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Appendix 1

Description of field methods for the Grandcour Experiment

We set up a multitrophic experiment in spring 2007 (May–June) by sowing experimental wildflower strips. The experimental fields were located around the village of Grandcour, Switzerland (46° 52' N, 6° 56' E, elevation 479 m a.s.l.). According to the Bundesamt für Meteorologie und Klimatologie MeteoSchweiz the annual precipitation in the region is 941 mm while the local mean annual temperature is 10.1°C. The landscape is a mosaic, typical for the Swiss lowland, where agricultural elements are interspersed with small traditional fruit orchards, gardens, forest patches and grassland. Soils can be classified as cambisol/arenosol and calcaric cambisols (Ducommun Dit-Boudry 2010).

Experimental design

The 12 wildflower strips (72 × 9 m or 108 × 6 m, 648 m^2) were each equally divided into three trophic treatments: 1) control (*C*, without fence), 2) vertebrate predator exclusion (*PE*, 25 mm mesh fence), and 3) vertebrate predator and major herbivore exclusion (*PHE*, 8 mm mesh fence). The full details of the experimental design are already published, and can be found in Bruggisser et al. (2012) and Fabian et al. (2012). Within each field treatment order was randomly assigned. We further divided each treatment into 4 subplots of 54 m^2 (6 × 9 m), which we then assigned to one of four plant species richness levels. This yielded a total of 144 subplots.

The species pool for the seed mixtures contained 20 plant species that are part of the wildflower mixture used in Swiss nature restoration schemes (Haaland et al. 2011, Haaland and Bersier 2011). The mixtures consisted only of species of the tall herb functional group (Roscher et al. 2004) (Table S1), as we excluded two legumes, a small herb species, and an exotic species, which are present in the conventional mixture. We assembled the four plant richness levels of 2, 6, 12 and 20 with regard to equal frequency by constrained random draw. Within each experimental wildflower strip each diversity level was repeated three times, in each trophic treatment once, so

that sown composition was kept constant within fields, but varied among fields. While the 20 species mixture was reproduced in all wildflower strips, the other diversity levels were represented by 12 different experimentally sown mixtures. In total this resulted in 37 different sown mixtures.

To assemble the experimental mixtures, we applied a substitutive design (Jolliffe 2000) where each plant species was added in the same proportion to result in maximum evenness. Taking into account the individual germination rates of the species predicted by the commercial seed provider (UFA Samen Lyssach, Switzerland), we corrected seed density to 1000 germinable seeds m^{-2} (Roscher et al. 2004).

Fields were prepared similar to conventional wildflower strips. The farmers harrowed the fields twice before sowing and sprayed them with the non-selective herbicide Roundup® (Glyphosate) to eliminate weeds and to reduce establishment from the seed bank. We scattered the seeds by hand; therefore soya groats were added as bulking agent to facilitate an even distribution within the subplots. As several studies have suggested that weeding might increase invasion (Wardle 2001, Roscher et al. 2009), we kept weeding to a minimum. Further, constant weeding would have disturbed other projects in our study system concerned with the fauna (Fabian et al. 2012, Bruggisser et al. 2012). Only in 2007 we removed *Chenopodium album* and *Amaranthus retroflexus* to avoid competition for light with germinating seeds. To prevent spread to adjacent fields and associated loss of environmental subsidies for the farmer, we removed the harmful agricultural weeds *Rumex obtusifolium* and *Cirsium vulgare* throughout the whole experiment. Besides one field, where due to high pressure of *Echinocloa crus-galli* mowing was recommended in the first year, subplots were not mown. The absence of weeding and mowing distinguishes the Grandcour Experiment from other studies such as BIODEPTH, the Jena Experiment or Cedar Creek, where grassland plots were cut or burned according to the management regime of the surrounding region (Hector et al. 1999, Roscher et al. 2004, Tilman et al. 2006).

We thus manipulated plant diversity by sowing different diversity levels but permitted establishment from external species; hence the communities consisted of the selected sown species complemented by locally existing species filling empty space.

Plant community assessment

We evaluated plant communities in a randomly selected 2 × 2 m quadrat in each subplot, taking care that it was placed at least 1 m from the border. Except for some vegetative Poaceae, all vascular plants were identified to species level. We estimated individual species cover (%) visually each year in early autumn. Community coverage may exceed 100% due to plants overlap. Total species richness *S* in the subplots varied from 6 to 42 species, with a mean of 22.8.

LAI measurements and biomass estimation

Aboveground biomass is often used as a substitute for (aboveground) productivity. Measuring biomass is generally done by clipping plant material, which is the most accurate method. However, it was difficult to apply in our experiment due to large amounts of biomass. Moreover, we wanted to avoid disturbance to the projects dealing with higher trophic levels. Therefore we measured the leaf area index (LAI) with a plant canopy analyser, which is an adequate alternative non-destructive method for estimating biomass. The canopy analyser measures light attenuation by the vegetation and a standard coefficient is then used to derive the LAI. In each subplot, we recorded above-canopy reference measurements and 24 below-canopy measurements at ground level in early fall 2008 and 2009. We covered the fish-eye sensor with a 270° black cap, which helped to account for the small subplot size and excluded the effect of the person taking the measurements, while it also prevented direct sunlight shining into the lens. We did not adjust measurements for leaf angles. We then calibrated the LAI measures with five randomly selected quadrats of 30 × 30 cm in eight subplots. Within the quadrats, all plants were clipped at ground level, stored in a paper bag and then dried to constant weight at 60 C. We established a linear regression between aboveground biomass and LAI in the eight subplots (Pearson product-moment correlation $r = 0.89$), which was used to convert average LAI measures to total aboveground biomass (dry weight $g \cdot m^{-2}$). Aboveground biomass *TB* ranged from 550.6 $g \cdot m^{-2}$ to 1799.2 $g \cdot m^{-2}$ with a mean of 1098.3 $g \cdot m^{-2}$. Note that our estimate of biomass is closely related to the "annual net primary production" (ANPP) measure that is typically analysed. As we only determined total community biomass, and because we did not establish monocultures for species arriving from the seed bank, analyses of biodiversity effects using additive partitioning to separate complementarity and selection effects (Loreau and Hector 2001, Fox 2006) were not feasible.

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Table 1. List of sown plant species.

Species name
Achillea millefolium L.
Agrostemma githago L.
Anthemis tinctoria L.
Centaurea cyanus L.
Centaurea jacea L.
Cichorium intybus L.
Daucus carota L.
Dipsacus fullonum L.
Echium vulgare L.
Hypericum perforatum L.
Leucanthemum vulgare LAM.
Malva moschata L.
Malva sylvestris L.
Origanum vulgare L.
Papaver rhoeas L.
Pastinaca sativa L.
Silene latifolia POIR.
Tanacetum vulgare L.
Verbascum lychnitis L.
Verbascum thapsus L.