

Process Monitoring & Herbivore Impacts

Process Monitoring – Methods development

The outcome of work will help the Cairngorms Peatland ACTION Programme to have a **better understanding of factors impacting on peatland restoration** outcomes. The results will help to **inform future decision-making on how and where to restore peatlands**.

Cairngorms National Park Authority site condition and process monitoring strategy

1. Rationale
2. Restoration approaches and outcomes
 - 2.1 Key characteristics of degraded peatland
 - 2.2 Approaches to restoration
 - 2.3 Processes affecting outcomes
3. Monitoring strategy
4. Monitoring schedule
5. Post-restoration baseline survey
 - 5.1 Post-restoration monitoring overview
 - 5.2 Post-restoration sampling framework
 - 5.3 Post-restoration general baseline survey
 - 5.4 Post-restoration process monitoring
 - 5.5 Post-restoration process monitoring
6. Data analysis and reporting
 - 6.1 Herbivore impacts on restoration outcomes – focused sub-study

Appendices:

- Appendix A: Pre-work survey protocol (Detailed + HIA)
- Appendix B: Post-restoration baseline survey protocol (Detailed + HIA)
- Appendix C: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix D: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix E: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix F: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix G: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix H: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix I: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix J: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix K: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix L: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix M: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix N: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix O: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix P: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix Q: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix R: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix S: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix T: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix U: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix V: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix W: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix X: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix Y: Post-restoration process monitoring protocol (Detailed + HIA)
- Appendix Z: Post-restoration process monitoring protocol (Detailed + HIA)

Process Monitoring

Process monitoring methods have been defined to **look at the interventions that have taken place and where relevant consider why these are not working**. This entails taking a baseline immediately post-work and **tracking the condition and fate of restoration features** and their related outcomes over time so we can understand **what is impacting on them**.

A wide range of variables can affect the outcomes of standard techniques. This work aims to identify which factors play a critical role in the success of outcomes on the sites we are restoring. Some of these factors are:

- Landscape and catchment position** - site gradient, aspect, exposure
- Changes in weather patterns** - less protective snow cover to shield peatlands from winter weathering, increased intensity and duration of rainfall events, increased drought frequency and duration
- Physical weathering** - freeze thaw, frost heave, aeolian, pluvial, fluvial
- Biological and ecological controls on recovery** - length of growing season
- Herbivore utilisation and impacts**
- Direct and indirect effects of land-management**

Alongside detailed desk-based assessment we take site-based measurements to help our understanding such as:

- Quality of material available and used** - turve composition and rigour, underlying substrates, peat condition
- Physical size and nature of features restored** - slope angles, orientation in the features, aspect, exposure
- The quality of the work carried out relative to the specification**
- Extent of site use by herbivores** - grazing, passage, residency
- Changes in hydrology** - water retention and flow effects
- Rates of vegetation colonisation or loss**
- Signs and extent of impacting factors** - animal passage damage, vegetation offtake, new erosion, reduction in vegetation cover, degradation of features



Camera Array Monitoring

Can be used to help understand **factors that affect peatland restoration sites** eg frequency of inundation, scale and intensity of water flow, duration and extent of snow cover.

Also show us **how herbivores use sites after restoration** eg how they access areas and key behaviours such as sheltering, residency, wallowing, browsing and passage.

CNPA has set a **Park-wide target of 5-8 deer per km²**. Some estates are close to, or below this already, but a lot still need to effect a big change.

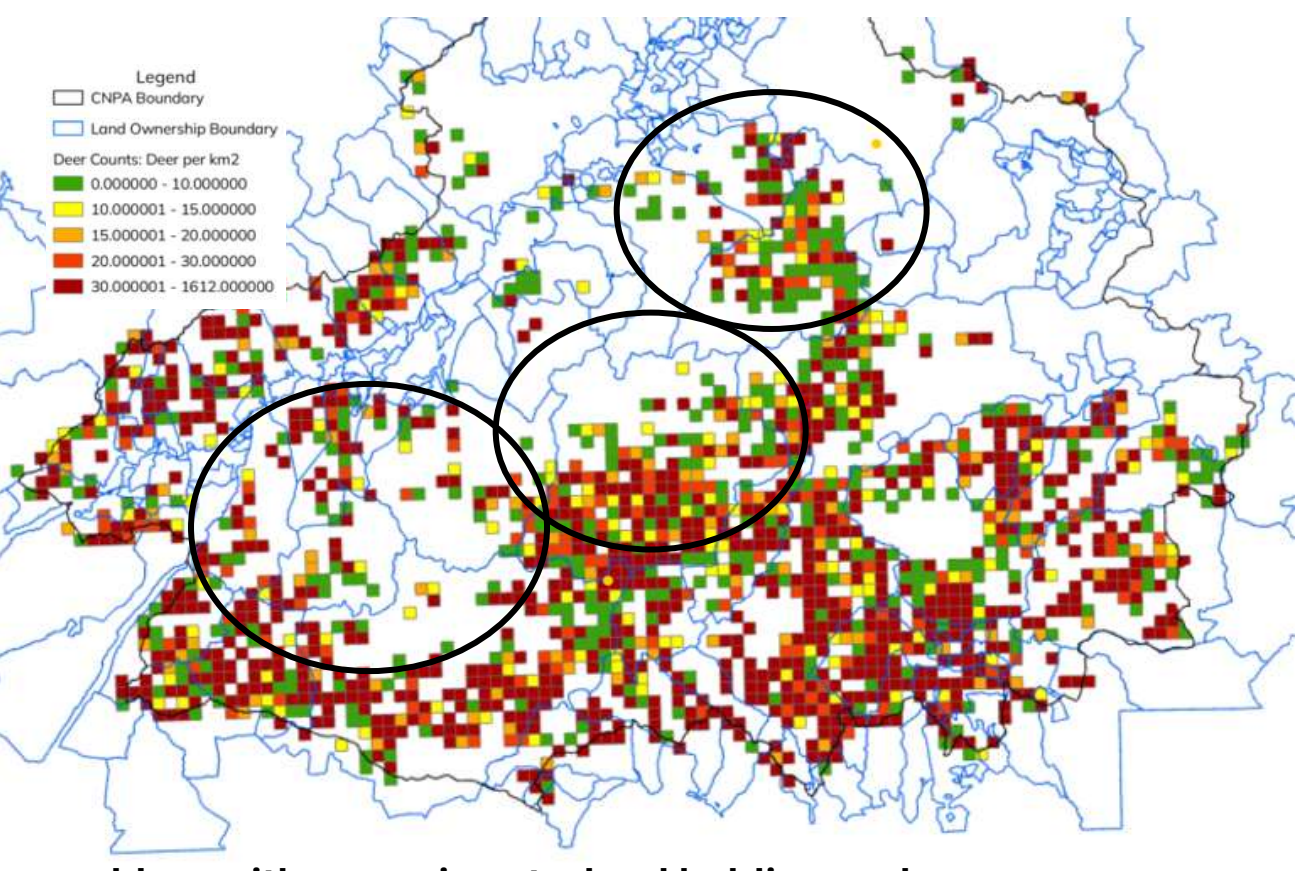
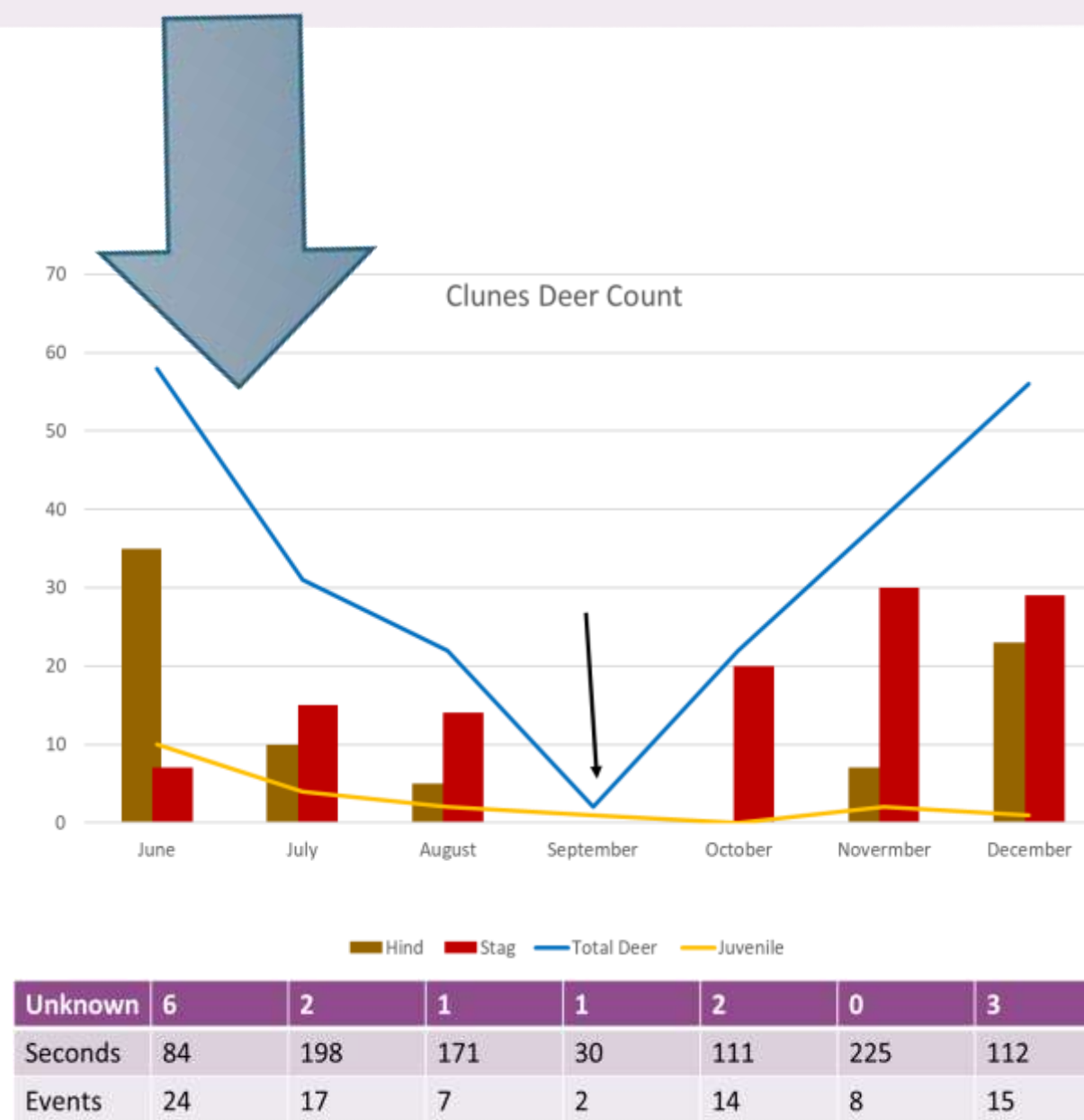
Reducing the impacts of deer and other herbivores across the Park will help woodland to expand, heather loss to be reversed, **peatlands to recover** and biodiversity and landscape enhancements to take place.

But even where count numbers are low herbivores can still impact on restoration site outcomes. Using this work, we hope to define a relationship between Herbivore Impact Assessment Data and impacts on restoration outcomes. This would allow HIA to be used to determine if restoration should be carried out.

This will be much better than using **count data** which imply that **animals average themselves out** across the landscape area assessed.

Set-Up

Arrays of post-mounted Bushnell trail cameras. Set to take 12 photos every day at fixed times. Plus, triggered movement video of 20 seconds. Placed in association with process monitoring points.



The problem with averaging at a land holding scale:
Black circles are zones with deer densities <5 per km², but this 2021 count data still shows counts of >30 per km² within these areas. This is partly because counts are carried out over winter when deer are clustered in less of the land area. Many areas need to effect a big change before restoration work is viable. There is a similar picture nationally across much of our uplands.



Camera Monitoring Summary: Red deer on Atholl Clunes

Total: 230 deer across 87 'events', an average of 2.6 deer per event. 115 males, 80 females, 20 young, 15 unknown
Ratios: M:F:Juv full period 1: 0.7: 0.17 June to Sept: 1: 1.38: 0.47 Oct to Dec 1: 0.38: 0.04
Behaviours: 7 Running events 2 Dust Baths All in June (mostly females and juveniles)
Seasonality: Spring: Red deer follow vegetation green-up up the elevation gradient. Winter: Deer come down off the hill for shelter. Clear shift during birthing and rut.

