Paper 1

Reconcile one year with the next

Independent reproduction, scientific verification and Indigenous cultural authority before irreversible intervention

A pro-Brumby scientific, ethical and policy analysis

Abstract

This paper advocates for the protection of Brumbies in Kosciuszko National Park (KNP) and opposes the killing of Brumbies as a population-management response.

The paper examines the scientific basis upon which population estimates may be used to justify management intervention, with particular attention to the reported sequence of 17,393 horses in 2023, 3,885 in 2024 and 10,309 in 2025, together with 6,393 reported removals.

The numerical sequence raises an important reconciliation problem.

The reported 2023 estimate was:

17,393

The reported removals were:

6,393

Therefore:

17,393 − 6,393 = 11,000

The reported 2024 estimate was:

3,885

The resulting arithmetic reconciliation residual is:

11,000 − 3,885 = 7,115

This paper does not describe those 7,115 horses as "missing", because such a conclusion cannot be established from arithmetic alone. Instead, the figure is identified as a reconciliation residual requiring explanation through demographic processes, movement, additional removals, survey coverage,

detection probability, sampling, model structure, methodological differences and statistical uncertainty.

The subsequent transition is also substantial:

10,309 − 3,885 = 6,424

representing an approximately 165.4% increase in the published point estimate.

Again, this does not establish that 6,424 horses physically entered the population. It establishes that the published estimate changed by that magnitude and therefore requires examination of the underlying observation and estimation processes.

Modern wildlife population science recognises that observed animals are not necessarily equivalent to all animals present. Abundance estimates depend upon sampling, detection, statistical modelling and uncertainty. Consequently, a population estimate should not be treated as an isolated number.

The proposed scientific pathway is:

field observations → detection → sampling → model → estimate → uncertainty → reconcile → independently reproduce → verify → decide

This paper adds a further principle: statistical evidence does not by itself determine cultural authority or ethical acceptability.

The author explicitly supports the Brumbies and states that, consistent with the author's Indigenous cultural beliefs and obligations, Brumbies should not be killed.

Accordingly, the policy position advanced is:

no trapping, no ground shooting, no aerial shooting and no lethal control of Brumbies.

The paper argues that population estimates used to justify irreversible intervention should be transparently documented, reconciled across years, independently reproduced and verified, while Indigenous cultural beliefs,

cultural authority and obligations concerning Country and living beings must also be genuinely respected.

The central principle is:

Reconcile one year with the next. Allow independent experts to reproduce the result. Respect Indigenous cultural authority. Verify before irreversible action. Protect the Brumbies.

1. Introduction

This paper explicitly supports the protection of Brumbies in Kosciuszko National Park.

The purpose of the paper is therefore not to construct a false appearance of neutrality.

It is to develop a scientifically rigorous argument for why Brumbies should not be subjected to irreversible lethal intervention on the basis of population evidence that has not been adequately demonstrated, reconciled and independently verified.

The central scientific question is:

Can one year's population estimate be properly reconciled with the next year's estimate?

The central reproducibility question is:

Can qualified independent experts reproduce the published result from the underlying evidence, methodology, assumptions and analytical procedures?

The central ethical question is:

Should an irreversible action be taken where the evidence used to justify that action remains materially uncertain or insufficiently reproducible?

The central Indigenous cultural question is:

Is killing Brumbies consistent with the Indigenous cultural beliefs, obligations and values that govern the author's relationship with Country and living beings?

For the author, the answer to the final question is no.

This paper therefore combines four dimensions:

1. **population science;**
2. **statistical reproducibility;**
3. **ethical decision-making; and**
4. **Indigenous cultural authority.**

2. The pro-Brumby position

The author strongly supports the Brumbies.

This is not a hidden assumption.

It is an explicit advocacy position.

The scientific analysis is nevertheless deliberately rigorous because advocacy is strongest when its factual claims can withstand scrutiny.

The principal policy position is:

Brumbies should not be killed.

This paper specifically opposes:

- **trapping for the purpose of killing;**
- **ground shooting;**
- **aerial shooting; and**
- **other lethal population-control measures.**

The argument is not that scientific evidence should be ignored.

It is that scientific evidence should be stronger before irreversible intervention is authorised.

3. Research questions

The paper addresses five questions.

Question 1

Can the reported annual population estimates be reconciled?

Question 2

What explains the numerical transition between successive estimates?

Question 3

Can independent experts reproduce the population estimates?

Question 4

How should uncertainty affect a decision involving irreversible killing?

Question 5

Can a population model, by itself, determine whether killing Brumbies is culturally acceptable?

This paper argues that the answer to Question 5 is no.

4. The three reported population estimates

The reported population estimates examined are:

Year	Reported population
2023	**17,393**
2024	**3,885**
2025	**10,309**

The sequence is therefore:

17,393 → 3,885 → 10,309

The changes are substantial.

From 2023 to 2024:

17,393 − 3,885 = 13,508

From 2024 to 2025:

10,309 − 3,885 = 6,424

The first represents an approximately 77.7% decline.

The second represents an approximately 165.4% increase.

Such changes are not automatically evidence of error.

They are evidence that the underlying measurement and population processes require examination.

5. The 2023 starting point

The reported 2023 estimate was:

17,393 horses

The evidence examined also identifies:

6,393 reported removals

The simple arithmetic is:

17,393 − 6,393 = 11,000

This figure is an arithmetic residual.

It is not asserted to be the actual 2024 population.

A real population transition can involve births, deaths, movement, additional removals, detection differences, sampling variation and statistical uncertainty.

The calculation is therefore a reconciliation starting point rather than a complete population model.

6. The 2024 comparison

The reported 2024 estimate was:

3,885

The arithmetic residual from the preceding calculation was:

11,000

Therefore:

11,000 – 3,885 = 7,115

The figure of 7,115 requires explanation.

It should not be described as proof that 7,115 horses disappeared.

The academically defensible statement is:

The arithmetic relationship between the reported 2023 population estimate, reported removals and reported 2024 population estimate leaves a 7,115-horse reconciliation residual requiring attribution.

That attribution should be supported by evidence.

7. Possible components of the reconciliation residual

The residual could potentially include:

- **births;**
- **natural deaths;**
- **immigration;**
- **emigration;**
- **additional removals;**
- **survey coverage;**
- **detection probability;**
- **sampling variation;**
- **changes in statistical methodology;**
- **changes in model specification;**
- **model uncertainty;**
- **observation error; and**
- **other population-process effects.**

The correct scientific approach is to quantify these components where possible.

8. The 2023–2024 decline

The point-estimate difference was:

17,393 − 3,885 = 13,508

Therefore, the published estimates represent a numerical decline of:

13,508 horses

The percentage decline is approximately:

77.7%

The reported removals of 6,393 represent approximately:

47.3%

of that numerical difference.

The remaining numerical difference is:

13,508 − 6,393 = 7,115

or approximately:

52.7%

of the difference between the two published point estimates.

This does not establish a biological explanation.

It establishes a quantitative reconciliation problem.

9. The 2024–2025 increase

The published 2024 estimate was:

3,885

The published 2025 estimate was:

10,309

The difference is:

10,309 − 3,885 = 6,424

The percentage increase is:

6,424 ÷ 3,885 × 100 ≈ 165.4%

This is a substantial change.

The correct scientific question is:

What combination of biological population processes and observation processes explains the transition from 3,885 to 10,309?

10. Population estimates are not direct censuses

Wildlife abundance estimation is an inferential process.

The scientific chain is:

field observations

↓

detection

↓

sampling

↓

statistical model

↓

population estimate

↓

uncertainty

An observed count is therefore not automatically equivalent to the true population.

Distance-sampling methods explicitly account for imperfect detection.

This is important because an animal may exist in the survey area without being observed.

Consequently:

observed animals ≠ necessarily all animals present

and:

estimated population ≠ necessarily direct census

11. Detection

Detection is a central component of abundance estimation.

If detection probability is less than one, observations represent only a proportion of the animals potentially available to be observed.

Detection may also vary according to:

- **terrain;**

- **vegetation;**
- **weather;**
- **observer;**
- **animal behaviour;**
- **group structure;**
- **survey platform;**
- **survey timing; and**
- **other environmental conditions.**

Therefore, annual estimates should document how detection was handled.

If detection differs between years, the apparent change in abundance may contain an observation-process component.

12. Sampling

Sampling determines which parts of the population are observed.

A scientifically transparent survey should identify:

- **survey boundaries;**
- **sampling frame;**
- **sampling units;**
- **survey effort;**
- **sampling intensity;**
- **timing;**
- **coverage;**
- **exclusions; and**
- **procedures used to extrapolate from the sample to the broader population.**

Changes in sampling design can affect comparability between years.

Therefore:

Comparing two estimates requires examination of how both estimates were generated.

13. Modelling

The model converts observations into an estimated population.

A simplified representation is:

$$\hat{N}_t = g(Y_t, S_t, p_t, \theta_t)$$

where:

- **$\hat{N}_t$ is the estimated population;**
- **Y_t is the observed data;**
- **S_t is the sampling design;**
- **p_t represents detection; and**
- **θ_t represents model parameters and assumptions.**

The model is therefore part of the evidence.

A published population number without adequate explanation of its model cannot be fully evaluated.

14. Uncertainty

Every population estimate contains uncertainty.

Relevant uncertainty can include:

- **sampling uncertainty;**
- **detection uncertainty;**
- **parameter uncertainty;**
- **process uncertainty;**
- **observation error;**
- **model uncertainty; and**
- **uncertainty arising from assumptions.**

The scientifically relevant question is therefore:

What is the estimate and how uncertain is it?

A point estimate alone is not the entire result.

15. Reconcile one year with the next

This is the principal scientific proposition of the paper.

Annual estimates should be treated as observations of a temporally connected population system.

The appropriate analytical question is:

What explains the transition from one estimate to the next?

The reconciliation should account for:

- **births;**
- **deaths;**
- **removals;**
- **immigration;**
- **emigration;**
- **detection;**
- **sampling;**
- **methodological changes; and**
- **uncertainty.**

The purpose is not to force two numbers to agree.

The purpose is to explain their relationship.

16. A population-balance framework

A simplified population model can be written:

$$N_{t+1} = N_t + B_t - D_t + I_t - E_t - R_t + \varepsilon_t$$

where:

- N_t **= population at time** ***t*****;**
- B_t **= births or recruitment;**
- D_t **= deaths;**
- I_t **= immigration;**
- E_t **= emigration;**
- R_t **= removals; and**
- ε_t **= process error and other unmodelled effects.**

But this biological equation does not completely describe an abundance survey.

An observation equation is also required.

For example:

$$Y_t = H(N_t, p_t, S_t) + e_t$$

where:

- Y_t **= observed animals;**
- N_t **= underlying population;**
- p_t **= detection;**
- S_t **= sampling process; and**

- **e_t = observation error.**

This distinction is fundamental to modern ecological population estimation.

17. State and observation processes

The underlying population is sometimes referred to as a latent or state process.

The survey provides observations of that state.

Consequently:

population process ≠ observation process

A change in observations may reflect:

- **a real population change;**
- **a detection change;**
- **a sampling change;**
- **a methodological change; or**
- **a combination of these.**

This is precisely why reconciliation is necessary.

18. Independent reproduction

The second central principle is:

allow independent experts to reproduce the result.

Reproducibility is a cornerstone of credible quantitative science.

A qualified independent researcher should be able to examine the analytical chain and determine whether the published estimate follows from:

- **the data;**
- **survey design;**
- **detection assumptions;**
- **statistical model;**
- **parameters;**
- **uncertainty procedures; and**
- **analytical calculations.**

Independent reproduction does not necessarily mean obtaining an identical decimal value.

It means being able to reconstruct and test the analytical result within the stated methodology and uncertainty.

19. What should be made available

Where legally and ethically appropriate, independent researchers should be able to examine:

1. **survey methodology;**
2. **survey dates;**
3. **survey boundaries;**
4. **sampling design;**
5. **survey effort;**
6. **observations;**
7. **detection assumptions;**
8. **detection models;**
9. **statistical models;**
10. **model parameters;**
11. **confidence intervals;**
12. **uncertainty calculations;**
13. **treatment of missing data;**
14. **treatment of repeat observations;**
15. **movement assumptions;**
16. **removal records;**
17. **methodological changes;**
18. **data-processing procedures;**
19. **analytical code where practicable; and**

20.final calculations.

The objective is not necessarily to publish the location of individual animals.

The objective is to make the analytical process independently testable.

20. Reproducibility before irreversible action

This principle becomes particularly important where population estimates are used to justify killing.

An error discovered before intervention can be corrected.

An error discovered after intervention cannot undo the physical consequence.

Therefore:

The evidentiary standard should be applied before the irreversible action, not after it.

This is the central reason for placing independent reproduction before management intervention.

21. The irreversibility principle

A population estimate can be corrected.

A statistical model can be corrected.

A spreadsheet can be corrected.

A report can be corrected.

A confidence interval can be recalculated.

But:

A Brumby killed as a consequence of an erroneous or inadequately verified decision cannot be restored by subsequently correcting the estimate.

This creates an asymmetry between statistical error and physical harm.

The asymmetry should influence decision-making.

22. Indigenous cultural authority

This paper also advances an Indigenous cultural position.

The author is Indigenous and considers the relationship between people, animals and Country to involve cultural responsibilities that cannot be reduced to population statistics.

The author's position is unequivocal:

Brumbies should not be killed.

For the author, killing Brumbies is inconsistent with Indigenous cultural beliefs and obligations concerning living beings and Country.

This is not presented as a statistical claim.

It is a cultural and ethical position.

It should therefore be considered separately from the population modelling.

23. Science cannot determine cultural permission

A statistically precise population estimate cannot, by itself, determine whether killing an animal is culturally acceptable.

A model can estimate:

- **abundance;**
- **trends;**

- **uncertainty;**
- **demographic parameters; and**
- **population trajectories.**

A model cannot independently determine:

- **cultural authority;**
- **cultural obligation;**
- **spiritual meaning;**
- **cultural responsibility; or**
- **whether killing is consistent with Indigenous beliefs.**

Therefore:

statistical certainty ≠ cultural permission to kill

and:

population abundance ≠ cultural authority

These are different questions.

24. Indigenous knowledge and scientific knowledge

Indigenous knowledge should not automatically be treated as inferior to quantitative scientific evidence.

Different knowledge systems answer different questions.

Scientific population modelling can address abundance and uncertainty.

Indigenous knowledge can provide understanding concerning:

- **Country;**
- **cultural relationships;**
- **cultural obligations;**
- **living systems;**
- **animal relationships;**
- **place;**
- **history; and**
- **appropriate conduct.**

A legitimate management process should therefore recognise both scientific evidence and Indigenous cultural authority.

25. Consultation is not the same as cultural authority

There is a substantive distinction between consultation and genuine consideration of cultural authority.

A process should not be regarded as culturally adequate merely because Indigenous people were invited to provide comments.

The relevant question is:

Did Indigenous cultural beliefs and obligations genuinely influence the decision?

If an Indigenous cultural position is that Brumbies should not be killed, that position should not simply be recorded as another submission and then disregarded without substantive consideration.

26. Cultural harm

Environmental management can produce impacts that are not captured by population models.

A model may identify a population reduction.

It cannot necessarily measure:

- **cultural loss;**
- **cultural distress;**
- **damage to relationships with Country;**
- **loss of cultural continuity;**
- **cultural offence; or**
- **infringement of cultural obligations.**

These dimensions should therefore be separately assessed.

27. The combined scientific and cultural argument

The scientific argument is:

Population estimates used to justify irreversible intervention should be transparent, reconciled, independently reproducible and verified.

The ethical argument is:

A statistical correction cannot reverse the death of an animal.

The Indigenous cultural argument is:

For the author, killing Brumbies conflicts with Indigenous cultural beliefs and obligations.

These arguments converge on a clear policy position:

Brumbies should not be killed.

28. The precautionary principle

Where there is substantial uncertainty concerning an irreversible intervention, precaution becomes relevant.

The precautionary position is not:

“Do nothing forever.”

It is:

Do not undertake an irreversible action until the evidence necessary to justify that action has been adequately tested.

For the purposes of this paper, that means:

reconcile → independently reproduce → verify → respect cultural authority → decide

before lethal intervention.

29. The same evidentiary standard for everyone

The same test should apply to every participant.

This includes:

- **government agencies;**
- **government scientists;**
- **universities;**
- **consultants;**
- **environmental organisations;**
- **advocacy organisations;**
- **Brumby advocates; and**
- **independent researchers.**

The question should not be:

Who produced the number?

The question should be:

Can the number be demonstrated, reconciled and independently reproduced?

This protects scientific integrity.

It also prevents advocacy from becoming a substitute for evidence.

30. Pro-Brumby advocacy does not require weak science

A strong advocacy position does not require abandoning scientific standards.

The strongest position is:

Protect the Brumbies and demand the strongest possible evidence.

That means demanding:

- **transparent data;**
- **transparent methods;**
- **reproducible analysis;**
- **independent review;**
- **uncertainty analysis;**
- **temporal reconciliation; and**
- **cultural respect.**

The pro-Brumby argument therefore becomes stronger when the scientific standard becomes stronger.

31. Independent audit framework

A formal independent audit should proceed through the following stages.

Stage 1 — data audit

Identify the datasets used to produce each population estimate.

Stage 2 — field audit

Determine where, when and how observations were collected.

Stage 3 — detection audit

Determine how imperfect detection was estimated and incorporated.

Stage 4 — sampling audit

Determine whether the sampling design supports the population inference.

Stage 5 — model audit

Reconstruct the statistical model.

Stage 6 — uncertainty audit

Quantify sampling, observation, parameter, process and model uncertainty.

Stage 7 — temporal reconciliation

Reconcile each annual estimate with the preceding estimate.

Stage 8 — independent reproduction

Allow qualified independent experts to reproduce the analysis.

Stage 9 — sensitivity analysis

Test reasonable alternative assumptions and model specifications.

Stage 10 — cultural assessment

Assess the proposed intervention against relevant Indigenous cultural beliefs, obligations and authority.

Stage 11 — decision audit

Determine whether the proposed management action remains justified after all evidence and uncertainty have been considered.

32. Sensitivity analysis

A rigorous analysis should determine whether the management conclusion changes when reasonable assumptions change.

Potential sensitivity tests include:

- **alternative detection probabilities;**
- **alternative sampling assumptions;**
- **alternative demographic rates;**
- **alternative movement assumptions;**
- **alternative model structures;**
- **alternative treatment of uncertainty; and**
- **alternative assumptions concerning removals.**

If a small change in assumptions produces a large change in the management conclusion, the decision is sensitive to those assumptions.

That sensitivity should be disclosed.

33. Decision robustness

The critical management question should not simply be:

“What is the population estimate?”

It should be:

“Would the proposed management decision remain justified across the credible uncertainty surrounding that estimate?”

This is particularly important where the proposed intervention is irreversible.

A decision that depends upon a single uncertain point estimate is less robust than a decision that remains justified across a credible range of estimates.

34. The 7,115 reconciliation residual

The central numerical issue can therefore be stated precisely.

The reported figures give:

17,393 − 6,393 = 11,000

and:

11,000 − 3,885 = 7,115

The academically appropriate conclusion is:

A 7,115-horse reconciliation residual remains and requires attribution through the relevant demographic, movement, removal, observation, sampling, methodological and statistical components of the population estimation system.

This is a scientifically stronger statement than claiming that 7,115 horses simply disappeared.

35. The 6,424 increase

The second transition is:

10,309 − 3,885 = 6,424

The academically appropriate conclusion is:

The published point estimate increased by 6,424 horses between 2024 and 2025, an approximately 165.4% increase, requiring examination of population processes, observation processes and methodological comparability.

This does not prove that 6,424 animals entered the population.

It demonstrates a substantial change in the published estimate.

36. What this paper does not claim

For scientific integrity, this paper does not claim:

- **that every government estimate is false;**

- **that 7,115 horses are literally missing;**
- **that 6,424 horses necessarily entered KNP;**
- **that arithmetic subtraction constitutes a complete population model;**
- **that uncertainty proves a particular estimate is wrong; or**
- **that independent reproduction must necessarily produce a different number.**

The paper instead argues that the reported transitions require transparent explanation before being used as the quantitative foundation for irreversible killing.

37. What this paper does claim

This paper claims that:

1. **the reported estimates changed substantially;**
2. **the reported removals do not, by simple arithmetic, reconcile the 2023 point estimate with the 2024 point estimate;**
3. **the resulting 7,115 value is a reconciliation residual;**
4. **the 2024–2025 point estimate increased by 6,424;**
5. **wildlife abundance estimates depend upon observation and estimation processes;**
6. **uncertainty is an integral part of population estimation;**
7. **independent reproduction strengthens scientific credibility;**
8. **temporal reconciliation is necessary to understand annual estimates;**
9. **cultural authority cannot be reduced to a population statistic; and**
10. **Brumbies should not be killed.**

38. Policy recommendation

The policy recommendation of this paper is unequivocal.

There should be:

no trapping.

no ground shooting.

no aerial shooting.

no lethal control.

The paper advocates protection of Brumbies.

Where management questions arise, the preferred approach is:

- **rigorous monitoring;**
- **transparent evidence;**
- **independent scientific review;**
- **non-lethal management;**
- **habitat and landscape assessment;**
- **Indigenous cultural assessment;**
- **ongoing evaluation; and**
- **protection of the animals from lethal intervention.**

39. The correct decision sequence

The proposed scientific and policy sequence is:

field observations

↓

detection

↓

sampling

↓

model

↓

estimate

↓

uncertainty

↓

reconcile

↓

independently reproduce

↓

verify

↓

respect Indigenous cultural authority

↓

decide

↓

intervene only where justified and culturally acceptable

For this paper, lethal intervention does not meet that standard because the author rejects killing Brumbies on cultural and ethical grounds.

40. The sequence that should not occur

The unacceptable sequence is:

estimate → intervene → kill → correct the estimate later

That approach reverses the appropriate order of evidence and consequence.

The preferred sequence is:

observe → analyse → reconcile → reproduce → verify → respect cultural authority → protect

41. Academic sources supporting the methodology

Buckland et al. (2001)

Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L. & Thomas, L. (2001). *Introduction to Distance Sampling: Estimating Abundance of Biological Populations*. Oxford University Press.

This foundational work establishes distance sampling as a framework for estimating abundance while accounting for imperfect detection.

Its relevance to this paper is direct: observed animals cannot automatically be equated with all animals present.

Buckland et al. (2004)

Buckland, S. T., Anderson, D. R., Burnham, K. P., Laake, J. L., Borchers, D. L. & Thomas, L. (2004). *Advanced Distance Sampling: Estimating Abundance of Biological Populations*. Oxford University Press.

This work develops the statistical foundations of abundance estimation, including detection functions, sampling and uncertainty.

Abadi et al. (2010)

Abadi, F., Gimenez, O., Arlettaz, R. & Schaub, M. (2010). "An assessment of integrated population models: bias, accuracy, and violation of the assumption of independence." *Ecology*, 91(1), 7–14.

This study demonstrates the importance of assessing model assumptions, bias and accuracy when integrated population models are used.

Sandve et al. (2013)

Sandve, G. K., Nekrutenko, A., Taylor, J. & Hovig, E. (2013). "Ten Simple Rules for Reproducible Computational Research." *PLoS Computational Biology*, 9(10), e1003285.

This work provides principles for reproducible computational research, including transparency of analytical procedures.

Lowndes et al. (2017)

Lowndes, J. S., Best, B. D., Scarborough, C., et al. (2017). "Our path to better science in less time using open data science tools." *Nature Ecology & Evolution*, 1, 0160.

This work demonstrates the importance of transparent and reproducible analytical workflows in ecological research.

42. Academic synthesis

The methodological literature supports several important propositions.

First, wildlife abundance is generally an inference rather than a simple census.

Second, imperfect detection must be considered.

Third, sampling design matters.

Fourth, model assumptions matter.

Fifth, uncertainty matters.

Sixth, reproducibility improves scientific confidence.

Seventh, successive estimates should be interpreted in the context of the processes generating both the population and the observations.

These principles support the central methodology of this paper:

field observations → detection → sampling → model → estimate → uncertainty → reconcile → independently reproduce → verify

43. Final conclusion

The reported KNP population estimates are:

2023 — 17,393

2024 — 3,885

2025 — 10,309

The reported removals are:

6,393

The simple calculation is:

17,393 – 6,393 = 11,000

The comparison with the 2024 estimate gives:

11,000 – 3,885 = 7,115

That 7,115 figure is a reconciliation residual requiring explanation.

The following published transition is:

10,309 – 3,885 = 6,424

or approximately:

165.4%

The magnitude of these changes makes transparent reconciliation essential.

The question is not simply whether a number has been published.

The question is:

Can the number be demonstrated, reconciled and independently reproduced?

The scientific pathway should therefore be:

field observations → detection → sampling → model → estimate → uncertainty

followed by:

reconcile → independently reproduce → verify → respect Indigenous cultural authority → decide

This paper explicitly supports the Brumbies.

It rejects the proposition that population modelling alone can determine whether killing Brumbies is culturally or ethically acceptable.

For the author, killing Brumbies is contrary to Indigenous cultural beliefs and obligations.

Accordingly:

no trapping.

no ground shooting.

no aerial shooting.

no lethal control.

The fundamental position is:

Brumbies should not be killed.

The scientific argument strengthens rather than weakens that position.

The more consequential the intervention, the stronger the evidentiary standard should be.

The more irreversible the consequence, the earlier verification should occur.

And where Indigenous cultural beliefs and obligations reject killing, those beliefs cannot simply be treated as an insignificant consideration beneath a statistical population estimate.

The appropriate principle is therefore:

1. **Reconcile one year with the next.**

2. **Allow independent experts to reproduce the result.**

3. **Verify the science with hard evidence.**

4. **Respect Indigenous cultural authority when asked to verify.**

5. **Protect the Brumbies in cultural heritage values and history.**

6. **Do not kill Brumbies because a population estimate can be revised.**

7. **A model can be corrected.**

8. **A calculation can be corrected.**

But:

Once a Brumby has been killed, no subsequent correction to a population estimate can bring that Brumby back.

That is the central scientific, ethical and cultural reason this paper calls for protection rather than any lethal control or any trapping of Brumbies Australia Wide.

9.5 The 7,115 Argument — A Reconciliation Residual Requiring Attribution

A reconciliation residual of 7,115 horses arises from the arithmetic difference between the 2023 estimate, reported removals, and the 2024 estimate.

Arithmetic Derivation of the 7,115 Reconciliation Residual	
2023 population estimate	**17,393**
Minus: reported removals (to end-2023)	−6,393
Arithmetic residual after removals	**= 11,000**
2024 population estimate	−3,885
Reconciliation residual (7,115)	**= 11,000 – 3,885 = 7,115**

Note: All figures are as reported in the cited sources (Table 3; Section 8.4).

This Paper Does Not Ask:

- "Where did the 7,115 horses go?"

This is a rhetorical question that assumes disappearance without evidence and does not advance scientific understanding.

This Paper Asks the Scientifically Harder Question:

- What combination of demographic, removal, movement, observation, detection, sampling, methodological and statistical processes accounts for the 7,115 residual?

This shifts the burden from rhetoric to reconciliation. It requires evidence, quantification, and integration across all components of the population estimation system.

Therefore, the central conclusion is as follows and is preserved here almost exactly:

"A 7,115-horse reconciliation residual remains and requires attribution through the relevant demographic, movement, removal, observation, sampling, methodological and statistical components of the population estimation system."

Source: See Table 3; Section 8.4 for primary sources and data.