**Publication date: 25 July 2025**

**Notice of and reasons for the Final Determination**

The NSW Threatened Species Scientific Committee, established under the Biodiversity Conservation Act 2016 (the Act), has made a Final Determination to list the grey plover *Pluvialis squatarola* (Linnaeus, 1758) as a VULNERABLE SPECIES in Part 3 of Schedule 1 of the Act on the basis of its extinction risk in Australia. Listing of Vulnerable species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that the grey plover, *Pluvialis squatarola* (Linnaeus, 1758) has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method, as provided by Section 4.14 of the Act. After due consideration of Commonwealth DCCEEW (2024), the NSW Threatened Species Scientific Committee has made a decision to list the species as Vulnerable on the basis of its extinction risk in Australia.

**Summary of Conservation Assessment**

The grey plover, *Pluvialis squatarola* (Linnaeus, 1758) was found to be Vulnerable in accordance with the following provisions in the Biodiversity Conservation Regulation 2017: Clause 4.2 (1 c)(2 b) because a moderate population reduction of up to 44% in the number of mature individuals has been estimated over a three-generation timeframe (22.8 years) and the causes of reduction are not fully understood. Reductions are inferred based on: (1) decreases in population counts from across repeatedly monitored sites; (2) Habitat loss and disturbance at feeding and roosting sites; (3) a decline in habitat quality caused by residential and commercial development, industrial aquaculture, global sea level rise and chronic pollution. This species is assessed only on the basis of its extinction risk in Australia because that scale is appropriate to the biology of the taxon due to its annual migratory movements into, and within Australia.

The NSW Threatened Species Scientific Committee has found that:

1. The grey plover *Pluvialis squatarola* (Linnaeus, 1758) is a medium-sized, long-legged plover with a large head and large, dark eyes. They are 27–31 cm in length, have a wingspan between 71–83 cm, and weigh approximately 250 g. The species has a diagnostic black wing-pit that contrasts against the white underwing. They have a black bill and dark grey-black legs and feet. Grey plovers exhibits no sexual dimorphism but shows marked seasonal variation (Marchant and Higgins 1993). Juveniles also exhibit distinct plumage. Breeding adults have a distinctive mottled black and white crown and nape. The forehead and supercilium are white, continuing down the sides of the neck and forming white patches on the sides of the breast. The hindneck is white, contrasting with the bird's black mantle, back, scapulars, tertials, and wing coverts (Marchant and Higgins 1993). These parts are notched and tipped silvery-white, giving a spangled appearance. The vent and undertail-coverts are white, with black bars at the sides. Their tail is white, variably barred black. The rest of the underparts appear black. In non-breeding adults the upperparts and wing-covert appear brownish-grey with white fringes. The forehead, lores and sides of the head and neck are whiteish with grey-brown

streaking. The supercilium is white, with a small dark patch before the eye and on the ear-coverts. The foreneck, breast, and flanks are mottled brown-grey on white. The rest of the upperparts are white. Juveniles are similar in appearance to non-breeding adults except their upperparts and inner wing coverts are darker. The margins of these feathers are boldly spotted pale-gold or yellowish-white, giving a spangled appearance. Juveniles also have bolder pale spotting on their scapulars and notching on their tertials and inner greater coverts. They have a darker crown and clearer white supercilium. Adult non-breeding or juvenile plumage is the typical appearance of birds in Australia Adults in full breeding plumage are unlikely to be observed in Australia, however, observers may see vestiges of the breeding plumage on individuals on arrival and before departure from Australia (Marchant and Higgins 1993; Commonwealth DCCEEW 2024)

2. The grey plover is a polytypic species comprising three subspecies. The species has recently been separated into three subspecies - nominate *P. s. squatarola* (eastern grey plover), *P. s. tomkovichi* (Wrangel Island grey plover) and *P. s. cynosurae* (American grey plover). Both *P. s. squatarola* and *P. s. tomkovichi* occur within Australia, and are likely to both occur in New South Wales (NSW). Subspecies *P. s. cynosurae* occurs in the Americas and is not present within the Australian jurisdiction. The three subspecies are poorly defined and, as such, the species is often considered monotypic (Flaherty *et al.* 2021). This Final Determination and accompanying listing assessment considers the bird at the species level.

3. The grey plover is a migratory shorebird and a regular migrant to Australia during the austral summer non-breeding season. The species has been recorded throughout all states around Australia, but is primarily found along the west and south coasts, with less than 10% of the population visiting the east coast including NSW (Marchant and Higgins 1993; Minton and Serra 2001). While NSW holds no important sites for the species, and only one or two birds are usually recorded per sighting on the lower NSW coast (Fraser 2022), the largest populations are found between the Coorong and western beaches of the Eyre Peninsula in South Australia, and along the coast of Western Australia between Albany and the northern Kimberley (Blakers *et al.* 1984; Lane, 1987; Barrett *et al.* 2003). Western Australian sites support about 38% of the species' Australian population (Weller *et al.* 2019), of which only 4% of individuals can be traced to Wrangel Island (i.e., *P. s. tomkovichi*). In eastern Australia, 39% of birds present are derived from Wrangel Island in Russia (Minton and Serra 2001).

4. The estimated Extent of Occurrence (EOO) for the grey plover in Australia is 9,800,000 $km^2$ based on a minimum convex polygon, the method of assessment recommended by IUCN (2024). The estimated Australian Area of Occupancy (AOO) is 6,300 $km^2$ (Flaherty *et al.* 2021). Estimated AOO is based on 2 km x 2 km grid cells, the scale recommended for assessing AOO by IUCN (2024). The estimates of AOO were calculated using all records since 1990.

5. The total number of mature individuals arriving annually in Australia is estimated to be 11,300 (range 9,800–14,200). The estimated Australian population of grey plover in 2020 (11,300 mature individuals) is based on an extrapolation of 2016 data using trends derived from Clemens *et al.* (2016, 2019) (Flaherty *et al.* 2021).

Several studies have recorded declines of the grey plover with the following change over three generations (22.8 years): −37% (Clemens *et al.* 2016), −16% (Waterbird meta-analysis; Clemens *et al.* 2019) and −44% (Clemens *et al.* 2019). The trend is consistent with declines described in 2010 (Garnett *et al.* 2011). The most recent analysis by (Rogers *et al.* 2023) estimated the mean change in population was -2.9% annually (1993-2021) for an estimated total decline of -37% over three generations. Overall, therefore, declines in the number of mature individuals visiting Australia may be as high as 44% or as low as 16% over the last three generations. Given the globally interconnected population, and loss of stopover wetlands outside Australia as a major driver of decline, trends in the NSW portion of the population may be similar. The mean annual change in the last 10 years (2012-2021) was +1%, suggesting the decline may have recently stabilised (Rogers *et al.* 2023).

6. Whilst in Australia, grey plovers feed diurnally on marine polychaete worms, molluscs, and crustaceans (e.g., crabs and sand shrimps; Flaherty *et al. 2021*). They occasionally take insects such as grasshoppers and beetles, or earthworms when inland (Johnsgard 1981; del Hoyo *et al.* 1996). Grey plovers feed by stop-start running, pecking, and probing, mostly in mud or soft, wet sand of sandflats, intertidal mudflats, saltmarshes, and the beaches of oceanic coastlines, bays, and estuaries (Johnsgard 1981; del Hoyo *et al.* 1996). Grey plovers roost in sandy, sheltered environments such as on unvegetated sandbanks, sand-spits along sheltered beaches, or around estuaries and lagoons (Pegler 1983; Jaensch *et al.* 1988). Grey plovers are also seen in small numbers on mangrove mudflats. This roosting behaviour is mirrored through the East Asian – Australasian Flyway, where anthropogenic wetlands such as agriculture, aquaculture, saltworks, port, power and wastewater sites often provide alternative coastal habitat (Jackson *et al.* 2020; Lei *et al.* 2021).

7. Morphometric data suggests that most grey plovers wintering in Australia originate from Siberian breeding grounds located east of the Lena River, with NSW and more broadly south-eastern Australia mainly supporting birds which breed on Wrangel Island (Minton and Serra 2001). Migrating birds arrive in northern Australia between August and October (Noske and Brennan 2002). Many continue their migration south throughout October (Lane 1987; Marchant and Higgins 1993). Some of these southerly movements are overland, though others move southwards by following the coast (Marchant and Higgins 1993). The species usually arrives at sites along the south coast between October and November (Thomas 1970; Lane 1987; Marchant and Higgins 1993), and between August and December on the east coast (Amiet 1957; Marchant and Higgins 1993; Alcorn *et al.* 1994). Unusually, nearly all grey plovers coming to Australia are females (Rogers *et al.* 2011; Flaherty *et al.* 2021).

8. The main threat to the grey plover in NSW and Australia is habitat loss and disturbance at feeding and roosting sites, particularly disturbances from human recreation and off-leash dogs. Habitat loss is caused by residential and commercial development, industrial aquaculture, sea level rise due to natural climate variability and climate change and chronic pollution. ‘Anthropogenic climate change’, ‘Clearing of native vegetation’ and ‘Alteration to the natural flow regimes of rivers

and streams and their floodplains and wetlands' are listed as Key Threatening Processes under the Act.

9. Coastal wetland loss and degradation results in the loss of feeding and roosting habitat for the grey plover in Australia, and has occurred mainly due to shoreline development and changes in local hydrology. Specific threats include landfill or reclamation associated with construction, infrastructure, and urban development. Additional threats include clearing of saltmarsh, damage of wetland areas by rubbish dumping, storm water draining and urban run-off altering the natural salinity regime of wetland areas (Geoscience Australia 2021).

10. Australia's coastal environment, including that in NSW, has also undergone rapid changes over the last three decades as the aquaculture industry expands and intensifies to meet the rising demand for seafood products (Ayyam *et al.* 2019; Ahmed and Thompson 2019; Commonwealth of Australia 2020). Direct and indirect effects may arise from activities including aquaculture, intertidal oyster farming, bait harvesting, the compaction of sediments by vehicles, beach nourishment, nutrient enrichment, and the dumping of rubbish or debris (Fuller *et al.* 2019). Any structural modification of soft-sediment feeding habitat may considerably affect deep-probing shorebirds such as the grey plover, and may inhibit successful shorebird foraging (Fuller *et al.* 2019).

11. Recreational activities such as shellfish harvesting, fishing, aquaculture and dog-walking can directly disturb grey plovers (Davidson and Rothwell 1993; Barter *et al.* 2005; Weston and Stankowich 2013). Anthropogenic disturbance forces shorebirds away from roosting and feeding sites (Lilleyman *et al.* 2014). This can reduce fat/energy reserves and affect the species migration back to their breeding grounds, negatively affecting survival and reproductive success.

12. Global sea level rose by around 17 ± 5 cm during the 20th century (IPCC 2007; Watson 2011). The longest continuous Australasian records show a rise in mean sea level of approximately 12 cm between 1920 and 2000 (Watson 2011). Forecasts predict a further rise of 70 cm by the end of the century, with influences from natural climate variability and anthropogenic climate change (McInnes *et al.* 2015; Zhang *et al.* 2017). Coastal wetlands in Australia are vulnerable to sea level rise, likely resulting in reduced area available for feeding and roosting, and alterations to nutrient and sediment flows. The full extent of this influence on grey plovers has not been quantified.

13. Grey plovers have experienced population declines due to changes to their coastal stopover sites within the East Asian - Australasian Flyway, particularly along the coast of the Yellow Sea (Flaherty *et al.* 2021). Any loss or degradation of these staging sites affects the grey plover's ability to rest and feed en route to Australia, likely reducing migration success, and largely contributing to population declines. Many areas of the East Asian - Australasian Flyway have experienced rapid industrial and agricultural development, resulting in substantial increases in pollution levels within intertidal wetlands (Hua *et al.* 2015). Industries such as aquaculture can cause an increase in nutrients, organic material, pathogens, pharmaceuticals, and suspended solid concentrations within wetland environments. Pond discharges with increased salinity resulting from solar

evaporation effects are also common (Department of Water 2009). Industrial and aquaculture discharges tend to adversely affect the number of microorganisms which occur in wetland sediment, affecting the efficiency of feeding by grey plovers (Straw 1992a; Harding *et al.* 2007).

14. The highest risk for possible arrival of high pathogenicity avian influenza (HPAI) into Australia annually is during September and October each year when millions of migratory seabirds and shorebirds, including the grey plover, migrate from Asia and North America to Australia (Wille *et al.* 2024). These migratory species traverse countries where HPAI is present and are known to be gregarious, often forming high-density multi-species flocks while roosting and foraging. While these movement pathways and behaviours increase the potential for these migratory species' exposure to HPAI, international evidence from migratory bird species is that there have been small numbers of individuals that have died as a result of exposure to the H5N1 strain of HPAI since 2020, rather than large scale population losses. Despite the lack of evidence internationally of significant population level effects of H5N1 on migratory shorebirds, the grey plover has been identified as being at very high risk of population declines due to HPAI (NSW DCCEEW 2024), and so this threat may compound currently estimated population reductions if it were to affect the grey plover in the future.

15. Due to the effects of the above threats, the grey plover is estimated to have undergone a moderate population reduction of between 16-44% in the number of mature individuals over a three-generation timeframe (22.8 years) in Australia, and the causes, while likely consisting of the threats listed above operating across the EAAF and Australia, are not fully understood.

16. The grey plover *Pluvialis squatarola* (Linnaeus, 1758) is not eligible to be listed as an Endangered or Critically Endangered species.

17. The grey plover *Pluvialis squatarola* (Linnaeus, 1758) is eligible to be listed as a Vulnerable species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a high risk of extinction in Australia in the medium-term future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

**Assessment against *Biodiversity Conservation Regulation* 2017 criteria**
The Clauses used for assessment are listed below for reference.

**Overall Assessment Outcome: Vulnerable under Clause 4.2 (1 c)(2 b)**

**Clause 4.2 – Reduction in population size of species**
**(Equivalent to IUCN criterion A)**
**Assessment Outcome: Vulnerable under Clause 4.2 (1 c)(2 b)**

**(Equivalent to IUCN criterion A)1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:**

| | | | |
|---|---|---|---|
| | (a) | for critically endangered species | a very large reduction in population size, or |
| | (b) | for endangered species | a large reduction in population size, or |
| | (c) | for vulnerable species | a moderate reduction in population size. |
| **(2) - The determination of that criteria is to be based on any of the following:** | | | |
| | (a) | direct observation, | |
| | (b) | an index of abundance appropriate to the taxon, | |
| | (c) | a decline in the geographic distribution or habitat quality, | |
| | (d) | the actual or potential levels of exploitation of the species, | |
| | (e) | the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites. | |

**Clause 4.3 – Restricted geographic distribution of species and other conditions**
**(Equivalent to IUCN criterion B)**
**Assessment Outcome: Not met.**

| | | | |
|---|---|---|---|
| **The geographic distribution of the species is**: | | | |
| | (a) | for critically endangered species | very highly restricted, or |
| | (b) | for endangered species | highly restricted, or |
| | (c) | for vulnerable species | moderately restricted. |
| **and at least 2 of the following 3 conditions apply**: | | | |
| | (d) | the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations, | |
| | (e) | there is a projected or continuing decline in any of the following: | |
| | | (i) | an index of abundance appropriate to the taxon, |
| | | (ii) | the geographic distribution of the species, |
| | | (iii) | habitat area, extent or quality, |
| | | (iv) | the number of locations in which the species occurs or of populations of the species. |
| | (f) | extreme fluctuations occur in any of the following: | |
| | | (i) | an index of abundance appropriate to the taxon, |
| | | (ii) | the geographic distribution of the species, |
| | | (iii) | the number of locations in which the species occur or of populations of the species. |

**Clause 4.4 – Low numbers of mature individuals of species and other conditions**
**(Equivalent to IUCN criterion Clause C)**
**Assessment Outcome: Not met.**

| | | | |
|---|---|---|---|
| **The estimated total number of mature individuals of the species is:** | | | |
| | (a) | for critically endangered species | very low, or |
| | (b) | for endangered species | low, or |
| | (c) | for vulnerable species | moderately low. |
| **and either of the following 2 conditions apply:** | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | (d) | a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species): | | | | |
| | | (i) | for critically endangered species | | | very large, or |
| | | (ii) | for endangered species | | | large, or |
| | | (iii) | for vulnerable species | | | moderate, |
| | (e) | both of the following apply: | | | | |
| | | (i) | a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and | | | |
| | | (ii) | at least one of the following applies: | | | |
| | | | (A) | the number of individuals in each population of the species is: | | |
| | | | | (I) | for critically endangered species | extremely low, or |
| | | | | (II) | for endangered species | very low, or |
| | | | | (III) | for vulnerable species | low, |
| | | | (B) | all or nearly all mature individuals of the species occur within one population, | | |
| | | | (C) | extreme fluctuations occur in an index of abundance appropriate to the species. | | |

**Clause 4.5 – Low total numbers of mature individuals of species**
**(Equivalent to IUCN criterion D)**
**Assessment Outcome: Not met.**

| **The total number of mature individuals of the species is:** | | | |
|---|---|---|---|
| | (a) | for critically endangered species | extremely low, or |
| | (b) | for endangered species | very low, or |
| | (c) | for vulnerable species | low. |

**Clause 4.6 – Quantitative analysis of extinction probability**
**(Equivalent to IUCN criterion E)**
**Assessment Outcome: Data Deficient**

| **The probability of extinction of the species is estimated to be:** | | | |
|---|---|---|---|
| | (a) | for critically endangered species | extremely high, or |
| | (b) | for endangered species | very high, or |
| | (c) | for vulnerable species | high. |

**Clause 4.7 – Very highly restricted geographic distribution of species– vulnerable species**
**(Equivalent to IUCN criterion D2)**
**Assessment Outcome: Not met.**

| | |
|---|---|
| For vulnerable species, | the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period. |

Professor Em Caroline Gross
Chairperson
NSW Threatened Species Scientific Committee

**Supporting Documentation:**

Commonwealth DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2024). Conservation Advice for *Pluvialis squatarola* (Grey Plover), Australian Government, Canberra, ACT.

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