

Summaries of recent research reports on waterfowl abundance

“McLeod, S., Brien, P. O., Dundas, S., & Scopelliti, I. (2022).

2023-2024 Annual Waterfowl Quota Report to NSW DPI Hunting, NSW Department of Primary Industries. Regional NSW Government.”

What is this report about? It is the output from duck population surveys of the Riverina district in southern NSW, roughly covering an 80,000 km² triangle from Balranald in the west, to Lake Hume in the east, and Hillston to the north. The study area is bordered in the south by the Murray River and so it is immediately adjacent to Victoria’s northern border with NSW. This study makes estimates of the population size in that area for up to nine species of ducks and follows on from similar annual estimates that have occurred since 2017 (see last figure). These population estimates are made so that the NSW government can set quotas as the upper limits to how many ducks can be culled as part of the pest-mitigation strategy for the rice growing industry in the region.

How do they do that? The survey design examined sub-samples of several types of duck habitat during May-July 2023. The sub-samples are a known fraction of the total type of each habitat. Once the duck-count is known for a sub-sample, the duck-count for the total habitat is calculated by extrapolation. For example, for the habitat type *small dams* (<5 Ha) the statistical method estimates the average number of ducks per dam, and this is multiplied by the total number of dams to give an estimate of duck abundance for all small dams in the Riverina. Irrigation channels, medium, large and extremely large dams along with wetlands and waste-water treatment ponds were all sub-sampled in a similar way and the estimates added together to produce a total estimate for all the duck habitat in the Riverina. It’s important to understand that although this process is not physically counting every duck, everywhere in the Riverina (which is not possible anyway) the estimate produced is statistically representative of the whole population. It’s the best-available science.

This statistical approach of using N-mixture models, was developed 20-years ago and is widely used to estimate wildlife abundance around the world¹. Counting things in the natural world is an imperfect process. Invariably if you count something twice (or two people count the same thing) you’ll get two different answers. This is mainly due to what we call “imperfect detection”. Reasons for ducks might include that, “*the birds moved*”, “*there was glare on the water*”, “*those trees got in the way*”, etc. However, if you count the same thing lots of times, the chances are that the average of those counts will be close to the actual number of things. Without going into much more detail, one of the great advantages of the statistical process used in this study, is that it estimates the level of imperfect detection and uses it to correct the count.



2023-2024 Annual Waterfowl Quota Report to NSW DPI
Hunting, NSW Department of Primary Industries
Steven McLeod, Patrick O'Brien, Shannon Dundas and Isabel Scopelliti
8 August 2022



¹ Royle, J. A. (2004). N-Mixture Models for Estimating Population Size from. *Biometrics*, (60), 108–115.

How is this different to the EAWS? The results of this Riverina duck count are required for setting quotas as a percentage of the total (regional) population. So, it's important here that the sampling represents the whole area-population and estimates **absolute abundance**. Which is why the subsamples are randomly chosen each year. If the proportion of sites surveyed is enough to represent the region, then random sampling is the best way to make statistical estimates of the size of a population, *i.e.*, *how many ducks there are in the Riverina*.

The Eastern Australian Waterbird Survey (EAWS) has a different aim. Its purpose is to monitor changes over time, *i.e.*, *are there more ducks or fewer ducks than last time we looked*. It does this by using more of a "fixed site" approach, flying the same aerial transects (nine survey bands) each year, monitoring changes in **relative abundance**. The disadvantage of monitoring fixed sites is that the estimate of relative abundance only represents those very sites surveyed along the nine survey bands, and not the whole population of the east of Australia.

So, what did they find in the Riverina duck count this year?

Species	Total abundance
Pacific black duck	2,761,575
Grey teal	762,224
Australian wood duck	719,075
Pink-eared duck	12,246
Chestnut teal	13,454
Hardhead	11,007
Australian Shelduck	9,474
Plumed whistling duck	4,703
Blue winged shoveler	1,074
Total	4,294,832

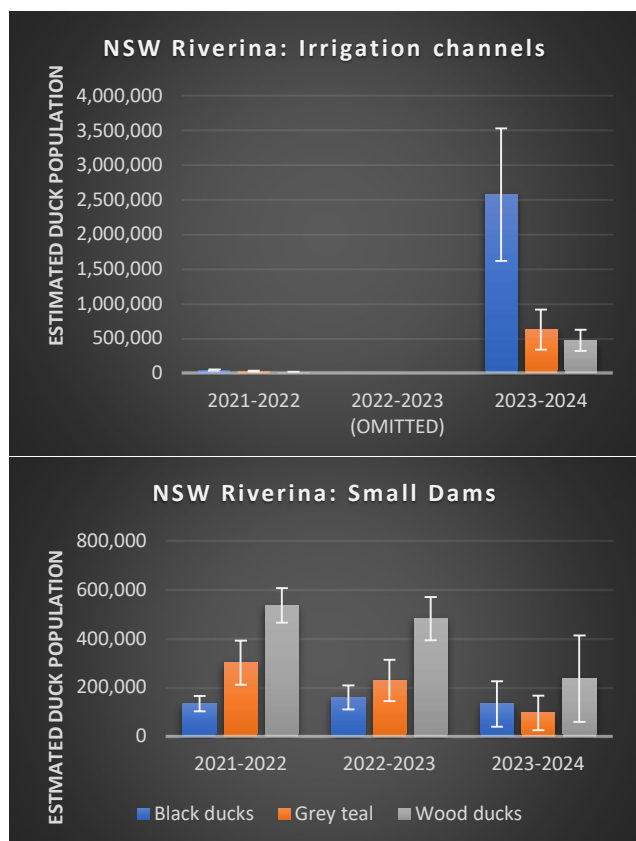
In the most recent survey of ducks in the NSW Riverina, a population of over 4 Million ducks was estimated. The margin of error on that estimate means that somewhere between 2.7 and 5.4 Million ducks were in the Riverina during May-July 2023.

This year, huge numbers of Black ducks (95%), Grey teal (85%) and Wood ducks (67%) were present along

the irrigation channels. **This is the largest population estimate since 2017, by far.**

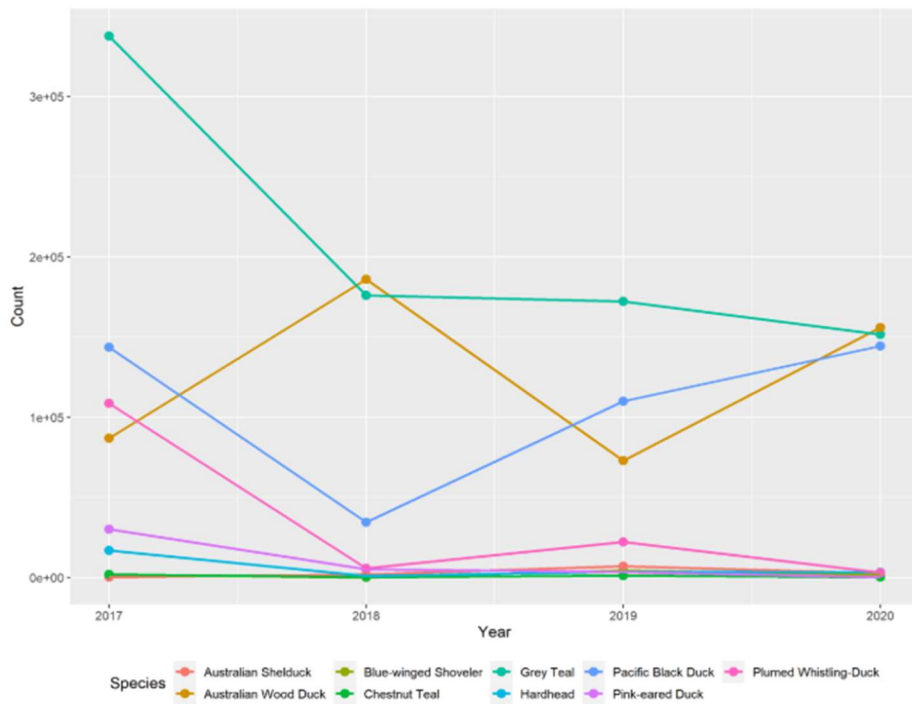
While the results can be directly compared with those in 2020-2021, and 2021-2022. Unfortunately, the results are difficult to compare with last-year's survey (2022-2023), and here's why. Last year (2021-2022), researchers did not survey any irrigation channels. No reason is given for why irrigation habitats were omitted. The previous time they included irrigation channel habitats (2021-2022), very few ducks were counted there – this time the channels were loaded with the three common species Black ducks, Grey teal and Wood ducks.

If we examine the results further, we can make some comparisons to last year and previous years for ducks on small-dams, which have been sampled consistently. For



the three most common species, just under half a million ducks were counted on small dams this year, 53% of the number found there last year and a similar abundance to back in 2020-2021.

Results suggest that this year's massive abundance of ducks in the Riverina occupied irrigation channel habitats in unprecedented numbers.



Time series of waterfowl abundances in the Riverina 2017-2020 from, Dundas, S. J., Vardanega, M., & McLeod, S. R. (2020). 2020-21 Annual Waterfowl Quota Report to the Game Licencing Unit, NSW Department of Primary Industries (y-axis scale is from 0 to 300,000).

Paul Brown

Fisheries and Wetlands Consulting

