Spatiotemporal Effectiveness of Aerial Baiting for Wild Dog Control: A Bayesian Analysis of Landscape-Scale Management in New South Wales

Steven McLeod

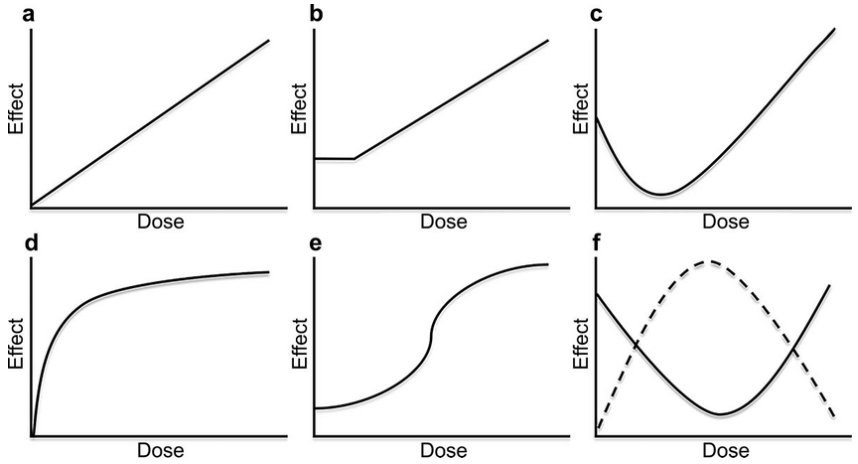
Department of Primary Industries

NSW DPIRD

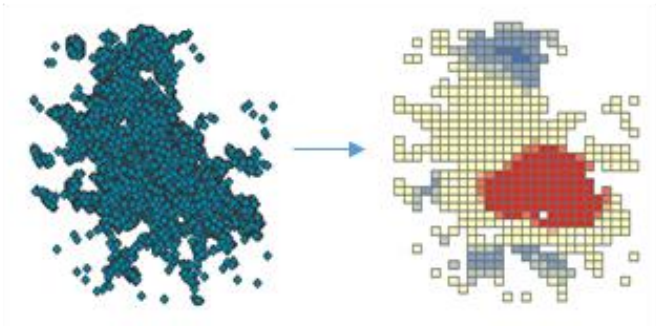
Assessment of 1080 Baiting Effectiveness in Northern Tablelands LLS

- 11-year study period (2014-2024)
- Property-level analysis of 1080 use across the Northern Tablelands LLS region
- Integration of Bayesian hierarchical and spatial statistical methods
- Key question: Does baiting intensity matter for wild dog control?

Study Objectives



- **Two Complementary Analytical Approaches:**
- **Baiting Effectiveness Analysis**
  - Quantify dose-response relationships
  - Identify habitat-based risk factors
- **Spatial Clustering Analysis**
  - Map attack hotspots and coldspots
  - Measure neighbourhood spillover effects
  - Inform landscape-scale management strategies



Key Finding 1: Strong Dose-Response Relationship

- **Higher Baiting Intensity = Fewer Attacks**
- **5% reduction in attack rates per unit increase in standardised baiting intensity**
- 95% probability that effect is real (95% CrI: 1.2% to 8.8%)
- **Quantitative evidence:**
  - Low intensity (bottom quartile): baseline attack rates
  - Moderate intensity (median): **16.3% reduction**
  - High intensity (top quartile): **31.1% reduction**
- **No diminishing returns observed** - higher rates continue to be more effective

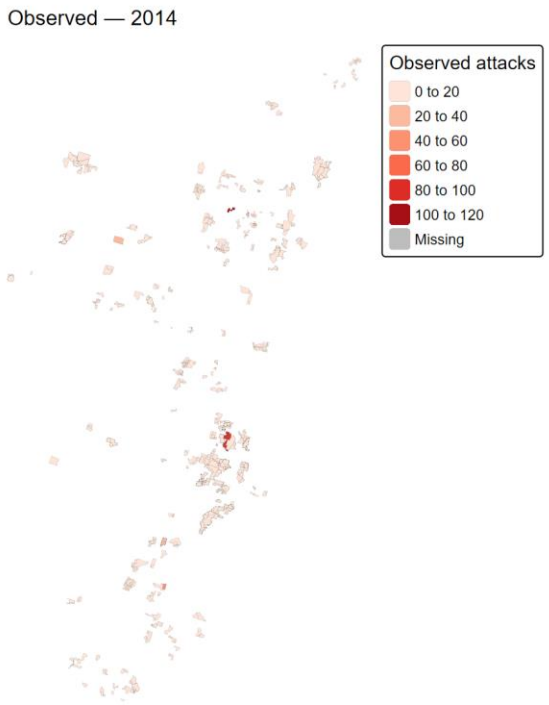
Key Finding 2: Habitat Risk Factors

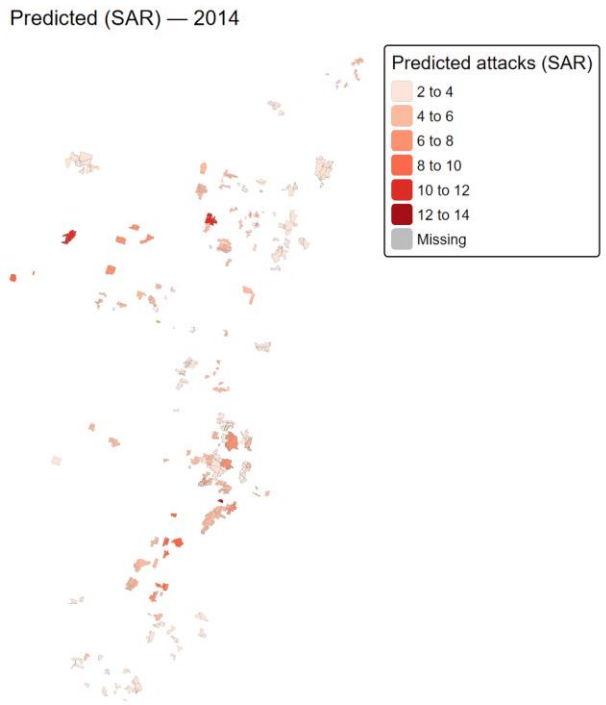
- **Living near forests (but not national parks) increases attacks.**
- If your property is within 5km of a forestry reserve, you're facing roughly double the risk.
- Looking at the actual numbers:
- **Near forest**: 1.67 attacks every 3 months
- **Away from forest**: 0.97 attacks every 3 months
- **The takeaway?** Focus management efforts on properties close to forests - that's where the risk is highest.

Model Performance & Reliability

- **The model works well.**
  - The analysis explains **67% of why attacks happen** where and when they do - that's quite good for real-world data.
- **How reliable is it?**
  - Predictions match reality closely (correlation coefficient = 0.87)
  - When tested on new data, predictions hold up well
- **One pattern to note**
  - If a location has a high risk this quarter, there's a **37% chance** that elevated risk carries over to the next quarter - attacks aren't random events.

Attacks: Predicted vs Observed



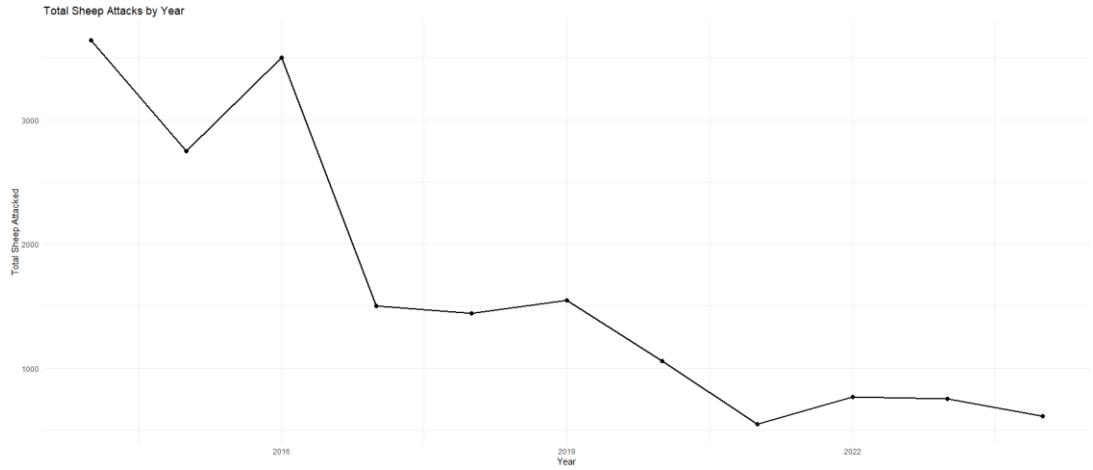


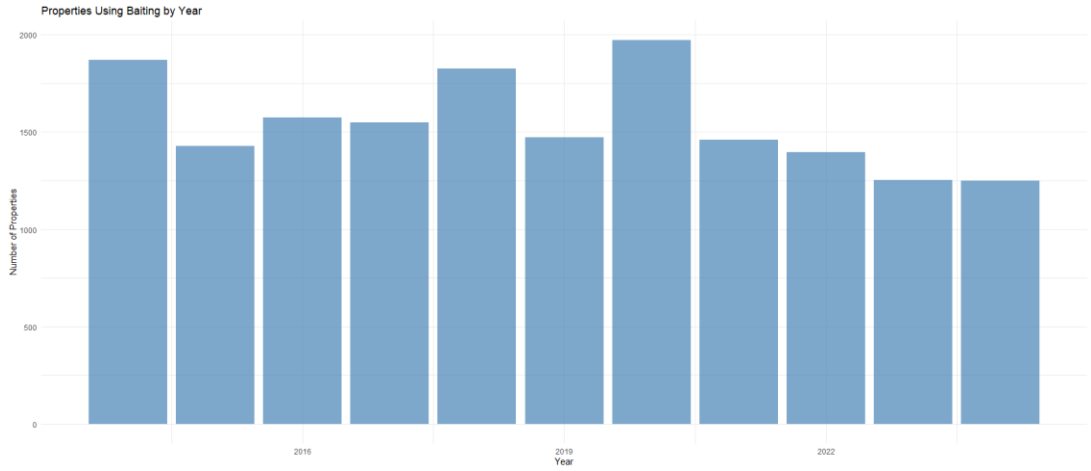
Key Finding 3: Strong Spatial Clustering

- **Attacks happen in clusters, not scattered randomly.**
- Statistical analysis strongly confirms that high-attack properties tend to be **grouped together** in certain areas, while safe properties cluster in other areas.
  - **21 "hotspot" zones** - high-risk properties bunched together
  - **31 "coldspot" zones** - low-risk properties bunched together
- Hotspot properties get hit **2.5 times more often** than average (2.97 attacks/year vs 1.19)
- **Why this matters:**
  - If attacks cluster geographically, you can't just treat one property at a time. You need to manage **entire neighbourhoods of properties or landscapes together**. Coordinated action across multiple properties will be much more effective.

Spatial Spillover Effects

- **What happens on nearby properties affects your risk.**
  - If your neighbours are experiencing attacks, your property faces a higher risk too - not huge, but it's real and measurable.
- **The numbers**
  - For every extra attack your neighbours experience, your risk goes up by about 0.18 attacks. It's a small spillover effect, but statistically significant.
- **The good news**
  - Overall, attacks are declining by about **1.75 per property per year** across the region (even after accounting for the neighbour effects).
- **Why this matters**
  - You can't fully protect your property in isolation. If your neighbours aren't managing the problem, some of that risk spills over to you. This is another reason why **coordinated programs across multiple properties** work better than going it alone.





Why Aerial Baiting Intensity Matters

- **Intensity is critical** - not just coverage
  - Linear relationship: more bait = fewer attacks
  - High-intensity achieves 31% reductions
- **Location targeting multiplies effectiveness**
  - Forest edges are high-risk zones
  - Spatial hotspots persist across years
- **Coordination amplifies impact**
  - Spillover effects between properties
  - Synchronized timing across clusters
- **Long-term commitment required**
  - Temporal persistence of risk
  - Sustained quarterly applications needed

Critical Management Implications

Evidence-Based Tiered Approach

- **HIGH PRIORITY (Intensive quarterly baiting ≥71.3 kg/km^2):**
  - Forest-adjacent properties in spatial hotspots
  - Expected outcome: **18% reduction in attacks**
- **MODERATE PRIORITY (Moderate intensity):**
  - Either forest-adjacent OR in hotspots (not both)
- **STANDARD PRIORITY (Reactive/coordinated):**
  - Low baseline risk properties
  - Focus on landscape-scale coordination

Recommendations & Conclusions

- **Aerial baiting works, but intensity and targeting matter**
- **Intensive application rates:** Don't under-dose high-risk areas
- Evidence supports moving away from extensive low-intensity coverage
- Coordinated intensive treatments in identified high-risk areas to provide the best return on investment
- Integration of spatial data enables precision wild dog management
- **Adaptive monitoring:** Track property-level AND landscape-level indicators

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