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# Pellet counts of herbivores in heath and meadow

## Motivation

Willow thickets and adjacent meadows constitute hot spots for biodiversity in the otherwise barren tundra. They are important habitats for willow ptarmigan and small rodents, especially Root voles, but also lemmings in peak years. They also constitute important summer feeding habitats of reindeer. A third species of small rodents, the Gray-sided vole, reside in the dominant landscape element, the heath. The heath also constitute important habitat for willow and rock ptarmigan (at higher altitude). Herbivore abundance recording in heaths and meadow is part of the ptarmigan module monitoring of interactions between climate, small rodents, reindeer, ground-breeding birds (e.g. ptarmigan) and willow thicket vegetation.

***State variables:*** Pellet counts in heaths and meadows are used as evidence of recent activity of small rodents and especially for calculating presence and abundance of ptarmigan and ungulates (Reindeer and Moose).

***Reference to method:*** first publication of these data can be found in Henden et al., 2011 (Basic and Applied Ecology).

## Spatial study design

The intensive design includes five river valley sections (see table below). Each river valley section has 4-6 sites per habitat (meadow, heath near productive habitats, heath far from productive habitats).

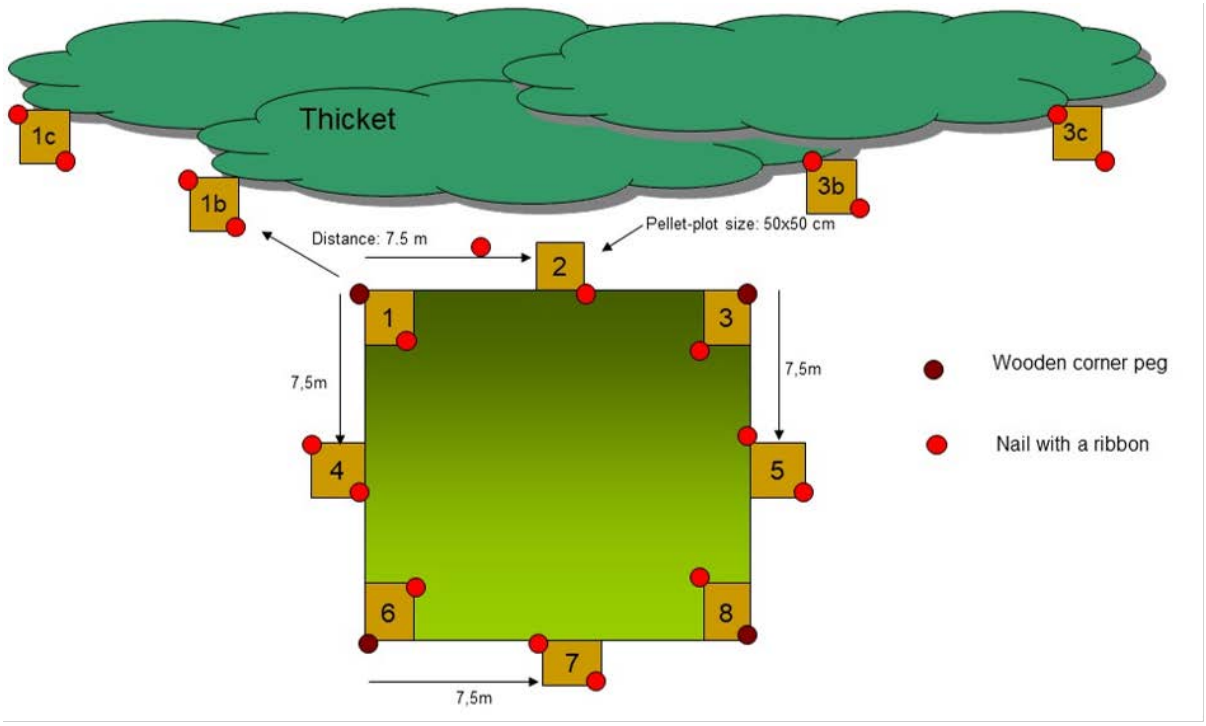
The complete list of siteIDs included in the current data collection is:

| locality | section | site_id |
|---|---|---|
| komagdalen | komagdalen_ovre | ko_ko_m_a, ko_ko_m_b, ko_ko_m_c, ko_ko_m_d, ko_ko_m_e, ko_ko_hn_a, ko_ko_hn_b2, ko_ko_hn_c, ko_ko_hn_d2, ko_ko_hn_e, ko_ko_hf_a, ko_ko_hf_b, ko_ko_hf_c, ko_ko_hf_d, ko_ko_hf_e |
| komagdalen | komagdalen_midtre | ko_km_m_a, ko_km_m_b, ko_km_m_c, ko_km_m_d ko_km_m_e, ko_km_hn_a, ko_km_hn_b, ko_km_hn_c, ko_km_hn_d, ko_km_hn_e, ko_km_hf_a, ko_km_hf_b, ko_km_hf_c, ko_km_hf_d, ko_km_hf_e |
| komagdalen | sandfjorddalen | ko_sa_m_b, ko_sa_m_c, ko_sa_m_d, ko_sa_m_e, ko_sa_m_f, ko_sa_hn_b, ko_sa_hn_d, ko_sa_hn_e, ko_sa_hn_f, ko_sa_hf_a, ko_sa_hf_b, ko_sa_hf_c, ko_sa_hf_d, ko_sa_hf_e |
| vestre jakobselv | torvhaugdalen | vj_to_m_a, vj_to_m_b, vj_to_m_c, vj_to_m_d, vj_to_hn_a2, vj_to_hn_b2, vj_to_hn_c, vj_to_hn_d, vj_to_hf_a, vj_to_hf_b, vj_to_hf_c, vj_to_hf_d |
| vestre jakobselv | bearaveaijohka | vj_be_m_a, vj_be_m_b, vj_be_m_c, vj_be_m_d, vj_be_m_e, vj_be_hn_a, vj_be_hn_b, vj_be_hn_c2, vj_be_hn_d2, vj_be_hn_e2, vj_be_hf_a, vj_be_hf_b, vj_be_hf_c, vj_be_hf_d, vj_be_hf_e |

These sites are in the file “V_ptarmigan_pellet_abundance_intensive_coordinates_2021.txt”.

**Design within-site**: Each site has a permanently marked 15*15m sampling grid. In general, 8 pellet plots (50x50 cm) are distributed around the 15x15 m sampling grid according to figure 1 (i.e. orange small squares). In meadow plots, pellet plots 1-3 are located along the thicket edge from right to left standing with your back in the thicket in the case of meadow plots. Note that in Sandfjorddalen the river has the same function in the location of pellet plots in meadows as the willow thickets. In the heath habitat, the pellet plots are located in the same manner as the meadow plots (figure 1, lower panel); starting with pellet plot 1 in the lower right corner when situated with your back towards the thicket/river catchment etc. In each corner of the sampling grid (15x15m) the pellet plots (50x50 cm) are located inside the sampling grid (i.e. plots 1, 3, 6 and 8), whereas one plot is located on the outside at the mid-point of each of the four sides of the sampling grid, i.e. 7.5 m from the corner (figure below). Two of the corners of the pellet plots are marked with either nails with ribbon or they share the same marking pin as the grid corners (figure 1).

In addition, there are four more pellet plots along the **thicket edge** in the meadow grids (figure 1, upper panel), two on each side of the sampling quadrat. They are spaced 7.5m apart, one meter into the thicket. These faecal plots are named 1b, 1c (outwards from faecal plot 1), and 3b and 3c (outwards from faecal plot 3). NOTE; these pellet plots are established only in areas with willow thicket (to monitor ptarmigans). Therefore, they do not exist at Sandfjorddalen, which is devoid of erect thickets.



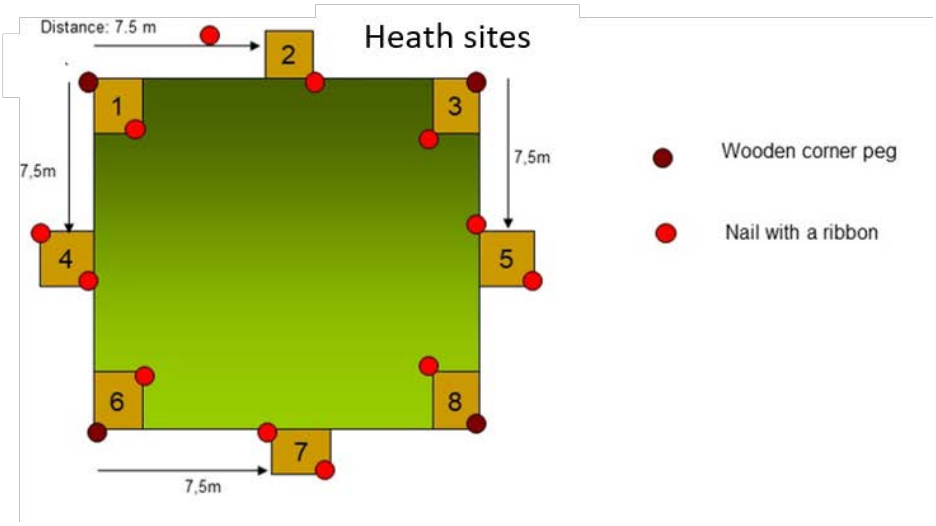




Figure 1: pellet count plots at a meadow/thicket site and at a heath site.

**Temporal study design**

The counts are conducted twice per year, soon after snowmelt (during 02.- 04.07.) and in early autumn (01.- 03.09).

**Procedure**

For sampling the pellet plots a metal frame (~50x50 cm) is placed on each pellet plot. Number of pellets of different herbivores are recorded to species, and all but rodent feces are thereafter removed.

**Equipment needed**

- Metal sampling frame (50*50 cm)
- Notebook, pencil
- Measuring tape (30 or 50 m long), to locate plots that are difficult to find
- A couple of new wooden poles (to replace the broken ones), 5 inch nails and blue marking tape

**Information recorded in the field**

**For each snow bed, record:** sampling date, observer

**For each subplot within the removal plot, record:**

- For each site, record the date and observer. For each plot, record number of pellets of different species. For rodents, register only **presence/absence** of new activity, such as fresh clipping of the vegetation along pathways or in burrows. With new activity, we mean activity that appears so new that it has occurred within a week or two. We do not record pellets as a sign of fresh activity. For reindeer, we may find clumps of faeces that are quite difficult to transform to individual pellets. In that case, one **clump** is assumed to contain approximately 20 pellets and therefore transformed and added to the number of individual pellets before noted.

**Data processing**

All field observers are in charge of typing their data into digital format (unless otherwise agreed with the data set responsible).

Template datasheet is available from John-Andre Henden. Follow the datasheet exactly; use exactly the same column names, large/small letters, for factorial values do not add new categories etc.

After completing a data file in excel (one datafile per year and locality), it should be saved as txt-file. Thereafter (unless otherwise agreed), data files are sent to dataset responsible (John-Andre Henden) who will quality-check them and store them in COAT data portal.

**Training requirements and specialized skills**

Field workers must be able to reliably identify the relevant herbivore species feces. See appendix. New field observers must work in teams with more experienced observers until this skill has been duly acquired.

**Appendix: herbivore feces**

Reindeer

Reindeer clump

Ptarmigan

Lemming/ Vole

Moose


Hare