

The management of dry grassland in Switzerland. A Swiss federal program and its local practical application

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Switzerland has a rich heritage of dry grasslands. The Swiss Government started to map and evaluate these endangered habitats in 1995. Objects of national importance will be defined by 2007. Instruments and regulations have been developed by the Swiss Agency for Environment, Forests and Landscape for the preservation of dry, species-rich grasslands. The main instrument is a financial contribution on the basis of contracts with farmers. The alliance with federal and cantonal agricultural agencies allows the long-term financing of sustainable farming together with the preservation of a very important part of Swiss biodiversity. Experience in the management of different types of dry grassland shows that, besides general regulations, numerous objects need tailored solutions to maintain their biodiversity and satisfy economic needs at the same time. One of the main problems to solve is their increasing isolation and the efficient management of habitat mosaics.

Keywords. Dry grassland, calcareous grassland, grassland-management, *Mesobromion*, *Xerobromion*, *Seslerion variaie*, *Caricion ferrugineae*, *Origanetalia*.

La gestion des prairies et pâturages sur calcaire en Suisse. La Suisse possède un riche héritage de prairies et pâturages secs. Afin de disposer d'une vue d'ensemble de ces habitats menacés, le Gouvernement suisse a entrepris leur inventaire dès 1995. Les objets d'importance nationale seront définis en 2007. L'Office fédéral de l'environnement, des forêts et du paysage a développé des instruments et des règles pour la préservation des prairies et pâturages secs riches en espèces. L'instrument principal réside dans l'établissement de contrats volontaires avec les exploitants. La collaboration avec les stations fédérales et cantonales d'agriculture assure le soutien financier à long terme d'une agriculture durable et, par là, la préservation d'une grande part de la biodiversité en Suisse. Les expériences de gestion de différents types de prairies et pâturages secs montrent que, en dehors des directives générales d'entretien, la majorité des objets nécessitent des solutions particulières pour maintenir leur biodiversité et pour satisfaire également aux besoins économiques. Leur isolement toujours croissant et la gestion rationnelle de mosaïques d'habitats représentent un défi majeur.

Mots-clés. Prairies et pâturages secs, prairies et pâturages secs sur calcaire, gestion de prairies et pâturages secs, *Mesobromion*, *Xerobromion*, *Seslerion variaie*, *Caricion ferrugineae*, *Origanetalia*.

1. A RICH HERITAGE

Switzerland has a rich heritage of various types of dry grassland. Soil type and its drainage properties, annual rainfall, nutrients, altitude and land-use are among the most important factors which determine the vegetation type and the degree of species-richness of these meadows and pastures.

Dry grasslands cover about 1% of the agricultural land of Switzerland and 2.3% of all grasslands. Their surface equals that of the Swiss vineyards. In contrast to their small surface, they contain 65% of our rare and endangered species. 40% of dry grassland phanerophyta are Red List-species. These 350 species represent 13.1% of the Swiss flora (Eggenberg *et al.*, 2001). Over half of all Swiss butterflies-species can be found on dry grasslands and 170 of them depend on this type of habitat.

Some Swiss dry grasslands are of international importance, e.g. the steppe-like *Stipo-Poion* or the

traditional "wild hay"-meadows of the Swiss Alps. Species like *Dracocephalum austriacum* or *Cypripedium calceolus* are very rare worldwide or protected by the Berne Convention.

This rich heritage plays a very important role not only ecologically but also economically if we consider e.g. tourism or soil protection against erosion.

2. CALCAREOUS GRASSLANDS OF SWITZERLAND

Of the dry grasslands, the calcareous associations are especially species-rich. The most widespread types are:

- Associations belonging to *Xerobromion* and *Mesobromion* which range from about 300 m and 1600 m above sea level.
- *Seslerion variaie* and *Caricion ferrugineae* associations from about 800 m to 1700 m above sea level.

These types do intermingle within their range. Often they are accompanied by dry fringe associations (*Origanetalia*) of various characters, according to altitude and other ecological determinants.

As in other European countries these habitats were dramatically reduced by the following factors:

- The processes summed up by the expression “intensified land-use”, above all fertilizing and an increasing cutting regime;
- Abandonment of land-use, especially in the Central and Southern Alps, with ensuing reforestation;
- Construction (mainly in the Swiss central plateau);
- Fragmentation due to these processes.

It is estimated that about 90% of these habitats in Switzerland have vanished since 1945 (Eggenberg *et al.*, 2001). Today an overwhelming part of the species-rich grasslands lie in the mountain areas of the Swiss Jura and Alps, with usually only relics on the Swiss central plateau. As areas with the richest diversity usually are economically weak, with settlement of people in the lowland agglomerations, dry grasslands will eventually almost die out without active counter-measures. These would have to improve the economic situation of the farmers.

Of the objects mapped so far presently about 61% are pastures, 27% are hay meadows, 9% are fallow and 3% are “wild hay meadows” (see below).

3. A SWISS FEDERAL PROGRAMME

Since 1994 a federal programme is running to map, evaluate, protect and further species-rich grasslands. This is a consequence of the ratification of the Rio Convention of 1992. The program does not include high alpine meadows like the *Caricetum curvulae* as these natural habitats are not endangered. The overall objectives of the programme are:

- The production of an overview of dry grasslands in Switzerland;
- To designate sites of national importance;
- To create a basis for the implementation of measures;
- To develop a specific conservation program;
- To create a basis for follow-up surveys (Eggenberg *et al.*, 2001).

In 2005 the mapping will be completed. This will be the first overview concerning the state of these habitats in Switzerland. By now 22 of the 26 cantons have been mapped. All the objects are subsequently valorised and prioritized. The estimated surface of objects with national importance is around 20,000 ha.

3.1. Strategies and instruments

The Swiss Agency for the Environment, Forests and Landscape (SAEFL) is not only responsible for the

mapping of dry grasslands but also for developing protection instruments. The cantons are responsible for implementation and additional instruments. Among the instruments are legal and economic regulations and management plans or concepts e.g. to improve connectivity.

The main instrument is the contract with the farmer. Protection of the objects should on the whole be achieved through an agreement. The following factors influence the likelihood of a farmer to sign a contract:

- Regulations (no fertilizing, date of mowing etc.);
- Economical importance of the payments;
- Extent and location of other ecological compensation areas;
- Complexity and management costs;
- Effects on the working-processes within the farm;
- Hay quality;
- The feeling of sovereignty over his land, which means the possibility to quit the contract after an accorded time.

In the beginning it was vital that the payments amounted to substantial figure. Nowadays it is more important to find enough manpower to do the work.

A new instrument is the so called “priority areas”. These include one or more dry grassland-objects of outstanding ecological importance and their neighbouring habitats. At least 30% should be dry grassland vegetation. In a priority area ecological functions and connectivity of the meadows or pastures should be improved along with the other habitats. The objective is to further large home range species like birds or reptile populations.

3.2. An alliance for biodiversity

The partnership between agriculture and nature protection goes beyond these contracts. Depending on the type of grassland (pasture, summering pasture, meadows) and many other factors like the canton, livestock units, altitude, steepness of the terrain and species diversity etc., between 50% and 80% of the direct payments come from the Swiss Federal Office for Agriculture (FOAG). There are basic payments for the maintenance of agricultural land and financial incentives for ecological goals. So the payments by the SAEFL and the cantonal agencies for nature and landscapes protection can focus on the financing of the biodiversity aspects of an object. Most of these financial instruments are already well established for other habitats like fens. Others will be implemented in 2006, but with pilot projects already under way. This sharing of responsibilities seems to be complicated but it reflects the history and aims of the involved partners, mainly the survival of sustainable farming and Swiss biodiversity. These well established and accepted instruments and channels have better chance to succeed than a completely new system.

In other cases, cooperation with forest management agencies may be necessary.

3.3. Management of different types of plant communities and land-use

The SAEFL is responsible for general guidelines and recommendations for the grasslands management and is helping the cantonal agencies to fulfil their tasks in this respect. Official guidelines and regulations for the optimum management of the different dry grassland types, meadows and pasture will be published in 2005. The regulations of course depend on the specific goals for an object. They comprise e.g. (BUWAL, 4.11.2003):

- Recommendations for the management of pastures (timing and technique of cutting);
- The advantages and disadvantages of different grazing animals in different types of grasslands;
- The treatment of problematic plant species like *Pteridium aquilinum*;
- Recommendations for the advancement of the specific fauna. A strong focus lies on the preservation of structures like stone walls, open soil, scrub, fringe vegetation etc.

The most important question and also quite difficult to organize is how to preserve a mosaic of vegetation and structure which has developed through centuries, within a new economic setting.

4. PRACTICAL APPLICATIONS

Every dry grassland site has its peculiarities and “personality”. So called objects of national importance have been designated on a provisional basis for the already mapped cantons. The respective cantonal agencies are responsible for their protection and management. They are supported in doing so by the federal state, with information and funding.

The task of those responsible is to find a balance between occasionally competing ecological goals, to satisfy economic requirements and to assure the practicability of the management. Four objects of national importance shall highlight different practical management aspects of this demanding task: 4.1 and 4.3 examples are from the northern Swiss Jura, 4.2 is from the north-eastern, and 4.4 from the central Swiss Alps.

4.1 The “Blauenweide”, in the Jura Mountains

In Switzerland cattle grazing is far more important than sheep or goat grazing. Structural and species diversity is usually higher in pastures than in meadows although common species are more frequent in the first ones. The balance between over- and undergrazing is very important and depends on the target species and other goals like shrub coverage.

The “Blauenweide” in the canton of Basel-Landschaft is a pasture of around 35 ha. It is a mosaic of *Meso-*

bromion with *Lolio-Cynosurion* communities. 250 plant species occur, e.g. *Ophrys holosericea*, *O. apifera* and *Spiranthes spiralis*. It is a commons pasture interesting for its concise regulations options (Masé, 1996):

- No fertilization allowed;
- A maximum of 85 cattle (with a maximum of 35 cows in calf) is allowed;
- The beginning of grazing is 1st June with a maximum period of 112 days;
- 2–3% of the surface should remain covered with shrubs;
- During the whole period, areas with flowering grasses and herbs must remain.

4.2 Organising 1200 m of altitude

From a 26 ha-farm in the Domleschg, canton of Graubünden, the Battaglia family manage 6.3 ha of dry pastures and meadows. They range from 700 m to 1900 m above sea level. Another 0.8 ha are fen. 28 livestock units have to be maintained for breeding reasons, with no dairy production.

To organise the mowing and grazing regime, it was necessary to establish a contract for the entire farm. Economical and ecological aspects were carefully balanced. E.g. small patches of species-rich grassland were integrated into larger surfaces which were easy to manage and were then extensified. Each object has been visited and the measures discussed with the farmer. The time of the first cut has sometimes been bargained as it was not possible to move the machines down to the dry meadow while the higher lying surfaces were cut.

This led to a management where the overall biodiversity should profit while the farmer family is highly motivated and stress their conviction to do the “right thing”. Obviously tourists cherish the flowers too. (C. Schibli, unpublished).

4.3. The “Reinacherheide”, a *Xerobromion* in an urban setting.

In the canton of Basel-Landschaft only 0.3% of the mapped surface of dry grasslands belong to the genuine *Xerobromion*-associations (Dipner, 1999). They contain some of the rarest species of that area like *Teucrium botrys*, *Medicago minima* or *Eryngium campestre*. They are found in the “Reinacherheide”, a relic in an otherwise urbanized area near Basel. Over 600 species survive there (Blass, Kienzle, 2002). The former alluvial system is now preserved for drinking water production and for its biodiversity. Much of the latter is due to different types of dry grasslands, including also *Mesobromion*. The “Reinacherheide” boasts a population of about 1000 *Ophrys holosericea* and over 100 endangered species. Half the species of the whole area occurring here, it is a focus of attention

of the cantonal agency for the protection of nature and landscape. A management plan incorporates the experience of years of (strip) mowing, top soil removing, woodland and scrub cutting, etc. A monitoring programme has been running since the late Eighties and has now been revised (**Table 1**) (Masé, 2003).

One of the goals was the reduction of neophytes. After hacking out the root systems of *Solidago canadensis* and *S. altissima* it took several years of subsequent regular mowing to get rid of this very dominant species. The result of the management has been e.g. the increase of species by over 200 within the last 20 years, although many of them are ruderal species (Blass, Kienzle, 2002). However *Ophrys holosericea* and *Orchis militaris* have markedly thrived. The grasshopper species *Oedipoda caerulea* and *Sphingonotus caeruleus* have been reintroduced and seem to do very well. They profit from the largely extended pioneer gravel surfaces. The monitoring indicates that the development on these surfaces can vary considerably due to differences in soil composition (sand, gravel, rubble) and proximity to the groundwater table. *Petrorhagia prolifera* e.g. is only found on sandy surfaces. Equally decisive is the closeness of diaspore source for the recolonisation (by root or seed).

Despite the management efforts the greatest challenge for this area of only 39 ha lies in its isolation. The revitalization of the river Birs, which forms part of the Reinacherheide, carries a certain potential for connectivity, another lies in the nature-adapted conception and management of the green areas of the surrounding industrial zone.

4.4. The “Erstfeldertal” a “wild hay”-meadow

Wild hay fields were managed for hay production in the summer pasture areas (Eggenberg *et al.*, 2001). They are usually found between 1800 m and 2300 m, sometimes on incredibly steep slopes and were mown

Table 1. Mowing regulations of the management plan for the “Reinacherheide” near Basel — *Régulation de la fauche dans le plan de gestion de la “Reinacherheide” près de Bâle.*

Vegetation type	Management category (yearly)
Former field with ruderal <i>Arrhenatheretum elatioris</i>	Mowing 2 times, from week 25
<i>Mesobromion</i>	Mowing of 50% once, between weeks 32 and 33
<i>Mesobromion</i> and <i>Xerobromion</i> mixed	Mowing once, from week 40, 20% remaining as unmown strips
Fringe (<i>Geranium sanguineum</i>)	Mowing of 50% once, together with mowing of adjacent surface; other half following year, width 1–3 m

once every two to three years. The hay was stored and used during the winter. Their origin goes back to early medieval times. Before World War II, in a time of permanent hay shortage, this type of meadows was very sought for. Additional hay was crucial for cattle feeding in alpine regions with its very long winters.

In the case of the “Erstfeldertal” in the canton of Uri, the wild hay surfaces were commons. Everybody was obliged to mow on the same published day in August. As people stayed near the meadow in primitive shelters to mow as much as possible on that day, it was a rule that mowing could only begin when it was possible to read a newspaper in the daylight.

Today these wild hay meadows are rapidly vanishing. In the Region of Davos, 70% were lost between 1945 and 1984 (Klaus, 2000). Some were transformed to pastures. It has been shown that this transformation changes the composition of the flora: grasses begin to dominate (Wipf, 1999).

Mowing of the “Erstfeldertal” wild hay meadows has been abandoned for about 30 years with occasional sheep grazing since then. The effects are discernible by a certain loss of diversity. The abandonment of hay cutting has the following effects:

- Erosion
- More avalanches
- Covering with rubble
- Decrease of species diversity
- Increase of grass dominance
- Loss of additional income, tradition and identity.

Switzerland has an international responsibility for this type of land use. It is a cultural and a natural heritage. About 4000 ha still exist in Switzerland, 2300 ha in Austria, just over 100 ha in Germany and an unknown (but small) number in Italy and Slovenia. It seems that the use of wild hay has been abandoned completely in France.

Following the mapping the canton has taken measures to revitalize the wild hay use in the “Erstfeldertal”. The meadows consist of 40% *Mesobrometum* with additional *Seslerion variaespecies*, 10% *Caricion ferruginei*, 10% *Laserpitietum sileris* and 5% species-rich *Trisetion*. First actions started in 2003 with a specialised team. The mowing has been extended to other surfaces in 2004. The effects on plant diversity are monitored (**Table 2**).

Working together with a local farmer in a very close way was decisive for the team since he passed on important knowledge, e.g. how to erect the traditional tall haystacks (“Tristen”). The use of the hay is still a matter of debate. The haystacks can be left as winter-fodder for chamois, red deer and roe deer. In 2003 with a shortage of hay due to extreme drought climate, the hay was used by the involved farmer. It was transported with a helicopter. As this would seem

Table 2. First results of monitoring indicate that in similar plots mown surfaces show more positive indicator species. But also *Trisetion*-species, indicating eutrophication, seem to profit — *Les premiers résultats du monitoring attestent que dans des parcelles comparables, les surfaces fauchées présentent plus d'espèces indicatrices positives. Cependant certaines espèces du Trisetion, indicatrices d'eutrophisation, semblent également en profiter* (E. Jenny, comm. pers.).

Species	Number of flowering individuals in 2004	
	mown 2003	unmown 2003
Positive indicators		
<i>Phyteuma orbiculare</i>		
plot 1	0	25
plot 2	52	1
plot 3	55	19
<i>Scabiosa lucida</i>		
plot 1	36	123
plot 2	469	261
plot 3	265	61
<i>Carlina acaulis</i>		
plot 1	6	4
plot 2	1	1
plot 3	14	4
<i>Helianthemum numm.</i>		
plot 1	33	17
plot 2	127	2
plot 3	80	16
Negative indicators		
<i>Trifolium medium</i>		
plot 1	31	109
plot 2	0	0
plot 3	383	574
<i>Laserpitium siler</i>		
plot 1	0	3
plot 2	34	102
plot 3	0	2
<i>Geranium sylvaticum</i>		
plot 1	78	1
plot 2	0	0
plot 3	15	0
<i>Trollius europaeus</i>		
plot 1	40	20
plot 2	0	0
plot 3	153	143

absurd from an environmental impacts and costs standpoint, Oekoskop (2004, unpublished) did a case study, comparing the costs and the CO₂-balancing. It shows that under these circumstances, with a helicopter base close-by, the costs per ton of hay were by far the least with the helicopter, compared to the transport with a specially designed cable car for hay transport or the transport with a lorry from other areas of Switzerland. The CO₂-output per ton of hay was the highest but only with 23 kg versus 19.5 kg (cable car) and 16 kg (lorry).

The costs of the cutting are however high and only feasible for selected objects of national importance and

if there is no farmer interested in doing the work. The following recommendations for the management of wild hay meadows can be given:

- Minimal use: mowing every two to 15 years depending on vegetation type and altitude;
- Research into historical and present land use;
- Assessment of risk factors for the discontinuation of the use;
- Inducement and support (economic, infrastructure, manpower);
- If fallen fallow: management plan.

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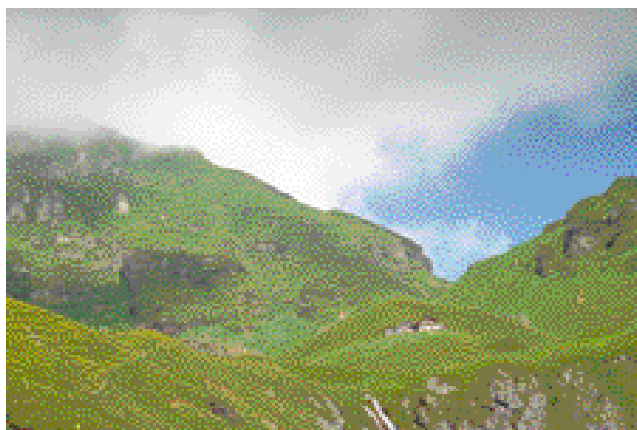
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Picture 1. The *Mesobromion*, here with *Onobrychis viciifolia* is the dominant dry grassland-vegetation type of the lower regions of Switzerland — *Le Mesobromion, ici avec Onobrychis viciifolia, est le type de végétation dominant des prairies et pâturages secs des régions de plaine en Suisse.*



Picture 2. Confronted with a rapidly increasing global competition, the alpine agriculture with its difficult conditions can only survive with direct payments — *Confrontée à la croissance rapide de la concurrence mondiale, l'agriculture alpine ne peut survivre que grâce aux paiements directs.*



Picture 3. The *Caricion ferruginei*, here with *Allium victorialis*, is the dominant vegetation type in the north-exposed, clay-rich subalpine zones of the calcareous Alps — *Le Caricion ferruginei, ici avec Allium victorialis, est l'un des types de végétation dominant de la zone subalpine des Alpes calcaires.*



Picture 4. The *Seslerion variae*, shown here with *Onobrychis montana*, is usually the most species-rich subalpine dry grassland type — *Le Seslerion variae, ici avec Onobrychis montana, est en général le type de végétation des prairies et pâturages secs de l'étage subalpin le plus riche en espèces.*



Picture 5. The removing of topsoil in the 'Reinacherheide' gave way to the re-introduction of *Oedipoda caerulescens*, which seems to thrive — *Le décapage de la couche superficielle du sol à la 'Reinacherheide' a rendu possible la réintroduction de Oedipoda caerulescens qui semble prospérer.*



Picture 6. The challenge of the preservation of dry grasslands lies in an adequate management to preserve all its habitats and structures. — *Le défi dans la préservation des prairies et pâturages secs réside dans un entretien adéquat visant à préserver tous les habitats et les structures.*

All pictures by Guido Masé — *Toutes les photos sont de Guido Masé.*