2. METHODS

2.1 Derivation of Population Estimates

The Convention on Wetlands (Ramsar, Iran, 1971) provides a global mechanism for the recognition of Wetlands of International Importance. The Convention has a number of criteria for identifying important sites, one of which relates to sites supporting 1% of the population of a shorebird. The East Asian – Australasian Shorebird Action Plan adopted this criterion for identifying internationally important sites for migratory shorebirds. To apply the 1% criterion, a population estimate is required in order to calculate the threshold that indicates when the criterion is met.

Population estimates for the EAA Flyway have been derived previously (e.g. Watkins 1993, Delany and Scott 2002). Recent work under the Shorebird Action Plan has generated a considerable volume of new count data, especially from eastern and south-eastern Asia. The present review draws on this expanded information base.

Estimates of population size need to be based on data on shorebird distribution and abundance. In the EAA Flyway, data on breeding densities and distribution are very limited. Surveys during migration periods are problematic to use for estimating population size unless the surveys are comprehensive (e.g. Barter 2002). The most comprehensive distribution and abundance data are from site counts during the non-breeding period (December to February), and it is these data that were used to derive population size estimates in this review.

The steps involved in the derivation of estimates of population size were:

1. Collate count data for the non-breeding period from across the EAA Flyway;
2. Assign data to 'survey regions', being either an entire country or regions within large countries;
3. Identify the maximum count of each population in the non-breeding period in each survey region (Regional Maxima);
4. Sum Regional Maxima within a country and adjust on the basis of the estimated coverage of habitat in surveys in that country (Country Estimate);
5. Sum the Country Estimates to yield an estimate of population size within the EAA Flyway (Flyway Estimate);
6. Adjust the Flyway Estimate by applying a set of rounding rules (see Country and Flyway Population Estimates, below); and
7. For species with inadequate count data to form the basis of a population estimate, assign a population range (see Populations for which Estimates could not be Derived, below).

In Australia, regional estimates were developed from the Regional Maxima and these were then summed to yield the Country Estimate.

Given the data available, two key assumptions were made to enable population estimates to be derived from count information:

- Any movement of shorebirds between survey regions during the non-breeding period is insufficient to influence the estimation process, and,
- Numbers present in each survey region are similar during the non-breeding period each year.

2.1.1 Count data

Ideally, population estimates would be derived from count data collected from extensive field surveys over the entire EAA Flyway, with all data collected simultaneously or at least within a short period of time. With the exception of New Zealand, Japan and some parts of Australia, however, such comprehensive data are not available.

Of necessity this review is therefore based on information from a wide range of published and unpublished sources. All sources of information are listed in the reference section. Published data were peer reviewed. Unpublished data came from systematic surveys conducted by observers under the supervision of reputable ornithological organisations. Such organisations typically provide training to new observers, and their survey programs are led by persons whose capability in counting and identifying shorebirds is widely recognised by peers.

Records from the Asian Waterbird Census database (1987 – 2000) provided the core information for countries in Asia. Wetlands International is currently undertaking a verification process of this count data. Data presented in this report may differ from the latest Asian Waterbird Census database. Count data from the Population Monitoring Programme of the Australasian Wader Studies Group (Birds Australia) represented the largest single source of data. It was beyond the scope of this review to systematically vet all records, so identifications and counts were accepted unless conspicuously erroneous. Location information (latitudes and longitudes) was vetted during mapping of important sites in this review.

The review database contains approximately 100 000 records, with each record being a count of a species at a site on a particular date. Coverage varied considerably, being extensive in Australia, Japan and New Zealand, moderately extensive in some regions, such as the Yellow Sea area (Barter 2002), but limited in most other countries. Data were available from the late 1970s, with some records from the 1960s, but only data collected from 1986 onwards were used in analyses. The authors decided that records more than 20 years old might not provide realistic indications of current population sizes.

2.1.2 Deriving Country and Flyway Estimates

In most parts of the Flyway the coverage of sites during the non-breeding period was incomplete. In order to develop Country Estimates, a conservative extrapolation was made based on the level of coverage of sites and the availability of habitat in each country. In Australia, it was possible to make extrapolations at the regional level because of a detailed knowledge on the extent of surveys and of available habitat.

Wherever possible, Regional Maxima and Country Estimates were reviewed by experienced ornithologists with local knowledge of the regions.

In some survey regions, especially those with frequent surveys, it was apparent that there were occasional high counts due either to fluctuations in actual population size, or to events that led to an unusual concentration of birds. This appeared to be particularly the case in Australia, where surveys have been carried out since the early 1980s. In Australia, expert opinion considered that some Regional Maxima were not representative of the size of populations usually present in that survey region during the non-breeding period. As a result, some Regional Estimates are less than the corresponding Regional Maxima.

The sums of the Regional Maxima and Estimates for each country are presented in Section 3.1. For Australia, the data are also presented by survey regions in Appendix 2.

Because Country Estimates ranged in magnitude from a few hundred to hundreds of thousands of birds, a set of rounding rules was applied to the Flyway Estimate of each species so that unrealistically precise estimates were not presented.

These rounding rules were:

Population size	Rounding
<10 000	nearest 500
10 000 – 25 000	nearest 1 000
25 000 – 100 000	nearest 5 000
100 000 – 250 000	nearest 10 000
>250 000	nearest 25 000

2.1.3 Species for which Population Estimates could not be derived

Despite the collation of a large data set, it was not possible to calculate population estimates for 20 of the 54 species assessed. These were species that are typically not sampled adequately during waterbird surveys because they are cryptic, do not form flocks and/or use inland wetlands and other habitats that are poorly surveyed. For these species, no Country Estimates were derived and for the EAA Flyway estimate the population range classes of Delany and Scott (2002) were applied.

The minimum of the range for these populations was used as the basis for the 1% threshold (Section 2.2). This approach differs from that of Delany and Scott (2002) where the maximum range value was used to derive the 1% threshold. Delany and Scott defend their approach by indicating that sites identified as internationally important will continue to meet the threshold, even if subsequent data show that the minimum population estimate is considerably lower.

We argue that shorebird conservation is better achieved by taking a precautionary approach and using the minimum value of the range to derive the 1% threshold.

This ensures that sites of potential international importance are recognised. This promotes appropriate management until such time as data is sufficient to fully assess their international importance. In contrast, if the maximum of the range is used and subsequent analysis generates a population estimate below that maximum, some sites that are internationally important may not have been appropriately managed.

2.2 Identification of Internationally Important Sites

The identification of internationally important sites is an important component of planning for the conservation of migratory shorebirds. It is also essential to the development of the Shorebird Site Network in the EAA Flyway.

Internationally important sites are those that

meet Criterion 6 of the Ramsar Convention, which states that “a wetland should be considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird” (Ramsar Convention Bureau 2000). In the case of a species with a population estimate of >2 000 000 the 1% threshold is set at 20 000 (Ramsar Convention Bureau 2000).

In addition to application of the 1% criterion to individual counts, the Ramsar Convention recognises the importance of sites that are important during migration, when birds move quickly through the site over a matter of only days or weeks. This phenomenon is termed ’turnover‘ and because of this passage of birds, the actual number that depends on a “staging” site is higher than the number present at any one time. To allow for this turnover, ‘staging criteria’ were applied to data collected from the northward and southward migration periods. To meet the staging criterion for a population, a site must have at least one count equal to or greater than 0.25% of the estimated size of the population. Such a count must be from a migration period and the site must be in a location that is used by birds on migration.

The staging criterion was applied conservatively and was not considered applicable in the non-breeding range of a species.

Whereas the population estimates were generated only from data from the non-breeding period, these estimates were applied to data from all four periods of the year for the identification of internationally important sites.

Two further issues need to be addressed in the application of Ramsar Criterion 6: the definition of a site and the meaning of the term “regularly supports”.

2.2.1 Site definition

Defining what constitutes a site was essential for the purpose of this review but was difficult to achieve because of the many sources of information, the lack of a uniform approach to defining sites across all survey efforts and the lack of familiarity of the authors with many of the (numerous) sites.

Some count data came from sites that were discrete and small in area, such as a single sand spit being used by shorebirds when roosting at high tide. Other sites were more complex and, for example, may have consisted of many square kilometres of mudflat where birds were foraging. The site name may have been given as an entire national park or reserve within which the count site(s) was located. There were also records from sites that were close together, such as the opposite sides of a bay, and instances where the same site was given different names by different observers.

The Ramsar Convention recommends that a wetland site should form an ecological unit, and can therefore be (for example) an entire bay, a lake or a network of small wetlands. This guideline was used to group clusters of records under one site name, with the highest single count being used to identify the importance of that site.

Defining ecological units facilitates management planning for the wise use of internationally important wetlands. In some cases protection/management units were already defined in the form of national parks or reserves. Where records from such a protected management unit could not readily be assigned to an ecological unit, the management unit was defined as the site. The most extreme example of this was Yancheng National Nature Reserve in China, which consists of a large expanse of continuous mudflats that cannot be readily divided into ecological units.

2.2.2 Definition of “Regularly Supports”

According to guidelines developed by the Ramsar Convention, for a site to be considered to “regularly support” 1% of a population, the 1% threshold must be achieved in at least two out of three seasons, or must be met by the mean of at least five maximum annual counts. The guidelines imply that this approach should be followed where there is a substantial body of count data. The majority of sites in the EAA Flyway do not have sufficient count data for this purpose. Allowance has been made for sites in remote areas, and it is accepted that “single counts can help establish the relative importance of the site for a species” (Ramsar Convention 2000). Sites in the EAA Flyway were therefore considered to have met the 1% criterion on the basis of a single count.

2.3 Presentation of Results

Results of this review are presented in three sections: an Overview, Species Accounts and Country Accounts.

The Overview section provides summary information on population sizes, important sites and species in the EAA Flyway and has four components:

- A table that summarises count data from the non-breeding period and population estimates for each species in each country. This al-

lows for a comparison to be made between the pooled Regional Maxima count data and the country population estimate derived from them. The table includes the EAA Flyway population estimate and previous estimates.

- A table that summarises information on species in countries of the EAA Flyway. For each country, this table includes the number of species on which non-breeding period data were available, the number of species that were represented by >1% and >5% of their Flyway population estimate, and the distribution of important sites by period (SM, NB, NM and B).
- A table that summarises information on sites in countries of the EAA Flyway. For each country, the total number of important sites is presented, as is the number of sites identified as important in each period (SM, NB, NM and B).
- Observations and conclusions arising from the above summary information.

The Species and Country Accounts refer back to the Overview but provide detailed information on species and countries respectively. Structures of the Species Accounts and Country Accounts are explained in the outline of each section.