Remark SNP 5.2.2009:

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Data from Alp Stabelchod

The dataset consists of four excel-files (Site_gridcells, Veg_antmound, Veg_gridcells, Seedbank). The following people were involved: Gérald Achermann, Majid Iravani, Anita Risch, Martin Schütz, Conny Thiel-Egenter (all WSL), Eliane Leuzinger (Univ. Zürich) Ramona Maggini (Univ. Lausanne).

Site_gridcells

A grid of 268 cells (20 m x 20 m) encompasses the entire grassland Alp Stabelchod (Achermann 2000), which is used for all the studies concerning spatial pattern on this particular grassland. The four edges of each cell were marked with stakes.
The aerial photograph (Fig. 1) presents the names of the gridcells (according to Achermann 2000) in pink while the stake numbers (in red) correspond to the system of the GIS SNP. Blue numbers represent stakes where the original stake of Achermann was not found anymore and the position of the stake had to be reconstructed.

Succession pattern were derived from i) the vegetation relevées sampled in each of the 268 gridcells (Achermann 2000) and ii) the succession pattern observed on permanent plots. The following table gives the probability of each species to belong to one of six distinctive succession stages. For more detailed descriptions, see Schütz et al. (2000a, b).

Phosphorus (P) cycling: The P content of the soil was determined in 1997 in each of the 268 gridcells on Alp Stabelchod (see methods in Achermann 2000). P pattern seems still to reflect the former agricultural use of the grassland as a partly irrigated cattle pasture, since gridcells that were irrigated before the Park foundation were found to have higher soil P pools than not irrigated gridcells (Achermann 2000). The amount of deer droppings per gridcell was estimated by Achermann (2000), whereas the amount of dry biomass consumed by deer was measured by Thiel-Egenter (2007). Phosphorus (P) content of both deer droppings (Achermann 2000) and leaf tissues (Thiel-Egenter 2007) combined with deer dropping and biomass consumption pattern were used to model P input and removal by red deer (Schütz et al. 2006).

Vegetation structure was sampled in each of the 268 gridcells (Achermann 2000). Cover of short-grass, tall-grass, trees, shrubs, and bare soil was estimated for the whole gridcell measuring 20 m x 20 m. The other parameters concerning species composition (cover of graminoids, herbs, legumes and species richness) were derived from the vegetation relevé data (see excel-file and chapter Veg_gridcells), i.e. estimated for a 1m x 1m plot located in the center of each gridcell (Achermann 2000).

Productivity pattern were collected in selected gridcells (Fig.2). For detailed information about criteria and all the methods used, see Thiel-Egenter et al. (2007). These data were used combined with data about vegetation structure of all the 268 gridcells (Achermann 2000) to model productivity and consumption pattern for all the gridcells (see Schütz et al. 2006).

Ant mounds of *Formica exsecta* Nyl. were counted in 1997 (Maggini 1999) and 2007 (Schütz und Risch unpubl.) in each of the 268 gridcells covering the grassland Alp Stabelchod (see Achermann 2000). The largest and smallest diameter as well as the height of each mound was also measured in both surveys. Mound volume data, however, are avaiable for the 2007 survey only.

Deer grazing pattern was directly observed on Alp Stabelchod in summer 1998 (for methods see Leuzinger 1999). The spatial reference for the deer observation was the systematic grid of 268 cells established by Achermannn (2000). The gridcells, which were not included in the observation study (=not visible from the cottage), are assigned with “N” in the column “Deer observation area” (see also Fig. 3). Number of deer droppings per gridcells as well as dropping weight were sampled in 1997 (Achermann 2000) and dry biomass consumed in 2001 by Thiel-Egenter (2007). Phosphorus (P) content of both deer droppings (Achermann 2000) and leaf tissues (Thiel-Egenter 2007) combined with deer dropping and biomass consumption pattern were used to model P input and removal by red deer (Schütz et al. 2006).

Veg_gridcells

A subplot 1 m x 1m was established in the centre of each of the 268 gridcells covering the grassland Alp Stabelchod (see Fig. 1). Vegetation relevés (Braun-Blanquet 1964) were sampled on each of those subplots from July to September in 1998 by i) identifying all plant

species growing in the subplot and 2) estimating the cover (%) of all the plant species (Achermann 2000). Nomenclature follows Hess et al. (1984).

Veg_antmound

We randomly selected 46 ant mounds on Alp Stabelchod with a diameter < 50 cm for a vegetation survey. 13 circular (diameter = 30 cm) vegetation relevés were sampled from each ant mound on four transects from the mound center into the grassland surrounding the mound. One relevé was sampled in the centre of the mound, four at the mound edge in each cardinal direction, four at a distance of 50 cm from the mound edge and another four at a distance of 100 cm (for more details see Schütz et al. 2008).

Seedbank

Grassland soil and ant mound cores were collected in 24 randomly selected gridcells (Fig. 4). Seven grassland soil cores (4.8 cm diameter, covering overall 126.6 cm^2 of the soil surface, 10 cm depth = overall volume of 1260 ml) including both the organic (litter) and mineral soil layer were systematically taken with a core sampler along a 20 m transect located 2 meters from the western edge of each of the 24 grid cells. Two ant mound cores of 200 ml (covering 32.88 cm^2 of the soil surface) each were taken from the mound that was located closest to the grid cell center.

All the cores were collected immediately after snowmelt at the end of May 2006, assuring that the seeds were stratified during the previous winter.

The samples were spread in thin layers (< 1 cm) on trays filled with sterilized woody substrate serving as moisture reservoir. The trays were randomly placed on shelves in a green house chamber and their positions were randomly changed every second week to prevent microclimatic effects on seed germination. The trays were illuminated with natural light, shaded from bright sunlight and watered daily with tap water. Five additional trays containing only woody substrate were used as a control to test for seed contamination of the substrate.

Seedlings were counted and identified as soon after germination as possible and were then removed from the trays. At the end of September 2006 all samples were crumbled and remained spread out in the tray for another two months to enable buried seeds to germinate. No attempt was made to assess the number of dormant seeds possibly remaining in the

samples.

The tables give data of the number of seeds found in the seven pooled samples of the two grassland soil layers (=126.6 cm2 surface area and 1260 ml volume) and the two pooled ant mound samples (=32.88 cm2 surface area and 400 ml volume). Data for comparisons between the various seed banks should therefore base on e.g. number of seeds m^{-2}. For further details see Schütz et al. (2008).

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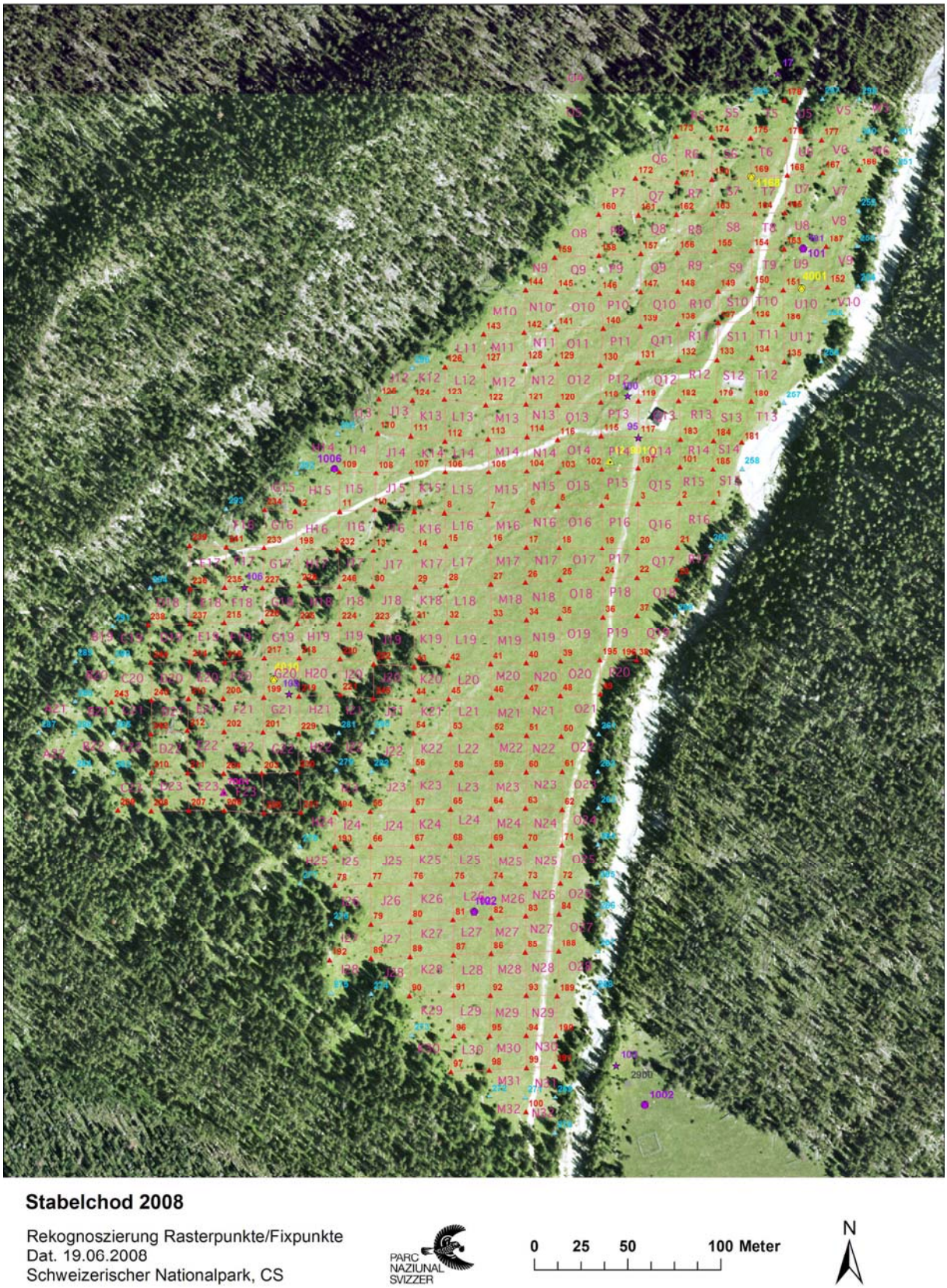

Fig. 1. The systematic grid on Alp Stabelchod consisting of 268 gridcells (Achermann 2000).

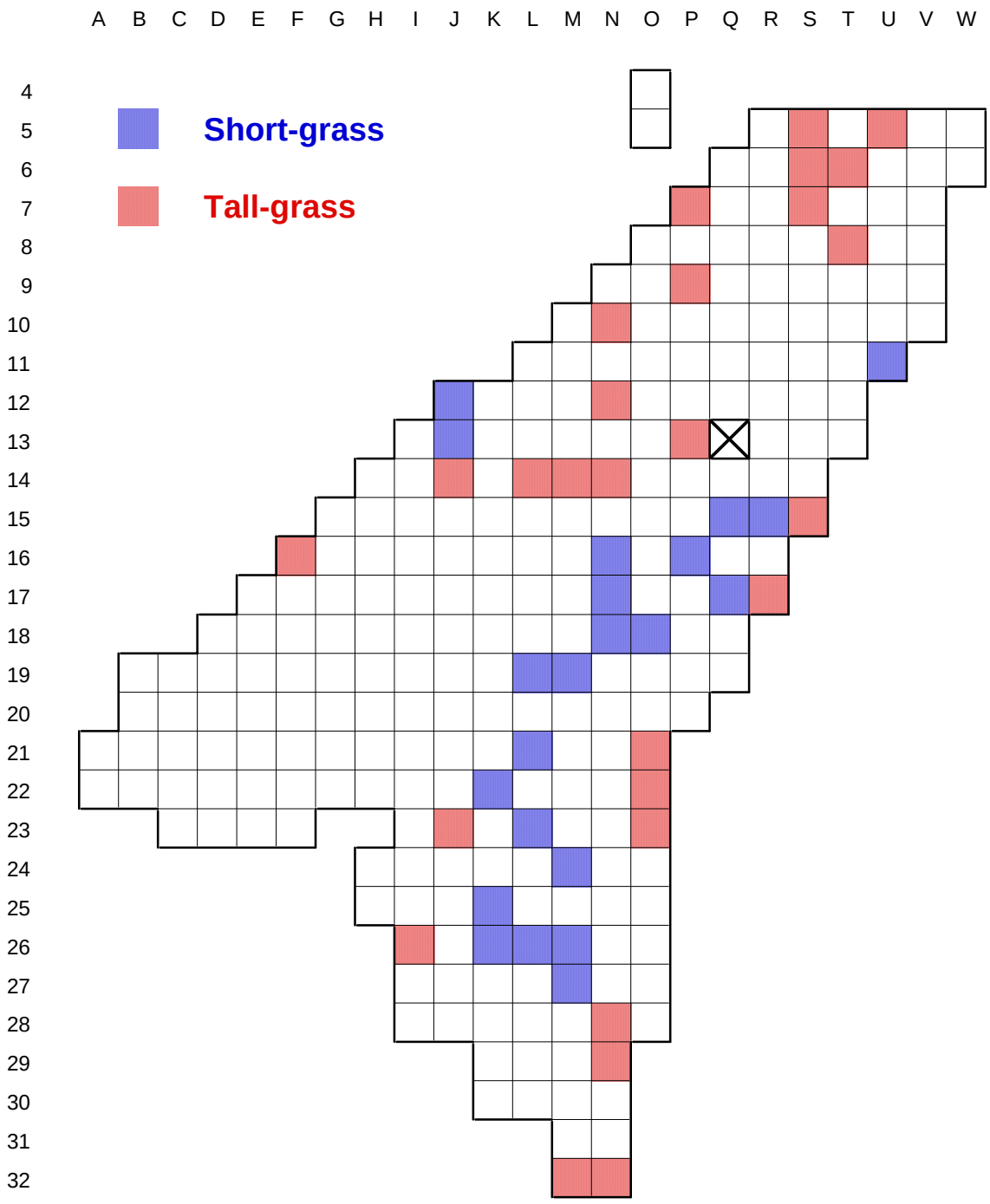

Fig. 2 Selected gridcells for the productivity study (Thiel-Egenter et al. 2007)

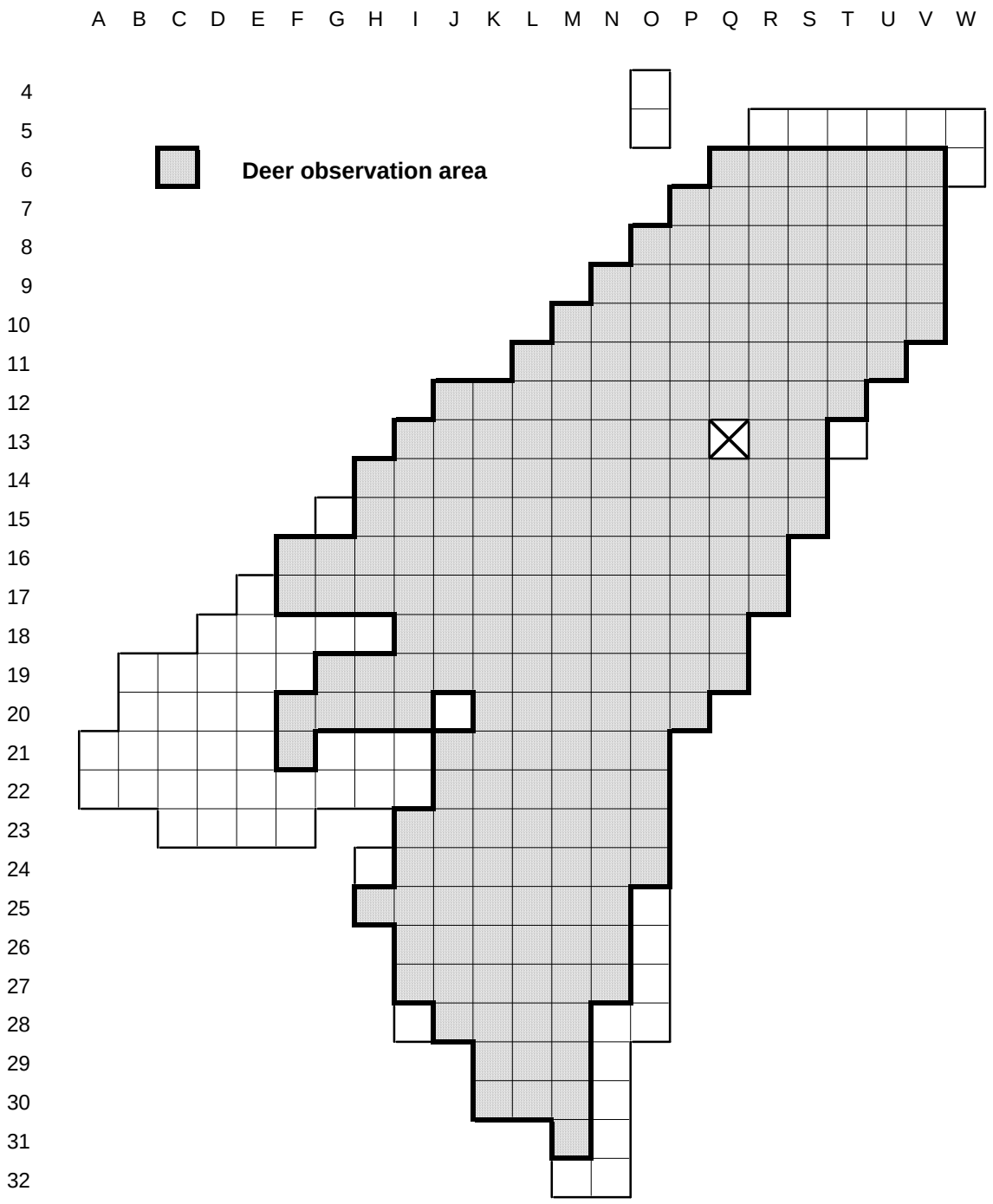

Fig. 3. Gridcells of the deer observation area (Leuzinger 1999), which were visible from the Stabelchod cottage.

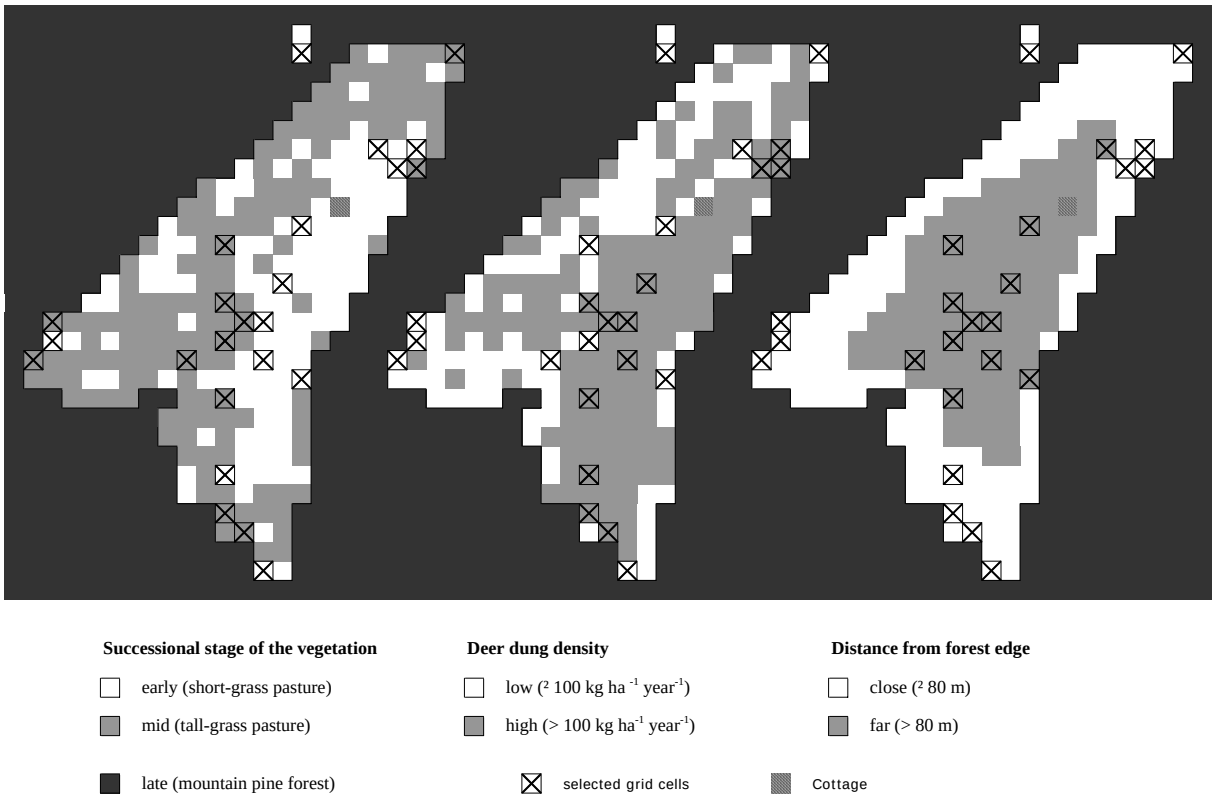

Fig. 4. Selected gridcells for the seed bank study (Iravani submitted).