Perth and Peel Green Growth Plan for 3.5 million

Strategic Assessment of the Perth and Peel Regions

Draft EPBC Act Strategic Impact Assessment Report

Appendix E: Migratory Shorebirds Background and Profiles

December 2015
Acknowledgements
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1 BACKGROUND

Thirty-six species of migratory shorebirds breed in the northern hemisphere and are known to regularly visit Australia each year in the non-breeding season. These species use the East Asian-Australasian Flyway which stretches from Siberia and Alaska, through east and south-east Asia, to Australia and New Zealand.

1.1 ASSESSING MIGRATORY SHOREBIRDS UNDER THE EPBC ACT

The 36 species are all listed as migratory under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) and are treated under a common set of processes given their similar ecology and behaviour. The Commonwealth provides two key pieces of guidance in relation to these species:

- Significant Impact Guidelines 1.1 (DoE 2009); and

The Significant Impact Guidelines 1.1 outlines two key concepts commonly applied under the EPBC Act for migratory species (DoE 2009):

- important habitat; and
- an ecologically significant proportion of the population.

Where neither of these two features of a migratory species is present, impacts are generally not considered an issue under the EPBC Act (DEWHA 2009a).

Policy Statement 3.21 (DEWHA 2009a) establishes specific criteria for identifying important habitat for migratory shorebirds and understanding the potential significance of impacts to those species. There is also an associated background paper (DEWHA 2009b) that accompanies the Policy Statement providing detailed recommendations about survey requirements for migratory shorebirds.

Under Policy Statement 3.21 (DEWHA 2009a), important habitats for migratory shorebirds (excluding Latham’s Snipe) are those that have been identified as internationally important in Migratory Shorebirds of the East Asian - Australasian Flyway; Population Estimates and Internationally Important Sites. Wetlands International – Oceania (Bamford et al. 2008) based on the Ramsar Convention and/or those sites that support:

- at least 0.1% of the flyway population of a single species;
- at least 2,000 migratory shorebirds; or
- at least 15 migratory shorebird species.

Important habitat for Latham’s Snipe (DEWHA 2009a) includes sites that:

- support at least 18 individuals of the species; and
1.2 MIGRATORY SHOREBIRD ECOLOGY

The 36 EPBC Act listed migratory shorebird species depend upon breeding, staging, feeding and roosting sites along a migratory pathway which extends from Alaska and Siberia to Australia. This section describes the migratory pathway and the national and regional roles played by Australia.

1.2.1 East Asian-Australasian Flyway

The East Asian-Australasian (EAA) flyway extends from Siberia and Alaska through east and south-east Asia (most predominately China and Korea) to Australia and New Zealand (DEWHA 2009b). The EAA flyway contains at least five million migratory shorebirds (Gosbel et al. 2004).

Migratory species using the EAA flyway undertake annual migrations of thousands of kilometres between their southern feeding areas to their breeding areas in the northern hemisphere. Species have been recorded traveling over 10,000 km non-stop, with total return distances from northern breeding grounds to southern feeding areas exceeding 29,000 km (Knowler 2008).

Northward migration to the breeding grounds typically takes place from March to early June. The birds arrive for the Arctic breeding season and must breed and fledge offspring within a six to seven week window of favourable summer climatic conditions. The return migration to non-breeding / feeding areas occurs from July to October. Most migratory shorebird species have delayed maturity, and will skip their first northerly migration by staying in Australia. The young of some species will not return to breed until they are two or more years old. These immature birds may undertake partial migration from southern to northern areas of Australia.

During migration birds move through staging areas. Staging habitat is defined as areas that meet shorebird feeding and roosting requirements during migration. Shorebirds exhibit strong site fidelity to preferred feeding and roosting areas and do not readily use alternative areas (Tudor 2002).

1.2.2 Habitat in Australia

Australia provides important feeding and roosting habitat for migratory shorebirds of the EAA flyway.

The migratory shorebirds that regularly visit Australia have a wide variety of habitat requirements, spatial distributions and patterns of habitat use (Marchant and Higgins 1993; Marchant et al. 1976). Migratory shorebirds arrive in northern Australia beginning in August, and then disperse throughout the country. Migratory shorebird habitat in Australia provides:

- Feeding areas with abundant food resources. Physical characteristics of feeding areas primarily consist of intertidal mudflats, sandy beaches, salt pans and rocky intertidal areas. The characteristics of high value feeding areas include large populations of invertebrates, low disturbance and undegraded soils. Several species also readily feed in wet or moist substrates on coastal or inland freshwater wetlands.

- Roosting areas where migratory shorebirds can sleep and preen during non-feeding times. Roosting areas in proximity to feeding areas reduce energetic costs and maintain positive energy flow. Physical characteristics of roosting areas include little or no vegetation on open ground that remains above water during high tides (Tudor 2002).
1.3 HABITAT IN WESTERN AUSTRALIA

Western Australia has 28 recognised internationally important sites for migratory shorebirds within the EAA Flyway (Bamford et al. 2008), which represent about 24% of the important sites within Australia. Most recognised important Western Australian sites are coastal or near-coastal, whereas in other parts of Australia, a greater proportion of sites are inland wetland.

Western Australia has wetland sites with some of the highest migratory shorebird diversity and abundance based on country-wide comparisons, particularly for sites in the northwest such as Eighty Mile Beach and Roebuck Bay which support tens of thousands of individuals of some species during the non-breeding season. Important habitats in Western Australia provide:

- A range of feeding habitat such as coastal and estuarine tidal mud flats, non-tidal episodic and ephemeral saline lakes with exposed mud shorelines, and groundwater dependant freshwater lakes having exposed mud flats determined by seasonal rainfall cycles from about November to April. These sites are important feeding sites during the non-breeding season, and during southward and northward migration periods. The important sites within the Perth – Peel area provide non-breeding feeding habitat. Some northwest sites (i.e. Roebuck Bay and Eighty Mile Beach) are important year-round feeding sites for immature birds that may forego migration until the following year.

- Night roosting habitat afforded by extensive open areas located above high tide level and in proximity to feeding sites.

- Staging areas in Western Australian along the north-south migration routes are limited to the northwest sites of Roebuck Bay and Eighty Mile Beach (Bamford et al. 2008) with high food abundance and proximity to final northern hemisphere migratory destination sites.

1.4 THREATS TO MIGRATORY SHOREBIRDS

Threats to migratory shorebirds are both global and regional as these birds rely on a series of key sites that together provide habitat for breeding, foraging, roosting and staging along the pathway of their seasonal movements across the EAA Flyway. The strong site fidelity to preferred feeding sites means that they depend on specific sites (Tudor 2002). Therefore the loss of any key site can have significant consequences to many species (MacKinnon et al. 2012).

The land area covering the EAA Flyway has a high human population and is subject to rapid economic and population growth, particularly in East Asia. For example, in areas such as the Yellow Sea of China and Korea where large areas of tidal mud flat representing important staging and feeding habitat have been reclaimed for industrial development (Barter 2002). Habitat loss resulting from development is consequently one of the most immediate and significant threats that currently affect migratory shorebirds throughout the flyway, including Australian sites.

Other recognised threats which appear to be most relevant to shorebird sites in China and Korea include overharvesting of shorebird prey species (molluscs and crustaceans), bird mortality as bi-catch through entanglement in fishing nests (MacKinnon et al. 2012), and hunting or net harvesting of birds for food although this activity appears to be on the decline (Barter 2002).

Anthropogenic disturbances of migratory shorebirds in Australia are also known to result from aircraft, industrial operations and construction noise, and recreational activities such as fishing, off-road driving on beaches, unleashed dogs and jet-skiing (Weston et al. 2012). Such disturbances during bird's
Roosting and daytime foraging activities are likely to have a significant energetic cost to shorebirds and may reduce bird's capacity to accumulate the necessary energy reserves required for migration (Goss-Custard et al. 2006).

Habitat modification through activities such as mining, agriculture and recreation can have a range of impacts such as increased siltation and pollution which can potentially lead to deterioration of the quantity and quality of the ecological resources available to support migratory shorebirds (Sutherland et al. 2012). These threats tend to have cumulative impacts over time, although acute pollution from major oil or chemical spills can cause major disruption to aquatic and benthic food sources. Invasive weeds such as Bulrush (*Typha*) also reduce habitat quality by replacing native wetland vegetation or invading bare shorelines making them unusable as foraging habitat.

### 1.4.1 Threats to migratory shorebirds in south-western Australia

Many of the threats to shorebirds that occur in an international and national context also apply within the Strategic Assessment Area and surrounds.

It is estimated that historically, 75% of wetlands within the Swan Coastal Plain have been cleared as a result of development (this percentage is higher in South-eastern Australia, primarily due to the concentration of the Australian population within coastal lowlands with estuaries and lakes (Lee et al. 2006)). Threats to remaining shorebird habitat within the south-west of Western Australia relate to current land and resource use practices. Key threats affecting the Peel-Yalgorup System have been identified by Hale and Butcher (2007) and these are also applicable within the wider region. Threats include agriculture, industry, and urban growth, groundwater extraction, clearing of vegetation, recreation, invasive species, commercial fishing and climate change. These threats can impact shorebird habitat by further reducing or fragmenting wetland habitat, altering hydrology such as water level, flood-dry cycles, cause pollution such as eutrophication, salinisation, and acidification, and cause direct disturbance to shorebirds.

A range of hydrology and groundwater related modifications within the greater Perth region also have the potential to reduce ecological value of wetland sites for migratory shorebirds. Groundwater extraction is a major source of Perth's potable water supply, as well as use for agricultural, open space and residential watering. Drainage modifications are made to reduce localised flooding of wetlands surrounded by lowland residential areas, and this can lead to significant changes to water flow regime, water depth, extent, duration, and seasonality of flood-dry cycles and habitat suitability. These changes impact both habitat availability and type, for example, loss of mudflats and shallows through permanent higher water levels, and disruption of lifecycles of aquatic ecosystems and food chain for migratory shorebirds.
2 MIGRATORY SHOREBIRDS IN THE STRATEGIC ASSESSMENT AREA

The Strategic Assessment Area provides a range of habitat types for migratory shorebirds. The following section outlines the base data that is available, the habitat values within the Strategic Assessment Area and the species that have been recorded at high abundance.

2.1 BASE DATA FOR THE ASSESSMENT OF MIGRATORY SHOREBIRDS

The Western Australian Government developed spatial information on the location of habitat across the Strategic Assessment Area for the 36 migratory shorebird species listed under the EPBC Act. This data set was developed to provide a consistent set of base information for mapping and assessing the relative value of habitat sites to migratory shorebird species across the Strategic Assessment Area. The spatial data was developed from the Department of Parks and Wildlife (Parks and Wildlife) data and mapping that identified 84 habitat sites with records of migratory shorebird species, together with the species recorded at those habitat sites.

The spatial data has identified:

- habitat sites that meet the EPBC Act Policy 3.21 criteria for important habitat; and
- other habitat site areas that are used by migratory shorebird species but that do not meet the important habitat criteria.

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1 As outlined in Section 1.1, important habitat for migratory shorebirds (excluding Latham's Snipe) includes sites that:

- have previously been identified as internationally important for migratory shorebirds; or
- support at least 0.1% of the flyway population; or
- support at least 2,000 migratory shorebirds; or
- support at least 15 shorebird species.

Important habitat for Latham’s Snipe includes sites that:

- have at least 18 individuals of the species; and
- are naturally occurring open freshwater wetland with vegetation cover nearby (for example, tussock grasslands, sedges, lignum or reeds within 100 m of the wetland).
2.1.1 Availability of information

Parks and Wildlife led the development of the migratory shorebird dataset and compiled the range of data that was held within the Western Australia (WA) Government. While it is considered that important habitat areas are relatively well known across the Strategic Assessment Area, only some of the areas identified have had adequate survey to provide species numbers. As a result, a precautionary approach was taken to the mapping that:

- identified areas that meet criteria for important habitat (where possible);
- included the whole habitat site as important habitat in situations where the data suggested at least part of the habitat site met the criteria for important habitat (consistent with the approach to contiguous habitat outlined in EPBC Act Policy 3.12); and
- identified areas as of secondary importance to shorebirds if they were known to support shorebirds, but not at levels sufficient to meet the important habitat criteria.

2.1.2 Mapping process

Parks and Wildlife applied the following mapping process:

- Known habitat sites were identified by review of the following datasets:
  - BirdLife Australia’s Shorebird 2020 data.
  - DoE potential habitat mapping for migratory shorebirds.
- Sites previously recorded as internationally important (Ramsar) habitat were identified using the criteria applied by Bamford et al. (2008), and the relevant species were listed for respective sites.
- Criteria for important habitat under the EPBC Act Policy Statement 3.21 were applied to each site.
- Where one or more of the criteria were met for habitat sites either within or outside of Ramsar areas, these sites were attributed as important habitat for migratory shorebirds.
- Remaining habitat sites identified across the Strategic Assessment Area that provide some habitat for migratory shorebird species were identified. These sites have records of migratory shorebird species but they do not meet the important habitat criteria.
- The final dataset has been referred to as Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014) throughout the rest of this report.

Other sources of literature and websites were also used to develop the base data and included:

2.1.3 Potential gaps and risk assessment

The process outlined above has identified the areas of important habitat within the Strategic Assessment Area. Given the degree of survey of the area, high level of interested population and thorough survey by organisations such as BirdLife Australia, it is unlikely that additional areas meeting the criteria of important habitat have been overlooked due to lack of available data.

As highlighted in Section 2.1.1, a precautionary approach was taken to the mapping and attributed whole habitat sites as important habitat, even if only components were known to support high numbers/diversity of shorebirds (i.e. sufficient to meet the important habitat criteria). In this way, the maximum extent of important habitat within the Strategic Assessment Area has been identified.

There may be some areas of habitat that do support small and intermittent numbers of shorebird species, including in cleared palusplain wetlands in the Peel region. However, these would not meet criteria for important habitat.

2.2 HABITAT FOR MIGRATORY SHOREBIRDS IN THE STRATEGIC ASSESSMENT AREA

Migratory shorebirds are found throughout the Strategic Assessment Area during their seasonal occurrence in the southern hemisphere. Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), 84 habitat sites are known to support shorebirds (see Figure E1).

Across these habitat sites usage varies. At a minimum, a few individual birds may opportunistically visit small or temporary artificial foraging sites such as irrigation channels, sewerage drying beds, as well as a range of relatively minor habitat sites throughout the region. However, extensive habitat and shorebird survey data highlight discrete sites or wetland systems within the Strategic Assessment Area that have been identified, mapped and classified as important sites, with high numbers of species and individuals.

The abundance and species richness of migratory shorebirds that visit these sites is largely due to the extent and array of foraging habitat on offer. The habitat sites provide a diverse range of feeding and roosting opportunities such as estuaries and coastal shores, freshwater and saline lakes. Temporal changes such as daily fluctuation subject to tides, and seasonal drying of lakes subject to rainfall and groundwater aquifers provides this habitat variety, and contributes to high species richness and abundance observed for many Strategic Assessment Area habitat sites.

Table E1 and Figure E2 summarise the 84 habitat sites within three main site groupings used in this assessment. These groupings are:

- Important habitat sites within Ramsar areas.
- Important habitat sites outside of Ramsar areas.
- Other sites.
Figure E-1: Eighty-four habitat sites considered in this analysis
Figure E-2: Migratory shorebird habitat types within the Strategic Assessment Area
The habitat groupings have been used to assess and describe the importance of sites and key threats to migratory shorebirds throughout the Strategic Assessment Area. Important habitat sites, both within and outside of Ramsar areas, are categorised as such based on relatively high abundance of a species or based on high species richness according to the assessment process stepped out in Section 2.1. The remaining habitat sites categorised as ‘other’ sites do not meet the important habitat criteria in Section 2.1, but are nonetheless known shorebird habitat sites based on review of BirdLife Australia’s species data and DoE habitat mapping data.

Table E1: Extent of migratory shorebird habitat types within the Strategic Assessment Area

<table>
<thead>
<tr>
<th>Habitat grouping</th>
<th>Total area within Strategic Assessment Area (ha)</th>
<th>Number of habitat sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Important habitat sites within Ramsar areas</td>
<td>19,593</td>
<td>11 (across three Ramsar sites)</td>
</tr>
<tr>
<td>Important habitat sites outside of Ramsar areas</td>
<td>3,067</td>
<td>18</td>
</tr>
<tr>
<td><strong>Total important habitat</strong></td>
<td><strong>22,661</strong></td>
<td><strong>29</strong></td>
</tr>
<tr>
<td>Other sites</td>
<td>8,058</td>
<td>55</td>
</tr>
</tbody>
</table>

### 2.2.1 Important habitat sites within Ramsar areas

Eleven sites have been identified as important habitat sites within Ramsar areas inside the Strategic Assessment Area (Table E2). These sites have been classified as important habitat because they trigger one or more of the criteria relating to recorded abundance of particular species, diversity and percentage of flyway population as outlined in Section 2.1. They also all occur within one of the following Ramsar areas – Peel-Yalgorup, Forestdale and Thompsons Lakes, and Becher Point.

Specific examples of important habitat sites within Ramsar areas and the criteria met include:

- Lake Preston where 11,700 Red-necked Stints have been recorded during a survey (Bamford et.al 2008);
- Lake McLarty where surveys have recorded several species such as the Sharp-tailed Sandpiper in numbers greater than 0.1% of the flyway population; and
- North Peel-Harvey Estuary where 26 migratory shorebird species have been recorded.

These 11 important habitat sites within Ramsar areas provide a range of habitat for migratory shorebirds due to suitable geographical and hydrological characteristics including: salinity, hydrology, depth, tidal influence, seasonal flooding and drying, and groundwater dependence. These characteristics together form a range of important seasonal foraging environments such as shallow water, shorelines and mudflats, which provide productive foraging and roosting resources.

The 11 important habitat sites within Ramsar areas have been categorised into five sub-groups according to geographical and hydrological characteristics (Table E2, Figure E3), influencing the shorebird species that occur. Each sub-group is discussed below.
Table E2 also presents a group of six lakes that are closely associated as a discrete local group of shallow saline lakes within the Peel region that together comprise the Yalgorup Lake system. The values of these lakes are enhanced by their combined function resulting from their close geographic proximity and hydrological integration as a discrete system.

**Table E2: Important habitat Ramsar site groupings**

<table>
<thead>
<tr>
<th>Name</th>
<th>Habitat site sub-group category</th>
<th>Ramsar site</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peel - Harvey System South</td>
<td>Peel-Harvey Estuary</td>
<td>Peel-Yalgorup System</td>
<td>6,339.0</td>
</tr>
<tr>
<td>Peel - Harvey System North</td>
<td></td>
<td></td>
<td>8,788.6</td>
</tr>
<tr>
<td>Lake Clifton</td>
<td></td>
<td></td>
<td>2,388.9</td>
</tr>
<tr>
<td>Martins Tank Lake</td>
<td></td>
<td>Yalgorup Saline Lakes</td>
<td>223.2</td>
</tr>
<tr>
<td>Lake Yalgorup</td>
<td></td>
<td></td>
<td>138.8</td>
</tr>
<tr>
<td>Lake Preston</td>
<td></td>
<td></td>
<td>804.2</td>
</tr>
<tr>
<td>Lake Newnham</td>
<td></td>
<td></td>
<td>85.2</td>
</tr>
<tr>
<td>Lake Pollard</td>
<td></td>
<td></td>
<td>115.6</td>
</tr>
<tr>
<td>Lake McLarty</td>
<td>Peel-Yalgorup Freshwater Lakes</td>
<td></td>
<td>211.7</td>
</tr>
<tr>
<td>Forrestdale Lake</td>
<td>Swan Coastal Plain Freshwater</td>
<td>Forrestdale and Thomsons Lake</td>
<td>221.9</td>
</tr>
<tr>
<td>Thomson Lake</td>
<td>Lakes</td>
<td></td>
<td>296.8</td>
</tr>
</tbody>
</table>

**Peel-Harvey Estuary**

This wetland system is comprised of Peel Inlet and Harvey Estuary, which together form part of a continuous open and relatively shallow water body. It receives seasonal inflow from the Murray, Serpentine and Harvey Rivers, and direct connection with the Indian Ocean through the Mandurah Estuary and the artificial Dawesville Channel providing tidal influence. The wetland has extensive shallow tidal shorelines and mudflats that provide feeding and roosting habitat for a range of migratory shorebird species. The Peel-Harvey Estuary is 2 km east of Lake Clifton, which is one of several adjacent saline lakes (discussed below) which are also important habitat sites within Ramsar areas, and together form the Yalgorup-Peel Ramsar system.

Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), the Peel-Harvey wetland area, including open water is approximately 15,107 ha, and this wetland is completely encompassed within the Peel-Harvey Estuary Ramsar site.

Species richness is relatively high with 18 shorebird species recorded within the northern Peel Inlet section and 26 species recorded within the southern Harvey Estuary section (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)). These totals include species present but at numbers below the 0.1% flyway population threshold. Species recorded at these habitat sites are those associated with open coastal and estuarine tidal shallows and flats. Tidal fluctuations expose large expanses of foraging and roosting habitat throughout the Peel-Harvey Estuary. High abundance of particular species recorded include 5,600 Red-necked Stints (*Calidris ruficollis*) and 2,400 Sharp-tailed Sandpipers (*Calidris acuminata*) (Bamford et.al 2008).
This habitat site is located within a southern development corridor of the City of Mandurah. Potentially significant impacts relate to land use activities within and around the habitat site such as pollution via runoff from adjacent urban and agricultural areas, disturbance through recreational and commercial fishing activities, and climate change affecting tidal characteristics and overall water level.

**Yalgorup Saline Lakes**

The Yalgorup Lakes system forms part of the larger regional Peel-Yalgorup Ramsar system. However, while these lakes are closely associated on a local scale with the Peel-Harvey Estuary, they are placed in a sub-group to differentiate them as non-estuarine habitat sites. They are characterised as shallow, and saline, and being non-estuarine are subject to groundwater aquifers rather than daily tidal fluctuation of the Peel-Harvey Estuary. Shallow shore lines and exposed mudflats of these lakes provide foraging habitat for migratory shorebirds, and proximity to the Peel-Harvey Estuary enhances the extent of foraging habitat and recorded usage by migratory shorebirds.

Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), the area of these lakes is approximately 3,757 ha of habitat including open water which is completely encompassed within the Ramsar area. This area is adjacent to bushland connecting the individual lakes within the system, and to coastal habitat and the Harvey Estuary. It is noted approximately 65% of Lake Preston extends beyond the Perth Peel region, therefore part of this Ramsar site falls outside the Strategic Assessment Area.

Species recorded within the Yalgorup Saline Lakes include those associated with open shallow or exposed mud flats along the lake shores, shallows and lake beds. High species richness and abundance have been recorded at a number of these lakes, such as Lake Preston and Martin’s Tank Lakes which recorded 7,500 and 2,600 Red-necked Stints respectively (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)).

These lakes are located within an area protected as conservation reserve. Potentially significant impacts relate to groundwater extraction, and climate change affecting seasonal habitat availability, and potential effects of eutrophication on aquatic biota and hence food availability for shorebirds.

**Peel-Yalgorup Freshwater Lakes**

Lake McLarty is located approximately 500 m east of the Harvey Estuary and is known to support a high number of migratory shorebirds. While technically located within the Perth Swan Coastal Plain, geographically it is very closely associated with the Peel-Harvey Estuary, but differs in being fresh water, non-tidal and subject to annual flooding and drying. The lake supports a range of invertebrate species that provide an abundant food source for shorebirds and is suitable feeding habitat for palaeartic waders, being one of the few local lakes to support this pre-migration feeding (Craig et al. 2004). Species richness and abundance are high, with 22 species, and up to 4,500 Sharp-tailed Sandpipers recorded (Birdlife Australian Shorebird 2020 database). Occasional winter observations of several migratory species indicate that when suitable habitat is available at the lake, it provides habitat for first year migrants who remain in Australia over the Austral winter (Craig et al. 2004).

Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), the approximate area of Lake McLarty is 212 ha which is entirely covered within the associated Ramsar area. Adjacent bushland connects the lake through vegetated corridors to the Harvey Estuary.
This habitat site is located within an area subject to historical clearing for agriculture. Potentially significant impacts relate to land use activities within and around the habitat site such as groundwater drawdown, and changes in rainfall patterns associated with climate change may also be a risk.

**Swan Coastal Plain Freshwater Lakes**

Perth Swan Coastal Plain Lakes (Thomson and Forrestdale Lake) generally have similar characteristics to the Peel-Yalgorup Freshwater Lakes. However, these lakes are approximately 45 km north within Perth’s southern metropolitan area and are the only Ramsar-listed lakes that are located outside of the Peel-Harvey Estuary, and therefore comprise a separate sub-group.

These lakes are separated by approximately 9 km of urban development and remnant bushland. They are characterised by having relatively fresh water, and as having a seasonal flood – dry cycle subject to local climate and associated groundwater levels. Extensive exposed mudflats can be seasonally available as the lakes dry out following adequate winter rain, and can provide invertebrate rich feeding habitat for up to 17 open foraging migratory shorebird species. Individual species counts of greater than 2,000 Red-necked Stints and Curlew Sandpipers, and several other species including Common Greenshank, Wood Sandpiper have been recorded in numbers greater than the 0.1% flyway population threshold (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)).

Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), these lakes have a combined area of approximately 519 ha, including open water and are entirely encompassed by the Ramsar site.

Since 1990 when they were designated as a Ramsar site, these lakes have experienced longer dry periods and are also drying out earlier than in previous years. During the annual drying phase in the 1980s, both lakes tended to dry completely as late as March. Since 2000, the lakes have been drying mostly during December and January. Prior to this time, in 1980, Thomsons Lake had dried in December only once, and Forrestdale Lake had not dried before January (Maher and Davis 2009).

The lake’s location within the southern metropolitan area of Perth is an area historically cleared for agriculture and more recently under increased demand for residential development. Potentially significant impacts relate to pollution via local drains, impacts caused by reduced water levels due to groundwater abstraction, altered drainage characteristics, and changes in rainfall patterns associated with climate change. The foraging habitat that these and other coastal plain freshwater lakes provide can be limited when winter rainfall is below average as is occurring under an increasing dry climate and/or early, leading to lakes drying early in the summer period.

**2.2.2 Important habitat sites outside of Ramsar areas**

Eighteen sites have been identified as important habitat sites outside of Ramsar areas within the Strategic Assessment Area (Table E3). These sites have been classified as important habitat because they trigger one or more of the criteria relating to recorded abundance of particular species, diversity and percentage of flyway population as outlined in Section 2.1. All occur outside of Ramsar sites.

Specific examples of important habitat sites outside of Ramsar areas and the criteria met include:

- Lake Cooloongup where 2,600 Curlew Sandpipers have been recorded during a previous survey (Bamford et.al 2008);
- Alfred Cove within the Swan River where surveys have recorded several species such as the Grey Plover in numbers greater than 0.1% of the flyway population; and
Woodman Point having 21 species of migratory shorebird recorded.

These 18 sites provide a range of habitat for migratory shorebirds due to their geographical and hydrological characteristics including: salinity, hydrology, depth, tidal influence, seasonal lake drying, and groundwater dependence. These characteristics together form a collection of important seasonal foraging and roosting environments such as shallow water, shorelines and mudflats providing productive foraging habitats.

A number of these sites may function as a connected group in providing important shorebird habitat. For example, those sites located within the Swan River estuarine system form a closely associated group of shallow tidal estuarine shores and sand bars.

The 18 important habitat sites outside of Ramsar areas are grouped into five sub-groups (Table E3, Figure E4) according to geographical and hydrological characteristics influencing the types of foraging and roosting habitat that they provide. The characteristics of these sites are similar to those of the Ramsar areas as they form part of the same wetland systems, consequently the habitat sub-group categories in Table E3 generally correspond with Ramsar site categories in Table E2.

**Table E3: Important habitat sites outside of Ramsar areas groupings**

<table>
<thead>
<tr>
<th>Name</th>
<th>Habitat site sub-group category</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Woodman Point</td>
<td>Coastal Shoreline</td>
<td>64.9</td>
</tr>
<tr>
<td>Yunderup Island Area</td>
<td>Peel-Harvey Estuary</td>
<td>555.7</td>
</tr>
<tr>
<td>Mandurah Estuary mouth</td>
<td>Peel-Harvey Estuary</td>
<td>107.4</td>
</tr>
<tr>
<td>Goegrup Lake</td>
<td></td>
<td>307.6</td>
</tr>
<tr>
<td>Yangebup Lake</td>
<td></td>
<td>90.5</td>
</tr>
<tr>
<td>Kogolup Lake</td>
<td>Swan Coastal Plain Freshwater Lakes</td>
<td>72.4</td>
</tr>
<tr>
<td>North Lake</td>
<td>Swan Coastal Plain Freshwater Lakes</td>
<td>24.6</td>
</tr>
<tr>
<td>Herdsman Lake</td>
<td></td>
<td>359.1</td>
</tr>
<tr>
<td>Lake Joondalup</td>
<td></td>
<td>610.7</td>
</tr>
<tr>
<td>Lake Cooloongup</td>
<td>Saline Lake</td>
<td>622.6</td>
</tr>
<tr>
<td>Dundas Point, Applecross</td>
<td></td>
<td>6.0</td>
</tr>
<tr>
<td>Chidley Point Reserve</td>
<td>Swan River Estuary</td>
<td>12.6</td>
</tr>
<tr>
<td>Devil's Elbow, Peppermint Grove</td>
<td></td>
<td>12.6</td>
</tr>
<tr>
<td>Milyu and Como Beach</td>
<td></td>
<td>47.9</td>
</tr>
<tr>
<td>Old Swan Brewery</td>
<td></td>
<td>12.6</td>
</tr>
<tr>
<td>Pelican Point</td>
<td></td>
<td>24.2</td>
</tr>
<tr>
<td>Point Walter</td>
<td></td>
<td>19.6</td>
</tr>
<tr>
<td>Alfred Cove Attadale foreshore</td>
<td></td>
<td>117.34</td>
</tr>
</tbody>
</table>

**Coastal Shoreline**

Woodman Point is located on the west coast within the Perth Peel region approximately 8 km south of the Port of Fremantle. Its coastal location provides shallow, sandy tidal shorelines for foraging migratory...
shorebirds. The tip of Woodman Point is partially separated from the mainland shore by a narrow tidal reef that provides night roosting shorebirds with some protection from predators.

The site provides roosting habitat during the summer non-breeding season, although the site is a relatively small section of coastline and therefore provides a relatively small area of foraging and roosting habitat compared to other sites such as the Peel-Harvey Estuary. However, being a coastal site, the marine ecology would provide a variety of invertebrate food species not available within estuaries or lakes.

Species recorded at Woodman Point are those associated with open coastal and tidal shallows and flats. Shorebird diversity has been recorded at 21 species of Sandpipers, Plovers, Godwits, Tattlers and other species, and individual species counts exceeding 0.1% of flyway populations of Grey Plover, Ruddy Turnstone and Sanderling (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)).

Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), this site has an area of approximately 65 ha.
Figure E-4: Important habitat sites outside of Ramsar areas
The coastal strip used by shorebirds is buffered from development by the Woodman Point Regional Park, an area of remnant bushland to the adjacent east. The site is located within the southern Perth metropolitan area and is surrounded by extensive land use activities including residential, industrial and maritime development. Potentially significant impacts relate to these land use activities and include pollution via industrial spillage, direct disturbance from human activities, and climate change affecting sea level and available shoreline foraging and roosting habitat.

**Peel-Harvey Estuary**

This group includes three tidally influenced sites within the Peel-Harvey Estuary system. Together these sites provide a range of foraging habitats including coastal and estuarine shores as well as ephemeral lakes. Its proximity to the Ramsar sites within the Peel-Yalgorup System provide opportunistic foraging habitat within the wider Peel-Harvey system for migratory shorebirds.

Migratory shorebird surveys have recorded over 15 species and individual species counts of Grey Plover, Common Greenshank, and Wood Sandpiper have been recorded exceeding 0.1% of flyway populations (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)).

Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), the total area of this habitat site group is approximately 970 ha.

The estuarine location of this habitat site group within the City of Mandurah has associated potentially significant impacts relating to land use activities within and around the habitat site such as pollution via runoff from adjacent urban and agricultural areas, direct disturbance thorough recreational and commercial fishing activities, and climate change affecting tidal characteristics.

**Swan Coastal Plain Freshwater Lakes**

This group of five lakes generally has similar characteristics to the Ramsar Lakes (Thomsons and Forrestdale) located on the Swan Coastal Plain and forms part of an extensive lake system within the Perth metropolitan residential area. These lakes generally have some degree of remnant bushland retained as conservation reserve buffering the water body and adjacent fringing wetland vegetation. They are characterised as having relatively fresh water, and as having seasonal fluctuation subject to annual rainfall and associated groundwater levels, however, due to infill residential development drainage characteristics have been altered to avoid localised flooding by artificially moderating water levels.

During the dry summer period when migratory birds are present, these lakes have exposed mudflats that provide invertebrate rich feeding habitat for several species. These lakes are important due to the recorded occurrence of greater than 0.1% of flyway populations for several species including Grey Plover, Common Greenshank, Wood Sandpiper, Sharp-tailed Sandpiper and Red-necked Stint (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)). These lakes also provide some well vegetated reed beds providing potential foraging habitat for cryptic species such as Australasian Bittern (not a shorebird species).

Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), the total area of this habitat site group is approximately 1,157 ha. These lakes are located within metropolitan areas of Perth, under increased demand for infill residential development. Potentially significant impacts relate to pollution via local drains, impacts caused by reduced water levels due to groundwater
abstraction or changes in rainfall patterns associated with climate change, and drainage modification to artificially moderate water levels.

**Saline Lake**

Lake Cooloongup is the only saline lake of the important habitat sites outside of Ramsar areas. It has similar characteristics to the Yalgorup Saline Lakes being shallow, saline, and subject to seasonal drying, but is located approximately 47 km north. Shallow shore lines and exposed mudflats of this lake provide foraging and roosting habitat for migratory shorebirds.

Species recorded at Lake Cooloongup are those associated with open shallow or exposed mud flats along the lake shores and lake beds. High abundance has been recorded with 3,700 Red-necked Stints and 2,600 Curlew Sandpipers. It also has recorded occurrences of greater than 0.1% of flyway populations for both of these species, as well as Common Greenshank and Sharp-tailed Sandpiper (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)).

Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), the area of these lakes is approximately 623 ha of habitat which is mostly open shallow water or season mud flats, but includes adjacent remnant vegetation.

This habitat site is located within the major southern metropolitan development corridor along the Perth Swan Coastal Plain. Potentially significant impacts relate to land use activities within and around the habitat site such as pollution and altered drainage via runoff from adjacent urban development to the west and agricultural areas to the east, direct disturbance thorough human activities, groundwater extraction, and climate change affecting the lake’s seasonal water level.

**Swan River Estuary**

This group of eight sites comprise shoreline, points and sandbars within the lower open area of the Swan River Estuary. This area receives tidal influence via direct connection with the Indian Ocean at Fremantle Port and seasonal inflow from the Swan and Canning Rivers, although flow rates have been historically reduced due to the damming of the Helena and Canning Rivers, and Wungong and Churchman Brooks. Together these sites comprise a series of sandy shorelines and sand bars connected by open water that provide feeding and roosting habitat for a range of migratory shorebird species.

Six species of migratory shorebirds including Grey Plover, Common Greenshank, Wood Sandpiper, Sharp-tailed Sandpiper, Red-necked Stint and Ruddy Turnstone have been recorded within these sites at occurrences greater than 0.1% of flyway populations, and species diversity has been recorded at Alfred Cove foreshore to be 21 species (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)).

Based on the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), these sites together total approximately 253 ha of shoreline, adjacent shallow tidal areas, and some areas of fringing estuarine reed beds.

These sites are located within the densely populated central Perth metropolitan area and as such potentially significant impacts relate to land use causing pollution via runoff from urban, industrial and agricultural activities, direct disturbance through recreational activity, and climate change affecting tidal characteristics. The lakes themselves are located within an area protected as conservation reserve.
2.2.3 Other habitat

There are an additional 55 habitat sites (Table E4, Figure E5) categorised as other habitat within the Perth Peel area. None of these sites meet the criteria for important habitat. However, migratory shorebirds have been recorded at these sites and are considered to provide habitat value within the Strategic Assessment Area.

Collectively these sites have a total area of approximately 8,058 ha, and include a range of habitat types including estuaries, saline and fresh water lakes that provide a variety of foraging habitats such as tidal estuarine shorelines and sandbars, and extensive mud flats, and lake beds. Data on species presence and abundance is not available, however, based on fauna database search results within the Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014), these sites are likely to represent wider opportunistic foraging sites for open foragers and coastal species associated with proximal habitat sites listed above.

These other sites are categorised into five sub-groups (Table E4) according to geographical and hydrological characteristics influencing the types of foraging and roosting habitat that they provide. As these form part of the same local and regional wetland systems as the above important habitat sites, the habitat site sub-group categories in Table E4 generally correspond with important habitat site categories in Table E2.

Table E4: Other habitat site groupings

<table>
<thead>
<tr>
<th>Habitat site sub-group category</th>
<th>Number of habitat sites</th>
<th>Sub-group area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peel-Harvey Estuary</td>
<td>4</td>
<td>685</td>
</tr>
<tr>
<td>Freshwater Lakes</td>
<td>29</td>
<td>3123</td>
</tr>
<tr>
<td>Swan Coastal Plain Saline Lakes</td>
<td>4</td>
<td>851</td>
</tr>
<tr>
<td>Swan River Estuary</td>
<td>14</td>
<td>3,159</td>
</tr>
<tr>
<td>Yalgorup Saline Lakes</td>
<td>4</td>
<td>213</td>
</tr>
<tr>
<td>Coastal Shoreline</td>
<td>1</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>55</td>
<td>8,058</td>
</tr>
</tbody>
</table>

**Peel-Harvey Estuary**

These habitat sites are brackish estuarine lakes associated with the Murray and Serpentine Rivers that flow into the eastern and northern sides of the Peel-Harvey Estuary. They receive both seasonal stream inflow and some tidal influence, providing shallow shorelines and mudflats that provide approximately 685 ha of feeding habitat including adjacent riparian habitat and small islands within the river systems for a range of open foraging and coastal migratory shorebird species. The close association with the Peel-Harvey Ramsar site means that they potentially provide additional opportunistic foraging sites for shorebirds associated with the Peel-Harvey Estuary.

Species recorded within proximity of these sites include Common Greenshank, Eastern Curlew and Red-necked Stint.
Potentially significant impacts relate to land use activities within and around the habitat site such as pollution via runoff from adjacent urban and agricultural areas, direct disturbance through recreational and commercial fishing activities, and climate change affecting tidal characteristics.

**Freshwater Lakes**

This group comprises 29 lakes having a total area of approximately 3,123 ha within the Strategic Assessment Area. They generally have similar characteristics to the important habitat sites outside of Ramsar areas and form part of the extensive lake system within the Perth Peel area. These lakes range from relatively intact wetlands subject to management planning such as Lake Mealup, to highly modified or artificial lakes such as Baldivis Ski Park. They all have some degree of remnant bushland retained as conservation reserve buffering the water body and adjacent fringing wetland vegetation. They are characterised as having relatively fresh water, and as having seasonal fluctuation in water level subject to annual rainfall and associated groundwater levels, however, due to infill residential development drainage characteristics have been altered to avoid localised flooding by artificially moderating water levels.

During the dry summer period many of these lakes have exposed mudflats or shorelines that provide potential foraging habitat for open forager and coastal shoreline species. Based on NatureMap database search results (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)), the species potentially occurring include Common Greenshank, Curlew Sandpiper Long-toed Stint, Marsh Sandpiper, Red-necked Stint, Sharp-tailed Sandpiper, and Wood Sandpiper.

These lakes are located within metropolitan areas of Perth, under increased demand for infill residential development. Potentially significant impacts relate to pollution via local drains, impacts caused by reduced water levels due to groundwater abstraction or changes in rainfall patterns associated with climate change, and drainage modification to artificially moderate water levels.

**Swan Coastal Plain Saline Lakes**

This group comprises three sites having a combined area of approximately 1,219 ha. Two of the lakes are located within proximity of, and have similar characteristics to Lake Cooloongup, which is an important habitat site outside of Ramsar areas. They are shallow, saline, and subject to seasonal drying, and their exposed mudflats and shorelines potentially provide additional foraging habitat for migratory shorebirds known to occupy Lake Cooloongup. Species listed on the NatureMap database search that potentially occur are Common Greenshank and Red-necked Stint (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)).

These lakes are located within the major southern metropolitan development corridor along the Perth Swan Coastal Plain.

The other lake is associated with permanent artificial lakes at Burswood, which were manufactured as part of the Golf Course. Common Sandpiper, Great Egret, Osprey, Common Greenshank, Red-necked Stint, Sharp-tailed Sandpiper and Caspian Tern have been observed at this site.

Potentially significant impacts at these lakes include pollution and altered drainage via runoff from adjacent urban areas, direct disturbance through human activities, groundwater extraction, and climate change affecting seasonal water levels.
**Swan River Estuary**

This group comprises 14 sites along the Swan River from the harbour in the west, the open water of the main Swan River and upper sections of the Swan and Canning Estuaries. The total area is approximately 3,159 ha and comprises sandy shoreline, points and sandbars providing potential shorebird foraging habitat for those species listed as occurring within proximal important habitat sites along the Swan River.

It is subject to tidal water level changes via direct connection with the Indian Ocean at Fremantle Port, and seasonal inflow from the Swan and Canning Rivers although flow rates have been historically reduced due to the damming of the Helena and Canning Rivers, and Wungong and Churchman Brooks. These sites together are a series of sandy shorelines and sand bars connected by open water providing tidal shoreline habitat that provide feeding and roosting habitat for a range of migratory shorebird species.

Migratory shorebird species listed on the NatureMap database search that potentially occur are Common Greenshank, Curlew Sandpiper, Grey-tailed Tattler, Red-necked Stint, Common Sandpiper, and Ruddy Turnstone (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)), however other species potentially forage within these sites, given the high species diversity recorded within the important habitat sites occurring locally along the Swan River.

These sites are located within the densely populated central Perth metropolitan area and as such potentially significant impacts include pollution via runoff from urban, industrial and agricultural activities, direct disturbance through recreational activity, and climate change affecting tidal characteristics.

**Yalgorup Saline Lakes**

These four lakes have a total area of approximately 213 ha and lie within the Yalgorup Lakes system. They are shallow, saline, and subject to seasonal fluctuation. Shallow shore lines and exposed mudflats of these lakes provide potential foraging habitat for migratory shorebirds. Due to the proximity of these lakes to the Ramsar Lakes such as Lake Clifton and Lake Preston, they represent potential opportunistic foraging habitat to those species that occur locally.

Migratory Shorebird species listed on the NatureMap database search that potentially occur are Common Sandpiper, Sharp-tailed Sandpiper, Curlew Sandpiper, Grey-tailed Tattler and Red-necked Stint (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)), however, given the high species richness recorded at adjacent Ramsar sites, other species potentially forage within these sites.

These lakes are located within an area protected as conservation reserve. Potentially significant impacts relate to climate change affecting seasonal habitat availability.

**Coastal Shoreline**

Becher Point is the only coastally located Ramsar site within the southern Perth metropolitan area. The Ramsar site associated with Becher Point relates primarily to the unique Holocene Dune seasonal swamp (DEP 2000) located directly behind the shoreline and extending approximately 3 km inland. The ecological value of Becher Point for migratory shorebirds focuses on the coastal shoreline on the western edge of the Ramsar site, and consequently some of the narrow coastal shoreline relevant to the shorebirds falls outside the 677 ha area mapped as the Ramsar site.
The coastal strip of Becher Point is a shoreline with some low limestone, and the shore is protected from heavy ocean swells by shallow reef within Warnbro Sound providing sheltered roosting habitat, and the adjacent bay provides shallow sandy tidal shorelines for foraging migratory shorebirds during the summer non-breeding season. Sanderlings have been recorded here at over 0.1% of flyway during at least one Bird Atlas survey (Strategic Assessment Area shorebird spatial dataset (Parks and Wildlife 2014)).

This strip of coastal habitat is relatively small, at most 5 ha and therefore provides a relatively small area of foraging habitat compared to other sites within the Strategic Assessment Area. However, being a coastal site, the marine ecology would provide a variety of invertebrate food species not available within estuaries or lakes. Although considered to not be important habitat by itself, it forms part of a wider series of important shorebird habitat sites due to its proximal location to important sites outside of Ramsar areas including Lake Cooloongup and Point Perron.

This site is buffered from Perth's southern development corridor by adjacent retained bushland at Port Kennedy, however, there is extensive residential development to the east. Potentially significant impacts include direct disturbance associated with human activities, and climate change affecting sea level and available shoreline foraging and roosting habitat.
Figure E-5: Other habitat sites

Legend
- Strategic Assessment Area
- Other Wetland Sub-Group
  - Peel Harvey Estuary
  - Swan Coastal Plain Saline Lakes
  - Swan River Estuary
  - Yalgorup Saline Lakes
  - Freshwater Lakes

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
2.3 RECORDS FOR MIGRATORY SHOREBIRDS

Twenty nine migratory shorebird species (out of the 36 listed under the EPBC Act) have been recorded within the Strategic Assessment Area. Table E5 shows the species recorded, the number of sites in which they occur, which species occur in numbers exceeding 0.1% of the flyway population, and the number of sites where that threshold is exceeded by each species.

Section 2.4 of this report provides more detail on the 15 species highlighted in Table E5 that have been recorded within the Strategic Assessment Area in numbers in excess of 0.1% of their flyway populations.

Two species that occur within the Strategic Assessment Area have recently been listed as critically endangered – Curlew Sandpiper (Calidris ferruginea) and Eastern Curlew (Numenius madagascariensis). The Curlew Sandpiper occurs in numbers in excess of 0.1% of the flyway population. Both these species are addressed in more detail in Section 2.4 below.

Table E5: List of migratory shorebird species from EPBC Act Policy Statement 3.21 occurring within the Strategic Assessment Area (occurrence in excess of 0.1% of flyway population highlighted in blue). CE – critically endangered species.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Number of sites where species recorded (or in proximity of site)</th>
<th>Species exceeds 0.1% threshold within Strategic Assessment Area?</th>
<th>Number of sites exceeding 0.1% flyway population threshold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bar-tailed Godwit</td>
<td>Limosa lapponica</td>
<td>4</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Black-tailed Godwit</td>
<td>Limosa limosa</td>
<td>5</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Broad-billed Sandpiper</td>
<td>Limicola falcinellus</td>
<td>4</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Common Greenshank</td>
<td>Tringa nebularia</td>
<td>52</td>
<td>yes</td>
<td>12</td>
</tr>
<tr>
<td>Common Redshank</td>
<td>Tringa totanus</td>
<td>1</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Common Sandpiper</td>
<td>Actitis hypoleucus</td>
<td>4</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Curlew Sandpiper (CE)</td>
<td>Calidris ferruginea</td>
<td>29</td>
<td>yes</td>
<td>8</td>
</tr>
<tr>
<td>Double-banded Plover</td>
<td>Charadrius bicinctus</td>
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<td>0</td>
</tr>
<tr>
<td>Eastern Curlew (CE)</td>
<td>Numenius madagascariensis</td>
<td>6</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Great Knot</td>
<td>Calidris tenuirostris</td>
<td>5</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Greater Sand Plover,</td>
<td>Charadrius leschenaultii</td>
<td>5</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Grey Plover</td>
<td>Pluvialis squatarola</td>
<td>20</td>
<td>yes</td>
<td>12</td>
</tr>
<tr>
<td>Grey-tailed Tattler</td>
<td>Heteroscelus brevipes</td>
<td>13</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Latham’s Snipe</td>
<td>Gallinago hardwickii</td>
<td>3</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Lesser Sand Plover</td>
<td>Charadrius mongolus</td>
<td>4</td>
<td>yes</td>
<td>1</td>
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<tr>
<td>Long-toed Stint</td>
<td>Calidris subminuta</td>
<td>11</td>
<td>yes</td>
<td>1</td>
</tr>
<tr>
<td>Marsh Sandpiper</td>
<td>Tringa stagnatilis</td>
<td>14</td>
<td>yes</td>
<td>3</td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
<td>Number of sites where species recorded (or in proximity of site)</td>
<td>Species exceeds 0.1% threshold within Strategic Assessment Area?</td>
<td>Number of sites exceeding 0.1% flyway population threshold</td>
</tr>
<tr>
<td>----------------------</td>
<td>--------------------------</td>
<td>---------------------------------------------------------------</td>
<td>---------------------------------------------------------------</td>
<td>------------------------------------------------------------</td>
</tr>
<tr>
<td>Oriental Plover</td>
<td>Chanadrius veredus</td>
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<td>no</td>
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</tr>
<tr>
<td>Pacific Golden Plover</td>
<td>Pluvialis fulva</td>
<td>8</td>
<td>yes</td>
<td>2</td>
</tr>
<tr>
<td>Pectoral Sandpiper</td>
<td>Calidris melanotos</td>
<td>4</td>
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</tr>
<tr>
<td>Red Knot, Knot</td>
<td>Calidris canutus</td>
<td>12</td>
<td>yes</td>
<td>2</td>
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<tr>
<td>Red-necked Stint</td>
<td>Calidris ruficollis</td>
<td>39</td>
<td>yes</td>
<td>18</td>
</tr>
<tr>
<td>Ruddy Turnstone</td>
<td>Arenaria interpres</td>
<td>13</td>
<td>yes</td>
<td>2</td>
</tr>
<tr>
<td>Ruff</td>
<td>Philomachus pugnax</td>
<td>5</td>
<td>yes</td>
<td>1</td>
</tr>
<tr>
<td>Sanderling</td>
<td>Calidris alba</td>
<td>10</td>
<td>yes</td>
<td>2</td>
</tr>
<tr>
<td>Sharp-tailed Sandpiper</td>
<td>Calidris acuminata</td>
<td>27</td>
<td>yes</td>
<td>8</td>
</tr>
<tr>
<td>Terek Sandpiper</td>
<td>Xenus cinereus</td>
<td>4</td>
<td>no</td>
<td>0</td>
</tr>
<tr>
<td>Whimbrel</td>
<td>Numenius phaeopus</td>
<td>8</td>
<td>yes</td>
<td>1</td>
</tr>
<tr>
<td>Wood Sandpiper</td>
<td>Tringa glareola</td>
<td>18</td>
<td>yes</td>
<td>8</td>
</tr>
</tbody>
</table>

2.4 **KEY SPECIES**

This section individually addresses each species that is found within the Strategic Assessment Area in numbers greater than 0.1% of the flyway population. Information about the species, distribution, population, ecology and habitat requirements is presented. A discussion of the specific habitat use within the Strategic Assessment Area is also provided.

2.4.1 *Tringa nebularia* (Common Greenshank)

**Description**

The Common Greenshank is a heavily built, elegant wader, 30 – 35 cm in length, weighing up to 190 g and having a wingspan of 55 – 65 cm. It has long yellowish-green legs and a slightly upturned bill (DoE 2014a).

**Australian distribution and population**

The Common Greenshank does not breed in Australia; however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia. The EAA Flyway population of the species is thought to be approximately 60,000, of which 18,000 – 19,000 spend their non-breeding season in Australia (DoE 2014).

Within WA the species occurs around the majority of the coast from Cape Arid in the south to Carnarvon in the north-west, including records in the south-west and north-east Kimberley. The species is
generally absent from the western Deserts although a few records occur from the Great Sandy Desert and the Nullarbor Plain (DoE 2014).

Sites of international importance for species within WA include Wilson Inlet, Eighty Mile Beach and Roebuck Bay.

**Habitat**

The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms (DoE 2014). The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats. It will also use artificial wetlands, including sewage farms and saltworks dams, inundated rice crops and bores. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees (DoE 2014).

Foraging primarily occurs at edges of wetlands, in soft mud on mudflats, in channels, or in shallows around the edges of water often among pneumatophores of mangroves or other sparse, emergent or fringing vegetation, such as sedges or saltmarsh. It is also known to occasionally feed on exposed seagrass beds (DoE 2014).

The species roosts primarily around wetlands, in shallow pools and puddles, or slightly elevated on rocks, sandbanks or small muddy islets, and occasionally perched on stakes. The species is also known to roost on an inland claypan near Roebuck Bay, WA, which may be an important roost site for the species at least during the non-breeding season.

**Presence within the Strategic Assessment Area**

The Common Greenshank is one of the most extensively occurring migratory shorebird species across the Strategic Assessment Area. It has been recorded from the southern Peel to the Swan Coastal Plain north of Perth from a diverse range of habitat site types such as saline and freshwater lakes, estuaries, and coastal shoreline areas, which have shallow or exposed mudflats that provide foraging and roosting habitat. This species does not appear to have a preference for a particular habitat site type, based on the wide range of habitat site characteristics utilised and its occurrence at many sites in high numbers.

The Common Greenshank is known to occur at, or within proximity to 52 sites within the Strategic Assessment Area, and 12 of these are important sites where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E6). Important sites where it has been recorded include:

- Alfred Cove Attadale foreshore;
- Forrestdale Lake;
- Goegrup Lake;
- Lake Cooloongup;
- Lake Joondalup;
- Lake McLarty;
- Mandurah Estuary mouth;
- Martins Tank Lake;
- Peel - Harvey System north;
- Peel - Harvey System South;
- Thomson Lake; and
- Yangebup Lake.
2.4.2 *Calidris ferruginea* (Curlew Sandpiper)

The Curlew Sandpiper is listed as critically endangered and migratory under the EPBC Act.

**Description**

The Curlew Sandpiper is a small, slim sandpiper 18 – 23 cm long and weighing 57 g, with a wingspan of 38 – 41 cm. The legs and neck are long. The bill is also long, and is decurved with a slender tip. The bill is black, sometimes with a brown or green tinge at the base. The head is small and round, and the iris is dark brown. The legs and feet are black or black-grey (DoE 2014).

**Australian distribution and population**

Within Australia the Curlew Sandpiper occurs primarily around the coast but is also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north (DoE 2014).

The Flyway population of the species was previously thought to be approximately 180,000, of which approximately 118,000 spent their non-breeding season in Australia (DoE 2014). However, numbers have declined recently and decreases appear to be on-going. The recently approved EPBC Act conservation advice for the species indicates a severe population decline for over 80% in ~23 years (TSSC 2015).

In WA they are widespread around coastal and sub-coastal plains from Cape Arid to south-west Kimberley, but are more sparsely distributed between Carnarvon and Dampier Archipelago. They occur in large numbers, thousands to tens of thousands, at Port Hedland Saltworks, Eighty Mile Beach, Roebuck Bay and Lake Macleod. The also occasionally occur inland, in areas south of 26°S (DoE 2014).

**Habitat**

Curlew Sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters (DoE 2014).

Curlew Sandpipers forage on mudflats and nearby shallow water. In non-tidal wetlands, they usually wade, mostly in water 15 – 30 mm, but up to 60 mm, deep. They forage at the edges of shallow pools and drains of intertidal mudflats and sandy shores. At high tide, they forage among low sparse emergent vegetation, such as saltmarsh, and sometimes forage in flooded paddocks or inundated saltflats. Occasionally they forage on wet mats of algae or waterweed, or on banks of beach cast seagrass or seaweed. In Roebuck Bay, northern WA, they are also said to feed on part of the mudflats that have been exposed for a longer period, foraging in small groups (DoE 2014).

The species generally roosts on bare dry shingle, shell or sand beaches, sandspits and islets in or around coastal or near-coastal lagoons and other wetlands, occasionally roosting in dunes during very high tides and sometimes in saltmarsh.
Presence within the Strategic Assessment Area

The Curlew Sandpiper has been recorded from the southern Peel to the Perth lakes within the Swan Coastal Plain. It has been recorded within a diverse range of habitat site types such as salt lakes, estuaries, coastal shoreline areas and freshwater lakes with exposed sand or mudflat that provide foraging habitat. Based on the wide range of habitat site characteristics (saline, estuarine, and fresh) where it has been recorded, it does not appear to have a preference for a particular habitat site type.

The Curlew Sandpiper is known to occur at, or within proximity to 29 sites within the Strategic Assessment Area, and eight of these are important sites where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E7). Important sites where it has been recorded include:

- Alfred Cove Attadale foreshore;
- Forrestdale Lake;
- Lake Cooloongup;
- Lake McLarty;
- Milyu and Como Beach;
- Peel - Harvey System North;
- Point Walter; and
- Thomson Lake.

Other sites this species has been recorded at or near include:

- Ascot Waters;
- Baldivis Ski Park;
- Bibra Lake;
- Canning River Regional Park;
- Goegrup Lake;
- Herdsman Lake;
- Jandabup Lake;
- Kogolup Lake;
- Lake Clifton;
- Lake Coogee;
- Lake Hayward;
- Lake Joondalup;
- Lake Monger;
- Lake Newnham;
- Lake Pollard;
- Lake Preston;
- Lake Yalgorup;
- Martins Tank Lake;
- South Lake;
- Woodman Point;
- Yangebup Lake; and
- Yunderup Island area.
2.4.3 *Numenius madagascariensis* (Eastern Curlew)

The Eastern Curlew is listed as critically endangered and migratory under the EPBC Act.

**Description**

The Eastern Curlew is a large wader with a long neck, long legs, and a heavy bill that curves downwards. The wingspan is 110 cm and the birds weigh approximately 900 g. The sexes are similar, but the female is slightly larger and has a longer bill (DoE 2014).

**Australian distribution and population**

Within Australia the Curlew Sandpiper occurs primarily around the coast and is found in all states, including Tasmania. It is rarely recorded in inland areas. It is most common and continuously distributed along the tropical Western Australian coast, across northern Australia (including the Torres Strait) and south to NSW. Elsewhere the distribution is patchy.

The Flyway population of the species has been previously estimated at 38,000 including 28,000 in Australia (Bamford et al. 2008). However, numbers have declined recently and decreases appear to be on-going. The recently approved EPBC Act conservation advice for the species indicates a severe population decline for over 80% in 30 years (TSSC 2015).

In WA, the species is distributed continuously from Barrow Island and Dampier Archipelago and across the north of the State. Key sites occur at Eighty Mile Beach and Roebuck Bay. In southern WA, Eastern Curlews are recorded from Eyre, and there are scattered records from Stokes Inlet to Peel Inlet. The species is a scarce visitor to Houtman Abrolhos and adjacent mainland, and is also recorded around Shark Bay (DoE 2014).

**Habitat**

The Eastern Curlew is most commonly associated with sheltered coasts, especially estuaries, bays, harbours, inlets and coastal lagoons, with large intertidal mudflats or sandflats, often with beds of seagrass. Occasionally, the species occurs on ocean beaches (often near estuaries), and coral reefs, rock platforms, or rocky islets. The birds are often recorded among saltmarsh and on mudflats fringed by mangroves, and sometimes use the mangroves (DoE 2014).

The Eastern Curlew mainly forages on soft sheltered intertidal sandflats or mudflats, open and without vegetation or covered with seagrass, often near mangroves, on saltflats and in saltmarsh, rockpools and among rubble on coral reefs, and on ocean beaches near the tideline. The birds are rarely seen on near-coastal lakes and in grassy areas (DoE 2014).

The Eastern Curlew roosts on sandy spits and islets, especially on dry beach sand near the high-water mark, and among coastal vegetation including low saltmarsh or mangroves. It occasionally roosts on reef-flats, in the shallow water of lagoons and other near-coastal wetlands. Eastern Curlews are also recorded roosting in trees and on the upright stakes of oyster-racks. Eastern Curlews typically roost in large flocks, separate from other waders (DoE 2014).

In some conditions, waders may choose roost sites where a damp substrate lowers the local temperature. This may have important conservation implications where these sites are heavily disturbed.
beaches. It may be possible to create artificial roosting sites to replace those destroyed by development (DoE 2014).

**Presence within the Strategic Assessment Area**

The Eastern Curlew has been recorded from the Swan River Estuary south to the Peel Harvey system. It has been recorded within a limited range of habitat site types including estuaries, coastal shorelines and riverine lakes under tidal influence. Based on the narrow range of habitat site characteristics where it has been recorded, it appears to have a preference for primarily estuarine habitat site types.

The Eastern Curlew is known to occur at, or within proximity to 5 sites within the Strategic Assessment Area. The species’ numbers at these site have not, however, been recorded in excess of 0.1% of the flyway population (Figure E8). Known sites where the Eastern Curlew has been recorded include:

- Alfred Cove Attadale Foreshore
- Black Lake
- Peel - Harvey System North
- Woodman Point
- Yunderup area (northern Peel Inlet)
Figure E-8: Presence of the Eastern Curlew within the Strategic Assessment Area

Legend

- **Strategic Assessment Area**
- **Species Recorded**

Datum/Projection: GDA 1994 MGA Zone 50

Data Source: DPaW

Prepared by: JL Date: 29/07/2015
2.4.4 *Pluvialis squatarola* (Grey Plover)

**Description**

The Grey Plover is a medium sized plover with long legs and a short, stout bill. The crown and nape are brown with fine white streaking. The rest of the upper parts are pale brownish-grey with white fringes to the feathers, giving a slightly mottled appearance, except for the rump and upper tail coverts, which are white. The forehead and lores are whitish, and there is an off-white supercilium with brown streaking above a brown eye-stripe. The rest of the face is whitish with fine grey-brown streaks. The chin and throat are white; the neck, breast and flanks are white with pale mottling and streaking, and the rest of the underparts are white (DoE 2014).

**Australian distribution and population**

In Australia the Grey Plover occurs in coastal areas around in every state. The species is also commonly recorded in inland areas during its migration to southern parts of the country (DoE 2014). It has been estimated that 3 – 4% of the world’s population of Grey Plovers occur in Australia, and these may represent 10 – 75% of the 16,000 – 125,000 Flyway population (DoE 2014).

In WA the species occurs along the majority of the coast during the non-breeding season with many birds from the Port Hedland and Broome areas not migrating north (DoE 2014). Of the three internationally important areas for the species in Australia, only one, Nuytsland Nature Reserve, occurs in WA.

**Habitat**

In non-breeding grounds in Australia, Grey Plovers occur almost entirely in coastal areas, where they usually inhabit sheltered embayments, estuaries and lagoons with mudflats and sandflats, and occasionally on rocky coasts with wave-cut platforms or reef flats, or on reefs within muddy lagoons. They also occur around terrestrial wetlands such as near-coastal lakes and swamps, or salt lakes. The species is also very occasionally recorded further inland, where they occur around wetlands or salt lakes (DoE 2014).

Grey Plovers usually forage on large areas of exposed mudflats and beaches of sheltered coastal shores such as inlets, estuaries and lagoons. They also occasionally feed in pasture and at the muddy margins of inland wetlands such as lakes, swamps and bores (DoE 2014).

The species usually roost in sandy areas, such as on unvegetated sandbanks or sandspits on sheltered beaches or other sheltered environments such as estuaries or lagoons (DoE 2014).

**Presence within the Strategic Assessment Area**

The Grey Plover occurs widely across the Strategic Assessment Area from the southern Peel to Swan Coastal Plain lakes within the Perth metropolitan area where it has been recorded from a diverse range of habitat site types such as salt lakes, estuaries, coastal shoreline and freshwater lakes with exposed sand or mudflat that provide foraging habitat. The majority of sites where it has been recorded in high numbers are from estuarine sites associated with the Peel-Harvey and Swan River systems.
The Grey Plover is known to occur at, or within proximity to 20 sites within the Strategic Assessment Area, and 12 of these sites are important sites where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E9). Important sites where it has been recorded include:

- Alfred Cove Attadale foreshore;
- Herdsman Lake;
- Lake Clifton;
- Mandurah Estuary mouth;
- Milyu and Como Beach;
- North Lake;
- Peel - Harvey System North;
- Peel - Harvey System South;
- Pelican Point;
- Point Walter;
- Woodman Point; and
- Yunderup Island area.
Figure E-9: Presence of the Grey Plover within the Strategic Assessment Area

Legend
- **Strategic Assessment Area**
- Species recorded at >0.1% flyway population
- Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
2.4.5 *Charadrius mongolus* (Lesser Sand Plover)

**Description**

The Lesser Sand Plover is a small to medium sized grey-brown and white plover which has a dark eye-stripe and which reaches 18 – 21 cm in length and 56 – 71 g in weight (DoE 2014).

**Australian distribution and population**

Within Australia, the Lesser Sand Plover is widespread in coastal regions, and has been recorded in all states. It mainly occurs in northern and eastern Australia, in south-eastern parts of the Gulf of Carpentaria, western Cape York Peninsula and islands in Torres Strait, and along the entire east coast, though it occasionally also occurs inland. It is most numerous in Queensland and NSW (DoE 2014). Approximately 130,000 – 140,000 birds are estimated to be present in the Flyway but exact numbers of these birds occurring in Australia is unknown.

In WA the species occurs around the majority of the coast, except for areas north-east of the Kimberley Division (DoE 2014). Internationally important areas for the species in WA include Eighty Mile Beach, Roebuck Bay, Broome and Port Hedland Saltworks.

**Habitat**

In non-breeding grounds in Australia, this species usually occurs in coastal littoral and estuarine environments. It inhabits large intertidal sandflats or mudflats in sheltered bays, harbours and estuaries, and occasionally sandy ocean beaches, coral reefs, wave-cut rock platforms and rocky outcrops. It also sometime occurs in short saltmarsh or among mangroves. The species also inhabits saltworks and near-coastal saltpans, brackish swamps and sandy or silt islands in river beds (DoE 2014). In north-western Australia specifically, the species appears to use the Port Hedland Saltworks in preference to nearby beaches (DoE 2014).

The species feeds mostly on extensive, freshly-exposed areas of intertidal sandflats and mudflats in estuaries or beaches, or in shallow ponds in saltworks. They also occasionally forage on coral reefs and on sandy or muddy river margins. At inland sites, they have been recorded foraging in muddy areas around lakes, soaks and bores (DoE 2014).

They roost near foraging areas, on beaches, banks, spits and banks of sand or shells, and occasionally on rocky spits, islets or reefs. The species has been recorded roosting on a sandbank in swamp associated with an artesian bore, on the grassy margins of temporary pools on low-lying river islets, and on an inland claypan (DoE 2014).

**Presence within the Strategic Assessment Area**

The Lesser Sand Plover has been recorded from estuarine and coastal shoreline with exposed sand or mudflat that provide foraging habitat. It is known to occur at, or in proximity to four sites within the Strategic Assessment Area, three of which occur in the Peel-Harvey system, including a single estuarine site. The Peel-Harvey System North is the only site where this species has been recorded in numbers exceeding the 0.1% flyway population (Figure E10).
Figure E-10: Presence of the Lesser Sand Plover within the Strategic Assessment Area

Legend
- Strategic Assessment Area
- Species recorded at >0.1% flyway population
- Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
2.4.6 *Calidris subminuta* (Long-toed Stint)

**Description**

The Long-toed Stint is a very small sandpiper attaining a weight of 25 g, a length of 13 – 16 cm, and a wingspan of 26 – 31 cm. It has distinctive shape in profile characterised by; small head, long narrow neck, rounded belly, short rump, long yellow legs, and long toes. It is distinguished from the Red-necked Stint by having smaller and finer build (DoE 2014).

**Australian distribution and population**

The species is distributed widely throughout Australia although less commonly recorded in the east compared with the west. It occurs along coastal shores, and estuaries, as well as inland ephemeral lakes where it will appear following episodic rainfall to take advantage of opportunistic foraging conditions. This species prefers shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds. Within WA sites of international importance include Parry Lagoons in the north and lakes in the Perth Peel area such as Thomsons Lake, and Lake McLarty (DoE 2014).

**Habitat**

During the non-breeding season in Australia, it forages in wet, muddy shoreline, and shallow water growths of short grass, weeds, sedges, low or floating aquatic vegetation, reeds, rushes and occasionally stunted samphire. It has also been observed at permanent wetlands such as reservoirs and artificial lakes. It will roost or loaf in sparse vegetation at the edges of wetlands and on damp mud near shallow water. Diet is not well understood, but known to be omnivorous, feeding on seeds, molluscs, crustaceans and insects, singly or in small flocks (DoE 2014).

**Presence within the Strategic Assessment Area**

The Long-toed Stint occurs widely across the Strategic Assessment Area from the Peel-Harvey to the northern Swan Coastal Plain. It has occasionally been recorded within estuarine sites, but has a clear preference for freshwater lakes with 10 of the 11 recorded sites being freshwater lakes. These sites provide shallow water and exposed mud flats and low vegetation for foraging and roosting. One site, Lake McLarty, is an important site within the Strategic Assessment Area where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E11).
Figure E-11: Presence of the Long-toed Stint within the Strategic Assessment Area

Legend
- Strategic Assessment Area
- Species recorded at >0.1 % flyway population
- Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT  Date: 17/02/2015
2.4.7 *Tringa stagnatilis* (Marsh Sandpiper)

**Description**

The Marsh Sandpiper is a medium sized member of the *Tringinae* family. It has a length of 22 – 26 cm, a wingspan of 40 – 45 cm and a weight of 70 g. In all plumages the species shows a contrasting outerwing, a very pale whitish tail and a bold white wedge up the back (DoE 2014).

**Australian distribution and population**

The Marsh Sandpiper is found on coastal and inland wetlands throughout Australia, though only scattered records of the species occur within WA, primarily within coastal areas. The Flyway population of the species is thought to be between 100,000 – 1,000,000; with the number spending their non-breeding season in Australia currently unknown (DoE 2014).

Sites of international importance for species within WA include Port Hedland Saltworks, Parry River floodplain, Peel Inlet, Camballin and Eighty Mile Beach (DoE 2014).

**Habitat**

The species occurs in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, saltmarshes, estuaries, pools on inundated floodplains, and intertidal mudflats and also regularly at sewage farms and saltworks. They are recorded less often at reservoirs, waterholes, soaks, bore-drain swamps and flooded inland lakes. Three of the five sites with highest recorded numbers are saltwater habitats (Hunter Estuary, NSW; Port Hedland Saltworks, WA; Tullakool Evaporation Ponds, NSW) (DoE 2014). In WA they prefer freshwater to marine environments. In southeast Australia they prefer inland saline lakes and coastal saltworks. They are found infrequently around mangroves (DoE 2014).

Foraging primarily occurs in shallow water at the edge of wetland. They probe wet mud of mudflats or feed among marshy vegetation (DoE 2014). The species roosts on tidal mudflats, near saltmarsh, and around inland swamps (DoE 2014).

**Presence within the Strategic Assessment Area**

The Marsh Sandpiper has been recorded within the Strategic Assessment Area from the southern Peel to the northern Swan Coastal Plain where it has been recorded from a diverse range of habitat site types such as including salt lakes, estuaries, coastal shoreline and freshwater lakes having exposed sand or mudflat that provide foraging habitat. Based on the range of habitat site characteristics (saline, estuarine, and fresh) where it has been recorded, it does not appear to have a preference for a particular habitat site type, although the majority of occurrences are freshwater lakes.

The Marsh Sandpiper is known to occur at, or within proximity to 14 sites within the Strategic Assessment Area, and three of these sites are important sites where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E12). Important sites where it has been recorded include Peel – Harvey System North, Lake McLarty and Forrestdale Lake.
Figure E-12: Presence of the Marsh Sandpiper within the Strategic Assessment Area

Legend
- Strategic Assessment Area
- Species recorded at >0.1 % flyway population
- Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
2.4.8 *Pluvialis fulva* (Pacific Golden Plover)

**Description**

The Pacific Golden Plover is a medium sized (length 23 – 26 cm; weight: 120 – 175 g) plover with long legs and an upright stance. The crown is dark brown with golden streaks; the nape and hindneck are similar, though slightly paler; the forehead, lores, supercilium, chin, throat and sides of the head are all golden or creamy buff (DoE 2014).

**Australian distribution and population**

Within Australia, the Pacific Golden Plover is widespread in coastal regions, though there are also a number of inland records (in all states), sometimes far inland and usually along major river systems, especially the Murray and Darling Rivers and their tributaries. Most Pacific Golden Plovers occur along the east coast, and are especially widespread along the Queensland and NSW coastlines. Elsewhere, they are recorded at scattered sites in the south-east (DoE 2014). It has been estimated that 4% (approximately 9,000 out of 209,500) of the world’s population occurs in Australia during the non-breeding season.

In WA, the species is seldom recorded along the southern or south-western coasts, but is more widespread along the Pilbara and Kimberley coasts between north-west Cape and the Northern Territory border (DoE 2014). No internationally listed important areas occur in WA, though Eighty Mile Beach is considered nationally important.

**Habitat**

The Pacific Golden Plover usually inhabits coastal habitats, though it occasionally occurs around inland wetlands. Pacific Golden Plovers usually occur on beaches, mudflats and sandflats in sheltered areas including harbours, estuaries and lagoons, and also in evaporation ponds in saltworks (DoE 2014). The species is also sometimes recorded on islands, sand and coral cays and exposed reefs and rocks. They are less often recorded in terrestrial habitats, usually wetlands such as fresh, brackish or saline lakes, billabongs, pools, swamps and wet claypans, especially those with muddy margins and often with submerged vegetation or short emergent grass (DoE 2014).

The species usually forages on sandy or muddy shores (including mudflats and sandflats) or margins of sheltered areas such as estuaries and lagoons, though it also feeds on rocky shores, islands or reefs. In addition, Pacific Golden Plovers occasionally forage among vegetation, such as saltmarsh, mangroves or in pasture or crops (DoE 2014).

Roost locations primarily occur near foraging areas and include, sandy beaches and spits or rocky points, islets or exposed reefs, and occasionally among or beneath vegetation including mangroves or low saltmarsh, or among beach cast seaweed (DoE 2014).

**Presence within the Strategic Assessment Area**

The Pacific Golden Plover has been recorded widely within the Strategic Assessment Area from the southern Peel to the Swan Coastal Plain where it has been recorded from a diverse range of habitat site types such as including salt lakes, estuaries, coastal shoreline and freshwater lakes having exposed sand or mudflat that provide foraging habitat. Based on the range of habitat site characteristics (saline,
estuarine, and fresh) where it has been recorded, it does not appear to have a preference for a particular habitat site type, although it occurs in highest abundance within the Peel-Harvey Estuary system.

The Pacific Golden Plover has been recorded within or within proximity to eight sites across the Strategic Assessment Area, and two of these sites are important sites where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E13). Important sites where it has been recorded are Peel - Harvey System South and Peel - Harvey System North.
Figure E-13: Presence of the Pacific Golden Plover within the Strategic Assessment Area

Legend
- Strategic Assessment Area
- Species recorded at >0.1% flyway population
- Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
2.4.9 *Calidris canutus* (Red Knot)

**Description**

The Red Knot is a small to medium member of the *Calidridinae* family. It has a length of 23 – 25 cm, a wingspan of 45 – 54 cm and a weight of 120 g. The species is robust, short-necked, rather dumpy but long bodied wader with a short straight bill, long wings extending beyond the tail and short legs (DoE 2014).

**Australian distribution and population**

The Red Knot is common in all the main suitable habitats around the coast of Australia, but is less numerous in south-west Australia than elsewhere. Of the 220,000 thousand birds that occupy the Flyway, 135,000 occur in Australia during the non-breeding season (DoE 2014).

In WA there are scattered records in the south, and it is occasionally seen around Peron Peninsula and Carnarvon. It is widespread on the coast from Ningaloo and Barrow Island to the south-west Kimberley Division, with very large numbers regularly recorded at Eighty Mile Beach and Roebuck Bay (DoE 2014). These two areas along with Lake Macleod are listed as the only international important areas for the species within WA.

**Habitat**

In Australia the Red Knot mainly inhabit intertidal mudflats, sandflats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours; sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools and pans, and recorded on sewage ponds and saltworks, but rarely use freshwater swamps (DoE 2014).

The species usually forages in soft substrate near the edge of water on intertidal mudflats or sandflats exposed by low tide. At high tide the may feed at nearby lakes, sewage ponds and floodwaters. They have also been recorded foraging on beds of eelgrass on tidal sandflats, on a thick algal mat in shallow water, and in shallow pools on crest of coral reef (DoE 2014).

They like to roost in open areas far away from potential cover for predators, but close to feeding grounds. These areas primarily include sandy beaches, spits and islets, and mudflats; also in shallow saline ponds of saltworks. They have been seen roosting on an inland claypan near Roebuck Bay, north-west WA (DoE 2014).

**Presence within the Strategic Assessment Area**

The Red Knot has been recorded at several sites across the Strategic Assessment Area from the southern Peel to the northern Swan Coastal Plain where it has been recorded from a diverse range of habitat site types such as including salt lakes, freshwater lakes, estuaries, and coastal shoreline having exposed or shallow mudflat that provide foraging habitat. Based on the range of habitat site characteristics (saline, estuarine, coastal and freshwater) where it has been recorded, it does not appear to have a preference for a particular habitat site type, although it occurs in highest abundance within sites within the Peel-Harvey area.
The Red Knott has been recorded within or within proximity to 12 sites across the Strategic Assessment Area, and two of these sites are important sites where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E14). Important sites where it has been recorded are Peel-Harvey System North and Lake McLarty.
2.4.10 Calidris ruficollis (Red-necked Stint)

**Description**

The Red-necked Stint is a small Calidridinae approximately 13 – 16 cm in length and is the smallest shorebird in Australia. It weighs 25 g and has a wingspan between 29 and 33 cm. The species is characterised by a small head, steep rounded forehead, and long thickset body with an attenuated rear end (DoE 2014).

**Australian distribution and population**

The species is distributed along most of the Australian coastline with large densities on the Victorian and Tasmanian coasts. The Red-necked Stint has been recorded in all coastal regions, and found inland in all states when conditions are suitable. Of the world’s total population of 315,000 – 353,000 it is estimated that 80% (260,000 individuals) reside in Australia during the non-breeding season (DoE 2014).

Within WA, sites of international importance include Eighty Mile Beach, Port Hedland Saltworks, Roebuck Bay, Wilson Inlet, Alfred Cove Nature Reserve, Lake Macleod and Peel Inlet (2014).

**Habitat**

In Australasia, the Red-necked Stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals (DoE 2014). They also occur in saltworks and sewage farms; saltmarsh; ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soak pits, and pools or ponds in saltflats, and sometimes use flooded paddocks or damp grasslands (DoE 2014).

The Red-necked Stint mostly forages on bare wet mud on intertidal mudflats or sandflats, or in very shallow water; mostly in areas with a film of surface water and mostly close to edge of water. During high tides they sometimes forage in non-tidal wetlands. Red-necked Stints may also forage in samphire, generally avoid beds of seagrass, but may feed along edges (DoE 2014). On Pelsaert Island, WA, they have been recorded foraging on mud beneath mangroves. On sandy ocean beaches they sometimes forage in beachcast seaweed (DoE 2014).

Roosting usually occurs on sheltered beaches, spits, banks or islets, of sand, mud, coral or shingle, sometimes in saltmarsh or other vegetation. They also occasionally roost on exposed reefs or shoals (DoE 2014). Large numbers sometimes roost on ocean beaches, though it is probably not a preferred habitat and use of this habitat may increase when high numbers of birds are present (DoE 2014).

**Presence within the Strategic Assessment Area**

The Red-necked Stint is one of the most extensively occurring migratory shorebird species across the Strategic Assessment Area. It has been recorded from the southern Peel to the Swan Coastal Plain north of Perth from a diverse range of habitat site types such as salt and freshwater lakes, estuaries, and coastal shoreline having exposed sand or mudflat that provide foraging habitat. Based on the wide
range of habitat site characteristics (saline, coastal, estuarine, and fresh) including many sites with high numbers recorded, it does not appear to have a preference for a particular habitat site type.

The Red-necked Stint is known to occur at, or within proximity to 39 sites within the Strategic Assessment Area, and 18 of these are important sites where this species' numbers have been recorded exceeding the 0.1% flyway population (Figure E15). Important sites where it has been recorded include:

- Alfred Cove Attadale foreshore;
- Forrestdale Lake;
- Goegrup Lake;
- Herdsman Lake;
- Lake Clifton;
- Lake Cooloongup;
- Lake McLarty;
- Lake Newnham;
- Lake Pollard;
- Lake Preston;
- Lake Yalgorup;
- Martins Tank Lake;
- Milyu and Como Beach;
- Peel - Harvey System North;
- Peel - Harvey System South;
- Pelican Point;
- Point Walter; and
- Thomson Lake.
Figure E-15: Presence of the Red-necked Stint within the Strategic Assessment Area

Legend
- Strategic Assessment Area
- Species recorded at >0.1 % flyway population
- Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT  Date: 17/02/2015
2.4.11 *Arenaria interpres* (Rudy Turnstone)

**Description**

The Ruddy Turnstone is a medium sized member of the subfamily *Arenariinae*. It has a length between 22 – 24 cm, wingspan of 50 – 57 cm and a weight of approximately 115 g. Compared to other waders it has a stocky, medium build with a short, slightly uplifted, wedge shaped bill. Its distinct features include a black or dark brown chest with pale patches and a striking, dark-white, flight pattern. The bird also has orange-red legs and a bustling gait (DoE 2014).

**Australian distribution and population**

The Ruddy Turnstone is widespread within Australia during its non-breeding period of the year, including from Tasmania in the south to Darwin in the north and many coastal areas in between. It is found in most coastal regions, with occasional records of inland populations (DoE 2014). Of an estimated 35,000 individuals that occupy the flyway, 14,000 occur in Australia during the non-breeding season. In WA the species occurs around the majority of the coast, except for areas north-east of the Kimberley Division (DoE 2014). Internationally important areas for the species in WA include Ashmore Reef, Roebuck Bay, Barrow Island and Lacepede Islands.

**Habitat**

In Australia, the Ruddy Turnstone is mainly found on coastal regions with exposed rock coast lines or coral reefs. It also lives near platforms and shelves, often with shallow tidal pools and rocky, shingle or gravel beaches. It can, however, be found on sand, coral or shell beaches, shoals, cays and dry ridges of sand or coral. It has occasionally been sighted in estuaries, harbours, bays and coastal lagoons, among low saltmarsh or on exposed beds of seagrass, around sewage ponds and on mudflats (DoE 2014).

The Ruddy Turnstone mainly forages between lower supralittoral and lower littoral zones of foreshores, from strand-line to wave-zone. They often forage among banks of stranded seaweed or other tide-wrack. They are also known to forage on exposed rocky platforms, coral reefs and mudflats (DoE 2014). Roosting primarily occurs on beaches, above the tideline, among rocks, shells, beachcast seaweed or other debris. They have also been observed roosting on rocky islets among grassy tussocks, and on mudflats and sandflats (DoE 2014).

**Presence within the Strategic Assessment Area**

The Ruddy Turnstone occurs widely across the Strategic Assessment Area. It has been recorded from the southern Peel to the Swan Coastal Plain from a diverse range of habitat site types such as salt and freshwater lakes, estuaries, and coastal shoreline having exposed sand or mudflat that provide foraging habitat. It does however appear to have a preference for the estuarine and coastal shore sites.

The Ruddy Turnstone is known to occur at, or within proximity to 13 sites within the Strategic Assessment Area, and two of these are important sites where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E16). Important sites where it has been recorded are Pelican Point and Woodman Point.
Figure E-16: Presence of the Ruddy Turnstone within the Strategic Assessment Area

Legend
- Red: Strategic Assessment Area
- Green: Species recorded at >0.1% flyway population
- Blue: Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
2.4.12 *Philomarchus pugnax* (Ruff)

**Description**

The Ruff is a medium sized shorebird reaching 32 cm, wing span of 60 cm, and the larger male attains a weight of approximately 180 g. It has a relatively small head, slightly decurved bill, longish neck, and short to medium length legs. There is a distinct seasonal plumage variation between juvenile and immature birds (DoE 2014). In the breeding season, males develop large ear tufts and colourful ruff on the neck which can distinguish individuals.

**Australian distribution and population**

The Ruff is widespread but uncommon within Australia occurring in all states and territories during its non-breeding period of the year. It is mostly found in coastal or near-coastal wetlands, with some inland areas particularly the major river systems in the south-eastern.

In WA the Ruff has mostly been recorded in the south-west region of the state. It has been sighted at the Vasse and King Rivers and several larger lakes associated with the Perth Swan Coastal Plain and Peel regions. Several north-west locations where it occurs include Port Hedland in the Pilbara, and the east Kimberley (DoE 2014).

**Habitat**

In Australia the Ruff is occurs on the exposed mudflats of lakes, swamps, pools, lagoons, tidal rivers, swampy fields, and floodlands ranging from fresh, brackish and saline water. Also occasionally occurs on coastal shorelines and on the drying beds of sewers and salt works. The Ruff forages on exposed mudflats, in shallow water and occasionally on dry mud, and they prefer to roost among shorter vegetation (DoE 2014).

**Presence within the Strategic Assessment Area**

The Ruff occurs at several sites within the Strategic Assessment Area. It has been recorded from the southern Peel to the Swan Coastal Plain south of Perth where is appears to have a preference for a freshwater lakes having exposed mudflat that provide foraging habitat. The Ruff is known to occur at, or within proximity to five sites within the Strategic Assessment Area, and one of these, Lake McLarty, is an important site where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E17).
Figure E-17: Presence of the Ruff within the Strategic Assessment Area

Legend
- **Strategic Assessment Area**
- **Species recorded at >0.1 % flyway population**
- **Species Recorded**

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
2.4.13 *Calidris alba* (Sanderling)

**Description**

A pale wader reaching 20 cm long, with a wingspan of approximately 40 cm and a weight of approximately 50 – 60 g. The species is pale grey above and white below, with a black patch at the angle of the wing. It has a short, straight, broad-based black bill, blackish-brown wings with broad, white wing-stripes, and short, black legs that only have three toes (DoE 2014).

**Australian distribution and population**

The Sanderling occurs in coastal areas around Australia. Inland records have occurred in most states of singles or small groups, birds probably on migration. An estimated 10,000 birds, approximately half of the flyway population, occur in Australia during the non-breeding season (DoE 2014).

In WA, the species occurs on most of the coast from Eyre to Derby, and also around Wyndham. They are more often recorded on the south and southwest coasts, north to around southern Shark Bay, with more sparsely scattered records further north in Gascoyne and Pilbara Regions and the Kimberley Division (DoE 2014). Important areas for the species within WA include Eighty Mile Beach and Roebuck Bay (DoE 2014).

**Habitat**

In Australia, the species is almost always found on the coast, mostly on open sandy beaches exposed to open sea-swell, and also on exposed sandbars and spits, and shingle banks, where they forage in the wave-wash zone and among rotting seaweed. Sanderlings also occur on beaches that may contain wave-washed rocky outcrops. Less often the species occurs on more sheltered sandy shorelines of estuaries, inlets and harbours. Rarely, they are recorded in near-coastal wetlands, such as lagoons, hypersaline lakes, saltponds and samphire flats. There are also rare inland records from sandy shores of ephemeral brackish lakes and brackish river-pools (DoE 2014).

Foraging may occur on open beaches and at the edges of shallow pools on sandspits, and on nearby mudflats. Roosting sands are usually restricted to bare sand high on the beach, clumps of washed-up kelp, coastal dunes and rocky reefs and ledges (DoE 2014).

**Presence within the Strategic Assessment Area**

The Sanderling occurs widely across the Strategic Assessment Area. It has been recorded from the southern Peel and coastal areas from a range of habitat site types such including estuarine, coastal shoreline, saltwater and freshwater lakes having exposed sand or mudflat that provide foraging or roosting habitat. It does however appear to have a preference for the estuarine and particularly coastal shore sites where it has been recorded in high abundance.

The Sanderling is known to occur at, or within proximity to 10 sites within the Strategic Assessment Area, and two of these are important sites where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E18). Important sites where it has been recorded are both coastal shoreline sites – Becher Point and Woodman Point.
Figure E-18: Presence of the Sanderling within the Strategic Assessment Area

Legend

- Strategic Assessment Area
- Species recorded at >0.1% flyway population
- Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
2.4.14 *Calidris acuminata* (Sharp-tailed Sandpiper)

**Description**

The Sharp-tailed Sandpiper is a small-medium wader. The bird has a length of 17 – 22 cm, a wingspan of 36 – 43 cm and a weight of 65 g. It is a portly sandpiper with a flat back, pot belly and somewhat drawn-out rear end. It has a small flat head on a short neck with a short and slightly decurved bill. The species has medium length legs. At rest, the primaries are level with or slightly short of the tip of the tail (DoE 2014).

**Australian distribution and population**

In Australia most of the population migrates to the south-east and are widespread in both inland and coastal locations and in both freshwater and saline habitats. During this passage many birds are recorded in inland areas (DoE 2014). The Flyway population of the species is thought to be approximately 160,000, of which approximately 91 spend their non-breeding season in Australia and New Zealand (DoE 2014).

In WA the species is widespread from Cape Arid to Carnarvon, around coastal and sub-coastal plains of Pilbara Region to south-west and east Kimberley Division. Inland records indicate the species is widespread and scattered from Newman, east to Lake Cohen, south to Boulder and west to Meekatharra (DoE 2014). Sites of international importance in WA include Eighty Mile Beach, Port Hedland Saltworks, Lake Gregory, Peel-Harvey system and Vasse Wonnerup Estuary (2014).

**Habitat**

The Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline salt lakes inland. They also occur in saltworks and sewage farms (DoE 2014).

Foraging occurs at the edge of the water of wetlands or intertidal mudflats, either on bare wet mud or sand, or in shallow water. They also forage among inundated vegetation of saltmarsh, grass or sedges. They forage in sewage ponds, and often in hypersaline environments. After rain, they may forage in paddocks of short grass, well away from water. Occasionally they forage on wet or dry mats of algae and among rotting beachcast seagrass or seaweed, and sometimes they are recorded foraging around the edges of stony wetlands or among rocks in water, and rarely on exposed reef (DoE 2014).

**Presence within the Strategic Assessment Area**

The Sharp-tailed Sandpiper occurs widely across the Strategic Assessment Area. It has been recorded at high abundance from a range of habitat site types such as salt lakes, estuaries, and freshwater lakes. It has also been recorded from coastal shoreline but at relatively low numbers. Exposed mudflats and tidal sand areas provide foraging habitat.
The Sharp-tailed Sandpiper is known to occur at, or within proximity to 27 sites within the Strategic Assessment Area, and eight of these are important sites where this species’ numbers have been recorded exceeding the 0.1% flyway population (Figure E19). Important sites where it has been recorded include:

- Alfred Cove Attadale foreshore;
- Forrestdale Lake;
- Herdsman Lake;
- Lake Cooloongup;
- Lake McLarty;
- Peel - Harvey System North;
- Peel - Harvey System South; and
- Thomson Lake.
Figure E-19: Presence of the Sharp-tailed Sandpiper within the Strategic Assessment Area

Legend
- Strategic Assessment Area
- Species recorded at >0.1% flyway population
- Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
2.4.15 *Numenius phaeopus* (Whimbrel)

**Description**

The Whimbrel is a medium sized curlew, with a length of around 40 – 45 cm, weight of approximately 350 g and wingspan of 76 – 89 cm. The Whimbrel is dark brown on the upper half of its body, varying spotted with pale fringes. The underside is predominately white with dark coarse brown streaks. Its legs are dull bluish-grey in colour, sometimes with a tinge of green (DoE 2014).

**Australian distribution and population**

Within Australia, the Whimbrel primarily occurs along most coastal areas with scattered inland records also occurring. It is estimated that 100,000 birds use the Flyway every year though the exact number that occur within Australia is unknown (DoE 2014). In WA, the species is common and widespread from Carnarvon to the north-east Kimberley Division. It is also occasionally recorded in south WA, along the south coast and as far north as Shark Bay on the west coast. The only internationally important area for the species in WA is Roebuck Bay (DoE 2014).

**Habitat**

The Whimbrel is often found on the intertidal mudflats of sheltered coasts. It is also found in harbours, lagoons, estuaries and river deltas, often those with mangroves, but also open, unvegetated mudflats. It is occasionally found on sandy or rocky beaches, on coral or rocky islets, or on intertidal reefs and platforms. It has been infrequently recorded using saline or brackish lakes near coastal areas. It also used saltflats with saltmarsh, or saline grasslands with standing water left after high spring-tides, and in similar habitats in sewage farms and saltfields (DoE 2014).

The species forages on intertidal mudflats, along the muddy banks of estuaries and in coastal lagoons, either in open unvegetated areas or among mangroves. They sometimes forage on sandy beaches or among rocks. It has occasionally been sighted feeding on exposed coral or rocky reefs and rock platforms. It is known to probe holes and crevices among rubble and on reef flats, but not on reef crests (DoE 2014).

The Whimbrel is one of a small group of shorebird species that regularly roost in mangroves and other structures flooded at high tide. They often roost in the branches of mangroves around mudflats and in estuaries and occasionally in tall coastal trees. They have also been observed to roost on the ground (sometimes under mangroves or in shallow water), on muddy, sandy or rocky beaches; rocky islets and coral cays (DoE 2014).

**Presence within the Strategic Assessment Area**

The Whimbrel has been recorded at a number of sites across the Strategic Assessment Area, having been recorded from the southern Peel north to the Swan River. It appears to prefer estuarine sites associated with the Peel-Harvey Estuary and Swan River systems, where most records are from, but is also known from coastal shoreline and salt lake sites that having exposed sand or mudflat that provide foraging habitat.
The Whimbrel is known to occur at, or in proximity to eight sites within the Strategic Assessment Area, and one of these, Peel-Harvey Estuary South is an important sites where this species' numbers have been recorded exceeding the 0.1% flyway population (Figure E20).
Figure E-20: Presence of the Whimbrel within the Strategic Assessment Area

Legend

- **Strategic Assessment Area**
- **Species recorded at >0.1 % flyway population**
- **Species Recorded**

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT  Date: 17/02/2015
2.4.16 *Tringa glareola* (Wood Sandpiper)

**Description**

The Wood Sandpiper is a small thin wader and member of the *Tringinae* family. The species has a length of 19 – 23 cm, a wingspan of 56 – 57 cm and a weight of 55 g. The species has a short straight bill and long legs. The species is a dark grey-brown or plain brown above and spotted paler and white below with a greyish wash on the breast. It has dark streaking on the foreneck and breasts as well as some barring on the fore-flanks. In all plumages the species shows a white supercilium, extending well behind the eye with greenish or yellow legs (DoE 2014).

**Australian distribution and population**

The Wood Sandpiper occurs throughout coastal all coastal areas across Australia, though in largest number in north-west Australia. The Flyway population of the species is thought to be between 100,000 – 1,000,000 with the number spending their non-breeding season in Australia currently unknown (DoE 2014).

In WA the species is widespread but scattered in most regions. All areas of international importance for the species in Australia are located in WA and include Parry Floodplain, Cambellin, Lake Argyle, Shark Bay area, Vasse Wonnerup Estuary, Lake McLarty and Kogolup Lakes.

**Habitat**

The Wood Sandpiper uses well vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially *Melaleuca* and River Red Gums *Eucalyptus camaldulensis* and often with fallen timber. They also frequent inundated grasslands, short herbage or wooded floodplains, where floodwaters are temporary or receding, and irrigated crops. They are also found at some small wetlands only when they are drying (DoE 2014). This species also uses artificial wetlands, including open sewage ponds, reservoirs, large farm dams, and bore drains.

The species primarily forages on moist or dry mud at the edges of wetlands, either along shores, among open scattered aquatic vegetation, or in clear shallow water. Roosting occurs on low, grassy hillock in flooded meadows, and occasionally low in tree and on fences (DoE 2014).

**Presence within the Strategic Assessment Area**

The Wood Sandpiper has been recorded at a number of sites across the Strategic Assessment Area, having been recorded from the Peel to northern Swan Coastal Plain. It has a strong preference for freshwater lakes where the majority of occurrences are known, including those sites where this species occurs in high abundance. The exposed or shallow mudflat of these lakes provide suitable foraging habitat.
The Wood Sandpiper is known to occur at, or in proximity to 18 sites within the Strategic Assessment Area, including eight sites where it has been recorded exceeding the 0.1% flyway population (Figure E21). Important sites where it has been recorded include:

- Forrestdale Lake;
- Herdsman Lake;
- Kogolup Lake;
- Lake Joondalup;
- Lake McLarty;
- Mandurah Estuary mouth;
- Thomson Lake; and
- Yangebup Lake.
Figure E-21: Presence of the Wood Sandpiper within the Strategic Assessment Area

Legend
- Strategic Assessment Area
- Species recorded at >0.1% flyway population
- Species Recorded

Datum/Projection: GDA 1994 MGA Zone 50
Data Source: DPaW
Prepared by: LT Date: 17/02/2015
3 REFERENCES


