The White-bellied Sea Eagle as a key indicator species by which to measure the health and stability of coastal biodiversity in South Australia.
Premise
Results from studies in Europe provide evidence of a positive link between top-order predatory species and ecosystem-level conservation outcomes; i.e. conservation plans based on apex predators deliver broad biodiversity benefits (vide Sergio et al. 2006).

Aim
The aim of this paper is to present the key conservation issues facing the White-bellied Sea Eagle population in South Australia to the wider community, and in particular, to natural resource management and land-use planning agencies, with the view of developing:

a) greater understanding and acceptance of the role of the White-bellied Sea Eagle as a critical indicator species by which to determine environmental stability in coastal regions;
b) acceptance of the need to protect and manage their breeding refuge habitat to halt further population decline and coincident biodiversity loss; and
c) community awareness about the biology and behaviour of White-bellied Sea Eagles, and the impact human activities can have on their breeding success and thus long-term population viability.

Summary
Due to a small and declining population, the White-bellied Sea Eagle (Haliaeetus leucogaster) is listed as Endangered in South Australia (National Parks and Wildlife Act 1972). Significant population declines have occurred on the mainland, where landscape scale land-use change and various human activities creating disturbance at critical periods of the breeding cycle have been directly implicated in nest failures and territory desertions in recent decades. As has occurred in Victoria and Tasmania, habitat protection and management strategies aimed at providing breeding refuge protection, are an important first step to reduce further declines. To ensure such measures are widely adopted they are best embodied within specific management or recovery plans, which require developers, private land-owners, land management and land-use planning agencies at all levels of government, to address and make provision for White-bellied Sea Eagle habitat conservation across coastal regions and the Riverland in South Australia.
Background

To many people large eagles are iconic symbols of wild places and their presence represents wilderness quality in a natural landscape (Threatened Species Section 2006). Eagles are long-lived, take several years to mature, and once paired, bond for life and defend a territory centred on favoured nesting sites which are used by successive generations. Many large eagle populations around the world are in decline (Newton 1991), including the White-bellied Sea Eagle in Australia (Shephard et al. 2005).

Recent surveys reveal that South Australia (SA) has a small and somewhat isolated White-bellied Sea Eagle breeding population of just 70–80 pairs. With the majority of these (~80%) found occupying offshore island habitats, including Kangaroo Island (Dennis et al. 2011b). Evidence was also found of a substantial decline in the breeding range over mainland coastal and River Murray habitats over the last century. In response to similar declines in Victoria and Tasmania, specific conservation strategies have been developed, i.e. the Flora and Fauna Guarantee Action Statement #60 (Clunie 2004) and the Threatened Tasmanian Eagle Recovery Plan 2006–2010 (Threatened Species Section 2006; see also Appendix 1). In SA, the White-bellied Sea Eagle was formally up-listed to *Endangered* status in 2008, and the development of specific habitat protection and site management strategies have been recommended to improve breeding productivity outcomes and prevent further decline (Dennis et al. 2011a).

Most eagle species (including the White-bellied Sea Eagle) are sensitive to disturbance during the breeding season, particularly at the most critical period of courtship and nest building, when disturbance is likely to cause nest abandonment (Olsen 1998; Clunie 2004; Threatened Species Section 2006; U.S. Fish and Wildlife Service 2007). The majority of sea-eagle nests in SA are located on coastal cliffs in open terrain, where any approach or disturbance typically occurs above nest guard-roost level, triggering both eagles’ natural reaction to loft (i.e. leaving the nest exposed) and rise above any perceived threat (Dennis et al. 2011a, b). Nest guard-roosts are always situated within line-of-sight of a nest, but may be up to 800m distant.

**Phases and timing of the White-bellied Sea Eagle breeding season in South Australia and likely levels of sensitivity to disturbance for each** *(vide National Bald Eagle Management Guidelines, 2007)*.

<table>
<thead>
<tr>
<th>Activity phase</th>
<th>Time-frame</th>
<th>Sensitivity</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courtship and nest building and repair</td>
<td>May and June</td>
<td><strong>Most sensitive period</strong></td>
<td>Disturbance is likely to cause abandonment of nest and breeding attempts, particularly in newly established territories.</td>
</tr>
<tr>
<td>Egg-laying and early incubation</td>
<td>July</td>
<td><strong>Very sensitive</strong></td>
<td>Human activity of even limited duration within the core territory may cause nest desertion for the season.</td>
</tr>
<tr>
<td>Incubation and early nestling period</td>
<td>Late July to mid-Sept.</td>
<td><strong>Very sensitive</strong></td>
<td>Flushed adults leave eggs or small young vulnerable to predation and exposure (e.g. dehydration, hypothermia or heat stress).</td>
</tr>
<tr>
<td>Nestling period, 4–8 wks</td>
<td>Mid-Sept. to mid-Oct.</td>
<td>Moderately sensitive</td>
<td>Risk of nest abandonment and vulnerability of young to prolonged exposure decreases; missed feedings may affect survival.</td>
</tr>
<tr>
<td>Advanced nestling period, &gt;9 wks</td>
<td>Mid-Oct. to mid-Dec.</td>
<td>Moderately sensitive</td>
<td>Nestlings &gt;9 weeks may flush from the nest prematurely if approached closely and subsequently perish.</td>
</tr>
</tbody>
</table>

(from Dennis et al. 2012)

A long-term study of the White-bellied Sea Eagle population on Kangaroo Island found a negative relationship between human activities and nest productivity. That study found that nest sites in many territories were frequently disturbed and that pairs from disturbed territories were significantly less productive.
than those in more isolated locations. That is, disturbed territories became active (eggs) less often, fledged fewer young and experienced higher rates of nest failure than those in remote locations (Dennis et al. 2011a). When these findings are considered together with the significant population declines evident on the mainland, there are irrefutable concerns for long-term White-bellied Sea Eagle population stability in South Australia.

Map showing the distribution of occupied and deserted White-bellied Sea Eagle territories in South Australian coastal regions in 2010.

What has been done for White-bellied Sea Eagle conservation so far in SA …

Population and status surveys – Over three breeding seasons (2008-10) comprehensive coastal and seabased surveys were undertaken (including offshore islands) to determine the distribution and status of White-bellied Sea Eagle and Osprey throughout the state (see Dennis et al. 2011b). These surveys identified three sub-regions where significant coastal raptor habitats occur, i.e. Western and Southern Eyre Peninsula, and Kangaroo Island (see map).

Waitpinga Cliffs, a case study – Between Franklin Harbour on eastern Eyre Peninsula and central Victoria the single remaining mainland coastal sea-eagle territory is situated in a Conservation Park on the Fleurieu Peninsula, with the Heysen Trail following the coastal cliff-line nearby. Despite the following management actions by local DEWNR staff this territory has fledged just one young (in 2008) since 2001:

- Volunteer project commenced in 2004 to monitor and report on breeding activity and threats (TD);
- Negotiated re-routing of Heysen Trail inland in 2005 to break line-of-sight to the nest;
• Waitpinga Cliffs Fly Neighbourly Agreement (FNA) finalised in 2007, and FNA brochure and posters produced and circulated to regional airports and to RAAF and ADF Airwing (NB both RAAF and ADF subsequently adapted their Aircraft Operation Protocols to accord with the FNA);

• A local DEWNR work protocol developed and adopted in 2007 requiring staff and volunteer groups to adjust work programs to avoid all activity inside a 1000m radius from the nest mid-May to December;

• Negotiated seasonal restrictions with special interest park-user groups (e.g. Adelaide Rock Climbers and hang-glider clubs) in 2007, to avoid the breeding season mid-May to December;

• Negotiated the removal of former Heysen Trail route from the NearMap smart-phone app in 2011;

• A revised version of the privately sponsored Waitpinga FNA brochure produced/distributed in 2013.

Elsewhere in SA …

• Submissions are lodged and advice is provided on development applications that threaten nest sites;

• Innes National Park and Althorpe Islands Conservation Park FNA finalised in 2009 to protect both Osprey and White-bellied Sea Eagles in the Southern Yorke Peninsula;

• Negotiations with recreation groups such as Walking Clubs and Geo-caching groups regarding planned activities during breeding seasons in the vicinity of nest sites are ongoing;

• Changes to terms and conditions for Commercial Tour Operators and Scientific Research permit applicants on Public Lands currently being drafted;

• Liaison with community groups and contractors working on Public Lands;

• FNAs developed over six areas of Kangaroo Island in 2013: eastern Cape Gantheaume Wilderness Protection Area (WPA), Seal Bay and Vivonne Bay CPs., Hanson Bay to Cape du Couedic, Paisley Is. and Cape Border to Western River WPA. on the north coast.

• Information sessions on the importance of conservation and management of White-bellied Sea Eagle habitat were presented to the KI NRM Board, Natural Resource staff and the community in August 2014,

• Zone boundaries have been amended in some Council Development Plans to provide additional protection to the critical breeding territories.

• DEWNR’s Regional Species Conservation Assessment Project identified White-bellied Sea Eagles as regionally endangered in the West, Yorke, South East and Adelaide-Mount Lofty Ranges regions, and critically endangered on Kangaroo Island and in the Murraylands.

• In some areas, DEWNR works programs and land management activities (such as pest plant and animal control) are planned to ensure that works are not undertaken within the core breeding territory within the breeding season.
Refuge habitat management tools already in the ‘toolbox’ …

- status and distribution confirmed
- precise nest/territory locations identified and mapped
- significant habitat identified (see map p3)
- threats to reproductive outcomes and population stability identified
- temporal (breeding season) and spatial refuge parameters understood

What additional conservation actions are required …

In recognition of the demonstrated White-bellied Sea Eagle population decline in SA; low productivity levels and the species tendency to abandon nesting early in the breeding season associated with disturbance; the following conservation actions are advocated:

i. The development of a species Management or Recovery Plan for the White-bellied Sea Eagle in SA;

In the interim;

ii. To address the threatening processes identified prioritised breeding habitat management prescriptions are required for critical remnant habitat areas; i.e. Kangaroo Island and Eyre Peninsula. These to include at least seasonally applied refuge buffer-zones over known nesting habitat i.e. 2000m radial dimension from the primary nest in coastal areas (critical at cliff-nests in SA’s open coastal landscapes) and 1000m for tree nests in the Murray River floodplain or other wetland settings. These dimensions are based on a precautionary principal to ensure adequate encompassment of nest guard-roost locations (disturbance trigger-sites; often 500–800m from the nest) and potential nest relocation events within the core-territory over time. However, refuge offset distances may be modified following comprehensive site assessment which considers: view-shed factors on all approach aspects to key territory trigger-sites; topography and presence of screening vegetation; and territory access-egress flyway flight-paths to and from foraging locations when nest provisioning.

iii. Coincident with i. (or ii.) develop community awareness on White-bellied Sea Eagle conservation issues across the state;

iv. Repeat state-wide population monitoring surveys every five years, and more frequently in key habitat regions (e.g. Kangaroo Island) and in known disturbed territories.

To be involved in the conservation and management of threatened coastal raptors, contact Sharie Detmar at sharie.detmar@sa.gov.au or 8124 4893 or Caroline Paterson at caroline.paterson@sa.gov.au or 8553 4481.
References cited


Appendix 1:

Extracts from key research and management plans (Australia wide)

The following extracts provide examples of recent research findings from several States. Collectively, these illustrate the broad consistency in conservation concerns for the White-bellied Sea Eagle across its range, and also in the remedial management actions required to ensure the long-term security of regional populations. Key messages are highlighted throughout for ease of reference:

**Northern Territory** – “… Sea-Eagle breeding habitats in the Northern Territory are under increasing threat from urban and tourism developments. This threat needs to be addressed through a process of management plans and public awareness programs about the ecological role of White-bellied Sea Eagles. … Specific management models are needed to ensure [sea-eagle] primary breeding refuges and foraging habitats are protected from inappropriate and ill-informed land-use developments.” (Corbett and Hertog 2011).

**New South Wales** – “… Nest sites of the White-bellied Sea Eagle are under increasing pressure from encroaching development and other human activities in coastal south-eastern Australia. Nests in the path of development have sometimes been destroyed or displaced, or become too disturbed for continued successful breeding. … the more highly and frequently disturbed nests had low breeding productivity or were abandoned. With rapid expansion of urbanisation likely to continue in coastal northern New South Wales … given its small population and the potential for an estimated 10% decline in abundance in three generations, it is recommended that the White-bellied Sea Eagle be considered for listing as Vulnerable in NSW.” (Debus *et al*. 2014).

**Victoria** – “… Habitat destruction represents the most significant threat to the species, as it has resulted in the direct loss of nesting sites and has caused birds to nest in suboptimal habitat types where breeding success can be reduced … Increased human presence has been detrimental to nesting White-bellied Sea Eagles because they are sensitive to disturbance and may desert nests and young. Management Action p5: … Protect known nesting sites and a suitable buffer zone around nests, from human and habitat disturbance on public land through appropriate land management practices. … incorporate the protection of suitable habitat in relevant CNR plans (e.g. Forest Management Plans) and local council planning controls. … Undertake a public awareness program on the importance of protecting the White-bellied Sea Eagle, emphasising the need to minimise the levels of human disturbance.” (Clunie 2004).

**Tasmania** – “… Prime nesting habitat is found along major estuaries where residential and industrial development is concentrated, thus placing the species under pressure from habitat loss and disturbance. … Additional threats arise from recreational use of the coastal zone, from marine pollution and debris, which can cause entanglement.” (Threatened Species Section 2006).

“… 31% of nest losses recognised as being the result of human disturbance … There needs to be stronger protection of all nests, which could avoid the type of incompatible development next to nest sites seen in this study, such as rural-residential subdivisions … industrial development cases, and a tourism development on the Tasman Peninsula.” (Thurstans 2009).