since 1989, perhaps as a response to increasing *Suaeda* density, or possibly due to increased disturbance by vehicles, but there has been a compensatory increase in birds using the stony western margin of the plain and the sparsely vegetated plateaux of the south-east. The western ridge has always been attractive to Wirebirds but usage of the increasingly *Carpobrotus*-dominated northern end has declined.

Territories:
Territories were identified by: a) the long-term presence of two adult Wirebirds obviously associating as a pair, b) aggressive interactions with intruding conspecifics, c) nesting, courtship display or copulation, d) presence of accompanying chicks.

Nine Wirebird territories were identified at Prosperous Bay Plain during the present study. None of these were located in the sandy centre of the basin (Figure 4.3). Two were at the base of the western ridge, one on the eastern margin of the Plain, on the edge of Prosperous Bay Valley, one at the base of the central rocky knoll, one on the south-eastern plateau, and four on the western ridge.

5.1.6. Character of territories
General impressions
Territories were positioned around the margins of the basin or on ridges and plateaux above. None of the territories was located on primarily sandy substrates, within extensive continuous creeper mats or amongst relatively tall *Suaeda*. The selected locations were generally characterized by a substrate of coarse gravel or scree with a sparse vegetation community consisting principally of low or prostrate *Suaeda*, *Atriplex* and *Eragrostis*.

Vegetation survey
In addition to the main vegetation survey, ten quadrats were laid independently at random positions within each territory. In cases where birds were incubating, or had young chicks, this was done cumulatively over two to three days. Percentage vegetation cover was recorded and the component means across all territories were compared with those for the Plain as a whole in an attempt to identify key vegetation or substrate characters that might influence territory location. Mean percentage vegetation cover for each individual territory is presented in Table 5.2 and comparison of cover by principal vegetation components between the site as a whole and the combined territories is shown in Table 5.3. Vegetation height was not measured as vegetation within territories was generally distributed in small, widely separated patches, thus making the concept of sward height relatively meaningless.

The territory-specific mean percentage cover values obtained broadly support the general impression of territory locations. Vegetation is generally very sparse and the *Suaeda/Atriplex/Eragrostis* assemblage is evident in all territories but one (T9). *Carpobrotus* is, however, more abundant than expected and the perceived prevalence of rocky substrates is not so evident in the results of the quadrat sampling (Table 5.2)

When compared to the mean cover values for the Plain as a whole, the combined data for the nine territories shows only one statistically significant difference – greater abundance of *Mesembryanthemum* in territories (Table 5.3). The extent of cover by this species is, however, so small that it seems unlikely to be an important factor in territory selection. Sandy substrates cover, on average, a smaller area within territories than on the Plain generally, but not significantly so. It may be that the sampling programme employed here is not sufficiently sensitive not detect important vegetation factors influencing territory choice by Wirebirds, especially as sampling within territories was necessarily restricted in extent to avoid excessive disturbance. It may, however, be the case that territory location is principally determined by other environmental or anthropogenic factors not measured. Differences in prey abundance may be one such

factor. No attempt was made to assess this at Prosperous Bay Plain as large-scale trapping might impact negatively on the unique community of endemic invertebrates found there. The substrates in many parts of the plain, particularly in areas supporting most territories, are also unsuitable for pitfall trapping. This would have led to a spatial bias in any data obtained

Table 5.2: Mean percentage cover of principal vegetation and substrate components from Wirebird territories at Prosperous Bay Plain. (Ten 0.25m^2 quadrats sampled per territory).

Species/Group	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**	**T9**
Sand Grass *Eragrostis cilianensis*	12.8	10.5	11.9	4.9	4.3	3.8	12.9	10.0	0.0
Atriplex semibaccata	4.0	3.2	2.1	5.8	3.2	5.6	6.3	0.6	15.6
Mesembryanthemum crystallinum	0.1	0.0	0.4	1.2	0.7	2.7	0.0	0.0	1.0
Baby's Toes *Hydrodea cryptantha*	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Creeper *Carpobrotus edulis**	10.6	6.7	16.5	4.8	10.0	13.2	2.9	8.5	11.8
Samphire *Suaeda helenae*	6.5	3.7	7.8	13.1	9.2	4.1	4.6	3.2	3.4
Prickly Pear *Opuntia* sp.	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
All Grasses	12.8	10.5	11.9	4.9	4.3	3.8	12.9	10.0	0.0
All Herbs	4.0	3.2	2.1	5.8	3.2	5.6	6.5	0.6	15.6
Gravel	29.1	53.6	20.7	41.9	44.4	59.8	21.3	36.5	2.3
Rock	0.4	1.6	5.4	5.7	10.1	10.0	4.3	8.3	0.7
Sandy Substrates	35.3	20.4	35.2	22.6	18.1	0.7	46.8	32.9	64.7
Rocky Substrates	29.5	55.2	26.1	47.6	54.5	69.8	25.6	44.8	3.0
Unvegetated	64.8	75.6	61.3	70.2	72.6	70.5	72.4	77.7	67.7

* includes both live plants and dead material

Table 5.3: Comparison of mean percentage cover of principal vegetation and substrate components between Prosperous Bay Plain as a whole (randomly sampled, 180 quadrats) and combined samples from nine Wirebird territories (90 quadrats).

	Prosperous Bay Plain		**Territories only**		
Species/Group	**Mean%**	**sd**	**Mean%**	**sd**	**Diff.**
Sand Grass *Eragrostis cilianensis*	**7.47**	15.57	**7.90**	12.77	*ns*
Atriplex semibaccata	**3.01**	10.95	**5.16**	12.60	*ns*
Mesembryanthemum crystallinum	**0.07**	0.43	**0.68**	3.28	*P<0.05*
Baby's Toes *Hydrodea cryptantha*	**0.29**	2.40	**0.03**	0.32	*ns*
Creeper Carpobrotus edulis*	**10.59**	22.12	**9.44**	18.64	*ns*
Samphire *Suaeda helenae*	**5.07**	12.76	**6.18**	9.83	*ns*
Prickly Pear *Opuntia* sp.	**0.16**	1.80	**0.13**	0.94	*ns*
All Grasses	**7.47**	15.57	**7.90**	12.77	*ns*
All Herbs	**3.11**	10.96	**5.18**	12.59	*ns*
Rocky Substrates	**34.79**	34.90	**39.57**	30.89	*ns*
Sandy Substrates	**38.45**	34.54	**30.74**	28.55	*ns*
Unvegetated	**73.23**	26.94	**70.31**	23.12	*ns*

*includes both live plants and dead material

5.1.7 Productivity

Frequent observations were carried out on all territorial pairs of Wirebirds at Prosperous Bay Plain to detect signs of breeding activity and, if possible, locate nests and determine their outcome. Nesting at the site appears to have begun rather late this year as only one chick was found by mid-December and there appeared to be no resident fledged juveniles on the Plain. The few juveniles observed had developed almost complete adult plumage, indicating that they were several months old.

By the end of the project, the single chick present at the start had fledged successfully, two clutches (both of two eggs) had been laid, two chicks had hatched and were still surviving and incubation was ongoing in one territory. Copulation had also been observed in one additional territory. No breeding activity was observed in the remaining five territories (Table 5.4).

The presence of juveniles hatched some months earlier highlights the current lack of information about the significance of wet season nesting. Only one previous study (1988/89) has included wet season fieldwork but lack of transport severely restricted the frequency of visits to Prosperous Bay Plain during this period. In 1989 wet-season nesting on grassland occurred at low frequency compared to the October-February period, but it is possible that environmental conditions at semi-desert sites during the wet season are more conducive to breeding than on pasture. This aspect of Wirebird ecology requires more research.

Table 5.4: Summary of breeding activity and chick production in nine Wirebird territories at Prosperous Bay Plain, 21 November – 19 December 2005.

Territory	Display/Copulation	Nest	Chicks	Outcome
1	yes	?		ongoing
2		not found	1	1 chick fledged
3		2 eggs	2	chicks yet to fledge
4	no breeding activity seen			
5	no breeding activity seen			
6	no breeding activity seen			
7	no breeding activity seen			
8		2 eggs		incubation ongoing
9	no breeding activity seen			

5.1.8 Potential impact of airport development

Construction of an airport and access routes at Prosperous Bay Plain would result in substantial permanent loss of existing Wirebird habitat currently included within nesting territories and displacement of birds occupying those territories. There would also be a high level of temporary disturbance to most of the remaining resident Wirebird population during the construction phase. Other potential longer-term effects might include exclusion from otherwise available habitat by disturbance caused by regular operations, and the risk of collision with aircraft or traffic on the access road. Theses issues are addressed more fully in Section 6.

If current territory locations were maintained into the construction period then a total of six territories (possibly seven, depending on the exact alignment of the access road)

would be directly impacted by construction work within their boundaries and the remaining two (T7, T8) are probably close enough (*c*100m) to construction areas to be subject to some level of disturbance (Table 5.5, Figure 5.2). All of Territories 3, 4, 5, and 6 would effectively be lost along with most of Territory 2. Territory 1 lies close to, or possibly on, the route of both options for the access route but the post construction effects on the physical environment would probably be slight. Territory 9 would only be impacted if the Woody Ridge option for the access road were utilized, when his would pass through the territory, or if there were to be a westerly re-alignment of the route from Cook's Bridge.

Table 5.5: Summary of Wirebird territories potentially affected by various components of airport construction at Prosperous Bay Plain (see Figure 4.2 for territory locations). Territory numbers in parentheses indicates provisional classification as the extent of the impact on these territories remains uncertain at the present time.

Airport component	Directly affected	Within 100m	Total
Runway/taxiway	T2 T4 T5 T6	T3 T7 T8	7
Terminal	T2 T3 T4		3
Access/haul road (Bradley's)	(T1) T3	T4	2 (3)
Access road (Woody Ridge)	(T1) T3 T9		2 (3)
Haul route (Prosperous Bay)	T2 T6	(T7)	2 (3)

The construction option minimising the number of territories on the Plain directly affected would comprise the runway and terminal with a combined haul/access route via Cook's Bridge. This would impact on five, possibly six, territories. Using a separate access route from Woody Ridge, in addition to a haul route from Cook's Bridge, would affect an additional territory, i.e. six (possibly seven) in total.

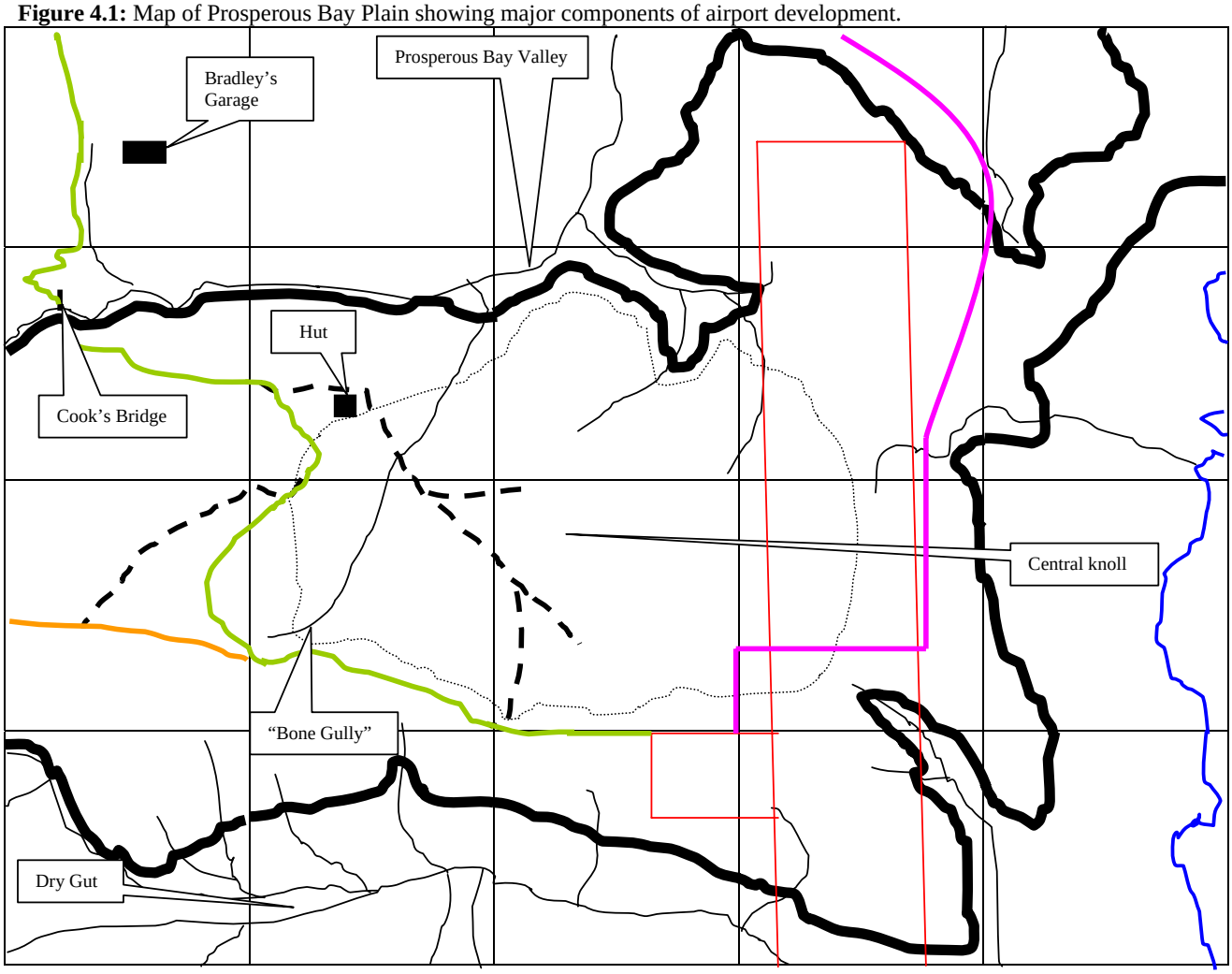
5.1.9. Additional site-specific threats to the Wirebird

Vehicle use on Prosperous Bay Plain increased greatly between 1989 and 2001. Much of this has been associated with building-stone collection of varying legality but much is merely leisure activity with little regard shown for well-established tracks. Alternative routes have continued to proliferate and must pose a threat to Wirebird nests. A relationship between this increase in vehicular activity, particularly by motorcycles, and the withdrawal of most resident Wirebirds to the periphery of the plain cannot be entirely ruled out. Observations during this study suggest, however, that casual vehicle use on the Plain is declining, possibly in response to the marking of the boundaries of the proposed basin conservation area. Limited quarrying operations at the site were formerly carried out on the eastern plateau (runway site) but this appears to have ceased.

Cats are probably the only predators of fledged Wirebirds. The subjective impression formed during this study was that feral cats had generally increased in numbers since 2001. A substantial cat population inhabits the Gill Point area, near Prosperous Bay Plain. A more recent development has been the establishment of a population of feral cats associated with the enlarged rubbish dump at nearby Horse Point Plain. Cat control measures appear to have been relaxed in recent years and this ha undoubtedly contributed to the increase. Cat tracks were encountered on the Plain during fieldwork and one individual was seen. No direct evidence of cat predation on Wirebirds was found at the site, however.

Common Mynahs are relatively scarce at Prosperous Bay Plain, compared to grassland sites but the species is always present and numbers may increase in the vicinity when Prickly Pear is fruiting. Mynahs are potential nest-robbers and predators of Wirebird chicks.

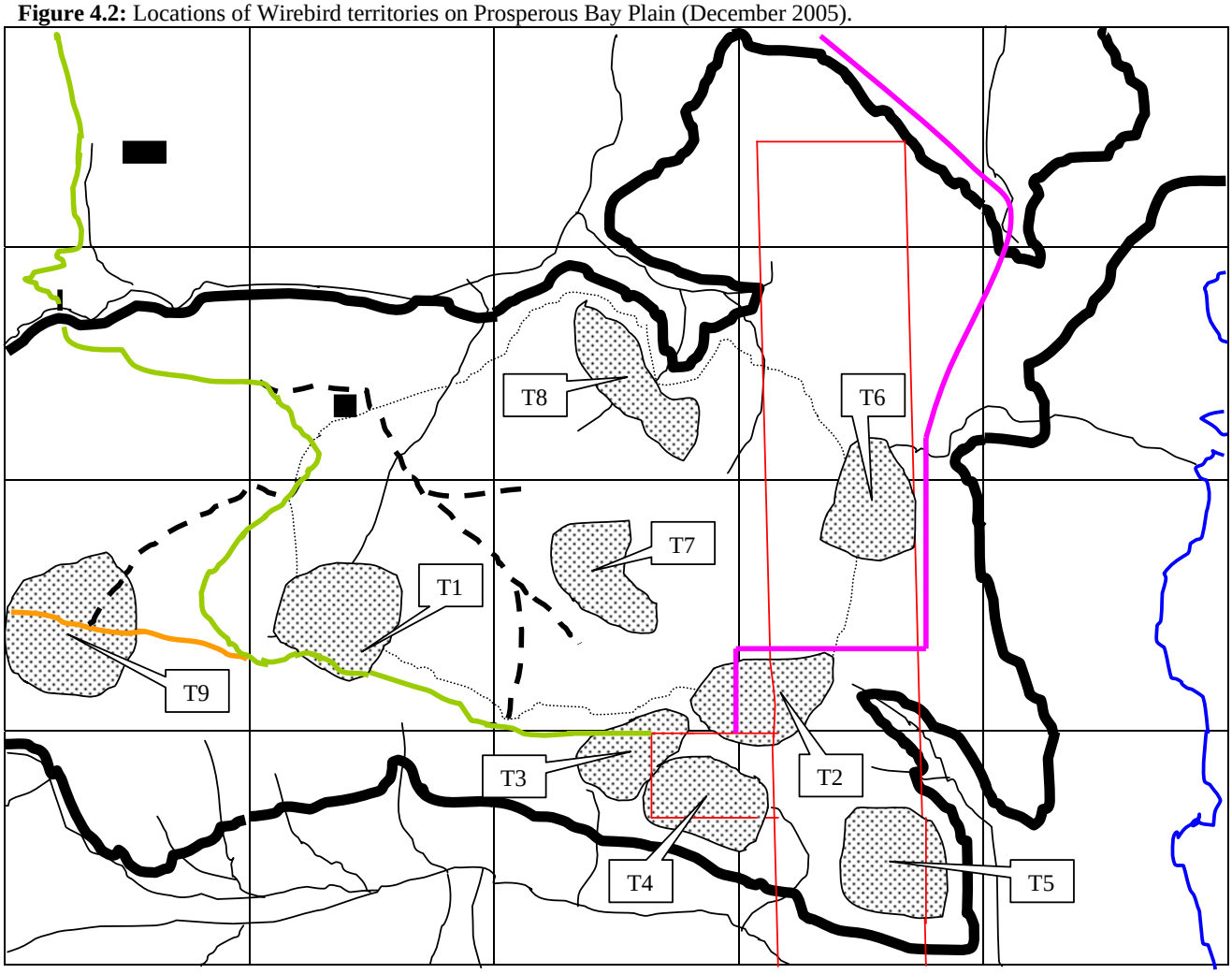
Figure 4.1: Map of Prosperous Bay Plain showing major components of airport development.



Key:

- Boundary of census area
- Watercourse
- Track
- Approximate boundary of "basin" area
- Site of runway/terminal
- Coastline
- Haul route option from Prosperous Bay
- Access/haul route option from Rupert's Bay/Deadwood Plain
- Access route option from Woody Ridge

Figure 4.2: Locations of Wirebird territories on Prosperous Bay Plain (December 2005).



Key:

- Boundary of census area
- Watercourse
- Track
- Approximate boundary of “basin” area
- Site of runway/terminal
- Coastline
- Approximate extent of core activity areas (territories) of resident Wirebird pairs
- Haul route option from Prosperous Bay
- Access/haul route option from Rupert’s Bay/Deadwood Plain
- Access route option from Woody Ridge

5.2 Deadwood Plain

5.2.1. Proposed development components:
Haul route, access road (two options).

5.2.2. Site Description:
Deadwood Plain is an area of pastureland covering, with the adjacent valleys of Netley Gut and Sheep Pound Gut, some 220ha in the north of St Helena. The plain rises in a shallow, but somewhat concave, slope from an altitude of 480m at Deadwood village in the south to 640m below the summit of Flagstaff Hill. The main plain itself is no more than 800m wide at any point and is bordered in the west and north-east by steep, eroded slopes with extensive gully systems. The area receives an annual rainfall of 300-500mm (Mathieson 1990).

Deadwood Plain's grassland is of relatively recent origin, having been established as a result of felling of extensive tracts of native Gumwood forest, which originally covered the Deadwood/Longwood area. (Beatson 1816). Clearance of this "Great Wood" was complete by the middle of the 18th Century (Cronk 1989). A vegetation survey carried out in 1989 showed that the present day grassland is dominated by the introduced Kikuyu Grass *Pennisetum clandestinum*. Grasses accounted for 67% of ground cover. There are extensive areas of low scrub on the north-western margins of the plain and around the heads of Netley Gut and Sheep Pound Gut. This largely consists of Port Jackson Willow *Acacia longifolia*, Wild Coffee *Chrysanthemoides monilifera*, New Zealand Flax *Phormium tenax* and Lantana *Lantana camara*.

Deadwood Plain has traditionally held the largest single population of Wirebirds on the island. Maintenance of the integrity of the breeding habitat at this site is likely to be a major factor if the Wirebird is to be successfully conserved.

The pastures at Deadwood Plain are divided into 16 paddocks (Figure 5.3), amongst which grazing has been carried out on a rotational basis overseen by a syndicate of cattle owners. This rotation has also included Sheep Pound Gut, Netley Gut and Flagstaff Meadow. During the dry season (approximately September – March) grazing pressure and very low growth have maintained a short, even sward across the entire plain. In the wet season, however, the rotational grazing regime imposed a mosaic of grass heights amongst the various paddocks, which had a strong influence on Wirebird distribution due to the species' preference for shorter grass (McCulloch 1992). The presence of Deadwood settlement around its southern and south-western margins results in a considerable amount of human activity daily on the lower part of the Plain.

5.2.3. Habitat change since 1998:
Vegetation cover, composition and sward height on Deadwood Plain was sampled and the results compared with the results of surveys carried out in 1998 and 2000 respectively.

Methods:
For methods used in the survey of vegetation cover and composition see Section 5.1.3. Point sampling of sward height was carried out for each individual paddock. An identical number of points to those sampled in 2000 were sampled in each paddock at

randomized positions along transects traversing the paddock starting from points themselves selected at random from a pool of numbered fence-posts. In larger paddocks, sampling was stratified by area on the basis of physical features or vegetation discontinuities to ensure proportional coverage of all parts of the paddock.

Results

a) *General impressions*:

On the first visit to Deadwood Plain during this study it was discovered that cattle numbers had been reduced from around 90 to 35 individuals of mixed age. Fences had also fallen into disrepair and most gates had been removed. This had effectively ended the previous rotational grazing regime. Although the cattle might be driven to different parts of the Plain each morning, they were then free to roam at will and generally tended to gravitate towards the same favoured area. This has resulted in much of the Plain remaining, at best, very lightly grazed and has allowed a substantial increase in sward height, with large areas becoming unfavourable for Wirebirds. The reduction in grazing and associated pasture management has also allowed a several of invasive exotic plant species to become established and spread, thus increasing the level of degradation of Wirebird habitat. The major non-woody invasive species include a fine leaved rush of South American origin, locally known as "Bull Grass" *Juncus capillaceus*, Creeper *Carpobrotus edulis*, and Everlasting *Helichrysum bracteatum*. Woody invasives include Lantana *Lantana camara*, Gorse *Ulex europaeus*, Wild Coffee *Chrysanthemoides monilifera* and "Cedar" *Juniperus bermudiana*. A subjective assessment of the relative severity of encroachment by the major invasives is presented in Table 4.6 on a paddock-by-paddock basis.

Table 5.6: Subjective assessment of the relative severity of encroachment by invasive plant species into paddocks on Deadwood Plain since 2001. N.B. Figures represent only the scale of increase within paddocks and may not reflect differences in cover by species between paddocks. Key: BGR = Bull Grass, CPR = Creeper, EVL = Everlasting, PPR = Prickly Pear, LTN = Lantana, GRS = Gorse, WCF = Wild Coffee, CDR = CDR. Scoring system: 3 = severe increase, 2 = moderate increase, 1 = minor increase, 0 = no apparent increase or species absent. FM = Flagstaff Meadow, NG = Netley Gut, SPG = Sheep Pound Gut.

Paddock	BLG	CRP	EVL	PPR	LTN	GRS	WCF	CDR
1	3	1	1	0	0	0	1	0
2	3	0	2	0	0	0	0	0
3	3	2	1	1	0	0	1	1
4	2	1	1	0	2	0	1	0
5	1	1	1	2	0	0	1	0
6	3	1	1	0	2	0	3	0
7	1	2	0	0	0	0	1	0
8	3	3	0	0	0	1	3	0
9	3	3	0	0	0	2	3	0
10	0	2	1	0	2	3	3	0
11	2	3	2	0	3	3	3	0
12	0	1	0	0	2	2	1	1
13	0	2	2	1	2	0	2	0
14	1	3	2	0	2	0	0	0
15	2	0	3	0	3	0	0	1
16	0	0	0	0	0	2	0	0
FM	3	1	0	2	0	3	1	0
NG	2	2	0	0	2	0	3	0
SPG	0	1	3	0	3	0	3	0

b) *Survey:*
Following the procedure established in previous studies, a total of 300 quadrats of 0.25m^2 area were sampled on Deadwood Plain, including Flagstaff Meadow, Netley Gut and Sheep Pound Gut. Sampling was stratified by paddock, with at least 13 quadrats being sampled in each paddock. The number of quadrats allocated to paddocks larger than 5ha was proportional to their area, up to 40 quadrats for Flagstaff Meadow.

The mean percentage ground cover for significant elements of the plant community are presented for the entire site in Table 5.7. where they are compared with the corresponding result from December 1989. Grass cover and the extent of unvegetated ground remained constant, but a number of species indicative of degradation of conditions for Wirebirds showed statistically significant increases. These included the rush Bull Grass, the tall herb Everlasting, Creeper, the shrub Wild Coffee and woody shrubs as a group. Mat Grass, which is likely to be unfavourable to Wirebirds due to its very dense ground cover and stiff leaves, and Lantana also showed increases on the borderline of statistical significance. There were significant declines in the low herb Centella asiatica and in herbs generally. A subjective impression gained during sampling was that the diversity of herbs had also declined, possibly as a result of competitive exclusion within a denser sward.

Table 5.7: Mean percentage cover by major vegetation components at Deadwood Plain in December 1998 and December 2005, with results of comparison by single-classification ANOVA.

	1998		2005		
Species/Group	**Mean %**	**s.d.**	**Mean %**	**s.d.**	**Diff.**
Kikuyu Grass *Pennisetum clandestinum*	**60.21**	31.12	**57.66**	29.95	*ns*
Mat Grass *Stenotaphrum secundatum*	**3.63**	16.22	**6.58**	20.30	*(P=0.05)*
Wire Grass *Cynodon dactylon*	**1.63**	9.32	**1.62**	8.38	*ns*
Hay Grass *Agrostis tenuis*	**0.21**	1.25	**0.12**	0.88	*ns*
Other grasses	**6.62**	11.63	**4.29**	10.70	*ns*
Bull Grass (rush) *Juncus capillaceus*	**1.02**	5.28	**4.79**	11.47	*P<0.001*
Monkey's Ear *Centella asiatica*	**7.99**	11.06	**4.52**	6.19	*P<0.001*
Everlasting *Helichrysum bracteatum*	**0.78**	2.80	**1.80**	3.76	*P<0.001*
Other herbs	**7.00**	11.57	**0.52**	1.19	*P<0.001*
Creeper *Carpobrotus edulis**	**0.63**	5.32	**4.05**	14.23	*P<0.001*
Gorse *Ulex europaeus*	**0.87**	8.82	**1.63**	9.29	*ns*
Lantana *Lantana camara*	**0.97**	6.03	**1.92**	6.08	*(P=0.05)*
Wild Coffee *Chrysanthemoides monilifera*	**0.00**	0.00	**1.15**	5.35	*P<0.001*
Prickly Pear *Opuntia* sp.	**0.00**	0.00	**0.16**	2.17	*ns*
All grasses	**72.31**	25.11	**70.42**	24.70	*ns*
All herbs	**15.77**	15.95	**6.84**	7.56	*P<0.05*
All shrubs	**1.85**	10.50	**4.71**	10.82	*P<0.01*
Unvegetated	**8.05**	16.98	**8.86**	14.06	*ns*

*includes both live plants and dead material

Sward height is considered to be one of the most important factors determining the distribution of Wirebirds within grassland habitats. Results of sward height sampling are shown in Table 5.8. The sward was sampled within each individual paddock and the results compared with those of December 2000. The results were also combined to

give an overall mean height for the main Plain (i.e. Paddocks 1-16). Flagstaff meadow was excluded from the latter analysis as the site was already in very poor condition by 2000. It had been virtually abandoned by Wirebirds at that time and has since deteriorated further. Netley Gut and Sheep Pound Gut were not sampled in 2000, so no comparison between years was possible for these sites. All paddocks that could be compared showed highly significant increases in sward height since 2000, ranging from 3 – 6cm. The overall mean height for the Plain increased by 5cm. There was a trend towards greater increase on the upper parts of the plain (Paddocks 5 – 9). This correlates both with relatively wetter conditions and an observed tendency for the cattle to avoid much of this area unless actually driven there. Paddock 3, which does not currently have open access to cattle also showed a particularly large increase in sward height.

Table 5.8: Mean sward height within individual paddocks at Deadwood Plain and for the entire main Plain (Paddocks 1-16 combined), with comparison of results from December 2000 by single classification ANOVA. N = number of points sampled.

		2000		2005		
Paddock	**N**	**Mean**	**s.d.**	**Mean**	**s.d.**	**Diff.**
P1	50	**2.51**	1.09	**6.12**	6.21	*P<0.001*
P2	50	**2.74**	1.10	**7.51**	5.60	*P<0.001*
P3	50	**3.23**	1.21	**9.10**	5.02	*P<0.001*
P4	60	**3.45**	1.66	**6.43**	6.20	*P<0.001*
P5	50	**2.40**	1.03	**6.88**	4.34	*P<0.001*
P6	70	**2.96**	1.26	**7.50**	5.01	*P<0.001*
P7	60	**3.31**	1.51	**9.75**	5.04	*P<0.001*
P8	50	**4.06**	1.80	**9.81**	3.89	*P<0.001*
P9	80	**3.91**	1.73	**10.56**	4.83	*P<0.001*
P10	60	**4.37**	2.14	**9.26**	5.30	*P<0.001*
P11	60	**3.64**	1.65	**8.28**	5.30	*P<0.001*
P12	90	**3.76**	1.56	**8.81**	4.21	*P<0.001*
P13	110	**3.44**	2.34	**8.45**	4.59	*P<0.001*
P14	70	**3.38**	1.49	**7.18**	4.42	*P<0.001*
P15	130	**3.94**	2.10	**8.99**	5.12	*P<0.001*
P16	50	**3.85**	2.07	**9.68**	5.27	*P<0.001*
FM	180	**7.35**	3.89	**10.98**	6.27	*P<0.001*
NG	100	*no data*		**8.19**	5.11	
SPG	120	*no data*		**9.42**	5.61	
Plain (P1-P16)	1090	**3.50**	1.79	**8.52**	5.12	*P<0.001*

Prey Abundance:
In addition to changes in the composition and structure of vegetation, it is likely that Wirebird numbers and distribution are also influenced by spatial and temporal variation in their invertebrate prey. This was investigated at Deadwood Plain.

a) Methods:
The relative abundance of ground-living invertebrates at Deadwood Plain was estimated by pitfall trapping. Traps were distributed throughout the plain on a random basis, stratified by paddock, with each paddock being allocated five traps. Sampling was carried over a single 24-hour period. The trapping pots used were plastic drinking cups, 9cm deep and 7cm diameter. Animals caught were classified to Order. Collembola were excluded from the analysis as their occurrence in the traps was more heavily influenced by climatic conditions than any other species. These and other very small (<1mm) animals were not recorded as they are unlikely to be significant Wirebird prey. Ants were also excluded from the analysis as trapping rates were strongly affected by soil disturbance and the proximity of ant nests to the trap site, making meaningful comparison between sites difficult.

b) Results:
Table 5.9 shows the taxonomic composition, by percentage, of the December 2005 invertebrate catch for the whole of Deadwood Plain. These results indicate that the terrestrial invertebrate macrofauna of Deadwood Plain is dominated by woodlice and beetles, with millipedes and earwigs being the only other components accounting for more than 5% of the total. The beetle catch consisted almost entirely of a small Tenebrionid species, tentatively identified as *Gonocephalum simplex*. This species is known to be a significant prey of Wirebirds. Scaraboid beetles were much scarcer than in previous years and large Carabid species were entirely absent from the sample.

Table 5.9: Numbers and percentage composition of invertebrates trapped at Deadwood Plain (entire site) during December 2005.

Order	**N**	**Percent.**
Woodlice *Isopoda*	697	54.28
Spiders *Arachnida*	17	1.32
Centipedes *Chilopoda*	2	0.16
Millipedes *Diplopoda*	65	5.06
Crickets *Orthoptera*	3	0.23
Earwigs *Dermaptera*	73	5.69
Bugs *Hemiptera*	2	0.16
Beetles (adult) *Coleoptera*	386	30.06
Beetles (larvae) *Coleoptera*	5	0.39
Moths (adult) *Lepidoptera*	22	1.71
Moths (larvae) *Lepidoptera*	5	0.39
Wasps *Hymenoptera*	1	0.08
Unidentified larvae	6	0.47
Total	1284	100.00

The results of trapping within each paddock are presented in Table 5.10 with the corresponding figures from December 2000. No attempt was made to compare the paddock-specific results between years statistically because of the small sample sizes. Comparisons by ANOVA were, however, carried out on mean catches for the entire site. This was done for all invertebrates combined, and for beetles (all age-classes), thus giving indications of change in general invertebrate abundance and in the abundance of probably the most important Wirebird prey category. There was no significant difference in total invertebrate abundance, but the frequency of occurrence of beetles in the traps was almost twice that observed in 2000 ($F=6.683_{(1,173df)}$, $P=0.01$). There was significant heterogeneity in abundance of both combined invertebrates and beetles in 2000 ($F=4.630_{(18,61df)}$, $P<0.001$ and $F=2.304_{(18,61df)}$, $P<0.01$ respectively). This variation of abundance of combined invertebrates was maintained in 2005 ($F=2.718_{(18,76df)}$, $P<0.01$) but beetles showed a similar level of abundance throughout the Plain. It would appear from these results that the Wirebird decline at Deadwood Plain is not due to a shortage of prey organisms.

Table 5.10: Mean pitfall catches in December 2000 and December 2005 of a) all invertebrates (excluding ants and organisms less than 1mm in length) and b) beetles (all age-classes) for individual paddocks and the entire site at Deadwood Plain. s.d = standard deviation.

a) All invertebrates

		2000		2005	
Paddock	**N**	**Mean**	**s.d.**	**Mean**	**s.d.**
P1	5 (5)	**8.40**	2.70	**19.00**	10.44
P2	4 (5)	**7.75**	4.92	**20.60**	8.79
P3	4 (5)	**12.50**	2.89	**6.40**	3.21
P4	4 (5)	**9.00**	2.16	**6.40**	1.95
P5	4 (5)	**8.50**	4.36	**7.00**	3.24
P6	4 (5)	**14.50**	5.80	**17.40**	10.38
P7	4 (5)	**15.00**	14.45	**17.40**	8.85
P8	4 (5)	**83.00**	64.82	**15.80**	12.93
P9	4 (5)	**9.00**	4.24	**16.40**	5.03
P10	4 (5)	**7.75**	3.95	**5.00**	4.06
P11	4 (5)	**7.75**	6.90	**7.20**	6.30
P12	4 (5)	**7.00**	5.48	**9.00**	5.39
P13	4 (5)	**8.25**	5.85	**10.40**	5.94
P14	4 (5)	**11.75**	8.50	**15.80**	11.12
P15	5 (5)	**15.40**	10.16	**29.20**	8.76
P16	4 (5)	**8.50**	9.15	**17.60**	17.31
FM	5 (5)	**15.60**	4.56	**16.60**	9.91
NG	5 (5)	**7.80**	4.66	**9.40**	8.62
SPG	4 (5)	**10.25**	7.41	**10.20**	2.59
Entire site	80 (95)	**13.98**	21.33	**13.52**	9.86

Table 5.10
b) Beetles

		2000		2005	
Paddock	**N**	**Mean**	**s.d.**	**Mean**	**s.d.**
P1	5 (5)	**2.80**	3.03	**8.40**	3.03
P2	4 (5)	**0.75**	0.50	**1.80**	0.50
P3	4 (5)	**3.50**	1.73	**3.00**	1.73
P4	4 (5)	**1.25**	1.26	**0.60**	1.26
P5	4 (5)	**1.75**	1.50	**4.40**	1.50
P6	4 (5)	**2.25**	2.22	**9.00**	2.22
P7	4 (5)	**1.75**	2.36	**5.40**	2.36
P8	4 (5)	**8.25**	4.19	**2.40**	4.19
P9	4 (5)	**1.50**	1.29	**2.60**	1.29
P10	4 (5)	**1.75**	2.87	**2.60**	2.87
P11	4 (5)	**1.75**	1.26	**2.40**	1.26
P12	4 (5)	**0.75**	0.96	**5.20**	0.96
P13	4 (5)	**1.75**	2.22	**3.40**	2.22
P14	5 (5)	**0.75**	1.50	**3.60**	1.50
P15	5 (5)	**7.80**	6.57	**4.60**	6.57
P16	4 (5)	**3.50**	5.74	**3.80**	5.74
FM	4 (5)	**1.60**	2.07	**3.40**	2.07
NG	4 (5)	**1.00**	1.00	**7.00**	1.00
SPG	5 (5)	**4.25**	3.86	**4.60**	3.86
Entire site	80 (95)	**2.60**	3.39	**4.12**	4.22

5.2.4 Wirebird population

A full census of the Deadwood Plain site, was carried out on 24 November 2005 using the methods described in Section 3.3.1. This produced a total of 35 adults, and 2 chicks. No fledged juveniles were seen. Due to the large size of the site and other commitments only one other complete survey was carried out but several counts covering alternate halves of the Plain were undertaken up to 19 December in association with investigations of territories. The second full count produced a total of 39 adults, 1 juvenile and 2 chick. The current population of territorial adults appears to consist of 14 pairs (see Section 5.2.5). The initial census figure represents a decline of 62% in the adult population of the Plain from the mean figure of the two censuses carried out in season 2000/2001.

5.2.5 Wirebird distribution

General distribution

During previous surveys, Wirebirds have been found in all parts of Deadwood Plain, though habitat degradation at Flagstaff Meadow between 1989 and 1998 had resulted in its virtual abandonment by the latter date (McCulloch & Norris 2001). Past densities have tended to be higher in the lower paddocks, between the gate and the wind turbines. Netley Gut has always been a well-used area but numbers in Sheep Pound Gut have been in decline since 1989. Percentage distribution of Wirebirds by paddock in 2000 and 2005 is presented in Figures 5.4 and 5.5 respectively.

At the present time, the paddocks above the wind turbines have been almost entirely deserted by Wirebirds. This is likely to be associated with the particularly large increase

in sward height in this part of the site. The south-eastern flank of the site (Paddocks 13-16 and Sheep Pound Gut) currently holds only one Wirebird territory. Grass height has increased throughout this area has increased, particularly in Paddocks 15 and 16, but some areas of the remainder still that appear to provide suitable habitat for Wirebirds are unused. The locations of the main concentrations of Wirebirds are currently: a) the north-west side of the main track, between the gate and the wind turbines (Paddocks 1-5); b) the western and lower parts of the ridge between Sheep Pound Gut and Netley Gut (Paddocks 11 & 12); c) Netley Gut.

Territories:
Territory identification at Deadwood Plain proved to be more time-consuming than in previous years as the Wirebirds have become more mobile. Many pairs have few close neighbours and so the need for territorial defence is relaxed. The birds therefore tend to forage over a greater area than previously, thus members of non-breeding pairs may be widely separated when first encountered and lengthy observation may be required to determine that they are in fact paired. In addition to a general increase in sward height, lighter grazing has resulted in a less even sward structure and it may also be that Wirebirds are now required to be more mobile in order to exploit discontinuous patches of suitable foraging habitat. This remains conjectural, however.

Fourteen Wirebird territories were identified at Deadwood Plain during the present study. Two of these overlapped Paddocks 1 and 2, and three were in Paddock 4. There was one territory in each of Paddocks 5 and 6. On the ridge between Sheep Pound Gut and Netley Gut there were three territories in Paddock 12 and one in Paddock 11, which extended a short distance onto the eastern flank of Sheep Pound Gut. Netley Gut supported two territories, that on the western side also incorporating part of Paddock 10. The only territory on the eastern flank of the main Plain was located on the southern edge of Paddock 14. The approximate extent of these territories is mapped in Figure 5.6.

5.2.6. Character of territories

General impressions
There is no obvious correlation between the current distribution of Wirebird territories and any particular plant assemblage. Vegetation structure appears to be of overriding importance, with the shortest swards being generally preferred, especially where grasses occur at relatively low density and the sward is interspersed with areas of bare soil.

Vegetation survey
As at Prosperous Bay Plain, ten quadrats were laid independently of the main vegetation survey at random positions within each territory. Mean percentage vegetation cover for each individual territory is presented in Table 5.11 and comparison of cover by principal vegetation components between the site as a whole and the combined territories is shown in Table 5.12. Sward height was also measured at 20 randomly allocated points within each territory.

The territory-specific mean percentage cover values obtained broadly support the general impression of territory locations. Vegetation composition varies considerably between territories but two trends emerge: the proportion of unvegetated ground is generally higher than the site average and invasive shrubs are relatively scarce (Table 5.11).

Table 5.11: Mean percentage cover of principal vegetation and substrate components, and mean sward height, from Wirebird territories at Deadwood Plain. (Ten 0.25m^2 quadrats and 20 sward heights sampled per territory).

Species/Group	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**
Kikuyu Grass *Pennisetum clandestinum*	82.9	83.8	56.9	60.3	31.8	64.8	62.2
Mat Grass *Stenotaphrum secundatum*	0	0	20.6	3.7	8.3	2.2	0
Wire Grass *Cynodon dactylon*	0	0	0	0	3	6.4	0
Hay Grass *Agrostis tenuis*	0	0	0	0	0	0	0
Other grasses	1.2	1.1	4.6	3.6	2.5	0.6	8
Bull Grass (rush) *Juncus capillaceus*	3.1	5.3	2.9	1.8	3.2	0.7	1.8
Monkey's Ear *Centella asiatica*	3.3	2.4	4.3	7.9	3.7	7.3	7.7
Everlasting *Helichrysum bracteatum*	0.5	1.3	1.2	2.1	4.7	1.7	0.8
Other herbs	0.2	0.1	0.5	0.3	0.4	0.3	0.7
Creeper *Carpobrotus edulis**	0	0.6	0.4	8.6	14.4	6	0.8
Gorse *Ulex europaeus*	0	0	0	0	0	0	0
Lantana *Lantana camara*	0.3	0	0.9	1.3	1.2	1.2	1
Wild Coffee *Chrysanthemoides monilifera*	0	0	0	0	0	0	0.2
Prickly Pear *Opuntia* sp.	0	0	0	0.2	0	0	0
All grasses	84.1	84.9	82.1	67.6	45.6	74	70.2
All herbs	4	3.8	6	10.3	8.8	9.3	9.2
All shrubs	0.3	0	0.9	1.3	1.2	1.2	1.2
Unvegetated	8.5	5.4	7.2	10.4	26.8	8.8	17.8
Sward Height (cm)	4.19	4.60	5.32	5.07	4.31	4.84	4.97

* includes both live plants and dead material

Table 5.11 (*continued*)

Species/Group	**T8**	**T9**	**T10**	**T11**	**T12**	**T13**	**T14**
Kikuyu Grass *Pennisetum clandestinum*	74	77.5	46.6	46.5	44	70.7	69.3
Mat Grass *Stenotaphrum secundatum*	0	3.4	21.4	21.7	31.7	0	0
Wire Grass *Cynodon dactylon*	0	0	0	0	0	4.1	0
Hay Grass *Agrostis tenuis*	0	0	0	0	0	0	1
Other grasses	8	5.4	0	0	0	0.4	0.3
Bull Grass (rush) *Juncus capillaceus*	4.8	2.6	0.4	0	1.5	0.8	4.1
Monkey's Ear *Centella asiatica*	0.5	4.8	5.5	4.4	6.5	2.1	3.7
Everlasting *Helichrysum bracteatum*	2.2	0.9	2.9	4.4	0.1	1.2	2.2
Other herbs	0.5	0.1	0.2	0.3	0.1	0.1	0
Creeper *Carpobrotus edulis**	0	0	0	1.4	7.6	0	11.3
Gorse *Ulex europaeus*	0	0	0	0	0	0	0
Lantana *Lantana camara*	0.4	0.3	0.7	1	1.3	1.4	1.2
Wild Coffee *Chrysanthemoides monilifera*	0	0.6	0	0	0	3	0.7
Prickly Pear *Opuntia* sp.	0	0	0	0	0	1.6	0
All grasses	82	86.3	68	68.2	75.7	75.2	70.6
All herbs	3.2	5.8	8.6	9.1	6.7	3.4	5.9
All shrubs	0.4	0.9	0.7	1	1.3	4.4	1.9
Unvegetated	9.6	4.4	22.3	21.3	7.2	14.6	6
Sward Height (cm)	3.9	4.9	5.3	5.2	5.9	4.2	6.6

* includes both live plants and dead material

When compared to the mean cover values for the Plain as a whole, the combined data for the 14 territories show a number of statistically significant differences, mostly supporting the hypothesis that increasing sward density and encroachment by tall and woody species are detrimental to the Wirebird. The invasive rush, Bull Grass, is less abundant within territories than on the Plain generally, as are Gorse, Lantana and all shrubs combined (Table 5.12). The mean coverage by Wild Coffee, included in the latter group, was also lower within territories, but the difference just failed to attain statistical significance in its own right (P=0.07). The proportion of unvegetated ground within territories was greater than in the site as a whole.

Table 5.12: Comparison of mean percentage cover of principal vegetation and substrate components between Deadwood Plain as a whole (randomly sampled, 300 quadrats) and combined samples from nine Wirebird territories (140 quadrats).

	Deadwood Plain		**Territories**		
Species/Group	**Mean %**	**s.d.**	**Mean %**	**s.d.**	**Diff.**
Kikuyu Grass *Pennisetum clandestinum*	**57.66**	29.95	**62.24**	26.58	*ns*
Mat Grass *Stenotaphrum secundatum*	**6.58**	20.30	**8.07**	20.48	*ns*
Wire Grass *Cynodon dactylon*	**1.62**	8.38	**0.96**	4.31	*ns*
Hay Grass *Agrostis tenuis*	**0.12**	0.88	**0.07**	0.61	*ns*
Other grasses	**4.29**	10.70	**2.55**	4.82	*(P=0.06)*
Bull Grass (rush) *Juncus capillaceus*	**4.79**	11.47	**2.36**	4.60	*P<0.05*
Monkey's Ear *Centella asiatica*	**4.52**	6.19	**4.58**	4.05	*ns*
Everlasting *Helichrysum bracteatum*	**1.80**	3.76	**1.87**	2.81	*ns*
Other herbs	**0.52**	1.19	**0.27**	0.59	*P<0.05*
Creeper *Carpobrotus edulis**	**4.05**	14.23	**3.65**	12.45	*ns*
Gorse *Ulex europaeus*	**1.63**	9.29	**0.00**	0.00	*P<0.05*
Lantana *Lantana camara*	**1.92**	6.08	**0.87**	1.90	*P<0.05*
Wild Coffee *Chrysanthemoides monilifera*	**1.15**	5.35	**0.32**	2.13	*(P=0.07)*
Prickly Pear *Opuntia* sp.	**0.16**	2.17	**0.13**	1.00	*ns*
All grasses	**70.42**	24.70	**73.89**	21.69	*ns*
All herbs	**6.84**	7.56	**6.72**	5.10	*ns*
All shrubs	**4.71**	10.82	**1.19**	2.75	*P=0.01*
Unvegetated	**8.86**	14.06	**12.16**	14.70	*P<0.05*

* includes both live plants and dead material

The average sward height within territories was 4.94cm (280 points sampled), some 3.5cm shorter than the site mean of 8.52cm (1090 points). This difference was highly significant ($F_{(1,1368)}$=119.142, P<0.001).

Five pitfall traps were deployed at randomised positions in each territory, independently of the general invertebrate survey. The components and relative abundance of the catch within each territory is presented in Table 5.13. The composition within territories was similar to that found on the Plain as a whole, with woodlice and beetles the dominant groups.

Table 5.13: Taxonomic composition and relative abundance (individuals/trap) of invertebrates trapped within 14 Wirebird territories at Deadwood Plain. Corresponding figures are also given for all territories combined (Terrs) and the entire Deadwood Plain site (DWP) during December 2005.

Order	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**T7**	**T8**
Woodlice *Isopoda*	7.8	6.6	9.8	4.0	4.2	5.4	2.6	2.0
Spiders *Arachnida*	0.6	1.0	0.2	0.6	0.6	0.2	0.4	0.0
Centipedes *Chilopoda*	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Millipedes *Diplopoda*	0.6	0.6	0.8	0.4	1.0	1.0	1.2	0.8
Crickets *Orthoptera*	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.0
Earwigs *Dermaptera*	0.4	1.2	1.4	0.8	1.4	1.0	1.0	0.4
Bugs *Hemiptera*	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.2
Beetles (adult) *Coleoptera*	4.0	7.0	5.4	1.2	2.6	1.6	3.4	2.8
Beetles (larvae) *Coleoptera*	0.0	0.2	0.0	0.0	0.0	0.0	0.2	1.0
Moths (adult) *Lepidoptera*	1.2	0.4	0.0	0.8	0.8	0.0	0.6	0.6
Moths (larvae) *Lepidoptera*	0.2	0.0	0.2	0.2	0.2	0.0	0.0	0.4
Wasps *Hymenoptera*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Flies *Diptera*	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.0
Unidentified larvae	0.4	0.2	0.4	0.0	0.4	0.0	0.2	0.2
Total	15.4	17.4	18.4	8.2	11.8	9.2	9.8	8.4

Order	**T9**	**T10**	**T11**	**T12**	**T13**	**T14**	**Terrs**	**DWP**
Woodlice *Isopoda*	9.8	2.2	1.0	4.4	3.2	1.6	4.6	7.3
Spiders *Arachnida*	0.0	0.4	0.8	0.2	0.0	0.2	0.4	0.2
Centipedes *Chilopoda*	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Millipedes *Diplopoda*	0.0	0.8	0.0	0.6	1.2	0.4	0.7	0.7
Crickets *Orthoptera*	0.2	0.0	0.0	0.0	0.2	0.0	0.1	0.1
Earwigs *Dermaptera*	0.6	0.0	0.4	0.4	0.0	0.2	0.7	0.8
Bugs *Hemiptera*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Beetles (adult) *Coleoptera*	3.4	4.8	7.6	7.2	8.4	2.4	4.4	4.1
Beetles (larvae) *Coleoptera*	0.2	0.0	0.8	0.0	0.2	0.0	0.2	0.1
Moths (adult) *Lepidoptera*	0.0	0.2	0.6	0.4	0.0	0.0	0.4	0.2
Moths (larvae) *Lepidoptera*	0.4	0.4	0.0	0.2	0.0	0.2	0.2	0.1
Wasps *Hymenoptera*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Flies *Diptera*	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0
Unidentified larvae	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1
Total	14.6	9.0	11.4	13.4	13.2	5.0	11.8	13.5

When data for all 14 territories were combine the resulting mean for catch rate for all invertebrates (11.8 per trap) was slightly lower than that for the entire site, but the difference was not significant ($F_{(1,163)}$=1.587, P=0.21). The difference between the corresponding figures for beetles (all age-classes), 4.6 and 4.1 respectively, was also not significant ($F_{(1,163)}$=0.567, P=0.45). There is therefore no conclusive evidence that prey is more abundant within territories at Deadwood Plain than at the site in general.

5.2.7 Productivity

As at Prosperous Bay Plain, levels of breeding activity among Wirebirds at Deadwood Plain appeared to be rather low at the start of the study period, relative to previous years. Only two chicks were observed and no fledged juveniles were present.

Breeding activity had been observed in nine territories by the end of the project (Table 5.14). Both of the chicks present at the start of the project had fledged successfully. Seven clutches (six of two eggs and one single egg) had been laid. Four of the clutches failed as a result of predation, one produced two chicks and incubation was ongoing at the remaining nest. Copulation had also been observed in Territory 6 (Paddock 4) where an earlier clutch was lost. No breeding activity was observed in the remaining five territories.

In none of the cases of predation could the identity of the predator be established. In all cases the eggs disappeared without any shell fragments being left in the vicinity. All affected nests were checked thoroughly for tiny shell fragments in the bottom of the nest scrape, typically indicative of hatching, and no potentially associated chicks were ever seen. The lack of egg remains suggests that the eggs were carried some distance away by the predator, which might implicate mynahs, or were consumed entirely by a mammal.

Despite the apparent shortage of immature birds at Deadwood Plain, the proportion within the population is not statistically different from that observed in December 2000, when the population was much larger.

Table 5.14: Summary of breeding activity and chick production in 14 Wirebird territories at Deadwood Plain, 18 November – 21 December 2005.

Territory	Display/Copulation	Nest	Chicks	Outcome
1	Display & copulation	2 eggs		incubation ongoing
2	no breeding activity seen			
3	no breeding activity seen			
4		1 egg	0	failed (predation)
5	no breeding activity seen			
6a		2 eggs	0	failed (predation)
6b*	copulation			
7		2 eggs		incubation ongoing
8		2 eggs		incubation ongoing
9	no breeding activity seen			
10	no breeding activity seen			
11			1	1 chick fledged
12		2 eggs		incubation ongoing
13			1	1 chick surviving
14		2 eggs	0	failed (predation)

* 2nd nesting attempt by same pair

5.2.8 Potential impact of airport development

Construction of a haul route and possibly an airport access road at Deadwood Plain would result in the permanent loss of existing Wirebird habitat currently included within nesting territories and displacement of birds occupying those territories. There would also be an increase in disturbance to Wirebirds in proximity to the haul during the construction phase both of the road and the airport itself. Other potential longer-term effects might include exclusion from otherwise available habitat by disturbance caused by regular operations, and the risk of collision with traffic. The latter seems less likely to be a problem in the case of the haul route, where most traffic would probably be relatively slow moving, but might be a more significant risk if a permanent access road were to be constructed. These issues are addressed more fully in Section 6.

At present only a very small number of Wirebirds use the area affected by the haul route, the population having declined greatly in this part of the plain in recent years (Figures 5.4 & 5.5). If current territory locations were maintained into the construction period then only two territories (T7 & T8) would be directly impacted by road construction within their boundaries and would suffer significant loss of habitat if the road were made permanent. One further territory (T5) is probably close enough (*c*100m) to the route to be subject to some level of disturbance during construction (Table 5.15, Figure 5.6).

It is assumed that the access road option would follow the line of the existing track down the centre of the Plain. If this is the case then only one, possibly two, additional existing territories would be crossed (T1 & possibly T2). Access to foraging on the existing rough track itself above Paddock 1 would be lost but core habitat on either side would remain intact. Any deviation of the route to the north-west side of the track would, however impact on one of the most heavily used Wirebird areas on the Plain, Paddock 4 and lower Paddock 5. The route would then pass through a further two territories (T4 & T6), with potential disturbance to T5). On the eastern side of the track, below Paddock 6, the paddocks adjacent to the route of the access road, Paddocks 3 and 13 currently hold no Wirebird territories. The option of a spur road through these paddocks to join the route of the haul road at the edge of Sheep Pound Gut would therefore have no impact. No Wirebirds are resident in Sheep Pound Gut at the present time.

Table 5.15: Summary of Wirebird territories potentially affected by haul route and airport access road options at Deadwood Plain (see Figure 4.6 for territory locations). Territory numbers in parentheses indicates provisional classification as the extent of the impact on these territories remains uncertain at the present time.

Airport component	Directly affected	Within 100m	Total
Haul route only	T7 T8	T6	3
Haul route and access road	T1 (T2) T7 T8	T4 T5 T6	6 (7)
Revised haul/access road	0	T1, T2, T4, T5, T6, T7	6

The original construction option minimizing the number of territories directly affected would comprise a temporary haul route only. This would affect three territories, two directly. Converting this haul route to a permanent way and adding an extension to Deadwood via the existing central track would impact upon a minimum of three additional territories and cause habitat fragmentation. A revised route passing to the

west of the pastures (see Appendix 1) would have no direct effect on Wirebird but would depending on where placed potentially cause some disturbance to Territories 1, 2, 4, 5, 6 and 7. This, however would be the optimal option in the long-term.

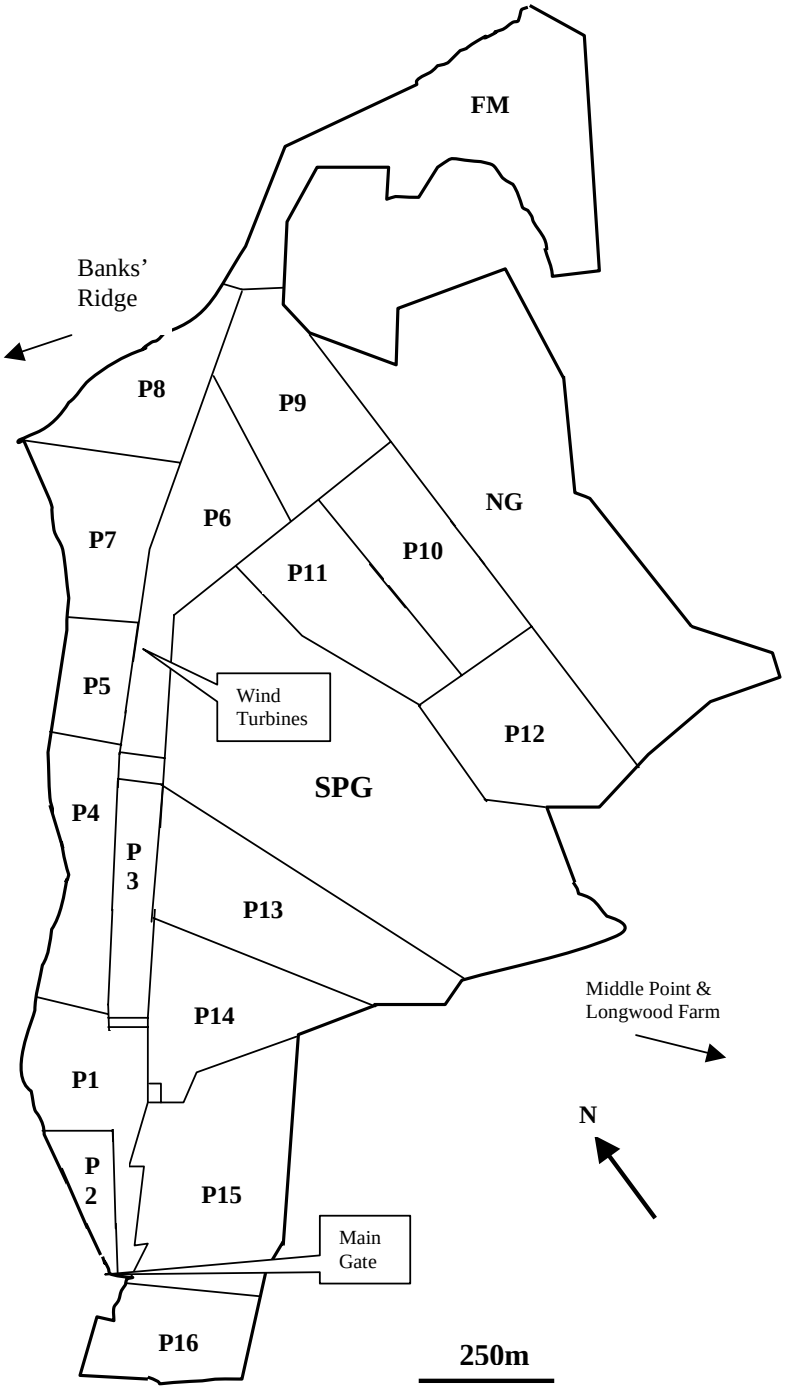


Figure 5.3: Paddock numbering system used at Deadwood Plain. FM = Flagstaff Meadow, NG = Netley Gut, SPG = Sheep Pound Gut

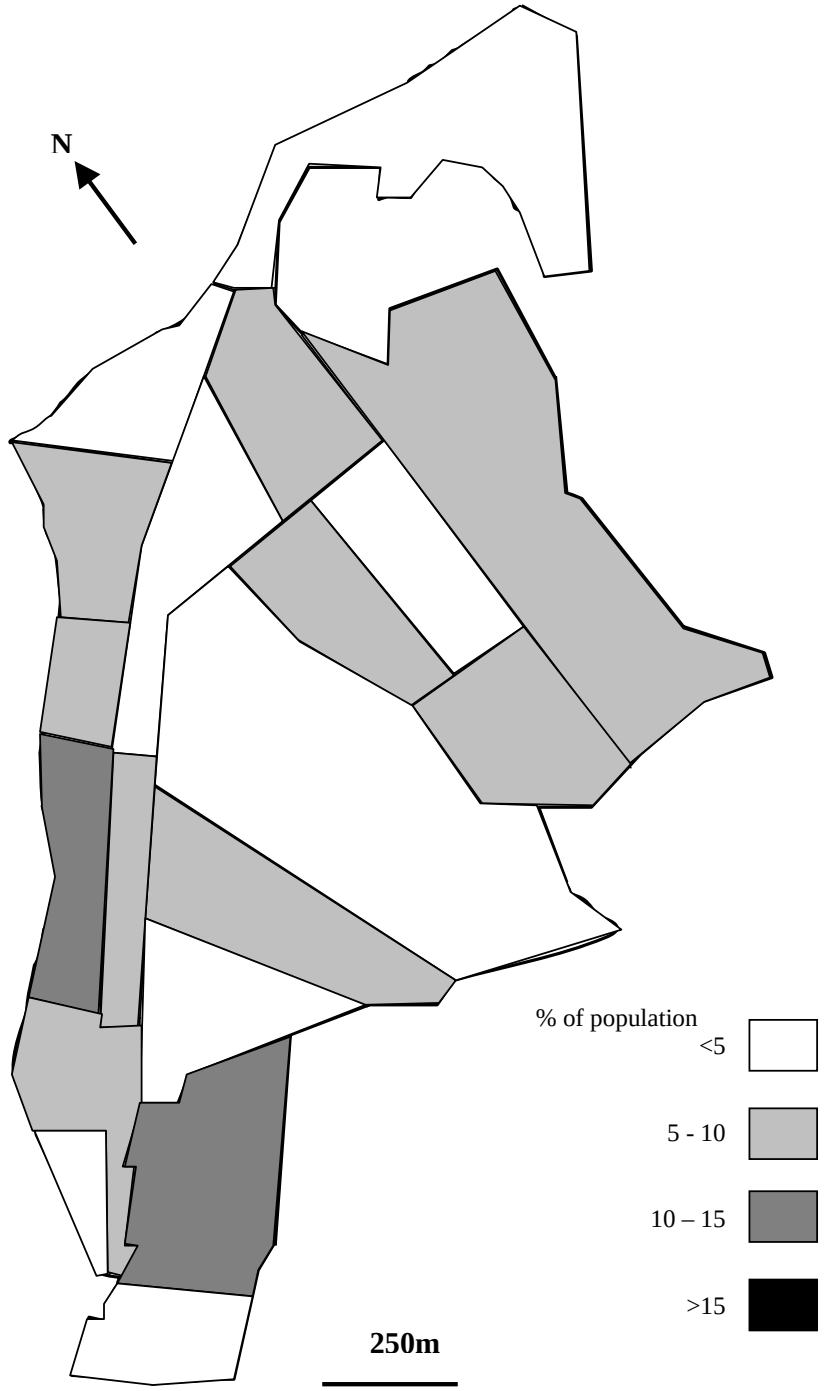


Figure 5.4: Percentage distribution, by paddock, of adult Wirebirds at Deadwood Plain, October 1999 – February 2000.

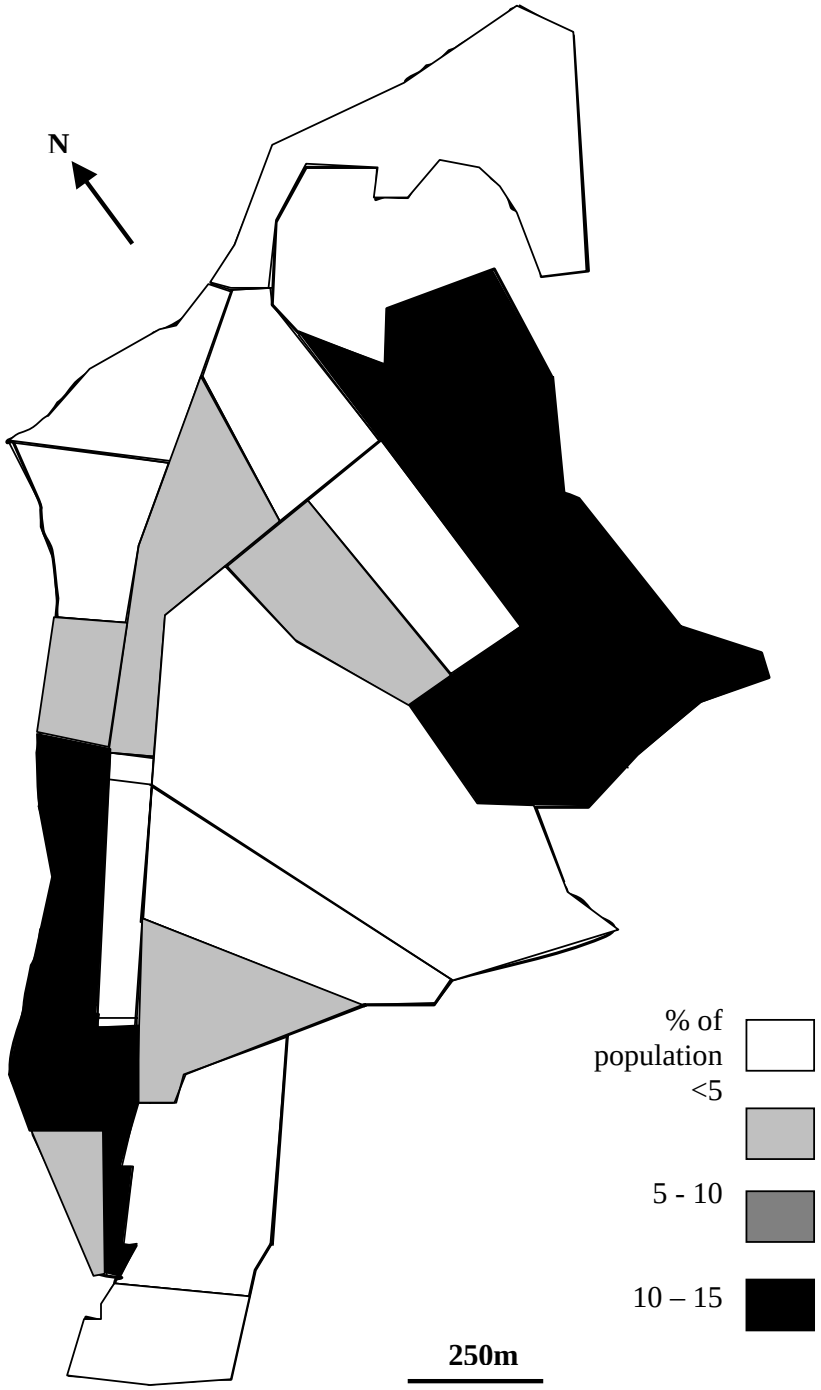


Figure 5.5: Percentage distribution, by paddock, of adult Wirebirds at Deadwood Plain, December 2005.

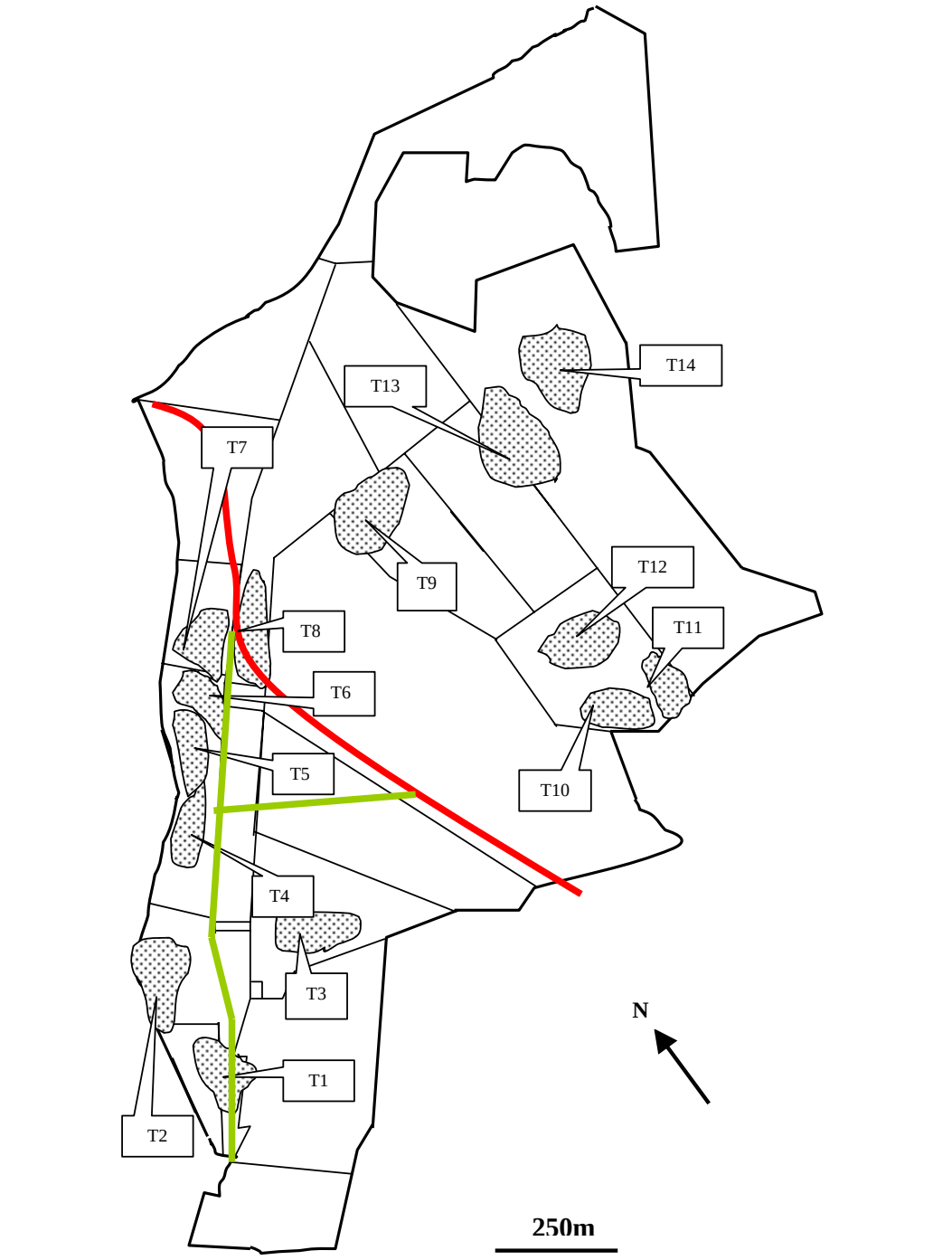


Figure 5.6: Location of Wirebird territories on Deadwood Plain, December 2005, in relation to options for haul route and airport access road.

5.2.9. Additional site-specific threats to the Wirebird

a) Predators

Cats
Deadwood Plain, particularly the lower parts, falls within the range of numerous domestic cats from the adjacent Deadwood and Longwood settlements. A population of feral cats is also established around Flagstaff Hill. These undoubtedly have some impact on the local Wirebird population. The scale of this is difficult to quantify. No evidence of cat predation on adult Wirebirds was found at the site during this study but little trace of attacks on chicks is likely to be detected and the effect on productivity could be significant. There is also a record of a cat taking Wirebird eggs. With a recent reduction in trapping effort, it is possible that cats have become more of a threat at Deadwood Plain.

Dogs
Intensive shooting campaigns during the 1990s greatly reduced the number of feral dogs on the island. In contrast to the situation in 1988-89, none of the dogs encountered at Wirebird sites during this study appeared to be truly feral. Little control is exercised over a large proportion of domestic pets, however, and these roam widely. Fewer dogs were, however, encountered wandering on Deadwood Plain during this study than in 1998-2001. Predation by dogs on Wirebirds is likely to be confined to chicks and eggs, though direct evidence is lacking. Dogs have been seen to chase adult Wirebirds but appear unlikely to catch them. The available evidence suggests that dogs are likely to be only occasional, and relatively minor, predators of Wirebirds.

Rats
Both the Black Rat *Rattus rattus* and the Brown Rat *R. norvegicus* are established on St Helena. Rats are undoubtedly present around Deadwood Plain, as they are throughout St Helena. Most are probably associated with human habitation around the southern and western margins, but droppings have occasionally been encountered around the fringes of more thickly vegetated parts of Flagstaff Hill. Rats are a potential threat to eggs, chicks and incubating adult Wirebirds and it is a matter of importance that rat control measures are maintained around Deadwood.

Mice
House Mice *Mus musculus* are present in large numbers at Deadwood Plain and, in the absence of significant predation, are active throughout the daylight hours. Their numbers appear to vary substantially over time since, however. Mouse abundance was very high during the 1988/89 study but had declined significantly by 1998. Current numbers are approaching the 1989 level. In other parts of the world mice have been found to eat the eggs of ground-nesting birds (e.g. Maxson & Oring 1978). No evidence of this was found at any of the failed nests recorded during this study, or previously, but the possibility remains.

Mynahs
Common Mynahs are frequently encountered on Deadwood Plain and their numbers appear to be increasing. A direct observation of an attack by a mynah on a newly hatched Wirebird chick was obtained at this site in 2000 and similar occurrences have

been witnessed by islanders elsewhere. It seems very possible that mynahs may have a significant effect on Wirebird productivity at this site. Their role, if any, as an egg predator requires further research. Mynahs are also the only significant avian competitor with the Wirebird for terrestrial invertebrates and they are undoubtedly an important dispersal agent for the seeds of several invasive plant species currently encroaching upon Wirebird habitat.

b) Disturbance

Regular disturbance of breeding birds by humans has been shown to result in reduced fledging success in some plover species by reducing the feeding and brooding time available to the chicks (e.g. Flemming *et al* 1988). Disturbance of Wirebirds can arise from the use of breeding areas by walkers, passage of motor vehicles and recreational activities.

The lower parts of Deadwood Plain are subject to frequent disturbance. The presence of Deadwood settlement around its southern and south-western margins results in a considerable amount of human activity daily on the lower part of the plain, much of it associated with the movement of cattle and provision of fodder. This involves both persons on foot and vehicles. Wirebirds are usually remarkably tolerant of disturbance by pedestrians. Non-breeding birds show little reaction, while those incubating will return rapidly to the nests once walkers have passed. There is no evidence that regular disturbance by pedestrians causes desertion of nests but it is not known if interruption of incubation occurs with sufficient regularity to reduce the probability of hatching.

Wirebirds are even more tolerant of vehicles and it is unlikely that these cause significant disturbance at any site. Vehicles do, however, pose a threat to nests and concealed chicks. Most vehicles on Deadwood Plain do not venture from the well-established central track, but the frequency of vehicles being taken into marginal areas, mainly for the collection of firewood, has increased in recent times. There has been a substantial increase in the use of four-wheeled vehicles and motorcycles off-road on St Helena since 1989 and the use of these for leisure activities may grow on Deadwood Plain. Though the low density of nests reduces the likelihood of their being destroyed by vehicles, such incidents have occurred at other sites and give some cause for concern.

c) Agricultural issues

Nest-trampling

The major threat posed to ground-nesting birds by livestock is that of nest-trampling. Studies of nesting waders in Holland and England have shown that trampling by cattle, at a grazing density of one cow per acre, can destroy 40% to 60% of nests (Beintema 1982, O'Connor and Shrubb 1986). Considerably higher grazing densities have occurred in some Deadwood Plain in the past. Such concentrations were, however, usually of short duration and were compensated by around 90% of the Plain remaining ungrazed concurrently. The trampling risk at Deadwood Plain appears remarkably low. Only one of the 72 Wirebird nests monitored at the site between October 1999 and March 2001 is known to have failed as a result of being trampled by cattle. It remains to be seen whether the greater freedom of cattle to wander within the Plain will have any effect on the level of trampling. Hopefully, wider ranging will be compensated by lower grazing densities.

Agricultural chemicals
The chemicals most likely to impact upon the Wirebird, through their potential effect on prey populations, are Ivermectin-based treatments for parasites of livestock. These can disrupt larval development in invertebrate species, including Coleoptera, that utilise dung. Such treatments are in widespread use on the island but, in the absence of long-term monitoring of invertebrate numbers, it is difficult to ascertain whether there is any correlation between the abundance of Wirebird prey at intensively grazed sites and levels of Ivermectin use. As limited sampling during Wirebird surveys has indicated that numbers of invertebrates in general, and beetles in particular, on Deadwood Plain have been at least maintained since 1989 it would appear that, if such a problem is occurring, it is of relatively minor effect.

5.3. Haul route and access road options

A number of options for haul routes for airport construction traffic and a permanent access road for the operational airport have been proposed. All of these run through, or adjacent to, a number of Wirebird sites in addition to Prosperous Bay Plain and Deadwood Plain. This section assesses the likely impact of these alternatives on Wirebird populations outside the latter two sites. The haul route from Prosperous Bay is covered in Section 4.1.

5.3.1. Haul routes

Route A: Rupert's Bay - Banks' Ridge (Pipe Path) - Deadwood Plain – Middle Point – Bottom Woods – Bradley's – Prosperous Bay Plain

Wirebird sites affected: Bank's Ridge, *Deadwood Plain*, Longwood Farm Pastures, Bottom Woods, Prosperous Bay North, *Prosperous Bay Plain*.

Bank's Ridge
Banks' Ridge is an arid area of low scrub and *Carpobrotus* mat on the northern fringe of Deadwood plain. Wirebirds tend to be found below the 440m contour, where the ridge forks. Thick *Opuntia* scrub forms the lower boundary of available habitat. Since 1989 Eucalypts and other scrub species planted as an erosion control measure have increased in area and density and the upper third of the ridge is now effectively woodland. This may at least partially account for the decline of Wirebirds at this site. The habitat has, however, always been marginal and the reduction in numbers here may simply reflect the smaller size of the population as a whole.

Wirebird population: One pair occupying the northern fork of the ridge.

Impact: If the haul route follows the track known as the Pipe Path this will wholly avoid the northern fork of the ridge and will not encroach upon the Wirebird territory. The latter is also far enough away from the track as to make major disturbance during construction or operation very unlikely.

Territories affected: 0

Longwood Farm Pastures

The Longwood Farm census area includes all grassland and adjacent tilled land between Longwood and Middle Point in the area bounded by Mulberry Gut and Bilberry Field Gut. Although grazing pressure has been low at this site since at least the mid 1990's, it has now been reduced to negligible levels. The sward height on the pastures has consequently increased very substantially and now averages 14.7cm (s.d. 5.8, 150 samples). Most of the area is now, therefore, unsuitable for Wirebirds. Since the lowest pasture at Middle Point was used as a dumping site for spoil from reservoir excavation in 1988 it has remained ungrazed. The soil heaps, formerly favoured as nesting sites by Wirebirds have become overgrown. Trees have been planted on approximately a quarter of this area and vegetation has become tall and rank or overrun by Creeper throughout the remainder, resulting in its abandonment by Wirebirds. Scrub invasion, especially by *Lantana* and *Juniperus*, is also becoming significant in the easternmost of the remaining Middle Point paddocks.

Wirebird population: Only two adults were observed during the census in an area of broken sward along the fence dividing the pastures from Middle Point. These birds were subsequently found not to be holding territory at the site but appeared to be dividing their time between Longwood Farm and Paddock 15 of Deadwood Plain.

Impact: There are two options for the haul route at Longwood Farm. The upper route follows the fence dividing the pastures from Middle Point. This would encroach upon the area in which the remaining Wirebirds were observed foraging. The alternative, lower, route would pass around the outer edge of the derelict pasture at Middle Point where no Wirebird activity has been observed recently.

Territories affected: 0. (Possibly some loss of marginal foraging habitat)

Bottom Woods

Formerly an area of very dry pasture with relatively sparse vegetation containing a high proportion of broad-leaved weeds, Bottom Woods has been the Wirebird site worst affected by habitat degradation since 1989. While grazing pressure in the past was necessarily relatively light, it has now been reduced to single figure numbers of sheep, goats and donkeys confined to the uppermost part of the site. This has allowed encroachment of scrub vegetation on a very large scale, with *Opuntia* and *Lantana* predominant. Extensive areas of *Carpobrotus* mat have also become established. A summary of current Vegetation composition at the site and a comparison of that within combined Wirebird territories is presented in Table 5.16. Table 5.17 summarizes the vegetation composition and sward height within the each of the territories at this site.

The area available to Wirebirds at Bottom Woods has also been reduced by development. A small reservoir, a series of irrigated agricultural terraces and a number of small livestock units (the latter have subsequently been removed) were constructed within the site during the early 1990s. Few of the terraces are currently in regular use and have become completely overgrown with rank vegetation. The upper end of the site is being progressively surrounded by housing development, with a consequent increase in disturbance. Further habitat loss has occurred on the southern margin of the site, where scrub planted for erosion control has increased in density and covered former feeding and occasional nesting areas. Bottom Woods supported over 40 Wirebirds during 1989

at the highest density on the island. The population at the site has since declined by around 85%.

Table 5.16: Comparison of mean percentage cover of principal vegetation and substrate components between Deadwood Plain as a whole (randomly sampled, 90 quadrats) and combined samples from nine Wirebird territories (20 quadrats).

	Bottom Woods site		**Territories**		
Species/Group	**Mean %**	**s.d.**	**Mean %**	**s.d.**	**Diff.**
Wire Grass *Cynodon dactylon*	**22.01**	24.96	**42.25**	36.59	*ns*
Atriplex semibaccata	**16.07**	15.84	**3.45**	4.97	*P<0.001*
Creeper *Carpobrotus edulis**	**33.31**	29.12	**13.70**	27.70	*P<0.01*
Prickly Pear *Opuntia* sp.	**1.04**	4.61	**0.00**	0.00	*ns*
Lantana *Lantana camara*	**3.02**	7.15	**0.65**	2.30	*ns*
All Grasses	**23.79**	25.81	**42.65**	36.55	*P<0.01*
All Herbs	**16.16**	15.95	**4.15**	5.20	*P<0.01*
Unvegetated	**17.52**	17.52	**38.10**	33.22	*P<0.001*
Sward height (cm)	**8.22**	4.25	**5.58**	3.01	*P<0.001*

* includes both live plants and dead material

Table 5.17: Mean percentage cover of principal vegetation and substrate components, and mean sward height, from Wirebird territories at Deadwood Plain. (Ten 0.25m^2 quadrats and 20 sward heights sampled per territory).

Species/Group	**T1**	**T2**
Wire Grass *Cynodon dactylon*	37.20	47.30
Other grasses	0.50	0.30
Atriplex semibaccata	4.90	2.00
Other herbs	0.90	0.50
Creeper *Carpobrotus edulis**	3.00	24.40
Lantana *Lantana camara*	0.30	1.00
Mosses	1.40	0.10
Dung	1.30	0.20
Rock	0.00	0.20
Bare earth	50.50	24.00
All grasses	37.70	47.60
All herbs	5.80	2.50
All shrubs	0.30	1.00
Unvegetated	51.80	24.40
Sward height	5.92	5.25

* includes both live plants and dead material

Wirebird population: Five adult and one juvenile Wirebirds were found during the census. The two territorial pairs were confined to the upper, grazed third of the site despite high levels of disturbance (Figure 4.7). A comparison between the vegetation composition and sward height of the territories and those of the site as a whole is presented in Table 4.16.

Impact: As at Longwood Farm, there are two options for the haul route at Bottom Woods (Figure 5.7). The lower route passes along the northern fence line to join the existing road at the Weather Station. This would avoid crossing either Wirebird territory, though Territory 1, and probably Territory 2, would be close enough to experience some disturbance during construction. The upper route would follow the outer margin of Longwood Farm, entering the Bottom Woods paddocks at the north-west corner and curving eastwards through Territory 2 to meet the existing main road from Longwood. Territory 1 would also be affected by disturbance during the construction of this option.

Territories affected: Upper option – 1 direct, 1 indirect. Total 2
Lower option – 2 indirect

Prosperous Bay North
This is a heavily gullied semi-desert site dominated by *Carpobrotus*, *Suaeda* and *Opuntia* and Wirebirds have formerly been found throughout the area on broad ridges and shallow slopes. The western end of the site, around Bradley's, has seen a marked decline in usage by Wirebirds in recent years.

Wirebird population: Only one territorial pair was found during the census, at a distance of around 600m from the haul route.

Impact: The haul route would cross the extreme western end of the site via the existing road past Bradley's to Cook's Bridge. This road would have to be replaced, however, and disturbance generated by construction would be inevitable.

Territories affected: 0

Route B ("revised route"): Rupert's Bay - Banks' Ridge (Pipe Path) - Deadwood Plain periphery – Fisher's Valley – Prosperous Bay Plain

Wirebird sites affected: Bank's Ridge, *Deadwood Plain*, Fisher's Valley, *Prosperous Bay Plain*.

***Bank's Ridge*:** (see Route A above)

Deadwood Plain periphery:
(see Sections 5.2.2. for site description and 5.2.4 for Wirebird population)

Impact: This revised option avoids crossing the pastures at Deadwood Plain by utilising the existing metalled road servicing dwellings on the western edge of the plain. No Wirebird territories would be lost or encroached upon by this option. Disturbance during any improvement of the existing track would affect six territories but the birds holding these territories are unlikely to be adversely affected during operation of the route as they are already habituated to the passage of traffic.

Territories affected: 0 direct, 6 indirect. Total 6

Fisher's Valley:
Most of this area consists of severely eroded hillsides with extensive gully systems amongst which Wirebirds occasionally forage, though no evidence of nesting has been found. The valley bottom has a narrow strip of pasture on which Wirebirds have previously held territories. Since 1989 there has been a small increase in scrub cover on the gullied areas, mainly as a result of anti-erosion planting. During 1988-89 small pools at Cook's Bridge provide a bathing and drinking site, which was heavily used, predominantly by non-resident juvenile Wirebirds. By 1998 these had dried up completely, apparently as a result of increased water abstraction higher up the valley. A rough track follows the northern edge of the valley floor between the bottom of Longwood Hangings and Cook's Bridge.

Wirebird population: During this study 2 adult and one juvenile Wirebirds were observed in the Fisher's Valley pastures. The adults were widely separated, however, and there was no indication of territoriality.

Impact: In most of the pastures the sward height is currently taller than is ideal for Wirebirds but the large central paddock still contains some areas that appear suitable. If the access road follows the existing valley track, this potential nesting habitat would remain intact.

Territories affected: 0

Route C: Turk's Cap Bay - Weather Station – Bradley's – Prosperous Bay Plain

Wirebird sites affected: Longwood Erosion Zone, Weather Station Ridge, Bottom Woods, Prosperous Bay North, *Prosperous Bay Plain*

Longwood Erosion Zone
This site comprises an extensive area of heavily eroded slopes and ridges lying between the pasturelands of Longwood Farm and Bottom Woods and Turk's Cap Valley. Nesting occurred at very low density, mainly above 350m, during 1988-89 but subsequent growth of scrub and dense *Carpobrotus* has rendered many former nesting areas unsuitable. No evidence of nesting was found at this site during the present study. A road into the area was constructed to service a small quarry during the 1990s, increasing levels of disturbance. Quarrying operations in this area appear now to have ceased and the road is little used.

Wirebird population: No adult Wirebirds were found at this site. A small flock of five juveniles was observed but these are unlikely to have remained resident in the area.

Impact: None.

Territories affected: 0

Weather Station Ridge
Weather Station Ridge is a relatively shallow slope running east from the meteorological station at Bottom Woods. Although sharing the same vegetation type and climate with the Longwood Erosion Zone the ridge supports Wirebirds more regularly, probably

because it is, on average, less steep. This site has also been affected by the construction of the quarry access road mentioned above and by increased vehicle movements associated with collection of building stone from the ridge itself. An additional track now gives access to the entire length of the ridge and the area immediately below. The recent decline in Wirebird numbers may also be related to the gradual spread of scrub and *Carpobrotus* on the upper half of the ridge since 1989.

Wirebird population: Two adults and a juvenile were present in December 2005. The adults were widely separated on an extensive sandy area on the lower slope below the point at which the quarry track turns towards Turk's Cap Valley. It could not be determined whether these birds were paired.

Impact: If the haul route follows the former quarry track then there would be little or no encroachment on a territory centred on the area where the adults were observed. This is however within the range of potential disturbance during construction.

Territories affected: Possibly 1 indirect.

Bottom Woods
See Route A (upper option) above.

Impact: Route utilises existing road on eastern boundary of site.

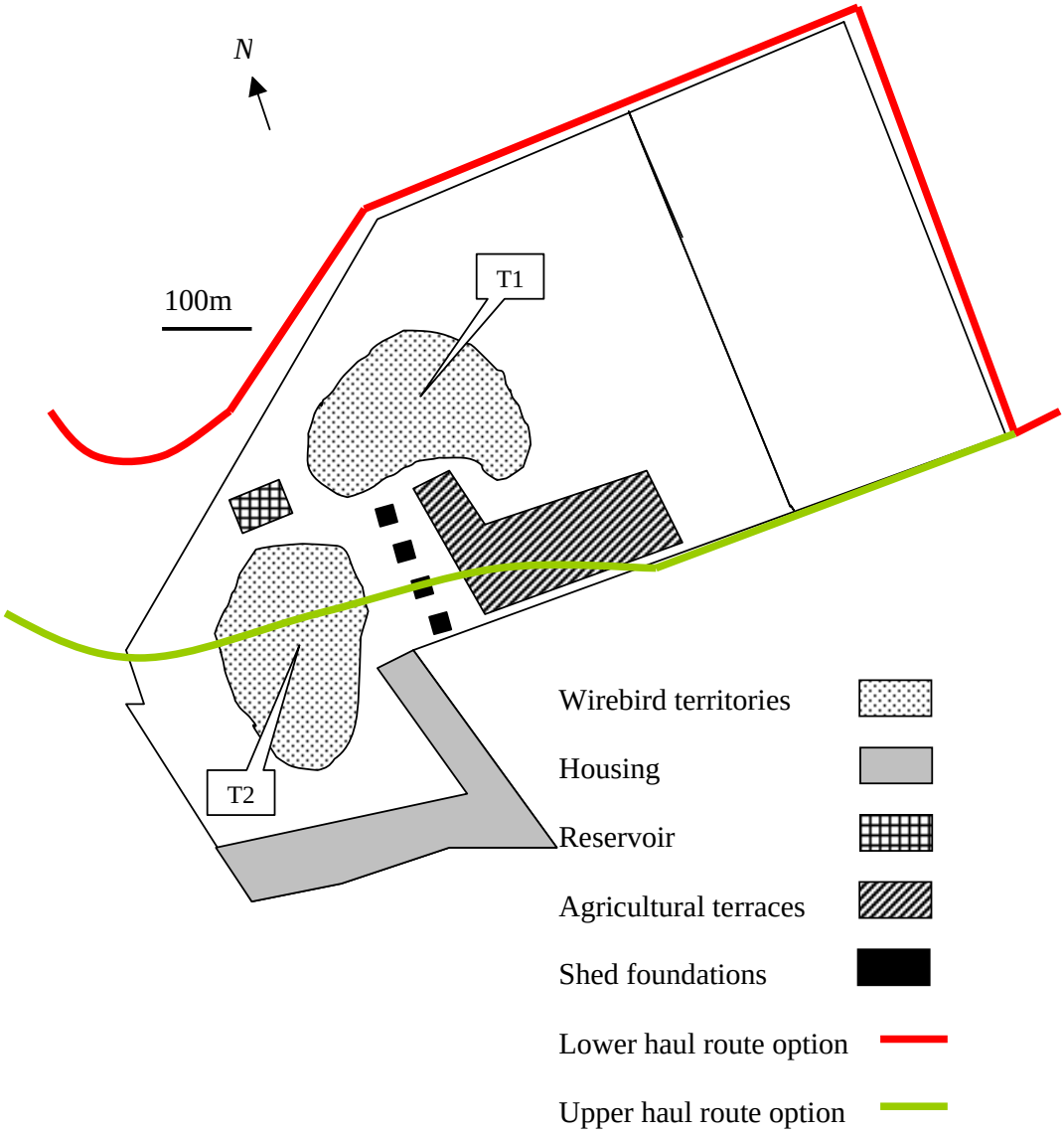
Territories affected: 0

Prosperous Bay North
See Route A above.

Impact: Route utilises existing road via Bradley's on western margin of site.

Territories affected: 0

Figure 5.7: Location of Wirebird territories at Bottom Woods in relation to haul route options.



5.3.2. Access Road

Route 1: Woody Ridge – Prosperous Bay Plain

Wirebird sites affected: Woody Ridge, Upper Prosperous Bay, *Prosperous Bay Plain*

Woody Ridge
This site comprises a narrow strip of pasture extending for approximately 1.5km below Woody Ridge Mill. Wirebirds are found mainly around the eastern, dryer, end of the ridge in the area known locally as Barley Field and on the northern flank of the ridge.

Much of the southern side of the ridge is steeper than is ideal for Wirebirds, as is most of the pasture below the main Levelwood road. Since 1989 the small, previously cultivated area at Woody Ridge has been returned to pasture and grazing has switched from sheep to cattle. *Lantana, Carpobrotus* and Bull Grass have become established in the lower parts of the pasture but grazing pressure has recently been substantially increased and a large increase in the Wirebird population has resulted.

Wirebird population: The census detected 24 adult Wirebirds and 1 juvenile at Woody Ridge, all in the Barley Field. The total included six territorial pairs, the remaining adults did not display obvious territorial behaviour. Four of the territories were located on the northern side of the ridge, close to the existing track to Prosperous Bay Plain.

Impact: If the access road follows the existing track it would avoid almost all suitable Wirebird habitat other than a small area at the bottom of the steep field leading down from the main road. The remainder of the track is separated from the Barley Field by a steep, relatively thickly vegetated bank, which screens the four territories on that side of the ridge. These would probably be subject to some degree of construction disturbance, however.

Territories affected: 4 indirect

Upper Prosperous Bay
This large, *Carpobrotus*-dominated arid area lies to the south-west of Prosperous Bay Plain, between Fisher's Valley and Shark's Valley. The lower limit of the census area is approximated by the 320m contour and the upper limit by scrub at around 450m. The majority of Wirebirds occur on the ridge forming the southern side of Fisher's Valley and in the upper parts of Dry Gut. Usage by Wirebirds of the Opuntia-dominated lower parts of this ridge has gradually declined since 1989. The ridge separating Dry Gut from Prosperous Bay Plain is included in the airport site and is covered in Section 5.1.

Wirebird population: 17 adult Wirebirds and 1 juvenile were found in the portion of Upper Prosperous Bay outside the airport site. Only two of these, a pair holding territory on the northern flank of the ridge leading to Prosperous Bay Plain, above the track to Fisher's Valley were close enough to the route of the access road to possibly be affected

Impact: The above territory is a borderline case for disturbance during construction.

Territories affected: 1 indirect

Route 2: Hutt's Gate – Longwood Hangings – Fisher's Valley – Prosperous Bay Plain

Wirebird sites affected: Fisher's Valley, Prosperous Bay Plain

Fisher's Valley: (see Section 5.3.1.)

Territories affected: 0

Route 3: Longwood Gate - Longwood Hangings – Fisher's Valley – Prosperous Bay Plain

Wirebird sites affected: Fisher's Valley, *Prosperous Bay Plain*

This route varies from Route 2 above only in its starting point.

Territories affected: 0

Table 5.18: Summary of numbers of Wirebird territories potentially affected by construction options for haul routes and an access road for the St Helena Airport. Numbers apply only to territories outside Prosperous Bay Plain and Deadwood Plain. Direct effect = route passes through territory; indirect effect = territory within 100m of route, potentially subject to disturbance. Figures in parentheses in the "Direct" column refer to territories where direct effect is uncertain. These are included in "Indirect" figure. Parentheses in the "Indirect column" refer to unconfirmed territories.

a) Haul routes

Start point	Direct	Indirect	Total
Rupert's Bay (upper)	1	1	2
Rupert's Bay (lower)	0	2	1
Rupert's Bay (revised)	0	0	0
Prosperous Bay	0	0	0
Turk's Cap Bay	0	(1)	(1)

b) Access roads

Start point	Direct	Indirect	Total
Rupert's Bay revised	0	0	0
Hutt's Gate	0	0	0
Longwood Gate	0	0	0
Woody Ridge	0	4 (5)	4 (5)

6. Mitigation of effects of airport construction on the Wirebird

Potential negative impacts of airport construction on birds fall into three principal categories:

- Habitat loss
- Disturbance
- Collision

6.1. Habitat loss

Habitat loss occurs as a result of birds being excluded from formerly utilized habitat as a result of, erection of large structures, modification of vegetation and/or soil characteristics within the site boundary. Exclusion may be a consequence of removal of feeding, nesting or roosting opportunities resulting from the above. Habitat loss may be either temporary or permanent.

6.2. Disturbance

Disturbance may be defined as the result of factors associated with the operation of an airport acting in such a way as to cause a lower or less efficient level of usage of the site by birds than that prior to the construction of the facility, despite the continued existence of suitable habitat on the site. The main potential causes of disturbance are the noise and motion of vehicles (especially during the construction phase) and aircraft, increased human activity on the site and reduction of feeding or nesting opportunities as a result of habitat modification. Reduction of feeding opportunities can occur through either decline in food abundance or decline in availability as a result of habitat modification. The consequences of disturbance for local Wirebird populations fall into two categories: a) total or partial avoidance of the affected area (habitat deterioration); b) reduced breeding and/or feeding success within the affected area (behaviour alteration).

6.3. Collision

The risk of collision with aircraft during landing or take-off is commonly perceived as the greatest threat posed to birds by the establishment of an airport, although both habitat loss and disturbance may often have more serious effects. It is impossible, at the present time, to quantify the collision risk at the selected site. Given the probable low frequency of aircraft operations and the relatively low density of Wirebirds at Prosperous Bay Plain, the risk appears small. There may also be a small risk of collision with motor vehicles and airport structures such as fences.

6.4. Possible consequences for the Wirebird population

Construction of an airport for St Helena will unavoidably involve significant negative impact on the Wirebird population. The project design process should, ideally, seek to minimize this. The major negative consequences would be large-scale disturbance during the construction phase and permanent loss of habitat within the runway site

leading to displacement of a proportion of the population and possibly degradation of neighbouring habitat. The latter could occur either physically (through reduction of feeding or nesting opportunities resulting from changes in substrate or vegetation, or from contamination) or as a result of increased disturbance associated with operation of the airport.

Wirebirds are often remarkably tolerant of disturbance but no population of the species has ever been subjected to disturbance on a scale that would be incurred during airport construction. The long-term effects are therefore unpredictable. It seems likely, however, that Wirebirds would habituate fairly rapidly to low-frequency aircraft operations, given the lack of a negative response by the species to the construction of wind turbines on Deadwood Plain. The Wirebird's closest relative, Kittlitz's Plover, frequently nests on or around bush airstrips in Africa and, as stated above, the likelihood of seriously high mortality occurring as a result of collisions with aircraft is low.

The problems that would be caused by permanent loss or degradation of habitat have potentially greater consequences for the future of the Wirebird. The species has been in decline over the past 15 years (McCulloch & Norris 2002). The results of the present study demonstrate that the rate of decline has accelerated during the past five years. Evidence suggests habitat degradation to have been a major factor in this decline (McCulloch & Norris 2001, this study). If this is indeed the case then there can be little spare habitat suitable for successful breeding currently available on the island. Birds displaced from the airport site, although they would probably survive, would be unlikely to contribute many progeny to the future breeding population. This would almost certainly lead to a further decline in numbers. At around 200-220 adult individuals the Wirebird population is vulnerable to chance catastrophes such as disease and climatic events. Every reduction in the population reduces its potential resilience to such events. Very small populations may also be subject to adverse genetic effects. As it can be safely predicted that airport construction will not be the only development to encroach upon current Wirebird habitat in the future, especially if a successful tourism industry is established on St Helena, it is essential that the former is carried out in such a way as to minimize the number of birds displaced.

6.5 Mitigation measures

6.5.1. Prosperous Bay Plain

The design of the airport construction project should seek to minimize the amount of Wirebird habitat at Prosperous Bay Plain that is permanently lost. Under current plans this would amount to four entire territories and parts of at least two others being lost. Unfortunately, physical constraints upon the layout of the runway preclude any flexibility in the positioning of the major components of the development (i.e. runway and terminal. The main opportunities for mitigation at this site will therefore be in minimizing the footprint of ancillary structures, including roadways, and in restoration and improvement of existing habitat.

The access and plant haul routes should minimize both additional land-take within territories and the number of territories exposed to serious disturbance. The haul route option from Prosperous Bay would be ideal in this context as it passes only through

territories that would be unavoidably destroyed by runway and terminal construction. This option may, however, be less favoured because of potentially adverse landing conditions for equipment at Prosperous Bay and the engineering difficulty associated with the route. If the Prosperous Bay route was found to be unfavourable, a combined haul/access route from Cook's Bridge is recommended as this would only affect one territory in addition to those impacted by construction of the main components. The access option from Woody Ridge would affect one more territory directly and probably cause disturbance to at least a further four.

The footprint of the development, including roadways, should be minimized by restricting the movement of plant, other vehicles and the workforce to clearly marked zones. These should be as small as is feasible for efficient working and should be strictly enforced. Great care should be taken to avoid spillages of toxic materials at the site, or anywhere within Prosperous Bay Plain, and any contamination should be cleaned up immediately.

The principal potential areas for habitat restoration and improvement include the runway apron, the ridge carrying the access road and, if the slope is sufficiently shallow to be attractive to Wirebirds, the fill embankments associated with the runway. These should ideally have a mixed substrate of gravel and sand and be planted with *Eragrostis cilianensis, Suaeda helenae* and *Atriplex semibaccata* as the principal species. This plant community already exists in patches on the western ridge but will probably require some restoration after the construction phase. The opportunity should also be taken to extend this habitat by removing the existing cover of *Carpobrotus edulis* and re-planting with the above species. It would probably be best to carry out creeper removal as a gradual process to prevent any large-scale wind erosion of the exposed substrate. It is also recommended that the access route on the western ridge does not follow the existing track line exactly but is re-aligned closer to the edge of the Prosperous Bay Plain basin. This would allow the establishment of the greatest possible extent of unbroken Wirebird habitat on the ridge. Any extensive planting of grass for amenity purposes around the terminal would possibly provide additional foraging, and perhaps nesting, opportunities for Wirebirds. Removal of Prickly Pear from the area around Territory 9 (see Section 5.1) at the foot of the track to Woody Ridge would also be of probable benefit to the species.

Any new fences, power lines and guy lines within the Prosperous Bay Plain area should be fitted with streamers to enhance visibility and reduce the risk of birds colliding with these unfamiliar structures, especially under poor lighting conditions. Any security fence around the runway would ideally have a mesh size at its base that would allow passage of Wirebird chicks and thus maximize foraging opportunities.

The Prosperous Bay Plain basin should be fenced to prevent access by unauthorised vehicles.

6.5.2 Deadwood Plain

Deadwood Plain holds the largest single population of Wirebirds. Although the rate of recent decline here has reduced its importance relative to other sites, Deadwood is still a very significant site and has the greatest potential for restoration of Wirebird habitat.

Measures should therefore be taken to minimize any negative effects associated with the airport project.

It is possible that Deadwood Plain will be crossed by at least a temporary haul route for plant and materials landed at Rupert's Bay. If the haul route goes across Deadwood Plain, it would affect three current Wirebird territories, two directly. Although haul route construction would result in relatively little land-take on the Plain itself, permanent habitat fragmentation would be caused, which would have long-term implications for the Wirebird, unless the route is temporary. The route could be restored if not converted to a permanent way.

As at Prosperous Bay Plain, the aim during the construction phase should be to minimize the area affected. This should be achieved out by marked zoning of access areas for vehicles and workforce. It is important that grazing should be maintained over a large proportion of the site, to maintain habitat conditions for Wirebirds, while work is progress. The area from which cattle are excluded should therefore be minimized.

Spillages of noxious materials should, again, be avoided and clear procedures for rapid clean-up of any such incidents should be established. It is possible that physical consequences of construction may affect the availability of invertebrate prey at the site after work is concluded. This is most likely to come about through soil compaction from the use of heavy machinery and should be rectified by harrowing or rotivating at the end of the construction phase, when the habitat should be restored to a condition as close to that optimal for use by Wirebirds as possible.

The main nesting season for Wirebirds at Deadwood Plain is from October to February. Ideally, construction work should be undertaken outside this period.

Establishment of a permanent access road on Deadwood Plain, following the line of the existing central track, is not recommended as this would result in disruption and disturbance to at least seven current Wirebird territories. These support half the breeding population at this site. Habitat loss within the construction footprint would be permanent and disturbance would be increased by improved vehicle access to the area.

It is uncertain as to how many vehicles would use an access road on Deadwood Plain as it seems unlikely that many motorists would choose to travel from Jamestown to Longwood via Rupert's Valley and the new road rather than use the existing main road, which is more direct. Any increase in vehicle movements on the Plain, especially as they would be travelling at greater speed on a metalled surface, is likely to present some risk of collision between Wirebirds and vehicles. There may be a particular danger to chicks crossing the road between fragmented areas of foraging habitat. Ease of access may also result in increased leisure use of the area, leading to more disturbance.

It is therefore recommended that, if the haul route option from Rupert's Bay is selected, only a temporary road is constructed across Deadwood Plain and that the affected Wirebird habitat is restored at the end of the project. Long-term adverse affects to the site could, however, be avoided by adoption of the revised route from

Rupert's Bay (see Appendix 1), which follows an existing road outside the pastures at Deadwood. The latter would be the ideal option.

6.5.3. Haul/access routes outside main sites

There are two options for the haul route from Rupert's Bay, as initially proposed, after it leaves Deadwood Plain and enters the Wirebird sites of Longwood Farm and Bottom Woods. The upper option passes along the boundary between Longwood farm pastures and the derelict former Wirebird area at Middle Point. This area is still used sporadically for foraging by Wirebirds, though no evidence of breeding was found during this study. The same option passes through the upper portion of Bottom Woods paddocks, encroaching upon one of the Wirebird territories there and probably causing significant disturbance to the other. The lower option follows the outer perimeters of both Middle Point and Bottom Woods and there avoids all areas used by Wirebirds at both sites, though one territory at Bottom Woods might be subject to some disturbance. Both routes then follow an identical track to the airport, encountering no further Wirebird territories until Prosperous Bay Plain. The lower option should therefore be used if the original Rupert's Bay haul route is selected. The revised haul access route from Rupert's Bay via the western edge of Deadwood Plain and Fisher's Valley avoids direct impact on Wirebird sites at Deadwood, Longwood Farm and Bottom Woods entirely.

The haul route option from Turk's Cap Bay would have little effect on Wirebirds as it does not impact on any confirmed Wirebird territories before reaching Prosperous Bay Plain. This route would rank second in preference to that from Prosperous Bay if found feasible on engineering grounds.

Either of the access route options from Hutt's Gate or Longwood Gate, via Fisher's Valley, would cause little disruption to Wirebirds as long as the pastures within Fisher's Valley were maintained. No territories were found in the valley but Wirebirds still forage there and future nesting cannot be ruled out. A road following the existing track through the valley would avoid the pastures. These options would be preferable the potentially more disruptive access route from Woody Ridge (see Section 6.5.1).

The recommended combination of haul route and access road to minimize impact on the Wirebird population would be:
Haul route – Prosperous Bay
Access Road – Hutt's Gate/Longwood Gate via Fisher's Valley

In the event of neither of the eastern haul routes being feasible, the revised Rupert's Bay route via the western edge of Deadwood Plain and Fisher's Valley is recommended.

6.5.4 General mitigation

The most effective means of ensuring that the airport project does not have a deleterious effect upon the Wirebird is to ensure that the status of the species generally is satisfactory. At present this is manifestly not the case, with the species having undergone a 40% reduction over the past five years. Previous studies have shown that the highest Wirebird densities occur on St Helena's drier grassland and it

is ultimately the maintenance of these areas in suitable condition that will ensure the survival of the species (McCulloch 1992, McCulloch & Norris 2002). Degradation of Wirebird habitat within the pasturelands has been occurring since at least 1990 and, as this study has shown, has accelerated recently. Restoration of grassland sites close to the airport would both provide a refuge for birds displaced by construction work and go a long way towards stabilizing the population as a whole.

The sites that should be targeted include Deadwood Plain (including Flagstaff Meadow), Longwood Farm pastures (including Middle Point) and Bottom Woods. Restoration measures should include clearance of scrub and other invasive species such as creeper. All cut material should be removed from the site. Scrub clearance on St Helena usually consists of cutting and then leaving the material where it falls. This is not acceptable as it results in little net gain in foraging habitat, especially if woody species are involved, as decomposition rates tend to be slow and can be a source of re-growth. In areas like Middle Point and Bottom Woods, which are heavily overgrown, the possible presence of machinery associated with road construction may provide an opportunity for large-scale clearance by mechanical means. Trees planted on the lower part of Middle Point during the 1990s should, ideally, also be removed. These measures should be followed up rapidly by re-planting with suitable species.

Sward height is a critical factor in determining usage by Wirebirds, with areas taller than 5cm generally being avoided. It is therefore critical that areas cleared of invasive species are maintained at a suitable height by grazing, or possibly mowing, especially during the October-February period. On Deadwood Plain and the Longwood Farm pastures it is essential that livestock numbers are increased, fences repaired and a rotational pattern of grazing restored. Given the currently low economic return on livestock production within St Helena, it is unlikely that many grazing syndicates or individual graziers would be willing or able to increase stocking densities or hire additional manpower for adequate control of invasive plant species. It is recommend that the possibility of obtaining external funding to establish a subsidy scheme to assist with increasing stock, provision of dry season fodder, maintaining fences and controlling scrub at key sites, especially Deadwood Plain.

All Wirebird sites supporting at least 5% of the total adult population should have effective formal protection restricting inappropriate land use and activities. At the present time many sites, including all of those in the Crown Wastes, receive some degree of protection under existing legislation, particularly under the Forestry Ordinance (1954). The current measures may, however, need to be reviewed in the light of better understanding of the Wirebird's environmental requirements. Previous studies have suggested that Deadwood Plain, in addition to supporting the largest single population of Wirebirds, may be of disproportionate importance to the survival of the species in terms of its productivity. It is therefore essential that this site is fully protected. Designation of the site as an equivalent to a UK Site of Special Scientific Interest would probably be the most appropriate action, as this would require the implementation of recommended habitat management practices by those using the site in addition to preventing inappropriate use. The appointment of a site manager with experience of habitat restoration, to oversee grazing and related matters to the benefit of the Wirebird, in co-operation with the graziers, would also be a positive step.

Although predation upon the Wirebird cannot currently be quantified it appears likely that this is increasing, with cats and mynahs probably the main predators. Regular trapping of feral cats should be re-instated in areas where this was formerly practiced and should also be extended to areas where cats are known to be concentrated such as the dump at Horse Point Plain and the Gill Point area. Research should be carried out into the distribution of feral cats and any additional “hot spots” targeted by trapping, particularly where these are close to major Wirebird sites. Neutering of domestic cats should be strongly encouraged.

Common Mynahs are known to be at least occasional predators of Wirebird chicks and may be significant egg thieves, at least in some areas. The species is also one of the main dispersal agents for invasive alien plants such as *Lantana* and *Opuntia*. The mynah population on St Helena is now very large and appears to be still increasing. Given the mobility of mynahs and the relative inaccessibility of much of the island, it is unlikely that any attempt to eradicate the species would be successful. It is, however, recommended that a mynah control programme is initiated with a view to reducing numbers substantially and preventing subsequent recovery. In view of the mynah’s role as an agricultural pest, such measures are likely to prove popular with the majority of islanders. Overseas expertise should ideally be sought at the planning stage of any major control programme.

7. A conservation strategy for the Wirebird

The Wirebird is a unique species. It is the last remnant of the once-rich diversity of birds native to St Helena and is one of the rarest birds in the world. No other member of its family has such a small range. Between 2001 and 2006 the adult Wirebird population appears to have undergone a dramatic decline of some 43%. The risk of extinction has, therefore, increased substantially over the last five years.

A number of threats to the Wirebird require to be addressed. It now seems unlikely that a full recovery to 1989 levels will be attainable, as habitat quality has declined at the majority of breeding sites and appears in danger of doing so at many others. The present study, and that carried out in 1998-2001 have indicated that habitat loss is now probably the single most important threat to the continued existence of the Wirebird. The numbers of mammal predators, particularly cats, also appear to be greater now than they were during the previous study. The continuation and intensification of control measures is essential to prevent a resurgence of all potential mammalian predators. Robbing of Wirebird nests by Common Mynahs has yet to be proved, but there is strong circumstantial evidence that this occurs. Predation of chicks by this species is known to occur. The limited data obtained during this study suggests that the reproductive output of Wirebirds (per pair) remains similar to that encountered during the previous study but current recruitment levels are unknown. These may well decline if the populations of mynahs and other predators continue to increase. It is possible that a number of Wirebird sites will come under threat from development in the future as attempts are made to improve economic conditions on St Helena and the infrastructure of a tourism industry is established. It is important that procedures are put in place to ensure that such developments are fully assessed and impacts ameliorated as far as possible.

Aside from any aesthetic or ethical considerations, the Wirebird is of value to St Helena in terms of the island's unique identity and heritage and constitutes a significant tourism resource. It is also important to the wider community in the fields of biodiversity conservation and evolutionary biology. Successful conservation of the species in the long term will depend on all factors affecting its biology being taken into account and this will be best implemented by agreement of a broad-based, inter-disciplinary management strategy. The outline of such a strategy was drawn up at the end of the Darwin Initiative Wirebird project in 2001 (McCulloch & Norris 2002) and is updated below to take into account the findings of the current study.

The principal aims of a typical conservation strategy have been defined by Williams *et al*. (1995). In the case of the Wirebird these should be:
(1) to set objectives and targets to focus conservation action, against which the effectiveness of action can be measured.
(2) to identify practical actions for conserving the Wirebird, based on the analysis of currently available data.
(3) to provide a means for achieving consensus among the various relevant organisations as to the actions required.
(4) to assign responsibility for various actions within and between organisations, to determine work programmes and budgetary requirements.

Preparing a conservation strategy

The setting of measurable objectives is an important first step. These should be defined in terms of future Wirebird numbers and range, and take into account the current analysis of constraints to Wirebird population size and distribution. Targets should be set for the short (1-5 years), medium (5-10 years) and long terms (10+ years). Care should be taken to set goals that, while not unduly conservative, take full account of feasibility in terms of logistics and financial considerations.

The next stage is to identify the particular actions required to achieve the objectives, compile these into a programme of action and assign responsibility for implementation. In our outline strategy we have grouped suggested actions under the following headings: policy and legislative, site safeguard, species management and protection, advisory, international, future research and management, communications and publicity. This may aid the delegation of tasks to particular organisations or individuals.

If the principle of a management strategy for the Wirebird is adopted the production of the action plan should be led by a "Plan Manager". Consideration should be given to including this function within the remit of the proposed Conservation Officer post within the St Helena National Trust. The Plan Manager would be responsible for convening meetings involving all interested parties and obtaining scientific advice from overseas agencies, where necessary. The main participants would include various Government departments (Agriculture & Natural Resources, and probably Education, Legal & Lands, Environmental Health and Tourism) and NGOs, principally the St Helena Nature Conservation Group and the Farmers' Association. The initial meetings would provide opportunities to bring together all the information necessary to draw up the strategy and to reach agreement on objectives, priorities and actions.

Implementing the strategy

By the end of the preparatory phase all participating organisation should be in agreement over the objectives, policies and priorities of the overall strategy. The various bodies will, however, vary in their capacity to take action and will therefore have to develop their own action plans relating to their particular responsibilities. These should take into account time and manpower availability and the allocation of financial resources. The principal role of the Plan Manager during the implementation phase would be in co-ordinating the responses of the participating organisations to deliver the most effective conservation action.

Monitoring progress

The resources available to conservation projects are often severely limited. It is, therefore, essential that these are used to best effect. It should also be remembered that natural systems do not remain static and that bird numbers and habitats may be affected both by natural processes and human activities. For both these reasons it is advisable to monitor the results of the implementation of the various elements of the strategy and review their effectiveness. The initial measures recommended are simply those considered most likely to deliver positive results in the light of available information. These may need to be refined in the light of experience and elements of the original strategy may require to be changed. Such a flexible approach is necessary if the strategy is to be able to respond adequately to the dynamics of the environment.

Recommendations for an outline conservation strategy for the Wirebird

Suggestions for a basic management plan framework are summarized in Table 7.1 and discussed in greater depth below.

Objectives

The future survival of the Wirebird depends principally on the maintenance of its preferred habitat, dry pastureland, and, to a lesser extent, adequate control of introduced predators. Addressing these needs is best considered as a two-stage process. The primary objective of a conservation management strategy should be to prevent any decline of the Wirebird population below the 2001 level of approximately 350 adult individuals and to halt any further reduction of its range by preventing further degradation and loss of habitat. The second objective is an extension of the first, seeking to increase Wirebird numbers to at least the 1989 level of approximately 450 adults, principally by restoring habitat that has been lost and improving that which has been degraded.

Suggested targets are:
Short-term (reviewed after 5 years) – a population of *c.*250 adults, regularly occurring at 25 sites and breeding on at least 18.
Medium term (reviewed after 10 years) – a population of over 300 adults, regularly occurring at 28 sites and breeding on at least 25.
Long term (periodic review from 10 years) – a relatively stable population of *c.*400 adults.

Policies

There are several principal areas where action will be required to achieve a secure future for the Wirebird. These include safeguarding both the birds themselves and their habitat, providing adequate monitoring of the population, identifying further research requirements and raising public awareness of the species and its problems within and beyond St Helena. Current legislation and activities already contribute to several of the themes, but these measures should be carefully reviewed and appropriate revisions made where necessary.

We recommend that the major policies of a conservation management strategy for the Wirebird should be:

(1) to ensure that existing Wirebird habitat is maintained in a condition suitable to support at least current densities of Wirebirds by promoting appropriate pasture management practices amongst landowners and graziers. This would principally target the control and eradication of invasive plant species, particularly Bull Grass, Lantana, Carpobrotus, Gorse, *Opuntia* and Wild Coffee, and would involve both advisory work and promoting the establishment of a financial assistance scheme that would allow the implementation of the required measures by grazing syndicates and others on a regular basis.

(2) to encourage the maintenance of grazing pressure (i.e. stock densities) on pastureland at a level adequate to maintain suitable vegetation conditions for Wirebirds by preventing the establishment of scrub and keeping sward height within the range preferred by Wirebirds.

(3) to investigate the possibility of rehabilitating Wirebird sites that have become degraded during the past ten years and to take restoration work forward wherever feasible.

(4) to protect existing Wirebird habitat against inappropriate development by ensuring that all construction projects or changes of land-use impinging on areas inhabited by Wirebirds are subject to a full and independent environmental impact assessment.

(5) to ensure that any effects of airport and infrastructure construction on St Helena potentially detrimental to the Wirebird are minimized and appropriate mitigation measures implemented.

(6) to promote research into the impact of introduced mammal and bird predators on the Wirebird population and encourage the implementation of predator control programmes where necessary, while ensuring the use of techniques unlikely to affect non-pest species.

(7) to implement a monitoring programme for the Wirebird population that would include a whole-island census at intervals not exceeding five years and coverage of major sites on an annual basis.

(8) to ensure long-term support for Wirebird conservation by promoting the subject in St Helena's school as part of a wider awareness campaign focussing on the island's unique natural history.

(9) to promote the Wirebird as a resource, along with other endemic plant and animal species, to promote ecotourism on St Helena.

Actions

In this section we suggest a number of actions within the categories discussed above that could be taken to conserve the Wirebird. In presenting these we recognise fully that not all may be feasible at the present time, given financial and manpower constraints on St Helena, but all should be considered when taking a long-term view.

(1) *Policy & Legislation*

(a) All Wirebird sites supporting at least 5% of the total adult population should have effective formal protection restricting inappropriate land use and activities. At the present time many sites, including all of those in the Crown Wastes, receive some degree of protection under existing legislation, particularly under the Forestry Ordinance (1954). The current measures may, however, need to be reviewed in the light of better understanding of the Wirebird's environmental requirements. Our study has suggested that Deadwood Plain, in addition to supporting the largest single population of Wirebirds, may be of disproportionate importance to the survival of the species in terms of its productivity. It is therefore essential that this site is fully protected. Designation of the site as an equivalent to a UK Site of Special Scientific Interest would probably be the most appropriate action, as this would require the implementation of recommended habitat management practices by those using the site in addition to preventing inappropriate use.

(b) Given the currently low economic return on livestock production within St Helena, it is unlikely that many grazing syndicates or individual graziers would be able to hire additional manpower for adequate control of invasive plant species. We recommend that the concept of provision of grant aid to graziers to assist with this is promoted within Government. Implementation would almost certainly be dependent on external funding, however, and this may be difficult to obtain because of the open-ended nature of the project. The possibilities should be explored, however. This, together with measure 2 below, should form an integral part of any mitigation package associated with airport development.

(2) *Site safeguard*
As indicated above, simply providing protection for existing Wirebird sites is unlikely to be sufficient to maintain their integrity. Observations during our study suggested that the majority of site had undergone some degree of degradation since 1989 and that this is likely to continue unless positive action is taken. This is particularly true of pastureland sites, many of which are threatened by the spread of invasive plant species. A conservation strategy for the Wirebird should aim to ensure positive habitat management at all major Wirebird sites. This would involve both active control of invasive plants and application of adequate grazing pressure to maintain suitable sward height. The recent Noxious Weeds legislation should give impetus to the former, but the spread of non-noxious but structurally unsuitable species, such as Bull Grass, also needs to be addressed.

(3) *Species management & protection*
The Wirebird suffers no direct human persecution and this aspect of protection is adequately covered by the Endangered, Endemic and Indigenous Species Ordinance (1996) and the Birds Protection Ordinance (1996). The threats that currently need to be addressed within a conservation strategy are predation by introduced species, use of toxic chemicals at Wirebird sites and inadvertent disturbance of breeding birds.

(a) Cats are probably the only significant predators of full-grown Wirebirds. While all evidence suggests that losses of adult Wirebirds to cats are small, this may be increasing and it is likely that many chicks are taken in some areas. The population of truly feral cats on St Helena appears to have increased since 2001. Control measures appear to have been reduced during the intervening period. These should be re-instated and intensified to ensure there is no resurgence. In particular, trapping should be continued and, if possible, intensified in the Longwood, Deadwood and Bottom Woods areas. Neutering of domestic cats should continue to be strongly promoted.

(b) Although direct evidence is lacking, it is thought likely that Indian Mynahs are significant predators of Wirebird eggs. They are, however, known to take very small chicks, at least in some areas. The species is also one of the main dispersal agents for invasive alien plants such as Lantana and *Opuntia.* The mynah population on St Helena is now very large and appears to be still increasing. Given the mobility of mynahs and the relative inaccessibility of much of the island, it is unlikely that any attempt to eradicate the species would be successful. It is, however, recommended that a mynah control programme is initiated with a view to reducing numbers substantially and preventing subsequent recovery. In view of the mynah's role as an agricultural pest, such measures are likely to prove popular with the majority of

islanders. Overseas expertise should ideally be sought at the planning stage of any major control programme.

(c) Dogs appear to be no more than minor predators of Wirebirds but may regularly take eggs and chicks at some sites, especially those in the Longwood/Deadwood area. The feral dog population has been much reduced over the past 12 years but it would be advisable to promote measures that would reduce the number of free-roaming domestic pets, both to prevent their direct predation on Wirebirds and to reduce the probability of the remnant feral population being maintained by interbreeding. For this latter reason, neutering of pet dogs should also be encouraged.

(d) The use of chemical pesticides has increased on St Helena in recent years. These could pose a threat both to the Wirebird itself and to the invertebrate prey species upon which it depends. At present the greatest concern is raised by treatment of livestock for external and internal parasites. Ivermectin–based internal treatments may leave residues in dung that are harmful to non-target species, while spray drift may be a hazard where external treatments are applied to individual animals over a wide area. At present there is no evidence that such treatments are seriously affecting prey populations but the data is not extensive and the ecology of the major prey species, particularly with respect to dung, is not well understood. Caution is therefore recommended and the use of treatments with the lowest environmental toxicity should be encouraged. Use of herbicides has, to date, been largely confined to road verges and small gardens where Wirebirds are unlikely to be encountered. The introduction of the Noxious Weeds legislation may, however, encourage landowners to consider using such substances within pastureland. Again it is essential that the use of compounds potentially harmful to the Wirebird or its prey is actively discouraged or, preferably, prohibited.

(e) Inadvertent disturbance or damage to Wirebird nests by walkers or vehicle users is undoubtedly a minor problem but may increase with larger scale tourism, particularly after the airport is built. This should be addressed. Any threat could be further reduced by the provision of advice for visitors to Wirebird sites in the form of a code of conduct. This should give information on how to recognise the proximity of hidden nests or chicks from the behaviour of adult Wirebirds and actions to take to minimize disturbance. Ideally this should be distributed as part of an information brochure on the Wirebird for visitors and should also be published occasionally in the local press.

(4) *Advisory*
(a) A central contact point should be established for those involved in the management of Wirebird sites who are seeking advice on Wirebird-related matters. Information should be disseminated both by direct discussion and by the provision of written material. This role should ideally be part of the remit of either the new National Trust Conservation Officer or a staff member at the Environmental Conservation Section.

(5) *International*
(a) As resources and expertise in bird conservation are limited on St Helena, the implementation of a management strategy for the Wirebird would be greatly assisted if access was readily available to experience gained in other parts of the world. It is particularly recommended that links are established with overseas organisations that

can provide advice in the fields of habitat management, predator control, pesticide use and locating sources of funding. Initial points of contact should include the Royal Society for the Protection of Birds (International Department), BirdLife International and the UK Overseas Territories Conservation Forum. The New Zealand Department of Conservation has unparalleled expertise in predator control. The St Helena National Trust should consider becoming a member of the BirdLife International partnership.

(6) *Future research & management*

(a) It is extremely important that the status of the Wirebird population is regularly monitored so that any decline can be identified, its causes investigated and remedial action taken as quickly as possible. It is recognised that manpower resources may not be available to allow a full census to be carried out annually but we recommend that this should be undertaken at intervals not exceeding five years, three years being the preferred compromise. Birds observed should be classified as adults, juveniles or chicks. Counts should ideally be undertaken during February-March, at the end of the peak breeding period, when the proportion of immature birds in the total will provide an estimate of relative productivity. Numbers are likely to fluctuate between years for a variety of reasons and a simple decline between counts need not be a cause for concern, unless it is particularly large. A continual decline over an extended period would suggest a serious problem, however.

(b) If full annual censuses are not possible, it is advisable that sites normally holding at least 20 adult Wirebirds should be monitored each year. The sites would include Deadwood Plain, Horse Point Plain, Prosperous Bay Plain, Upper Prosperous Bay, Broad Bottom, Southern Pastures (*i.e*. Thompson's Wood – Botley's) and Man and Horse. These support a large proportion of the total population and changes in numbers here would be likely to reflect general trends. Timing should be as for full censuses.

(c) It would be advisable to carry out periodic studies of Wirebird productivity at major sites, particularly Deadwood Plain for which baseline data already exists. This would involve the frequent monitoring of a large sample of nests and broods and may, as with other recommended research, require the involvement of overseas institutions. Productivity monitoring would be particularly important in the event of any future decline in the Wirebird population.

(d) The 1998-2001 Wirebird study able to provide only a rough very rough estimate of the adult Wirebird survival rate (McCulloch & Norris 2002). It is recommended that further research is carried out to define this parameter with much greater precision. Only when adult survival can be estimated with greater confidence will it become apparent whether productivity is sufficient to maintain the population in the long term. This would require a marking programme on a scale much larger than we have been able to achieve within the constraints of limited manpower and a multi-faceted project and would ideally include investigation of the movements of individual birds after breeding by means of radio tracking.

(e) Habitat change at major Wirebird sites should be monitored periodically by sampling vegetation composition, employing methods comparable to those used in this study.

(f) Rats may be significant predators of Wirebird eggs and chicks but little is known about their distribution and abundance at Wirebird breeding sites. This should be investigated. Attempts should also be made to identify the main nest predators by using artificial eggs, which retain marks of teeth or bills.

(7) *Communications & publicity*
(a) Results of Wirebird censuses and other research on the species should be routinely published/broadcast through the local media in a form easily understood by the general public.

(b) Neither St Helena itself nor the Wirebird are well known in the wider world. All opportunities should be taken to disseminate information on the island's natural history, its environmental problems and the Wirebird in particular in both scientific and popular publications overseas. This is likely to encourage both research and tourism, both of which would benefit the island's economy as a whole and conservation in particular.

Table 7.1 Suggested framework of a conservation strategy for the St Helena Wirebird

Current Status
A total of approximately 210 adult individuals in 2006. 43% decline since 2001. Classified by IUCN as Endangered, but subject to review. Occurs regularly at 22 sites. Breeding confirmed or likely at 16 sites.

Main Threats
Degradation and loss of short grass habitat through reduced grazing of livestock and development. Predation of eggs and chicks by introduced species.

Habitat Status
Over 90% of Wirebird sites show some degree of degradation since 1989. Problem most serious on pasture, relatively minor in semi-desert. Serious degradation at three major pasture sites associated with significant Wirebird declines.

Objectives of Management Plan
1) to prevent further decline in Wirebird numbers and contraction in range.
2) in the long term, to increase the numbers and breeding range of the Wirebird

Policies
1) to maintain Wirebird habitat by promoting appropriate pasture management, including control and eradication of invasive plant species, among landowners and graziers through advisory work and promotion of grant aid to assist implementation of required measures.
2) to encourage maintenance of levels of grazing pressure adequate to sustain suitable Wirebird habitat in St Helena's grasslands.
3) to investigate possibilities of restoring degraded former Wirebird habitat.
4) to protect existing Wirebird habitat by ensuring that all proposed development within major Wirebird sites is subject to a full and independent environmental impact assessment.
5) to minimize detrimental effects on the Wirebird of airport construction

6) to investigate impact of predation on the Wirebird population and encourage implementation of predator control measures where required.
7) to implement a population monitoring scheme that would include a full census of Wirebirds at intervals not exceeding five years.
8) to promote Wirebird conservation in St Helena's schools.
9) to promote the Wirebird as a tourism resource.

Proposed Actions

1) *Policy & legislative*
    a) promote formal protection for all Wirebird sites currently holding 5% or more of the total adult population.
    b) promote pasture maintenance assistance scheme.
2) *Site safeguard*
    a) ensure positive habitat management at all major Wirebird sites.
    b) undertake habitat restoration as compensation and mitigation for losses incurred as a result of airport construction.
3) *Species management and protection*
    a) encourage continuation and expansion of feral cat control programme and neutering of domestic cats.
    b) institute a control programme for Indian Mynahs.
    c) encourage control of unsupervised roaming by domestic dogs.
    d) encourage use of pesticide treatments for livestock that pose minimum risk to the Wirebird and its prey species.
    e) provide a code of conduct for visitors to Wirebird sites.
4) *Advisory*
    a) provide advice on Wirebird-related matters to all those involved in the management of Wirebird sites.
5) *International*
    a) establish links with organisations off-island that have relevant experience in species and habitat management and fund-raising.
6) *Future research & management*
    a) carry out full surveys of the Wirebird population at intervals not exceeding five years.
    b) carry out annual Wirebird population surveys at selected major sites.
    c) carry out periodic surveys of Wirebird productivity at major sites, especially Deadwood Plain.
    d) investigate survival rate and movements of adult Wirebirds.
    e) carry out periodic vegetation surveys at Wirebird sites to assess habitat change.
    f) investigate the abundance of rats at major Wirebird sites.
7) *Communications & publicity*
    a) publicize the conservation requirements of the Wirebird through the local media.
    b) encourage wider interest in environmental conservation generally through articles in off-island publications.

8. Acknowledgements

This study was funded by the UK Government's Department for International Development. Thanks are due to Sarah Sanders at RSPB for her efficient management of the project and help and encouragement throughout, and to Stella Rumbles and Judith O'Brien for assistance with travel arrangements and administrative matters. On St Helena much useful discussion and practical assistance was provided by The St Helena Government's Environmental Co-ordinator, Ms Isabel Peters, Dr Rebecca Cairns-Wicks of the St Helena National Trust, Mr Vincent Williams and Mrs Marjorie Fowler of the Environmental Conservation Section of the Agriculture and Natural Resources Department and Ms Kathryn Thorp and Mr William Latimer of Faber Maunsell Consultants. Ms Sophie Thorpe and Mr Woodrow Stevens kindly volunteered to assist with the fieldwork. I am extremely grateful to the Environment and Heritage Service (Northern Ireland) for allowing me to take special leave in order to carry out this study, and especially to Dr Howard Platt, Mr Ian Enlander and Mr Gregor Watson for their support of my participation in the project.

9. References

Alexander, C. (1985). The St Helena Wirebird: its status and distribution. *Unpublished report.*.

Ashmole, N.P. (1963). *The extinct avifauna of St Helena island. Ibis 103b: 390-408.*

Basilewsky, P. (1970). Vertebrés. Pp. 77-130 in La faune terrestre d l'ile de Sainte-Helene, *Annales de la Musee Royale de L'Afrique Centrale, Tervuren* Serie 8, Sci. Zool. 181.

Baker, E. (1868). The birds of St Helena. *Zoologist* (2) 3: 1472-1476.

Beatson, A. (1816). *Tracts Relative to the Island of St Helena*. Jamestown, St Helena.

Beintema, A.J. (1982). Meadow birds in The Netherlands. *Rijksinstituut voor Natuurbeheer - Rapport 1981*: 86-93.

Brown, L.C. (1982) *The Flora and Fauna of St Helena*. Project Record 59 (S.HEL-01-12/REC-59/82). Overseas Development Administration, Surbiton, Surrey, UK.

Collar, N.J., Crosby, M.J. & Stattersfield, A.J. (1994) *Birds to Watch 2*. BirdLife International, Cambridge, UK.

Cronk, Q.C.B. (1983). The decline of the redwood *Trochetiopsis erythroxylon* on St Helena. *Biol. Conserv.* 26: 163-174.

Cronk, Q.C.B. (1986a). The decline of the St Helena ebony *Trochetiopsis melanoxylon. Biol. Conserv.* 35: 159-172.

Cronk, Q.C.B. (1986b). The decline of the St Helena Gumwood *Commidendrum robustum. Biol. Conserv.* 35: 173-186.

Cronk, Q.C.B. (1987). The history of endemic flora of St Helena: A relictual series. *New Phytol.* 105: 509-520.

Cronk, Q.C.B. (1989). The past and present vegetation of St Helena. *Journal of Biogeography*, 16, 47-64.

Collar, N.J. and Stuart, S.N. (1985). *Threatened Birds of Africa and Related Islands.* Cambridge, U.K.: International Council for Bird Preservation.

Flemming, S.P., Chiasson, R.D., Smith, P.C., Austin-Smith, P.J. & Bancroft, R.P. (1988) Piping Plover status in Nova Scotia related to its reproductive and behavioral responses to human disturbance. *Journal of Field Ornithology*, **59**, 321-330.

Hartog, J.C. den (1984). A note on the avifauna of St Helena, South Atlantic Ocean. *Bull. Brit. Orn. Club* 104: 91-95.

Huckle, C.H. (1924). Birds of Ascension and St Helena. *Ibis* 11: 818-821.

Mathieson, I.K. (1990). *The Agricultural Climate of St Helena (With Reference to Ascension)*. Overseas Development Administration, and St Helena Department of Agriculture and Forestry, London, UK & Jamestown, St Helena.

Maxson, S. and Oring, L. (1978). Mice as a source of egg loss among ground-nesting birds. *Auk*, **95**, 582-584.

McCulloch, M.N. (1991) Status, habitat and conservation of the St Helena Wirebird *Charadrius sanctaehelenae*. *Bird Conservation International*, **1**, 361-392.

McCulloch, M.N. (1992) *The Status and Ecology of the St Helena Wirebird*. BTO Research Report 97. British Trust for Ornithology, Thetford, UK.

McCulloch, N. & Norris, K. (2001) Diagnosing the cause of population changes: localized habitat change and the decline of the endangered St Helena wirebird. *Journal of Applied Ecology*, **38**, 771-783.

McCulloch, N. & Norris, K. (2002) A Review of the Status and Ecology of the St Helena Wirebird, with Recommendations for its Conservation. Unpublished report, School of Animal & Microbial Sciences, University of Reading.

Moreau, R.E. (1931). Some birds on a voyage. *Ibis* 13: 778-781.

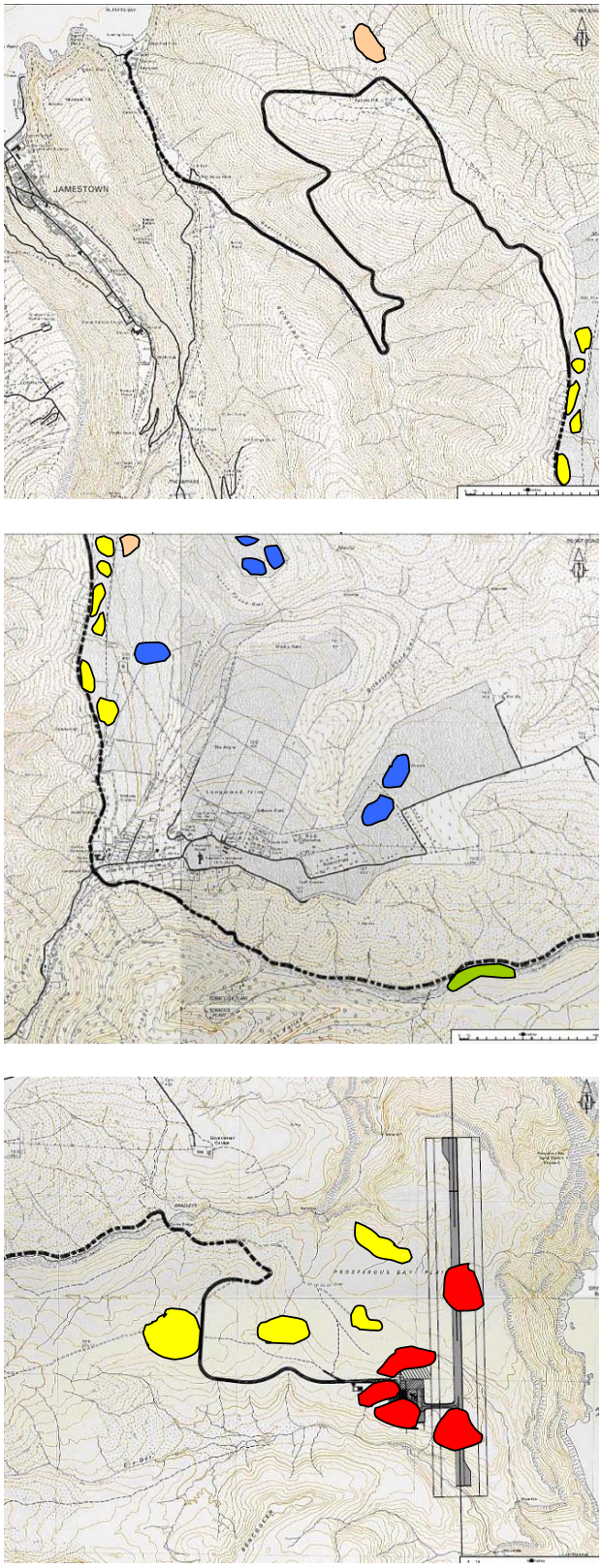
O'Connor, R.J. and Shrubb, M. (1986). *Farming and Birds*. Cambridge University Press, Cambridge, UK.

Olson, S.L. (1975) *The Palaeornithology of St Helena Island, South Atlantic Ocean.* Smithsonian Contributions in Palaeobiology No.23. Smithsonian Institution Press, Washington D.C.

Pitman, C.R.S. (1965) The eggs and nesting habits of the St Helena sand-plover *Charadrius pecuarius sanctaehelenae*. *Bulletin of the British Ornithologists' Club*, **85**, 121-129.

Williams, G., Holmes, J. & Kirby, J. (1995) Action Plans for United Kingdom and European rare, threatened and internationally important birds. *Ibis*, **137** (Supplement), S209-S213.

Appendix 1: Location of Wirebird territories in relation to revised proposal for haul/access route from Rupert's Bay to Prosperous Bay Plain



Key: Blue = not affected; Beige = possibly affected; Yellow = disturbance during construction; Red = lost
Green = area previously favoured for nesting by Wirebirds, not occupied Nov. 2005 – Jan 2006.

Appendix 2

ST HELENA ACCESS PROJECT - WIREBIRD STUDY

TERMS-OF-REFERENCE

The Consultant will supply the following services to the Government of St Helena

1 BRIEF DESCRIPTION

1.1 This assignment requires the nominated consultant - the Royal Society for the Protection of Birds (RSPB) – to commission and manage the services of an appropriately qualified and experienced specialist ornithologist to update baseline data on the status of the population of the Wirebird *(Charadrius sanctaehelenae)* at St Helena. This activity, to take place over a period of approximately 3 months, will complement a separate environmental assessment and management support consultancy and will help to inform the detailed design of a new aerodrome and associated facilities at St Helena and the development of an environmental management plan for their construction.

2 BACKGROUND

2.1 The St Helena and UK Governments propose to construct a 2,250m runway on St Helena. It will be the first air access to the island, which is suffering from a poor economy and outward migration. It is hoped that the aerodrome will be in operation by 2010, when it will replace the current access through the island's dedicated shipping service, the RMS St Helena.

2.2 There is concern about the likely detrimental impact on St Helena's biodiversity, especially the endemic and globally threatened Wirebird, specifically:

Direct detrimental impacts

a) Loss of habitat and displacement of birds from the runway and fringing development;

b) loss of habitat from the development of ancillary infrastructure – eg airport buildings, emergency service provisions, navigation lights and access to these;

c) loss of habitat from construction of haul road;

d) loss of habitat from temporary construction facilities eg accommodation, vehicle compounds, spoil tips, fuel storage etc;

e) bird strikes.

Indirect detrimental impacts

a) Disturbance effect of construction activities;

b) disturbance effect of airport operation – lights, noise;

c) disturbance effect of transport activity and increased number of people around the airport;

d) mortality of chicks on roads with increased traffic levels;

e) attraction of increased number of predators to Prosperous Bay Plain and Deadwood plain areas;

f) further built development in sensitive locations due to increased number of tourists/residents;

g) changes in grazing/land management patterns due to changed opportunities for income as a result of the project;

h) further disturbance from increased tourist activities.

2.3 At the last census in 2001, there were 350 individual Wirebirds. The most recent count conducted by the Conservation Section of St Helena's Agriculture and Natural Resources Department (ANRD) gave a substantially lower figure. It is not clear, however, whether this was due to a catastrophic decline or to possible deficiencies in the monitoring methodology. The uncertainty surrounding many aspects of the Wirebird population and conservation status has highlighted the urgent need for a baseline study before airport construction goes ahead.

3 PURPOSE

3.1 The purpose of the study is to ensure sufficient knowledge is available to inform the airport project design and environment management plan, which includes mitigation and compensation activities, so that adverse impacts on the Wirebird are minimised.

4 SCOPE OF WORK AND MAIN TASKS

4.1 The following tasks will be undertaken:

a) Conduct a census of the Wirebird population at St Helena:

- Counts to be conducted at 11 sites identified in previous census.

b) Collect detailed site information on the Wirebird at Prosperous Bay Plain (aerodrome site and potential haul route from Prosperous Bay) and Deadwood Plain and vicinity, including Bottom Woods (potential haul routes/access roads):

- identification and mapping of all Wirebird territories likely to be impacted by the development; comparison with data for previous years to see if there are any further potential territories or territories lost as a consequence of habitat deterioration;
- assessment of habitats chosen for territory/nesting;
- initial assessment of egg/chick survival by territory;
- observations on the threats relating to predation, effects of disturbance etc.

c) Undertake a rapid assessment of the status of other Wirebird sites including those indirectly affected by the development so that the effects of the aerodrome and haul routes can be put into the wider context of the entire Wirebird population:

- identify extent of habitat deterioration;
- identify main threats and the extent of them;
- prioritise potential sites for restoration interventions;
- develop suggested programmes for 'scrub' clearance and other management on the priority sites.

5 OUTPUTS

5.1 The following outputs will be delivered:

By end-December 2005

- Map of Wirebird territories (Prosperous Bay Plain and Deadwood Plain);
- Report on the detailed assessment of the Wirebird at Prosperous Bay Plain and Deadwood Plain (item 4.1(b) above).

By end-February 2006

- Updated population estimate;
- Report on the status of other Wirebird sites and recommendations for restoration (item 4.1(c) above).

5.2 The outputs to be delivered by end-December will be critical to the development of the Invitation to Tender for the Design/Build/Operate contract. Any significant interim results of the research that could materially affect the work or conclusions of other stakeholders (eg environmental assessment consultants, DBO contract procurement consultants etc) should therefore be made immediately available, following the procedure set out in Section 8 – Reporting, below.

6 COMPETENCY AND EXPERTISE REQUIREMENTS

6.1 The person commissioned to undertake this assignment will have appropriate professional qualifications and ornithological research experience, and will ideally have been involved in earlier fieldwork on the Wirebird at St Helena.

7 CONDUCT OF THE WORK

7.1 The specialist ornithologist undertaking the fieldwork will consult closely with the SHG's Environmental Coordinator who will be the principal point of contact with SHG's Access Project Team.

7.2 Close collaboration will also be maintained with SHG's Chief Agriculture and Natural Resources Officer and other relevant government officials during the implementation of the fieldwork.

7.3 The separately commissioned environmental assessment and management support consultants should also be kept fully informed of the progress of the work. This will ensure that the information collected during the study is available to inform the wider environmental assessment and the development of the environmental management plan in which the necessary mitigation and compensation measures will be identified. (See also para 8.2 below.)

7.4 Both the specialist ornithologist and the RSPB will seek to work in close collaboration with the Wirebird group, individual conservationists and conservation NGOs, as well as other local people in St Helena.

7.5 During the course of the consultancy, the specialist ornithologist will seek to enhance local capacity in census techniques and monitoring methodology so that the necessary skills will be available for future monitoring work and to implement any recommendations arising from this consultancy. It is envisaged that such

training will be extended to ANRD's conservation staff, members of the National Trust and other SHG officers as appropriate.

7.6 The Proposed schedule is as follows:

13th November	Brize Norton – Ascension
15th November	Depart Ascension
19th November	Arrive St Helena
19th January	Depart St Helena
25th January	Arrive Walvis Bay
27th January	Arrive UK
15th February	Reports completed

7.7 Arrangements for financial administration will be set out in the contract document issued by DFID.

8 REPORTING REQUIREMENTS

8.1 Final reports will be submitted in hard copy (4 copies) and electronic format to the SHG and DFID through the RSPB in accordance with the timetable set out in Section 5 above.

8.2 Any interim results (para 5.2 above) should not be formally released without prior clearance of the SHG and DFID, which should be sought through the RSPB.

9 CONTRACTUAL ARRANGEMENTS

9.1 The first point of contact between the Consultant and SHG will be Isabel Peters, Environmental Coordinator, Development and Economic Planning Department (isabel@sainthelena.gov.sh)

9.2 The DFID first point of contact and lead adviser for this consultancy will be Dick Beales, Senior Natural Resources and Environment Adviser, Overseas Territories Department (R-Beales@dfid.gov.uk).

9.3 The DFID Project Officer for this consultancy will be Andrea Woodrow-Bennett, Deputy Programme Manager (St Helena), Overseas Territories Department (A-Woodrow-Bennett@dfid.gov.uk).

9.4 All correspondence pertaining to this assignment should also be copied to Nigel Kirby, DFID Access Project Manager (N-Kirby@dfid.gov.uk), Sharon Wainwright, St Helena Access Project Team Manager (access.exec@sainthelena.gov.sh) and the DFID Deputy Programme Manager (A-Woodrow-Bennett@dfid.gov.uk).

SHG/DFID
October 2005