# ECO-FAUNA-DATABASE: A TOOL FOR BOTH SELECTING INDICATOR SPECIES FOR LAND USE AND ESTIMATING IMPACTS OF LAND USE ON ANIMAL SPECIES

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## -- Parallel Session --

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1. FAL, Swiss Federal Research Station for Agroecology and Agriculture.

**Eco-Fauna-Database: A Tool for Both Selecting Indicator Species for Land Use and Estimating Impacts of Land Use on Animal Species.**

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***Abstract***
In order to get a tool that considers the needs of wildlife during the planning stages of projects and management plans the Eco-Fauna-Database was developed. It contains ecological information for nearly 3000 animal species, as e.g. habitat requirements, phenology, mobility. The database is relational in structure and enables the rapid listing of potential target and indicator species for agricultural areas at varying altitudes and within different habitats and biogeographic regions in Switzerland. This will be shown for Rhopalocera and Hesperiidae and Saltatoria, which inhabit grassland. An important aspect of the database is that it differentiates between the development stages of the individual animal species. Thus, an impact of the land use practice can be estimated by taking into account the mobility and phenology, e.g. of the egg, larvae, pupae and imago of holometabolic insects. An example is given for butterfly and bird species of a litter meadow cut at different time periods.

***Keywords***
database, fauna, ecology, management, impact, indicator species

***Introduction***
The primary objective behind the development of an Eco-Fauna-Database was to establish a tool that considered the needs of wildlife during the planning stages of projects and management plans. A database was therefore constructed which contains information regarding the habitat requirements, phenology, distribution, mobility, diet, Red List category and systematics for a large number of animal species. The data were added to the database by the experts of the different animal groups using a combination of their own personal knowledge together with information gained from the literature. To date information for nearly 3000 animal species is available within the database. This includes complete information for the following groups of Swiss fauna: Mammalia, Aves, Reptilia, Amphibia, Apoidea, Carabidae, Heteroptera, Mollusca, Odonata, Rhopalocera and Hesperiidae, Saltatoria.
The database is financed by the Swiss Agency for the Environment, Forests and Landscape. The Swiss Federal Research Station for Agroecology and Agriculture (FAL) and the Centre Suisse de Cartographie de la Faune (CSCF) are responsible for both its management and further development.

***Structure of the database***
The database has been developed in MS Access and is relational in structure. An important aspect of the database is that it differentiates between the development stages of the individual animal species. The following list gives an overview of the most important tables within the database:

- Habitat: This table specifies in which habitats the different development stages of a species may occur.
- Structure: The structure table lists the use of the different habitat structures by each animal species at their various development stages (e.g. ground-, moss-, herb-, bush-, tree-layer, death wood, tree holes, etc.).
- Traits: E.g. daily activity period, habitat specialisation, favourite range of moisture, temperature.
- Mobility: This table details the swim-, flight- and ground locomotion-ability of the animal species at the different development stages.
- Phenology: This table lists the occurrence of each animal species together with their monthly development stage.
- Diet: This table details the diet of each animal species at their different development stages.

- Distribution: This table lists the distribution of each animal species within 11 biogeographical regions of Switzerland and within the altitude gradients - colline, montane, subalpine, alpine.
- Threats: The Red List categories (national and international) of each animal species.
- Climate: The climate-table lists the occurrence of each animal species within a range of average July-temperatures, annual sum of degree days and precipitation per year.
- Systematics: The table lists the scientific, german, french, italian names.
- Record: A record corresponds to one registration of an animal species in the database of the Schweizerische Vogelwarte or the CSCF. It contains the species name, the geographical coordinates of the location, the date of the observation, the name of the observer.

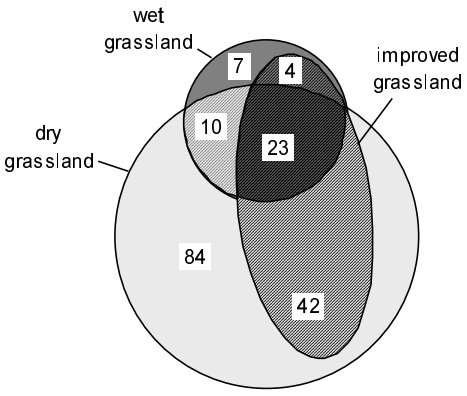
***Potential target and indicator species***

The database enables the rapid listing of potential target and indicator species for agricultural areas at varying altitudes and within different habitats and biogeographic regions in Switzerland. An example is given here for butterflies (Rhopalocera and Hesperiidae) and grasshoppers (Saltatoria), which occur in grassland habitats (Table 1, at the end of the text). Butterflies and grasshoppers are very suitable biodescriptors for grassland as more than 80% of these species inhabit grasslands. Furthermore, they are easy to observe and are also representative of the biodiversity for the grassland-fauna. In the following example the grassland is divided into three main ecological groups:

- wet grassland as purple moor-grass meadow, meadowsweet fen meadow, small sedge fen and tall sedge fen
- dry grassland as semi arid meadow and arid meadow
- improved grassland as fodder meadow rich and poor in plant species

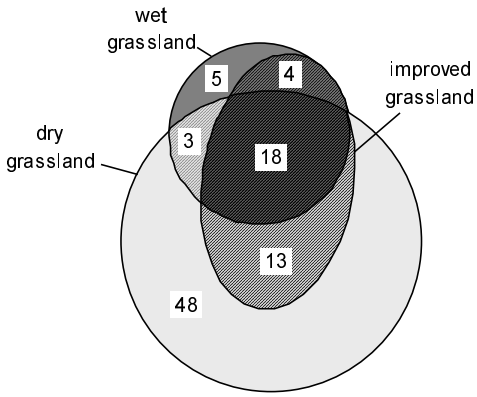
If necessary a more differentiated classification level of the grassland can be chosen. Target species can be selected for the different regions and ecological grassland groups. Species of different Red List categories as well as not threatened species should be chosen. This enables the user to measure the success or the failure of a program at different start - levels of biodiversity. To get the most exclusive describers for the different ecological grassland groups, species which occur only in one or a few grassland-types should be chosen. Figure 1 and 2 show the number of species occurring in the three ecological grassland groups

**Figure 1. The number of butterfly species in different ecological grassland groups.**




170 butterfly species (Rhopalocera and Hesperiidae) inhabit grassland habitats in Switzerland.
The ecological grassland groups are defined in the text.

**Figure 2. The number of grasshopper species in different ecological grassland groups.**



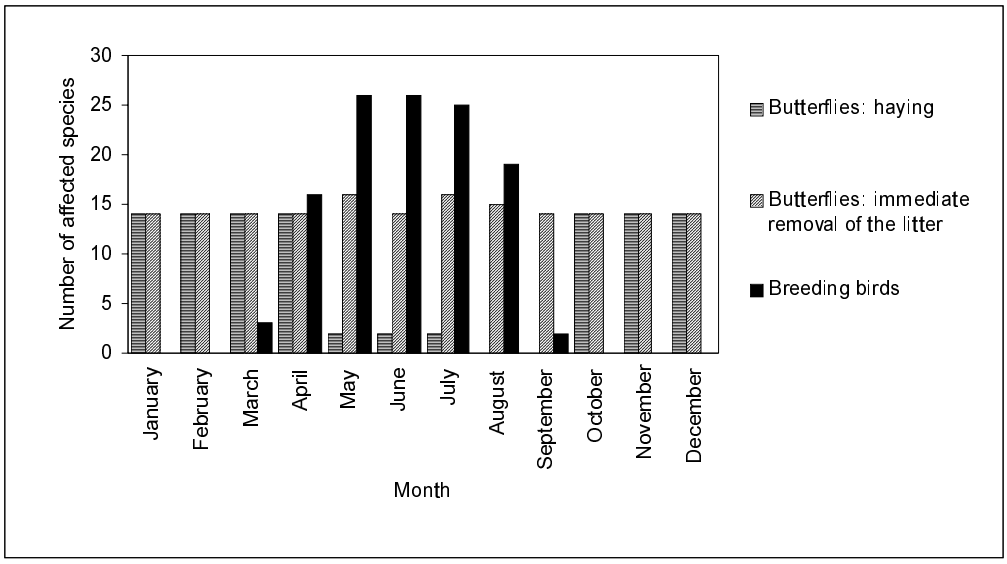

91 grasshopper species (Saltatoria) inhabit grassland habitats in Switzerland.
The ecological grassland groups are defined in the text.

mentioned above. Forty percent (84 species) of the "grassland butterflies" inhabit dry grassland only, whereas 6% (7 species) inhabit only wet grassland. By way of contrast, no species inhabit only improved grassland. The grasshoppers show similar proportions.

***The potential impact of cutting a litter meadow (Magnocaricion) at different time periods on butterflies and birds***

The database can help to estimate the possible impacts of mowing time and mowing technique on different species. The following example shows the impact of cutting a litter meadow on butterflies and birds at different time intervals. Phenology, habitat and structure information can be used to provide a list of the species which may be affected by the cutting of a litter meadow at different time periods. Furthermore, the database will also detail the development stage that the animal is in at the time of mowing. Information about mobility enables the user to find out, whether a development stage can escape the impact of cutting. It is clear that cutting a meadow will have an impact on the immobile development stages in a herb layer, e.g. the eggs and pupae of butterflies and the eggs and nestlings of birds. The mowing technique also decides the death or survival rate of the slowly mobile caterpillar. Some of the caterpillars should survive mowing if the herbs are left to dry as the caterpillars should be able to crawl out of the herb layer. However, if the mowed herb is carried away immediately, the caterpillars will have no possibility to escape. Figure 3 shows the number of threatened species (Duelli, 1994) which are affected by mowing a litter meadow at different time periods. The optimal mowing date varies for different species or animal groups and also depends on the mowing technique. Therefore the management of the meadow has to be adapted to the target species. The database is a helpful tool to optimize this management.

**Figure 3. Threatened butterfly and bird species affected by litter meadow cut in different months.**




The eggs and nestlings of birds will not survive.
The survival of the butterflies depends on the cutting management: For example, leaving the hay to dry will allow the survival of some of the caterpillars whereas the immediate removal of the litter will kill the caterpillars.

***References***

Duelli, Peter (1994). "Rote Liste der gefährdeten Tierarten in der Schweiz." Swiss Agency for the Environment, Forests and Landscape (BUWAL), Bern.

## Table 1: Butterfly and grasshopper species occuring in grasslands in different altitudinal belts and regions of Switzerland.

1. Swiss Red List categories (Duelli, 1994):
   - 0 extinct or disappeared
   - 1 near by extinction
   - 2 strongly threatened
   - 3 threatened
   - 4 potentially threatened
   - n not threatened
   - - observed in Switzerland, but not established populations
   - 9 not evaluated

2. The ecological grassland groups are defined in the text.
   - X occurence in the correspondent ecological grassland group

| | | Grassland group [2] | | | Altitudinal belt | | | | Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species** | Swiss Red List [1] | **wet grassland** | **dry grassland** | **improved grassland** | colline | montane | subalpine | alpine | Western Jura Mountains | Northern Jura Mountains | Northeastern Switzerland | Western Central Plateau | Eastern Central Plateau | Western Northern Alps | Eastern Northern Alps | Western Central Alps | Eastern Central Alps | Engadine | Southern Alps |
| **Butterflies (Rhopalocera, Hesperiidae)** | | | | | | | | | | | | | | | | | | | |
| Brenthis ino | 3 | X | | | X | X | X | | X | X | X | X | X | X | X | X | X | X | |
| Coenonympha tullia | 2 | X | | | X | X | | | X | X | X | X | X | X | X | | X | X | |
| Lycaena helle | 2 | X | | | X | X | X | | X | | | X | X | X | X | | | | |
| Maculinea alcon | 1 | X | | | X | X | | | X | | | X | X | X | X | | | | |
| Maculinea nausithous | 2 | X | | | X | X | X | | X | X | X | X | X | X | X | | | | |
| Maculinea teleius | 2 | X | | | X | X | X | | X | X | X | X | X | X | X | | | | |
| Mellicta britomartis | - | X | | | X | X | | | | | | | X | | | | | | |
| Albulina orbitulus | n | | X | | | X | X | X | | | | | | X | X | X | X | X | X |
| Arethusana arethusa | 1 | | X | | X | | | | X | X | | | | | | X | | | X |
| Aricia agestis | 3 | | X | | X | X | | | X | X | X | X | X | | | | | | X |
| Aricia artaxerxes | n | | X | | X | X | X | X | | | | | | X | X | X | X | X | X |
| Brenthis daphne | 2 | | X | | X | X | | | X | X | | | | X | | X | | | X |
| Brintesia circe | 2 | | X | | X | X | | | X | X | | X | | X | | X | | | |
| Callophrys rubi | 3 | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Carcharodus alceae | 1 | | X | | X | X | | | | | | X | X | X | X | X | | X | X |
| Carcharodus boeticus | 1 | | X | | X | X | | | | | | | | | | X | | | |
| Carcharodus flocciferus | 2 | | X | | X | X | | | X | X | X | X | X | X | X | X | X | | X |
| Carcharodus lavatherae | 1 | | X | | X | | | | X | | | X | | X | | X | | | X |
| Chazara briseis | 1 | | X | | X | X | | | X | X | | | | | | | | | |
| Clossiana dia | 2 | | X | | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Clossiana euphrosyne | n | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Clossiana thore | 2 | | X | | | X | X | | | | | | | X | X | X | X | X | X |
| Colias alfacariensis | n | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Cupido minimus | 3 | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Cupido osiris | 2 | | X | | X | X | | | X | | | X | | X | | X | | | X |
| Erebia cassioides | n | | X | | | | X | X | | | | | | X | | X | | | |
| Erebia christi | 4 | | X | | | X | X | | | | | | | | | | | | X |
| Erebia flavofasciata | 4 | | X | | | | | X | | | | | | | | | | X | X |
| Erebia gorge | n | | X | | | | X | X | | | | | | X | X | X | X | X | X |
| Erebia ligea | n | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Erebia meolans | 3 | | X | | | X | X | X | X | X | | | | X | X | X | X | X | X |
| Erebia mnestra | n | | X | | | | X | X | | | | | | | | X | X | X | X |
| Erebia montana | n | | X | | | X | X | X | | | | | | X | X | X | X | X | X |
| Erebia nivalis | 4 | | X | | | | | X | | | | | | X | X | | | | |

Table 1 continued

| | | Grassland groups [2] | | | Altitudinal belt | | | | Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species** | Swiss Red List [1] | **wet grassland** | **dry grassland** | **improved grassland** | colline | montane | subalpine | alpine | Western Jura Mountains | Northern Jura Mountains | Northeastern Switzerland | Western Central Plateau | Eastern Central Plateau | Western Northern Alps | Eastern Northern Alps | Western Central Alps | Eastern Central Alps | Engadine | Southern Alps |
| Erebia pluto | n | | X | | | | X | X | | | | | | X | X | X | X | X | X |
| Erebia pronoe | 3 | | X | | | X | X | X | X | | | | | X | X | X | X | X | X |
| Erebia styx | 4 | | X | | | X | X | X | | | | | | | | | | X | X |
| Erebia triaria | 2 | | X | | X | X | X | | | | | | | | | X | X | X | X |
| Erebia tyndarus | n | | X | | | X | X | X | | | | | | X | X | X | X | X | X |
| Eurodryas debilis | n | | X | | | | X | X | | | | | | X | X | X | X | X | X |
| Everes alcetas | 2 | | X | | X | X | | | | | | X | | X | | X | | | |
| Hipparchia alcyone | 2 | | X | | X | X | | | X | X | | | | | | X | | | X |
| Hipparchia fagi | 2 | | X | | X | X | | | X | X | | | | | | | | | X |
| Hipparchia semele | 2 | | X | | X | X | X | | X | X | X | X | | X | X | X | X | X | X |
| Hipparchia statilinus | 2 | | X | | X | X | | | X | | | | | | | X | | | X |
| Hyponephele lycaon | 3 | | X | | X | X | X | | X | | | | | | | X | | X | X |
| Iolana iolas | 1 | | X | | X | | | | | | | | | X | | X | | | |
| Iphiclides podalirius | 2 | | X | | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Issoria lathonia | n | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Lampides boeticus | - | | X | | X | | | | X | | | X | | X | | X | | | X |
| Lasiommata maera | n | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Lasiommata megera | n | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Lasiommata petropolitana | 3 | | X | | | X | X | | X | | | X | X | X | X | X | X | X | X |
| Lopinga achine | 2 | | X | | X | X | | | X | X | X | X | X | X | X | X | | | X |
| Lycaeides argyrognomon | 1 | | X | | X | | | | | | | X | | | | | | | X |
| Lycaeides idas | 3 | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Lysandra coridon | 3 | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Maculinea arion | 3 | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Maculinea rebeli | 2 | | X | | X | X | X | X | X | X | | | X | X | X | X | X | X | X |
| Meleageria daphnis | 2 | | X | | X | X | X | | | | | | | X | | X | X | X | X |
| Melitaea cinxia | 2 | | X | | X | X | | | X | X | X | X | X | X | | X | X | X | X |
| Melitaea didyma | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Melitaea phoebe | 2 | | X | | X | X | X | | | X | X | X | X | X | X | X | X | X | X |
| Mellicta deione | 2 | | X | | X | X | | | | | | | | | | X | | | |
| Oeneis glacialis | n | | X | | | | X | X | | | | | | X | X | X | X | X | X |
| Pararge aegeria | n | | X | | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Parnassius apollo | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Pieris mannii | 2 | | X | | X | X | | | | | | X | | | | X | | | X |
| Plebejides pylaon | 2 | | X | | | X | X | | | | | | | | | X | | | |
| Plebejus argus | 3 | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Plebicula dorylas | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Plebicula escheri | 2 | | X | | X | X | X | X | | | | | | X | X | X | X | X | X |
| Plebicula thersites | 3 | | X | | X | X | X | | X | X | | X | X | X | X | X | X | X | X |
| Polyommatus eros | n | | X | | | X | X | X | | | | | | X | X | X | X | X | X |
| Pontia daplidice | 2 | | X | | X | X | | | X | X | | X | X | X | X | X | X | X | X |
| Pseudoaricia nicias | 4 | | X | | | X | X | X | | | | | | | X | | | X | X |
| Pseudophilotes baton | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Pyrgus alveus | 3 | | X | | X | X | X | X | | | X | | | X | X | X | X | X | X |
| Pyrgus andromedae | n | | X | | | X | X | X | | | | | | X | X | X | X | X | X |
| Pyrgus armoricanus | 2 | | X | | X | X | | | X | X | | X | X | | | X | X | | X |
| Pyrgus cacaliae | n | | X | | | X | X | X | | | | | | X | X | X | X | X | X |
| Pyrgus cirsii | 2 | | X | | X | | | | X | X | | X | | | | | | | |

Table 1 continued

| | | Grassland groups [2] | | | Altitudinal belt | | | | Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species** | Swiss Red List [1] | **wet grassland** | **dry grassland** | **improved grassland** | colline | montane | subalpine | alpine | Western Jura Mountains | Northern Jura Mountains | Northeastern Switzerland | Western Central Plateau | Eastern Central Plateau | Western Northern Alps | Eastern Northern Alps | Western Central Alps | Eastern Central Alps | Engadine | Southern Alps |
| Pyrgus fritillarius | 3 | | X | | X | X | X | | | | | X | X | X | X | X | | X | |
| Pyrgus malvoides | n | | X | | X | X | X | | | | | | | X | X | X | X | X | X |
| Pyrgus onopordi | 2 | | X | | X | X | | | | | | X | | | | X | | | X |
| Satyrium acaciae | 2 | | X | | X | X | | | X | X | | X | | | | X | | | X |
| Satyrus ferula | n | | X | | X | X | X | | X | | | | | X | | X | | | X |
| Scolitantides orion | 2 | | X | | X | X | | | | | | | | | X | X | | X | X |
| Spialia sertorius | n | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Syntarucus pirithous | - | | X | | X | | | | | | | X | | X | | X | | | X |
| Zerynthia polyxena | - | | X | | X | | | | | | | | | | | | | | X |
| Carterocephalus palaemon | n | X | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Clossiana selene | 3 | X | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Coenonympha glycerion | 2 | X | X | | X | X | X | | X | X | X | X | | X | X | X | X | X | |
| Eurodryas aurinia | 2 | X | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Everes argiades | 1 | X | X | | X | | | | X | X | X | X | X | X | | X | | | X |
| Hamearis lucina | 3 | X | X | | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Heteropterus morpheus | 2 | X | X | | X | | | | | | | | | | | | | | X |
| Melitaea diamina | 3 | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mellicta athalia | 3 | X | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Minois dryas | 2 | X | X | | X | X | X | | X | | | X | X | X | X | X | X | | X |
| Aglais urticae | n | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Clossiana titania | 3 | X | | X | | X | X | | X | | | X | X | X | X | X | X | X | X |
| Cynthia cardui | n | X | | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Vanessa atalanta | n | X | | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Agriades glandon | n | | X | X | | X | X | X | | | | | | X | X | X | X | X | |
| Agrodiaetus damon | 3 | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | |
| Anthocharis cardamines | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Coenonympha arcania | 4 | | X | X | X | X | | | X | X | X | X | X | X | | X | | X | X |
| Coenonympha darwiniana | 4 | | X | X | | X | X | | | | | | | | | X | X | X | X |
| Coenonympha gardetta | n | | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Coenonympha pamphilus | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Colias crocea | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Colias hyale | n | | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Colias phicomone | n | | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Cyaniris semiargus | n | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Erebia aethiops | 3 | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Erebia alberganus | n | | X | X | | X | X | X | | | | | | | | X | X | X | X |
| Erebia epiphron | n | | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Erebia manto | n | | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Erebia pandrose | n | | X | X | | | X | X | | | | | | X | X | X | X | X | X |
| Erebia pharte | n | | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Erynnis tages | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Euchloe simplonia | n | | X | X | | X | X | X | | | | X | | X | X | X | | | X |
| Eumedonia eumedon | 3 | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Fabriciana adippe | 3 | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Fabriciana niobe | 3 | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Glaucopsyche alexis | 2 | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Hesperia comma | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Hypodryas cynthia | n | | X | X | | X | X | X | | | | | | X | X | X | X | X | X |

Table 1 continued

| | | Grassland groups [2] | | | Altitudinal belt | | | | Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species** | Swiss Red List [1] | **wet grassland** | **dry grassland** | **improved grassland** | colline | montane | subalpine | alpine | Western Jura Mountains | Northern Jura Mountains | Northeastern Switzerland | Western Central Plateau | Eastern Central Plateau | Western Northern Alps | Eastern Northern Alps | Western Central Alps | Eastern Central Alps | Engadine | Southern Alps |
| Leptidea sinapis | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Lycaena phlaeas | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Lysandra bellargus | n | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mellicta asteria | 4 | | X | X | | | X | X | | | | | | | | | X | X | X |
| Mellicta aurelia | 2 | | X | X | X | X | X | | | X | | | | | X | X | X | X | X |
| Mellicta parthenoides | 2 | | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Mellicta varia | n | | X | X | | X | X | X | | | | | | X | | X | X | X | X |
| Pieris bryoniae | 3 | | X | X | | X | X | X | X | X | | | | X | X | X | X | X | X |
| Polyommatus icarus | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Pontia callidice | n | | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Pyrgus carlinae | n | | X | X | | X | X | | | | | | | X | | X | | | X |
| Pyrgus malvae | 3 | | X | X | X | X | | | X | X | X | X | X | X | X | | | | |
| Pyrgus serratulae | 3 | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Pyronia tithonus | 2 | | X | X | X | | | | X | X | X | X | X | X | | | | | X |
| Thymelicus acteon | 2 | | X | X | X | X | | | X | X | X | X | X | X | | X | | X | X |
| Thymelicus lineolus | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Thymelicus sylvestris | n | | X | X | X | | | | X | X | X | X | X | X | X | X | X | X | X |
| Aphantopus hyperantus | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Boloria napaea | n | X | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Boloria pales | n | X | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Coenonympha oedippus | 1 | X | X | X | X | | | | | | | X | X | | | | | | X |
| Erebia euryale | n | X | X | X | | X | X | X | X | X | | | | X | X | X | X | X | X |
| Erebia medusa | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Erebia melampus | n | X | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Erebia oeme | 3 | X | X | X | | X | X | X | | | | | | X | X | X | X | X | X |
| Erebia sudetica | 4 | X | X | X | | X | X | | | | | | | X | | | | | |
| Inachis io | n | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Lycaena alciphron | 2 | X | X | X | X | X | X | | | | | | | | | X | | X | X |
| Lycaena hippothoe | n | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Lycaena tityrus | n | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Lycaena virgaureae | 3 | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Maniola jurtina | n | X | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Melanargia galathea | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Mesoacidalia aglaja | n | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Ochlodes venatus | n | X | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Papilio machaon | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Pieris brassicae | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Pieris napi | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Pieris rapae | n | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Plebicula amanda | 4 | X | X | X | X | X | X | | | | | | X | | X | | | X | |
| **Grasshoppers (Saltatoria)** | | | | | | | | | | | | | | | | | | | |
| Chorthippus montanus | 3 | X | | | X | X | X | | X | X | X | X | X | X | X | X | X | | |
| Conocephalus discolor | 3 | X | | | X | X | | | X | X | | X | X | X | X | X | X | X | X |
| Conocephalus dorsalis | 2 | X | | | X | | | | | X | | X | X | X | | X | | | X |
| Paracinema tricolor | 0 | X | | | X | | | | | | | X | | | | | | | |
| Stethophyma grossum | 2 | X | | | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Aeropedellus variegatus | n | | X | | | | | X | | | | | | | | | | X | |
| Aeropus sibiricus | n | | X | | | X | X | X | | | | | X | X | X | X | X | X | X |

Table 1 continued

| | | Grassland groups [2] | | | Altitudinal belt | | | | Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Species** | Swiss Red List [1] | **wet grassland** | **dry grassland** | **improved grassland** | colline | montane | subalpine | alpine | Western Jura Mountains | Northern Jura Mountains | Northeastern Switzerland | Western Central Plateau | Eastern Central Plateau | Western Northern Alps | Eastern Northern Alps | Western Central Alps | Eastern Central Alps | Engadine | Southern Alps |
| Aiolopus strepens | 3 | | X | | X | X | | | | | | X | | | | X | | | X |
| Anonconotus alpinus | n | | X | | | X | X | X | | | | | | X | | X | | | |
| Antaxius difformis | n | | X | | | | X | X | | | | | | | | | | X | X |
| Antaxius pedestris | 3 | | X | | X | X | X | X | | | | X | | | | X | X | X | X |
| Barbitistes serricauda | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | |
| Calliptamus barbarus | - | | X | | X | | | | X | | | X | | | | | | | |
| Calliptamus italicus | 3 | | X | | X | X | X | | X | X | X | X | X | X | | X | X | | X |
| Calliptamus siciliae | 3 | | X | | X | X | | | X | | | X | | | | | | | X |
| Chorthippus apricarius | n | | X | | X | X | X | | X | X | X | | | X | | | X | X | |
| Chorthippus brunneus | n | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Chorthippus mollis | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Chorthippus vagans | 3 | | X | | X | X | X | | X | X | | | | | | X | | | X |
| Dociostaurus genei | - | | X | | X | | | | | | | | | | | X | | | X |
| Ephippiger ephippiger | 1 | | X | | X | X | | | X | X | | X | | X | | X | | | |
| Ephippiger terrestris | n | | X | | | X | X | | | | | | | | | | | | X |
| Ephippiger vicheti | 3 | | X | | X | X | X | | | | | | | | | | | | X |
| Leptophyes laticauda | 3 | | X | | X | X | | | | | | | | | | | | | X |
| Leptophyes punctatissima | 3 | | X | | X | X | | | X | X | X | X | X | X | X | X | X | | X |
| Myrmeleotettix maculatus | 2 | | X | | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Nemobius sylvestris | n | | X | | X | X | | | X | X | X | X | X | X | X | X | X | | X |
| Oecanthus pellucens | 3 | | X | | X | X | | | X | X | | X | X | X | | X | X | | X |
| Oedaleus decorus | 1 | | X | | X | X | | | | | | | | | | X | | | X |
| Oedipoda caerulescens | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Oedipoda germanica | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Omocestus haemorrhoidalis | 3 | | X | | X | X | X | | X | X | | X | X | X | X | X | X | X | X |
| Omocestus rufipes | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Pachytrachis striolatus | 1 | | X | | X | X | | | | | | | | | | | | | X |
| Pezotettix giornae | n | | X | | X | X | | | | | | | | | | X | | | X |
| Phaneroptera falcata | 3 | | X | | X | X | | | X | X | X | X | X | X | X | X | X | | X |
| Phaneroptera nana | 3 | | X | | X | X | | | | | | | | | | X | | | X |
| Pholidoptera aptera | n | | X | | | X | X | | | | X | | X | | X | | X | X | X |
| Pholidoptera fallax | 3 | | X | | X | X | X | | | | | | | | | | | | X |
| Pholidoptera littoralis | 1 | | X | | X | X | | | | | | | | | | | | | X |
| Platycleis albopunctata | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | | |
| Platycleis grisea | n | | X | | X | X | X | | | | | | | | | | | X | X |
| Platycleis tessellata | 9 | | X | | X | | | | | | | X | | | | | | | |
| Psophus stridulus | 3 | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Saga pedo | 1 | | X | | X | X | | | | | | | | | | X | X | | |
| Stenobothrus lineatus | n | | X | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Stenobothrus nigromaculatus | 3 | | X | | X | X | X | | | | | | | | | X | | | X |
| Stenobothrus rubicundulus | n | | X | | | | X | X | | | | | | | | X | X | X | X |
| Stenobothrus stigmaticus | 9 | | X | | X | X | | | X | X | | | | | | | | | |
| Tartarogryllus burdigalensis | 1 | | X | | X | | | | | | | X | | | | | | | X |
| Tetrix bipunctata | 3 | | X | | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Tetrix depressa | 3 | | X | | X | X | X | | | | | | | | | X | | | |
| Yersinella raymondi | n | | X | | X | X | | | | | | | | | | | | | X |
| Decticus albifrons | - | X | X | | X | | | | | | | | | | | | | | X |
| Euchorthippus declivus | 1 | X | X | | X | | | | | | | X | | | | | | | X |

Table 1 continued

| | | Grassland groups [2] | | | Altitudinal belt | | | | Region | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| Metrioptera brachyptera | 3 | X | X | | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Chorthippus albomarginatus | 3 | X | | X | X | X | | | | | | X | X | | | | | | |
| Miramella alpina | 3 | X | | X | | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Pteronemobius heydenii | 3 | X | | X | X | | | | X | X | X | X | X | X | X | X | | | X |
| Tetrix undulata | n | X | | X | X | X | | | X | X | | X | X | X | X | | | | |
| Arcyptera fusca | n | | X | X | | X | X | X | | | | X | | X | | X | | X | X |
| Barbitistes obtusus | 3 | | X | X | X | X | X | | | | | | | | | | | | X |
| Bohemanella frigida | n | | X | X | | | X | X | | | | | | X | | X | X | X | X |
| Chorthippus biguttulus | n | | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | |
| Chorthippus eisentrauti | n | | X | X | | X | X | | | | | | | | | | | X | X |
| Chorthippus parallelus | n | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Chorthippus scalaris | n | | X | X | X | X | X | X | X | | | X | | X | X | X | X | X | X |
| Gryllus campestris | 3 | | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Locusta migratoria | 1 | | X | X | X | | | | | | X | X | X | X | X | X | X | | X |
| Metrioptera bicolor | 3 | | X | X | X | X | | | X | X | X | X | X | | | | X | X | X |
| Podisma pedestris | 3 | | X | X | | X | X | X | X | | | X | | X | X | X | X | X | X |
| Tetrix tenuicornis | n | | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Tettigonia caudata | 1 | | X | X | | X | X | | | | | | | | | | | X | |
| Chorthippus dorsatus | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Chrysochraon brachyptera | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Chrysochraon dispar | 3 | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | | | |
| Decticus verrucivorus | 3 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Gomphocerus rufus | n | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Gryllotalpa gryllotalpa | 3 | X | X | X | X | X | | | X | X | X | X | X | X | X | X | X | | X |
| Melanogryllus desertus | 0 | X | X | X | X | | | | | | | | | | | | | | X |
| Metrioptera fetschenkoi | 3 | X | X | X | X | X | X | | | | | | | | | | | | X |
| Metrioptera roeselii | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | |
| Metrioptera saussuriana | n | X | X | X | | X | X | X | X | | | | | X | X | X | | | X |
| Omocestus viridulus | n | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Parapleurus alliaceus | 3 | X | X | X | X | X | | | X | X | X | X | X | X | X | X | X | | X |
| Pholidoptera griseoaptera | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Polysarcus denticauda | 2 | X | X | X | | X | X | | X | | X | | | X | | | | | X |
| Ruspolia nitidula | 3 | X | X | X | X | | | | | | | X | X | | X | | | | X |
| Tetrix subulata | n | X | X | X | X | X | | | X | X | X | X | X | X | X | X | X | X | X |
| Tettigonia cantans | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |
| Tettigonia viridissima | n | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X | X | X |