'PROMOTING COEXISTENCE BETWEEN RECREATIONISTS AND BEACH-NESTING BIRDS' **PROJECT**

MONITORING HOODED PLOVERS ON THE FLEURIEU PENINSULA: DISTRIBUTION, BREEDING SUCCESS AND MANAGEMENT IN THE 2010-2011 SEASON

Report by Dr Grainne Maguire, Birds Australia, July 2011
Maps by Nicolas Esbert, Kasun Ekanayake and Mel Hardie.

Birds Australia
CONSERVATION THROUGH KNOWLEDGE

Government of South Australia
Adelaide and Mount Lofty Ranges
Natural Resources Management Board

CARING FOR OUR COUNTRY

Introduction

The pressures placed on the Australian coast by over 80% of the population living within 50kms of the coast, a growing trend for a 'seachange' and coastal tourism representing a 20 million dollar recreation investment, are undoubtedly taking their toll on the resident shorebirds who breed on our ocean beaches during the spring and summer. In South Australia, there are four species of resident shorebirds, the Pied and Sooty Oystercatchers, Red-capped Plovers and Hooded Plovers, that nest on ocean beaches and offshore islands. Hooded Plovers are listed as *Vulnerable* and both Oystercatcher species as *Rare* in South Australia under the National Parks and Wildlife Act 1972. The Hooded Plovers are most threatened because they are limited to breeding exclusively on ocean beaches in South Australia, with the rare exception of some coastal saline lakes in parts of the South East coast and on the Eyre Peninsula. The oystercatchers have a broader nesting habitat range which includes rocky outcrops, islands and more heavily vegetated dune areas, and the red-capped plover can also breed around wetlands and low energy beaches. Colonial seabirds, such as Little Terns (*Vulnerable,* NPWS Act*;* rare west of Corner Inlet in Victoria and into South Australia) and Fairy Terns (*Vulnerable,* NPWS Act*;* breed in South Australia), are also beach-nesters, and suffer similar threats to the Hooded Plover.

Beach-nesters make simple nest-scrapes in the sand and their well-camouflaged eggs and chicks are extremely difficult to spot, and therefore at great risk of being trampled by visitors to the beach. People, unleashed dogs, horses and vehicles on beaches not only pose a direct threat, but they also disturb incubating adults, resulting in temporary nest abandonment which exposes the eggs to harsh temperatures, and predators such as ravens, gulls, foxes and cats. This is particularly true of disturbances caused by unleashed dogs, where adults spend long periods away from the nest. Furthermore, residential developments and littering attract increased numbers of predators to beaches. Chicks cannot fly for 5 weeks and need to forage on the beach in order to survive – this places them in harms way, and they are easily crushed or disturbed by people, dogs and vehicles on the beach. If they spend too much time in hiding, they can starve to death or be exposed to harsh temperatures in the absence of brooding. The parent birds try to distract potential threats, leaving the chicks unattended and exposed to predators. Furthermore, vehicles on beaches compact the sand, killing the bulk of prey items that these shorebirds rely on.

Given the severe pressures placed on coastal breeding birds, in particular the threatened status of the Hooded Plover, Birds Australia embarked on a project to 'promote coexistence between recreationists and beach-nesting birds'. This project is funded by the Australian Government's Caring for our Country, the Victorian Government and Adelaide and Mount Lofty Ranges (AMLR) Natural Resources Management (NRM) Board. Beaches will always be popular places for recreation within Australian culture, and the best solution to a problem which is very much human generated, is to try and engage people to change their behaviours and help protect these birds so they have a future.

The main aim of the beach-nesting birds' (BNB) project is to involve coastal communities and land managers in best practice management of breeding sites to see an overall improvement in breeding success of beach-nesters. The project uses the Hooded Plover in Victoria and South Australia as a case study for developing and improving on-ground management strategies and community awareness methods. The results will be applicable in a broader sense to other beach-nesting birds around Australia. The outline of the project is as follows:

1. Maintain a distribution map and database of location of breeding pairs of Hooded Plovers along the Victorian, South Australian and NSW Coast, updated every two years and comparable over time.
2. Estimate state and regional population numbers of Hooded Plovers in Victoria, South Australia and NSW every two years.
3. At the time of each biennial count, assess the threats to each pair and any management in place to alleviate these threats.
4. Assess gravity of threats at breeding sites from data collected during the biennial count and map sites according to threat status.
5. Choose sites in Victoria and South Australia for monitoring of breeding success during the breeding months (August-March). Seek to maintain monitoring of these sites over at least 5 years for a comparison of site-based threat profiles and to quantify improvements in breeding success related to management.
6. For monitoring sites selected, develop site profiles that assess threats in more detail and describe management of the site (e.g. identify land managers; identify full suite of management regulations for sites in relation to access, dog, horse and vehicle restrictions; assess weed infestations and availability of suitable nesting habitat).
7. Carry out on-ground management of vulnerable breeding sites following management directions outlined in 'A practical guide to managing beach-nesting birds in Australia.'
8. Compare threats and breeding success at managed and unmanaged sites.
9. Coordinate student research projects investigating the effectiveness of new management techniques and investigating attitudes and values held by people regarding beaches and conservation of beach-nesting birds.
10. Trial nest cameras to detect and identify nest predators and to determine nest fates. With large enough sample sizes, predation risk could be compared across habitat types and the probability of predation compared to the density of predators at sites.
11. Assess success of managements and make modifications for subsequent seasons. Managements need to adapt to local site and beach user specifications.

The main roles of the different groups working on this project are as follows:

- Birds Australia Staff provide advice, workshops, training and technical support, as well as data analysis and maintenance of a national database.
- On the Fleurieu peninsula, Adelaide and Mount Lofty Ranges Natural Resources Management (AMLR NRM) Board officers support the project and volunteers, and local council and Department of Environment and Natural Resources (DENR) staff assist with nest protection responses.

- The Normanville Natural Resources Centre facilitates school and public awareness of the project including chick shelter construction and dogs breakfast awareness events.

At a regional level, two Coastal Action Plans have been completed for the Adelaide and Mount Lofty Ranges Natural Resources Management Board region; the Southern Fleurieu Coastal Action Plan and for relevant coastal areas of the Metropolitan Adelaide and Northern Coastal Action Plan. These plans contain detailed coastal maps and plant and animal lists. The plans also outline key conservation priorities along our coast, provide suggested actions and identify key players to be involved.

The Coastal Action Plans are used to assist in priority setting of coastal management actions for the AMLR NRM Board, councils and DENR. In implementing the Coastal Action Plans, the Adelaide and Mount Lofty Ranges NRM Board resources the local implementation of actions identified in the Coastal Action Plans including implementation of local initiatives to conserve Hooded Plovers.

Relevant actions and priorities of the (draft) South Australian Recovery Plan for the Hooded Plover (Baker-Gabb and Weston 2006) were incorporated into the Coastal Action Plan's detailed local actions to manage foreshore use to minimise impact on the species during the nesting and fledging season. Key players identified are the Department for Environment and Natural Resources, councils, community and the Natural Resources Management Board.

In view of the status of this species, the Hooded Plover has also been flagged as a focal species for the Southern Fleurieu Coastal Action Plan and for relevant coastal areas of the Metropolitan Adelaide and Northern Coastal Action Plan area.

The November 2010 Biennial Count

In 2010, official survey routes were developed for the Hooded Plover biennial count so that we could create better consistency with data collection over time and so that participants and land managers will be able to directly compare bird numbers for given routes across counts.

In total, 336 routes were surveyed across NSW, Victoria and South Australia, including 82% of suitable beaches. In comparison to the November 2008 count, this was 21% greater coverage (for routes that were surveyed using the same method for both 2008 and 2010 counts; see full biennial count report by Ewers *et al.* 2011). In total, 1231 Hooded Plovers were spotted (1164 adults, 67 juveniles). On the Fleurieu Peninsula, 26 routes were surveyed by 19 volunteers (32 hours of walking!), including 83% of suitable Hooded Plover habitat. In total 38 Hooded Plovers were detected: 37 adults and 1 juvenile. This accounts for 3.1% of the population count of East coast mainland Australia and 6.2% of the South Australian population as detected from our count. From our monitoring of breeding in 2010-2011, we expect the population to have 19-20 breeding pairs, so that during the count, the population was only slightly underestimated. It would appear that there have been changes in the

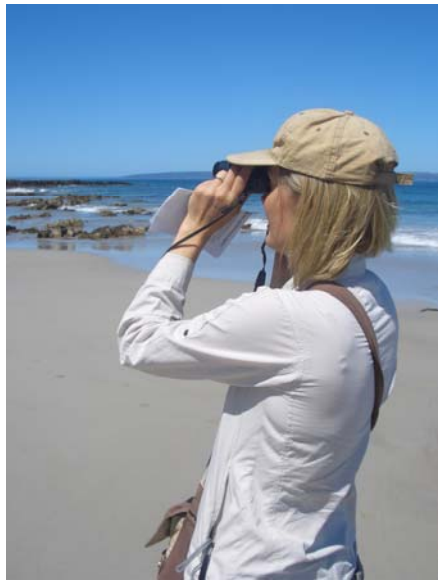
beaches used by the birds over time, with Coolawang not occupied this season or last and one less pair present at Port Willunga, while South Port and Moana now have pairs present.

Other species of beach-nesting birds were also counted during these surveys, but of course, because the suitability of habitat varies for these species, this is not a comprehensive estimate of their population; instead it gives an estimate of their numbers (and overlap with Hooded Plovers) on sandy ocean beaches. In total, there were 1526 Pied Oystercatchers (1457 adults, 69 juveniles), 649 Sooty Oystercatchers (626 adults, 23 juvenile) and 1550 Red-capped Plovers (1521 adults, 29 juveniles) detected during the count. On the Fleurieu Peninsula, there were 16 Pied Oystercatchers (6 adults, 10 juveniles), 9 Sooty Oystercatchers (8 adults, 1 juvenile) and 3 Red-capped Plovers (all adults) detected during the count. This makes up 1.0%, 1.4% and 0.2% of total sightings respectively. There were a high number of Pied Oystercatcher juveniles sighted (14.5%) comparative to other locations along the East coast of mainland Australia. Most of the Pied Oystercatchers and Red-capped Plover sighted during the count were on the South Australian coast.

Below are Tables 1 and 2 of the numbers of birds detected in each survey zone of South Australia and the routes surveyed on the Fleurieu Peninsula; and maps of a) the routes surveyed and b) the distribution of beach-nesting birds on the Fleurieu Peninsula as detected during the Nov 2010 Biennial count.

Table 1. Beach-nesting birds recorded in South Australia during the Nov 2010 Biennial Count.

ZONE	Hooded Plovers			Red-capped Plovers			Sooty Oystercatchers			Pied Oystercatchers		
	Adults	*Juvs*	***Total***	*Adults*	*Juvs*	***Total***	*Adults*	*Juvs*	***Total***	*Adults*	*Juvs*	***Total***
South East SA	51	1	52	255	0	255	7	0	7	63	0	63
Coorong	29	3	32	165	3	168	6	2	8	117	3	120
Fleurieu Peninsula	37	1	38	3	0	3	8	1	9	6	10	16
Kangaroo Island	169	13	182	93	1	94	45	0	45	245	11	256
Yorke Peninsula	161	7	166	131	4	135	63	1	64	77	0	77
Eyre Peninsula	123	20	143	536	16	552	310	12	322	447	40	487
TOTAL	**570**	**45**	**613**	**1183**	**24**	**1207**	**439**	**16**	**455**	**955**	**64**	**1019**

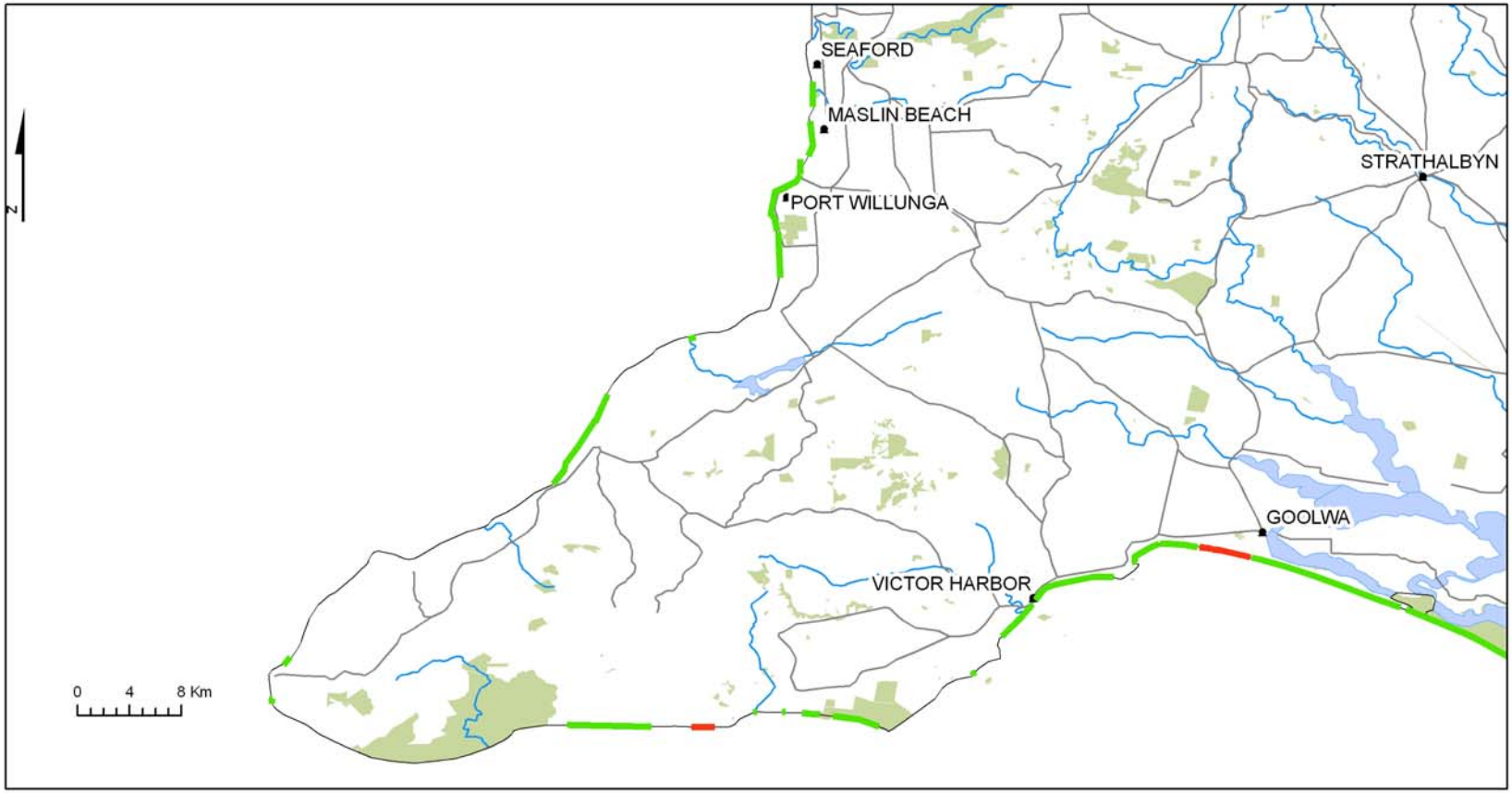


The stunning Waitpinga beach; Emma and volunteers surveying Myponga beach; Emma Stephens hard at work! (Photos courtesy Grainne Maguire).

Table 2. Survey routes on the Fleurieu Peninsula and their coverage during the Nov 2010 Biennial count.

Routes on the Fleurieu Peninsula	**Covered: No=0, Yes=1**
Aldinga	1
Bashams Beach	1
Boomer Beach (Watsons Gap)	1
Carrickalinga-Normanville 1	1
Carrickalinga-Normanville 2	1
Carrickalinga-Normanville 3	1
Coolawang Beach	1
Goolwa Beach	1
Hindmarsh River	1
Kings Beach	1
Lady Bay	1
Lands End	1
Maslin Beach	1
Middleton Beach	1
Moana	1
Monument - Lady Bay	1
Morgans Beach (SA)	1
Myponga Beach	1
Parsons Beach	1
Port Willunga	1
Sheepies	1
Silver Sands	1
Sir Richard Peninsula - Goolwa Beach	0
Snapper Pt	1
Tunkalilla	1
Two bays	0
Victor Harbor foreshore (Inman River)	1
Waitpinga Beach	1

a) Routes surveyed during the Nov 2010 Biennial count.



Hooded Plover Biennial Count 2010
Zone 18 - Fleurieu Peninsula South Australia

Survey Routes

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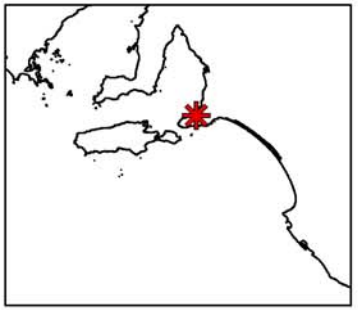
Government of South Australia
Adelaide and Mount Lofty Ranges
Natural Resources Management Board

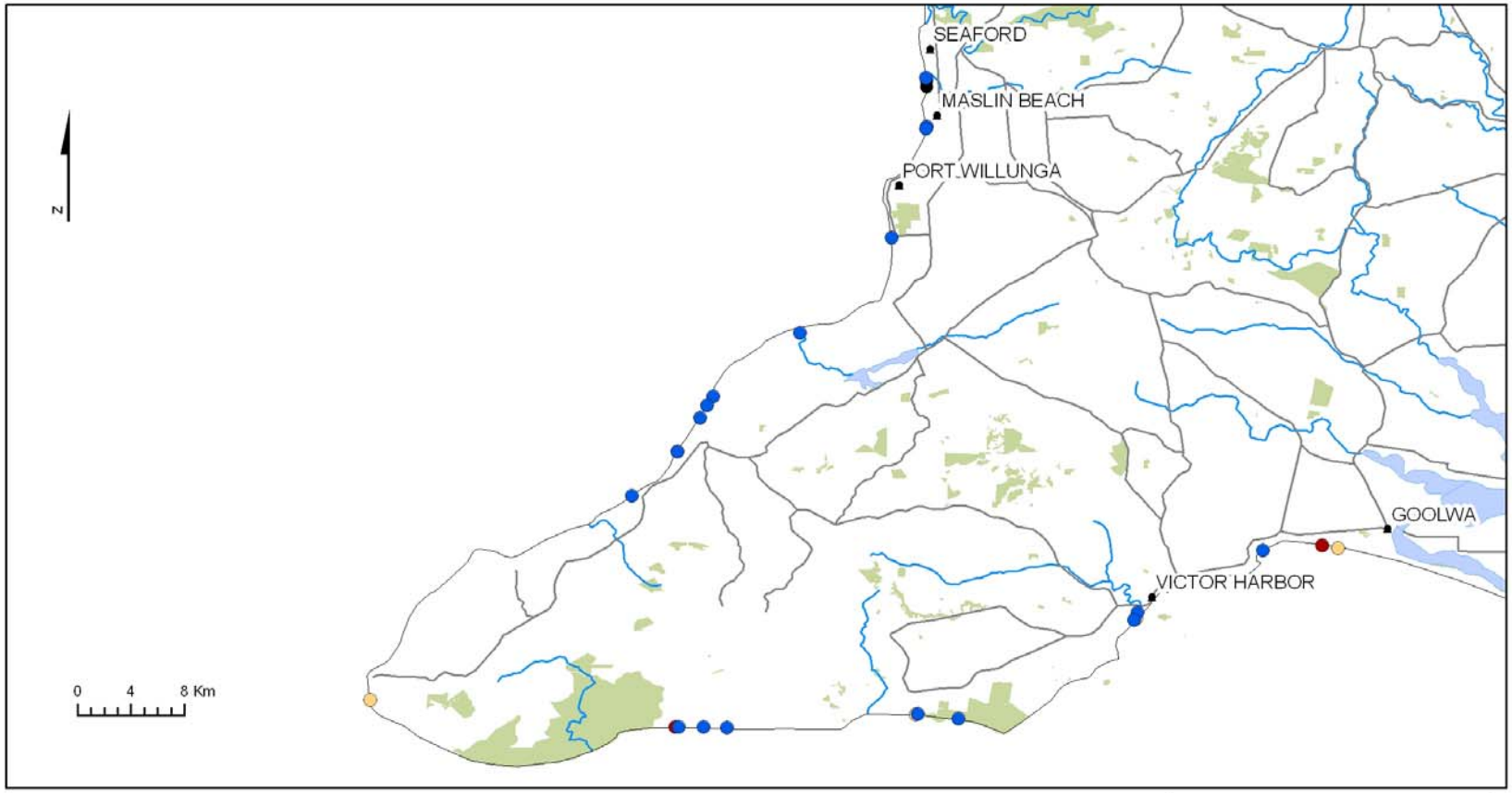
Road
water
Water
Parks and reserves

Routes

Not complete
Complete

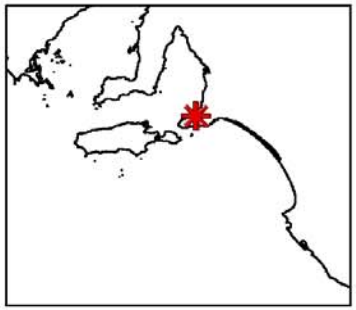


b) The distribution of beach-nesting birds on the Fleurieu Peninsula as detected during the Nov 2010 Biennial count.



Hooded Plover Biennial Count 2010
Zone 18 - Fleurieu Peninsula South Australia
Distribution of Beach Nesting Birds

Hooded Plover
Pied Oystercatcher
Red Capped Plover
Sooty Oystercatcher
Road
water
Water
Parks and reserves



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Government of South Australia
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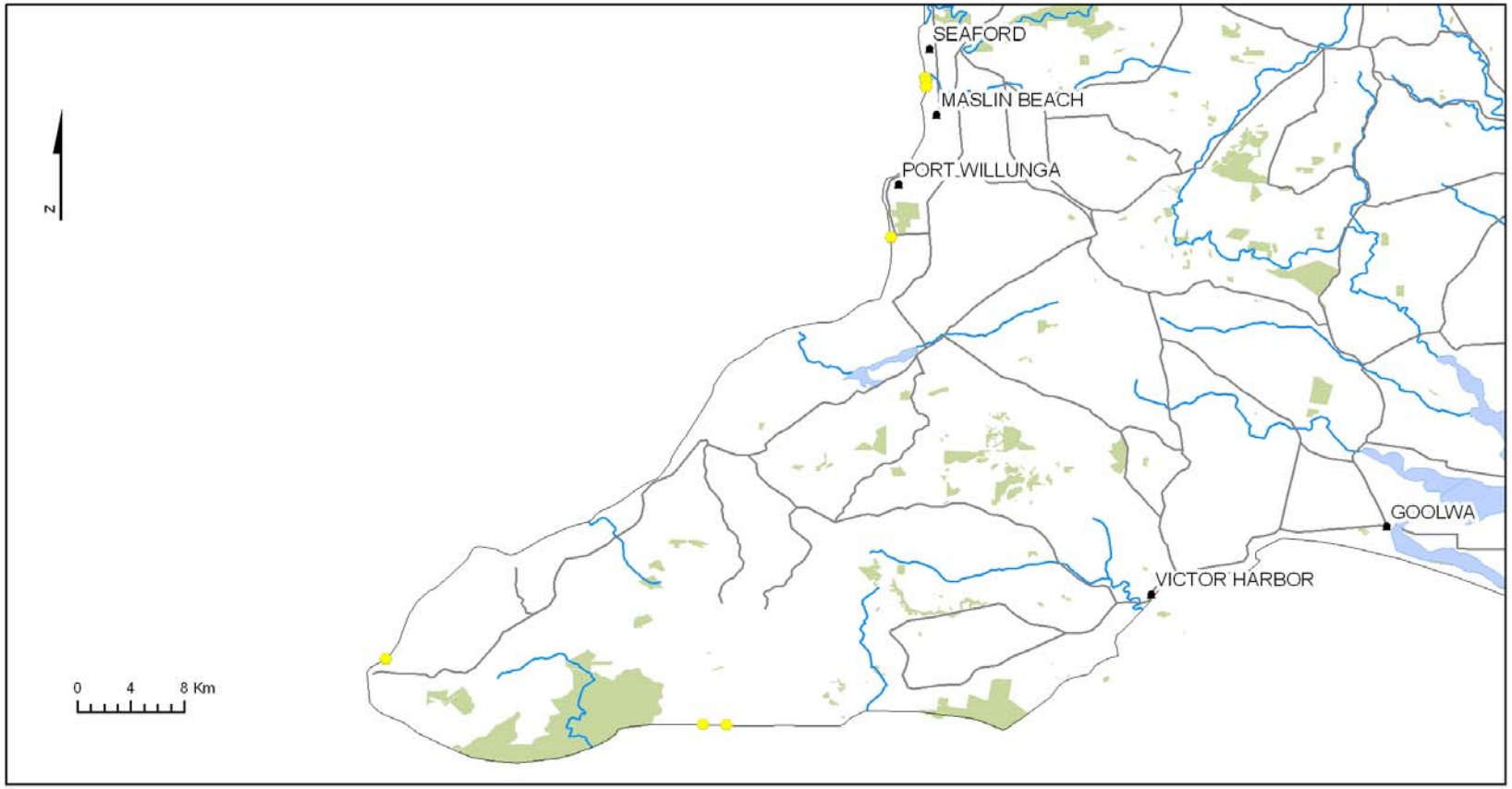
Biennial count threat assessments

Volunteers were asked to assess threats present at sites during the count and below are maps of a) the presence of vehicles, b) weed species (Marram Grass, Wheat Grass and Sea Spurge) and c) an overall threat index which weights each threat according to its impact on breeding birds (Types of vehicles=5; Horses/stock/deer=5; Dogs off leash=4; Dune use=4; Dogs on leash=3; Evidence of dogs=3; Evidence of people=3; Cats=3; Foxes=3). Threats given a score higher than 3 are rated as having a greater impact because they have multiple impacts on the birds, their eggs and chicks, and are generally spread/present across a greater cross-section of the birds' habitat (i.e. water's edge, beach and dune).

Weeds were not included in the above threat score because we did not have an estimate of their density, and for weeds in really low abundance they may have negligible effects on the birds at present (becoming an issue in the future) but for weeds in high abundance at present, these would be of greater threat to the birds and nesting habitat availability. For future surveys, we will add Pyp grass to the weed list, as this is a species that can occur in some abundance on South Australian coasts.

The map of threat scores shows that most sites on the Fleurieu fall into moderate to high threat categories, mostly because off-leash dogs feature at most sites, vehicles are common at a number of sites and beaches are frequented by people with only a few exceptions. An interesting comparison that we will make in future will be between 1) the threat scores as revealed by threat assessments made during regular breeding monitoring visits and 2) the threat scores as revealed by a single assessment made during the November count. This will tell us more about how accurate single visits can be and how likely we are to miss threats that feature consistently at sites. This information would be useful to consultants who carry out Environmental Impact Assessments.

a) Presence of vehicles on beaches of the Fleurieu Peninsula as detected during the Nov 2010 Biennial Count.



Hooded Plover Biennial Count 2010
Zone 18 - Fleurieu Peninsula South Australia
Vehicle Threat for Beach Nesting Birds

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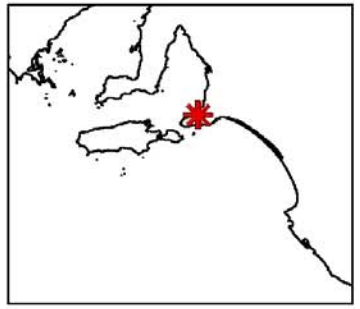
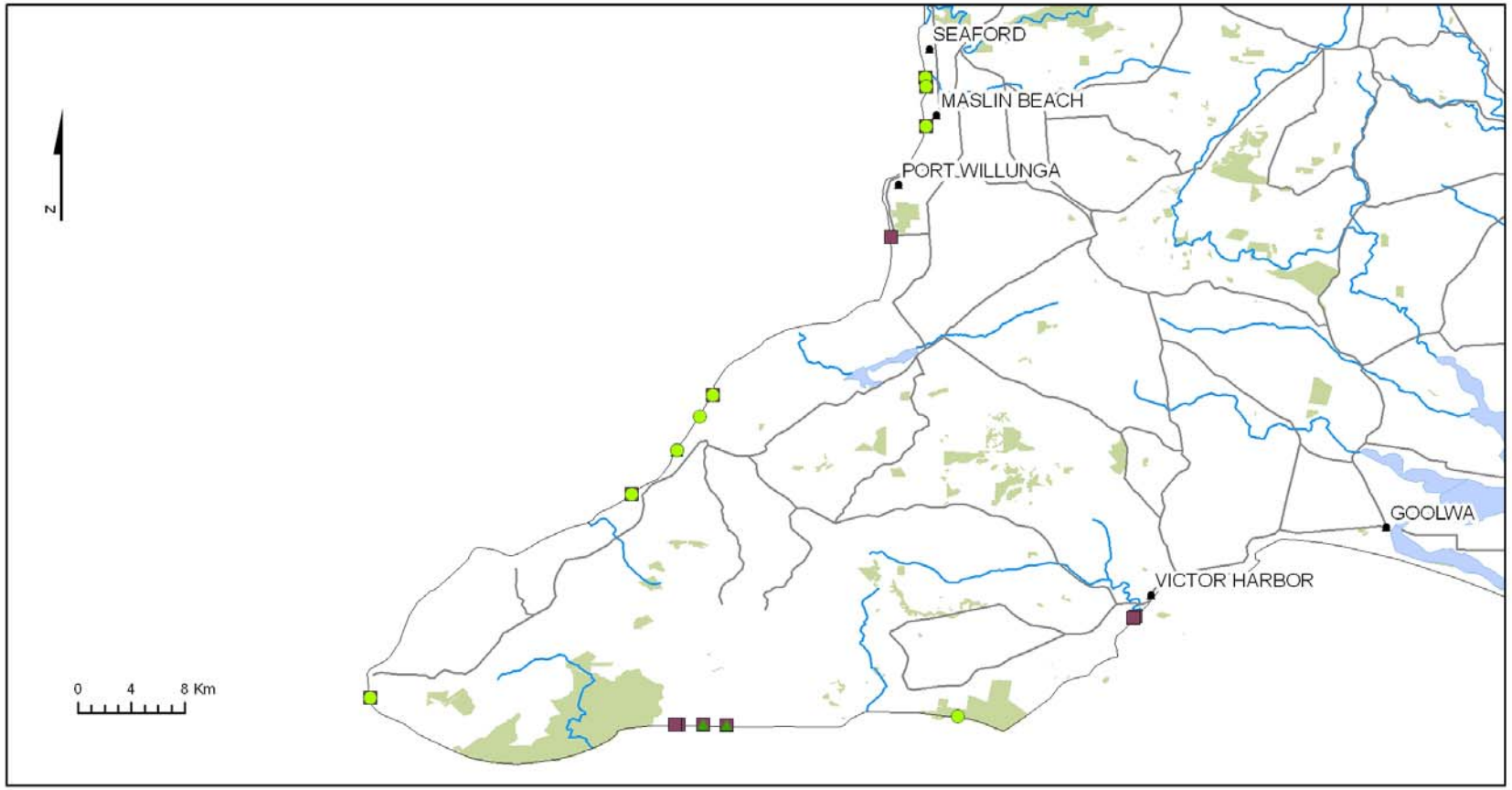
CONSERVATION THROUGH KNOWLEDGE

Government of South Australia
Adelaide and Mount Lofty Ranges
Natural Resources Management Board

- 4WD
- Trail Bikes
- Quad Bikes
- Road
- water
- Water
- Parks and reserves



b) Presence of weed species (Marram Grass, Wheat Grass and Sea Spurge) on beaches/dunes of the Fleurieu Peninsula.

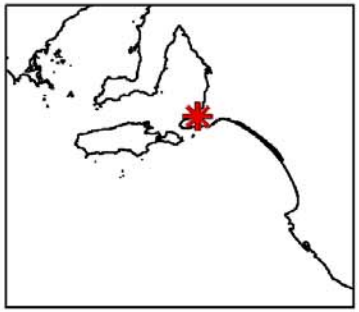


Hooded Plover Biennial Count 2010
Zone 18 - Fleurieu Peninsula South Australia
Weed Threat for Beach Nesting Birds

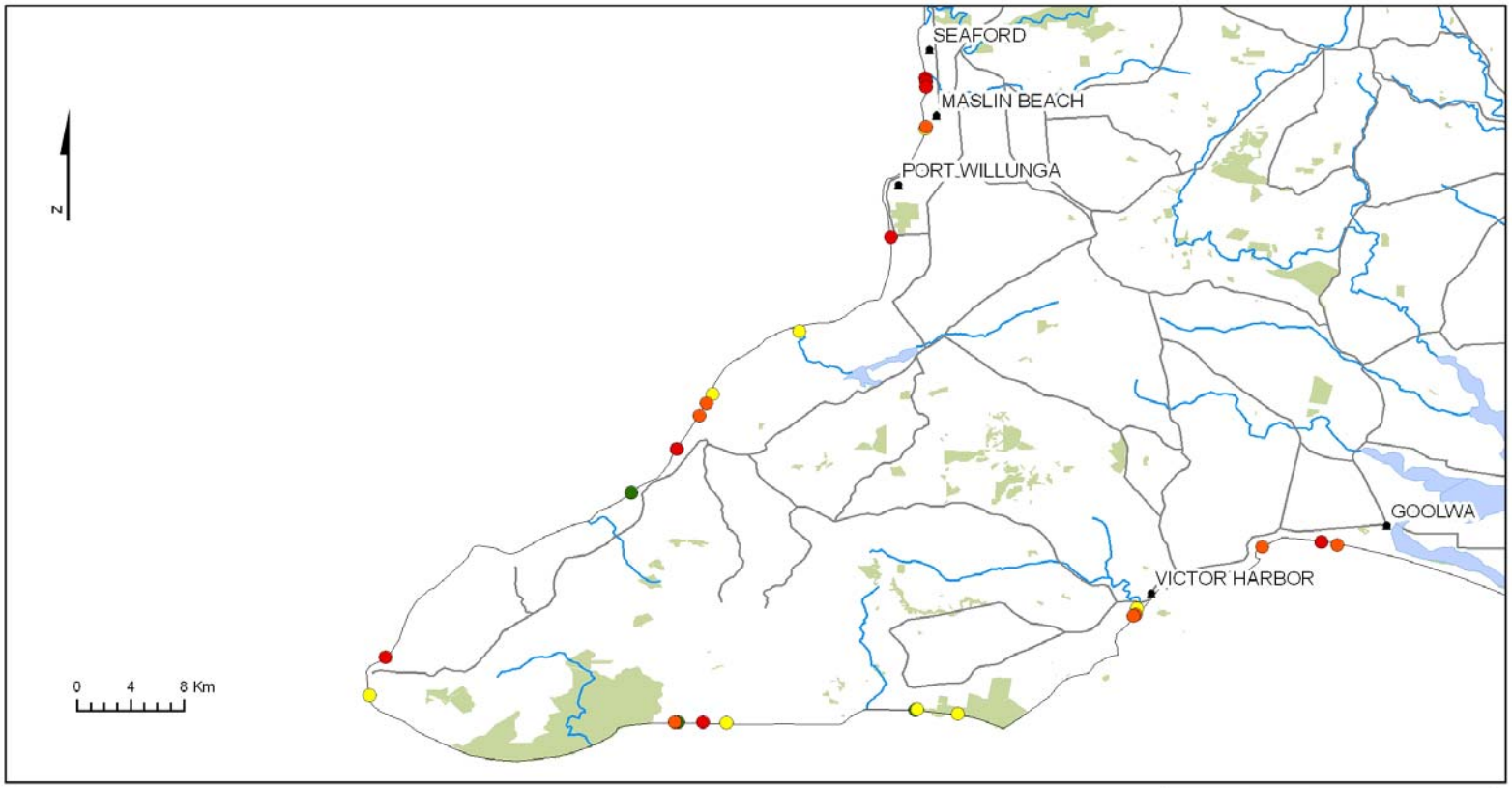
Birds Australia
CONSERVATION THROUGH KNOWLEDGE

Government of South Australia
Adelaide and Mount Lofty Ranges
Natural Resources Management Board

- Marram Grass
- Wheat Grass
- Sea Spurge
- Road
- water
- Water
- Parks and reserves



c) Threat score for each site where beach-nesting birds were observed on the Fleurieu Peninsula during the Nov 2010 Biennial Count.



An overview of the 2010-2011 Breeding Season

Victoria

The BNB project has been running since 2006 in Victoria, with breeding success and threats at breeding sites monitored over 5 successive breeding seasons for up to 103 pairs.

This season was one of mixed success. High tides and erratic and severe weather meant more egg losses to natural causes. We did however maintain a similar fledging success rate to the 2006/07 season (0.41 fledglings/pair), but this was nowhere near as high as last season (0.67 fledglings/pair) where tide and climate conditions were ideal. Chicks appeared to survive longer than usual, with losses at 2 to 3 weeks of age being common. Often Nankeen Kestrels or other Hooded Plovers were suspected of foul play, however, chick fates continue to remain the biggest knowledge gap that we have. Below are summary tables of breeding success over the five successive breeding seasons:

Table 3. Number of pairs monitored, nests found and their fate. Data for the 2010/11 is incomplete at this stage as it takes several months after the season ends to collate data.

Season	Pairs monitored	Total nests	Nests fail egg	Nests Hatched	Nests fledged	# fledglings	# eggs laid	# chicks hatched
2006/07	90	147	86	61	24	35	353	145
2007/08	86	157	100	57	24	32	372	140
2008/09	79	119	74	45	23	30	290	102
2009/10	103	167	96	70	43	69	386	139
2010/11	103	209	-	-	-	43	-	-

Table 4. Number of fledglings produced by pairs in Victoria (including additional pairs monitored by Phillip Island Nature Park) according to the different regions of the coast:

Region	2006/07 106 pairs	2007/08 100 pairs	2008/09 96 pairs	2009/10 119 pairs	2010/11 123 pairs
Far West Vic	2	6	11	31	10
Shipwreck coast	7	3	0	4	-
Otway coast	0	1	3	0	2
Surf coast	2	4	2	2	2
Bellarine	3	3	4	4	3
Mornington Peninsula	10	6	6	7	9
Phillip Island	8	4	6	9	7
Bass Coast	4	2	4	20	17
Venus Bay	1	0	0	2	0
Lakes area, EG	2	0	0	0	-
Croajingalong (Marlo-Mallacoota)	4	7	0	1	0
Total fledglings	43	36	36	80	50
# fledglings per pair monitored	0.41	0.36	0.38	0.67	0.41

South Australia

Monitoring of breeding pairs was carried out in three zones (Eyre, Fleurieu and Coorong) in South Australia as part of the BNB project in the 2010/2011 breeding season. 381 data records (13 in winter, 368 in the breeding season) have been sent to Birds Australia for a total of 25 sites on the Fleurieu Peninsula (279 hours of observation excluding travel times), 111 data records for 12 pairs on Eyre and 31 data records for pairs along Young Husband Peninsula on the Coorong.

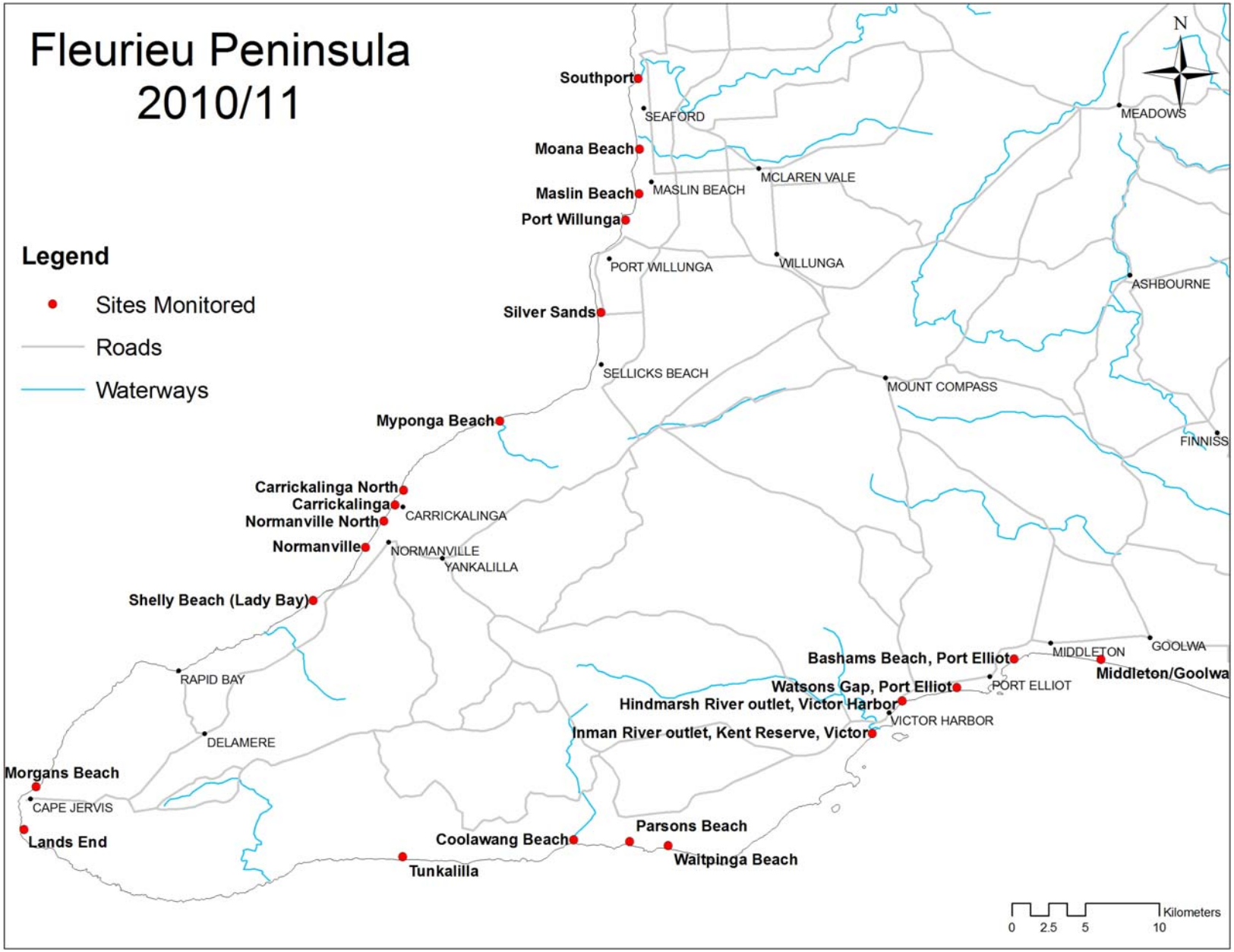
Table 5 shows the breakdown of visits and volunteers visiting sites on the Fleurieu Peninsula; there were 2 sites where Hooded Plovers were not sighted on any visit (Coolawang, Middleton), plus an additional site (Morgans beach) where Hooded Plovers were only seen in October and not on subsequent visits. There was incomplete monitoring at Waitpinga (Oct-Nov) with a nest found during the single November count visit. Monitoring began at South Port in December as birds had not been sighted here earlier in the season (only during June, and then the City of Onkaparinga ranger observed birds in late November). At Waitpinga, Watsons Gap and Lands End, Hooded Plovers were often absent from their sites during the breeding season. There are 18 pairs for which we have sufficient data on breeding attempts during the season. The AMLR NRM Coast Estuary and Marine officers also carried out many visits through their role facilitating and supporting volunteers, and implementing nest site protection.

Table 5. Visits to pairs on the Fleurieu Peninsula during the 2010/11 breeding season, visits when the pair were present and names of monitors (as taken from data sheets submitted). An asterisk depicts that insufficient data was collected to assess threats and a cross depicts insufficient data to detect breeding or breeding fate.

Pair	Visitation period (winter, breeding season)	Total visits	Visits pres.	Main monitor/s	Additional observers
South Port +	10/6/10, 25/12/10-9/4/11	1, 12	1, 9	Charles Simmons, Ashley and Sue Read	Emma Stephens, Faye Lush, Joyce West
Moana beach	6/10/10-15/12/10	12	11	Ashley and Sue Read	Emma Stephens, David Woollard
Silver Sands	10/11/10-2/2/11	16	10	Faye Lush, Joyce West, Julie Turner	
Maslin Beach	19/6/10, 21/8/10-4/4/11	1, 43	1, 43	Ashley and Sue Read	Emma Stephens
Port Willunga	29/9/10-11/3/11	12	7	Ashley and Sue Read	Emma Stephens, Helen McSkimming
Myponga Beach	5/9/10-27/1/11	16	16	Mike Fairbain, Linda Stacey	Emma Stephens, Joyce West, Faye Lush

Pair	Visitation period (winter, breeding season)	Total visits	Visits pres.	Main monitor/s	Additional observers
Carrackalinga North	5/8/10-27/3/11	19	12	Lauren Davis	Jack James, Emma Stephens, Brynn Garner, Sullivan Garner, Cindy Whittlesea, Russell Garner
Carrickalinga	30/8/10-23/3/11	30	29	Wendy White	Jack James, Emma Stephens, Lauren Davis
Normanville North	15/8/10-7/3/11	19	17	Jack James, Colin and Pia Pilcher	Emma Stephens
Normanville South *	9/12/10-15/12/10	3	2	Pia Pilcher	Emma Stephens, Corey Jackson
Shelly beach (Lady Bay)	1/8/10-26/3/11	23	15	Lauren Davis, Russell Garner	Sullivan Garner, Cindy Whittlesea, Emma Stephens
Morgans Beach *+	29/9/10-24/3/11	7	1	David Woollard, Bill Page	Corey Jackson
Lands End	25/10/10-12/3/11	8	4	Bill Page	Janet Page, Emma Stephens
Tunkalilla *	21/11/10-7/3/11	4	4	James Ellis, Thirza Thomas, Piers Plumridge, Emma Stephens	Corey Jackson, Aleisa Lamanna
Coolawang Beach *	15/11/10-6/3/11	4	0	Julie Turner, Faye Lush	Joyce West, Brenton Lush, Nick Tebneff
Parsons beach	10/9/10-14/2/11	11	9	Dean Cutten, Dodge Farmer	Emma Stephens
Waitpinga Beach	3/9/10-7/3/11	9	4	Terry Dennis, Winston Syson	Dean Cutten, Dean Hull
Inman River outlet, Kent Reserve, Victor Harbor	18/9/10-21/3/11	33	27	Ross Brittain and Janette Diment, Terry and Helen Dennis, Verle Wood	Emma Stephens
Hindmarsh River outlet, Victor Harbor	19/4/10-18/6/10, 26/7/10-9/4/11	11, 31	11, 25	Andrew Jeffrey, David Thorn, Richard Edwards	Emma Stephens
Watsons Gap, Port Elliot	30/8/10-7/10/10	7	3	Ann Turner, Kerri Bartley	Michelle and Jerry Foster, Emma Stephens
Bashams beach, Port Elliot	2/08/10 – 14/2/11	28	26	Winston Syson	Emma Stephens
Middleton/Goolwa *	22/8/10-9/1/11	3	0	Michelle Foster	Emma Stephens

Figure 1. Hooded Plover monitoring sites on the Fleurieu Peninsula over the 2010/11 breeding season.



Nesting success

Overall, there were 36 nesting attempts monitored on the Fleurieu Peninsula. Most pairs had between one and three nesting attempts that were detected, although one pair at Hindmarsh river had six nesting attempts, none of which were successful. Table 6 summarises nesting activity of pairs according to data sheets submitted and Table 7 expands this into more detail.

Of the 36 nests monitored, 61.1% failed during the egg stage (a loss of 57 eggs). The following causes of egg failure were suspected: loss to high tide/storm surges (Carrackalinga North in late Oct, Normanville North and Normanville South in mid Dec), extreme heat (camera confirmed 1 nest at Tunkalilla eastern end in late Jan), partial failure (2 eggs unhatched Maslin beach), wind burial (Watsons Gap), raven (Lands End, Carrackalinga, Hindmarsh river mouth), fox (Bashams), and human disturbance/crushing combined with avian predation (Hindmarsh river mouth).

Of the 38.9% of nests that hatched, 26 chicks were observed and 9 went on to fledge (1 in early Nov, 3 in late Jan, 1 in mid Feb, 4 in early March) from 7 separate nesting attempts. 7 out of 9 chicks that fledged were from managed sites. Chick fates were difficult to ascertain but at some sites the suspected causes were kestrels (Shelly Beach), foxes (Hindmarsh River mouth) and frequent off-leash dog activity (Maslin beach).

Scoutguard nest cameras were used on two nests this season: one was abandoned at the egg stage after a spell of extreme heat (and subsequently eaten by a fox) at Tunkalilla, and one nest hatched at Shelly beach. Images from these nests appear on pages 19 and 20 respectively.

There was a single juvenile sighted in late Jan around the middle of Tunkalilla beach. There were numerous sightings at Maslin beach from early March through April of between one and two juveniles. These chicks were of flying age and it was unknown where they originated from but they could have been some of our monitored fledged chicks dispersing from their sites.

Overall, an egg had a 10.8% chance of fledging a chick successfully (9 of 83 eggs) and a nest a 16.7% (6 of 36 nests produced fledglings) chance of fledging at least one chick.

In comparison to the 2009/10 season, the pairs were more intensively monitored this season so that we are more likely to have detected most of their nests. Last season there were 1.5 nests per pair (18 nests recorded for 12 pairs) while in 2010/11 there were 1.9 nests per breeding pair, which is slightly higher. Hatching success was 10% lower this season, but because nest fates are so rarely identified, it is unclear whether this is because of prevailing weather/tidal conditions, predators or human threats. However, in Victoria, tide and weather appeared to take more nests than usual in the 2010/11 season. Use of nest cameras will shed better light on nest fates, allowing us to more accurately understand the relative impact of different threats at sites. Chick survival was similar in the two seasons on the Fleurieu Peninsula, with 37% of chicks surviving to fledge in 2009/10 and 34% in 2010/11.

Above: Scout guard remote nest camera images. The parent birds try to cope with extreme heat on 30th Jan 2011 (continued to 31st Jan) by regular shifts in incubation, one brooding the other, panting and shading. A white-faced heron visits and the nest is eventually abandoned, with a fox visiting two days later in the night but not detecting the eggs, but then two days after that, a fox in the day eats the eggs.

Above left: Eggs circled in centre of shot at Shelly beach. Off leash golden retriever circled in right of shot. The Hooded Plover has come off the nest and is vigilant, looking at the dog in the distance. Above right: both chicks are circled, one has been brooded by the parents and is crouching underneath an adult's leg, while the other has been moving about foraging. The second parent is keeping watch nearby. Left: eggs in the nest about to hatch (photo Emma Stephens). Below right: access signs by gate (photo Emma Stephens). Below left: Scoutguard photo of chick and adult on egg yet to hatch.

Figure 2. Nests found on the Fleurieu Peninsula in the 2010/11 breeding season.

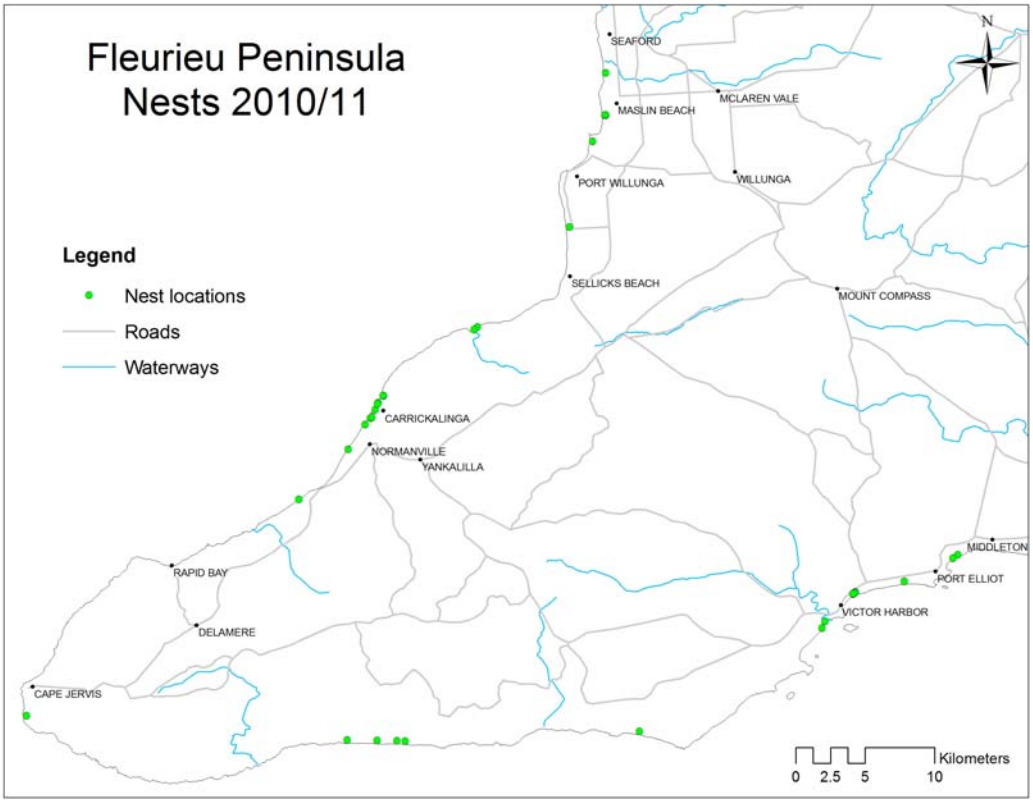
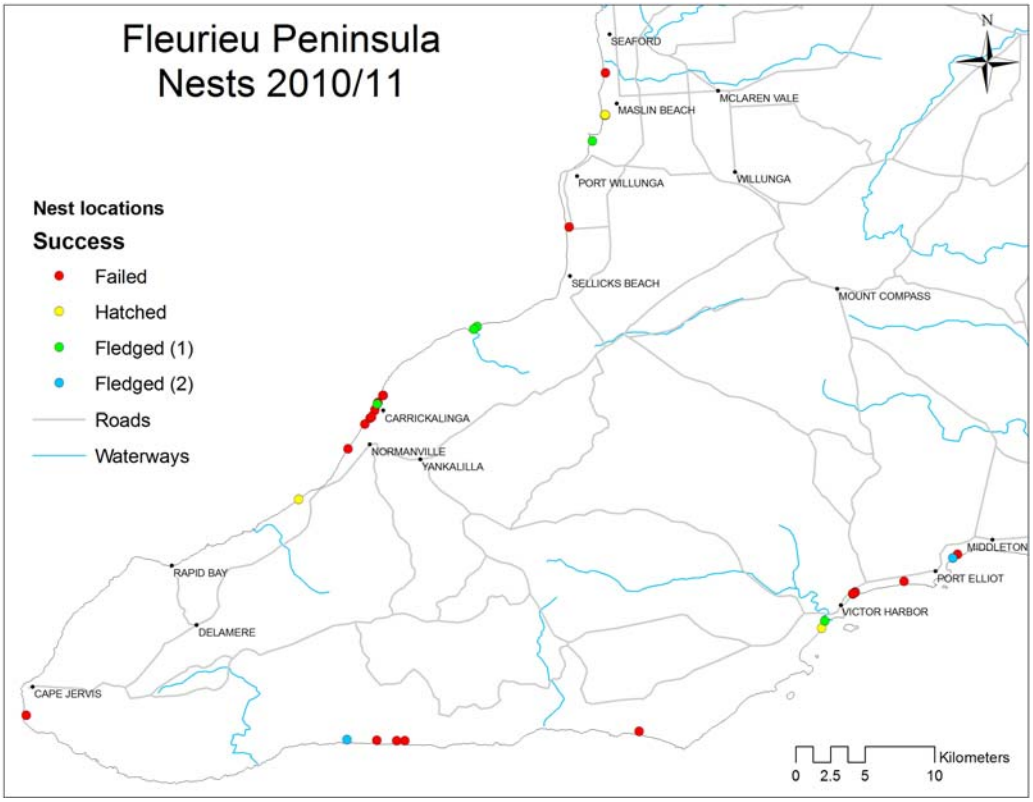
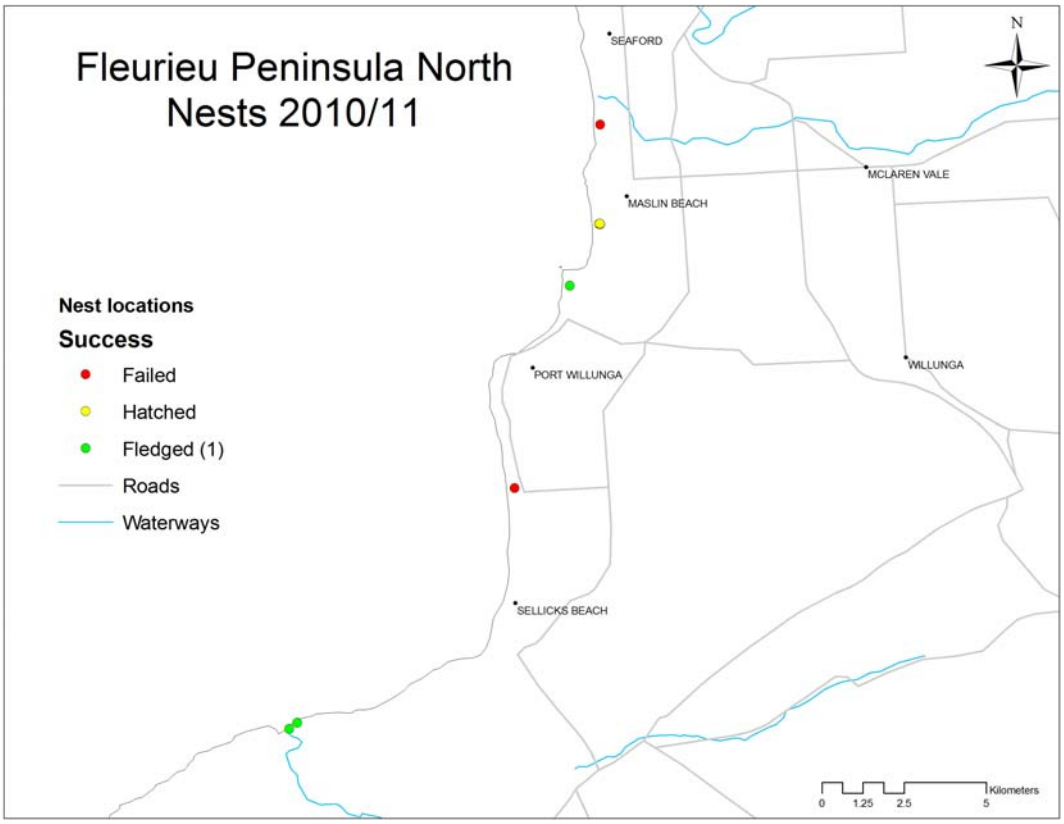
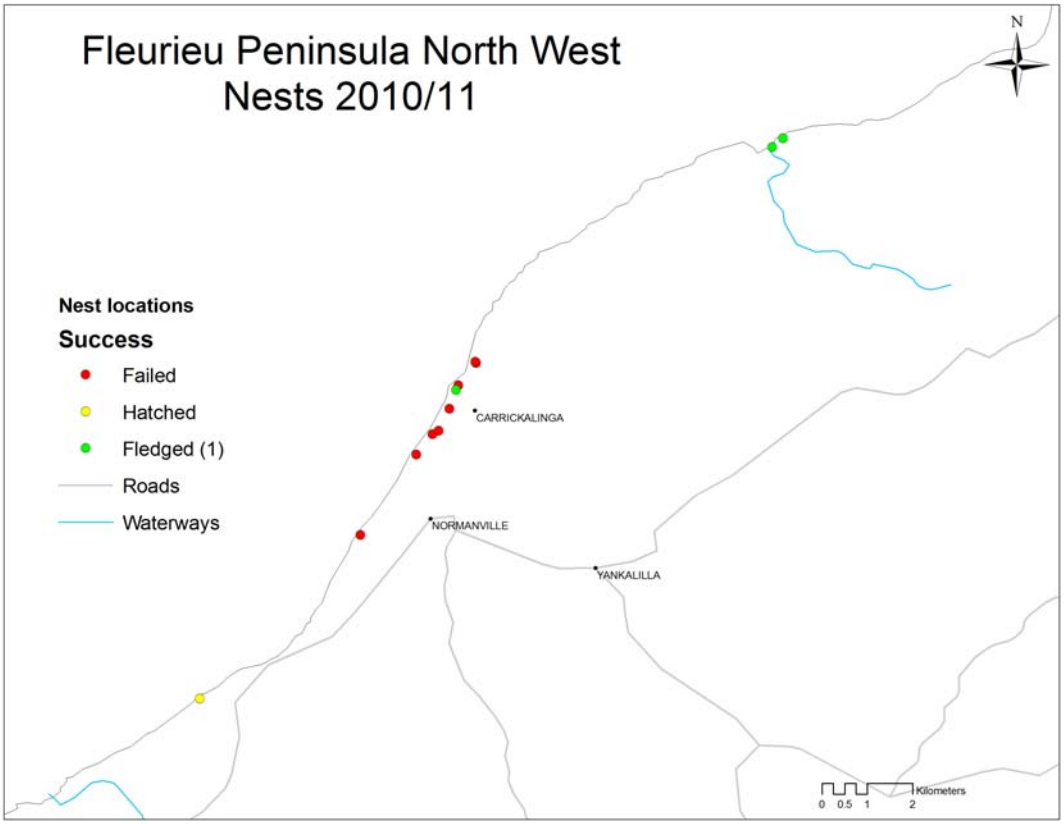
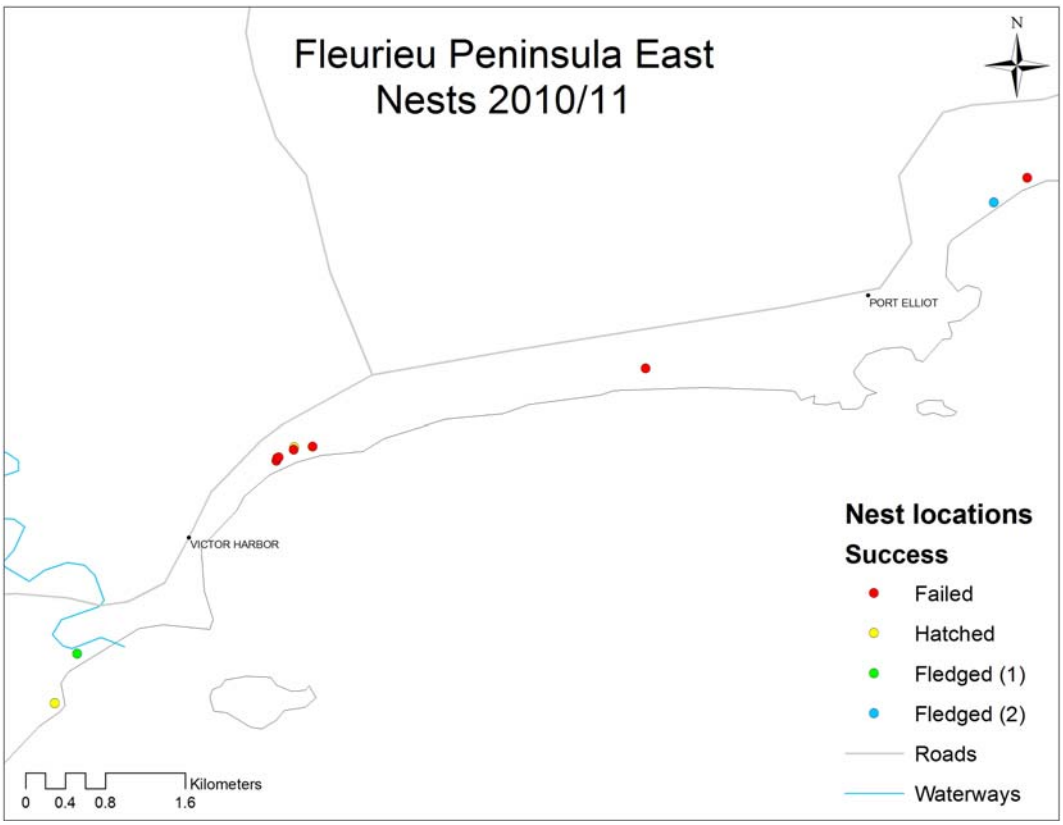


Figure 3. Map of nests according to success/failure; further below are zoomed in maps of areas with multiple nests which are not as visible on the map of the whole peninsula.




Fleurieu Peninsula North
Nests 2010/11
N
SEAFORD
MCLAREN VALE
MASLIN BEACH
PORT WILLUNGA
WILLUNGA
SELLICKS BEACH
Nest locations
Success
Failed
Hatched
Fledged (1)
Roads
Waterways
0 1.25 2.5 5
Kilometers


Fleurieu Peninsula North West
Nests 2010/11
N
CARRICKALINGA
NORMANVILLE
YANKALILLA
Nest locations
Success
Failed
Hatched
Fledged (1)
Roads
Waterways
0 0.5 1 2
Kilometers



Off leash dog chasing adult Hooded Plover at Inman River mouth, Jan 2011. The pair had recently hatched chicks at this time. (Photo courtesy Richard Edwards)

Table 6. Overall summary of nests, number of nests managed, hatching or failing at egg stage, total number of eggs and chicks observed and total chicks that fledged from that site in the 2010/11 breeding season.

Pair	# nests	# nests managed	# hatch	# fail at egg stage	total eggs	total chicks obsv.	total fledged
South Port	0						
Moana beach	1	1	0	1	1	0	0
Silver Sands	1	1	0	1	2	0	0
Maslin Beach	3	3	3	0	8	6	0
Port Willunga	1	1	1	0	2	1	1
Myponga Beach	2	1	2	0	3, 3+	5	2
Carrackalinga North	2	2	0	2	4	0	0
Carrickalinga	3	3	1	2	6	2	1
Normanville North	3	3	0	3	9	0	0
Normanville South	1	1	0	1	3	0	0
Shelly beach (Lady Bay)	1	1	1	0	3	3	0
Morgans Beach	0						
Lands End	1	0	0	1	3+	0	0
Tunkalilla far western end	1	0	1	0	3	3	2
Tunkalilla middle 1	1	0	0	1*	2	0	0
Tunkalilla middle 2	1	0	1	0	3+	1	unk
Tunkalilla eastern end	2	0	0	2**	4	0	0
Parsons beach	0						
Waitpinga Beach	1	0	0	1	2	0	0
Inman River outlet	2	1	2	0	6	6!	1
Hindmarsh River outlet	6	4	1	5	15	3	0
Watsons Gap	1	0	0	1	1	0	0
Bashams beach	2	2	1	1	6	2	2
TOTALS	36	24	14	22	83	26	9

* assume as chicks were not seen on a subsequent visit, but visits to this site were rare. ** fate of second nest unknown. + nests were not found so that egg number was assumed to be 3 based on the most common clutch size. ! chicks were not sighted from one nest here, however, one observer had a strong indication that there were chicks on several visits (after the eggs were no longer seen) based on the adult behaviour, so we are tentatively counting this as hatched.

Table 7. Detailed summary of nest progress for each pair according to data sheets sent in to Birds Australia for the 2010/11 breeding season.

Pair/location	Date	Nest update	Nest #
South Port	Aug-late Dec	no monitoring so possibly missed a nesting attempt?	
South Port	late Dec-Mar	no nests	
Moana	6/10/2010	courting, no nest observed	
Moana	13/10/2010	only a single bird seen and returns to same location	
Moana	10/11/2010	scrapes observed	
Moana	25/11/2010	nest found with 1 egg	1
Moana	3/12/2010	nest failed	2
Silver Sands	14/11/2010	suspect nest	1
Silver Sands	19/11/2010	nest found with 2 eggs	1
Silver Sands	28/11/2010	nest failed (unknown cause), last seen on nest 26/11	1
Silver Sands	3/12/2010	scrapes observed	
Silver Sands	5/12/2010	birds not seen at site from this date onward	
Maslin beach	21/08/2010	nest found with 2 eggs	1
Maslin beach	24/08/2010	3 eggs now	1
Maslin beach	14/09/2010	nest hatched (last visit 9/9), 3 chicks observed	1
Maslin beach	30/09/2010	chicks not observed, suspect failure (last seen 28/9)	1
Maslin beach	18/10/2010	nest found with 3 eggs	2
Maslin beach	17/11/2010	nest hatched (last visit 10/11), 1 chick seen (2 eggs unhatched/abandoned)	2
Maslin beach	22/12/2010	chick not observed (cause unknown), last seen 15/12	2
Maslin beach	30/12/2010	nest found with 2 eggs	3
Maslin beach	30/01/2011	nest hatched (last visit 30/12), 2 chicks observed	3
Maslin beach	6/02/2011	1 chick gone (cause unknown)	3
Maslin beach	9/02/2011	final chick gone (cause unknown)	3
Port Willunga	29/09/2010	no visits made in Oct and Nov, potentially missing a nest	
Port Willunga	15/12/2010	nest found with 2 eggs	1
Port Willunga	8/01/2011	nest hatched (last visit 4/1), 1 chick observed	1
Port Willunga	14/02/2011	chick fledged (had not been seen since 21/1)	1
Myponga Beach	25/09/2010	2 chicks sighted, nest not detected on earlier visits	1
Myponga Beach	25/10/2010	1 chick gone (cause unknown)	1

Pair/location	Date	Nest update	Nest #
Myponga Beach	4/11/2010	chick fledged	1
Myponga Beach	3/12/2010	suspect nest	2
Myponga Beach	5/12/2010	nest found with 3 eggs	2
Myponga Beach	21/12/2010	nest hatched (last visit 9/12), 3 chicks observed	2
Myponga Beach	13/01/2011	1 chick gone (cause unknown)	2
Myponga Beach	22/01/2011	1 chick gone (cause unknown)	2
Myponga Beach	27/01/2011	chick fledged	2
Carrickalinga North	26/10/2010	nest found with 1 egg	1
Carrickalinga North	31/10/2010	nest failed (high tide/storm), last visit 27/10	1
Carrickalinga North	31/10/2010	fresh scrapes	
Carrickalinga North	27/11/2010	nest found with 3 eggs (by Jack James reported to Emma Stephens)	2
Carrickalinga North	30/11/2010	nest failed (cause unknown)	2
Carrickalinga	27/10/2010	nest found with 1 egg	1
Carrickalinga	2/11/2010	nest failed (suspect avian predator), last visit 27/10	1
Carrickalinga	13/12/2010	nest found with 3 eggs	2
Carrickalinga	17/12/2010	nest failed, last visit 17/12	2
Carrickalinga	10/01/2011	nest found with 2 eggs	3
Carrickalinga	31/01/2011	nest hatched (last visit 29/1), chicks not seen	3
Carrickalinga	2/02/2011	2 chicks observed	3
Carrickalinga	8/02/2011	1 chick gone (cause unknown)	3
Carrickalinga	1/03/2011	chick fledged	3
Normanville North	18/10/2010	nest found with 3 eggs	1
Normanville North	26/10/2010	nest failed (last checked this AM)	1
Normanville North	13/11/2010	nest found with 3 eggs	2
Normanville North	20/11/2010	nest failed (unknown cause), last seen on nest 13/11	2
Normanville North	28/11/2010	nest found with 2 eggs	3
Normanville North	5/12/2010	3 eggs now	3
Normanville North	14/12/2010	nest failed (suspect high tide), last seen 11/12	3
Normanville South	9/12/2010	nest found with 3 eggs	1
Normanville South	12/12/2010	nest failed (tides plus fox and dog prints), last visit 9/12	1
Shelly Beach (lady bay)	10/10/2010	scrapes observed	
Shelly Beach (lady bay)	31/10/2010	scrapes gone due to wild weather	

Pair/location	Date	Nest update	Nest #
Shelly Beach (lady bay)	12/02/2011	scrapes observed	
Shelly Beach (lady bay)	15/02/2011	nest found with 3 eggs	1
Shelly Beach (lady bay)	25/02/2011	nest hatches, at least 2 chicks seen on camera	1
Shelly Beach (lady bay)	26/02/2011	only 1 chick observed, all eggs absent from nest, assume all hatched	1
Shelly Beach (lady bay)	6/03/2011	chick gone (suspect kestrels), last seen 1/3	1
Morgans Beach	15/10/2010	pair sighted foraging	
Morgans Beach	24/01/2011	pair not sighted on this or subsequent visits	
Lands End	25/10/2010	nest never found, but found egg with beak mark discarded on wet sand	1
Lands End	20/02/2011	suspect nest but no sign of nesting on next visit 12/3	2
Tunkalilla - far West end	21/11/2010	nest found with 3 eggs	1
Tunkalilla - far West end	27/01/2011	3 chicks observed (stage 3), nest potentially from 21/11	1 or 2
Tunkalilla - far West end	7/03/2011	2 chicks observed (stage 4), nest not found	1 or 2
Tunkalilla – East end	21/11/2010	scrapes observed	
Tunkalilla – East end	27/01/2011	nest found with 3 eggs	1
Tunkalilla – East end	30/01/2011	nest failed (camera: extreme heat led to abandonment, fox subsequently ate eggs)	1
Tunkalilla - East end	7/03/2011	nest found with 1 egg, fate unknown	2
Tunkalilla - 200m E mid	27/01/2011	nest found with 2 eggs, unknown if hatched but no sign of chicks here in March	1
Tunkalilla - near W end	27/01/2011	1 chick observed (stage 3), nest not found	1
Parsons beach	21/12/2010	observed copulating	
Parsons beach	Sept-Feb	no nests found	
Waitpinga Beach	Sept-Nov	nest found with 2 eggs during single Nov count visit, no other visits made in Oct/Nov	1
Waitpinga Beach	Dec-Mar	nest assumed to have failed (no nest or chicks), and no nests found to end of season	1
Waitpinga Beach	Jan	beach very eroded and not conducive to nesting	
Inman River Outlet	13/10/2010	copulating, suspect nest but not found	
Inman River Outlet	14/10/2010	nest found with 3 eggs	1
Inman River Outlet	7/12/2010	nest gone	1
Inman River Outlet	12/12/2010	suspect chicks	1
Inman River Outlet	14/12/2010	adults not sighted	1
Inman River Outlet	16/12/2010	suspect chicks	1
Inman River Outlet	17/12/2010	no sign of chicks, presume chicks lost	1

Pair/location	Date	Nest update	Nest #
Inman River Outlet	28/12/2010	nest found with 3 eggs	2
Inman River Outlet	31/01/2011	nest hatched (last visit 24/1), 3 chicks seen	2
Inman River Outlet	10/02/2011	two chicks gone	2
Inman River Outlet	5/03/2011	1 chick fledges	2
Hindmarsh River Mouth	16/09/2010	nest found with 2 eggs (west of mouth)	1
Hindmarsh River Mouth	22/09/2010	nest failed (suspect human disturbance plus avian predator?), last visit 20/1	1
Hindmarsh River Mouth	8/10/2010	scrapes observed	
Hindmarsh River Mouth	10/10/2010	nest found with 1 egg (west of mouth)	2
Hindmarsh River Mouth	16/10/2010	2 eggs in nest now (last check 13/10)	2
Hindmarsh River Mouth	26/10/2010	nest failed (suspect human crushing or gull predation, shell fragments), last visit 22/10	2
Hindmarsh River Mouth	12/11/2010	nest found with 3 eggs (east of mouth)	3
Hindmarsh River Mouth	7/12/2010	nest hatched (last visit 6/12), 3 chicks seen	3
Hindmarsh River Mouth	10/12/2010	1 chick gone (cause unknown)	3
Hindmarsh River Mouth	12/12/2010	chicks gone (suspect fox)	3
Hindmarsh River Mouth	15/12/2010	nest found with 3 eggs (east of mouth)	4
Hindmarsh River Mouth	20/12/2010	nest failed (cause unknown), last visit 15/12	4
Hindmarsh River Mouth	8/01/2011	nest found with 3 eggs (east of mouth)	5
Hindmarsh River Mouth	28/01/2011	nest failed (cause unknown), last visit 8/1	5
Hindmarsh River Mouth	28/01/2011	nest found with 2 eggs (west of mouth)	6
Hindmarsh River Mouth	29/01/2011	nest failed (raven prints by nest), last visit 28/1	6
Watsons Gap	1/10/2010	scrapes observed	1
Watsons Gap	4/10/2010	nest found with 1 egg	1
Watsons Gap	6/10/2010	nest failed (high winds burying egg)	1
Bashams Beach	18/09/2010	nest found with 1 egg	1
Bashams Beach	23/09/2010	3 eggs in nest now	1
Bashams Beach	21/10/2010	2 eggs gone from nest (fox prints nearby), 1 egg abandoned	1
Bashams Beach	25/11/2010	nest found with 3 eggs	2
Bashams Beach	20/12/2010	nest hatched (last visit 12/12), 2 chicks observed	2
Bashams Beach	19/01/2011	2 chicks fledge	2

Threats to breeding pairs

Of the potential threats to Hooded Plovers monitored by volunteers during the breeding season, people and dogs off lead were most prevalent at sites on the Fleurieu Peninsula from 309 threat assessments at 21 sites. Silver gulls, dogs on lead, vehicles and ravens were also common. See Tables 8-10 below for summaries of the proportion of visits and sites where each threat was observed, and a snapshot of what activities people were commonly using the beaches for. Table 11 assesses the prevalence and intensity of threats at each site separately and Table 12 provides average number of people and dogs on and off lead sighted. Please note that these figures should be interpreted with caution as some are based on small sample sizes across a broad time frame, making these less representative of the actual prevalence and intensity of threats at these sites (sites with infrequent threat assessments are denoted by an asterisk; namely Normanville South, Morgans beach, Coolawang and Tunkalilla).

This season we were able to get a comprehensive threat profile for most sites due to a high number of visits where threat assessments were carried out. This gave us greater understanding of the visitor activities which occurred, and we were able to see distinct differences in the visitor base for sites. Waitpinga and Parsons beaches were most frequented by fishermen; South Port, Silver Sands and Tunkalilla by surfers/swimmers; Moana, Port Willunga and Shelly beach by dog walkers; and Carrickalinga by people sitting/sunbaking. The remaining sites were predominantly visited by walkers.

Vehicles, horses and foxes were present at more sites than last season. Sightings of dogs off lead were fewer but this related to the lack of dogs at additional sites monitored this season (Tunkalilla, Coolawang and Myponga).

Table 8. Proportion of visits where threats were observed (this includes evidence of tracks unless specified).

Threat	**Prop. visits present (total visits=309)**
Evidence of people (prints &/or sightings)	96.1% (289)
Evidence of dogs (prints &/or sightings)	89.3% (276)
Dog prints	88.0% (272)
People sighted	73.8% (228)
Dogs sighted	47.2% (146)
Dogs off lead	38.2% (118)
Silver gulls	34.3% (106)
Dogs on lead	21.4% (66)
Vehicles	19.7% (61)
Ravens	16.2% (50)
Foxes	13.9% (43)
Pacific gulls	9.4% (29)
Horses	5.2% (16)
BOP	4.5% (14)
Magpies	2.3% (7)

Table 9. Proportion of sites where threats were observed (sites are named in abbreviated form). Tracks and prints are included as evidence of threats, unless categorised separately.

Threat	Prop sites present (21)	Detected at:	Not detected at:
Foot prints	100%	All	
Dog prints	100%	All	
People	95.2%		Coolawang
Dogs sighted	85.7%		Coolawang, Myponga, Parsons
Dogs off	81.0%		Coolawang, Myponga, Parsons, Tunkalilla
Silver gulls	81.0%		Coolawang, Lands End, Morgans, Normanville South
Dogs on	76.2%		Coolawang, Myponga, Parsons, Waitpinga, Watsons Gap
Vehicles *	71.4%		Lands End, Hindmarsh, Inman, Parsons, Waitpinga, Watsons Gap
Foxes	57.1%	Bashams, Coolawang, Hindmarsh, Lands End, Morgans, Normanville North, Normanville South, Parsons, Shelly, South Port, Tunkalilla, Waitpinga	Carrackalinga, Carrackalinga North, Inman, Maslin, Moana, Myponga, Port Willunga, Silver Sands, Watsons Gap
Ravens	52.4%	Carrackalinga, Carrackalinga North, Coolawang, Hindmarsh, Normanville North, Parsons, Shelly, Silver Sands, Tunkalilla, Waitpinga, Watsons Gap	Bashams, Inman, Lands End, Maslin, Moana, Morgans, Myponga, Normanville South, Port Willunga, South Port
Pacific gulls	47.6%	Bashams, Carrackalinga North, Hindmarsh, Inman, Maslin, Myponga, Parsons, Shelly, Silver Sands, Waitpinga	Carrackalinga, Coolawang, Lands End, Moana, Morgans, Normanville North, Normanville South, Port Willunga, South Port, Tunkalilla, Watsons Gap
Horses	38.1%	Bashams, Coolawang, Moana, Myponga, Normanville South, Shelly beach, Silver Sands, Port Willunga	
BOP	28.6%	Maslin, Moana, Normanville North, Shelly, Silver Sands, Watsons Gap	
Magpies	19.0%	Carrackalinga North, Moana, Shelly, Silver Sands	
Reptile	4.8%	Coolawang	

* Vehicles detected on beaches where vehicles are not permitted can sometimes be management vehicles or in the case of Maslin beach, the ice-cream van!

Table 10. The main activities people were observed using the beaches for. In total, there were 1685 people at the water's edge, 351 on the beach, 8 observed inside signed/fenced areas and 9 in the dune.

Human recreational activity (of 2055 people observed)	**% intensity**
Walking	36.2% (743)
Dog walking	23.7% (487)
Sitting/sun-baking	18.2% (373)
Surfing/swimming	14.8% (305)
Fishing	4.9% (100)
In vehicles	2.2% (46)
Horse riding	0.0005% (1)

Table 11. The prevalence of potential threats to Hooded Plover at sites monitored (those with an asterisk have so few threat assessments, data should be treated with caution here). Prevalence refers to the how frequently that threat was observed (# times/# visits). Threat prevalence is categorised as heavy, moderate, sparse or rare according to the percentage of time recorded.

Site (number of threat assessments)	**Heavy threats (>50%)**	**Moderate threats (20-50)**	**Sparse threats (<20%)**	**Rare threats (<6%)**	**Common activity**
South Port (12)	Dog prints, People, Vehicles, Dogs off	Silver gulls, Dogs on		Foxes	Surf/swim, Walk, Dog walk, Sit/sunbake, Drive, Fish
Moana beach (10)	People, Dog prints, Dogs off, Vehicles	Horses, Dogs on, Silver gulls	Raptors	Magpies	Dog walk, Walk, Fish, Drive
Silver Sands (15)	People, Vehicles, Dogs off, Dog prints, Silver gulls	Dogs on, Horses, Ravens	Pacific gulls	Magpies, Raptors	Surf/swim, Dog walk, Walk, Drive, Sit/sunbake, Fish
Maslin Beach (35)	Dog prints, People	Dogs off, Silver gulls, Dogs on	Pacific gulls, Raptors	Vehicles	Walk, Dog walk, Sit/sunbake, Fish
Port Willunga (12)	Dogs off, People, Dog prints	Silver gulls	Dogs on	Vehicles, Horses	Dog walk, Walk, Surf/swim, Sit/sunbake, Fish
Myponga Beach (13)	Silver gulls, Dog prints	Pacific gulls	People	Vehicles, Horses	Walk, Dog walk, Fish
Carrackalinga North (16)	People, Dog prints, Ravens	Dogs off, Silver gulls	Dogs on, Magpies, Pacific gulls	Vehicles	Walk, Dog Walk, Fish, Sit/sunbake

Site (number of threat assessments)	Heavy threats (>50%)	Moderate threats (20-50)	Sparse threats (<20%)	Rare threats (<6%)	Common activity
Carrickalinga (29)	People, Dog prints		Dogs off	Dogs on, Silver gulls, Ravens, Vehicles	Sit/sunbake, Walk, Dog walk, Fish
Normanville North (19)	Dog prints, People, Dogs off	Silver gulls, Ravens	Dogs on, Vehicles, Foxes	Raptors	Walk, Dog walk, Fish, Sit/sunbake, Drive
Normanville South (3) *	People, Vehicles, Horses, Dog prints	Dogs off, Dogs on, Foxes			Walk, Dog walk
Shelly beach (20)	People, Dog prints	Vehicles, Dogs on, Ravens, Dogs off, Birds of prey, Silver gulls	Magpies, Pacific gulls	Foxes, Horses	Dog walk, Walk, Fish, Surf/swim, Sit, Drive
Morgans Beach (4) *	Vehicles, People, Dog prints	Foxes	Dogs off, Dogs on		Walk, Surf/swim, Sit/sunbake, Dog walk, Fish, Drive
Lands End (8)	Foxes, Dog prints	People	Dogs off, Dogs on		Walk, Dog walk
Tunkalilla (4)*	Foxes, Dog prints	Vehicles, Ravens, People	Silver gulls, Dogs on		Surf/swim, Dog walk
Coolawang (3) *	Foxes	Vehicles, Ravens, Horses, Dog prints, People prints			-
Parsons beach (9)	Foxes, Ravens, Silver gulls	People	Pacific gulls, Dog prints		Fish, Walk, Surf/swim
Waitpinga Beach (7)	Foxes, Ravens	People, Silver gulls, Dogs off, Dog prints	Pacific gulls		Fish, Surf/swim, Walk, Sit, Dog walk
Inman River outlet (28)	Dog prints, People	Dogs off	Dogs on	Silver gulls, Pacific gulls	Walk, Dog walk, Sit/sunbake, Fish, Surf/swim
Hindmarsh River mouth (23)	Dog prints, People, Dogs off	Silver gulls, Dogs on	Ravens	Pacific gulls, Foxes	Walk, Dog walk, Surf/swim
Watsons Gap (6)	Dog prints, Silver gulls	Ravens, People, Dogs off	Raptors		Walk, Dog walk, Fish, Sit/sunbake
Bashams beach (28)	Dog prints, People	Silver gulls, Pacific gulls, Dogs on	Dogs off, Foxes	Vehicles, Horses	Walk, Dog walk, Sit/sunbake, Fish

Table 12. Mean (± standard error) number of people and dogs on and off leash observed at sites. Sites with an asterisk have too few threat assessments to provide accurate data.

Site (number of assessments)	Number of people	Number dogs off lead	Number dogs on lead
South Port (12)	14.33 ± 3.84	2.67 ± 0.70	0.83 ± 0.37
Moana beach (10)	5.30 ± 0.75	1.60 ± 0.43	1.40 ± 0.70
Silver Sands (15)	17.67 ± 3.74	2.33 ± 0.36	1.53 ± 0.45
Maslin Beach (35)	4.54 ± 0.54	1.17 ± 0.29	0.66 ± 0.17
Port Willunga (12)	11.58 ± 2.11	4.42 ± 1.20	0.25 ± 0.18
Myponga Beach (13)	0.15 ± 0.15	0	0
Carrackalinga North (16)	6.69 ± 1.66	1.13 ± 0.41	0.75 ± 0.27
Carrickalinga (29)	18.55 ± 5.66	0.10 ± 0.06	0.38 ± 0.32
Normanville North (19)	3.63 ± 0.99	1.11 ± 0.30	0.37 ± 0.16
Normanville South (3) *	5.67 ± 1.76	0.33 ± 0.33	0.67 ± 0.33
Shelly beach (20)	3.50 ± 0.85	0.60 ± 0.26	0.65 ± 0.21
Morgans Beach (4) *	7.50 ± 2.66	0.25 ± 0.25	0.50 ± 0.50
Lands End (8)	3.38 ± 3.23	0.13 ± 0.13	0.25 ± 0.16
Tunkalilla (4)*	0.67 ± 0.47	0	0.33 ± 0.33
Parsons beach (9)	1.60 ± 1.25	0	0
Waitpinga Beach (7)	4.25 ± 2.30	0.25 ± 0.17	0
Inman River outlet (28)	1.86 ± 0.36	0.36 ± 0.13	0.21 ± 0.09
Hindmarsh River mouth (23)	6.91 ± 1.43	2.00 ± 0.51	1.61 ± 0.52
Watsons Gap (6)	7.67 ± 6.70	1.17 ± 0.83	0
Bashams beach (28)	3.35 ± 0.97	0.32 ± 0.14	0.71 ± 0.25

Management of breeding pairs during the 2010/11 breeding season

The majority of nests/chick sites were managed in the 2010/11 breeding season (69.4% of 36 nesting attempts). Nests at Tunkalilla and Waitpinga were not managed due to the remoteness of the site and to the infrequent visitation rate. At Lands End a predated egg was found without ever locating the nest, however, this site would not have been managed due to its remoteness. At Inman river outlet, the pair's first nest on the foredune was not managed and we assume this hatched but failed within the first week, however this is based on adult behaviour and the chicks were never sighted. At Hindmarsh river mouth, the first two of the six nests were not managed and it was suspected that people and/or avian predators were the demise of these nests. The third nest hatched with management but the chicks died within the first week and a fox was the main suspect. The subsequent three fenced nests failed to hatch and raven prints were found by the nest in one case but otherwise evidence was not clear at the other two nests.

Tunkalilla was the only unmanaged site where chicks fledged, otherwise all sites with fledglings were managed with signage and often accompanying fences (78% of fledglings

were from managed sites). Table 13 provides details of site managements. There is insufficient data to correlate management with success as most sites with human threats were managed for the purposes of protecting the eggs/chicks. At Hindmarsh river however, it may be that the suspected human cause of failure for the first two nests may have been avoided with signage and/or fencing, although they still may not have hatched, as three managed nests did not hatch due to at least one predator.

A range of managements to reduce the impact of these potential threats to breeding Hooded Plovers were used at sites on the Fleurieu Peninsula including:

- Signs around the nesting site
- Signs around the nesting site accompanied by a rope fence
- Signs around the general area chicks were using (with specific messages relating to improving chick survival)
- Signs with a "thank you" message to the community for assisting during the nesting phase (i.e. with leashing dogs, sitting away from the fenced area etc)
- Signs at the access point
- The fenced nest at Bashams Beach was provided with added protection through the installation of signage approximately 100m either side of the nest encouraging walkers to use the sealed pathway behind the dunes for this section of beach. Many walkers complied with this, and with the community education undertaken by local volunteers, the Hooded Plovers successfully raised 2 chicks. The signage was instigated by the Compliance officer of DC Alexandrina. This support from DC Alexandrina and all Councils has enabled this program to manage vulnerable nests/chicks to improve breeding success.
- Wooden A-frame chick shelters (built by the Normanville Natural Resources Centre with Yankalilla Area School students)
- Permanent Hooded Plover signs at access points
- Distribution of 'beach-nesting birds' brochures to beach users
- Media in local newspapers, ABC radio and television coverage on Channel 10 Weather
- Seven dog's breakfast events were held in collaboration with the Normanville Natural Resources Centre at: Maslin Beach, Port Willunga, Normanville, Inman River, Hindmarsh River, Port Elliot and Bashams Beach. Relevant AMLR NRM Board and Council staff and volunteers also attended workshops.
- School education through the Normanville Natural Resources Centre
- Birds Australia's Schools Education Resource "The Wing Thing" distributed to Encounter Lutheran School, Yankalilla Area School and other schools in the Victor Harbor vicinity.
- Training of 7 new volunteers regarding monitoring guidelines, datasheet entry and fencing/signage installation.
- Two nest cameras (Scoutguard) were installed, one at Tunkalilla and the other at Shelly Beach.
- NRM Board purchase of equipment for Hooded Plover fencing and signage kits put together and distributed to Council depot and volunteers around the Fleurieu (12 fencing

and signage kits including a total of 72 signs). These kits were used extensively throughout the 2010/11 breeding season by volunteers, AMLR NRM Board and Council staff. An inventory of items needing to be replaced has been undertaken and the completed kits are ready to be used in the 2011/12 breeding season.

- Council Response Plans – a response plan for volunteers, councils, Department of Environment and Natural Resources (DENR) and AMLR NRM Board staff to follow should fencing/signage be required.
- The National Biennial Hooded Plover count occurred in November 2010 – 26 sites were surveyed by 19 volunteers.
- Coast to Coast Conference September 2010: the AMLR NRM Board submitted a poster on the Hooded Plover program on the Fleurieu Peninsula, Grainne Maguire of Birds Australia provided 2 workshop presentations, and the Hooded Plover program was featured in the field trip.
- Grainne Maguire visited all Hooded Plover Fleurieu sites to meet volunteers, observe the pairs, typical nesting sites and collect information for the Site Profiles document for the Fleurieu Pensinsula. This report will be available on the AMLR NRM Board's website.
- Volunteers, who did not have a GPS, were provided with a GPS to record coordinates onto datasheets of HP adult sightings, nest locations and chick sightings. The GPS units were funded through Caring for Country funds devolved by Birds Australia Beach-nesting Birds Program.
- The AMLR NRM Board's "Coastal Ambassadors" program held a community workshop on beach-nesting birds. Presentations were provided by Grainne Maguire and Emma Stephens.
- A meeting was held between AMLR NRM Board and City of Onkaparinga Rangers. Rangers were provided with a summary of the program, Hooded Plover breeding behaviour and nesting sites within City of Onkaparinga, and the Council Response Plan. Rangers are now made aware of nest/chick locations, and rangers have provided significant assistance with transporting kits and assisting with installation and removal of fencing/signs.
- City of Onkaparinga staff member Nikola Vollmer provided a presentation to all City of Onkaparinga staff regarding Hooded Plovers and the program on the Fleurieu Peninsula.
- Nest/chick information was provided to both Victor Harbor Beachfront Holiday Park (Caravan Park) and Adare Caravan Park. Staff were very willing to provide this at the front desk and on information boards. Chick signs were also installed at the two access points that lead from the Victor Harbor Caravan Park onto the beach at the Inman River outlet.
- DC Yankalilla requested HP stickers to be available at the front desk of the council during dog registration time.
- Watsons Gap Management Plan (AMLR NRM Board and DC Alexandrina) – this new plan includes information and management relevant to the Hooded Plover pair present at this site.
- Presentations on the Hooded Plover program were provided to the Biological Society of SA and DENR Biodiversity staff and Rangers in the Adelaide region.

- The recently released "Marine Boat Owners Guide" (Conservation Council SA) included information on Hooded Plovers and encouraged 4WD and boat owners to be aware of nests and chicks when launching boats.

Roles of each participating group in the coming breeding season

Birds Australia:

- Provision of 'My Hoodie' guide books.
- Visit additional sites to assess threats and management requirements.
- Education Professional Development workshop.
- Coastal Ambassadors workshop.
- Capture training workshop.
- Review of management effectiveness.
- Develop online forms and nest progress tracking system.
- Develop Red-capped Plover monitoring program.

NRM Board:

- Continued support of volunteers from NRM Coast, Estuary and Marine Officers.
- Visit volunteers to provide on-site training relevant to their sites.
- Actively engage new volunteers for sites not being monitored, and to provide additional support at sites currently being monitored.
- Expansion of project and on-ground works (continue to trial nest cameras to detect and identify nest predators and to determine nest fates).
- Community awareness efforts, e.g. media, events, targeting local schools or community centres.
- Continue to work with DENR, Local councils and other project partners.
- Community awareness efforts, e.g. media, events, targeting local schools or community centres.

DENR:

- Oversee and administer the Hooded Plover Recovery Plan for South Australia (currently still on in draft form, awaiting Ministerial approval).
- Assisting with policy and planning changes, e.g. Dog and Cat Management Plan.
- Threatened species officers - providing technical advice and support (i.e. assistance with formulating council response plans, etc).

Volunteers:

- Monitoring pairs at nominated sites.
- Collecting data using data sheets (e.g. for each nest keeping records that follow through the fate of a nest; recording threats at sites; noting when birds were absent).
- The potential to liaise with the public when visiting the birds.
- Attending training events.
- Letting us know about your needs and sharing ideas/concerns about conservation of the species.

Figure 4. Map of nests according to whether they were managed or unmanaged.

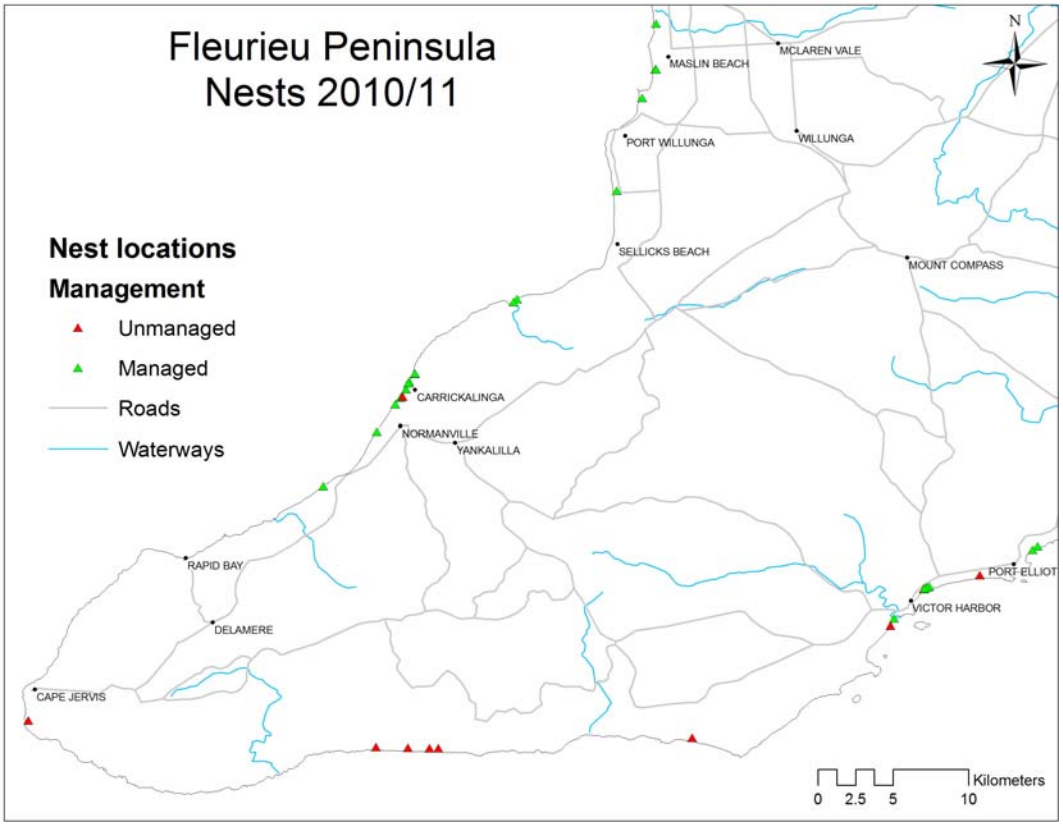
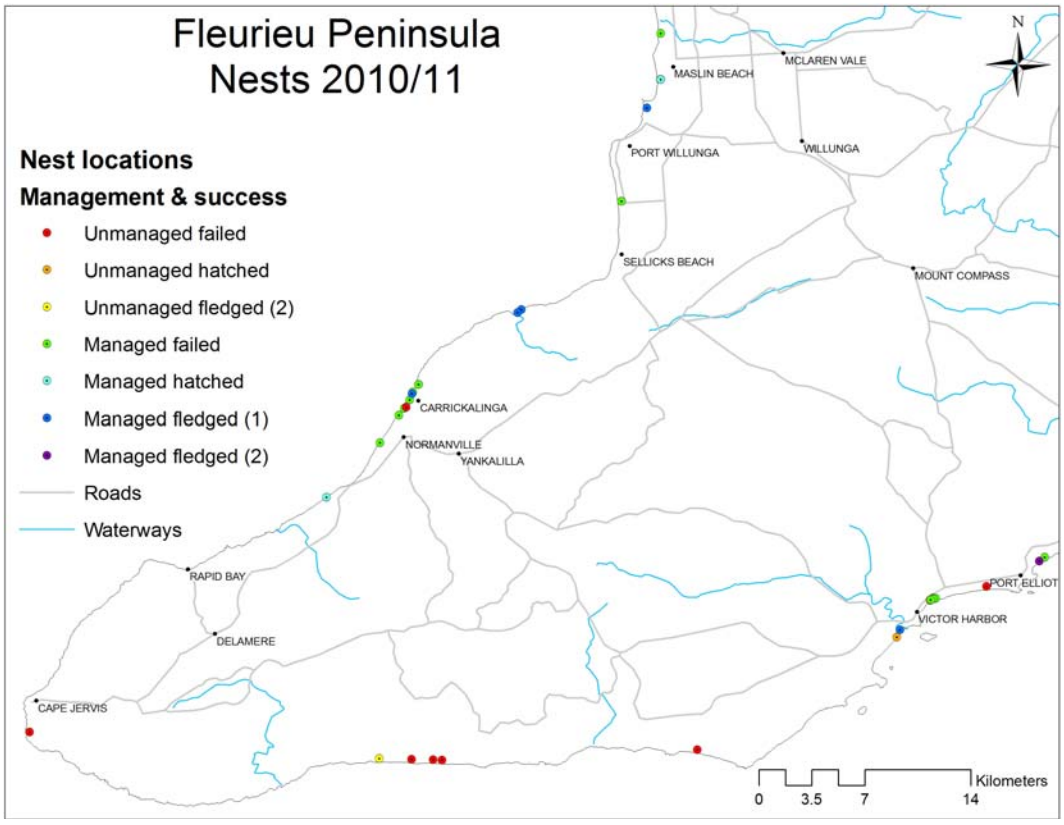
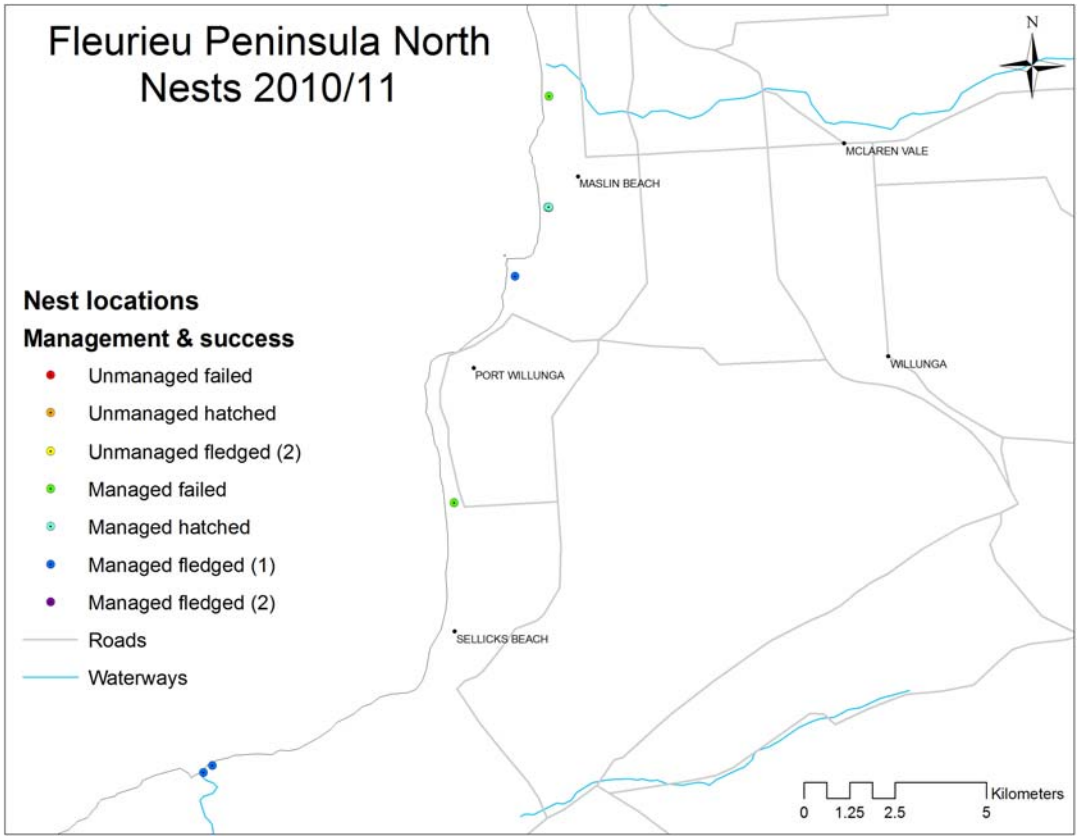
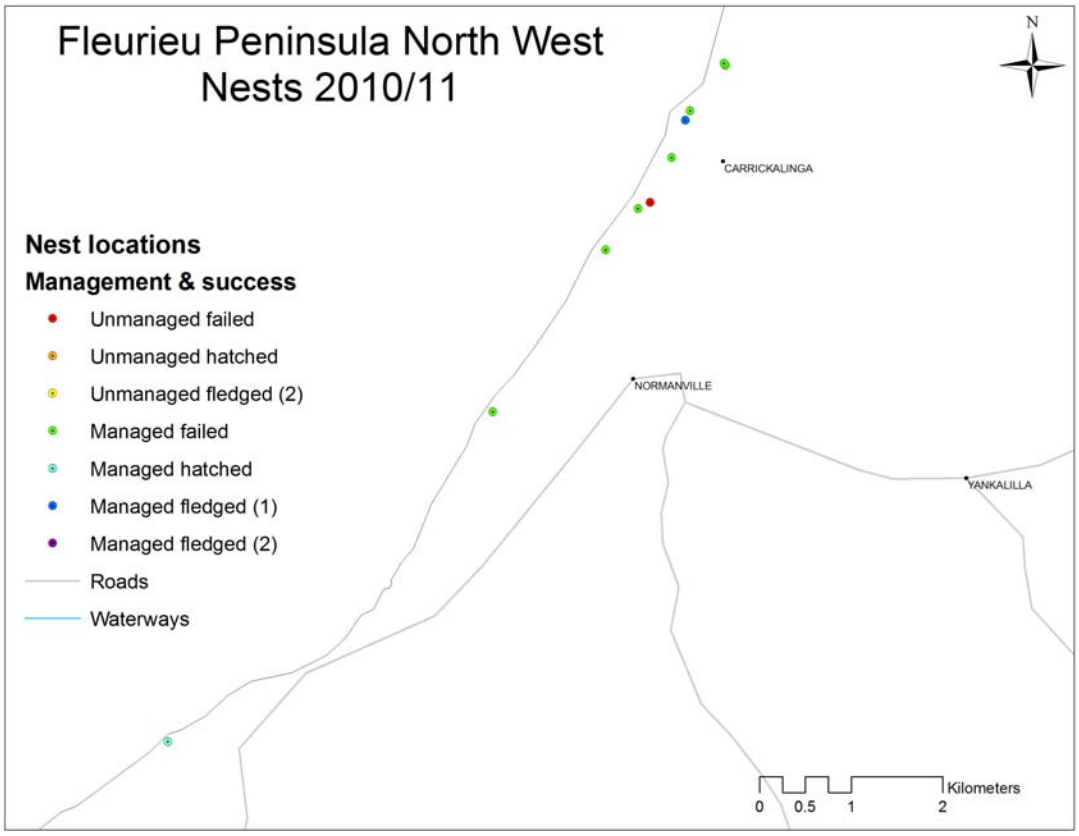
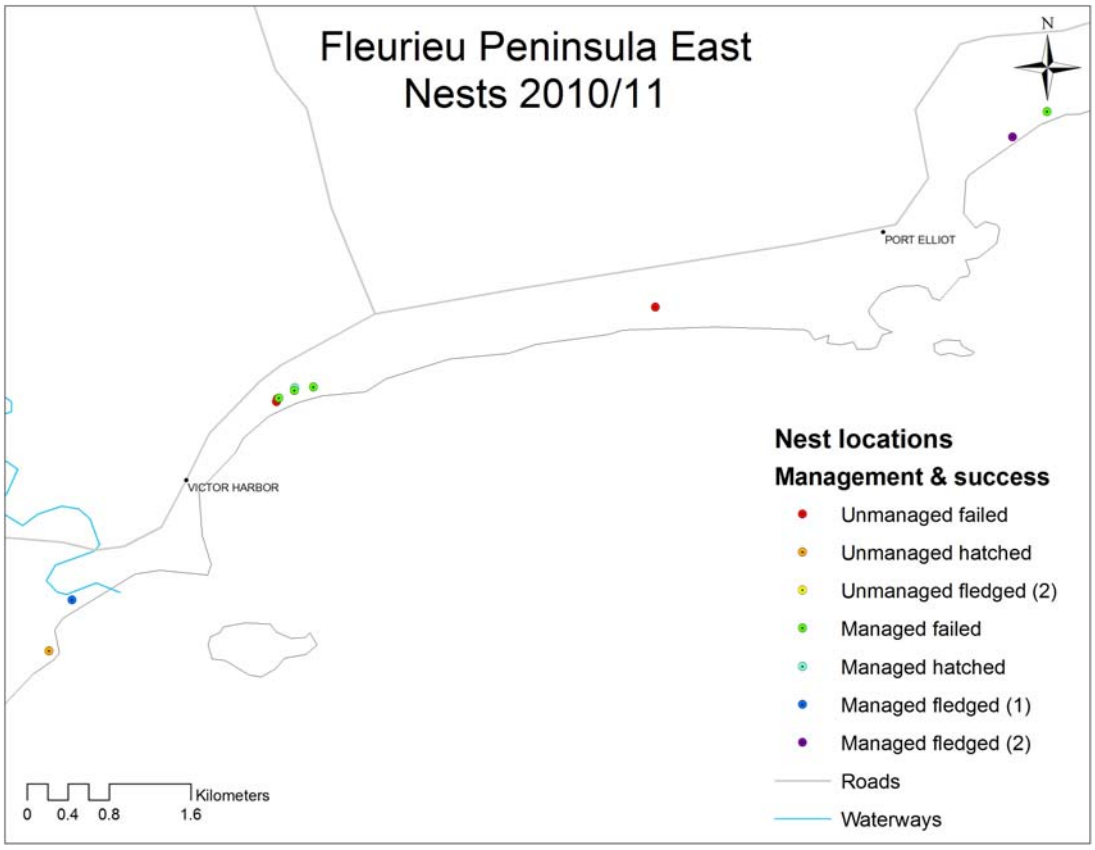


Figure 5. Map of nests according to management and their success/failure. Below are zoomed in maps of the regions of the Fleurieu with multiple nests.




Fleurieu Peninsula North
Nests 2010/11
N
MCLAREN VALE
MASLIN BEACH
WILLUNGA
PORT WILLUNGA
SELLICKS BEACH
Nest locations
Management & success
Unmanaged failed
Unmanaged hatched
Unmanaged fledged (2)
Managed failed
Managed hatched
Managed fledged (1)
Managed fledged (2)
Roads
Waterways
0 1.25 2.5 5
Kilometers


Fleurieu Peninsula North West
Nests 2010/11
N
CARRICKALINGA
NORMANVILLE
YANKALILLA
Nest locations
Management & success
Unmanaged failed
Unmanaged hatched
Unmanaged fledged (2)
Managed failed
Managed hatched
Managed fledged (1)
Managed fledged (2)
Roads
Waterways
0 0.5 1 2
Kilometers



Nest at Hindmarsh river mouth with 2 eggs, out in the open on the estuary, 18th Sept 2010 (Photo Grainne Maguire).

Table 13. Summary of managements across sites during the 2010/11 breeding season. An asterisk denotes nests that were never located and here an assumption of 3 eggs was made (the most common clutch size).

Site	Date found	Eggs	Hatched	Chicks	Fledge	Location	Cause fail?	Nest mgmt	Chick mgmt
Moana	25/11/2010	1				upper beach	unknown	signs	
Silver Sands	19/11/2010	2					unknown	fence, sign	
Maslin beach	21/08/2010	3	14/09/2010	3	0	dune face	Chicks being harrassed by dogs a few days earlier, lots of dog activity on beach	signs	access signs
Maslin beach	18/10/2010	3	17/11/2010	1	0	base of main dune, behind foredune	2 eggs unhatched	fence, signs	fence, signs
Maslin beach	30/12/2010	2	30/01/2011	2	0	upper beach, base of foredune		fence, signs	fence, signs
Port Willunga	15/12/2010	2	8/01/2011	1	1	raised mound at top of beach		fence, signs	access signs, shelters, fence
Myponga Beach	not found	3*	25/09/2010	2	1	not found			access signs
Myponga Beach	5/12/2010	3	21/12/2010	3	1	on estuary		fence, signs	signs
Carrickalinga North	26/10/2010	1				upper beach, 2-3m from foredune	high tide/storm surge	access signs, signs	
Carrickalinga North	27/11/2010	3				upper beach	unknown	access signs, signs	
Carrickalinga	27/10/2010	1				upper beach	suspect raven	access signs, signs	
Carrickalinga	13/12/2010	3				above htm	unknown	fence, signs, access signs	
Carrickalinga	10/01/2011	2	31/01/2011	2	1	upper beach, halfway between htm and base dune		fence, signs, access signs	fence, signs, access signs

Site	Date found	Eggs	Hatched	Chicks	Fledge	Location	Cause fail?	Nest mgmt	Chick mgmt
Normanville North	18/10/2010	3				upper beach, 5m before base foredune	unknown	fence, signs	
Normanville North	13/11/2010	3					unknown	signs	
Normanville North	28/11/2010	3				estuary, 3m from edge of creek	high tide	fence, signs	
Normanville South	9/12/2010	3				close to the dunes	high tide (also dog and fox prints about)	fence, signs	
Shelly Beach	15/02/2011	3	25/02/2011	3	0	base of dunes between 2 large rocks	suspect kestrels	fence, signs	fence, signs
Lands End	25/10/2010	3*				not found	suspect raven	None	
Tunkalilla - far West	21/11/2010	3	late Dec	3	2	upper beach		None	none
Tunkalilla – East end	27/01/2011	3				dune, surrounded by rocks	extreme heat	None	
Tunkalilla – East end	7/03/2011	1	fate unknown			upper beach, 3m in front of foredune		None	
Tunkalilla - 200m mid	27/01/2011	2	assume failed to hatch			upper beach		None	
Waitpinga	13/11/10	2	assume failed to hatch					None	
Inman River Outlet	14/10/2010	3	7/12/2010	3*		edge of foredune		None	
Inman River Outlet	28/12/2010	3	31/01/2011	3	1			signs, access signs	signs, access signs

Site	Date found	Eggs	Hatched	Chicks	Fledge	Location	Cause fail?	Nest mgmt	Chick mgmt
Hindmarsh River	16/09/2010	2				low mound on west estuary	human disturbance plus avian predator	none	
Hindmarsh River	10/10/2010	1				slight rise near dune, 8m from foot of D, west estuary	shell fragments, human or gull	none	
Hindmarsh River	12/11/2010	3	7/12/2010	3	0	in foredune approx 1m above bch, east estuary	suspect fox	fence, signs	fence, signs
Hindmarsh River	15/12/2010	3				foredune, east estuary	unknown	fence, signs	
Hindmarsh River	8/01/2011	3				foredune, east estuary	unknown	fence, signs	
Hindmarsh River	28/01/2011	2				middle beach, west estuary	suspect raven	fence, signs	
Watsons Gap	4/10/2010	1				upper beach, 5m in front of dune	wind burial	none	
Bashams Beach	18/09/2010	3				dune ledge	fox prints nearby	signs	
Bashams Beach	25/11/2010	3	20/12/2010	2	2	upper beach		fence, signs, access signs (encouraging people to use sealed path behind dunes).	


Chick sign at Myponga beach; Emma with Channel 10 presenter; Dogs Breakfast at Bashams beach (courtesy AMLR NRMB Ben Grant)

Student research projects

Birds Australia has also been supervising several student projects looking at a range of new management techniques that have not previously been used for the Hooded Plover; aspects of red-capped plover breeding behaviour and ecology; and social studies investigating the way Australians value beaches, people's knowledge and understanding of Hooded Plovers and their reaction to different management options, and attitudes of dog owners to leashing on beaches.

The following research papers have been published this year in association with the BNB project:

Maguire, G. S., Duivenvoorden, A. K., Weston, M. A., and Adams, R. (2011) Provision of artificial shelter on beaches is associated with improved shorebird fledging success. Bird Conservation International 21:172-185.

Weston, M. A., Ehmke, G. and Maguire, G. S. (2011). Nest Return Times of a Beach-nesting Plover in Response to Static versus Mobile Human Disturbance. Journal of Wildlife Management 75: 252-255.

Honours theses with their abstracts:

Parental Care and Breeding Ecology of Red-capped Plovers (*Charadrius ruficapillus*). Jessica Bywater, Deakin University, 2009.

Red-capped Plovers (*Charadrius ruficapillus*) are resident shorebirds which occur in all but the waterless areas of Australia. The breeding ecology and parental care of these small birds are virtually unstudied, although several conservation threats are thought to be related to poor reproductive success, and sexual dimorphism and semi-colonial breeding (in some areas) suggests the birds may have interesting breeding and parental care systems. This study examined Red-capped Plover breeding ecology with a focus on parental care and reproductive success, in the Point Cook and Altona areas, Victoria. The sexes partitioned incubation across the day/night cycle, whereby females incubated by day, and males by night. Males had longer incubation bouts during nocturnal hours, while females had shorter but more frequent bouts during the day. Overall females contributed slightly more to incubation of the eggs. There were differences in parental care across the stages of the breeding cycle; females attended more during the incubation and brood-rearing stages, with males having higher attendance during laying. To determine reproductive success, the fate of nests was determined; 79.6% (n=44) failed to hatch due mostly due to predators and flooding. While this study confirms previously held suspicions of complete biparental care, it has elucidated how that care is partitioned between the sexes, with partitioning of care being influenced by stages of the breeding cycle and the day/night cycle.

The effects of urbanisation on reproductive success and parental care in the masked lapwing *Vanellus miles*. Adam Cardilini, Deakin University, 2010.

Ecological traps occur where organisms are misled by positive cues to select maladaptive habitats, for example, habitats which reduce reproductive fitness. Ecological traps can operate through a variety of mechanisms including resource limitations, increased mortality, or disruption during critical life stages such as during breeding. This study examined the reproductive success and quality of parental care among masked lapwing *Vanellus miles* in suburban and rural areas to determine if urbanisation creates an ecological trap for this ground-nesting, precocial species. There was no significant difference in overall reproductive success between the two habitats (probability of egg producing a chick that fledged; suburban, 0.37 ± 0.06 [mean ± SE], rural, 0.39 ± 0.10), however, eggs were more likely to hatch in suburban habitats (probability of hatching; suburban, 0.73 ± 0.04, rural, 0.56 ± 0.05) and chicks were substantially but not significantly more likely to fledge in rural habitats (probability of fledging; suburban, 0.31 ± 0.06, rural, 0.48 ± 0.10). The expectation that incubation would be more disrupted at suburban nests was not met (overall time unincubated, 88.62 ± 11.95 min. per nest day). Rural females were in poorer condition (7% lighter), and laid smaller eggs (2% shorter), compared with females in suburbia. Suburban breeders were more likely to engage in active defence of their eggs (aggression and distraction) compared with rural breeders (odds ratio, aggression, 10.40; distraction 9.63 i.e., 9.63 times more likely to distract). These data suggest there is no ecological trap evident for reproductive success; however, the differences described between the habitats may represent differences in the costs and benefits of breeding in the two habitats.

Does sexually dimorphic ornamentation in birds attract predators as well as mates? Kasun Ekanayake, Deakin University, 2011.

A potentially important cost of sexually dimorphic ornamentation is that the ornaments may attract visually foraging predators as well as mates. Among species where the ornamented sex contributes to parental care, a potential anti-predator adaptation may exist whereby the ornamented sex provides parental care only by night, when visually foraging predators are inactive. This study examined whether relatively frequent detection of ornamented males by visually foraging predators helps explain the division of incubation duties between sexes of the red-capped plover (*Charadrius ruficapillus*), a species in which the brighter males incubate only by night, adults exhibit obvious inter- and intra-sexual variation in head colour, and egg predation is common. Firstly, this study demonstrated that little ravens (*Corvus mellori*) were a common, visually foraging, daytime-only predator of plover eggs. Spectrophotometry was used to inform the production of realistically coloured model incubating birds of both sexes. Eggs placed next to male models experienced increased depredation during daytime compared with duller females [probability of daytime depredation; males, 0.89 ± 0.03 (SE); females, 0.17 ± 0.03 (SE)] while at night depredation risk was the same for both sexes (binomial GLM; interaction between males and daytime, C = -3.51, SE = 0.53, z = -6.62, $P \leq 0.001$). The intra-sexual variation in degree of ornamentation among females, quantified by image analysis, did not significantly predict hatching success of real nests (GLMM excluding

eggs not lost to predators; head colour, C = -0.376, SE = 1.57, t63 = -0.23, P = 0.81) after accounting for four variables which may have influenced depredation risk (i.e., nest cover, date, breeding season, age at discovery). While the scheduling of incubation duties between the sexes reduces depredation risk of eggs during daytime, the relatively subtle variation in the degree of ornamentation among females does not apparently alter depredation risk of eggs.

Acknowledgements

The volunteers are the people who spend hours on the beach collecting all of this information, braving all kinds of weather and human encounters, and feeling all the highs and lows their pair of birds experience. Sincerest thanks to everyone for their efforts and also for their patience when it comes to recognising that some changes to conservation management can take a long time to come about. The data collected is invaluable and helps us put into perspective how threatened each pair is and to adapt our managements to suit sites better. It also will help in future with any proposed planning or changes to regulations: statistics lend great weight to our submissions and recommendations.

An enormous thanks to Emma Stephens who is a brilliant coordinator of the Hooded Plover efforts which take place on the Fleurieu Peninsula, to Corey Jackson and Emma for their site visits and assistance with site management, and to Tony Flaherty and the Adelaide and Mount Lofty Ranges NRM Board for their support and for recognising the importance of coastal biodiversity. Special thanks to the councils and rangers involved for protecting nesting sites and supporting the project: City of Onkaparinga, District Council of Yankalilla, DENR (Newland Head Conservation Park - National Parks and Wildlife SA), City of Victor Harbor and District Council of Alexandrina.

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Chick at Hindmarsh River mouth beach
(courtesy Richard Edwards)