Preliminary results from the 2025 survey of game ducks in Victoria and recommendations for seasonal arrangements

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Background

The Victorian government has committed to adopting Adaptive Harvest Management (AHM) by implementing a proportional harvest scheme to regulate the recreational harvest of game ducks. Proportional harvest quotas are currently set at 10% of the total population of game ducks in Victoria. Implementing a proportional harvest scheme relies on comprehensive monitoring to estimate the abundance of game ducks, which has been undertaken yearly since 2020 using statewide aerial and ground surveys (e.g. Ramsey 2020; Ramsey and Fanson 2022).

Aerial surveys of game ducks were undertaken between 21 October and 7 November 2025. Ground counts were undertaken from 13 - 30 October 2025. Monitoring was undertaken for different types of water bodies including wetlands, dams, sewerage treatment ponds, rivers and streams, which were also categorised according to size class (< 6 ha, 6-50 ha, >50 ha). Waterbodies were further stratified into four broad geographic regions in the state (North, South, East and West).

Total abundance estimates were calculated for each game species across all waterbodies within Victoria of the types specified above (the sampling frame). Estimates of the number of waterbodies of each type containing surface water were based on analysis of recent satellite imagery (Landsat and Sentinel-2). The following report provides preliminary results from the analysis of the 2025 survey data including recommendations for seasonal arrangements (daily bag limit) to achieve the 10% harvest quota for the forthcoming recreational duck hunting season. A more comprehensive analysis and presentation of methods and results will be made available in the final report.

Methods overview

1 Surface water availability

Surface water availability was estimated from analysis of Landsat and Sentinel-2 satellite imagery using the most recent images obtained prior to the survey dates, mostly within the Spring period (September – December). As part of this work all the waterbody spatial layers were updated with the latest spatial products obtained from the Victorian Wetland Inventory (VWI) (DEECA 2025). This included updates to the small farm dam layer with spatial data integrated from both VWI as well as AusDam (Malerba et al. 2021). This update included new classifications

and additional metadata for all waterbodies in Victoria. Estimates of surface water used an updated methodology based on water detection algorithms as detailed in Ramsey and Fanson (2021) with calibration of Sentinel-2 images undertaken to improve classification accuracy. Calibration used actual observations of surface water within each sampled waterbody obtained during the aerial and ground surveys.

2 Sampling of game ducks

A total of 889 waterbodies were sampled during the 2025 survey. Of these, 828 were monitored from a helicopter and 61 monitored from the ground. Both aerial and ground surveys were conducted with two observers conducting counts of game ducks at each waterbody independently. For some large wetlands subject to aerial surveys, counts were obtained from a portion of the waterbody, usually 30% (selected at random), which was then used to estimate the count for the entire waterbody. A similar method was used for ground counts where only a portion of the waterbody was monitored. Due to the adoption of the updated spatial data, some of the monitored waterbodies were required to be merged into a single waterbody due to reclassification. Following merging, data from a total of 855 individual waterbodies were subject to analysis (Table 1).

Counts of Chestnut teal on waterbodies surveyed from the ground were partitioned separately into adult male and females. These counts were then used to determine the mean ratio of male/female Chestnut teal. This ratio was subsequently used to adjust the counts of Chestnut teal counted from the helicopter, which only included observations of males. From the ground surveys, a total of 468 Chestnut teal males were observed from 23 waterbodies where at least one male Chestnut Teal was present. The mean numbers of male and female Chestnut Teal observed were 20.3 and 25.8, respectively, with a trimmed mean estimate of the male/female sex ratio of 0.85 (SD = 0.10). This meant that, for waterbodies with observations of Chestnut teal males, there were around 1.18 females present for every male.

3 Abundance estimation

The two independent replicate counts of ducks at each sampled waterbody were used to estimate the abundance of ducks at each waterbody, corrected for imperfect detection (birds missed by the observers) using a N-mixture model approach (Ramsey and Fanson 2021). Additional variables were also investigated in the model to determine if they resulted in improvements to model fit. Parameters for abundance and probability of presence were estimated separately for each duck species with a common set of parameters for the detection probability component. Models were fitted in a Bayesian framework using Stan (Carpenter et al. 2017).

Prediction of game duck abundance for the entire sampling frame (i.e. waterbodies containing water within Victoria) were estimated using a model-based approach (Thompson 1992). Further details of the model improvements and additional investigations into the predictive accuracy of the model will be detailed in the final report.

Key findings

4 Surface water availability

A total of 672 of the 795 waterbodies monitored through aerial surveys and 60 of 60 waterbodies monitored through ground surveys were observed with surface water (Table 1). Hence 14% of surveyed waterbodies were observed to be dry.

Table 1. Waterbodies sampled by aerial and ground surveys during 2025. The number of these waterbodies observed with surface water are given in parenthesis.

Waterbody type	Aerial	Ground	Totals
Dams	266 (248)	16 (16)	282 (264)
Sewage ponds	4 (4)	28 (28)	32 (32)
River/Streams	95 (94)	0	95 (94)
Wetland	430 (326)	16 (16)	446 (342)
Total	**795 (672)**	**60 (60)**	**855 (732)**

The number of waterbodies (dams, sewage ponds, wetlands and rivers/streams) categorised as containing surface water following calibration of the satellite imagery was estimated at 234,093. This was a 68 % increase compared with the estimate for the previous survey in 2024 (139,440). Overall, surface water availability in 2025 slightly increased by 9% compared to that in 2024, resulting in a total surface water area of 199,026 ha (Figure 1).

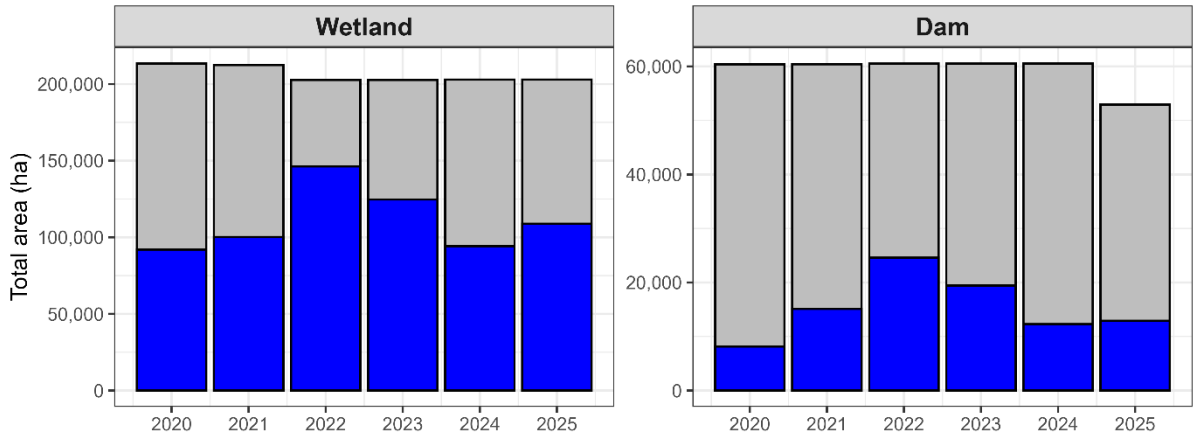

Figure 1: Temporal pattern in surface water for Victorian waterbodies over the last five years.

5 Game duck abundance estimates for Victoria

Counts for each of the eight species of game duck[1] revealed that Grey teal were the most numerous species encountered during the surveys, followed by Chestnut teal and Hardhead (Table 2).

Table 2. Total counts of each species by waterbody type. The maximum of the two counts for each waterbody was used to calculate the total. Species codes are: GT = Grey Teal; CT = Chestnut Teal; WD = Australian Wood Duck; PBD = Pacific Black Duck; AS = Australian Shelduck; HH = Hardhead; PED = Pink-eared Duck; BWS = Australasian Shoveler. *n* = number of waterbodies with surface water.

Waterbody type	n	GT	WD	AS	PBD	CT	HH	PED	BWS
Dams	264	3,918	1,359	536	1,230	1,057	1,046	642	53
Streams	94	518	1,426	10	837	205	36	0	0
Sewage ponds	32	14,755	246	1,011	699	1,455	6,131	1,866	427
Wetlands	342	33,141	2,188	4,371	4,105	14,787	1,296	793	51
Total	**732**	**52,332**	**5,219**	**5,928**	**6,871**	**17,504**	**8,509**	**3,301**	**531**

Aerial and ground survey data were adequate to estimate abundance for all eight species of duck, including the major game species (Table 3). Model-based estimates indicated that the population of game ducks on dams, sewage ponds, wetlands and streams in Victoria was approximately 4.9 M birds (Table 3). Grey teal were the most numerous game species (~1.65 M), followed by Wood Duck (~1.47 M) and Pacific Black Duck (~0.84 M). Precision of the overall estimate of abundance was good, with a 3% (0.03) coefficient of variation (CV), well within the target threshold of 15% identified by Ramsey and Fanson (2021) as being of adequate precision. However,

[1] Although a declared game species under the *Wildlife Act 1975*, the Australasian Shoveler has a year-round closed season as prescribed in the Wildlife (Game) Regulations 2024. Therefore, the species is not available for hunting.

precision of estimates for the individual game species was variable with estimates for Pink-eared Duck and Australasian Shoveler having CVs of greater than 30%.

Table 3: Summary of model-based estimates of total abundance for eight species of native duck in Victoria. SE – Standard error; CV – coefficient of variation; L95 – lower 95% confidence interval; U95 – upper 95% confidence interval.

Species	Estimate	SE	CV	L95	U95
Australian Wood Duck	1,474,600	88,000	0.06	1,318,400	1,638,200
Australian Shelduck	147,600	18,900	0.13	115,600	185,100
Australasian Shoveler	19,200	7,600	0.39	8,700	37,800
Chestnut Teal	522,000	46,500	0.09	441,900	611,600
Grey Teal	1,648,900	94,200	0.06	1,480,300	1,826,200
Hardhead	181,600	29,000	0.16	131,600	239,300
Pacific Black Duck	838,100	48,500	0.06	753,200	933,100
Pink-eared Duck	43,400	13,900	0.32	24,200	77,200
Total	**4,875,400**	**150,300**	**0.03**	**4,589,600**	**5,178,900**

6 Seasonal arrangements

Implementing the proportional harvest approach for Victoria's recreational harvest requires that the seasonal regulations regarding the daily bag limit and season length be set to achieve a 10% harvest quota. To determine how bag limits and season length relate to the total number of harvested ducks we analysed 17 years of data that recorded total harvest, daily bag limit, season length as well as the total number hunting days. The latter variable was substituted for the total number of licence holders used in previous modelling (Ramsey et al. 2025). A model was fitted with these variables with total harvest as the response and the remaining variables as predictors. This model was a superior fit to the harvest data compared with the model of Ramsey et al. (2025). We then used this model to predict the bag limit that was most compatible with achieving a 10% level of harvest (i.e., 486,000 ducks), assuming a season length of 83 days and the number hunting days set to the estimate for the 2025 season (108,600 days).

Analysis revealed that a maximum daily bag limit of 9 is the smallest value that would result in an expected proportional harvest of at least 10% (10.3% - Table 4). A bag limit of 9 would be expected to result in a total harvest of approximately 498,500 ducks (90% CI: 359,900 – 656,400), (Table 4).

A second analysis was also conducted to determine how a bag limit of 9 would affect the harvest rate for individual species. Hence, a similar model to that used for the total harvest was fitted to the harvest for individual species. For these analyses, we excluded harvest data for Hardhead as there were several years when this species was excluded from recreational harvest. Analysis revealed that a bag limit of 9 would be expected to result in harvest rates of less than 10% for Grey Teal, Australian Wood Duck, Australian Shelduck and Chestnut Teal. However, expected harvest rates for Pacific Black Duck and Pink-eared Duck were estimated to be 18% and 36%, respectively (Table 5).

Table 4 Expected total duck harvests under different bag limits, including the expected percentage of the total duck population harvested. Green shading identifies the smallest bag limit that would be expected to achieve at least a 10% quota of 485,620 ducks. These estimates assume a season length of 83 days and 108,600 total hunting days.

Daily bag limit	Expected harvest (90% CI)	Percent harvested (90% CI)
1	289,873 [193,072, 406,340]	6.0% [4.0%, 8.4%]
2	309,344 [207,259, 428,750]	6.4% [4.3%, 8.8%]
3	330,270 [228,608, 444,287]	6.8% [4.7%, 9.1%]
4	353,471 [247,107, 476,761]	7.3% [5.1%, 9.8%]
5	379,095 [269,086, 507,737]	7.8% [5.5%, 10.5%]
6	404,217 [289,646, 535,314]	8.3% [6.0%, 11.0%]
7	433,268 [312,635, 566,969]	8.9% [6.4%, 11.7%]
8	465,492 [340,477, 613,746]	9.6% [7.0%, 12.6%]
9	498,456 [359,942, 656,369]	10.3% [7.4%, 13.5%]
10	535,795 [384,870, 708,329]	11.0% [7.9%, 14.6%]

Table 5. Expected harvest for six game duck species under a proposed bag limit of 9 ducks/day. These estimates assume a season length of 83 days and 108,600 total hunting days

Species	Bag limit	Quota	Expected harvest (90% CI)	Percent harvested (90% CI)
Grey teal	9	164,890	153,440 [71,318, 286,513]	9.3% [4.3%, 17.4%]
Australian Wood Duck	9	147,460	117,738 [93,700, 146,109]	8.0% [6.4%, 9.9%]
Australian Shelduck	9	14,760	7,878 [3,119, 16,356]	5.3% [2.1%, 11.1%]
Pacific Black Duck	9	83,810	149,697 [102,382, 213,150]	17.9% [12.2%, 25.4%]
Chestnut Teal	9	52,200	30,721 [14,377, 56,865]	5.9% [2.8%, 10.9%]
Pink-eared Duck	9	4,340	15,510 [1,560, 63,772]	35.7% [3.6%, 146.9%]

7 Conclusions

The total statewide abundance of game ducks in 2025 has increased by around 22% compared with the abundance estimated in 2024. This was primarily due to the 68% increase in the number of waterbodies containing surface water compared with 2024. Based on the aggregate abundance estimate for the six game species having abundance estimates with adequate precision, a daily bag limit of 9 ducks/day under a proportional harvest scheme will result in an expected harvest of 10.3%. It should be noted that the estimates contained within this report are of a preliminary nature only and may be subject to revision in the final report. In particular, the inventory of Victorian waterbodies used for these analyses has undergone major revision this year which has resulted in many waterbodies being re-classified and/or merged. It is likely that these revisions will require a re-balancing of sample sizes of waterbodies for the different strata to be monitored for the 2026 survey.

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We acknowledge Victorian Traditional Owners and their Elders past and present as the original custodians of Victoria’s land and waters and commit to genuinely partnering with them and Victoria’s Aboriginal community to progress their aspirations.