Considerations for the 2022 duck season

Current as at 17 December 2021

Game Management Authority

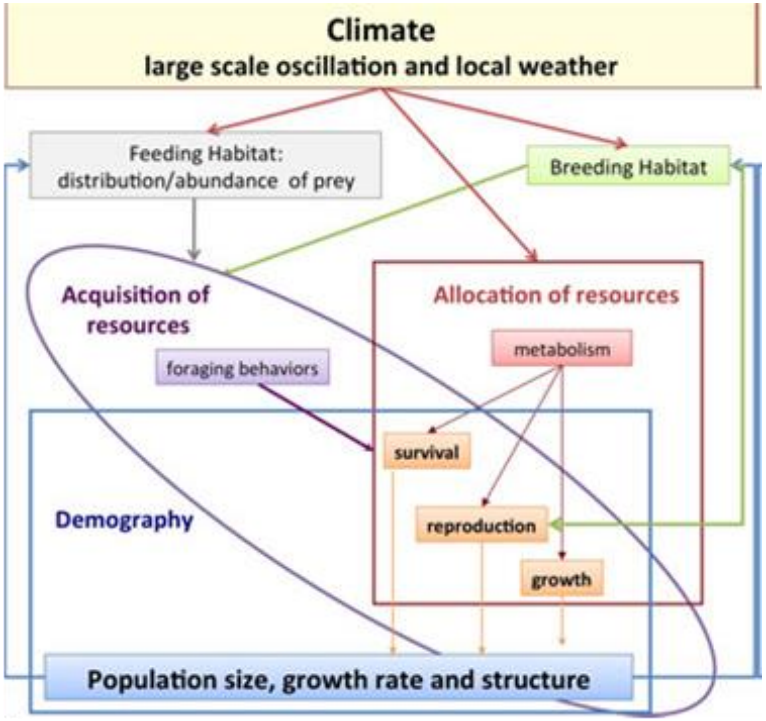
Climate

Past and present climatic conditions dictate present environmental conditions

Climatic predictions can be used to consider whether environmental conditions will change into the future

Climatic conditions and waterfowl

- Climatic conditions, such as large scale oscillations (e.g. Southern Oscillation Index) and local weather (e.g. rainfall and temperature) can effect the distribution, productivity and size of waterfowl populations.
- In Australia, waterbird abundance is strongly related to river flows and rainfall (Kingsford *et al.* 2017).
- Large and extensive rainfall events can contribute to population increase as conditions are enhanced to support breeding and recruitment. Conversely, during dry periods, breeding may be modified or greatly reduced (see Kingsford and Norman 2002).
- Hunting during periods when there is little recruitment (e.g. dry periods) removes breeding adults which can negatively affect subsequent recruitment and further drive declines in hunted species (Kingsford *et al.* 2017).



Climate effect on waterbird populations. Source: Jenouvrier 2013

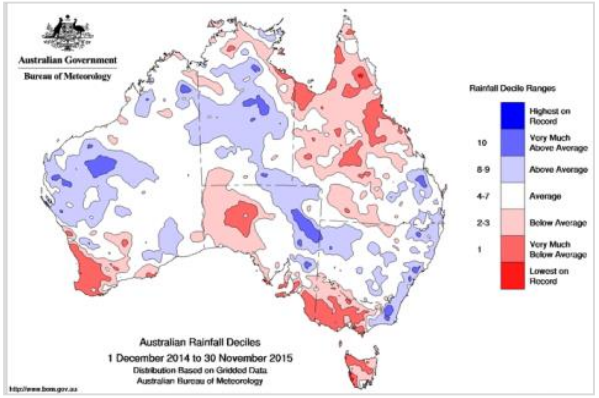
Game Management Authority

Annual rainfall deciles 2015 to 2021

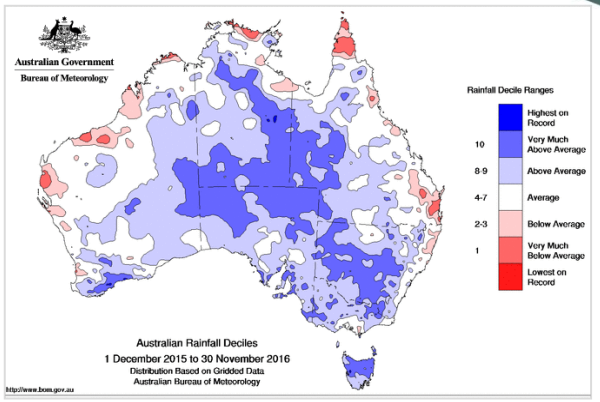
(Deciles = rainfall received compared to historical averages)

Source: www.bom.vic.gov.au

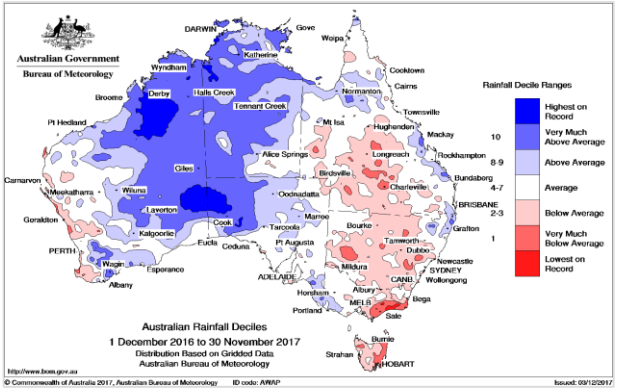
2015



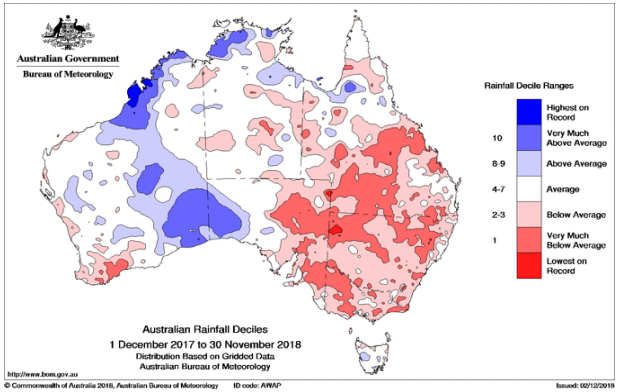
2016



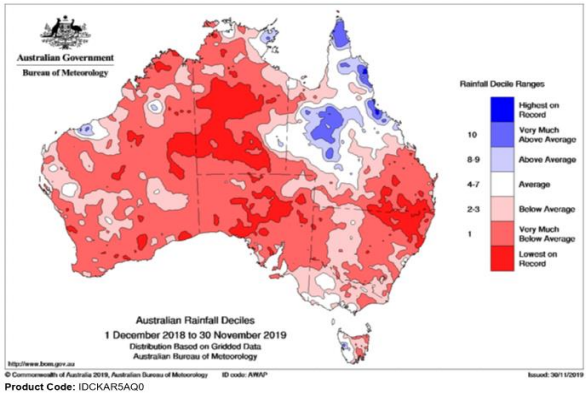
2017



2018



2019



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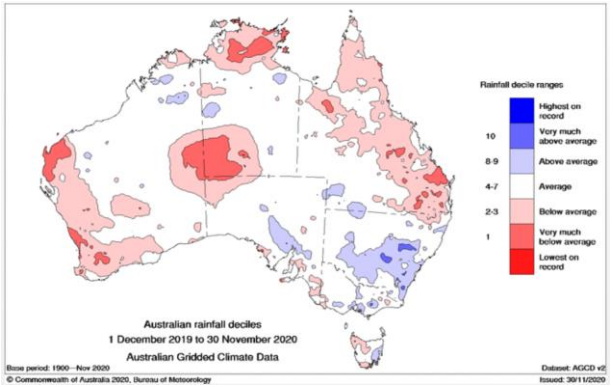
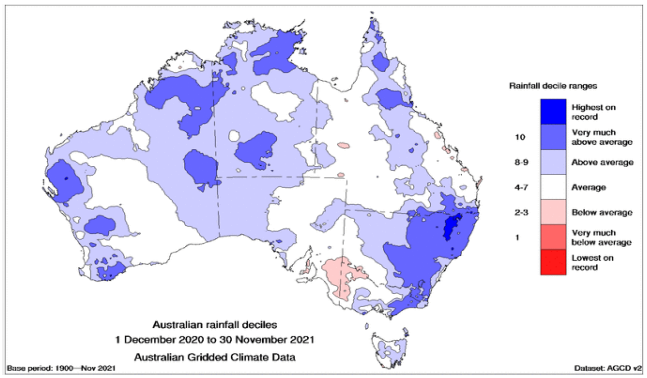
2020

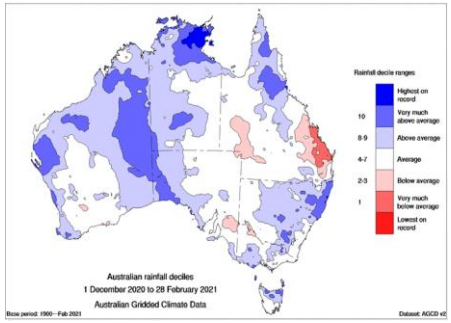


2021

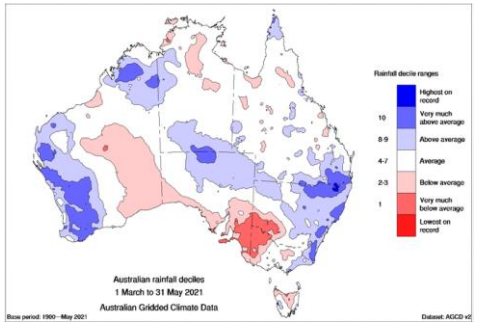


Rainfall through the seasons 2021

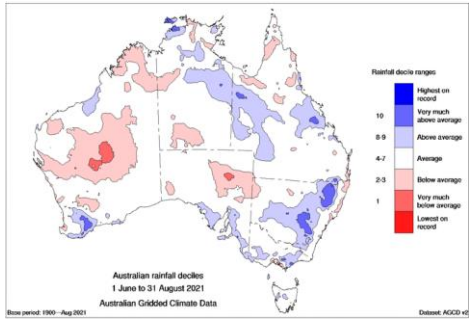
Summer



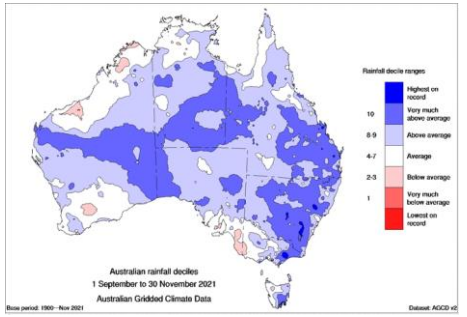
Autumn



Winter



Spring

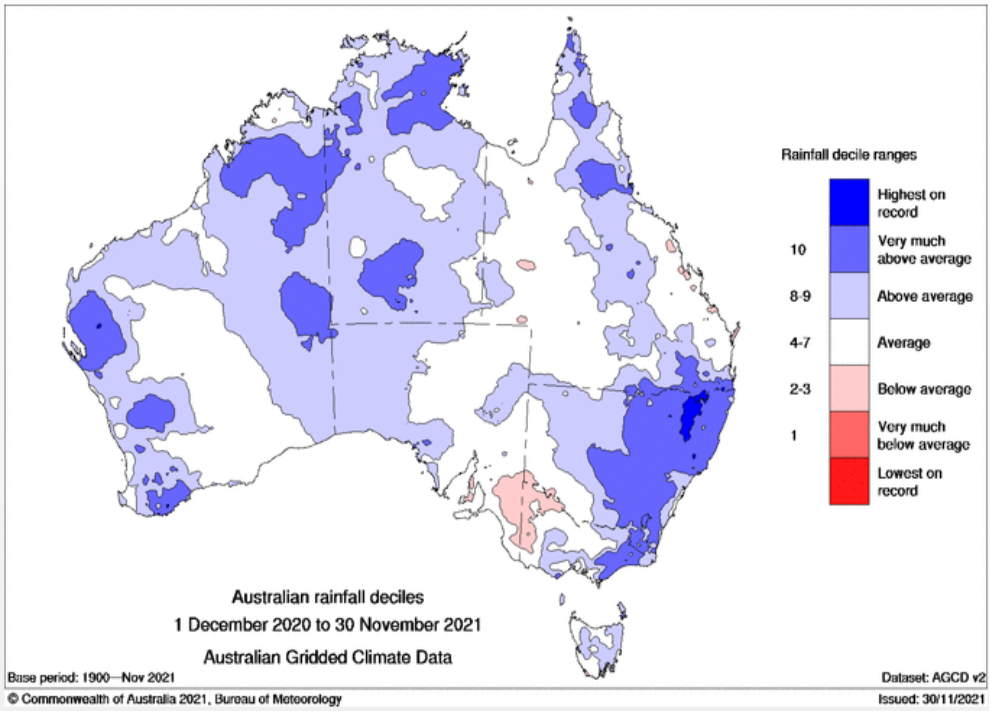


- Much of the NSW portion of the Murray Darling Basin (MDB) received above average rainfall over the summer period, as well as central and south west Victoria and parts of northern QLD. The central and southern coast of QLD received below to very much below average falls. Much of the west of Australia received above average rainfall.
- The MDB continued to receive above average rainfall in NSW, southern QLD and eastern Victoria in autumn. Average falls were recorded throughout most of the rest of eastern Australia except northern and western Victoria and south-eastern SA which received below to very much below average rainfall.
- Above average rainfall was received across approximately half of NSW and in parts of central QLD, coastal SA and Gippsland and parts of south western Victoria in winter. The rest of eastern Australia mostly received average rainfall.
- Most of Australia received above average to very much above average rainfall in spring. South eastern SA received below average rainfall.

Source: www.bom.gov.au

Year-to-date rainfall 2021

- November was Australia's, NSW's, SA's and the MDB's wettest November on record, fuelled by a weakening negative Indian Ocean Dipole and La Nina.
- It was Australia's wettest spring since the La Nina of 2010, and the tenth wettest since records began in 1900.
- Serious rainfall deficiencies for the period commencing April 2020 have been cleared from QLD following very much above average rainfall during November.

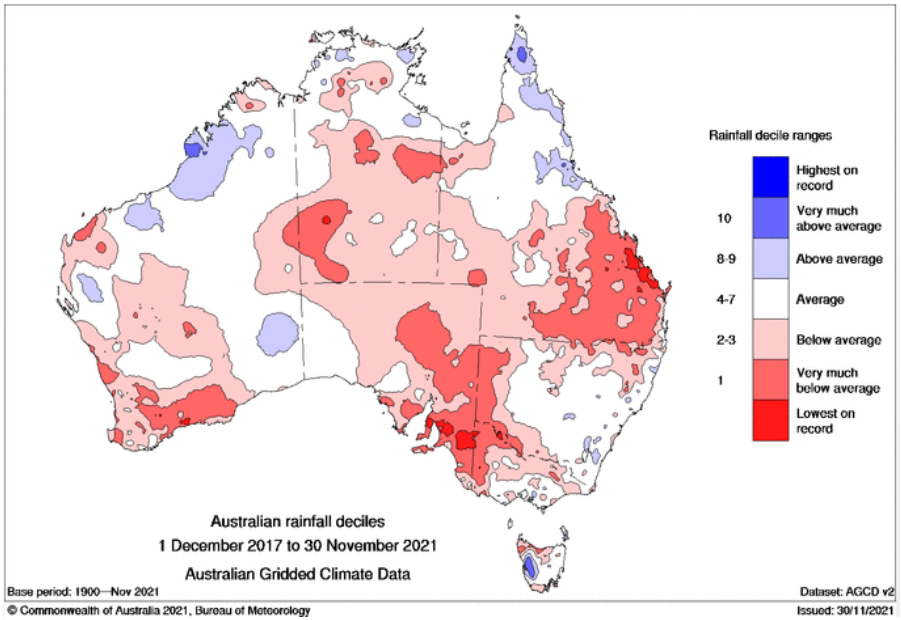


- Rapid filling of storages continued in the northern MDB during spring, and many storages are above full capacity.
- Hume dam storage is at its highest level in five years.
- South-east and central QLD storages have started to increase.

Source: www.bom.vic.gov.au

Four-year rainfall

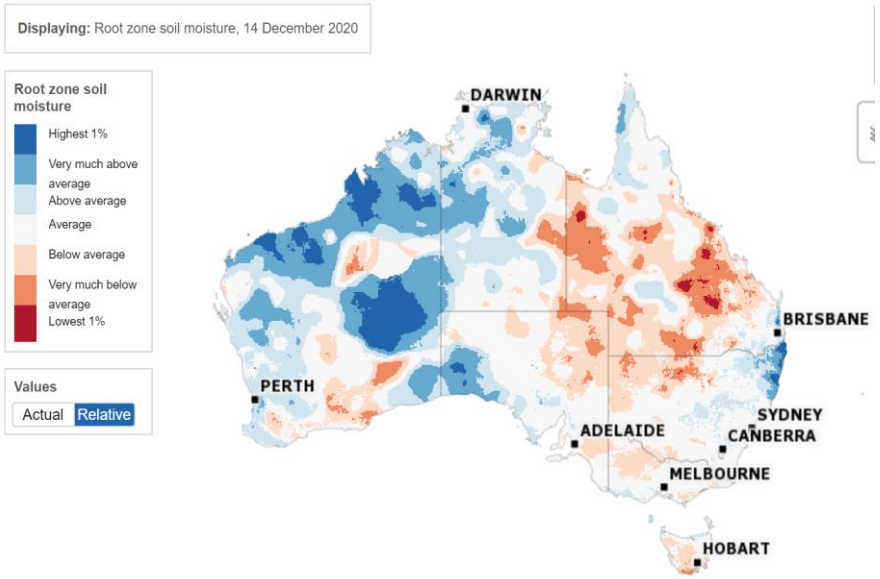
- Multi-year rainfall deficiencies which originated during the 2017-2019 drought remain over large parts of the country, despite some lessening following the record-wet November. While there has a been a reduction in NSW and of the area of lowest on record in eastern QLD, the accumulated rainfall anomalies remain very large for some areas.
- Over the past two years, seasonal conditions have improved over large areas. Water storages have increased across much of Australia, especially in the Murray-Darling Basin
- Many areas experiencing rainfall deficiencies for periods longer than 24 months have typically experienced below average rainfall between April and October, which is consistent with the long-term trends in rainfall reduction over southern Australia and along the Great Dividing Range.



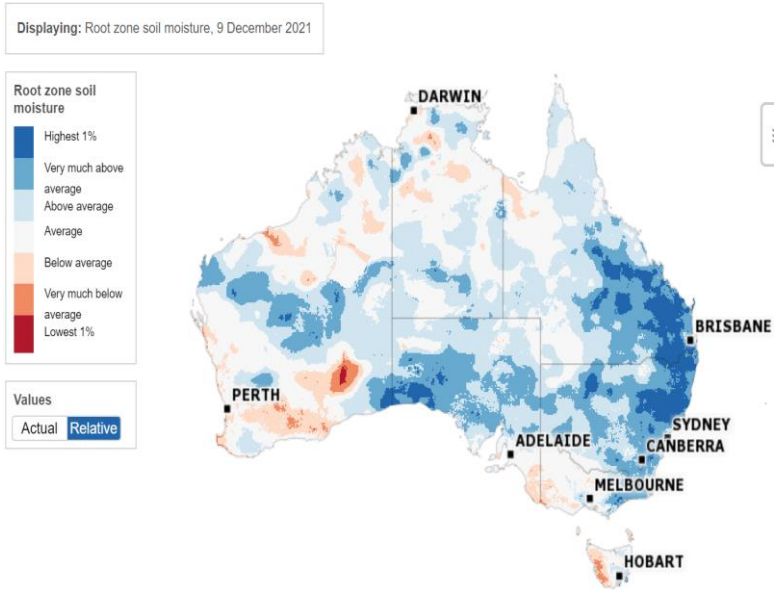
- Further periods of above average rainfall are needed to continue drought recovery, especially in parts of QLD, South Australia, far west NSW and large parts of Victoria, particularly in the north west.

Source: www.bom.vic.gov.au

Soil moisture – December 2021



2020



2021

- Root zone (0-100cm) soil moisture at December improved over much of eastern Australia from 2020 to 2021.

- At 9 December 2021, root zone soil moisture was above average across most of Australia, including the Murray-Darling Basin, reflecting recent above average spring rainfall.

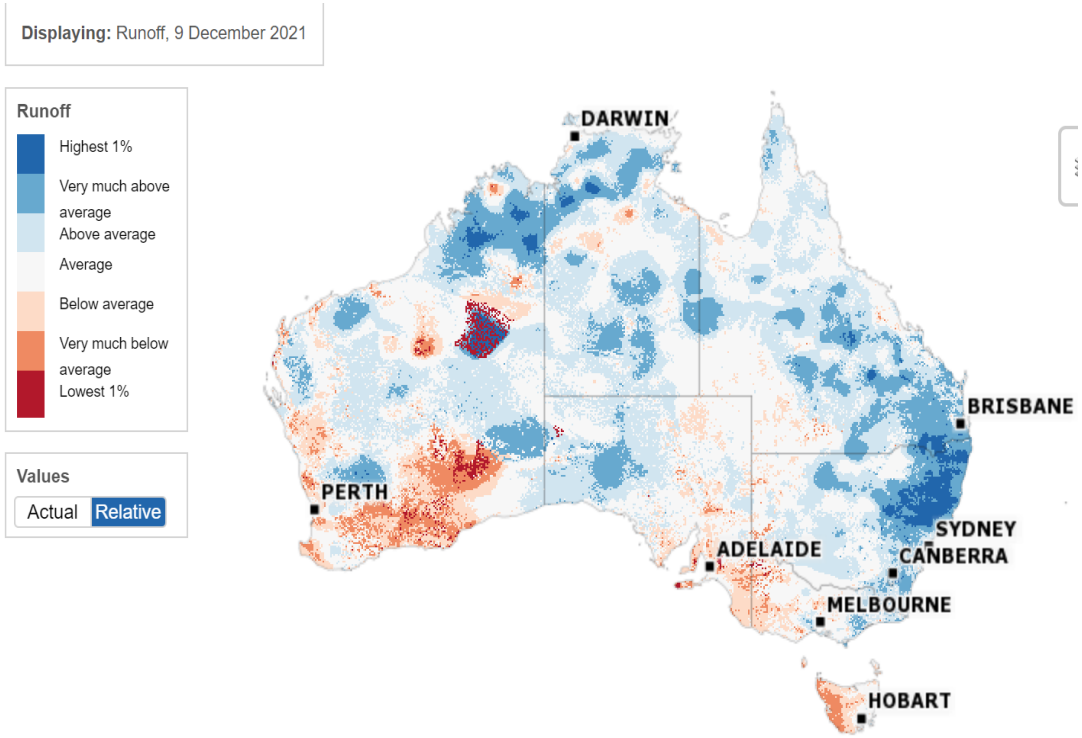
Game Management Authority

Source: www.bom.gov.au

Runoff

Runoff impacts the availability of water in the wetlands and the health of riverine systems. It has a direct influence in the creation and maintenance of waterbird habitat.

- Year-to-date runoff for much of eastern Australia has been above average to very much above average.
- However, for western Victoria and much of eastern South Australia, runoff has been below average.



Source: www.bom.gov.au

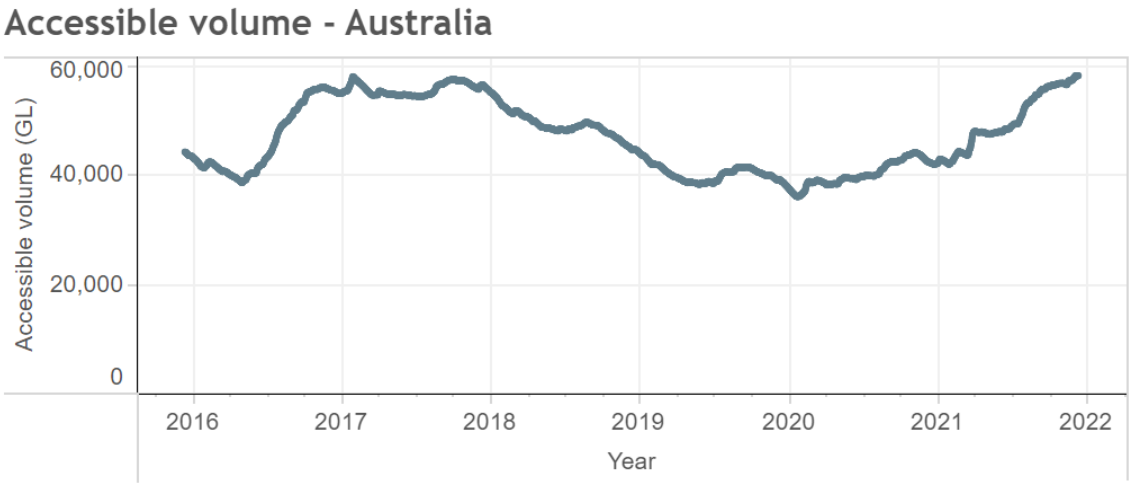
Australian water storage levels

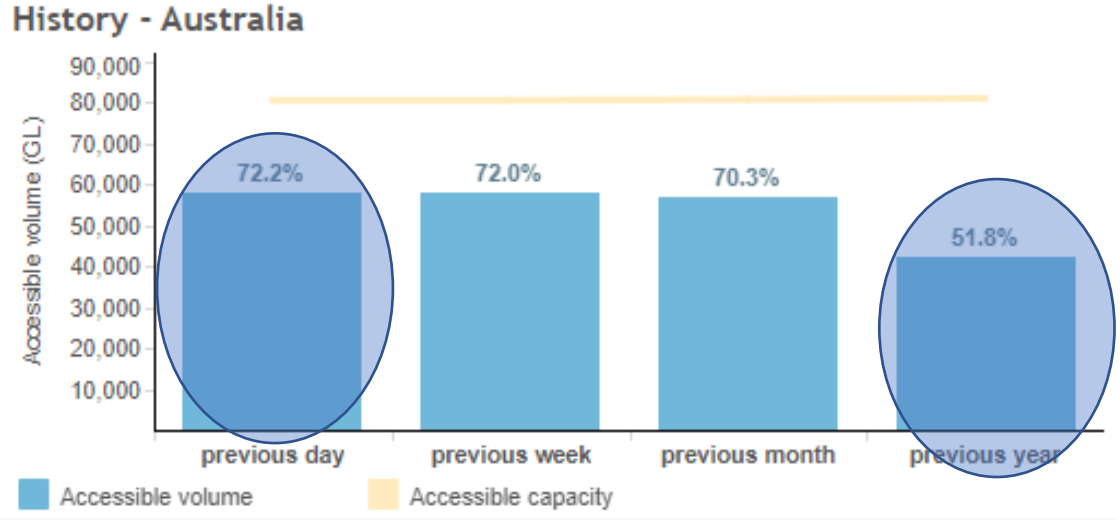
Water storage levels provide an indicator of the availability of waterbird habitat and waterflows through feeder systems.

However, often impoundments and storages can trap water and prevent it from entering creeks, streams and wetlands, thereby reducing available habitat. Therefore, this information must be considered in context, particularly during dry periods.

Deep storages generally provide poor habitat for game ducks.

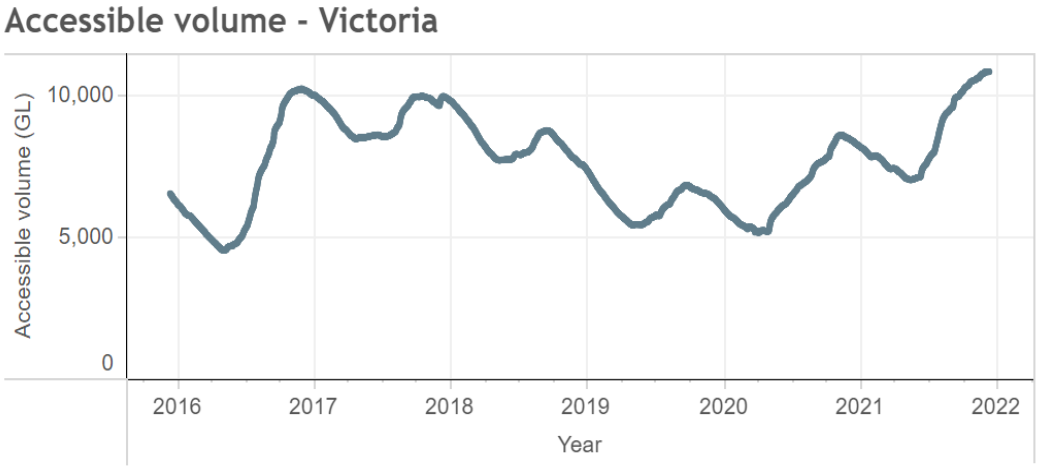
- In 2021, Australia's water storages increased significantly by 20.4% from the same time last year, from 51.8% to 72.2%.

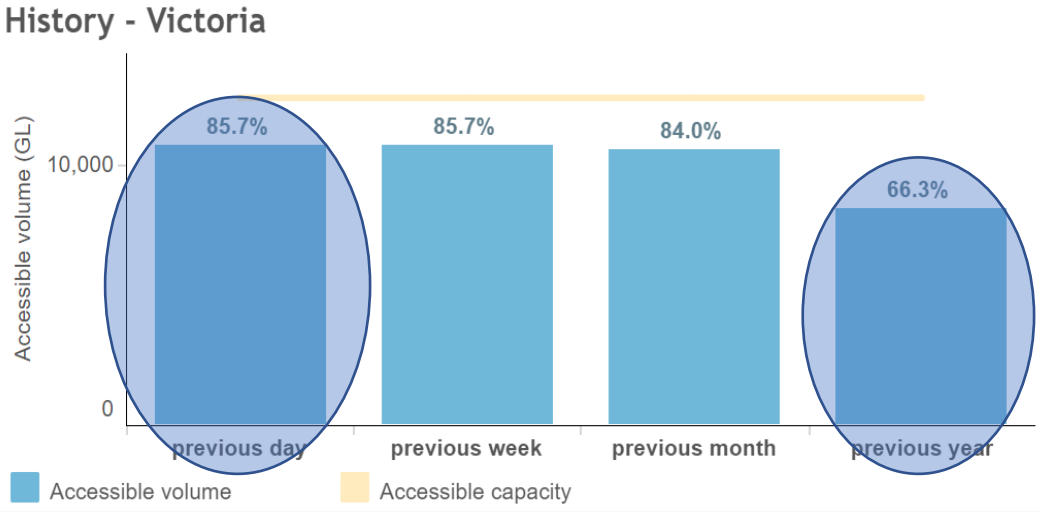




Source: www.bom.gov.au

Victorian water storage levels





- The total (Melbourne and Regional) Victorian water storage levels are currently at 85.7% compared to 66.3% last year.
- Storage levels have increased by 19.4% from this time last year.

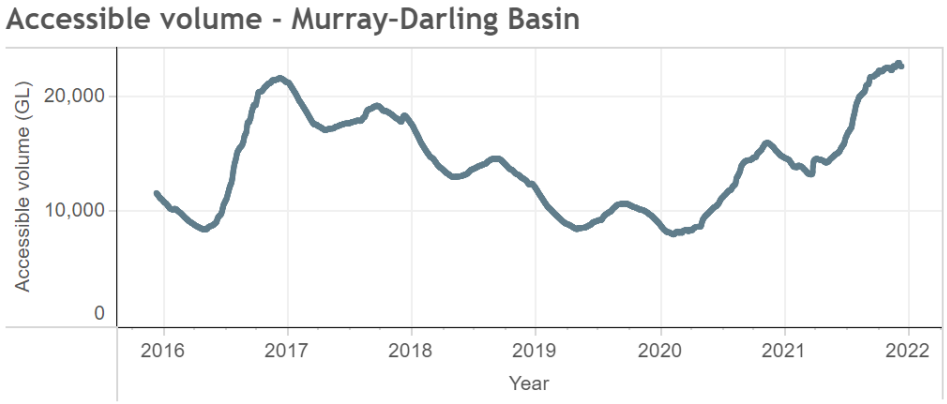
Game Management Authority

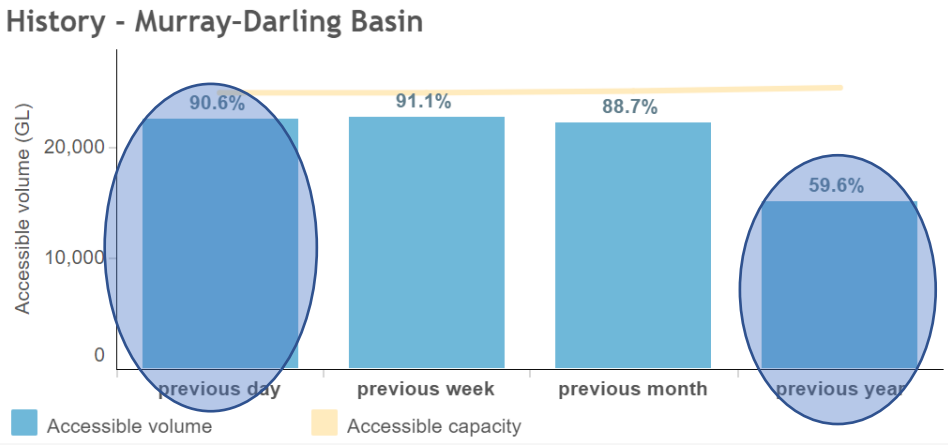
Source: www.bom.gov.au

Murray-Darling Basin water storage levels

The Murray–Darling Basin is a critical area for waterfowl production and Australia's most developed river basin (240 dams storing 29,893 GL).

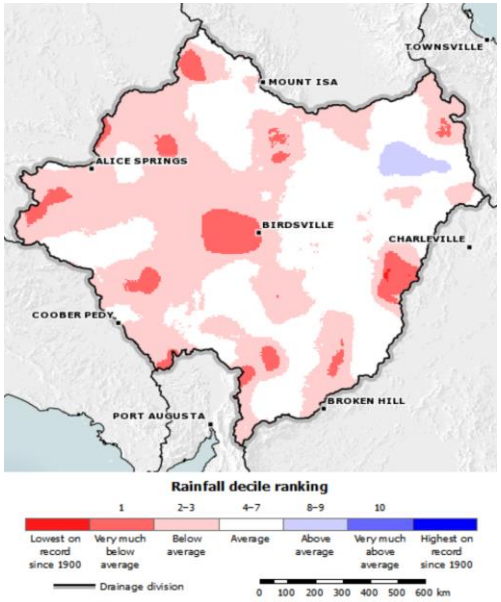
- Storage systems in the MDB are at 91% of capacity, which is 31% higher than at the same time last year (60%).
- Storage volumes in the northern MDB have significantly increased to 90.9% from 24.5% in November 2020.
- Storage volumes in the southern MDB are at 90.4% up from 69% in November 2020.

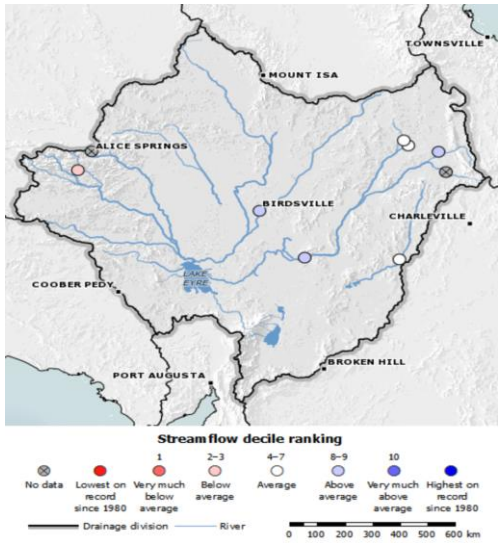




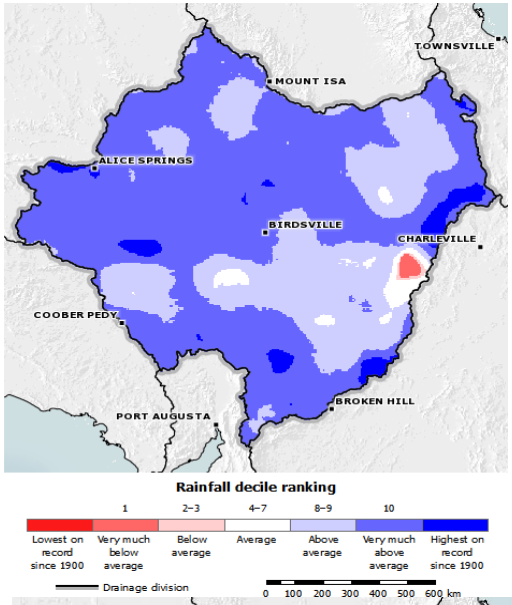
Source: www.bom.gov.au

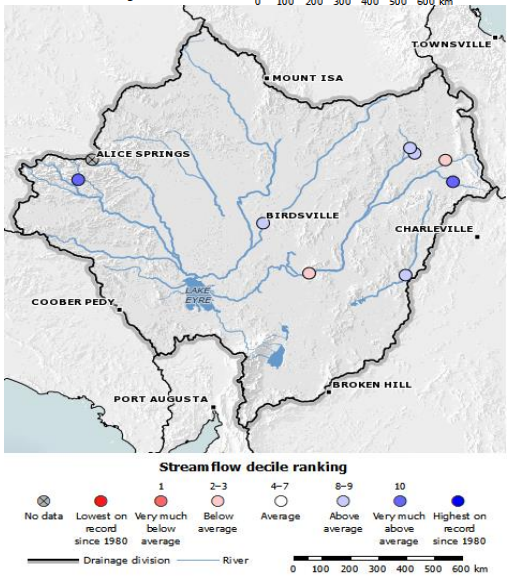
2020





2021





Lake Eyre Basin

- Rainfall across the Lake Eyre Basin increased from 2020.
- Rainfall was higher than average across 97% of the Basin area and very much above average across 67% of the area in November.
- Total rainfall was 60mm, 216% higher than the long-term mean of 19mm for November.
- Streamflows were higher than average for 75% of sites in November.
- Most of Lake Eyre is dry.

Game Management Authority

Source: www.bom.gov.au

Habitat availability

Eastern Australian Waterbird Survey (EAWS)

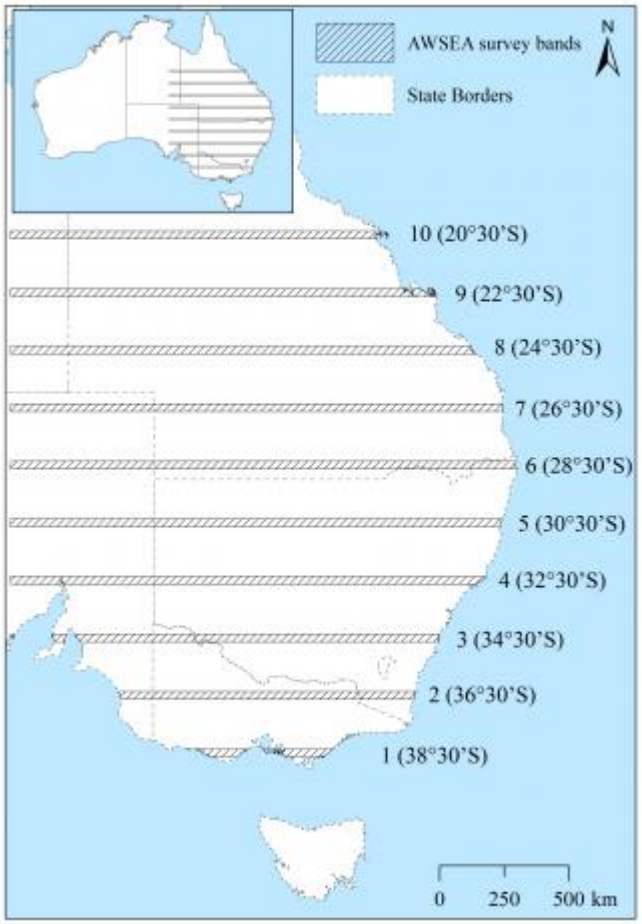
The EAWS monitors changes in the abundance and distribution indices of 50 waterbird species in eastern Australia. It also tracks changes in waterbird habitat over time.

The EAWS was designed by CSIRO's Dr Graeme Caughley and has been conducted annually in October since 1983. Waterbirds are counted from the air across ten aerial survey bands (each 30 km in width), every two degrees of latitude, crossing eastern Australia to monitor all wetlands over 1ha in size.

The EAWS provides:

- an index (not total count) of abundance of waterbirds, including game ducks
- information on the distribution of waterbird and game duck populations along survey bands
- the extent and distribution of habitat along survey bands, and
- information on waterbird breeding.

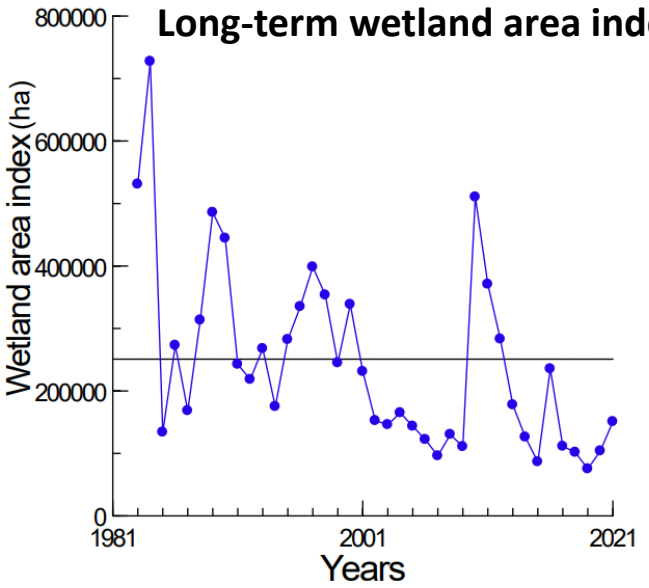
The information is valuable for examining waterbird trends on over one-third of continental Australia and over a long period.



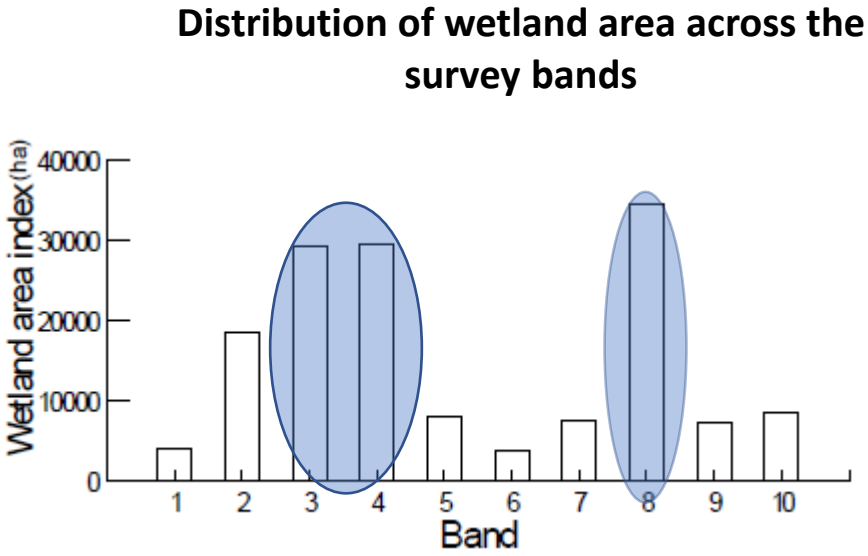
EAWS wetland area index

The wetland area index is a measure of wetland availability across all 10 EAWS transects (bands). This gives an indication of the extent and distribution of habitat available for waterbirds.

- The 2021 wetland area index ranked 27th of the 39 surveys.
- There was an increase in the index from last year but it is 61% of the long-term average.
- The majority of the available habitat occurs from southern to central NSW (bands 3 & 4) and central QLD (band 8).



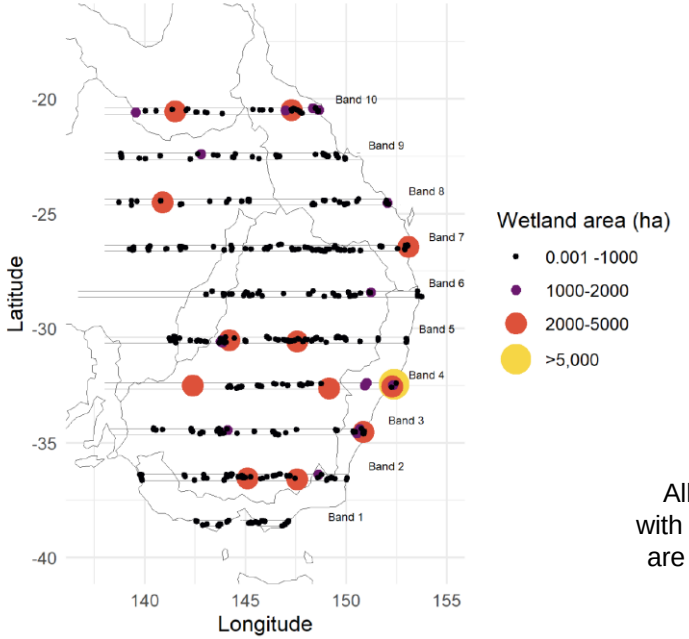
Changes over time in wetland area in the Eastern Australian Waterbird Survey (1983 - 2021); horizontal line shows long-term average.



Distribution of wetland area index in 10 survey bands of the Eastern Australian Waterbird Survey in 2021.

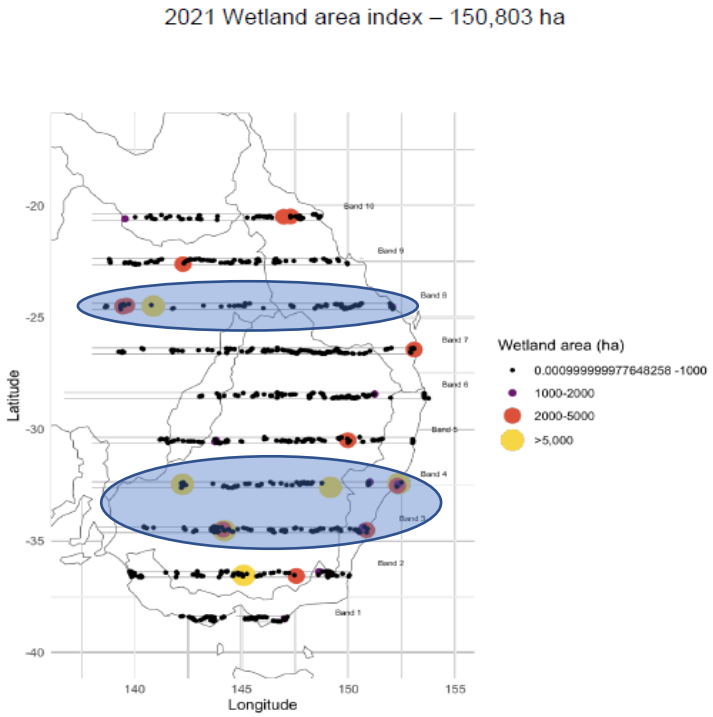
Wetland distribution

2020



All surveyed wetlands with surface water present are plotted; dry wetlands not plotted

2021



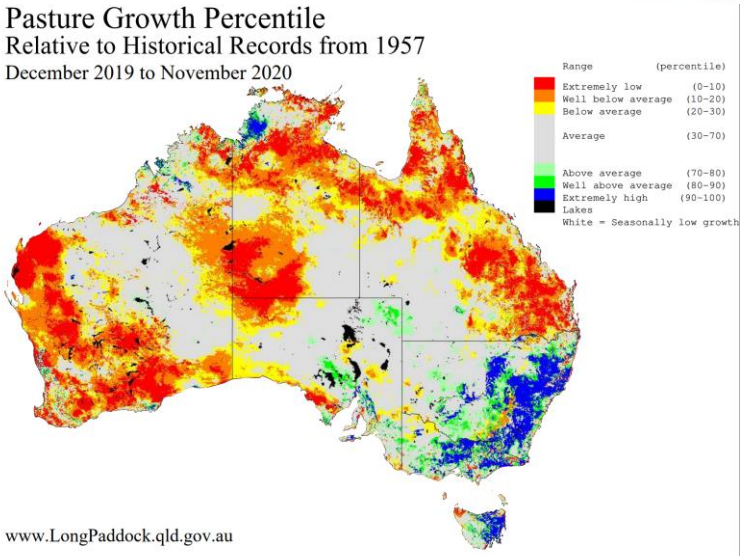
- The majority of the habitat surveyed occurred in bands 3 & 4 and 8. This is reflected in the increased wetland area in the Murray-Darling Basin and, in particular, those areas of the Lachlan and Murrumbidgee Rivers which experienced flooding. Band 8 also recorded a greater amount of habitat compared with remaining bands.
- 48% of surveyed wetlands (including dry wetlands) held no waterbirds.

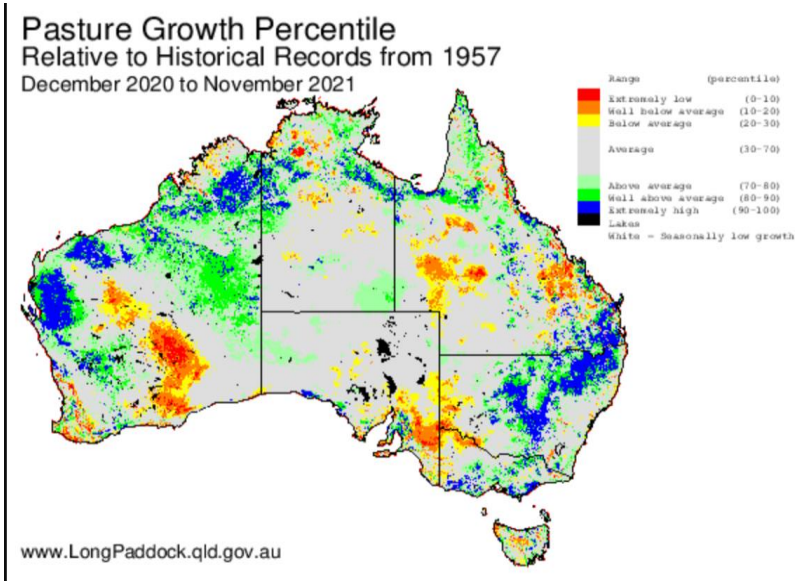
Pasture conditions

Pasture conditions are a coarse indicator of potential feeding habitat for grazing species, such as Wood Duck and Mountain Duck, and nesting habitat for ground-nesting game ducks.

Current conditions

- Over the last 12 months, pasture growth across NSW and Victoria has remained at average or higher.
- Pasture growth in QLD has improved throughout much of the state, however some deficiencies remain in the central west and east.
- South-eastern South Australia, parts of northern Victoria and far west NSW has experienced below to well below average growth.



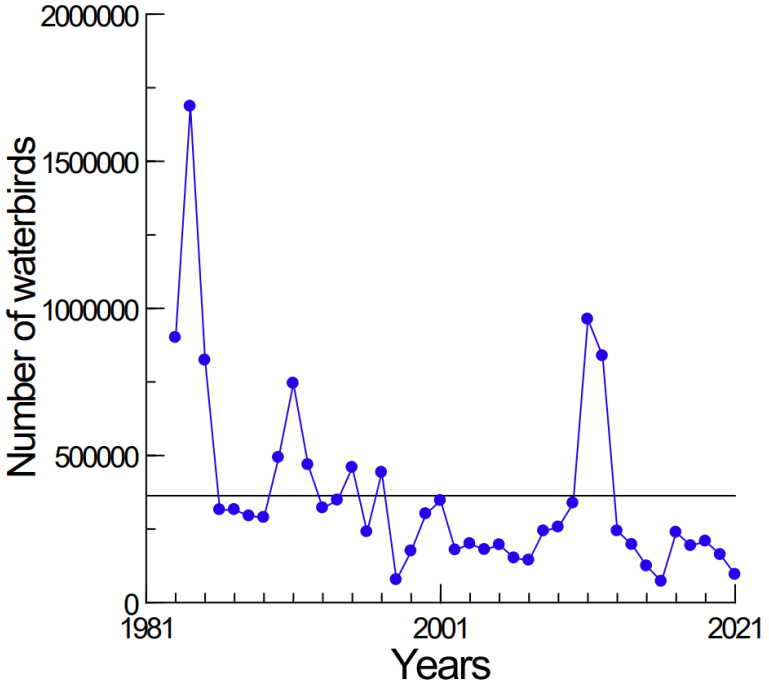


Population indices of abundance, distribution and breeding

Index of waterbird abundance (all waterbirds)

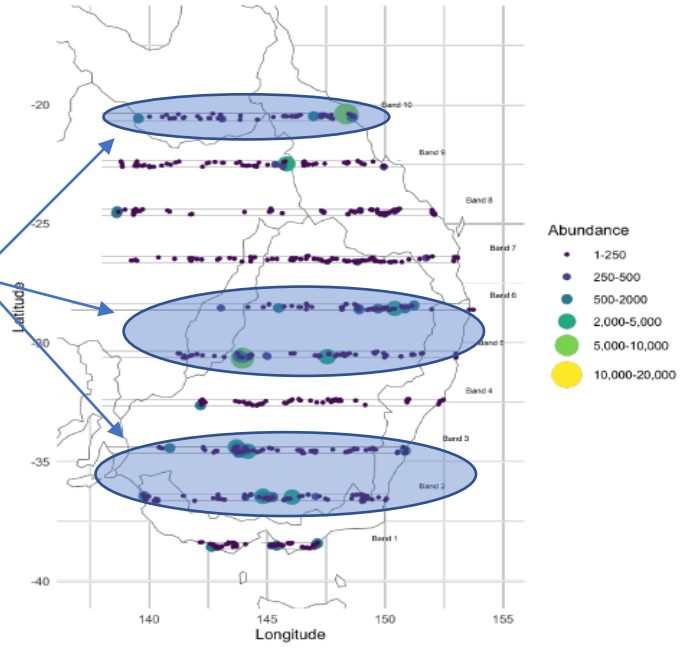
Up to 50 waterbirds species are surveyed in October each year and includes all Victorian game duck species and non-game species such as swans, Freckled Duck, ibis, coots etc.

- The total index of waterbird abundance (95,306) decreased by 41% from 2019 (162,824). The total waterbird abundance index is the 3rd lowest in 39 years.
- Only 2 wetlands supported more than 5,000 waterbirds.



Waterbirds were most abundant in Bands 2&3, 5&6 and 10.

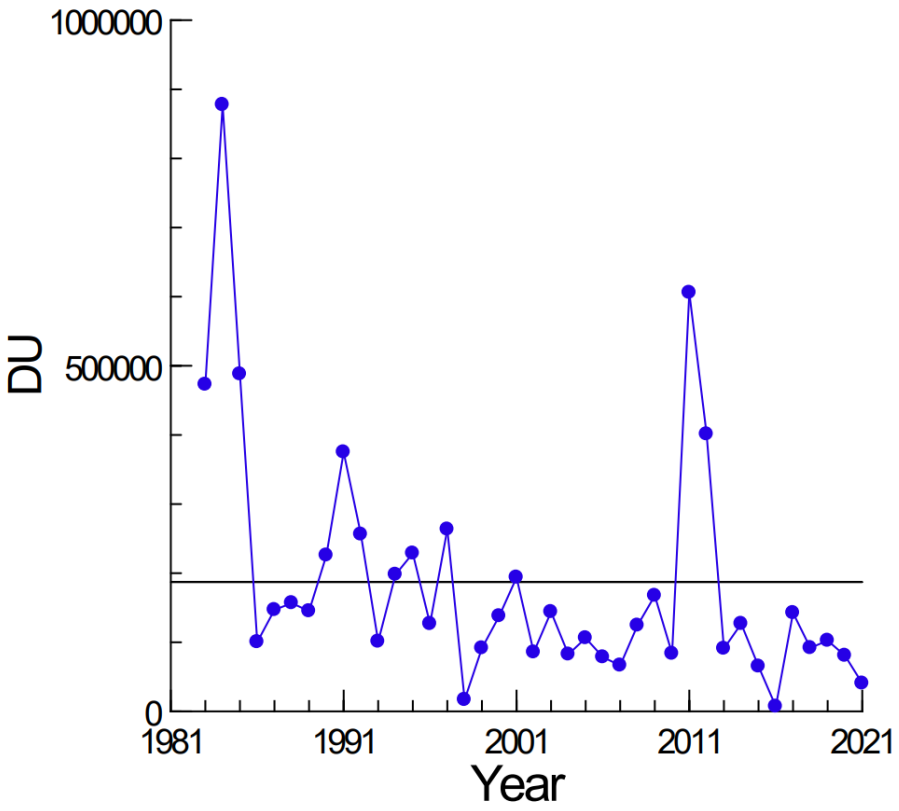
2021 Total abundance 95,306



Dry wetlands and wetlands with zero waterbirds not plotted

The abundance index is not a total count. It provides information on the trends in waterbird abundance along the survey bands.

EAWS game duck abundance index



This index provides information on game ducks only.

- The game duck abundance index decreased by 58% from last year.
- The 2021 game duck abundance index was the 3rd lowest recorded in 39 years of survey and is 25% of the long-term average.
- The decrease in the index was despite an increase in available habitat. Habitat availability and game duck abundance have a positive relationship, so when habitat increases, so does duck abundance but with a lag as it takes time for the habitat and birds to respond.

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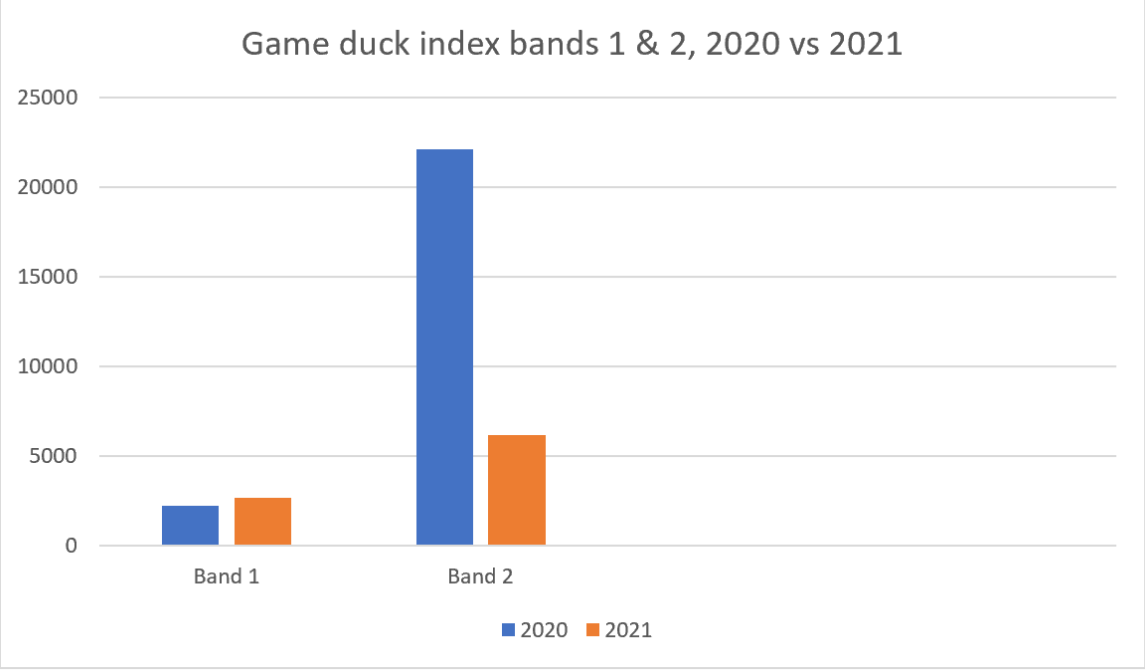
EAWS game duck abundance index bands 1 & 2

- Bands 1 and 2 cover parts of Victoria. Band 1 covers parts of southern coastal Victoria and band 2 covers parts of northern Victoria.
- Game duck abundance in band 1 was similar for 2020 and 2021 but declined significantly in band 2 in 2021 reflecting the drier conditions in that band.



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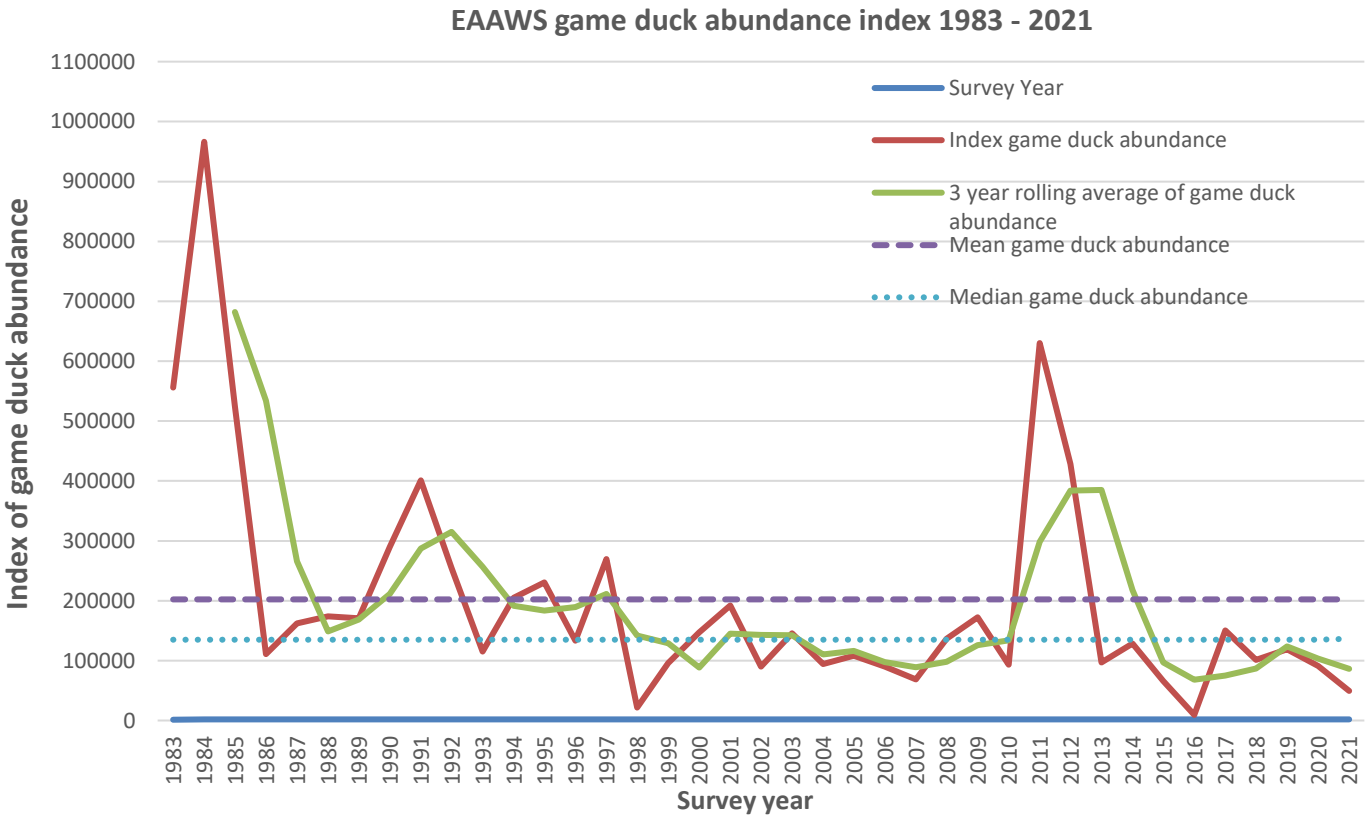
Game Management Authority

EAWS game duck abundance index over time

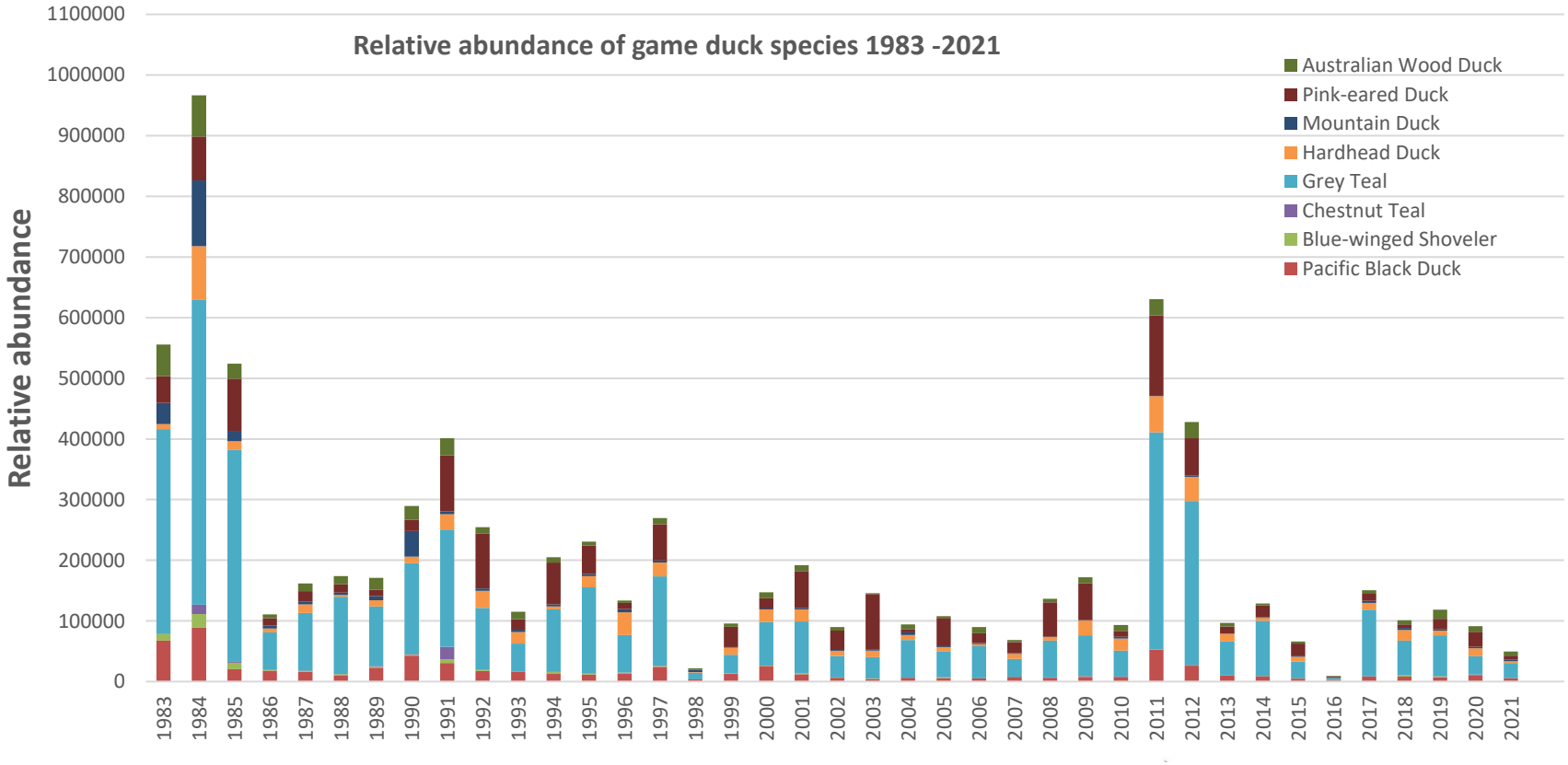


When considering management implications, the abundance index must be considered in context with:

- distribution of birds
- habitat availability and distribution
- climatic forecasts
- concentrations of birds

- This graph includes abundance index data (red line) and the rolling (or moving) average (green line). A rolling average is used to get an overall trend in a data set. In this case, the rolling average is calculated for three-year subsets.
- The long-term average (mean) and median abundance levels are also included. The median is the mid-value and is more statistically suitable than the average when outliers are present.

Relative abundance of game duck species 1983-2021 (EAWS)



The percentage of game ducks detected in 2021 EAWS were:

Black Duck 11% (12%), Grey Teal 50% (33%), Wood Duck 14% (10%), Pink-eared Duck 13% (27%), Hardhead 6% (14%), Mountain Duck 5% (3%), Chestnut Teal <1% (1%) and Blue-winged Shoveler <1% (<1%). Figures in parentheses are from 2020.

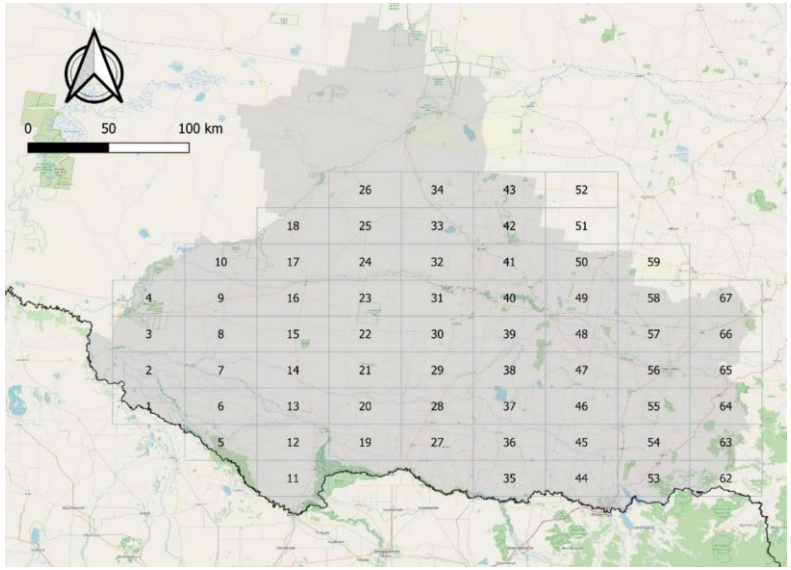
Victorian game duck abundance estimates

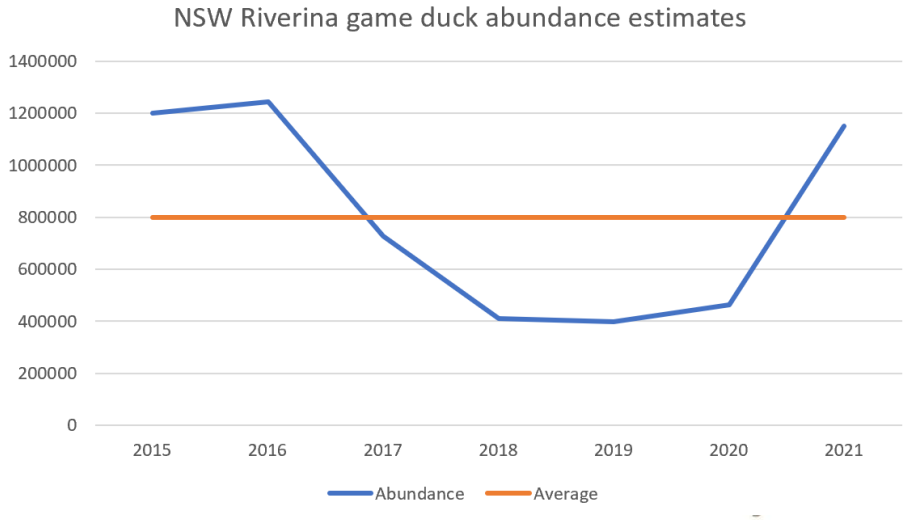
- Aerial and ground counts were conducted on randomly selected farm dams, sewage ponds, wetlands, creeks, rivers and irrigation channels throughout Victoria in October.
- It was estimated that there were 2.94 million game ducks on these habitats. This is compared to 2.42 million game ducks in 2020, a 20% increase.
- The total statewide abundance of game ducks was higher than in 2020, mainly due to the inclusion of estimates for rivers/streams and sewage treatment ponds, which were not included in the pilot survey in 2020.
- Total surface water (combined dams and wetlands) increased by 13% (14,326 hectares) between 2020 and 2021.
- Wood Duck were the most numerous game species (~1,240,500), followed by Grey Teal (~609,300), Australian Shelduck (~503,900) and Pacific Black Duck (~443,700).
- These estimates are preliminary and may be subject to revision.

Ramsey, D. and Fanson, B. (2021) *Preliminary results from the 2021 survey of game ducks in Victoria.*

NSW Riverina waterfowl abundance surveys

- Helicopter, drone and ground counts of randomly selected farm dams, treatment ponds and wetlands were conducted throughout the NSW Riverina to determine waterfowl abundance in order to set annual crop damage mitigation destruction quotas.
- Surveys were conducted in late-April to July.
- Game duck* numbers increased from the previous year by almost 250% from 463,0404 to 1,149,395 reflecting the improved conditions in this part of the MDB.
- Numbers of waterfowl are recovering towards 2016 levels following a decline in response to the drought years of 2017-2019.



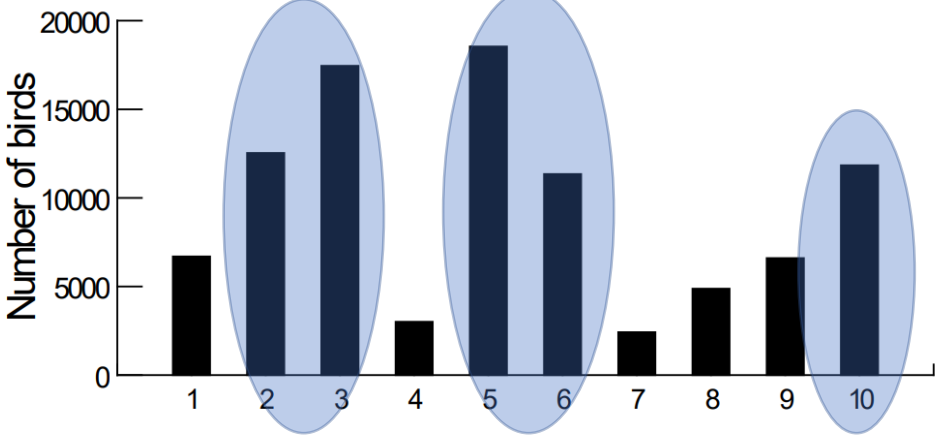


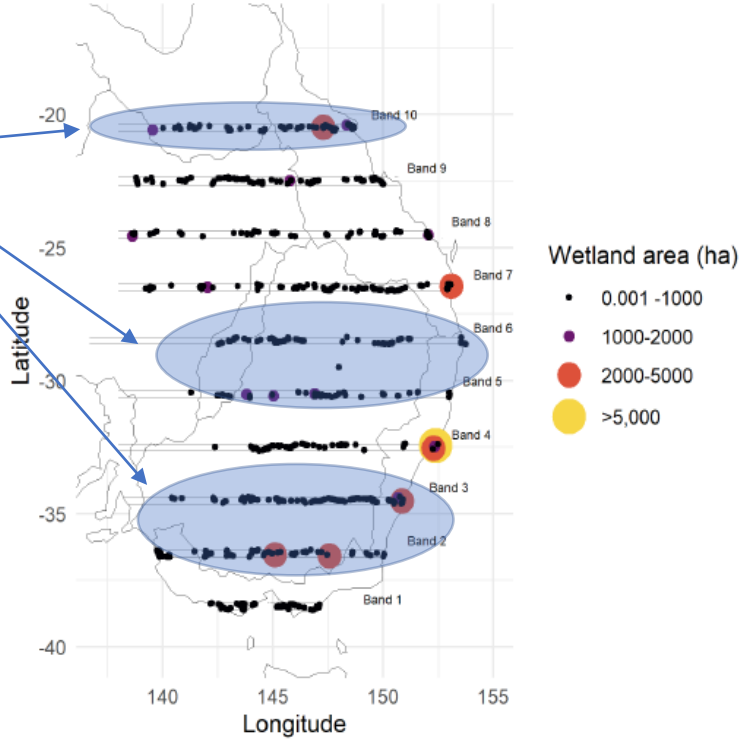
*Includes Plumed Whistling Duck, which is not a Victorian game duck species

Source: NSW Department of Primary Industries (2021) *2021-2022 Annual Waterfowl Quota Report to DPI Hunting.*

EAWS waterbird distribution

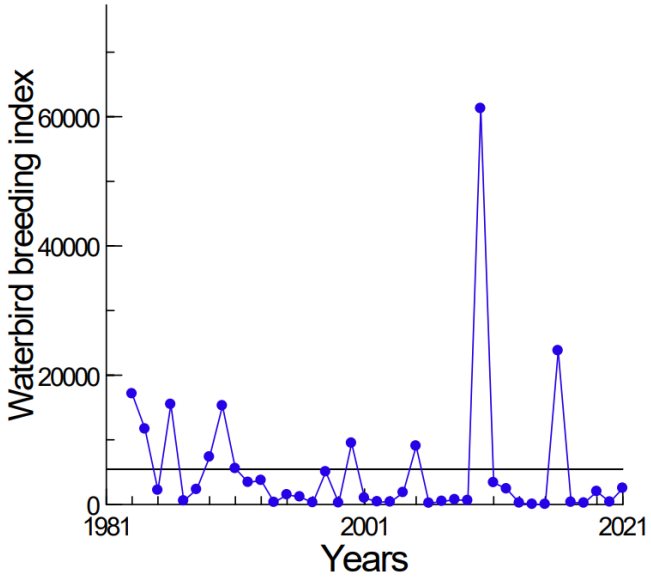
Waterbirds were most abundant in bands 2&3, 5&6 and 10.

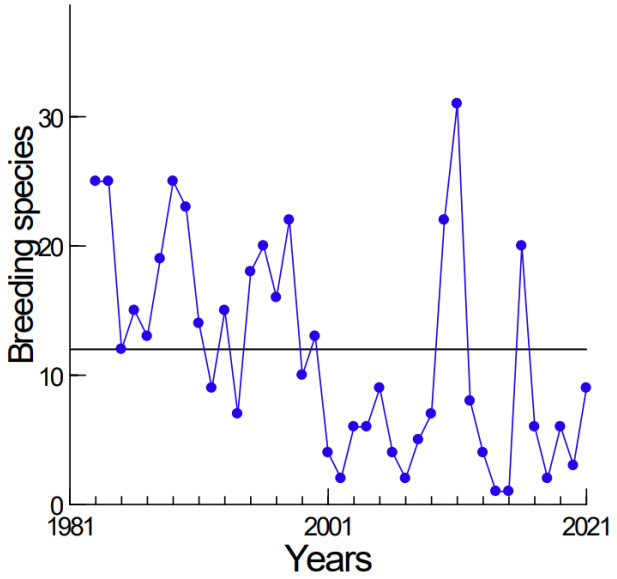




- Waterbirds were again widely dispersed (similar to 2020) and less concentrated, reflecting an increase in habitat availability, especially in the Murray-Darling Basin.
- Surveyed waterbirds were most abundant in bands 2 & 3, 5 & 6 and 10. Data shows these same bands also held the most game ducks. The majority of the habitat occurred in bands 3&4 and 8.
- Only two wetlands supported more than 5,000 waterbirds, representing 13% of total abundance. Five wetlands supported more than 5,000 waterbirds in 2020. More than 48% of surveyed wetlands supported no waterbirds (which includes wetlands that were dry).

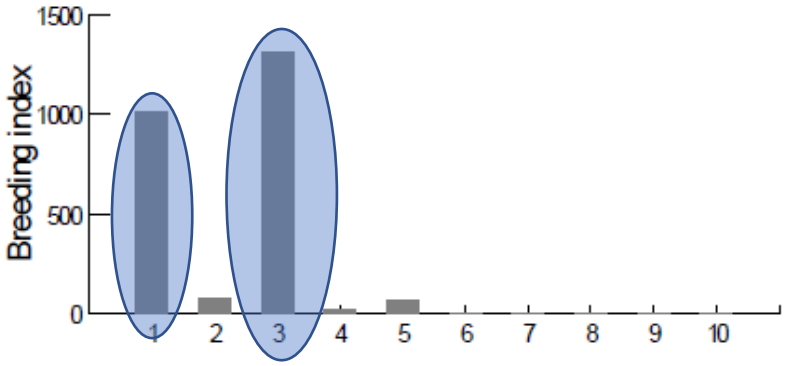
Waterbird breeding (all species combined)



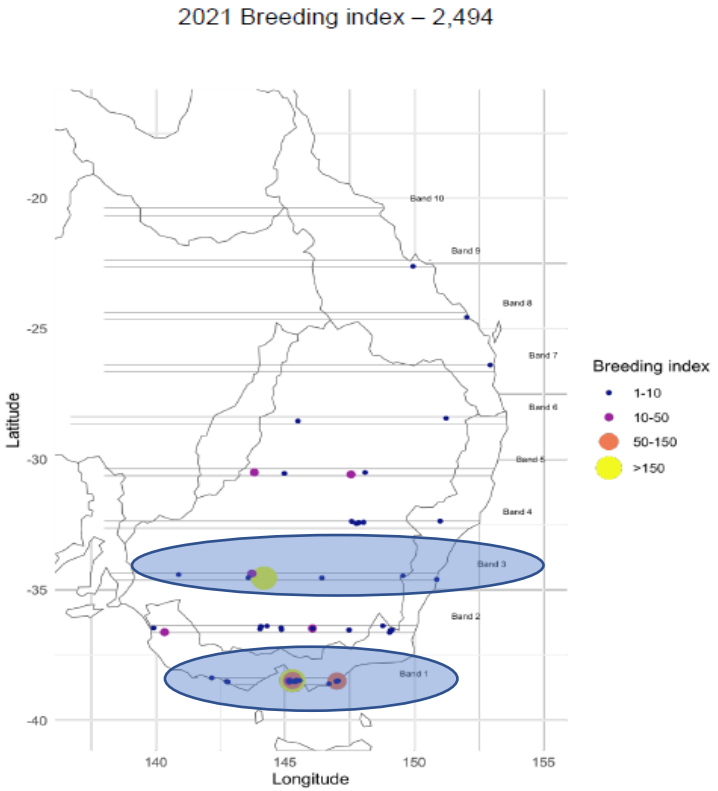


- The EAWS total breeding index (all species combined) increased considerably from the previous year but was still below the long-term average.
- EAWS breeding species richness (i.e. the number of different species observed breeding) also increased from last year but was below the long-term average and was the ninth lowest on record. Ibis made up 83% of the total breeding records.

Waterbird breeding (all species combined)



- Most breeding occurred in bands 1 and 3.
- Ibis comprised most of the breeding recorded (83% of the total).



Only wetlands with breeding recorded are plotted.

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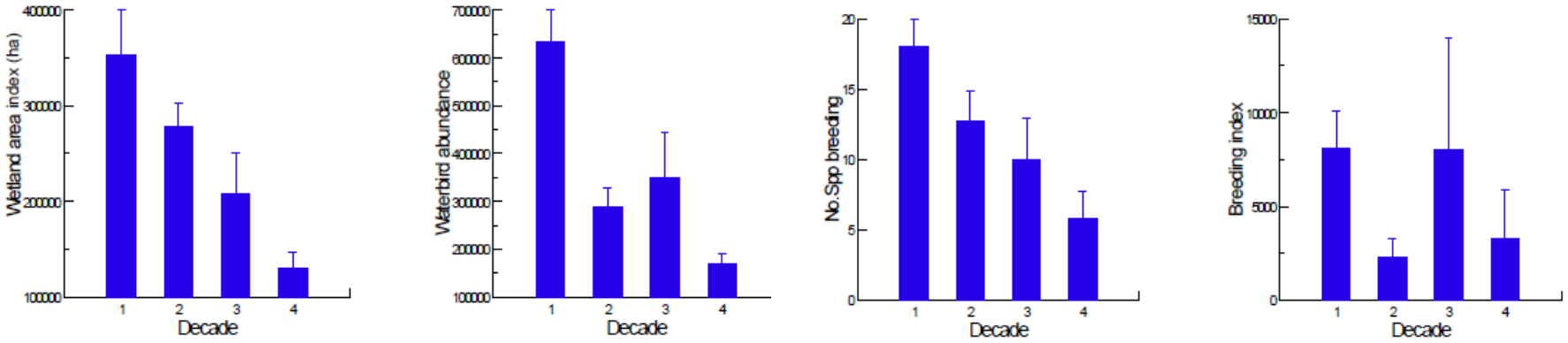
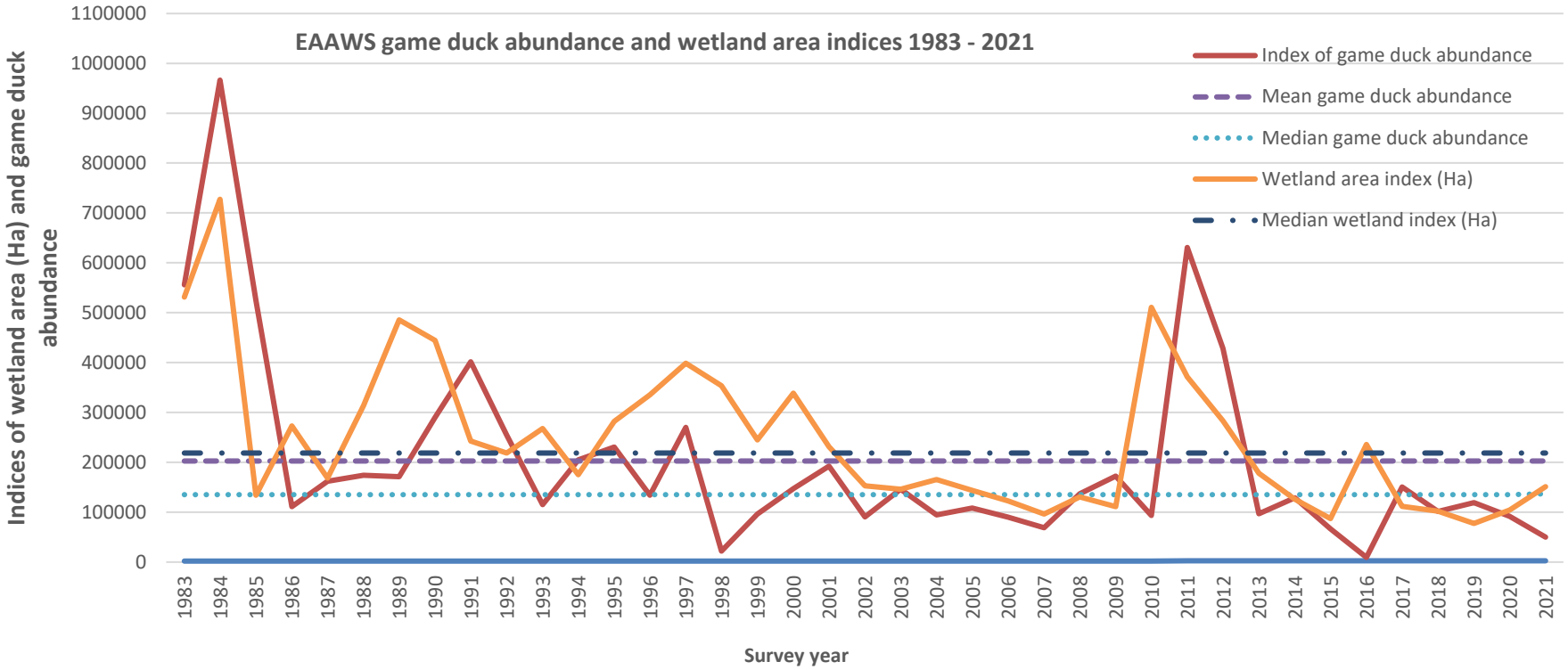
EAWS indices over time



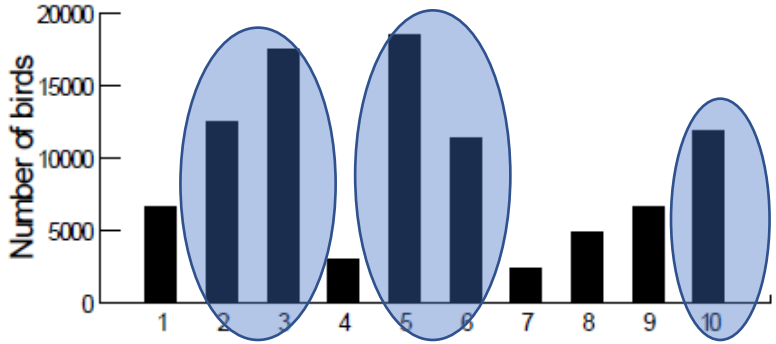
Decadal changes in indices for total abundance, wetland area, number of breeding species and breeding in the EAWS 1983 - 2021

- For eastern Australia, overall waterbird abundance, breeding index and breeding species are positively related to habitat availability (wetland area index).
- All major EAWS indices for waterbirds (wetland area index, total abundance index, number of species breeding and breeding index) continue to show significant declines over time.

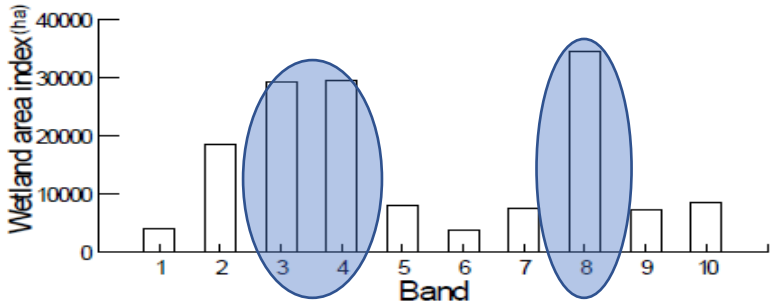
EAWS game duck abundance, distribution and habitat - summary



Where the ducks are



Where the habitat is



Climate predictions – future conditions

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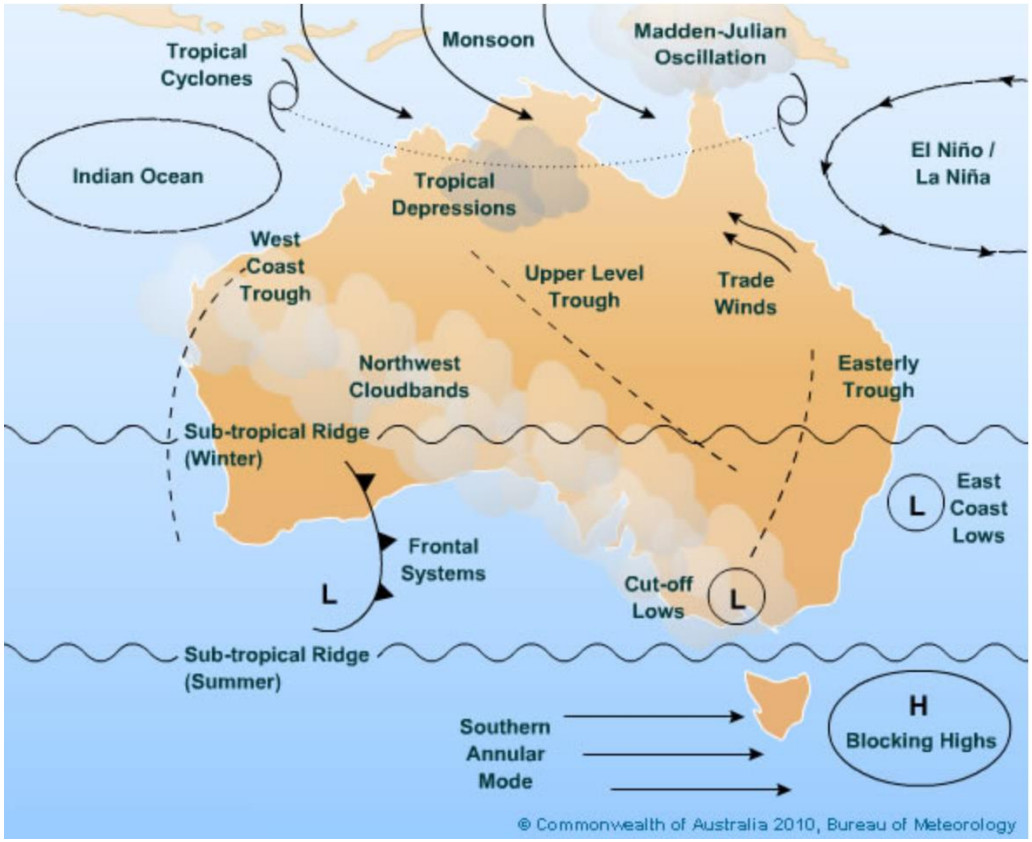
Current climate drivers

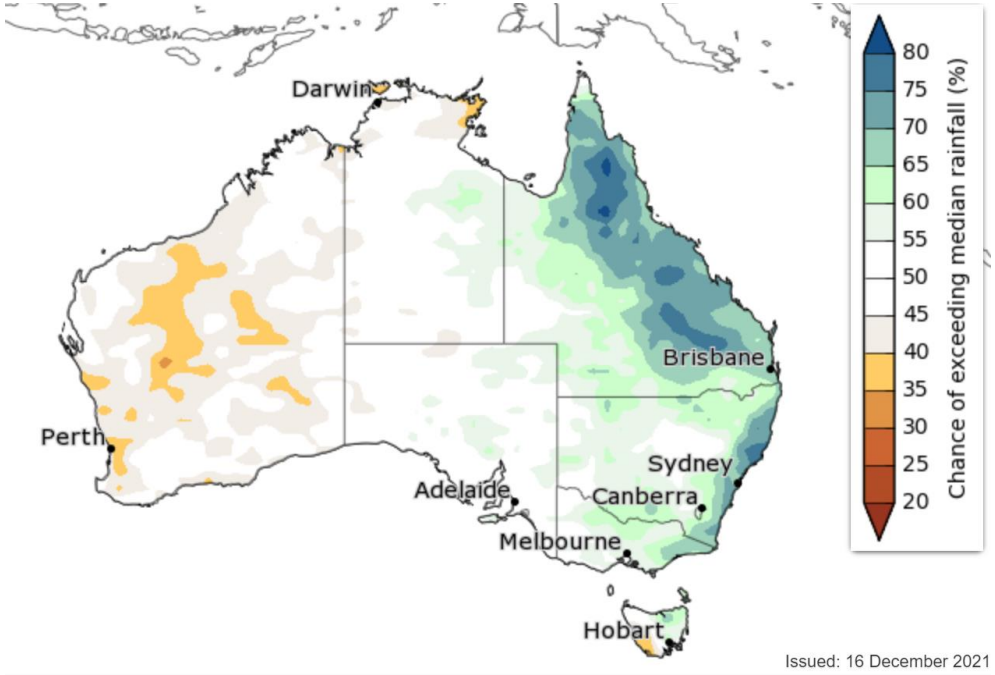
- Australia's climate can vary greatly from one year to the next.
- A number of drivers can influence the Australian climate. Influences will have varying levels of impact in different regions at different times of year.
- Current influences on Australia's climate include:
  - La Niña
  - The Southern Annular Mode (SAM)
  - The Madden–Julian Oscillation (MJO)
- All of these influences typically result in above average rainfall for northern, eastern or central parts of the country.



Source: www.bom.gov.au

January – March 2022 predicted rainfall

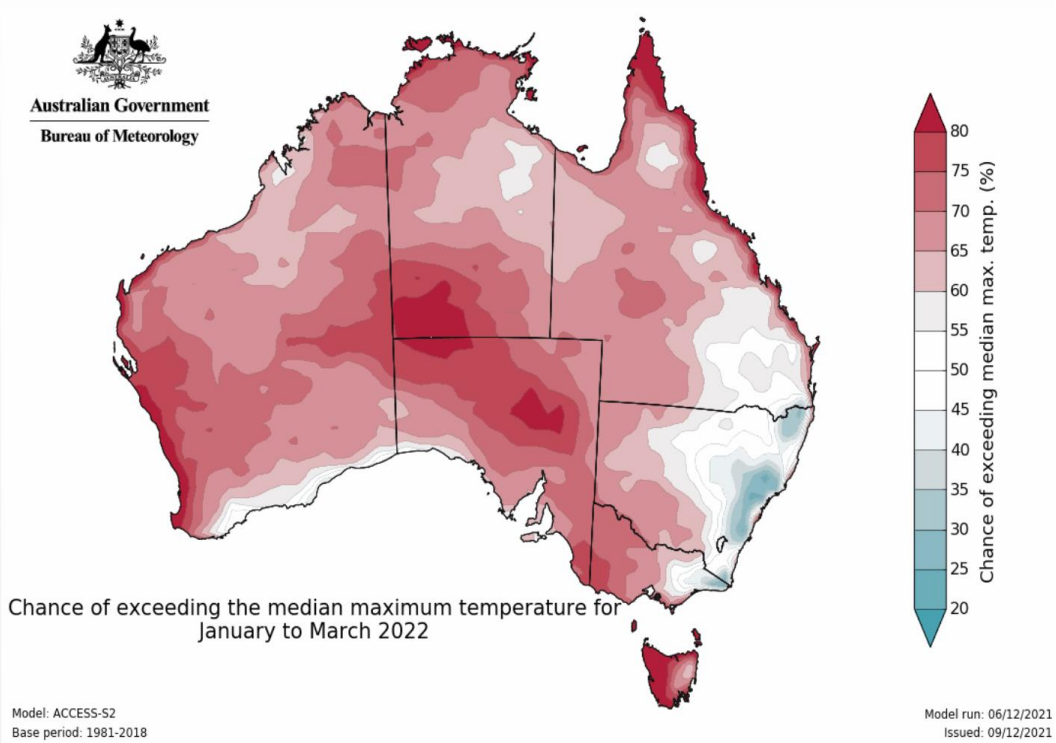
January – March rainfall prediction can be used to indicate the potential impact on habitat for the forthcoming season.



- January to March rainfall is likely to be above median for eastern QLD, east coast NSW, eastern Victoria, areas near the NSW-Victoria border, and north-east Tasmania (chance of exceeding median is greater than 60%).
- The rest of Australia has roughly equal chances of above or below median rainfall (chance of exceeding the median is close to 50%).
- There is an increased chance of unusually high rainfall (in the top 20% of historical records) for January to March in eastern Queensland, through parts of eastern NSW and eastern Victoria, and in small patches of western Queensland and western NSW (1.5 to 2.5 times the usual chance).

Source: www.bom.gov.au

January – March 2022 temperature prediction



- January to March maximum temperatures are likely to be above median for most of Australia (>65% chance), except east of the Great Dividing Range in NSW and Victoria and the WA southern coastline with a mixed or below median outlook.

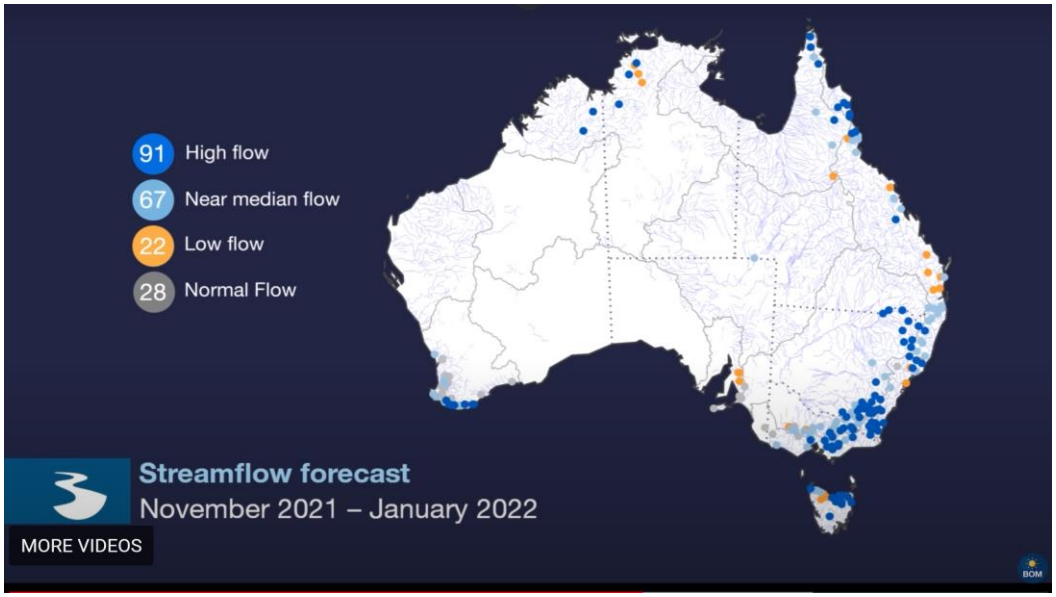
Source: www.bom.gov.au

Streamflow predictions

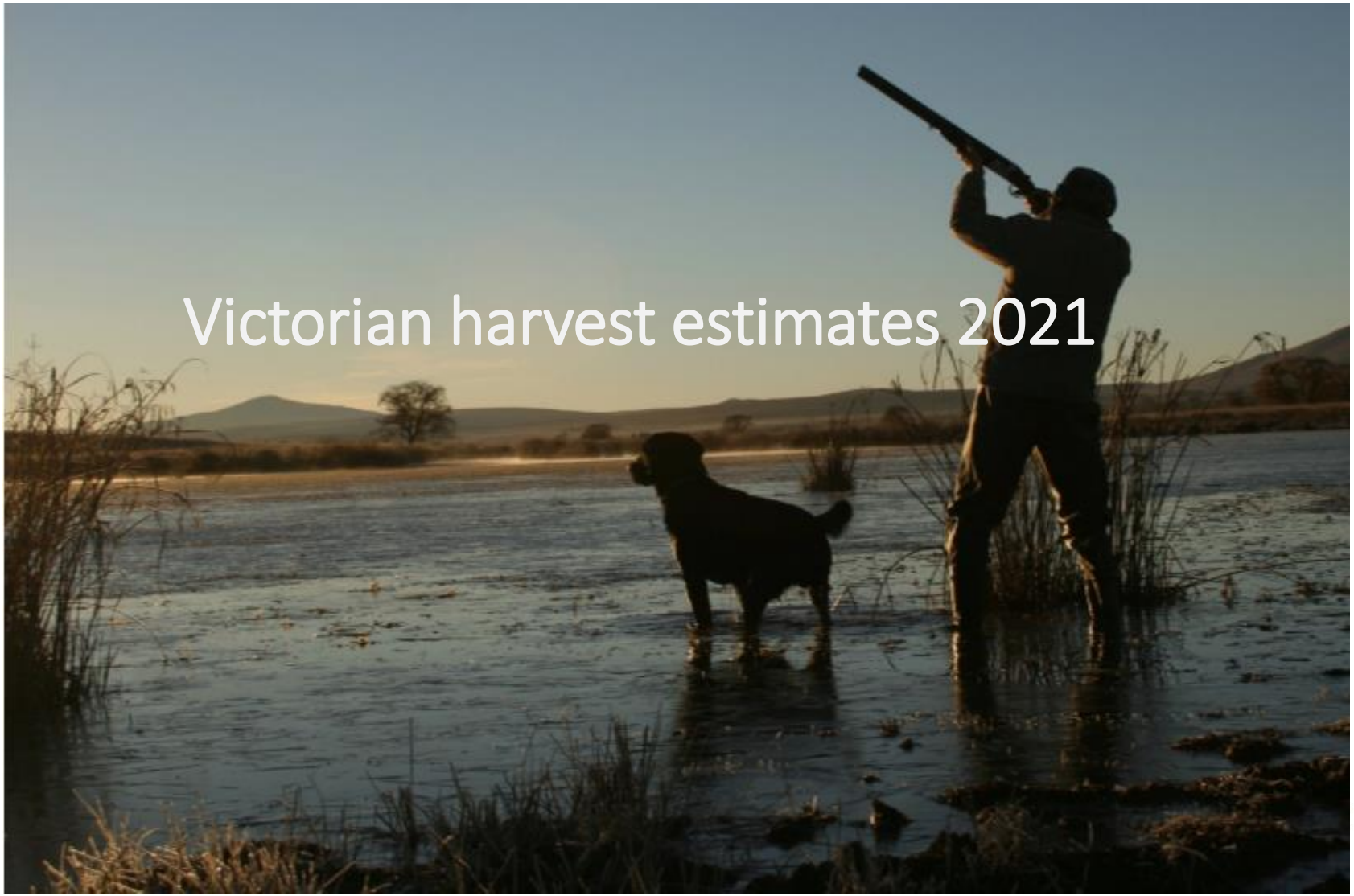
Streamflow has a direct influence on waterbird habitat extent and population abundance. Rivers and creeks provide feeding, resting and breeding habitat and provide inputs into wetlands where they have not been diverted.

Current prediction

- For November - January, near median or high stream flows are expected across most of central and eastern Victoria, and parts of southern and north-eastern NSW. Near median or high stream flows together with predicted high summer rainfall increases the risk of flooding across areas of eastern Australia which can provide waterbird habitat of varying duration depending on the extent of flooding and follow-up rains.



Source: www.bom.gov.au


Victorian harvest estimates 2021

2021 harvest estimates

Harvest statistics can provide information on the health and dynamics of game duck populations, including distribution, abundance and productivity.

- The 2021 duck season was modified, due to ongoing reduced game duck abundance. The season length was 20 days, commencing on 26 May and concluding on 14 June, and the daily bag limit was five birds. Blue-winged Shoveler could not be hunted.
- COVID-19 restrictions impeded the movement of hunters within Victoria. These restrictions and the reduced season significantly impacted on participation levels and the resultant size of the total seasonal harvest.
- There was a maximum of 24,330 Game Licence holders endorsed to hunt duck in 2021. It was estimated that 32%, or 7,785, actually hunted, each taking an average seasonal harvest of 6.8 birds.
- The average number of duck hunting days per active duck hunter was estimated to be 2.6 days.

Source: Moloney, P.D. and Flesch, J.S. (2021) *Estimate of duck and Stubble Quail harvest in Victoria for 2021.*

2021 harvest estimates cont…

- The total estimated seasonal harvest in 2021 was 52,500, the lowest recorded harvest since the telephone surveys were introduced in 2009 and less than one-sixth of the average annual duck harvests revealed by previous surveys (347,000).
- The total estimated number of duck hunting days was 19,700 and was the lowest recorded, less than one-quarter of the average annual duck hunting days in previous surveys (90,000).
- The two most commonly harvested species were Pacific Black Duck (37% of the total harvest) and Australian Wood Duck (27% of the total harvest). The remaining ducks harvested were Grey Teal (21%), Chestnut Teal (10%), Mountain Duck (3%) and Pink-eared Duck (1%) and Hardhead (<1%).
- The total harvest was estimated to be greatest in the West Gippsland CMA, followed by the North Central CMA and the East Gippsland CMA. The top five towns for the total reported number of ducks harvested were (in descending order) Sale, Bairnsdale, Heyfield, Loch Sport and Warragul.

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Long-term harvest estimates

Estimates	2009[1]	2010[2]	2011	2012	2013	2014	2015[3]	2016[4]	2017[5]	2018[6]	2019[7]	2020[8]	2021[9]	Avg 2009 - 2021
Licensed hunters	18,348	21,861	23,716	24,533	24,036	26,261	25,837	25,681	26,324	25,799	24,925	23,378	24,330	24,233
Total # hunter days	76,659	85,801	103,450	109,718	91,748	118,800	91,264	100,749	96,508	91,570	81,023	29,501	19,720	84,347
Total harvest	222,302	270,574	600,739	508,256	422,294	449,032	286,729	271,576	438,353	396,965	238,666	60,403	52,456	324,488
Average # days hunted in the season	4.0	4.0	4.5	4.6	3.7	4.6	3.6	3.9	3.8	3.6	3.3	1.26	2.57	3.65
Seasonal harvest per licence holder	11.1	12.5	26.0	21.2	17.2	17.3	11.4	10.5	17.4	15.7	9.62	2.58	2.16	13.44
Opening weekend bag per hunter	4.5	4.2	9.2	5.3	9.5	5.7	5.8	5.1	7.1	6.3	4.4	N/A	N/A	5.6*
Average # ducks per day hunted	2.7	3.1	5.7	4.6	4.6	3.7	3.1	2.6	4.5	6.4	2.9	2.05	2.33	3.71

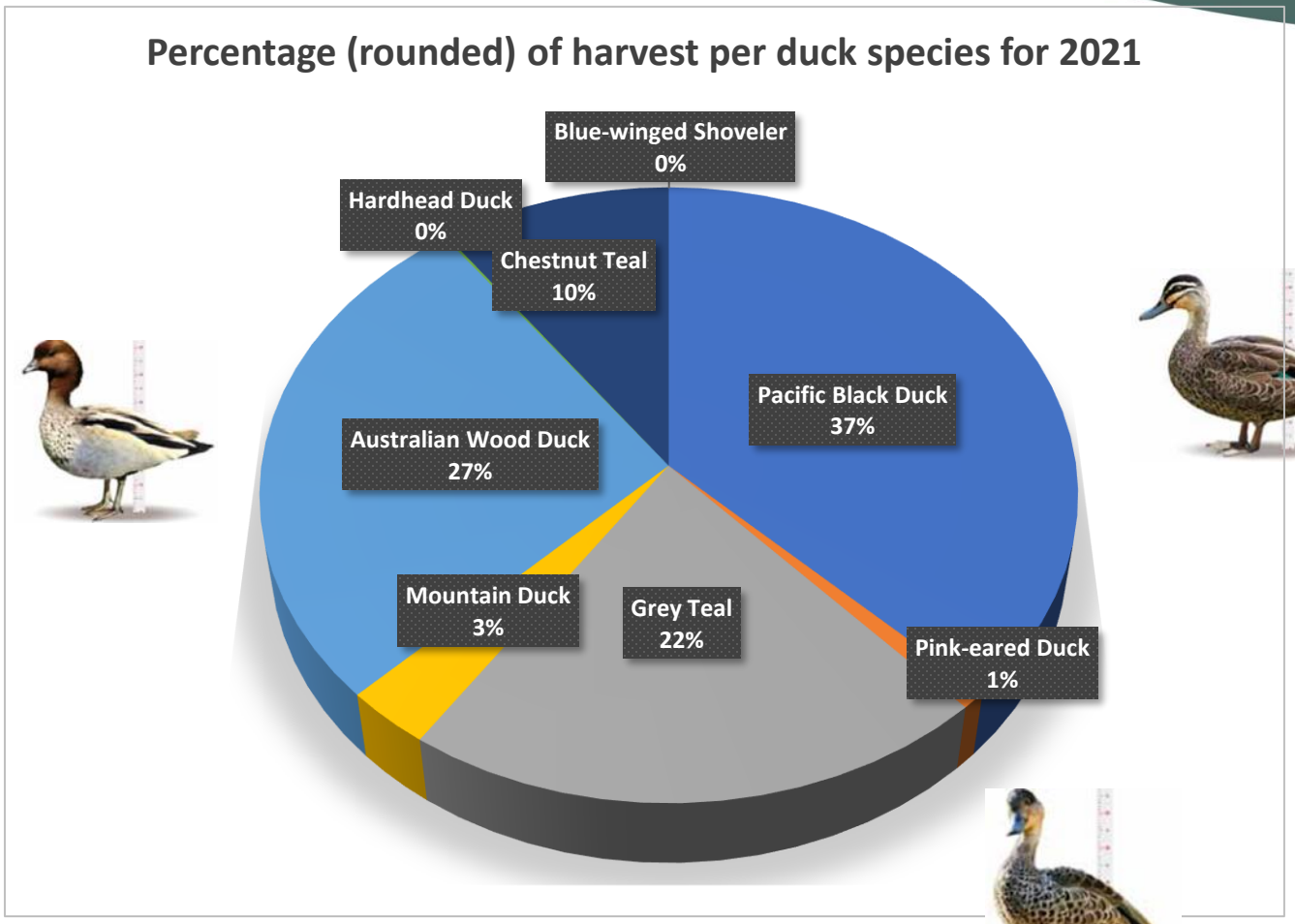
**Does not include 2020 and 2021*

Harvest estimates are at 95% confidence intervals

Modified season arrangements

1. Two (2) birds per day with an additional three (3) Wood Duck. No Blue-winged Shoveler, Pink-eared Duck or Hardhead duck (49 day season)
2. Five (5) birds per day with an additional three (3) Wood Duck. No more than 1 Blue-winged Shoveler (72 day season)
3. Ten (10) birds per day which included a maximum of two Blue-winged Shoveler on opening day. Five (5) birds per day which includes a maximum of one Blue-winged Shoveler for remainder of season (80 day season)
4. Eight (8) birds on opening day. Four (4) birds per day for remainder of the season. No Blue-winged Shoveler hunted in 2016 (87 day season)
5. Ten (10) birds per day. No Blue-winged Shoveler hunted in 2017 (87 day season)
6. Ten (10) birds per day. No Blue-winged Shoveler hunted in 2018 (87 day season)
7. Four (4) birds per day on opening weekend. Five (5) birds per day for the remainder of the season. No Blue-winged Shoveler hunted in 2019 (65 day season)
8. Three (3) birds per day. No Blue-winged Shoveler hunted in 2020 (38 day season). COVID-19 restrictions applied to travel, gathering size, no overnight camping
9. Five (5) birds per day. No Blue-winged Shoveler hunted in 2021 (20 day season). COVID-19 restrictions applied to travel and the size of social gatherings

Harvest per game species



Grey Teal, Wood Duck and Black Duck consistently make up the majority of the harvest each year. The size of the Grey Teal harvest was significantly lower than normal in 2021 and accords with the reduction in Grey Teal abundance detected during the EAWS. The Black Duck harvest was slightly higher than normal and Wood Duck slightly lower.

Source: Moloney, P.D. and Flesch, J.S. (2021) *Estimate of duck and Stubble Quail harvest in Victoria for 2021.*

Summary

Summary

- La Nina has influenced Australia's climate for the last two years, resulting in improvements in rainfall. Water storages, wetlands and waterways have benefitted, as has the wildlife that inhabits these environments. New South Wales and parts of the Murray Darling Basin in particular have benefitted. Despite these improvements, the EAWS wetland area index is at 61% of the long-term average.

- Multi-year rainfall deficiencies experienced during the 2017 – 2019 drought still remain for some parts of eastern Australia. Waterbird habitat is patchy with areas including south-east South Australia, northern Victoria, western Queensland and far western New South Wales experiencing accumulated rainfall deficiencies.

- The EAWS index of game duck abundance for eastern Australia has declined and is the third lowest recorded in 39 years, or 25% of the long-term average. Victoria's estimated total game duck abundance has increased somewhat from 2020 and total abundance has significantly increased in the NSW Riverina, an area that has benefitted from the improved rainfall over the last two years. Waterbird breeding has increased in response to the improved conditions but is still below the long-term average.

- Waterbirds, including game ducks, are widely dispersed throughout eastern Australia and in relatively low densities. Only two wetlands in the EAWS held more than 5,000 waterbirds. There is some concentration of game ducks in southern and central NSW and central Queensland.

- Waterbird abundance, breeding index, breeding species richness and habitat availability are showing continuing long-term declines throughout eastern Australia. Five of the eight game duck species are showing long-term declines.

- Most of eastern Australia is predicted to receive above average rainfall over the January to March period. As a consequence, median or high streamflows are predicted for November – January at most locations which poses an increased risk of flooding, which would benefit waterbirds.

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