UNIVERSITÄT BERN

OESCHGER CENTRE
CLIMATE CHANGE RESEARCH

Barriers and factors of success within the implementation of mire conservation in Switzerland

Master thesis
MSc Climate Sciences

Olivia Linda Bolliger
17-203-688

August 2023
University of Bern
Oeschger Centre for Climate Change Research (OCCR)

Supervisor: Prof. Dr. Ralph Winkler

Table of Contents

Table of Figures

Abstract

Wetlands are the fastest decreasing type of ecosystem worldwide, with more than 85% of wetlands lost since 1700 (Anisha et al., 2020). They comprise a range of different ecosystems including, lakes and rivers, mires and many others (United Nations, 2022). In Switzerland mire and mire landscapes of national importance are unconditionally protected by the Swiss constitution (Küchler et al., 2018). Despite the constitutional protection, the quality of Swiss mires continues to decline (Bundesamt für Umwelt, 2007). Even though there is a distinct gap between the regulation, which is strong, and its implementation, which is weak, it is difficult to pinpoint the origin of the regulatory failure within peatland protection. Therefore, this thesis focused on the main reasons for the lack of implementation of the constitutional protection of mires and their continued decline in quality. To answer the research questions there were interviews, a literature review and two case studies conducted. The main barriers identified within the implementation of mire conservation were the conflicting interests of landowners and land managers. These are strongly interconnected with the current agricultural system and its intensification. Thus, the solutions proposed aim to bring the interests of land owners and managers closer to those of mire conservation.

1. Introduction

Wetlands are the fastest decreasing type of ecosystem worldwide, with more than 85% of wetlands lost since 1700 (Anisha et al., 2020). They include a range of different ecosystems such as, lakes and rivers, peatlands, coral reefs, human made aquatic sites and many others (United Nations, 2022). Peatlands make up over half of the worlds wetlands and can be found all over the world (Wetlands International, 2023a). Peatlands are ecosystems with accumulated organic matter and consist of a layer of peat, formed by dead and decaying plant material (IUCN UK Peatland Programme, 2023). They can be classified into mires (bogs and fens) and peatlands dominated by trees, also called peat swamps (Brunkhurst & Bowman, n.d.). Mire refers to a peatland, which actively forms peat and is formed on constantly wet and water saturated soil (Joosten & Clarke, 2002; Küchler et al., 2018). Mires are generally nutrient poor with little ground cover and have terrestrial as well as aquatic features, which makes them unique (IUCN UK Peatland Programme, 2023; Küchler et al., 2018).

Peatlands and mires provide a variety of valuable services to society. For example, they are the largest terrestrial carbon store in the world and hold a variety of endangered and specialist species, even though they only make up around 3% of the Earth's surface (Wetlands International, 2023b). Peatland soils store over 600 gigatons of carbon worldwide (International Union for Conservation of Nature, 2021). If managed well, peatlands can continue to take up carbon from the atmosphere. Peatlands also serve as important water stores, protecting against floods, droughts and ensuring clean water supply (Wetlands International, 2023b). In fact, millions of livelihoods are sustained by peatlands, and they provide a touristic, recreational and cultural site (Anisha et al., 2020). Nonetheless, the economic incentives for private landowners are often different from what is best for society. This is due to the public good nature of many of the benefits provided by mire restoration and protection (Hansen et al., 2015). As a result, many mires and peatlands worldwide have been destroyed (Anisha et al., 2020).

In Switzerland, there are very similar trends. Wetlands in Switzerland have undergone massive changes in the last few centuries. With population growth came the increase of agricultural production and the rising demand for agricultural land grew. As a result, many mires have been destroyed. Many rivers were straightened and "tamed", which lead to the draining of lands and made them available for agriculture and other land usages. Drainage, peat extraction and the creation of water reservoirs were some of the main drivers of the destruction of mires. Since 1900 the surface area of mires in Switzerland has decreased by 80% (Stuber & Bürgi, 2018).

In 1987 voters in Switzerland recognized the urgency to act against mire destruction. They accepted the popular initiative called the "Rothenthurm-Initiative." It constitutionally and unconditionally protects mires and mire landscapes of national importance in Switzerland. Thanks to the "Rothenthurm-Initiative" an inventory of Swiss mires has been created and has stabilized the surface area of mires in Switzerland (Küchler et al., 2018).

Despite constitutional protection, the quality of Swiss mires continues to decline (Bundesamt für Umwelt, 2007). The legal protection has shown little to no effect on the deterioration of mires (Pro Natura, 2010). Only few mires have been rewetted after the acceptance of the "Rothenthurm-Initiative" and the majority of Swiss mires are still in degrading conditions (Küchler et al., 2018). Today, almost 100% of mires are affected by this continued quality loss (Bundesamt für Umwelt, 2019a). The mires in Switzerland are becoming increasingly dry and more nutrient rich. Additionally, the ground cover by shrubs and trees has increased, while the typical vegetation and species have decreased. One of the main drivers of the continued quality loss of Swiss mires are active drainage systems in peatlands. The active drainage systems further dry out the peatlands. Secondly, manure and fertilizer increase the nutrient contents of the nutrient poor ecosystem (Bundesamt für Umwelt, 2007). The high number of livestock in Switzerland also leads to additional nitrogen input through the air (Bundesamt für Umwelt, 2019a). Thirdly, the abandoning of agricultural use as meadows and pastures increases the ground cover (Bundesamt für Umwelt, 2007).

The goal of this thesis is to deepen the understanding of the underlying problems that are hindering the effective implementation of the current peatland protection laws and regulations in Switzerland. The focus was set on Switzerland, a wealthy country with strong regulations, one of the longest lists of endangered species and still one of the smallest percentages of protected areas. Even though there are very clear and strong national policies in place, the implementation of mire protection is relatively weak (Pro Natura, 2021). Despite the clear gap between the strong regulation and lack of effective implementation, it is difficult to pinpoint the regulatory failure within peatland protection.

Therefore, this thesis aims to answer the following research questions:

What are the main reasons for the lack of implementation of the constitutional protection of mires and the continued quality loss despite the strong legal protection of Swiss mires?

What type of policies can advance the implementation of mire protection in Switzerland?

To answer the research question, I carried out a case study of 2 exemplary mires, in Lucerne, Vaud and Fribourg. This helped to examine the main barriers and factors of success of effective policy implementation in each case. In a first step I conducted a literature review and interviews to gain a deeper understanding of the most important and pressing problems within mire protection in Switzerland. I used this in order to set a focus on a few specific problems to be studied. In a second step I chose the cases to be studied according to the main problems identified. I highlighted different aspects of each mire to deepen the understanding and specificity of each mire. I analyzed the historical development of each mire. In order to further classify each case, I examined the inventory and inventory types, the protective measures, quality of the mire, land tenure, local jurisdiction and the responsible nature protection office.

The interviews were conducted with at least one representative of the most important stakeholder groups: state representatives on a federal and cantonal level, farmers and landowners, nature protection organizations and scientists. For each case I conducted separate semi-structured interviews. The interviews ranged from 30 to 90 minutes and were unpaid. The interviews were not transcribed but interview notes were taken. The questions were adapted for each interview, depending on the stakeholder and the previously gained information. During the interview I left a lot of freedom to the interviewed stakeholders. This avoided steering their answers in a certain direction and helped to find the most pressing barriers and problems from their perspective. In total I conducted 15 interviews, one of which was conducted in writing.

The goal of the case studies was to find common as well as case specific barriers and factors of success. The case studies aimed to conceptualize and to deepen the understanding of the underlying problems within mire protection in Switzerland. With this deeper understanding and the conceptualization of the problems at hand, possible solutions were proposed in a third step. The goal was to mainly propose solutions that are as widely applicable as possible and can potentially be used to optimize mire protection in Switzerland.

The remainder of the thesis is structured as follows. The second section analyses different aspects of mire conservation in a detailed literature review. The literature review reveals that there are many different aspects to be considered within mire conservation and the underlying problems are multifactored and interdependent. Section three dives into the two case studies and the main insights from the conducted interviews. For the case studies we look at the Juchmoos in the canton of Lucerne and “les Mosses de la Rogivue” in the canton of Vaud. Both are rather positive examples of implementation of mire conservation. Nevertheless, they are both far from complete implementation of the current law. The results from the conducted stakeholder interviews revealed that some of the main barriers of implementation are related to land ownership and the current agricultural system. In the fourth section I propose possible solutions to the problems identified in section three. An alternative land use where the peatlands and mires are rewetted was identified as the only sustainable way to preserve the valuable ecosystems and their services. In order to implement the change in land use, I propose measures like changes in subsidies and an expansion of the educatory offer. In the last two sections I conclude and discuss the findings.

2. Literature Review

There have been some studies looking into the reasons for the continuous deterioration and insufficient implementation of the protection laws and regulations. Raemy (2008) found that municipalities lack the necessary financial and technical competences to halt the degradation of mires. One of the problems is that the focus so far is set on protection and not the ecological evolution and ecological, cultural, social and economic valorization of the mire. Mires are insufficiently protected against infrastructural expansions and other disturbances. Extensive cultivation forms, which would be necessary for peatland conservation, are barely compatible with modern agricultural production (Raemy, 2008).

The United Nations Environment Programme (2021) found that the continued degradation of global mires and peatlands is mainly caused by undervaluation of their socio-economic benefits and underinvestment in conservation and restoration of mires.

In Switzerland, the costs of mire protection are split between the Federal and Cantonal Government at around 80% to 20%. Nature and landscape protection spendings by the Federal Government are financed through the Federal Office for Agriculture and the Swiss Federal Office for the Environment, with the Federal Office for Agriculture spending 2.5 times the amount of the Swiss Federal Office for the Environment. There is still a significant gap between the actual spendings and the financial resources necessary for the protection of mires. This is suspected to be one of the main reasons for the continued depreciation of mires. The longer the necessary investments are not carried out, the more the mires deplete and the higher the cost for regeneration (Ismail et al., 2009).

Some cantons and municipalities lack political will to effectively protect mires even though there is a clear legal framework in place (Bundesamt für Umwelt, 2019a). An environmental performance review conducted by the OECD (2017) found that proper implementation of environmental law is obstructed by insufficient inspection and prosecutors lacking expertise on environmental law.

Another study focusing on agriculturally used organic soils and peatlands found that the lack of change in land management is due to the high profitability of the current land use. Other reasons identified were the difficult economic environment of farmers, the cultural background of the region studied and the absence of systematic soil data (Ferré, 2017).

2.1 Terminology

Since a large part of the literature included, is written in German and not translated to English, it is necessary to establish the translations and terms used. Additionally, there are multiple overlapping terms, that should be defined.

The following terms are the main ones used in the Swiss legislation: “Moor”, “Hochmoor”, “Flachmoor” and “Moorlandschaft”. These are translated as follows. Mire (“Moor”) can be used

as the overarching term for fens (“Flachmoore”) and raised bogs (“Hochmoore”). The term “Moorlandschaft” has been translated to wetland in the English translation of the Swiss constitution, while the term used by the Federal Office for the Environment is mire landscape (Bundesamt für Umwelt, 2022c; Federal Constitution of the Swiss Confederation, 2022).

According to the Ramsar Convention on Wetlands, wetlands are areas, where the environment and the present flora and fauna is primarily controlled by water. They are present in areas where the land is covered by water or the water table is at or near the ground level (Ramsar Convention on Wetlands, 1971). The most common type of wetland are peatlands, representing over half of global wetlands. Peatland is defined as an “area with a naturally accumulated peat layer at the surface” (Joosten & Clarke, 2002, p. 24). The water saturated conditions and the lack of oxygen give them the unique ability to accumulate and store dead organic matter in the form of peat. The International Mire Conservation Group has defined mires as wetlands with actively peat forming vegetation. While all mires are considered to be peatlands, ecosystems that are no longer accumulating peat are no longer considered mires (Joosten & Clarke, 2002). The term wetland consequently comprises a wider variety of ecosystems than the term mire landscapes. Therefore, it also seems more appropriate to use the term mire landscapes.

There are two types of mires: raised bogs and fens. Because the nutrient supply in intact raised bogs occurs mainly through rainwater and atmospheric deposition, they are amongst the most nutrient poor habitats in Central Europe. Due to the nutrient poor and wet environment trees cannot grow in the center of raised bogs. There can be tree growth, in more drained marginal areas. In contrast to raised bogs, fens are not only fed through rainwater but also mineral groundwater or slope water. The mineral rich water supplies the fen with nutrients and fens do not necessarily actively accumulate peat (Bundesamt für Umwelt, 2007).

2.2 Historical Development

Since 1800 the mire surface area in Switzerland has decreased by around 80%, with many mires already disappearing before 1900. The degradation of mires and the decrease in surface area started in the 18th century and has accelerated since 1850 (Küchler et al., 2018). The main reasons for the degradation of mires in Switzerland in the last 200 years are well known: drainage, construction of reservoirs, peat extraction, nutrient input through the air and other surroundings, scrub encroachment, excessive grazing but also abandonment of land use (Fischer et al., 2015). Peat was extracted from raised bogs for heating fuel and fens were drained due to the straightening of rivers and lowering of lakes levels. Both raised bogs and mires fell victim to drainage during the hydrological “meliorations” conducted in Switzerland. After the peat extraction and drainage of mires, the fertile peat soils were converted into arable and pasture lands. Peat extraction in Switzerland continued until the 1980s (Küchler et al., 2018).

The continued loss of mires lead to an opposition of the Swiss population. A planned military base in the mire landscape of Rothenthurm united local farmers and nature conservation organizations, fighting against the destruction of the landscape, the expropriation and for a better protection of mires. They started the “Rothenthurm-Initiative” and 1983 they achieved to collect 160 thousand signatures within 6 months. At a popular vote in 1987 the initiative was approved by 58% of the Swiss population. The political discourse around the initiative also lead to a revision of the Federal Act on the Protection of Nature and Cultural Heritage, which strengthened the protection of biotopes. The “Rothenthurm-Initiative” lead to the protection of mires and mire landscapes of national importance (Küchler et al., 2018). In order to create an inventory of the mires and mire landscapes of national importance, they were mapped. The mapping of mires and mire landscapes was officially recognized between 1991 and 1996. There have been very minimal changes to the inventory thereafter (Verordnung den Schutz der Hoch- Und Übergangsmoore von nationaler Bedeutung, 1991; Verordnung den Schutz der Flachmoore von Nationaler Bedeutung, 1994; Verordnung über den Schutz der Moorlandschaften von besonderer Schönheit und von nationaler Bedeutung, 1996). Since the acceptance of the “Rothenthurm-Initiative” 1987, the surface area of mires has been relatively stable (Küchler et al., 2018).

2.3 Current State

In the past 30 years since the “Rothenthurm-Initiative” entered into force, most mires that are part of the national inventory were assigned a status of protection. Nevertheless, rewetting has only been carried out in few cases. Over two thirds of raised bogs are still in a degrading state (L. Gubler & Seidl, 2020). The surface area of mires in Switzerland today is estimated at around 33’700 hectares, which is less than 1% of the surface area of Switzerland (Küchler et al., 2018).

Between 1997 and 2010 the quality of raised bogs and fens of national importance has decreased substantially. Around a third of Swiss mires have become drier, more nutrient-rich and have seen a decrease in peat and a decrease in light due to increased vegetation cover in over a third of Swiss mires. Over half of raises bogs in Switzerland have become drier, more nutrient rich and have seen an increase in vegetation cover. There are similar developments found for fens in Switzerland. Around half of them have become drier and their vegetation cover has increased. Around 30% of fens have also become more nutrient rich. Many other mires show similar tendencies. These are undesired developments, since they go against the typical characteristics of raised bogs. The decreasing quality of mires can also be observed in the change of vegetation types. The desired raised bog vegetation has transformed into wet meadows and forests. So even though the surface area of mires is relatively stable, this shift in vegetation types leads to a decrease in raised bogs and fens. Few mires show desired trends, only 14% of mires have become more humid. This can be partly associated to implemented regeneration measures (Küchler et al., 2018).

2.4 Legal Framework

The mire protection of Switzerland is very unique and there is no other country that guarantees absolute protection for mires (Forum Biodiversität Schweiz, 2007). The legal framework for mires in Switzerland is based on the federal constitution article, implemented by the acceptance of the "Rothenthurm-Initiative".

> *Art. 78 par. 5 "Moors [mires] and wetlands [mire landscapes] of special beauty and national importance shall be preserved. No buildings may be built on them and no changes may be made to the land, except for the construction of facilities that serve the protection of the Moors [mires] or wetlands [mire landscapes] or their continued use for agricultural purposes."*
> (Federal Constitution of the Swiss Confederation, 2022)

As stated in the constitution there are two main objects of protection, mires and mire landscapes. Additionally, to the constitution, there is the Federal Act on the Protection of Nature and Cultural Heritage and three national ordinances on fens, raised bogs and mire landscapes. Together they build the main legal framework for mire protection in Switzerland (Bundesamt für Umwelt, 2002).

The ordinances on fens and raised bogs have many similarities. There is a general prohibition of the creation of buildings and other facilities and changes of the ground. Not affected by this prohibition are changes that serve the maintenance of the protection goals. The two ordinances only differ slightly, with the ordinance on raised bogs being moderately stricter. In this context the difference is neglectable. The ordinance on mire landscapes follows the same structure as the other two and has many parallels when it comes to its content. However, the ordinance on mire landscapes is slightly less strict. The main difference is that change within the mire landscape is allowed as long as this conforms with the maintenance of the typical elements of the landscape. So, a change can be carried out as long as the effect on the protection goal is neutral or positive. The primary objective of the ordinances is the protection of mires under public law and in a way that is binding for landowners. Additionally, the protection of mires should be done through the cantons and there is a need for the definition of protection and maintenance measures. Secondly, the cantons are required to define large enough buffer zones (Bundesamt für Umwelt, 2002).

According to the law, the cantons are responsible for the implementation of the mire and mire landscape protection (Bundesgesetz über Den Natur- und Heimatschutz, 2022). As stated above, the implementation of mire protection in Switzerland is far from complete. Today, 91 % of raised bogs and 79% of fens are under legal protection status and have a maintenance plan (Bundesamt für Umwelt, 2019b). According to the national law this should have been implemented by 1997 for raised bogs and 2000 for fens. In the case of failure to meet necessary implementation within the legal time frame, the federal department of home affairs may take actions on behalf of the cantons and charge them with an appropriate part of the costs (Bundesgesetz über den Natur- und Heimatschutz, 2022).

2.5 Buffer Zones

When it comes to the demarcation of the mires, according to the ordinances for raised bogs and fens cantons need to declare a large enough ecological buffer zone around the protected fens and raised bogs (Verordnung über den Schutz der Hoch- und Übergangsmoore von nationaler Bedeutung, 2017; Verordnung über den Schutz der Flachmoore von nationaler Bedeutung, 2021). As determined by the federal court, the ecological buffer zone needs to fulfill three main functions. The ordinance requires a hydrological buffer zone, where no changes in the water regime, that would affect the water supply to the mire, are allowed (Bundesamt für Umwelt, 2002). Secondly, a nutrient buffer zone is required in order to reduce and impede the eutrophication of the nutrient poor ecosystem. Thirdly, there is a biological buffer zone necessary, which serves as a transitional zone for the mire specific flora and fauna (Bundesamt für Umwelt, 2002).

In order to support cantons in the implementation of buffer zones, there has been a guideline developed for the determination of nutrient buffer zones (Marti et al., 1997).The Federal Office for the Environment has also created a method to determine the hydrological buffer zone. If the cantons follow these guidelines to declare the hydrological and nutrient buffer zone, this ensures that the defined buffer is supported by the federation. The guideline for the determination of the hydrological buffer zone has been created as a part of a pilot project started in 2014 that will continue to improve the implementation of the hydrological buffer zone (Grosvernier, 2023). For the ecological buffer zone, the Federal Office for the Environment has yet to create a guide as to how it can and should be implemented (Bastien Amez-Droz, personal communication, 17 May 2023).

Even with the clear definition of the functions of buffer zones and the guidelines provided, the implementation of the buffer zone is insufficient. There are regular surveys of the cantons conducted on the subject of biotope protection in Switzerland. According to the last survey from 2021 the implementation of buffer zones is far from sufficient. Only 60% of nutrient buffer zones for fens and about 68% for raised bogs have sufficiently been implemented. Barely more than 10% of biological buffer zones for fens and 40% for raised bogs are sufficiently implemented. In fens around 15% of hydrological buffer zones and for raised bogs 20% have been classified as sufficient. It seems relevant to mention, that these numbers are merely based on the self-evaluation of cantons (Bundesamt für Umwelt, 2022b).

2.6 Economic Value

Peatlands and mires fulfill many important functions and are considered to be one of the most valuable type of ecosystems, due to the many benefits they provide. One of their key functions is the sequestration of carbon. Peatlands are the largest terrestrial carbon store and transform into a large carbon emitter, when drained (United Nations Environment Programme, 2021). Peatlands also play an important role for the preservation of biodiversity, since they provide a habitat for many threatened and unique species. Additionally, they support the water cycle and not only serve as flood plains but also support drinking water supply (Martin-Ortega et al.,

2014). With increasing risks from climate change, periodic droughts and freshwater scarcity, the ability for peatlands to support the drinking water supply becomes increasingly important. Peatlands also control water pollution and sediments and can supply locally harvested products. Additionally, mires hold religious, spiritual and cultural values and serve as a touristic, recreational and educational space. The services provided by peatlands are not only important for current but also future generations (United Nations Environment Programme, 2021).

Many of the ecosystem services provided by peatland conservation, like carbon storage and the conservation of threatened species, benefit societies worldwide. The costs of peatland conservation are however carried by the countries that contain them (United Nations Environment Programme, 2021). As for many other public goods the exploitation and degradation of peatlands provides benefits to only few and costs, as in loss of ecosystem services, for many. Therefore, there is an unequal distribution of costs and benefits and the exploitation of peatlands generates negative externalities on society (De Groot et al., 2006). Many of the benefits provided by peatlands are not transacted on markets. This leads to the undervaluing of peatlands. In order to evaluate their benefits, there is a need to use non-market valuation techniques (United Nations Environment Programme, 2021).

Since peatlands are rapidly decreasing there is also a strong decrease in their yearly ecosystem values (Davidson et al., 2019). The opportunity costs of delaying action on peatland restoration could be fundamental. The failure to act on peatland restoration will lead to irreversible carbon emissions and decreases in ecosystem services (Glenk et al., 2021).

2.7 Subsidies

Switzerland heavily subsidizes agriculture. Since 2000, in Switzerland on average around 54% of the yearly gross farm income has come from governmental support. The EU average lies at around 20% (OECD, 2023). In 2022, the financial support of the agricultural sector by the Swiss federation amounted to over 3.6 billion Swiss francs. Almost 3 billion of which went towards direct payments to farmers (Eidgenössische Finanzverwaltung, 2023). There were additional costs bared by the cantons. The total economic costs for society have been estimated at around 20 billion Swiss francs yearly, including 7.6 billion Swiss francs of environmental costs. The agricultural sector's net value added is negative for almost every canton. Due to the heavy subsidization, there is a high alignment of production structures to subsidies. The innovation and entrepreneurial freedom in the agricultural sector suffer from this high alignment of production structures to subsidies (Dümmler & Bonato, 2020).

Subsidies not only decrease innovation and entrepreneurial freedom but can also have direct negative impacts on biodiversity. A study identifying and quantifying the negative effects towards biodiversity due to subsidies in Switzerland, found 160 subsidies that are harmful to biodiversity. The total amount of quantifiable subsidies that are harming biodiversity sums up to 40 billion Swiss francs. These biodiversity harming subsidies do not account for the implicit subsidies, like negative externalities. Therefore, the total costs of biodiversity harming subsidies

are estimated to be significantly higher. 46 out of 160 biodiversity harming subsidies identified go towards the agricultural sector. They pollute, harm and destroy habitats through intensive farming and homogenization of landscapes (Gubler et al., 2020). Aside from biodiversity, agricultural subsidies also have significant negative effects on climate change and other environmental functions (OECD, 2022). In contrast to the biodiversity harming subsidies, the governmental funding going towards the promotion of biodiversity lies somewhere between 520 million and 1.1 billion Swiss francs (Gubler et al., 2020).

An example of a subsidy with biodiversity harming effects is the so-called basic contribution, where a fix amount is paid per cultivated hectare, also intensively farmed land. Additionally, extensive and less intensive permanent grasslands receive 450 Swiss francs per hectare, while other forms of land use receive 900 Swiss francs per hectare. The basic contribution for intensively farmed lands is therefore higher. Moreover, the basic contributions is linked to a minimum quantity of livestock, creating an incentive to increase the number livestock for less intensive farms (Möhring et al., 2018).

2.8 Biodiversity

Biodiversity describes the diversity of life on our planet. It encompasses the richness of species and habitats, the diversity within species and the diversity of interactions between and within species and habitats. Ecosystems provide many important functions, products and services in a cost-effective way to the benefit of society. Due to the severe decline in biodiversity the ability of many ecosystems to provide their vital and valuable services has been strongly restricted. This is especially concerning as climate change emits growing pressure on ecosystems (Fischer et al., 2015).

Switzerland's topography, high variation in altitude and the central location within Europe makes it rich in biological diversity. However, the state of biodiversity in Switzerland is alarming and has suffered a massive decline in the past 100 years. The population of many species have reached such a low level that their long-term survival is no longer guaranteed. Over a third of the species in Switzerland have been classified as threatened and another 10% are considered to be potentially threatened (Fischer et al., 2015). With the intensification of agriculture and the increase in nutrient input, the decrease of biodiversity has been especially strong on the agricultural lands on lower altitudes (Meier et al., 2021). So far, measures taken to protect biodiversity in Switzerland have only prevented the state of biodiversity from being much worse. These measures are however not sufficient in order to stop the significant decline in biodiversity. According to experts, the area that is currently reserved for biodiversity, needs to be at least doubled. There is also a need for more connectivity of these surfaces and a more biodiversity friendly land use outside of biodiversity or protection areas (Fischer et al., 2015).

Mires are of high importance for biodiversity in Switzerland, especially raised bogs. The number of endangered and rare species found in raised bogs is particularly high, even though mires are not very species rich. There is a very high percentage of endangered and very typical species

found in mires, that can only survive in the distinct conditions present in mires (Küchler et al., 2018). Raised bogs, for example, are very low in nutrients, present acidic conditions and are therefore poorer in species. However, they are rich in species that can adapt to the extreme conditions (Heinrich-Böll-Stiftung et al., 2023).

As previously discussed, the surface area of mires in Switzerland has significantly decreased. The decrease in surface area was followed by a drastic loss of connectivity of the different biotopes. This connectivity is especially crucial for biodiversity. Today many of these biotopes are fragmented. The fragmentation of different habitats impedes genetic exchange between populations. Due to limited migration abilities mire species are particularly vulnerable to habitat fragmentation (Gimmi et al., 2011). Species react in different ways to changes within an ecosystem. Some species disappear immediately, since the ecosystem does not offer the necessary environmental conditions anymore. Other species survive but cannot reproduce and die out slowly. Therefore, there is a time lag between a change in the ecosystem and the extinction of species. This phenomenon can take up to decades and is called extinction debt. Due to extinction debt, even with the stabilization of the surface area more species are expected to go extinct (Küchler et al., 2018; Tilman et al., 1994).

One example for a typical mire species is peat moss. It grows in nutrient poor and wet conditions. Peat mosses are mainly present in raised bogs but can also be found in fens and humid forests. They steadily grow upwards, while with the lack of air the lower part of the moss decomposes into peat. Through this process the peat moss bind carbon and play an important role in the global carbon budget. The peat layer of mires binds around double the amount of carbon compared to forests worldwide (Küchler et al., 2018).

2.9 Climate Change

It is very likely that in the long-term temperatures will continue to rise in Switzerland, the warming is predicted to be higher than the global average. The mean precipitation in Switzerland will likely decrease during warmer seasons and increase during the colder seasons. During summer, the warming will likely lead to less wet days, drier soils and longer periods without rain. An increasing evaporative demand will likely lead to more pronounced agricultural drought. With substantial warming it is expected that heavy precipitation will be more frequent and intense, particularly in winter (National Centre for Climate Services, 2018).

Due to the increased rain and decreased snowfall in winter, there will be less melt water feeding the rivers and lakes in summer. The water outflow will be higher in winter and lower in summer. This could lead to an increase of regional water shortages during summer. Due to more extreme precipitation the number of floods is also expected to increase (Bundesamt für Umwelt, 2021).

Mires depend on cool and humid climatic conditions, which is why they are expected to be especially vulnerable to climate change. A study from Austria, found that summer

temperatures especially influence the mire ecosystem. Precipitation also appears to be a major contributing factor. Therefore, climatic factors are especially explanatory to the distribution of mire ecosystems. Hydrologically intact mires are more resistant to climate change and can help mitigate effects of climate change, since they belong to the most important carbon stocks. With increased summer drought, peat mineralization might increase and enable the release of captured carbon into the atmosphere. Mires in lower altitudes are expected to be more threatened by climate change than in higher altitudes, since they are already at their thermal and precipitation limits (Essl et al., 2012). In order to reduce CO_2-emissions and conserve endangered species regenerating drained mires can be a cost-effective solution. The regenerative measures can increase the resilience of mires to climate change (Carroll et al., 2011).

The continued degradation of peatlands contributes to at least 5% of the total anthropogenic emissions globally, even though they only make up around 3% of the global land surface (Anisha et al., 2020). By emitting large amounts of greenhouse gases, the loss of peatlands will further amplify climate change (World Economic Forum, 2022). 20% of the carbon stored in the ground is found in mires, which is the equivalent of 60% of the carbon in the atmosphere. Even though growing peat moss emits methane, the positive effects of the CO_2 sequestration predominate (Küchler et al., 2018).

2.10 Peat Soil

Peat soil is formed through the accumulation and decomposition of organic matter. The organic matter is decomposed under waterlogged conditions with a lack of oxygen. Soil with more than 20% of organic matter is defined as organic soil. Once the organic matter within the soil surpasses 75% it is defined as peat soil (Gowthaman et al., 2022). Soil is a non-renewable resource. The depletion of soil organic matter, erosion, compaction and contamination with pollutants contribute to the loss of soil. Soil provides ecologically and economically valuable services, including food and resource production (Schweizerischer Bundesrat, 2020). The importance of soil and its contributions to ecosystem services often go unrecognized. This might be due to the perception of soil as being inexhaustible. Soil threats typically manifest slowly and are invisible to many people (Schweizerischer Bundesrat, 2020).

Agricultural activities have significant influence on soil organic matter and its loss affects all soil functions. The loss of soil organic matter contributes to most of the CO_2 emissions in Swiss agriculture and leads to soil subsidence and compaction. Many peat soils have been drained and used for agriculture for approximately 50 to 150 years, decreasing the peat thickness by around 50 to 200 cm. Many of those drainage systems have reached the end of their lifespan and need replacement and renewal. Since many of the drainage systems are close to 100 years old, the maintenance is becoming increasingly expensive (Zollinger, 2006). This raises the opportunity to reconsider the future use of these soils. Peatlands also suffer from excessive nitrogen deposition from the air, the source of which is primarily agriculture. Yearly peat

subsidence in intensively farmed and drained peatlands may exceed 1 cm per year (Schweizerischer Bundesrat, 2020).

Soil contains large volumes of carbon within its organic matter, which is lost in substantial amounts through agricultural use, particularly through drainage of peatlands. These substantial emissions are an indication for the currently unsustainable use of soils. Climate change, especially higher temperatures and increased droughts is expected to further lead to increased carbon losses from soils due to increased decomposition of the soil organic matter. Despite the small share of land area, peatlands hold a significant share of the carbon stock in Switzerland. However, since 1850, they have lost 80% of their carbon stock due to drainage and peat extraction. Peat soils in Switzerland contain the highest carbon stock per surface area, with an average of 1070 tons of carbon per hectare (Hagedorn et al., 2018). Drained organic soils emit between 30 and 51 tons of CO_2 equivalents per hectare and year. The surface area of agriculturally managed organic soils is estimated to be around 28'000 hectares, emitting between 520'000 and 890'000 tons of CO_2 equivalents per year. These emissions amount to around 8-15% of total annual greenhouse gas emissions of the agricultural sector in Switzerland (Wüst et al., 2021). In contrast, agriculturally managed organic soils account for less than 2% of the agricultural land in Switzerland (Bundesamt für Statistik, 2023). From an economic perspective the release of greenhouse gases represents a significant cost. A German study determined the economic value of peatland loss to be 120 euros per ton of CO_2 (Hartje et al., 2015).

2.11 Peatland Management

Next to the protected mires, there are also many drained peatlands that are agriculturally managed (Bundesamt für Umwelt, 2007). For the last decades the drainage of peat soils has helped to develop the economy in some of the poorest Swiss regions and contributed to food security, but the negative outputs of drained peatlands are becoming more apparent (Ferré et al., 2019). The rate of renewal for peat is so low, that it is considered as a non-renewable resource (Joosten, 2007). There are still many drained peatlands used for agricultural crop production. The drainage of these peatlands leads to subsidence of the soil due to compaction and microbial respiration leading to CO_2 emissions (Everett, 1983). Globally, the emissions from peat are equivalent to two thirds of emissions caused by deforestation (Leifeld, 2013). Some of the additional negative externalities are carbon and nitrogen leaching, increased risk of floods and a reduced retention function for pollutants (Ferré et al., 2019). Therefore, the mitigation potential of drained peatlands is considerable.

In order to preserve peat, there is a need to increase the water level. An increased water table does not allow intensive agriculture and is a politically sensitive issue also on a market level. One of the largest peatland areas in Switzerland lays in the Seeland and is intensively used for agriculture. If the depletion, drainage and intensive farming on these lands continues, they have the potential to emit a large amount of greenhouse gas emissions (Ferré et al., 2019).

A study found that one of the main reasons that a shift towards more sustainable land management practices is not occurring, is due to high profitability of the current land use. Other reasons are the difficult economic environment of farmers, the cultural background of a region and insufficient systematic data. The same study also states that current carbon-offsetting schemes fail to fully compensate the opportunity costs of shifting land use practices on intensively farmed land (Ferré et al., 2019). There is also a lack of information on the quality, type and depth of soil in Switzerland. This impedes the sustainable management of soil (Schweizerischer Bundesrat, 2020).

3. The State of Mire Conservation in Switzerland

In this section we further analyze the main barriers and factors of success within implementation of mire conservation in Switzerland. For these two mires were examined in detail with the help of semi-structured stakeholder interviews and internal documents provided. The first mire examined is the Juchmoos in the canton of Lucerne. The Juchmoos is located within one of the largest and most dense mire landscape of Switzerland, the UNESCO Biosphere Entlebuch (Grünig, 1994). The second mire is les Mosses de la Rogivue located at the cantonal border between Fribourg and Vaud. The majority of the mire lies in the canton of Vaud, while the water catchment area of the mire lies in Fribourg, where the land is intensively farmed (Pro Natura Vaud, 2009). Both mires are part of the inventory for fens and raised bogs of national importance (Verordnung über den Schutz der Hoch- und Übergangsmoore von nationaler Bedeutung, 2017; Verordnung über den Schutz der Flachmoore von nationaler Bedeutung, 2021). Both mires are rather good than bad examples of implementation, since in both cases there have been regeneration measures taken. Nevertheless, they both face problems within implementation and the legal protection is far from being fully implemented, especially the buffer zones. These cases were chosen since the implementation of the mire protection can be analyzed in a more nuanced way. There are however also cases of mires that have been too severely damaged, and regeneration is not possible anymore (Bastien Amez-Droz, personal communication, 13 March 2023).

There are several important stakeholders to consider within implementation of mire protection in Switzerland. On the governmental level there is the Federal Office for the Environment and the cantonal offices responsible for the implementation of mire protection. Other important stakeholders are the landowners and land managers in and around the mire perimeter, private environmental offices and NGOs. Landowners are often private property owners and not seldomly also the land managers of their land. On the other hand, around 10 % of raised bogs are within the property of Pro Natura, a nature conservation organization (Bastien Amez-Droz, personal communication, 17 May 2023). For both cases if involved and possible, these stakeholders were interviewed.

3.1 Implementation

According to the law, by the beginning of 1997 and the end of 2000, respectively, the implementation of the protection of fens and raised bogs should have been completed (Bundesamt für Umwelt, 2002). The cantos would have had to define boundaries of the protected mires on a parcel-by-parcel basis and in a legally binding way for the landowners. Additionally, they would have had to establish object-specific protection and maintenance measures through legally binding planning instruments. A study conducted in 2018 by the Federal Office for the Environment revealed that not only are there still major deficits in the implementation of the protection and maintenance measures but that for many objects there are no concrete protection and maintenance measures at all. For the mire landscapes cantons should have had defined a precise demarcation of the landscapes and object specific protection and maintenance measures by mid 2002. In 2018 only 58% of mire landscape protection have

been implemented properly (Bundesamt für Umwelt, 2018). The results of the study conducted by the Federal Office for the Environment reveals that the implementation of mire protection is far from where it should be. The difficulties within the cantonal implementation were found to be the lack of financial and personnel resources, difficulties with understanding, defending and communicating the mire protection and the development of agricultural land. Other difficulties identified were increased leisure activities in some places, internal difficulties concerning coordination and prioritization and methodological difficulties (Bundesamt für Umwelt, 2019b).

In the following I will use the results of the interviews in order to further investigate the main difficulties and reasons for the lack of implementation.

In the last decades since mire protection has been implemented into the law, some of the framework conditions have changed. This brings new challenges to the implementation of mire protection. One of the main changes has been climate change, bringing warmer and longer dry periods (Ariel Bergamini, personal communication, 23 March 2023; Peter Ulmann, personal communication, 15 May 2023). Due to the change in precipitation and temperatures, there have been observations of mires in previously good conditions that are now drying out (Bastien Amez-Droz, personal communication, 17 May 2023). Farmers involved in the protection of mires have also observed an increased dryness due to climate change (Christian Schnider, personal communication, 11 April 2023; Philippe Grosvernier, personal communication, 02 June 2023).

In Switzerland, there is an increased demand for soil and surface area, which is also noticeable within mire protection. The pressure on surface areas keeps increasing and the intensification of agriculture is one of the main contributing factors. Through more intensive farming practices, the amount of animals, fertilizers and nutrients increase and there is an increased demand for water. Another threat to mire protection that has developed in the last decades is nitrogen input through the air. Therefore, the guideline for the nutrient buffer zone released in 1997 does not consider nutrient input through the air (Peter Ulmann, personal communication, 15 May 2023, Peter Staubli, personal communication, 13 June 2023).

Since there are many different interests represented within the cantonal departments, this can lead to conflicts with respect to the implementation of mire conservation. In such a case, other interests like agriculture or tourism are often able to overrule the interests of nature conservation. The different departments need to come to a compromise. It is especially difficult to implement new agricultural practices, therefore often a compromise is needed. If a conservation project is supported by the agricultural office of a canton, it is much easier and more likely to be implemented. This can lead to a weakening of the mire protection (Bastien Amez-Droz, personal communication, 17 May 2023; Nicolas Hausel, personal communication, 06 June 2023). Some cantons are a lot stricter with the implementation of mire conservation than others. In some cases, if the land owners are against the implementation of mire

conservation or reconstruction, the canton does not force nature protection. Other cantons implement protective measures even if that is against the will of the landowner (Kaspar Zirfass, personal communication, 13 June 2023). Since many cantonal nature conservation offices prefer to avoid conflicts within implementation, they choose the least controversial implementation measures. These might not always be what is best for the mire (Bastien Amez-Droz, personal communication, 17 May 2023). Since the implementation of mire protection and their buffer zones go through multiple steps and cantonal departments, there is the possibility of the protection measures to be weakened (Philippe Grosvernier, personal communication, 02 june 2023).

The landowner and their willingness to cooperate plays a significant role in the implementation of mire protection. Much of the land in and around the mires is owned by farmers. Their interest is often to manage the lands as intensively as possible (Bastien Amez-Droz, personal communication, 17 May 2023). This creates a divergence of interests, with farmers wanting to produce as much as possible and valuing things like the accessibility and the possibility to use heavy machinery. On the other hand, the need for higher water levels and less nutrient input of mires call for an extensification of agriculture. With an increase in water level, it becomes less feasible to use heavy machinery for the land management (Peter Ulmann, personal communication, 15 May 2023).

Next to private owners, like farmers, Pro Natura is one of the largest private owners of mires, with around 10% of raised bogs in their hand (Bastien Amez-Droz, personal communication, 17 May 2023). Pro Natura is often asked to purchase land in order to avoid an expropriation by the state and in order to avoid a conflict of interest between the landowner and mire protection (Bastien Amez-Droz, personal communication, 13 March 2023).

Even if it is economically more feasible to sell the land, many landowners are not willing to do so. There appears to be a certain pride attached to the land ownership and many farmers do not want to lose land (Jaques Frioud, personal communication, 14 June 2023). This was confirmed by the landowner of the Juchmoos (Pius Thalmann, personal communication, 27 June 2023). Therefore, an exchange of land is often a more realistic option. However, such an exchange of land is only possible if the canton owns a piece of land that the land owner would be interested in (Jaques Frioud, personal communication, 14 June 2023). Expropriations are not very common within mire protection, since there is a fear that the parliament might react with a weakening of the law (Bastien Amez-Droz, personal communication, 13 March 2023). Even though an expropriation is legally possible it is politically difficult and controversial and is therefore not common (Peter Ulmann, personal communication, 15 May 2023).

Even though farming can often be the reason for less strict implementation of mire protection, in many cases it is necessary to keep mires from overgrowth of bushes and trees. Both farmers interviewed recognized the importance of mire protection and appear to see mire landscapes and their protection as part of their duty and identity. Nevertheless, they both indicated that

farmers should be better involved in the design of the implementation of protective measures. Both of them expressed that some of the measures that are implemented by the law are not the most ideal for the protection of the mires. This is due to the fact that some protective measures are prescribed in a very general way, without necessarily taking into account the specificities of each mire (Christian Schnider, personal communication, 11 April 2023; Franz Achermann-Felber, personal communication, 19 April 2023). Franz Achermann-Felber for example criticized the practice of how mires are mowed, since the green cover is then carried away, which decreases biodiversity (personal communication, 19 April 2023).

Since the implementation of the "Rothenturm-Initiative" followed a rather top-down approach, this made some landowners feel like they were expropriated and did not have a say in the decision over their land. Therefore, some are still quite sensitive about the topic of mire protection and restoration (Florian Knaus, personal communication, 11 May 2023).

Another factor that needs to be considered, when it comes to land ownership, are subsidies. Since raised bogs usually do not need to be grazed or mowed, they are not part of the agricultural direct payments. Fens on the other hand often are, which makes the regeneration of fens more difficult. If they are rewetted and cannot be agriculturally managed anymore, they are not part of direct payments anymore (Kaspar Zirfass, personal communication, 13 June 2023). For mires there are two different ordinances, one for fens and one for raised bogs. This differentiation does not make sense in every case, since in many cases the inventory for fens overlaps that of raised bogs. Therefore, it would make more sense to class them as mire in a more general sense (Bastien Amez-Droz, personal communication, 13 March 2023). Within fens it is for example still allowed to renew drainage systems in order to manage the land (Ariel Bergamini, personal communication, 23 March 2023).

Including landowners and land managers in the process of mire restoration from an early stage onwards can make the implementation significantly more successful (Florian Knaus, personal communication, 11 May 2023). The landowners in the Juchmoos were involved in different steps of the process of implementation of mire regeneration, which seems to have been greatly appreciated by them (Pius Thalmann, personal communication, 27 June 2023). The wish for stronger inclusion of land managers was expressed by both of the farmers interviewed (Christian Schnider, personal communication, 11 April 2023; Franz Achermann-Felber, personal communication, 19 April 2023).

Assuming the landowners agree to a mire regeneration, there are only few mire specialists able to do mire reconstructions, while the demand is very high. According to Kaspar Zirfass, Pluspunkt, an ecological office that also does mire reconstructions, has more requests than capacity. Since there are not many experts in the field of mire reconstruction, they also take up a certain educational role for new employees. This educational task takes up personnel resources that are already scarce (Kaspar Zirfass, personal communication, 13 June 2023). Not only within private environmental offices the personnel resources are scarce but also within

the governmental organizations. The lack of resources within the cantons can lead to only simple and non-controversial reconstruction projects being realized (Bastien Amez-Droz, personal communication, 17 May 2023).

In the case of failure to implement mire protection, the state has very few possibilities of sanctioning cantons. So far there are no consequences for the cantons that do not properly implement mire protection (Peter Staubli, personal communication, 13 June 2023; Bastien Amez-Droz, personal communication, 13 March 2023).

The implementation of buffer zones is also far from where it should be. Both of the farmers interviewed did not know what a buffer zone is (Christian Schnider, personal communication, 11 April 2023; Franz Achermann-Felber, personal communication, 19 April 2023). Their implementation appears to be rather difficult due to their size and can lead to many discussions between the governmental offices and the landowners. According to Peter Ulmann from the Canton of Lucerne a systematic implementation of the buffer zone for every mire would not be politically supported (personal communication, 15 May 2023). One of the difficulties with the implementation of buffer zones is the fact that a rewetting of the land makes land management less feasible (Florian Knaus, personal communication, 11 May 2023).

Due to the large surface area of especially the hydrological buffer zone, its implementation would have effects on many different areas, like farmland but also residential areas. For the implementation of the buffer zone, it is necessary to study the mire area, since every mire has its own specificities. Therefore, there is no “one-size-fits-all” solution (Philippe Grosvernier, personal communication, 02 June 2023). Consequently, so far, the hydrological buffer zone is only taken into account when it comes to new constructions and changes in infrastructure that could disturb the hydrological buffer zone (René Amstutz, personal communication, 05 June 2023).

3.2 Juchmoos

The Juchmoos, a raised bog of national importance, lies in the municipality of Hasle in Lucerne. The Juchmoos is owned by the personal corporation of Romoos. People with citizenship of Romoos are able to join this corporation. The corporation holds various types of property and uses the income for cultural and charitable purposes (UNESCO Biosphäre Entlebuch, 2018). The mire is part of the inventory for fens (number 3386), raised bogs (number 400) and mire landscapes (Klein Entle, number 98) of national importance (Schweizerische Eindgenossenschaft, 2023). Figure 1 shows the special distribution of the inventory. The Juchmoos is also located within the UNESCO Biosphere Entlebuch. Compared to the rest of Switzerland the density and number of mires and mire landscapes is extraordinarily high in the area of the UNESCO Biosphere Entlebuch (Grünig, 1994). The Juchmoos was given as a good example of implementation of mire protection in the Entlebuch Biosphere by both the Department for Agriculture and Forestry of Lucerne and the UNESCO Biosphere Entlebuch

(Florian Knaus, personal communication, 11. May 2023; Peter Ulmann, personal communication, 15 May 2023).

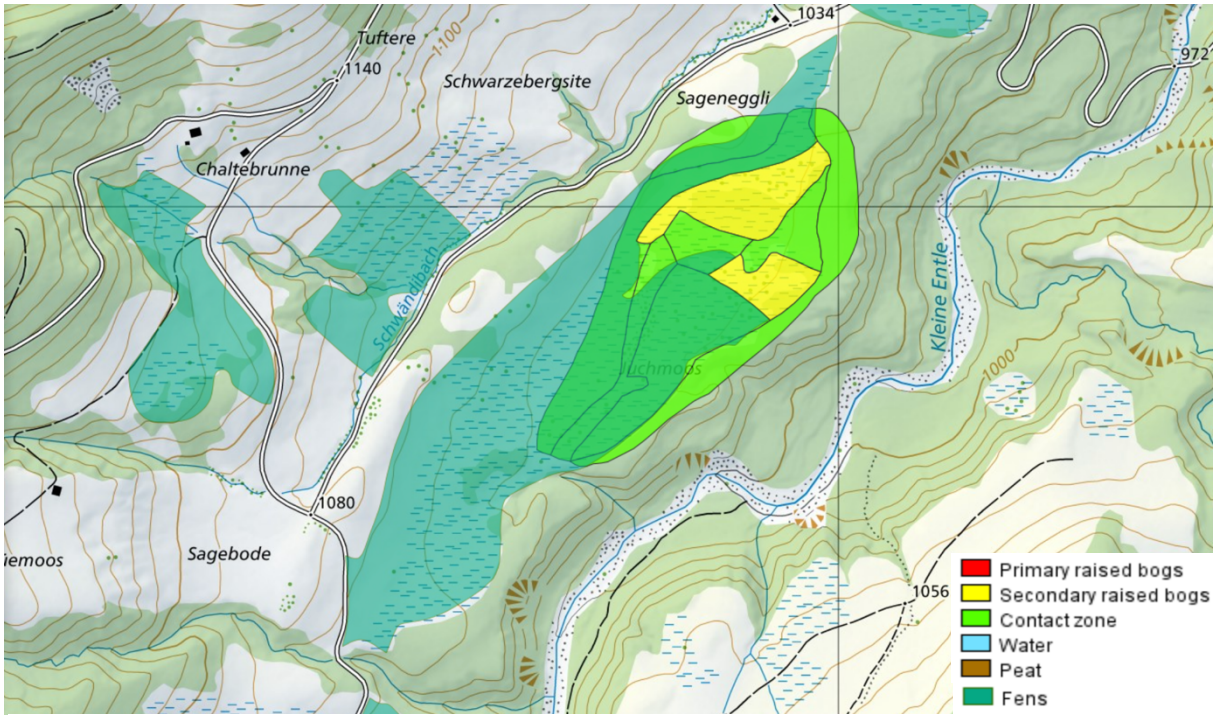

Figure 1: Inventory for fens and raised bogs of national importance, Juchmoos (source: swisstopo, 2023)

The UNESCO Biosphere Entlebuch is a regional organization that in part serves as a competence center for mires. It is mainly financed by the public sector and some donations (Gemeindeverband UNESCO Biosphäre Entlebuch, 2023). They are involved in scientific projects, take up an educatory role and also implement regeneration projects, like at the Juchmoos (a raised bog of national importance). The UNESCO Entlebuch Biosphere closely works together with the cantonal offices of Lucerne and regional institutions. The fact that the organization is largely supported by the local population gives the UNESCO Entlebuch Biosphere a more direct link to local farmers (Florian Knaus, personal communication, 11 May 2023).

The raised bog borders and overlaps with a fen of national importance and encompasses a forest (see Figure 1: Inventory for fens and raised bogs of national importance, Juchmoos (source: swisstopo, 2023). Like many other mires, some of the peat of the Juchmoos has been cut. Due to drainage systems in the mire that were installed in order to make cultivation more feasible, the mire has been degrading and drying out. The degradation of the mire can also be noticed through a change in vegetation and increased vegetation cover. Nevertheless, there are still many endangered species present (UNESCO Biosphäre Entlebuch, 2018).

In 2009 the first regeneration measures were planned by the Agricultural and Forestry Department of the Canton of Lucerne but rejected due to diverse reasons, one of which was too high costs (UNESCO Biosphäre Entlebuch, 2018). The second attempt of a regeneration of the Juchmoos was taken by the regional organization “UNESCO Biosphäre Entlebuch”. The regionality of the project initiators seems to have been beneficial for the acceptance of the

project (Florian Knaus, personal communication, 11 May 2023). Additionally, there were less measures planned, which might have been favorable for the acceptance of the project as well. The goal of the regeneration measures was to increase the water level through damming of the drainage ditches and a thinning of the trees. Secondly the creation of small waterbodies was aimed to promote the resettlement of a formerly present and endangered dragonfly (UNESCO Biosphäre Entlebuch, 2018).

The regeneration measures were started in winter 2020 with woodcutting to free the area from trees and increase the amount of light. In September of 2021 a large part of the main drainage ditch and one of the additional ditches was dammed and 12 small waterbodies of high importance for biodiversity were created along the former drainage ditch. The aim of the creation of these waterbodies is to promote the occurrence of endangered species, like the alpine emerald, a dragonfly. There was a continued monitoring of the water level done before during and after the measures were taken (Pluspunkt, 2021). The monitoring of the raised bog after implementing the regeneration measures has not yet been evaluated. The first preliminary evaluations show a higher and more stable water table in the vicinity of the implemented measures (Florian Knaus, personal communication, 22 May 2023).

The strong inclusion of the landowners has been greatly appreciated by them, especially the on-site explanation of the implementation and problems prior to implementation (Pius Thalmann, personal communication, 27 June 2023). This can be seen as one of the factors of success.

There were some restrictive and conflicting interests that were considered in the implementation of the regeneration measures. Due to power poles within the mire perimeter the implementation of the measures was slightly restricted. The presence of protected forest ants had to be taken into account for the implementation of the measures. Additionally, the landowner wished to be able to maintain the forest road in the raised bog used for the management of the land. It was also taken into account that the bordering cropland does not become waterlogged in order to avoid complication of land management. This led to measures being taken in only a part of the drainage ditches (UNESCO Biosphäre Entlebuch, 2018).

According to the law any change to the mire that does not serve the conservation purpose, or the previous agricultural use is prohibited. Therefore, the presence of the power poles raises some questions. The department for Agriculture and Forestry of Lucerne was not able to provide any information concerning the legality of the power poles (Peter Ulmann, personal communication, 25 June 2023).

After the implementation of the first damming measures, there were two additional drainage ditches within the mire evaluated. Since it was quite possible that the neighboring managed fen would become wetter, the implementation of damming for one of the drainage ditches was ruled out. For the other drainage ditch waterlogging of the neighboring land was ruled out and

damming measures are planned to be implemented in the second half of 2023 (Pluspunkt, 2022)

3.3 Les Mosses de la Rogivue

The mire “les Mosses de la Rogivue” is located at the cantonal border between Vaud and Fribourg and is mainly situated in the canton of Vaud, as seen on Figure 2: Inventory for fens and raised bogs of national importance, les Mosses de la Rogivue (source: swisstopo, 2023). It is based in the municipalities of Maracon, Vaud and Saint-Martin, Fribourg and bordering the municipality of Semsales, Fribourg. The water catchment area of the mire lies in Fribourg, where the land is intensively farmed (René Amstutz, personal communication, 05 June 2023). Before les Mosses de la Rogivue was exploited for peat and drained, the peat thickness is expected to have measured up to ten meters. In 1974 a large part of the mire was acquired by Pro Natura and the first measures to elevate the water level were implemented in 1983 and water bodies were created. Formerly the mire was surrounded by fens, which helped to hold up the water from escaping the mire. Today the surrounding lands have been drained and are used as grassland (Pro Natura Vaud, 2009). Peat extraction in les Mosses de la Rogivue was active until the 1970s (A. Maibach Sàrl, 2014). Two of the main parcels of the mire were purchased by Pro Natura in 1973. The land is mainly owned by Pro Natura and there are 4 different lease agreements on the land (A. Maibach Sàrl, 2014; Pro Natura Vaud, 2009). The other parcels belong to the canton of Vaud, the municipality of Maracon and private owners (A. Maibach Sàrl, 2014). Pro Natura being the main landowner of the mire has been a significant factor of success and has facilitated and pushed rehabilitation forward (Nicolas Hausel, personal communication, 06 June 2023).

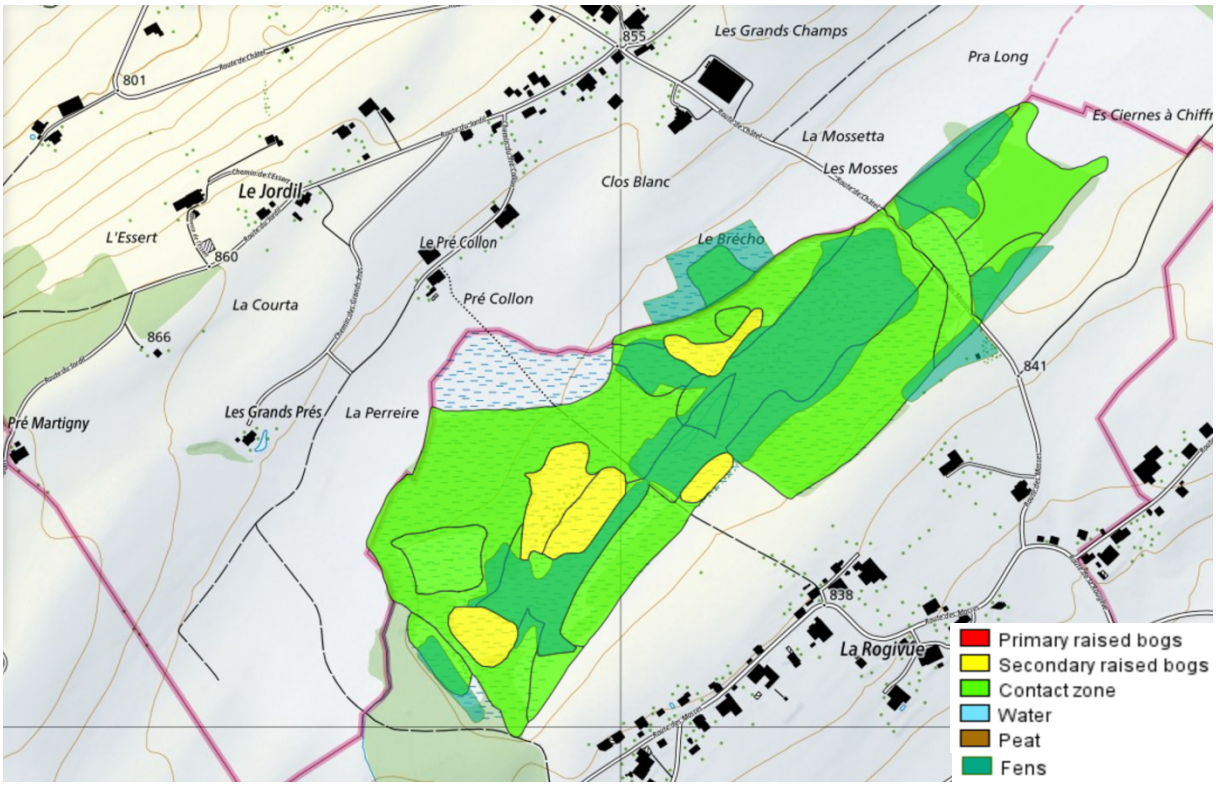

Figure 2: Inventory for fens and raised bogs of national importance, les Mosses de la Rogivue (source: swisstopo, 2023)

The mire is part of the inventory for fens (number 1400), raised bogs (number 60) and reproduction site for frogs and toads of national importance (see Figure 2: Inventory for fens and raised bogs of national importance, les Mosses de la Rogivue (source: swisstopo, 2023)). In 1993 there was a management plan created, based on a vegetation mapping, which initiated the management committee still in place today. The management committee comes together at least yearly. Since the first management plan in 1993 there have been many changes, therefore a new management plan was created for the period of 2015 until 2025 (A. Maibach Sàrl, 2014). Today the management committee for the mire consist of representatives of the cantons of Vaud (VD) and Fribourg (FR), the municipalities Maracon (VD), Saint-Martin (FR), Semsales (FR), Pro Natura (regional and national representatives), the farmers managing the land and the landowners (Commission de gestion de la réserve naturelle Les Mosses de la Rogivue, 2020). The management committee is highly appreciated by the involved parties and collaboration is very good and simplifies the coordination. The creation of the new management plan, even though very time consuming, has been very beneficial. Since for any regenerative measures there is an involvement of the landowner and the responsible authorities needed, the management commission has been especially helpful and efficient (René Amstutz, personal communication, 05 June 2023).

There is one main drainage pipe around 8 meters under the ground, draining the mire and collecting water from smaller drainage pipes. These drainage systems were built to be able to intensively farm the peatland (A. Maibach Sàrl, 2014).

The northeastern part of the mire is severed by a cantonal road. Since the Mosses de la Rogivue is considered to be an amphibian breeding site of national im, a migratory barrier on each side of the road was installed in 1998. The migratory density around these barriers is among the most important in Switzerland (A. Maibach Sàrl, 2020). A part of the mire had previously been used as landfill by Semsales and has been rehabilitated (A. Maibach Sàrl, 2014).

Les Mosses de la Rogivue has also been used as one of the examples of the project “espace.marais”. The necessary hydrological and nutrient buffer zones were calculated (see Figure 3: Buffer zones, les Mosses de la Rogivue (source : Bundesamt für Umwelt) ; Figure 4: Mire perimeter, les Mosses de la Rogivue (source: Bundesamt für Umwelt)). Compared to the total surface area including the buffer zones (see Figure 3: Buffer zones, les Mosses de la Rogivue (source : Bundesamt für Umwelt) ; Figure 4: Mire perimeter, les Mosses de la Rogivue (source: Bundesamt für Umwelt)), Figure 3: Buffer zones, les Mosses de la Rogivue (source : Bundesamt für Umwelt) ; Figure 4: Mire perimeter, les Mosses de la Rogivue (source: Bundesamt für Umwelt) gives the possibility to compare it to the surface area of the mire perimeter itself. Compared to the implemented buffer zones, the calculated buffer zones are significantly larger (Bundesamt für Umwelt, 2017). Additionally, the current buffer zones implemented only consider the nutrient buffer (René Amstutz, personal communication, 05 June 2023). Some of the buffer zones are located within the mire perimeter instead of around it (Bundesamt für Umwelt, 2017). For the implementation of the hydrological buffer zone, there

are two options, since some of the drains feeding the water supply of the mire come from nutrient rich and intensive agricultural lands. It is important to not only consider the quantity but also the quality of water reaching the mire. If the nutrient rich water is directly drained into the mire, the nutrient buffer does not fulfill its purpose. Therefore, the nutrient buffer zone can either be extended to the hydrological buffer zone or the drainage systems around the mire need to be adapted and some of the soil rewetted and the nutrient buffer zone can stay the same size (Philippe Grosvernier, personal communication, 02 June 2023).

Since the water catchment area is intensively farmed, it is to be expected that the quality of the water feeding the mire from the agricultural fields is not sufficient. There have been some studies of the water quality conducted but their results have been non-significant. Currently, another study of the water quality has been conducted on behalf of the canton of Fribourg and will soon be evaluated. There has been a verbal agreement with the framers around the mire, that there will be no restriction as long as there is no clear evidence of insufficient water quality. The farmers have been strongly holding on to this agreement and therefore there have not been any measures taken in order to increase the water quality of the water supply (René Amstutz, personal communication, 05 June 2023).

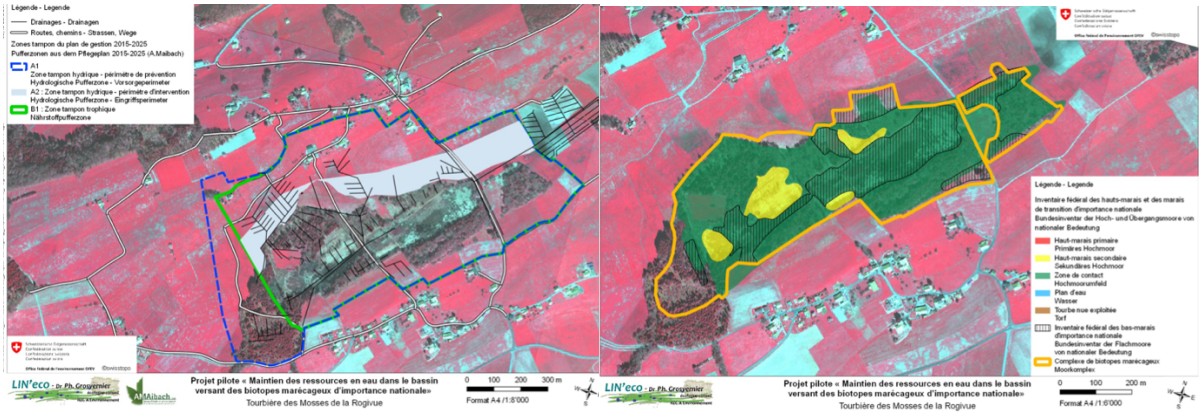

Figure 3: Buffer zones, les Mosses de la Rogivue (source : Bundesamt für Umwelt) ; Figure 4: Mire perimeter, les Mosses de la Rogivue (source: Bundesamt für Umwelt)

Contrary to the mire, the surrounding areas that entail the buffer zone, are not owned by Pro Natura but various different private owners and farmers. This has led to difficulties within implementation of the buffer zone in the past, with certain farmers not wanting to implement the necessary measures. Many of the farmers in the region are specialized on livestock farming at an intensive level, which stands in direct contrast with the optimal land use for the mire surroundings (Nicolas Hausel, personal communication, 06 June 2023). The farmers of the region have a strong sense of pride in what they do and the products they are able to produce. Many see using agricultural land in a more extensive way as a loss. They have oftentimes invested in a type of business model, like livestock farming. For example, they might have invested into a larger barn or more animals and are therefore more reluctant to change towards a more sustainable land use. According to Jaques Frioud, in order to properly implement buffer zones there is a need for a stronger legal embedding and enforcement in

land use planning to avoid lengthy negotiations (Jaques Frioud, personal communication, 14 June 2023).

Through the introduction of the beaver into the region there were problems with the regulation of the water level that occurred. The water level rose, the buffer zones around the mire were flooded and there were large fluctuations of the water level occurring. This was very challenging for the management of agricultural lands and the large fluctuations of the water level were also not beneficial for the mire. Therefore, the regulation system was replaced and a maximum water level was defined together with the farmers around the mire. Even though a higher water level would be preferable for the mire, this was a compromise that allowed the mire to benefit from the more stable water level. Simultaneously, the water level was chosen such that the adjacent fields would not be affected. This was done to avoid conflict with the landowners and farmers in the area. Nevertheless, there is a positive development for the mire, thanks to the raising and stabilizing of the water level.

Les Mosses de la Rogivue is currently sufficiently supplied with water and therefore further measures concerning the hydrology are not very pressing. The only concern would be the quality of the water arriving in the mire. Nevertheless, the vegetation in the mire does not currently indicate any acute problems of too high nutrient supply. There are however still some individual parts of the mire that would require a higher water level. Since raising the water level further would not be possible without affecting the neighboring agricultural lands, this would politically be very difficult to implement.

The drainage systems in the canton of Fribourg need to be replaced or renovated in the near future. This would present an opportunity for a larger scale melioration and a rewetting of the peatland. The difficulty of such a melioration is the large scale and the high number of stakeholders affected. This would most probably lead to oppositions. For the implementation of the hydrological zone there are similar problems to be faced. Therefore, it is only taken into account when there are new interventions within the hydrological zone, that affect the mire (René Amstutz, personal communication, 05 June 2023).

Les Mosses de la Rogivue has been a prime example of the specificity of each case and the multiple factors that need to be taken into account when it comes to mire protection. Therefore, there is no “one-size-fits-all” solution. The specific factors of each case need to be looked at before it is possible to implement the necessary measures. Taking into account the specific variables of a mire, like the hydrology or involved stakeholders, necessitates time (Philippe Grosvernier, personal communication, 02 June 2023).

4. Political Recommendation

The United Nation Environment Program stated that in order to end the undervaluing of peatlands, policies need to comprise six key elements:

- Monitoring and assessment of peatlands
- Regulations that prevent additional drainage and damage to remaining peatlands
- Stop subsidies going towards practices that are harming peatlands
- Use financial incentives to further avoid peatland harming practices
- Use financial incentives to encourage peatland protection and restoration
- Increase funding towards peatland conservation and restoration (2021)

These factors and the insights from the conducted interviews and literature review have led to a political recommendation for mire protection in Switzerland. For this recommendation we first touch on the underlying framework conditions and talk about how the measures could be implemented before going into the detailed measures to be implemented.

As mentioned previously, climate change has made the survival of mires more difficult, due to higher temperatures and longer dry periods. Mires that have previously been in good condition are starting to deteriorate (Bastien Amez-Droz, personal communication, 13 March 2023). This is a factor that needs to be anticipated and incorporated into measures taken to protect mires.

Historically, decisions around resource use and the environment were taken on a relatively local level. Around the 1900s this changed to a more centralized and top-down approach (Garcia et al., 2014). There has however been a shift towards and an appreciation of more participatory decision-making approaches when it comes to nature conservation. This shift has shown major conservation successes due to the resource dependent communities being able to share the decision-making power (Berkes, 2009). There is evidence suggesting that community-based conservation approaches are most likely to be successful (Charles, 2021). However, this is only true under certain conditions, like people being able to benefit form their own stewardship (Ostrom, 2015). The involvement of stakeholders in the process of mire regeneration and protection appears to also have been a factor of success for both the Juchmoos and les Mosses de la Rogivue. Both farmers interviews have also expressed a wish to be better involved in the process of mire protection. Therefore, we would recommend the implementation of the mire conservation to involve stakeholders as for example in les Mosses de la Rogivue with a management committee. This would also encourage exchange of knowledge, experience and common learnings. Being involved in the process would also potentially make land managers more accountable. Especially if there is a need for cooperation and coordination, bringing stakeholders together in form of a management committee can increase efficiency.

Rigid and more prescriptive regulatory approaches may restrain innovation (Pelkmans & Renda, 2014). This is also the case for the agricultural sector. The high alignment of production structures decreases innovation and entrepreneurial freedom (Dümmler & Bonato, 2020). In order to stimulate innovation, we recommend more flexibility within regulations concerning

the implementation of mire protection. This does not refer to the mire protection and the protection goals themselves but more so to the exact implementation measures that are used to achieve the mire protection goals.

Studies conducted by Agroscope show that in the coming 15 years half of the farm managers will surpass the age of 65. At this age the direct governmental payments stop, therefore many farms are handed over at this point. This shift in management is an opportunity to implement the necessary transition to a more sustainable land management (Liner, 2022; Zorn, 2020). With new measures implemented with the generational change there is the advantage that the following farm manager knows in advance which changes are to be expected (Liner, 2022). Younger farmers might also be less resistant to change and more open alternative methods of land use (Ferré et al., 2019).

Change does not only need to happen at a certain level but should involve all levels and stakeholders. There is a need for cooperation between politicians and land managers and owners.

4.1 Carbon Market

According to myclimate there is a large demand from companies wanting to support nature based and regional climate mitigation projects. There has already been a method developed in order to determine the CO_2 sequestration of mire regenerations in a standardized matter. Within the voluntary carbon market mire regeneration projects can already generate certificates (Christina Jany, personal communication, 10 July 2023). For peat soils this is not the case yet (Ferré et al., 2019). For the rewetting of peat soils, the introduction of carbon certificates could further help finance the change in management. CO_2 Certificates could be a measure to increase finances, where the current financial resources are not sufficient.

4.2 Subsidies

Subsidies can be used as an effective measure to incentivize sustainable and nature friendly land management measures. Nevertheless, there are many subsidies in Switzerland, that are harmful to biodiversity and nature conservation (Gubler et al., 2020). Subsidies that are harmful to biodiversity and nature conservation should be abrogated or redesigned before creating new subsidies. Subsidies can also create false incentives and render the implementation of nature and mire protection more difficult. For example, the basic contribution is paid per cultivated hectare. The cultivated hectares are also linked to a minimum quantity of livestock and the amount of manure that is allowed to be spread (Bauernzeitung, 2022; Möhring et al., 2018). Since raised bogs are mostly not part of the agricultural direct payments, land managers and owners are often more willing to cooperate in mire regeneration projects (Peter Staubli, personal communication, 13 June 2023). Therefore, it would make sense to change subsidies in a way not to make active land use the preferred alternative for land owners and managers if this is not desired for mire protection.

4.3 Education and Awareness

Increasing financing does however only cover a part of the shortage of resources, since there is also a shortage of personnel resources (Bundesamt für Umwelt, 2019b). There is a lack of specialists that are able to implement mire regeneration projects (Ariel Bergamini, personal communication, 23 March 2023). Starting mid 2024 there will be a certificate of advanced studies on mire diagnostic and regeneration (Peter Staubli, personal communication, 13 June 2023). This and other courses can help to bridge the knowledge gap when it comes to mire regeneration. Agricultural schools should also include more knowledge transmission on the importance of mire conservation and sustainable management of peat soils. More generally, the awareness about the importance of mire conservation should be increased not only among direct stakeholders but also on a political and societal level.

4.4 Land Purchase

In order to most effectively implement new protective measures, the purchase of land through the public authorities or nature conservation organizations presents an powerful lever (see Interviews). One way to accelerate this process would be a pre-emputive right for the state to purchase land for nature and mire conservation.

As stated in section 5.1, even though a land purchase might be the most effective way to implement mire protection, the landowner might not always be willing to sell their land, even if economically more feasible. In this case an exchange of lands can be a possible alternative. In order to quantify the implementation of mire protection with a buy-out of the land, I conducted a cost-benefit analysis for les Mosses de la Rogivue. This case was chosen since the necessary buffer zones have already been defined. For the identified costs there were two main categories defined: the costs of land acquisition and the costs of regeneration. The benefits were limited to climate mitigation. The size of the mire is around 28 hectares. If the buffer zone according to the management plan were to be implemented this would total to a surface area of around 79 hectares (Commission de gestion de la réserve naturelle Les Mosses de la Rogivue, 2021; Schweizerische Eindgenossenschaft, 2023). A buy out makes sense especially, if the landowner has contradicting interests to those of mire conservation and cooperation is difficult or impossible.

The maximum price for agricultural land in Fribourg in the region of les Mosses de la Rogivue lies at 3.19 Swiss francs per square meter or 31’900 Swiss francs per hectare (Behörde für Grundstückverkehr, 2022). For the canton of Vaud, we assumed the same price, since the land lease prices for both cantons are around the same level (Canton de Vaud, 2018; Staat Freiburg, 2021). Therefore, the purchase of the total land would cost around 2.5 million Swiss francs. This is assuming that the land is currently completely in the hand of private property owners with diverging interests to mire protection. While this is mostly true for the adjacent buffer zone areas, this is not the case for the mire, since the mire is mainly owned by Pro Natura and public authorities (Commission de gestion de la réserve naturelle Les Mosses de la Rogivue, 2021; Schweizerische Eindgenossenschaft, 2023).

A study estimated the one-time costs of mire reconstruction to be 90'400 Swiss Francs per hectare for raised bogs, which is an average from 7 mire reconstructions conducted. This might not be representative for all mires, since it is assumed that so far mainly the simpler reconstructions have already been carried out. Therefore, it is likely that future mire reconstruction might be more expensive. For fens the reconstruction costs were calculated to be 67'800 Swiss Francs per hectare. The study calculated the yearly costs of mowing of fens to be around 1'500 Swiss Francs per hectare. This would however only be necessary for around 10% of the surface area of fens. For raised bogs it is to be assumed that after a successful reconstruction there is no maintenance necessary (Ismail et al., 2009).

For our calculation we assumed that the rewetting of the surrounding buffer zone to have the same costs as fen reconstructions.

The total net present value of the costs over the next 50 years assuming a discount rate of 0.93% is given by the following calculation:

$$79 * 31'900\ CHF + 28 * 90'400\ CHF + 51 * 67'800\ CHF + \sum_{n=0}^{50} \frac{0.1 * 51 * 1'500\ CHF}{(1 + 0{,}0093)^n}$$
$$= \mathbf{8'821'530\ CHF}$$

The discount rate was chosen according to the discount rate of Swiss government bonds over 20 years and is given by 0.93% (Fusion Media Limited, 2023).

Drained organic soils yearly emit between 30 to 51 tons of CO_2 equivalents per hectare (Wüst et al., 2021). Intact, natural mires on the other hand yearly take up between 4 to 8 tons of CO_2 equivalents per hectare (Giesler, 2022). Therefore, rewetting drained mires and peatlands could potentially reduce emissions by 34 to 59 CO_2 equivalents per hectare and year if we assume that regenerated mires take up CO_2 at the same capacity as undisturbed natural mires. We assumed that all of the surrounding lands and the buffer zone, are peat soils. Therefore, we assumed the same emission mitigation potential for all lands included in the calculations.

The current CO_2 levy in Switzerland lies at 120 Swiss francs per ton of CO_2 (Bundesamt für Umwelt, 2020). If we therefore calculate the yearly monetary value of the avoided emissions, we obtain between 4080 and 7080 Swiss francs per hectare. The following calculation shows the net present value of the benefits generated through carbon sequestration:

$$\sum_{n=0}^{50} \frac{79 * 4'080\ CHF}{(1 + 0{,}0093)^n} = \mathbf{13'163'605\ CHF}$$
$$\sum_{n=0}^{50} \frac{79 * 7'080\ CHF}{(1 + 0{,}0093)^n} = \mathbf{22'842'726\ CHF}$$

This gives a net present value for the benefits between 11’004’395 and 19’095’851 Swiss francs.

Subtracting the costs from the benefits gives a net present value as follows:

$$\sum_{n=0}^{50} \frac{79 * 4'080\ CHF}{(1+0{,}0175)^n} - 79 * 31'900\ CHF + 28 * 90'400\ CHF + 51 * 67'800\ CHF + \sum_{n=0}^{50} \frac{0.1 * 51 * 1'500\ CHF}{(1+0{,}0093)^n} = \mathbf{4'342'070\ CHF}$$

$$\sum_{n=0}^{50} \frac{79 * 7'080\ CHF}{(1+0{,}0175)^n} - 79 * 31'900\ CHF + 28 * 90'400\ CHF + 51 * 67'800\ CHF + \sum_{n=0}^{50} \frac{0.1 * 51 * 1'500\ CHF}{(1+0{,}0093)^n} = \mathbf{14'021'200\ CHF}$$

The total net present value lies between 4'342'070 and 14'021'200 Swiss francs.

The CO_2 levy has increased tenfold since 2008 (Bundesamt für Umwelt, 2022a) and was intended to stay between 96 and 210 Swiss francs in the CO_2 act that was refused in 2021 by a popular vote (Schweizerische Eidgenossenschaft, 2021). The German Environmental Agency estimates the costs of CO_2 emissions per ton to be even higher than 210 Swiss francs (Umwelt Bundesamt, 2023). Therefore, we assume that the price of CO_2 is likely to further increase and the assumed price of 120 Swiss francs is rather conservative.

It is important to note that the calculation does not include opportunity costs of the change in land management and only considers the benefit of CO_2 sequestration. The CO_2 emission reduction calculation is estimated to be rather generous, since the same emission reduction is assumed for the entirety of the land. Due to the lack of soil data this cannot be validated. There are however many additional benefits to mire conservation, like biodiversity conservation, flood control, water supply, tourism, recreation and many others. A study estimated the monetary value of ecosystem services provided by different types of ecosystems. They estimated the value for inland wetlands ecosystem services to be 25’682 dollars per hectare and year of which 488 dollars stem from climate regulation, which represents 1,9% of the total value (de Groot et al., 2012). Another study estimated the total value provided by ecosystem services in the European Union in 2012 to be 171’521 million Euro, of which 5.4%, 9’189 million Euro were accounted to carbon sequestration (Vysna et al., 2021). The proportion of the value of carbon sequestration compared to the total value of ecosystem services provides by peatland in Switzerland is expected to be slightly different. Nevertheless, we may assume that a large part of the value of ecosystem services provided by peatlands is not represented by

carbon sequestration. Therefore, we assume the total benefits of mire and peatland reconstruction to be largely higher than the calculated value.

4.5 Drainage System and Buffer Zones

In order to properly regenerate the mires and peatlands of Switzerland, they need to be rewetted (Ferré, 2017). If the water level is chosen according to the needs of the mire, some of the adjacent surfaces will also be rewetted. For the implementation of the buffer zones there would be a need of extensification of agriculture of the surrounding areas and a ban for the renewal of drainage systems (René Amstutz, personal communication, 05 June 2023). Since many agricultural drainages would need renewal in the next few years (Béguin & Smola, 2010), this presents a window of opportunity to rethink the current zoning and spatial planning.

About one third of the existing drains in Switzerland are in poor or unknown condition. The cost of a restoration is estimated at around 1.7 billion Swiss francs (Walter & Hänni, 2018). Renewing the drainage system in drained organic soils is estimated to cost around 25'000 Swiss francs per hectare (Béguin & Smola, 2010). Assuming a lifespan of 50 years, the cost of drainage per year and hectare would amount to 500 Swiss francs. In the case of mire regeneration, these costs could be avoided.

As there is a lack of information on soil qualities in Switzerland (Schweizerischer Bundesrat, 2020), there is a need for soils to be mapped. There is not yet sufficient systematic data on soil properties to efficiently implement rewetting of peatlands on a large scale (Steiger et al., 2018). This would help to identify the most important areas of drained peat soils and allow surface areas of peat soil to be rewetted. Such a soil mapping could be completed within about two decades. The cost of such a mapping would be between 200 and 500 million Swiss francs. Under very conservative assumptions this would save around 130 million Swiss francs yearly through efficiency gains and avoided costs of environmental damage. However, it is important that the information is effectively used for prevention (Steiger et al., 2018).

4.6 Paludiculture on Peat Soils

Balancing peat preservation, productive agricultural and forestry use, and biodiversity-promoting practices is crucial to achieve effective, comprehensive and socially acceptable peatland conservation (Närmann et al., 2021). Preserving peatland represents a cost-effective alternative to reduce greenhouse gas emissions. Based on the current knowledge economically viable intensive agriculture on drained peat soils is not possible in a sustainable and soil carbon preserving manner (Hagedorn et al., 2018). Further delay in addressing this issue is problematic, since the natural processes of drained peat soils will lead to the loss of soil organic matter in the coming decades. However, their use is especially important for the vegetable production in Switzerland (Walter & Hänni, 2018).

The agricultural and forestry use of wet and rewetted peatlands is referred to as paludiculture. Paludiculture plants can typically tolerate wet conditions and above ground biomass can be economically used. The main focus within paludiculture is the production of renewable resources rather than food. Paludiculture can be used to generate building material, fuel, biogas, animal bedding, feed, medicine, food and peat substitutes (Heinrich-Böll-Stiftung et al., 2023). Products from paludiculture not only reduce greenhouse gas emissions by rewetting peat lands but also replace energy-intensive products and fossil resources. A stronger recognition of this, for example, through product labels could further incentivize enterprises to transition to paludiculture. There is also a need to develop the necessary distribution channels and utilization methods for the new resources generated by paludiculture products. This process needs to be supported by political measures. Currently, there are only few paludiculture products on the market, since there are not yet sufficient cultivation areas. This further hinders companies from investing into new production methods. Public funding throughout the entire production chain could help to bridge this gap. The collaboration of actors all along the production chain would be beneficial for the development of a more sustainable land use (Heinrich-Böll-Stiftung et al., 2023).

The transition from an intensive agricultural land use of drained lands towards paludiculture, a more sustainable use of peatlands and organic soils, brings significant challenges (Heinrich-Böll-Stiftung et al., 2023). Also, rewetted peatlands often experience greater water level fluctuations than undisturbed peatlands. Wet management practices make it more difficult to distinguish between the peatland and the groundwater. This would make it more difficult to exclude possibly harmful effects from pesticide use on the ground water (Närmann et al., 2021). The establishment of new plantations, raising of water levels and acquisition of new machinery is necessary. This often requires construction work and therefore planning and permits. Wet peat soils can also only be worked on by vehicles that exert low ground pressure. Paludicultre projects are very complex and can mainly be implemented on a large scale, due to the raising of the water level. Therefore, an early coordination with water management, agriculture and nature conservation authorities is crucial (Närmann et al., 2021). There is a conscious societal decision necessary on the future management of drained peat soils.

Drained organic soils emit between 30 and 51 tons of CO_2 equivalents per hectare and year. The surface area of agriculturally managed organic soils is estimated to be around 28’000 hectares, emitting between 520’000 and 890’000 tons of CO_2 equivalent per year. These emissions amount to around 8-15% of total annual greenhouse gas emissions of the agricultural sector in Switzerland (Wüst et al., 2021). Agriculturally managed organic soils account for less than 2% of the agricultural land in Switzerland (Bundesamt für Statistik, 2023).

As the current use of drained organic soils is especially important for the vegetable production in Switzerland, there is a need for alternative production surfaces. Today more than 60% of arable land in Switzerland is used for the production of animal feed (233’047 ha + evtl. 722 ha). Since on around half of that surface area crops are grown, which are also feasible for human

consumption, it seems reasonable to assume that at least half of the arable land used for animal feed could also be used to grow food for humans (Bundesamt für Landwirtschaft, 2022). Therefore, it seems reasonable, that with a decrease in animal products the land used for animal feed could more effectively be used for plant calories. The additional arable land could take up the food production that takes place on drained organic soils. At the same time the organic soils used for paludiculture would still remain productive.

5. Discussion

The case studies and literature review has led us to identify several important factors holding back the implementation of mire protection. The identification of these barriers can be of great significance, since changing these factors can act as a powerful lever to advance mire protection in Switzerland. This is a pressing issue since climate change is further adding pressures to the already vulnerable and degrading ecosystems.

Land ownership and management were identified as important factors in mire protection, since the willingness of the landowners and managers can significantly advance or hinder implementation of mire protection. Many landowners are farmers managing the land and agricultural use of mires and peatlands are historically strongly interconnected. Agricultural management is also a necessary measure in order to maintain fens. On the other hand, agricultural land use has become increasingly intensive, which has been very harmful to nature and mire conservation. At the same time, agricultural subsidies have further encouraged this development and the strong regulation has impeded innovation. Another reason for farmers and landowners opposing mire conservation, is the top-down decisions that have occurred in the implementation of the "Rothenturm-Initiative".

Consequently, I recommend a stronger involvement of stakeholders into the process of mire conservation as well as less restrictive implementation in order not to impede innovation. More flexibility within implementation is however not referring to the conservation or the conservation goals themselves but only to the implementation of measures. I also see a need for a change in subsidies, since existing subsidies encourage the current intensive agriculture and directly and indirectly harm biodiversity and nature conservation. Innovation and new land management methods should be accompanied at every level. Like creating a market and legal framework around paludiculture, as to avoid a production without demand. For the implementation of changes within the agricultural system the generational change and the end of the life span of most drainage systems serve as an optimal window of opportunity.

The conducted cost benefit analysis reveals that the benefits of mire conservation outweigh the costs. Even though the analysis might not be representative of all mires in Switzerland and only a part of the costs and benefits were considered, I assume the benefits to outweigh the costs in most cases. This assumption is made due to the mere magnitude of the benefits provided by mire conservation.

Another significant factor that is hindering the implementation of mire protection is the lack of resources on a financial and personnel level. The missing personnel resources appear to represent a more important bottleneck. Therefore, I suggest an expansion of educational programs concerning mire conservation, diagnostic and reconstruction.

The lack of awareness appears to further impede the implementation of mire protection, since the support on a political and societal level is rather low. Therefore, the awareness of the importance of mire conservation should be raised on a political and societal level as well.

A lack of financial and technical resources has also previously been identified as a barrier for the implementation of mire protection (Raemy, 2008). Ismail et al. (2009) also detected there to be a significant disparity between the necessary financial resources and the actual expenses for mire protection in Switzerland. Another study found the lack of protection of mires globally to be caused by an undervaluation of mires (United Nations Environment Programme, 2021). As I found there to be a lack of awareness for the importance of mire conservation, this appears to be true also for the case studies.

The Federal Office for the Environment has also identified a lack of political will within public departments for the implementation of mire protection (2019a). According to the interviews conducted, some cantons show little resistance when facing oppositions from landowners or managers and appear to avoid conflict at every cost.

A paper on management practices on peatlands in Switzerland found there to be a high opportunity cost for changing to more sustainable land management practices due to high profitability of current land use (Ferré et al., 2019). This is however not the case for mires of national importance, since they are mostly very extensively used or not actively managed at all. Nevertheless, the surrounding areas that should be extensified and act as buffer zones are often intensively used for agriculture. The same study also found the absence of systematic data on soil characteristics to be a contributing factor (Ferré et al., 2019). This also emerged from the interviews conducted, although not as prime focus. However, it is likely to play a more important role for the implementation of the buffer zone, as the mire inventory has already been clearly defined.

According to a survey conducted by the Federal Office for the Environment only 10-40 % of the hydrological and biological buffer zones have been sufficiently implemented (Bundesamt für Umwelt, 2022b). According to the results from the interviews this number appears to be far lower.

The barriers and factors of success identified from the case studies and different interviews had many communalities and appear to be relatively representative of many other mires and peatlands in Switzerland. Nevertheless, there might be additional barriers and factors of success that were not at all identified in this study. Since every mire is very specific and unique, there might be cases that are not necessarily represented by the findings of this study. Both cases studied have already undergone regenerative and protective measures that appear to have been successful. Cases that have not undergone any measures or have had unsuccessful results from measures taken, are not represented in this case study.

An important part of the findings come from semi-structured interviews aiming to gather different perspectives on the implementation of mire conservation. Thus, the information gathered is at least partly subjective and dependent on the people interviewed. Nonetheless, these subjective perspectives are also very much part of, and important to understand the implementation of mire protection.

This study presents some potential solutions to break up the barriers holding back implementation of mire protection. However, it is difficult to say how feasible their implementation is. There might be additional difficulties on a political and socio-economical level that complicate their implementation.

6. Conclusion

Peatlands are part of the fastest decreasing ecosystem globally, even though they provide a variety of valuable services to society and are the largest terrestrial carbon store worldwide (wetlands international, 2023b). Since 1900 the surface area of mires in Switzerland has decreased by 80% (Stuber & Bürgi, 2018). While legally mires are very strongly protected, the implementation of mire conservation is far from complete, and mires keep deteriorating (Pro Natura, 2010). The underlying factors contributing to this gap between regulations and implementation are numerous and diverse. This study used two case studies, semi structures interviews and a literature review to examine some of the main factors contributing to the lack of implementation. The identification of these factors can help to identify possible levers of improvement. This study makes suggestions on how to better implement mire conservation in Switzerland. These might help to bridge the gap between current regulations and the lack of implementation of mire conservation.

In general, I conclude that the main contributing barriers within mire conservation implementation are conflicting interests of landowners and land managers. They are strongly interconnected with the current agricultural system and its intensification. Therefore, the solutions proposed aim to align the interests of landowners and managers with those of mire conservation. I also aim to make the current agricultural system more sustainable by proposing a redesign of subsidies and encouraging innovation.

A systematic and more extensive study of mire conservation in Switzerland could help to give a more representative image of the problems and factors of success within implementation of mire conservation. A more extensive cost-benefit analysis could bring a more detailed representation of the costs and benefits that occur through mire conservation. A quantification and the conceptualization with the help of an economic model can help to make mire conservation more tangible. The specific study of implemented regeneration projects can also further advance future mire regeneration projects, as it would be possible to learn from examples of failures and successes.

Sources

A. Maibach Sàrl. (2014). *Tourbière des Mosses de la Rogivue. Réactualisation du plan de gestion : étape 2*. (Unpublished report) A. Maibach Sàrl.

A. Maibach Sàrl. (2020). *Tourbière des Mosses de La Rogivue. Suivi des migrations de batraciens en 2020*. (Unpublished report) A. Maibach Sàrl.

Anisha, N. F., Mauroner, A., Lovett, G., Neher, A., Servos, M., Minayeva, T., Schutten, H., & Minelli, L. (2020). Locking carbon in wetlands: Enhancing climate action by including wetlands in NDCs. *Alliance for Global Water Adaptation and Wetlands International*.

Bauernzeitung. (2022, February 19). *Wie hoch darf die Güllegabe im Acker- und Futterbau ausfallen?* https://www.bauernzeitung.ch/artikel/pflanzen/wie-hoch-darf-die-guellegabe-im-acker-und-futterbau-ausfallen-401607

Béguin, J., & Smola, S. (2010). Stand der Drainagen in der Schweiz, Bilanz der Umfrage 2008. *Bundesamt für Landwirtschaft (BLW), Bern.*

Behörde für Grundstückverkehr. (2022). Karte der Höchstpreise 2022. *Staat Freiburg*.

Berkes, F. (2009). Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management*, *90*(5), 1692–1702. https://doi.org/10.1016/j.jenvman.2008.12.001

Brunkhurst, E., & Bowman, P. (n.d.). *The Habitat Stewardship brochure: Peatlands*.

Bundesamt für Landwirtschaft. (2022). *Agrarbericht 2022*. Bundesamt für Landwirtschaft (BLW), Bern.

Bundesamt für Statistik. (2023, June 3). *Landwirtschaftsflächen*. https://www.bfs.admin.ch/bfs/de/home/statistiken/raum-umwelt/bodennutzung-bedeckung/landwirtschaftsflaechen.html

Bundesamt für Umwelt. (2002). Rechtliche Rahmenbedingungen. *Handbuch Moorschutz in Der Schweiz*.

Bundesamt für Umwelt. (2007). *Zustand und Entwicklung der Moore in der Schweiz*. Bundesamt für Umwelt, Bern.

Bundesamt für Umwelt. (2017). *Journée technique marais / Fachtagung Moorschutz*. Bundesamt für Umwelt, Bern.

Bundesamt für Umwelt. (2018). *Bericht zu Handen der UREK-S zu rechtlichen und sachlichen Fragen des Moorschutzes.* Bundesamt für Umwelt, Bern.

Bundesamt für Umwelt. (2019a). *Moorlandschaften im Spannungsfeld der Interessen. Referat von Dr. Franziska Schwarz, Vizedirektorin des BAFU.* Bundesamt für Umwelt, Bern.

Bundesamt für Umwelt. (2019b). *Umsetzung der Moorlandschaften von nationaler Bedeutung, Auswertung der Kantonsumfrage (2017-2018) Schlussbericht.* Bundesamt Für Umwelt, Bern.

Bundesamt für Umwelt. (2020, December 29). *CO2-Abgabe*. https://www.bafu.admin.ch/bafu/de/home/themen/klima/fachinformationen/verminderungsmassnahmen/co2-abgabe.html

Bundesamt für Umwelt. (2021). *Auswirkungen des Klimawandels auf die Schweizer Gewässer*. Bundesamt Für Umwelt, Bern.

Bundesamt für Umwelt. (2022a). *Rückverteilung der CO 2-Abgabe: von der Einführung bis heute*. Bundesamt Für Umwelt, Bern.

Bundesamt für Umwelt. (2022b). *Stand der Umsetzung der Biotopinventare von nationaler Bedeutung. Kantonsumfrage 2021*. Bundesamt Für Umwelt, Bern.

Bundesamt für Umwelt. (2022c, December 20). *Landschaft: Das Wichtigste in Kürze*. https://www.bafu.admin.ch/bafu/de/home/themen/landschaft/inkuerze.html.

Canton de Vaud. (2018). Direction générale de l'agriculture, de la viticulture et des affaires vétérinaires. *Canton de Vaud*.

Carroll, M. J., Dennis, P., Pearce-Higgins, J. W., & Thomas, C. D. (2011). Maintaining northern peatland ecosystems in a changing climate: Effects of soil moisture, drainage and drain blocking on craneflies. *Global Change Biology*, *17*(9), 2991–3001. https://doi.org/10.1111/j.1365-2486.2011.02416.x

Charles, A. (ed.). (2021). *Communities, conservation and livelihoods*. IUCN, Gland. Community Conservation Research Network, Halifax. https://doi.org/10.2305/IUCN.CH.2021.01.en

Commission de gestion de la réserve naturelle Les Mosses de la Rogivue. (2020). *Reserve naturelle des Mosses de la Rogivue. Proces-verbal de la seance du 23 juin 2020*. (Unpublished) Commission de gestion de la réserve naturelle Les Mosses de la Rogivue.

Commission de gestion de la réserve naturelle Les Mosses de la Rogivue. (2021). *Plan de gestion 2015 – 2025 pour la réserve naturelle LES MOSSES DE LA ROGIVUE*. (Unpublished) Commission de gestion de la réserve naturelle Les Mosses de la Rogivue.

Davidson, N. C., Van Dam, A. A., Finlayson, C. M., & McInnes, R. J. (2019). Worth of wetlands: Revised global monetary values of coastal and inland wetland ecosystem services. *Marine and Freshwater Research*, *70*(8), 1189–1194. https://doi.org/10.1071/MF18391

De Groot, R., Brander, L., van der Ploeg, S., Costanza, R., Bernard, F., Braat, L., Christie, M., Crossman, N., Ghermandi, A., Hein, L., Hussain, S., Kumar, P., McVittie, A., Portela, R., Rodriguez, L. C., ten Brink, P., & van Beukering, P. (2012). Global estimates of the value of ecosystems and their services in monetary units. *Ecosystem Services*, *1*(1), 50–61. https://doi.org/10.1016/j.ecoser.2012.07.005

De Groot, R., Stuip, M., Finlayson, M., & Davidson, N. (2006). *Valuing wetlands Guidance for valuing the benefits derived from wetland ecosystem services Ramsar Technical Reports*. International Water Management Institute.

Dümmler, P., & Bonato, M. (2020). *Kantonale Agrarpolitik auf dem Prüfstand. Ansatzpunkte für mehr Regionalisierung in der Schweizer Landwirtschaft*. Avenir Suisse.

Eidgenössische Finanzverwaltung. (2023, June 19). *Ausgaben*. https://www.efv.admin.ch/efv/de/home/finanzberichterstattung/bundeshaushalt_ueb/ausgaben.html

Essl, F., Dullinger, S., Moser, D., Rabitsch, W., & Kleinbauer, I. (2012). Vulnerability of mires under climate change: Implications for nature conservation and climate change adaptation. *Biodiversity and Conservation*, *21*(3), 655–669. https://doi.org/10.1007/s10531-011-0206-x

Everett, K. R. (1983). *HISTOSOLS* (Vol. 11, pp. 1–53). Elsevier Science Publishers B.V. https://doi.org/https://doi.org/10.1016/S0166-2481(08)70612-3

Ferré, M. (2017). *Sustainable Management of Cultivated Organic Soils in Switzerland-An Economic and Policy Analysis*. https://doi.org/10.3929/ethz-b-000213859

Ferré, M., Muller, A., Leifeld, J., Bader, C., Müller, M., Engel, S., & Wichmann, S. (2019). Sustainable management of cultivated peatlands in Switzerland: Insights, challenges, and opportunities. *Land Use Policy*, *87*. https://doi.org/10.1016/j.landusepol.2019.05.038

Fischer, M., Altermatt, F., Arlettaz, R., Bartha, B., Baur, B., Bergamini, A., Bersier, L.-F., Birrer, S., Braunisch, V., Dollinger, P., Eggenberg, S., Gonseth, Y., Guisan, A., Guntern, J., Gutscher, H., Herzog, F., Humbert, J.-Y., Jenny, M., Klaus, G., … Zumbach, S. (2015). *Zustand der Biodiversität in der Schweiz 2014 Die Analyse der Wissenschaft*.

Forum Biodiversität Schweiz. (2007). Biodiversität in Feuchtgebieten. *HOTSPOT*, *16*.

Fusion Media Limited. (2023, July 25). *Schweiz - Staatsanleihen*. https://de.investing.com/rates-bonds/switzerland-government-bonds

Garcia, S. M., Rice, J., & Charles, A. (2014). Governance of marine fisheries and biodiversity conservation. In *Governance of Marine Fisheries and Biodiversity Conservation* (pp. 18–36). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118392607.ch2

Giesler, S. (2022, June 14). *Renaturierte Moore als Kohlenstoffdioxid-Speicher. Klimaschutzfaktor Moore – CO2 binden statt freisetzen*. https://www.biooekonomie-bw.de/fachbeitrag/aktuell/klimaschutzfaktor-moore-co2-binden-statt-freisetzen

Gimmi, U., Lachat, T., & Bürgi, M. (2011). Reconstructing the collapse of wetland networks in the Swiss lowlands 1850-2000. *Landscape Ecology*, *26*(8), 1071–1083. https://doi.org/10.1007/s10980-011-9633-z

Glenk, K., Faccioli, M., Martin-Ortega, J., Schulze, C., & Potts, J. (2021). The opportunity cost of delaying climate action: Peatland restoration and resilience to climate change. *Global Environmental Change*, *70*. https://doi.org/10.1016/j.gloenvcha.2021.102323

Gowthaman, S., Chen, M., Nakashima, K., Komatsu, S., & Kawasaki, S. (2022). Biocementation technology for stabilization/solidification of organic peat. In *Low Carbon Stabilization and Solidification of Hazardous Wastes* (pp. 49–64). Elsevier. https://doi.org/10.1016/B978-0-12-824004-5.00019-0

Grosvernier, P. (2023, June 12). *Marais*. https://marais.ch/de/home.html

Grünig, A. (1994). *Mires and Man. Mire conservation in a Densely Populated Country - the Swiss Experience. Excursion Guide and Symposium of the International Mire Conservation Group to Switzerland 1992.*

Gubler, G. L., Ismail, S. A., & Seidl, I. (2020). Biodiversitätsschädigende Subventionen in der Schweiz. *WSL Berichte*, *96*.

Gubler, L., & Seidl, I. (2020). *Klimaschutz durch Hochmoorschutz CO 2-Kompensation durch Hochmoorrenaturierung in der Schweiz*.

Hagedorn, F., Krause, H.-M., Studer, M., Schellenberger, A., & Gattinger, A. (2018). *Boden und Umwelt Organische Bodensubstanz, Treibhausgasemissionen und physikalische Belastung von Schweizer Böden. Thematische Synthese TS2 des Nationalen Forschungsprogramms «Nachhaltige Nutzung der Ressource Boden»*.

Hansen, L., Hellerstein, D., Ribaudo, M., Williamson, J., Nulph, D., Loesch, C., & Crumpton, W. (2015). *Targeting Investments to Cost Effectively Restore and Protect Wetland Ecosystems: Some Economic Insights*. https://ssrn.com/abstract=2735071

Hartje, V., Wüstemann, H., & Bonn, A. (2015). *NATURKAPITAL UND KLIMAPOLITIK. Synergien und Konflikte*.

Heinrich-Böll-Stiftung, Bund für Umwelt und Naturschutz Deutschland, & Michael-Succow-Stiftung. (2023). *Mooratlas Daten und Fakten zu nassen Klimaschützern* (Vol. 1).

International Union for Conservation of Nature. (2021). *PEATLANDS AND CLIMATE CHANGE*.

Ismail, S., Schwab, F., Tester, U., Kienast, F., Martinoli, D., & Seidl, I. (2009). *Kosten eines gesetzeskonformen Schutzes der Biotope von nationaler Bedeutung. Technischer Bericht.*

IUCN UK Peatland Programme. (2023, May 15). *About Peatlands*. https://www.iucn-uk-peatlandprogramme.org/about-peatlands

Joosten, H. (2007). The International Peat Society: fossil or renewable? An analysis of the IPS stand towards peat renewability and climate change. *International Mire Conservation Group (IMCG) Newsletter, 2*.

Joosten, Hans., & Clarke, Donal. (2002). *Wise use of mires and peatlands: background and principles including a framework for decision-making*. International Mire Conservation Group.

Küchler, M., Küchler, H., Bergamini, A., Bedolla, A., Ecker, K., Feldmeyer-Christe, E., Graf, U., & Holderegger, R. (2018). *Moore der Schweiz. Zustand, Entwicklung, Regeneration* (Vol. 55). Haupt Verlag.

Leifeld, J. (2013). Prologue paper: Soil carbon losses from land-use change and the global agricultural greenhouse gas budget. In *Science of the Total Environment* (Vol. 465, pp. 3–6). https://doi.org/10.1016/j.scitotenv.2013.03.050

Liner, M. (2022). *Ein neuer Weg zur ökologischen und sozialen Transformation der Schweizer Agrarpolitik. «Der Generationenwechsel in der Landwirtschaft als ökologische Chance»*. Pro Natura, Basel.

Marti, K., Krüsi, B. O., Heeb, J., & Theis, E. (1997). *Pufferzonen-Schlüssel Leitfaden zur Ermittlung von ökologisch ausreichenden Pufferzonen für Moorbiotope*. Bundesamt für Umwelt, Wald und Landwirtschaft, Bern.

Martin-Ortega, J., Allott, T. E. H., Glenk, K., & Schaafsma, M. (2014). Valuing water quality improvements from peatland restoration: Evidence and challenges. *Ecosystem Services*, *9*, 34–43. https://doi.org/10.1016/j.ecoser.2014.06.007

Meier, E., Lüscher, G., Buholzer, S., Herzog, F., Indermaur, A., Riedel, S., Winizki, J., Hofer, G., & Knop, E. (2021). Zustand der Biodiversität in der Schweizer Agrarlandschaft. *Agroscope Science*, *111*. https://doi.org/10.34776/as111g

Möhring, A., Mack, G., Zimmermann, A., Mann, S., & Ferjani Agroscope, A. (2018). Evaluation Versorgungs sicherheitsbeiträge Schlussbericht. In *Agroscope Science | Nr* (Vol. 66). www.agroscope.ch/science

Närmann, F., Birr, F., Kaiser, M., Nerger, M., Luthardt, V., Zeitz, J., Tanneberger, F., & Skripten, B.-. (2021). *Klimaschonende, biodiversitätsfördernde Bewirtschaftung von Niedermoorböden*. https://doi.org/10.19217/skr616

National Centre for Climate Services. (2018). *CH2018-Climate Scenarios for Switzerland Imprint*.

OECD. (2017). *OECD Environmental Performance Reviews: Switzerland 2017*. https://doi.org/https://doi.org/10.1787/19900090

OECD. (2022). *Agricultural Policy Monitoring and Evaluation 2022*. OECD Publishing. https://doi.org/10.1787/7f4542bf-en

OECD. (2023, July 4). *Agricultural support*. https://data.oecd.org/agrpolicy/agricultural-support.htm

Ostrom, E. (2015). The Evolution of Institutions for Collective Action. In *Governing the Commons* (pp. xi–xvi). Cambridge University Press. https://doi.org/10.1017/CBO9781316423936.001

Pelkmans, J., & Renda, A. (2014). How Can EU Legislation Enable and/or Disable Innovation. *European Commision*.

Pluspunkt. (2021). *Regeneration Hochmoorobjekt HMI 400 "Juchmoos"- Ausführungsbericht*. (unpublished report) Pluspunkt.

Pluspunkt. (2022). *Regeneration HMI 400-Juchmoos-Etappe 2 2022 - Projektierungsbericht und Bauneschrieb*. (unpublished report) Pluspunkt.

Pro Natura. (2010). Moore: Bedrohte Refugien und wichtige Klimagasspeicher. *Pro Natural Magazin*, *2*.

Pro Natura. (2021, October 20). *Die Schweiz braucht eine Biodiversitätsoffensive*. https://www.pronatura.ch/de/2021/die-schweiz-braucht-eine-biodiversitaetsoffensive.

Pro Natura Vaud. (2009). *Les Mosses de la Rogivue*. Pro Natura Vaud, Maracon.

Raemy. (2008). *Nutzungs-, Schutz-und Konfliktregelungen des Moorlandschaftsschutzes*.

Ramsar Convention on Wetlands. Ramsar Information Paper no. 1. (1971). *What are wetlands?* Ramsar Convention on Wetlands, Ramsar.

Schweizerische Eidgenossenschaft. (2021). *Volksinitiative 13. Juni 2021. Vierte Vorlage: CO2-Gesetz*.

Bundesgesetz über den Natur- und Heimatschutz, SR 451. Schweizerische Eidgenossenschaft (2022).

Schweizerische Eidgenossenschaft. (2023). *swisstopo*. https://map.geo.admin.ch

Verordnung über den Schutz der Hoch- und Übergangsmoore von nationaler Bedeutung, SR 451.32. Schweizerische Eidgenossenschaft (2017).

Verordnung über den Schutz der Moorlandschaften von besonderer Schönheit und von nationaler Bedeutung, SR 451.35. Schweizerische Eidgenossenschaft (2017).

Schweizerischer Bundesrat. (2020). *Bodenstrategie Schweiz für einen nachhaltigen Umgang mit dem Boden*. www.bafu.admin.ch/ui-2018-d

Verordnung über den Schutz der Flachmoore von nationaler Bedeutung, SR 451.33. Schweizerische Eidgenossenschaft (2021).

Staat Freiburg. (2021). *Höchstzulässiger Pachtzins in Franken pro Hektare*.

Steiger, U., Knüsel, P. & Rey, L. (2018). *Die Ressource Boden nachhaltig nutzen. Gesamtsynthese des Nationalen Forschungsprogramms «Nachhaltige Nutzung der Ressource Boden»*. Leitungsgruppe des NFP 68.

Stuber, M., & Bürgi, M. (2018). *Vom "eroberten Land" zum Renaturierungsprojekt. Geschichte der Feuchtgebiete in der Schweiz seit 1700*. Haupt Verlag.

Federal Constitution of the Swiss Confederation, art. 78 par. 5 (2022). Swiss Confederation.

Tilman, D., Mayt, R. M., Lehman, C. L., & Nowakt, M. A. (1994). Habitat destruction and the extinction debt. *Nature 371*, 65–66.

Umwelt Bundesamt. (2023, March 27). *Gesellschaftliche Kosten von Umweltbelastungen*. https://www.umweltbundesamt.de/Daten/Umwelt-Wirtschaft/Gesellschaftliche-Kosten-von-Umweltbelastungen#undefined

UNESCO Biosphäre Entlebuch. (2018). *Aufwertungskonzept Hochmoor Juchmoos*. (unpublished) UNESCO Biosphäre Entlebuch.

United Nations. (2022, February 1). *'Unsung heroes' of the climate crisis*. https://news.un.org/en/story/2022/02/1111052

United Nations Environment Programme. (2021). *Economics of Peatlands Conservation, Restoration, and Sustainable Management - A Policy Report for the Global Peatlands Initiative.* United Nations Environment Programme.

Vysna, V., Maes, J., Petersen, J.-E., La Notte, A., Vallecillo, S., Aizpurua, N., Ivits, E., & Teller, A. (2021). *Accounting for ecosystems and their services in the European Union (INCA). Final report from phase II of the INCA project aiming to develop a pilot for an integrated system of ecosystem accounts for the EU. Statistical report*. Publications office of the European Union.

Walter, F., & Hänni, E. (2018). *Wege zu einer nachhaltigen Bodenpolitik. Thematische Synthese 5 des Nationalen Forschungsprogramms «Nachhaltige Nutzung der Ressource Boden»*. Leitungsgruppe des NFP 68.

Wetlands International. (2023a, March 8). *Types of Wetlands*. https://www.wetlands.org/Wetlands/Types-of-Wetlands-2/

Wetlands International. (2023b, March 15). *Peatlands*. Https://Www.Wetlands.Org/Our-Work/Peatlands/. https://www.wetlands.org/our-work/peatlands/

World Economic Forum. (2022, March 24). *Why wetlands are a versatile climate and biodiversity hack*. https://www.weforum.org/agenda/2022/03/wetlands-climate-change/

Wüst, C., Paul, S., Heller, S., & Leifeld, J. (2021). *Greenhouse gas emissions from agriculturally managed organic soils*. Agroscope.

Zollinger, F. (2006). Drainagen: Unterhalt bis in alle Ewigkeit? *Geomatik Schweiz: Geoinformation Und Landmanagement*, *104*. https://doi.org/10.5169/seals-236373

Zorn, A. (2020). Kennzahlen des strukturwandels der schweizer landwirtschaft auf basis einzelbetrieblicher daten. *Agrarforschung Schweiz*, *11*(3), 1–58. https://doi.org/10.34776/as88g

Appendix A: List of conducted Interviews

Bastien Amez-Droz – Pro Natura – March 13, 2023
Ariel Bergamini – WSL – March 23, 2023
Christian Schnider – LW Entlebuch – April 11, 2023
Franz Achermann-Felber – LW Entlebuch – April 19, 2023
Florian Knaus – UNESCO Biosphere Entlebuch – May 11, 2023
Peter Ulmann – Canton of Lucerne – May 15, 2023
Nora Aellen – Canton of Lucerne – declined to provide written information
Bastien Amez Droz – Pro Natura – May 17, 2023
Philippe Grosvernier – LIN'eco – June 2, 2023
René Amstutz – Pro Natura – June 5, 2023
Nicolas Hausel – Canton of Vaud – June 9, 2023
Kaspar Zirfass – pluspunkt – June 13, 2023
Peter Staubli – BAFU – June 13, 2023
Jacques Frioud – Canton of Fribourg – June 14, 2023
Pius Thalmann – Korporation Romoos: Landowner Community – June 26, 2023
Christina Jany – Myclimate – written statement – July 10, 2023
Luca Vial – Canton of Fribourg – declined to provide information

Appendix B: Interview mit Bastien Amez-Droz – 13. März 2023

Was sind die grössten Barrieren in der Umsetzung des Moorschutzes in der Schweiz?

- Kantone haben zu wenig Mittel (Finanzen und Personal)
- Naturschutzämter haben immer mehr Aufgaben
- Finanzen: beim Bund genügend
- NFA (Neugestaltung des Finanzausgleichs und der Aufgabenteilung zwischen Bund und Kantonen) Periode 2020- 2024 -> Kantone können nicht
- Politischer Druck bei Kantonen
- Gewisse Moore sind zu stark beschädigt
- Probleme in und um die Moore

Pufferzonen:

- Laut Bundesgerichtsentscheid 3 Funktionen zu erfüllen: Nährstoffe, hydrologisch, ökologisch

Nährstoffe

- Manchmal Drainagen direkt ins Moor -> Puffer funktioniert nicht
- Pufferzone noch nicht überall umgesetzt, wo die Bauern nicht so begeistert sind…
- Studie NE, SG & FR: über 50% nicht respektiert -> keine Folgen für die Kantone (nicht nur Moore)

Hydrologisch

- Espace marais, marais.ch, erst neue Methode / Studien
- Wenn man etwas baut, dann zeigen, dass kein Problem (hydrologisch)
- «bei jeder sich bietender Gelegenheit verbessern / Beeinträchtigungen beheben» (Gilt fürs ganze Moor)
- Wenn Intensivlandwirtschaft, dann muss hydrologische Pufferzone deutlich grösser sein

Ökologisch

- Extensive Feuchtvegetation
- Bspw. Schmetterling
- noch nicht umgesetzt
- was kann man machen: Blumen um die Moore

- Eigentümer (Moor oder Nachbarsparzelle) haben keine Lust Moorschutz zu betreiben
- Durch Wiedervernässung geht auch benachbartes Landwirtschaftsland verloren
- Pro Natura wird regelmässig angefragt, Flächen zu kaufen damit der Kanton eine Enteignung vermeiden kann, da dabei das Risiko besteht, dass das Parlament als Reaktion darauf eine Verfassungsänderung vornimmt
- Naturfachstellen im Wald / LW Amt: LU, NE, SZ
- Wenn das Landwirtschaftsamt ein vorhaben unterstützt, ist es einfacher durchzubringen, aber der Naturschutz ist oft schwächer und hat eine tiefere Priorität
- Bericht des Bundes (2007) erst wenn über 10% ...
- Geschwindigkeit des Verlusts noch die selbe, wie vor der Initiative
- Teufelskreis: je schlechter, desto schlechter

- Stickstoffverschmutzung durch Regen
- Es fehlen Leute, die eine Moordiagnose machen können
- Meinrad Küchler (WSL Pensioniert) Einsiedeln
- Faulbaum, Birke, Gebüsche
- Zürich: Hochmoor vom Einzugsgebiet trennen
- Gespaltene Meinungen unter Experten, erster Austausch
- Inventar 1996 -> zwei Verordnungen Hoch vs. Flachmoor aber unter fast allen Hochmooren befinden sich auch Flachmoore -> sollte primär ein Moorobjekt sein
- Peter Staubli, BAFU
- Kanton ZH, Pascale Weber, Flächen isolieren
- Wasserqualität vs. Wasserquantität, veränderter Niederschlag durch Klimawandel
- Wenn vom Einzugsgebiet trennen, dann viele Probleme gelöst
- Wenn Topografie stark verändert wurde, ist eine Regeneration schwierig
- Drainagen im Einzugsgebiet (schmutziges Wasser kommt ins Moor oder benötigtes Wasser wird umgeleitet), Drainage des Moors
- Drainagen in Mooren sollten geschlossen werden
- Um effektive Massnahmen vorzunehmen, muss man das Moor wirklich verstehen, aber das ist teuer und zeitintensiv
- Oft wird die einfache Lösung gewählt

Appendix C: Interview mit Ariel Bergamini – 23. März 2023

- Aktuellster Stand der Moorentwicklung in der Schweiz? 2021, gleicher Trend wie bisher?

2019 Publikation, hotspot scnat Kurzartikel, grössere Publikation im 2025, Zwischenauswertung: Mai 2022
Vegetationserhebungen
Trockener, aber nicht zu spät zu agieren
Trends werden zu sehen sein
Lichtzahl: dunkler, Verbuschung
Nähstoffzunahme: Nährstoffe scheinen nicht zu zunehmen, nicht zu sehen bei Pflanzen, noch unklar
Luftbildanalyse noch nicht gemacht, nächstes Jahr (2024)
Zustand 90er (Inventarisierung 90er und 80er) und Zustand 2015, letzte 6 Jahre noch unklar
Vegetationsanalyse: teilweise Verbuschung
Hochmoore im Mitteland werden feuchter und lichtreicher, Effekt von Renaturierungen, nicht viel Hochmoore im Mitteland, Renaturierung zeigen schnell positive Effekte, bis ein funktionierendes Hochmoor entsteht braucht es aber Geduld

- Was sind aus Ihrer Sicht die grössten Hürden in der Umsetzung des Moorschutzes der Schweiz?

Drainagegräben, dürfen in Flachmooren unterhalten werden; auch Entwässerung, wenn nicht unterhalten
Bewirtschaftung wichtig, Beweidung: wenig Wissen was optimal, eher Erfahrungswissen wenig wissenschaftliche Untersuchungen -> Verbuschung

Nährstoffzunahme: sieht im Moment nicht danach aus, nicht kein Problem, Massnahmen unbedingt aufrechterhalten (Nährstoff-Pufferzonen, Luftreinhaltemassnahmen)

Klimawandel

Hürden: Kantone zuständig, Naturschutzämter sind sehr engagiert und Fachleute vorhanden, Naturschutzämter unterfinanziert (Personal und Finanzen), zu wenig Mittel

Gräben:
Hochmoor muss nicht bewirtschaftet werden, Besitzverhältnisse kompliziert

N+L Insight (KBNL): Artikel Hudelmoos (St Gallen), Besitzverhältnisse, Finanzen
Myclimate: Moore zu CO2 Kompensation, viel Geld, zu wenig Projekte, private Büros (wenige Büros), ca. 5 schweizweit, Fachleutemangel
Flachmoore: u.U. zu nass, wenn alle Gräben zu, dann kann man mit Maschine nicht mehr schneiden, Raupenfahrzeug (Neuenburgersee)

Kanton Bern: Effekt von Gräben, wann besonders schädlich für Moore, Abklärungen im Gange

BAFU Bericht 2022: Umsetzung aber langsam

- Hauptprobleme sind lange klar: Aktive Entwässerung, Nährstoffeintrag und Verbuschung -> wieso passiert trotzdem nichts?

Es passiert nicht nichts – im Gegenteil, viele Objkete werden relegmässig gepflegt (z.B. Entbuschung, Neophyten entfernen), aber die Umsetzung (Pufferzonen einrichten, Gräben schliessen) geht deshalb langsam voran, weil die Naturschutzämter immer unterdotiert waren. Dies dürfte der Hauptgrund für die langsame Umsetzung sein.

Torfschichten relativ dünn, dann Hochmoor auch von Grundwasser abhängig und immer noch wichtig («Espace Marais», siehe https://www.marais.ch); d.h. Beeinträchtigung der hydrologischen Verhältnisse in der Umgebung der Moore sind auch wichtig.

- Beispiele wo besonders gut / schlecht?

Moore der Schweiz: Beispiele, grundsätzlich positiv aber noch nicht so positiv, alle noch nicht dort wo man sie möchte, typisches Torfmoos breitet sich sehr schnell wieder aus (wichtig)
Grundsätzlich sehen wir weiterhin negative Veränderungen bei Hoch- und Flachmooren in der Schweiz. Bei Hochmooren im Mittelland scheinen allerdings die vielen Renaturierungen zu wirken, die Moore scheinen nasser zu werden. Bei Renaturierungen von Hochmooren stellen sich relative schnell erste Erfolge ein, die Torfmoose zeigen bei Wiedervernässungen z.B. meist starkes Wachstum.

Isolationseffekte bei wenig mobilen Arten, fehlende Vernetzung

Hagenmoos, Forenmoos, Gamperfin, Etang de la Gruère etc.: frische Renaturierungen, erste positive Effekte sichtbar.

Renaturierungen funktionieren
Flachmoor deutlich weniger Renaturierungen

- Ist es noch möglich die Moore zu «retten»?

Höhere Lagen, ja, genügend Regenfälle
Tiefere Lagen: unsicher, Klimawandel; auf jeden Fall wichtig kein Wasser aus den Mooren abzuleiten und auch hydrologische Beeinträchtigungen in der Umgebung in Betracht ziehen.
Andere Verteilung der Niederschläge prognostiziert (Sommer trockener, Winter feuchter), aber unsicher wie sich auswirkt

Gräben schliessen
Gletscherwasserzufuhr: Problematisch für Moore in alpinen Lagen

Appendix D: Interview mit Christian Schnider - 11. April 2023

Entlebuch:

- Inwiefern sind Sie in den Moorschutz involviert? Was ist Ihre Rolle?

Moorgebiet, Sörenberg, Glaubenberg
Moorflächen
Flächen pflegen
Nach Vertrag

- Zustand der Moore und Moorlandschaften im Entlebuch?

Schwierig zu sagen
Kommt auf die Probleme an
Klimawandel immer trockener
Bewirtschaftung streng kontrolliert
Bewirtschaftung nicht optimal aber vorgeschrieben

- Was Schwierigkeiten in der Umsetzung des Moorschutzes? (im Entlebuch)

Problem Zielkonflikt, LW, Tourismus,
Moorschutz vs. Förster
Erneuerbare Energien
Moor zu nass, Bewirtschaftungswege, Riesenverfahren

- Was sind Erfolgsfaktoren / was braucht es für einen effektiven Schutz?

Kommt auf Sichtweise an
Weg oder Graben
Erhalten
Schnittzeitpunkte, immer besser? Nicht ganz klar
Veränderungen mit Bewirtschaftung und Pflege, aber sehr stark vorgegeben
Bauern besser einbeziehen, wenn machen was wollen, dann enge Grenzen
Moorschutz ist gegeben
Nicht das Gefühl, dass schlechter werden

- Was sind aus Ihrer Sicht die grössten Hürden in der Umsetzung des Moorschutzes der Schweiz?

Zu wenig Moore, Biodiversität, sehr wichtig
So wie jetzt, gut, hat sich bewährt
Wenn zu eng, schwierig

- Wie beeinflusst die UNESCO Listung den Moorschutz?

Beeinflusst Arbeit nicht, Mithilfe, anderes Niveau
Regionalentwicklungsprojekt, Kanton
Eher andere Projekte

Man hat sich arrangiert
Teil des Einkommens, Richtig, dass gemacht wird
Bergbahnen, kann nicht beschneien
Stark eingeschränkt (Beschneien), weniger Schäden

Zusätzliches Wasser in die Fläche, hat das Gefühl es würde helfen, aber andere Meinungen, dann Gesetzgebung
Hürden wenn etwas Bauen
Im Einzelfall nicht
Ämter halten sich extrem an Artikel
Biken

- Entwicklung des Zustands der Moore?

Verbessert nicht
Betrieb 95% Biodiversitätsfläche, jetzt bei 60%, ohne Moorschutz dann weniger
Verbuschung aufhaltbar
Keine Renaturierungsprojekte, ganz wenige
Keine Verbesserung

- Pufferzone?

Kennt Pufferzone nicht, noch nie gehört
Intensiv LW
Auf Plan GIS

Appendix E: Interview mit Franz Achermann-Felber – 19. April 2023

Entlebuch:

- Inwiefern sind Sie in den Moorschutz involviert? Was ist Ihre Rolle?

Alp in Flühli, davon 52 ha Moorschutzflächen
Extensive Wiesen (inkl. NHG) gesamt, 476 a Mahd im Tal, 45 ha Weide und 7 ha Mahd auf der Alp
Die Dexter-Herde beweidet extensive Moorschutzflächen in der UNESCO Biosphäre Entlebuch.

LAWA (LW & Wald in Sursee), Kanton
Ant für Natur und Landschaftsschutz
Dauernde Wechsel

- Zustand der Moore und Moorlandschaften im Entlebuch?

Mahd: Biodiversität nimmt ab, Raubbau
besser: Entbuschung und liegen lassen
Besser wenn Beweidung mit kleinen, leichten Kühen

- Was sind die Schwierigkeiten in der Umsetzung des Moorschutzes? (im Entlebuch)

Stetiger Wandel der Leute in versch. Ämtern, nicht fixer Ansprechpartner, irgendwelche Biologinnen, denen man erklären muss, wir müssen Schulung bekommen und nicht umgekehrt, muss gesamtheitlich anschauen nicht einzeln nur Moore
Kein Wissen über LW, Erschliessungen, Wildtiere, Nutztiere
Anna Tina Bühler (gute Erfahrung)
Verschiedene Interessen müssen abgedeckt werden

- Wie Umsetzung? Involvierung Kanton / UNESCO / Naturschutzorganisationen?

UNESCO hat keinen Einfluss
Keine Naturschutzorganisationen
Öffentlichkeitsarbeit fehlt
machen Rundgänge und Marketing zu moorbeef.ch, nur privat

- Was sind Erfolgsfaktoren / was braucht es für einen effektiven Schutz?

Diverse Verbesserungsmöglichkeiten
Andere Alpen mit grossen Rindern: Trittschäden

Freiwillige Verträge mit Amt für Natur und Landschaftsschutz, aber diese gekündigt, da nicht im Moorschutzperimeter
Flächen mit Moorschutzqualität, gäbe «zu viel Arbeit im LAWA», wir würden gerne Flächen im Moorschutz aufnehmen, die nicht im Register Moorflächen enthalten sind, aber die Anforderungen erfüllen
Moorinventar: Sollte regelmässig angepasst werden

Bewirtschafter (nicht Besitzer) sollten besser involviert werden
Kontinuität beim Personal wäre besser, aktuell viele Wechsel
Kontrolleure bei schlechtem Wetter senden, damit sie nicht Arbeit stören, Ohrfeige an Älpler, wir müssen bei schönem Wetter etwas anderes arbeiten

- Pufferzonen

Kennt nicht, Pufferzonen wären sinnvoll
Kennt nur vom Gewässer

Appendix F: Interview mit Florian Knaus – 11. Mai 2023

- Inwiefern sind Sie in den Moorschutz involviert? Was ist Ihre Rolle?

Laufendes Projekt und langfristiges Ziel: Moorkompetenzzentrum der Schweiz
Keine Hoheitlichen Aufgaben des Kantons übernehmen
Keine gesetzliche Legitimation für Aufgaben des Vollzugs (Aufgabe Kanton)
Moorrevitalisierungen in Absprache mit Kanton, Wiedervernässungsprojekte, Konzepte, Projekt und Baueingabe, Umsetzung begleiten, Kanton bucht und zahlt
Aufgaben die Ökobüros auch machen, + Absprache mit Grundeigentümerschaft
Viele Grundeigentümer nicht so gut zu sprechen auf Kanton aber UNESCO Biosphäre Entlebuch gutes Image aus Region
Kanton unterstützt finanziell, eng bei Projekten dabei
Auch Forschung, Monitoring, Zustand der Moore, touristische Vermarktung – umfassendes Verständnis von «Moorkompetenzzentrum»
Bildungsschiene: Exkursionen, Fachleute und Schulen, Kurse, Komm & Sensibilisierung

- Wie Umsetzung? Zusammenarbeit Kanton / UNESCO / Naturschutzorganisationen?

Zusammenarbeit mit Universitäten: Forschungsprojekte, WSL, ETH, Thomas Hammer Publikationen; Zusammenarbeiten mit Ökobüros mit Spezialisierung auf Moorrevitalisierungen (nationaler Austausch); UNESCO keine Aufgaben, nur Titelgeberin.
3 Gebiete die Pro Natura gehören, Freiwilligeneinsätze und Exkursionen zusammen, Austausch, Austausch Bastien Amez-Droz

- Zusammenarbeit mit Landwirt:innen und Kanton?

Merkt schnell ob offen oder nicht für Moorschutz, wenn nicht offen, dann sehr emotional, da top down, quasi Enteignung
Moorschutzverträge teilweise nicht unterschrieben (das sind historische Sachen und betreffen den Kanton/Vollzugsdefizite (die gibt's in der ganzen Schweiz, nichts Spezielles für LU)

- Inwiefern hilfreich, dass UNESCO gelistet?

Kernzonen sind Hochmoore, stärkere Bedeutung in der Region, regionale Institution getragen der Bevölkerung und Zugang zu Bauern grösser, nicht so Hoheitlich wie Kanton

- Zustand der Moore und Moorlandschaften im Entlebuch? Was Schwierigkeiten in der Umsetzung des Moorschutzes? (im Entlebuch)

Objekte gut aber Umfeld müsste angepasst werden, Nährstoffpufferzonen zuweilen knapp
Hydrologische Pufferzonen BAFU daran, espace.marais, sollte irgendwann kommen
Schwierig Leute zu finden die bereit für Umsetzung, eingebettet in Flachmoore die landwirtschaftliche Nutzfläche mit Naturschutzverträgen, wenn wiedervernässt auch umgebende Flächen, dann nicht so einfach zu bewirtschaften, dann verlieren LN und Subventionen
Hochmoore die genutzt werden, die LN sind, wenn wiedervernässt, Verlust für LW
Auch Geldfrage, wenn Subventionen wegfallen
Grundeigentümerschaft: Erbengemeinschaft, manchmal sehr viele, manchmal zerstritten

- Was sind Erfolgsfaktoren / was braucht es für einen effektiven Schutz?

Lebenswelt der Bauern kennen und Stellenwerte, Empathie mit Wissen und Erfahrung, versuchen einzubinden, Holzer- oder Pflegearbeiten, Revitalisierung so, dass weiter nutzbar, nicht zu starke Veränderungen sondern gewisse Kompromisse
Destruktiver Grundeigentümer: dann nichts zu machen
Bauer der Moore aktiv schädigt, Anzeigen, Polizei – zum Glück Ausnahmen!

- Beispiele wo besonders gut / schlecht?

Positiv: Juchmoos Gemeinde Hasle, Wasserpegelmesser vor Wiedervernässung, zuerst durchforstet, dann laufend Monitoring, Moorlibellenförderung, nicht ganzen Kanal zugemacht, Objekt Kanton versucht vor 15 Jahren, Korporation Romoos (=Grundeigentümer) wollte nicht, dann wir und funktioniert

Positiv: Alte Schiessstände vom Militär die revitalisiert, Gemeinde Flühli, Wagliseichnubel

- Wer wichtigen involvierten Parteien, die zu involvieren sind?

Grundeigentümer, Bewirtschafter, kantonale Behörden, NGO's, BAFU, Öko-Büros (4 Büros in der Schweiz), WSL

- Ist es noch möglich die Moore zu «retten»?

In Inventarobjekten ja; wobei es recht komplexe Objekte gibt (z.B. teilweise abgetorft, mit verschiedenen Bodenzorizonten); es braucht noch Arbeiten, wir sind aber auf gutem Wege, es läuft viel. gewisse warten auf Resultate der Revitalisierungen
Nicht in Inventaren (also Torfböden, die landwirtschaftlich genutzt werden v.a. als Wiese), Boden knapp, Bauern sehr emotional an Produktion hängend, da sehr schwierig und wird in der Schweiz nicht angegangen, in anderen Ländern schon.

Appendix G: Interview mit Peter Ulmann – 15. Mai 2023

Entlebuch:

- Wie setzen Sie den Moorschutz im Kanton Luzern um? Zusammenarbeit mit Gemeinden, NGO's, Landwirt:innen, UNESCO, BAFU, Ökobüros? Wichtige Partner / Instrumente in der Umsetzung?

Umgang mit Schutzobjekten: Grundkonzept, Objekte nach Bedeutung gruppiert, Inventarobjekte liegen in der obersten Kategorie, Grundlagen, Zustand, Delta zwischen Soll und Ist, Massnahmenplan, Umsetzung, Controlling
Schutz entweder aus Abteilung mit Mitarbeitenden mit Kernaufgabe Moorrevitalisierung
In House: LW Wald, Abteilung Wald, Waldbiodiversität, Moore im Wald
Verschiedenste Schienen, Pro Natura, Bundesebene
Andere Behörden, UBE, NGO
Gemeinden: nationale Bedeutung, dann kantonal (federführende Instanz), Initiative geht nicht von Gemeinde aus
Kleinstflächen die Gemeindehoheit

NGO: Gebiete in ihrem Eigentum, Baldeggersee gehört PN, Fläche ins Eigentum, Aufwertungsprojekte auf diesen Flächen, Projektvorstellungen und fragt um Finanzierung, Initiative von Pro Natura

Flächen in aller Regel im Privatbesitz und werden bewirtschaftet mit Bewirtschaftungsvertrag, per se ein Interessensdivergenz, Sicht Moorschutz, besser je mehr Wasser, organische Substanz, Vernetzung, weniger Mineralisierung, Verbuschung
Vs. Bewirtschaftung, Produktion, Befahrbarkeit

Moore als Kohlestoffspeicher, dann auch zusätzliche Vernässung notwendig

Auch LW mit Grosses Bewusstsein mit
Tendenz: in höheren Lagen, schleichende Intensivierung, LW immer mehr in die Nutzung und Intensivierung

UNESCO

- Alleistellungsmerkmal «verkaufen» damit werben
- Profitierende sind sich bewusst, dass das ihr Kapital
- Sensibilisierung, Information zu Bedeutung der Moore sehr wertvoll, Bewusstsein
- Promotion
- Für sie nicht einfacher als für Kanton, Interesse der Grundeigentümerschaften, spielt keine Rolle wer vernässt

- Was Schwierigkeiten in der Umsetzung des Moorschutzes? (im Entlebuch)

Rahmenbedingungen haben sich erschwert, Klimaerwärmung, längere Trockenphasen

Begehrlichkeiten Quellen, besser oder neu fassen, Wasser ableiten akzentuiert sich
Nährstoffverfrachtungen über die Luft
Intensivierung der LW, mehr Tiere, mehr Wasser, mehr Dünger
Druck auf den Boden ist grösser geworden (begrenzte Ressource)

- Was sind Erfolgsfaktoren / was braucht es für einen effektiven Schutz?

Biodiversität Strategie LU, Klimastrategie LU
Bedeutung der Moore klar dargelegt worden, Moore wichtig für CO2 Bindung wichtig, ist klar
In diese muss investiert werden, ÖI Diskussion hat viel gebracht, Niveau muss erhalten bleiben
Planungsbericht Bio, Klima und Energie

- Pufferzonen: wie setzt der Kanton Luzern diese um?

Intensiv damit auseinander gesetzt, Närstoff, hydor,
Nährstoff früh umgesetzt
So weit wie damals möglich
Lufteintrag: neue Dimension
Nähstoff mit Ausscheidung von Perimeter mitintegriert in Ausscheidung von Moorflächen

Heikles Feld, bei Gewässerraumausscheidung, wo auch Moorbiotope, dort nach Pufferzonenschlüssel, wenn Seeanliegen, Biotope, die Nährstoffsensitiv, riesen Probleme, Pufferzonenschlüssel, riesen Diskussionen, da grosse Pufferräume
Bei allen Moorbiotopen anwenden, dann nicht politisch getragen
Keine systematische Anwendung für die Ausscheidung von hydrologisch
Hydrologisch: nationale Vorschläge: sehr teuer, vereinfachte Modelle nutzen
Für systematische Anwendung fehlt Methodik die Umsetzbar, finanzierbar und in nützlicher Sicht realisierbar
Bund: zu detailliert, wissenschaftlich, nicht umsetzbar

- Wiedervernässung

Bereits vernässte Flächen, zunehmend schwierig so zu belassen, erst recht wenn Vernässung ausweiten, im Wald sehr viel einfacher, stellt man auch im Bieberschutz fest
Landwert (Wald vs. Offenland, verbunden mit Subventionen)
Äusserst schwierig, möglich bei Kleinstflächen, FFF, Suche nach solchen Flächen unglaublich schwierig
Richtige Vernässung schliesst Nutzung aus, Beitragszahlungen mit Nutzung verbunden, Wegfall von LW Direktzahlungen
Chance nur wenn als Kanton, in Eigentum nehmen
Eigentümer nicht immer bereit die Fläche zu verkaufen, viele Zusammenhänge, wollen nicht Fläche verlieren
Erwerb Landeigentum sehr teuer
Enteignung wäre gesetzlich möglich aber keine Tradition und politisch schwierig
Andere finanzielle Subventionen, sehr viel teurer und aufwändiger (Abhängigkeit), Übervorteilung der Eigentümerschaft?, dann kaum zu rechtfertigen, kein haushälterischer Umgang mit öffentlichen Geldern

Moorschutz: beste Lösung, Flächen in Staatseigentum, sofern nicht in bestehender Abgeltungsmodalität lösbar für nötige Sicherungsmassnahmen der Biotope nationaler Bedeutung

Subventionen: eigene Thematik

- Öffentlich ersichtlich wer für welche Moorfläche verantwortlich?

Parzelle, wer Bewirtschafter kann man herausfinden, nicht im Geoportal, Gemeinde nachfragen

Appendix H: Interview mit Bastien Amez-Droz – 17. Mai 2023

Verschiedene Kantone

- Beispiele schlechter Umsetzung/ guter Umsetzung

Balmoos: Nachbar will nicht Regeneration, Pufferzone (Teil des Inventares, wurde illegal drainiert), immer noch im Boden, Extensivwiese, ein Teil Intensiv, BFF
Einzugsgebiet mit kleinem Einzugsgebiet, viel Niederschlag, Einzugsgebiet: Intensiv, im Moor Brennnesselfläche: Nährstoffe
Mehr Wasser von Quelle, Drainage ins Moor (mit schlechter Qualität), Pufferzonen die drainiert sind, Sperren (warten bis Wasser nicht belastet), Eigentümer möchte nicht aber auch Nährstoffreiches Wasser, Quellrecht, nur Massnahme am Weg umsetzbar, Ideen der Massnahmen sind da, aber Kanton muss Pufferzonen umsetzen (Nährstoffpuffer stimmt nicht, da Drainagen) hydrologische und Nährstoffpuffer verbunden
Grundeigentümer (Pro Natura), Moor geht nicht gut
Kaufen und Nutzungsrecht
Bedürfnisse der LW viel höher als Naturschutz, politisch
Bereits einmal Baugesuch aber LW hat doch nicht unterzeichnet
Hat Weg gebaut um Holz zu holen, schon teilweise im Inventar (illegal)
Bestehender Weg, der durch LW breiter gemacht wird, auch Graben
Wanderweg hätte umgeleitet werden aber kleine Strasse (100m), Interessen Tourismusamt, andere Interessen werden höher gewichtet
Politisch
Kleine Fläche nicht Puffer, macht keinen Sinn
Zu hohe Wasserschwankungen
Klimawandel: mehr Trockenheit, neuer Komponente -> Flächen die jetzt sterben
Sehr kompakt und geringe Durchlässigkeit, braucht lange bis wieder nass, kann Wasser nicht so schnell aufnehmen
Zu wenig Leute die beim Kanton für die Umsetzung zuständig sind, dann Dinge machen die einfach / auf wenig oder kein Widerstand stossen
Viele seltene Arten in diesem Moor
Gräben, die illegal sind
Anzeige möglich aber nicht zweckfördernd

Les Mosses de la Rogivue (Studie marais)
Auch PN Fläche
Pufferzone nicht überall umgesetzt, umgeben von drainierter Intensiv LW
Kanton VD und FR
Einzugsgebiet FR
Francesca Cieda (FR)
Verschmutzungspeaks
Werte von Bach genommen um zu bewerten

Viele Daten
Drainagensystem der Strasse in andere Drainagen geleitet
Drainage sollten geschlossen
Sind diese Pufferzonen wirklich wirksam?
Peter Staubli (Juni in Pension)
Monitoring: Nährstoffpufferzonen wirksam? Schlüssel alt
Probleme von Drainagen nicht berücksichtigt
Rene Amstutz (PN) -> Daten

aber Weg förderlich für Hydrologie, wie Barrage (Stauung)
Geodienste.ch und importieren in geo admin
Geoportal Kanton
Einige Interviews: WSL, Bauern, LU, UNESCO Biosphäre Entlebuch
Weitere wichtige Stakeholder? BAFU, Ökobüros

Wichtige Themenschwerpunkte

- Pufferzonen
- Bereitschaft der Grundeigentümerschaft
- Bewirtschaftung
-

- Bund könnte Massnahmen ergreifen, warum tut er das nicht?

BAFU selber Prio, bis zu ¾ Beiträge finanziell, politisch schwierig, Direktorin BAFU möchte Konflikte vermeiden, wertvollste TWW, altes Bahnareal (TWW wertvollste), grosses Projekt, grosser Teil soll überbauen werden, Schneeberger hat bewilligt nachdem BAFU mehr als 10 Jahre gekämpft
Wie mehr wirken damit etwas passiert?
Beck und Staubli (Beratung, Zug / Ägeri)
Zu wenig Ressourcen, niemand der umsetzt

Wieviele Moore gehören Pro Natura? Manchmal Moore, manchmal Teile; 66 (1/4 oder mehr der Fläche), ca. 10% Hochmoorflächen

Pufferzonen: Wo festgehalten? Wie festgelegt?
Kantonaler Nutzungsplan (NE)
Kantonal unterschiedlich
Kanton FR: Methode um Pufferzonen automatisch berechnen (Nicolas Fasel)
Kanton willig für Verbesserung aber politisch nicht so einfach

Wenn Landabtausch möglich, hängt sehr von Personen ab
Nichts verlieren, überall so intensiv wie möglich

Bespiel: Doline (Pufferzone)
LW wollte nicht Puffer, dann von Wasser getrennt, Graben (Hochmoor SO, selten im Mittelland), wollte kein Konflikt

Kanton Bern: alle Flachmoore: Modellierung -> wo besser nachschauen / wo lohnt es sich zu prüfen

PN macht Arbeit des Kantons, Rothenthurm hat Kanton noch nie selber umgesetzt
Sollte durch Kanton finanziert werden

Appendix I: Interview mit Philippe Grosvernier – 02. Juli 2023

- Pufferzonen: espace.marais, LIN'eco wichtige Rolle im Projekt

Feuchtgebiete aber Wasserzufuhr fehlt, Pufferzone nur für Nährstoffe umgesetzt, hydrologisch kein Thema, Bundesgerichtsentscheid: klare Definition der Pufferzone
Für Moore wichtig, dass Wasserversorgung und nicht entwässert
Zusammen mit BAFU überlegt, deshalb etwas ähnliches wie bereits beim Gewässerraum, Moor braucht auch Raum / Einzugsgebiet
BAFU Klimawandel Pilotprojekt, Wettbewerb, LIN'eco hat Gelegenheit gefasst
Zusammen mit Centre Hydrologie, WSL
Messungen, Plausibilisierung
-> Pilotprojekt, siehe Webseite
Kanton Bern, für alle Moore gemacht, mit GIS, Vorsorgeperimeter, wenn immer ins Feld, dann zu teuer und aufwändig
Danach spezifische umsetzen

- Können bereits Erfolge von espace.marais festgestellt werden? Wie weit ist die Umsetzung?

Ganz frisch, überall etwas Pilotprojekt, jeder Kanton individuell
Pilotprojekt, 16 Kantone dabei, grosses Interesse
VD: Valais de Joux, alle besucht und hydrologische Puffer ausgeschieden, und in die Raumplanung/ Nutzungsplan eingeflossen, mehr oder weniger, Raumplaner hat so viel möglich abgeschwächt
Grosser Widerstand, neu und zum Teil grosse Gebiete
Rothenturm aktiv daran die Abgrenzung, grosse Arbeit in Kommunikation, erklären, muss aufpassen aber darf Sachen machen, kein totales Verbot

-> wie konkret
Konkrete Umsetzung hat noch nicht stattgefunden
Umleitungen, dann fehlt Wasser im Moor
Umsetzung wäre Wasser wieder ins Moor zu leiten
Drainage rund um das Moor Intensiv LW, direkt ins Moor, Wasser fliesst in Moor etwas zu schnell und zu punktuell aber Qualität des Wassers nicht genügend
Entweder Drainage behalten und Nährstoffpuffer auf Drainierte Fläche, oder Drainage brechen auf Distanz von 30-40 m und dann Nährstoffpuffer, und diffuser Wasserfluss
Bei Ausscheidung der Puffer, dann Möglichkeit zu diskutieren

Weg Kanton Bern, Ebene Kommunikation überlegen, dass keine Blockade, Diskutieren und Lösungen finden zusammen, Dialog, LW will entwässern und sollte aber einen Teil wieder vernässt werden, andere Bewirtschaftungsart, die trotzdem ökonomisch
Suche nach Alternativbewirtschaftungen, Paludikultur, Nasskulturen, Nasswiesen
Deutschland bereits fortgeschritten, CH: Überlegungen in Gang

Pilotprojekt A2.1 (Aktionsplan Biodiversität des Bundes): «Eindämmung des Klimawandels - Nachhaltige Nutzungen helfen den Schweizer Mooren»: Berechnen alle Vorsorgeperimeter für alle Objekte, dann 50 Objekte bis zur Ausscheidung der Pufferzonen, Entwicklung von möglichen Lösungen auch ökonomisch
Solche Überlegungen, gemeinsamer Dialog

- Was ist das grundsätzliche Feedback ?
Sehr divers, aber grundsätzlich sehr positiv, grosses Interesse, bereits sehr einfach verglichen zu anderen Ländern, ZH SZ; VD; NE; BE packen an und gehen vorwärts; nicht so kompliziert

Les Mosses de la Rogivue

- Eines der Hauptbeispiele von espace.marais?
VD hat viel finanziell beigetragen, gutes Beispiel um alle Probleme darzustellen
Fast jedes Moor ein Einzelfall, kein Allgemeinrezept, Bauer kennt sein Land, muss plausibel sein, sicher sein, dass Fakten stimmen, Zein nehmen Objekt zu verstehen

- Inwiefern bringt espace.marais die Umsetzung der Pufferzonen voran? Wie sieht die Umsetzung der Pufferzone in les Mosses de la Rogivue aus?
Entweder riesige Nährstoffpufferzonen und Drainagen behalten oder kleine Nährstoffpufferzonen und Drainagen ändern, Kanton hat regelmässig, Wasserqualitätsmessungen vorgenommen, damit Fakten, da Bauern sagen, bringen nicht so viel Nährstoffe aus
Im Rahmen des Bundesprojekts wird LIN'eco das Moor weiter begleiten

Objekt an kantonaler Grenzen auch dies untersuchen
Mitarbeit und Wille beide Kantone sehr gut, hängt ab was für eine Lösung

- Was sind die Schwierigkeiten in der Umsetzung der Pufferzonen ?

Wird als kompliziert wahrgenommen, wenn erklärt dann geht

Flächen müssen vernässt werden, grosse Frage, was mit vernässten Flächen machen, Sachen versuchen
Meliorationsprojekt NE: Drainagen von organischen Böden, genau diese Frage, mit Bauer einmal Versuche machen, fängt jetzt an, solche Pilotprojekte braucht es
In 30 Jahren keine andere Wahl, dann kein Moorboden mehr, das was heute, geht langfristig nicht, 30-50 cm organischer Boden, 1-2 cm pro Jahr Abbau
Wenn weiter bewirtschaften und Boden behalten, dann muss vernässen

Mit Klimawandel, Pufferzonen noch Gras, da nässer, merken (LW), dass langsam ein Problem, dann bereiter mitzuwirken, nicht viel Auswahl / Lösungen aber muss gefunden werden
Produktives System, immer mehr und immer trockener

Wandel braucht Zeit aber muss jetzt beginnen
Wollen nicht glauben aber wissen schon (LW)
Aber politischer Ebene muss auch etwas passieren, damit Ausweichslösung, Unterstützung
-> grosse Schwierigkeit, alle gemeinsam, LW-Schulen, Zeit Gelegenheit zu fassen

- Was sind Erfolgsfaktoren ? Was muss passieren, dass die Umsetzung des Moorschutzes effektiver wird?
Gemeinsam Lösungen finden, nicht Silo-denken, Dialog, mehr Wissen, Erfahrung, Pilotprojekte, Versuche, was funktioniert, was nicht
Zusammen mit LW, mit Politik
Vorgehen von Kanton Bern sehr exemplarisch, auch Kommunikation, berührt viele Gebiete
Eine Art Businessplan, Deutschland verschiedene Versuche mit Nassboden aber kein Markt dafür
Bsp. Schilf, wie wachsen lassen, was damit machen, Industrie aufstellen, Material umwandeln in Isolation, Markt entwickeln, Kunden müssen kaufen und glauben dass gutes Material
Alle Aspekte parallel entwickeln

➔ Bodenstrategie Schweiz: Bundesrat 2020, sehr starke Aussagen, Synthese von NFP (nationales Forschungsprogramm) Projekt: Bodenuntersuchungen, 30 Jahre, Synthesebericht

Appendix J: Interview mit René Amstutz – 05. Juni 2023

- Durch wen wird das Land verpachtet? Pro Natura?

Eigentümer 2 Parzellen Kanton VD, Pachtverträge, wenn unsere Parzellen (PN)
Ansonsten LN Verträge, BFF
Gewisse Bestimmungen drin, Streuwiesen, extensive Wiese (im Pachtvertrag mit PN)
BFF zusätzlich
FR, zusätzlich LN für kleine Fläche zusätzlich gedeckt
Geportal: FR auch schauen welche LN Verträge, Stand 2021 immernoch aktuell
LN-Verträge für Puffer, nicht alle LW willig aber auch nicht überall fliesst ins Moor
Regierungsbeschluss VD; drumherum Puffer
Kleine Ecke nördlich, dort auch Pachtverträge, extensive Wiesen
Östlich der Strasse nicht PN, Keine LN Verträge
Nur Nährstoffpufferzone umgesetzt
Biologische noch gar nicht umgesetzt, abhängig der Arten die vorkommen, noch kein Vorgehen entwickelt (schweizweit)
Ganze LW-Fläche ist drainiert und fliesst unter dem Moor durch und fliesst in den Bach, fliess immer noch Wasser ins Moor, mehrere Untersuchung zur Wasserqualität die unbefriedigend sind (Studie, nicht Resultat), Versprochen keine Einschränkungen, solange nicht bewiesen, dass Qualität schlecht, Intensive Flächen mit Milchproduktion (Mündliche Abmachung und Bauern beharren darauf)
Neuer Auftrag durch FR, Jahr lange Studie der Drainagen (wöchentlich), jetzt abgeschlossen, nächstens Resultate der Studie
Jaques Frioud (FR)
Aline Gatouillat (VD)

- Seit wann gibt es die commission de gestion? Gibt es das häufig für Moorobjekte? -> was genau die Funktion?

  Schon länger, mind seit Schutz Beschluss VD (ungefähr 99), 1-2 mal pro Jahr
  Schutzgebietsbetreuer: Freiwillig, leitet
  Wird sehr geschätzt und gute Zusammenarbeit, offene Kommunikation, Schutzkonzept sehr hilfreich, langer Prozess bis bewilligt, Basis, viel gebracht
  Gute Zusammenarbeit, VD: überall Freiwillige, komplexe Objekte dann immer Kommissionen, sehr bewährt

Mehrere aber eher nicht Mehrheit
Bewährt sich, keine Streitereien, Missverständnisse
Immer Eigentümer und Behörden involvieren, dann sowieso zusammenkommen und sich einigen

- Wozu gibt es Gullies im Moor? Wieso war es ein Problem, dass die Gullies verstopft waren und der Wasserpegel erhöht? Ist das nur ein Problem für die anschliessenden Landwirtschaftsflächen oder auch für das Moor selber?

Aus Bewirtschaftungszeit, verschieden Gründe, dass nicht zugemacht, hatten keinen Nutzen mehr

Wasserleitung durch das Moor, Wasserstand erhöht, Regulierungssystem, vor 10 Jahren Biber ins Gebiet, Wasserstand erhöht, Pufferzonen wurden überschwemmt, Schwierigkeiten bei Bewirtschaftung und grosse Schwankungen (auch Moor nicht vorteilhaft, wenn grosse Schwankungen)
Regulierungssystem wurde erneuert, maximum damit LW auch zufrieden, maximum wird nicht mehr überschritten, bis zu gewissem Niveau, danach fliesst weg
Viel Wasser vorhanden, eher Qualität
Kompromiss, könnte weiter aber LW Land überfluten, wäre politisch nicht umsetzbar, vielleicht in ein paar Jahren, bereits höher als früher, wieder vernässter, positive Entwicklung
ehemalige Deponie im Moor,
Sektoren die zu hoch sind werden nicht vernässt, wenn nicht mehr Gebiete um das Moor herum vernässt
Drainagen FR ziemlich alt, Erneuerung wäre notwendig, muss sich gut überlegen, ob das darf
Müsste eigentlich eine Melioration geben, alle müssten einverstanden sein
Objekt aktuell genügen Wasser, gewissermassen positive Entwicklung, gewisse Teile immer noch zu trocken aber kann nichts gemacht werden, da LW Flächen nicht vernässt werden

- Aktueller Stand der Umsetzung der Pufferzonen. Wurde die Pufferzone durch Marc Piccand nun entsprechend umgesetzt? Sehe ich es richtig, dass erst die Nährstoffpufferzone umgesetzt wurde?

Fläche FR, um «Toast,» ganz klare Verträge aber nicht eingehalten, Kanton hat angezeigt und Busse, hat sich geregelt
Bewirtschaftet auch extensive Wiese im Moor und funktioniert gut

- Bereitet die Beteiligung von mehreren Kantonen Komplikationen?

Koordination notwendig aber gut

- Weshalb sind einige der prioritären Massnahmen nicht umgesetzt, während einige nicht prioritäre Massnahmen bereits umgesetzt wurden?

Grosser Massnahmenkatalog, nicht alles umsetzbar, Widerstand
Hydrologische, Bewirtschaftung und bis in die Siedlung, noch kein genauer Konsens, politisch nicht machbar, wenn neue Eingriffe, dann berücksichtigen aber nicht proaktiv, und Wille Seiten Kantone nicht da
Luxusproblem, da genügend Wasser, Vegetation zeigt auch keine Qualitätsprobleme an (Brennesseln)

Appendix K : Interview avec Nicolas Hausel – 08. Juin 2023

- Quels sont les principales difficultés dans l'implémentation de la protection des marais dans « les Mosses de la Rogivue » ?

La chance du site est qu'une grande partie a été acquis par ProNatura il y a plusieurs décennies. Une maitrise foncière est donc un atout pour la protection de ce site. Toutefois cette maitrise foncière s'arrête pratiquement aux limites de l'inventaire. Toute la question des zones tampons autour du site, de l'alimentation en eau en quantité et en qualité doit donc être traitée avec différents propriétaires privés et de nombreux exploitants agricoles et différents acteurs. La gestion ciblée du site semble maintenant bien adaptée et bien organisée. Les moyens financiers suffisants pour cet entretien et le suivi courant est à disposition.

- Coordination avec les nombreux propriétaires peut être compliqué : Autres difficultés ?

Protection forte, bien pris en mains, pas de conflits avec les propriétaires (PN), manière financiers

Difficultés autours du site avec certains agriculteurs

Pas trop de problème d'eutrophisation, en dehors on pourrais avoir une zone plus proche de la nature, prairie de meilleure qualité, participation active des agriculteurs, 1-2 pas très d'accord, difficile, pas une question financière mais de métier, élevage au vache, exploitation au maximum, avec finance aussi difficile

Problème pour zone tampon, inventaire appartiens à Pro Natura

Peut y avoirs problèmes de chemins (dans d'autre cas)

Très différent dans chaque cas, en fonction du propriétaire, la plupart du temps plusieurs propriétaires

---

- Que faut-il pour améliorer la mise en œuvre de la protection des marais ? Quels sont les priorités de la protection dans « les Mosses de la Rogivue » ?

- La garantie de l'alimentation en eau (quantité)
- Le maintien du niveau de l'eau (mise en place d'un système de régulation du niveau)

Élever le niveau d'eau = faisable ? system de drainages doit être rénové ?

Ouvrage récemment pour augmenter et stabiliser quelque peu l'endroit où l'eau s'accumule à la fin, niveau a été négociée

Au dehors de la décision sur le classement, Compromis pour éviter résistance

Idéalement un peu plus élevée, système de régulation -> plus stable

Aide à maintenir le niveau d'eau suffisamment élevé

- L'entretien ciblé des différents milieux naturels pour éviter l'embroussaillement (plan de gestion et contrats avec entreprises spécialisées et agriculteurs)
- La garantie de l'alimentation en eau (qualité)

Données sur la qualité ? Qu'est qui ce passe si la qualité n'est pas au niveau nécessaire ?

Les données sont disponibles, conductivité et nutriment, VD étude de synthèse (dans quelques semaines), comprendre si une influence sur le marais, comprendre les pics (d'où viennent-ils ?), minéralisation des sols

90% eau de fribourg, un paysan un peu difficile

données comme base de discussion, mieux cibler les difficultés

contraindre des modification de pratique

- La migration des batraciens (construction d'un crapauduc)
- Le suivi biologique des interventions pour l'adaptation des mesures (suivi des libellules, suivi des sphaignes, suivi de la flore, …)
- La gestion du public

Qu'est que ca inclus ?

- Quels sont les différences dans l'implémentation de la protection dans « les Mosses de la Rogivue » entre Fribourg et Vaud ?

  - La tourbière de la Rogivue est située à 95% dans le canton de Vaud. La protection légale du site a donc été faite par le canton de Vaud sous la forme d'une décision de classement (plan et règlement) et d'une affectation en zone de protection de la nature et du paysage 17 LAT
  - Les systèmes de contribution nature au paiement direct pour les agriculteurs sont de même type sur Vaud ou sur Fribourg. Cependant, le marais est situé dans le canton de vaud, mais l'essentiel du bassin versant alimentant le marais est situé sur le canton de Fribourg. La problématique de la gestion des zones tampons hydriques et trophiques et bien plus importante sur Fribourg

Ne fonctionne pas sans coordination?

Fonctionne très bien grâce à la commission de gestion, les deux y font partie,

parfois le département de l'agriculture ne veut pas la même chose que la protection de l'environnement

si contre l'agriculture, pas sûr que le département de l'agriculture soutienne le canton, collaboration pas toujours les mêmes intérêts

si la commission ne peut pas le régler, régler à un niveau plus supérieur

Arrangement entre les differents services

Normalement ca marche bien mais dans des cas extremes il peut y avour des problemes, comme si les agriculteures doivent changer leurs pratiques

essayer de négocier avec les agriculteurs, essayer de trouver une solution

contrainte directe n'est pas préférable, ça ne donne pas des bons résultats

essentiel pour la protection des marais, beaucoup plus cher si bureau écologique, inclure comme partenaire, plus de relations

mais légales et donnes comme base

- Quels sont les facteurs clés des réussites dans l'implémentation de la protection dans « les Mosses de la Rogivue » ?

    - La maitrise foncière
    - La protection légale
    - Le plan de gestion et la commission de gestion
    - Le contact avec les propriétaires, les exploitants, les communes

---

- Que pouvez-vous me dire sur l'implémentation des zones tampon ? Comment l'estimation de espace.marais a-t-elle été utile ? Comment vont les zones tampon hydrique et biologique être implémentées ? Quels sont les difficultés ?

    - Un gros travail de définition de la zone d'influence hydrique du marais avait déjà été effectuée dans le cadre du plan de gestion 2015-2025 avec par exemple un relevé des drains existants. Des analyses de la qualité de l'eau ont été menées. Cette proposition de zones tampons du plan de gestion ne se différencie pas vraiment de l'analyse Lineco d'espace marais lot 2.

Ne sera pas mis en œuvre, car influence si grande, plus de difficultés, pas de difficultés avec la quantité d'eau, zones biologiques peut-être à améliorer, peut-être problème de qualité

Trophiques, Peut-être dans le prochain plan et avec des études comme base

Trophique et bio tout autour Agriculture mais hydrique beaucoup plus large, beaucoup plus d'influence aussi sur la population, les service de l'eau -> difficile

Wird sich treffen diesen sommer, ab 2025 wieder planen

- Les espaces nécessaires pour installer les zones tampons sont essentiellement situés sur des terrains privés et exploités par l'agriculture. Les conventions sont des contrats de droits privé qui doivent se négocier au cas par cas avec chaque agriculteur. Une collaboration active doit donc être mise en place entre les exploitants et les services de l'agriculture et de protection de la nature pour l'acceptation de ces conventions.

Comment fonctionne la coordination avec les services de l'agriculture ? Divergences / difficultés ?

- Malgré les analyses entreprises, il reste difficile de définir exactement quelle est la part de l'agriculture ou de la minéralisation des sols dans l'eutrophisation du marais. Une synthèse par un bureau spécialisé des analyses d'eau réalisées ces dernières années a été demandée et pourra peut-être aider à répondre à cette question

---

- Est-ce qu' il y a déjà une barrière à batraciens fixe ?
  - Oui un crapauduc de 250m de long a été construit il y a moins de 5 ans. Le suivi de la migration montre l'effet positif sur les populations de batraciens

Collaboration avec service qui s'occupe des routes

Appendix L: Interview mit Kaspar Zirfass – 13. Juni 2023

- Deutschschweiz: Verschiedene Ansätze für Moorregenerationen. Was ist Ihr Ansatz?

Abklärung: wieviel Wasser und Herkunft und Qualität
Bei Wasserqualität: Nährstoffe, Kalkreich (nicht gut)
Dann entscheiden was damit machen
Was für eine Situation
Wasser kann gelenkt werden, zurückbehalten, trennen aber abhängig von Zielen und Gegebenheiten
Störungen grossflächig, wichtig wieder Wasser oder nur Qualität
Mit klimatischen Entwicklungen, dann schauen, dass Wasser auch wenn nicht Qualität
Zeit notwendig
Zustandbericht WSL: trockener und nährstoffreicher, hydrologische Defizite, Verschiebung Niederschlag

- Nur wenige Büros die umsetzen können: wie die Nachfrage? Mehr Ökobüros = Lösung?

Wenig Spezialisten, Nachfrage ist sehr hoch ununterbrochen, mehr Anfragen als Aufträge, Anfragen von weit her
«3 Spezialisten bei uns im Büro»
Müssen versuchen Leute zu finden, die bereits möglichst viel mitbringen und weiter spezialisieren, Wissen weitergeben aber sehr aufwändig für kleine Büros (2-3 Jahre), braucht viel von der bereits beanspruchten Kapazität
Vorbereitungskurse an Unis und Hochschulen, spezifische Ausbildungsmöglichkeiten, Ausbildungslast den Ökobüros abnehmen
ZB. Kanton Zürich viel Ressourcen
Sieht nur wo Ressourcen vorhanden (wo Aufträge reinkommen)

- Grössten Hürden in der Umsetzung des Moorschutzes?

Kantonal sehr unterschiedlich, politisch
Nur geschützte Moorfläche oder auch Puffer
Zürich grosser Effort für Nährstoffpuffer auszuscheiden und vertraglich absichern
Andere Kantone beliebig und zufällig, meisten wenn mehr als 10m schwierig umzusetzen
Amt zu wenig Rückhalt
Scheitert an Willen von Bewirtschaftern und Eigentümern
Wird sehr unterschiedlich gehandhabt
ZH wenn geschützt, dann setzt sich Kanton gegenüber Bewirtschafter durch
Andere Kantone, wenn Eigentümer dagegen wird nicht entgegengehalten

- Erfolgsfaktoren?

Vielschichtig, viel zusammenkommen
Technische Erfolgsfaktoren, Topographie etc., Gelände
Eigentümer mit gleichen Zielen (z.B. öffentliche Hand / Schutzorganisationen)

Objekt im Zielzustand für LW immer noch gleich viel Wert
Hochmoor nicht in Beiträgen
Flachmoor, wenn nicht Bewirtschaften, nicht in Bewerbsstruktur
Falsche Anreize
Gute Beispiele / Projekte, einfacher zu überzeugen / motivieren für Umsetzung

- Pufferzone? Wie in Projekte eingebunden?

Viele Kantone bemüht aber nicht viel mehr
Werden auch miteinbezogen, Einzugsgebiet wichtig für Regenration
Graben zu, dann auch Wasserhaushalt der Böden drumherum beeinflusst, Puffer kann gewisse Vernässung in Kauf nehmen, da nicht intensiv bewirtschaftet

«es mänschelet»

Juchmoos

- Was genau die Rolle von PlusPunkt? Noch immer involviert?

Technisch, Umsetzungsplanung

- UNESCO Listung förderlich?

Entebuch Personalwechel, dann Pluspunkt
Grossflächige Abklärungen nicht von PlusPunkt
Puffer kein Thema, da Einzugsgebiet extensiv genutzt
Hydrologisch mehrheitlich intakt

Romoos: Holzkorporation, Verhandlungen, bei anderen Projekten nein gesagt und jetzt sollen wir Hand bieten (Sicht Romoos), 12 verschiedene Abteilungen bei Kanton, dann schwierig; mehrere Begehungen, Zeit nehmen, Goodwill schaffen

Ökonomischer Wert (Kosten Nutzen)
Nutzen schwierig zu monetarisieren
Bei möglichen Projekten: Gute Priorisierung notwendig (auch Fläche pro Franken)
Priorisierung der Umsetzung auch anhand von Kosten & Nutzen

Buy Out
Wird häufig gemacht, zumindest angeboten
Problem, Bauern geben nicht gerne Land her, emotionale Bindung

andere Private, haben Geld nicht notwendig, und man wird nicht «reich» vom Verkauf der Moor-/ Naturschutzflächen

➔ Finanzieller Anreiz zu tief

Wenn gelingt, dann sehr viel angenehmere Ausgangslage (buy out)

Landumlegungen: gute Chance

Appendix M: Interview mit Peter Staubli – 13. Juni 2023

9 Jahre bei BAFU, in 1,5 Monate nicht mehr
Beck und Staubli: Regenrationsprojekte, Zusammenarbeit mit LIN'eco
Rothenthurm Aktivist, Oberägeri gewohnt

- Wie erklären Sie sich, dass Anliegen des Moorschutzes politisch anderen Anliegen nachgestellt werden, obwohl dies rechtlich nicht so sein sollte? (besonders Landwirtschaft)

Moorschutz Verfassungsmässig geregelt, keine Interessensabwägung, Initianten haben Militär nicht getraut, deshalb keine Interessensabwägung, deswegen sehr scharf
4 Ausnahmen: LW, FW, Natur & Menschen; Moorlandschaften: sanfter Tourismus
Ausnahmemöglichkeiten, aber anderwärtig keine Interessensabwägung (Strom, Militär)
Rückwirkungsartikel (Rückbau), 5 Jahre Zeit bis zur Initiative

- Zu wenig Ressourcen, Personen die Moorregenerationen umsetzen können. Gibt es Bemühungen diesem Mangel entgegenzuwirken?

1987 Initiative, toller Nebeneffekt, indirekter Gegenvorschlag, Revision NHG, Biotope nicht nur Moore
In der Zeit, weiter Biotope kartiert, Moorschutzkredit, viele Stellen, später zurückgefahren, da Inventare vorhanden
Sieht momentan nicht nach Stellenschaffung aus seitens BAFU

NEU:
Ausbildung: CAS nächsten Mai etwa, mit Philippe Grosvernier: August Vorbereitung in Modulen
Momentaner Mangel
Leute haben gewissen Respekt, da komplexe Aufgabe
Viele, die in diesem Bereich tätig sind, sind etwas reingewachsen

Bern: Best Practice Projekt, Voralpen und Alpen, viele beeinträchtige Moore
Regional eingesetzte Fachleute, machen alle Themen, unterschiedliche Ansätze und Büros
Von Wyss und BAFU finanziert, 4 Expert:innen (NL; DE; FR; ..) beurteilen 8 Regenerationsprojekte
Kleiner Bericht und Tagung vorgestellt
Fachstelle Bern

- CO-2 Kompensation durch Moorregenerationen bisher nur auf dem freiwilligen Kohlenstoffmarkt möglich. Wieso nicht im Schweizer Emissionshandelsregister?

Max.moor: nicht viel Geld, kleine Gebiete (hohe Kosten aber nicht riesige Einsparung)
Geld nicht ein Problem, myclimate
Zu kleine Verhältnisse
Zu kleiner Hebel
LW-Torfböden grösserer Hebel

- Der Schlüssel zur Ausgrenzung der Nährstoffpufferzonen stammt aus 1997. Ist eine Aktualisierung vorgesehen und gibt es eine Evaluierung bzw. ein Monitoring zur Wirksamkeit dieser?

Pufferzonenschlüssel, Rechtsicherheit, wird nicht geändert
Hydrologische Vorsorgeperimeter (mit Hinweischarakter sind in Bearbeitung); hydrologische Pufferzonen sind je nach Kanton in Bearbeitung

- Gibt es Bemühungen eine Methode zur Ausscheidung der biologischen Pufferzone zu entwickeln? (wie es bereits für die Nährstoff und hydrologische Pufferzone existiert)

Störungspuffer
Mehrere Gutachten auf Kantonsstufe
Verschiedene Ansätze: Störung als Ausgangspunkt, andere vom Organismus

- Art 18a NHG: Ordnet ein Kanton die Schutzmassnahmen trotz Mahnung nicht rechtzeitig an, so kann das Eidgenössische Departement für Umwelt, Verkehr, Energie und Kommunikation die nötigen Massnahmen treffen und dem Kanton einen angemessenen Teil der Kosten auferlegen. Bund könnte Massnahmen ergreifen, warum tut er das nicht?

Nach Initiative nicht sofort Wirkung, Feuchtgebiets-Kartierungen verglichen mit aktuellen Kartierungen und Resultate politisch eingespeist, Motion (1989), BR: Zustand nicht gut, wenn Kantone nicht, dann Bund, dringliche Massnahmen
Warnschuss von Parlament und BR, dann gewisse Kantone los; aber Kantone Widerstand gegen Bund der eingreift
Grosser Widerstand der Kantone, Kantone haben eigentlich Mittel
Bund hat wenig Sanktionsmittel
Versuchen Verhandlungsmässig
Viele positive Entwicklungen
Reguläre Verfahren, sind häufiger (Schutz der Moore geht vor), illegale viel schwieriger, auch nicht überall Kenntnis
Nicht gut im Vollzug, Stand der Umsetzung

- Ökonomischer Wert (Kosten Nutzen Analyse)

Nein, wenn Projekt machbar, dann wird gemacht
Hochmoorregenration: häufig keine LN, Bauern schneller bereit, an Regenrationen mitzumachen
Flachmoore meistens LN, dann Gelder
LN bestimmt/schreibt Dünge- und Milchmenge vor

Alle wollen Land
Sehr föderalistisch
Beispiel: Korporationen haben viel macht
Gemeinden vs Kantone stark
Bspw. SG: kantonales Beugesetz: Naturschutz ist Sache der Gemeinden

Appendix N : Interview avec Jacques Frioud – 14. Juin 2023

- Quels sont les principales difficultés dans l'implémentation de la protection des marais dans « les Mosses de la Rogivue » ? Que faut-il pour améliorer la mise en œuvre de la protection des marais ?

- Agriculture intensive, région de production laitière, grosses exploitation, pas prêt à mettre beaucoup de surface
- Surfaces productive, dommage de les perdre
- Beaucoup de propriétaires privée
- Zones tampons

Divergences entre les services de l'agriculture et de protection de la nature ?

De moins en moins, évolution des services agricole meilleures prise en compte

Dans certains cantons, pas d'échange, bon échange à FR

- Cost – Benefit Analysis? analyse coûts-bénéfices? Implémentation des projets ?

Études avec espace marais, agridea (OFEV)
Très peu jusqu'à présent mais peu fructueux
Les avantages sont bien supérieurs aux coûts
Les agriculteurs veulent des zones de production, sans restrictions
Question sociologique, positions immuables, ils ont investi dans des étables, se sont spécialisés et veulent produire, remet en cause leur modèle économique, similaire dans 5-10 ans
Biotope plus clairs, zone tampon plus difficile à justifier
Mise en œuvre au niveau de l'aménagement du territoire
Rogivue, pas de négociation possible, contrainte

- Une des difficultés peut être si le ou la propriétaire n'a pas les mêmes intérêts. Est-ce que vous achetez aussi du terrain ? Quels sont les difficultés ?

Commencé a poser ses questions, agriculture autre part a proposé échange de terres

Agriculteurs ne veulent pas perdre des terres, peut être échanges,

Beaucoup d'échanges sans implication cantonale

Très difficile, ne veulent pas perdre de terres, l'échange serait préférable mais il n'y a pas de terres disponibles

Un exploitant agricole a acheté cette parcelle, puis le canton a indiqué qu'il devait être utilisé de manière extensive, très difficile, car il n'aurait pas acheté dans ce cas, mais le canton n'était pas au courant de la vente

Autorités foncière (Behörde für Grundstückverkehr) cantonale qui gère mais ne vont pas venir vers eux, validation seulement si négociations déjà en cours

- Quels sont les facteurs de succès et difficultés dans la coopération avec les paysans ?

Globalement bon, communication, raisons, objectifs de protection, espèces, voient également leur intérêt

Zones tampons, terres productives, réticence à l'extensification, problématique si propriété privée

Mosses de la Rogivue, très proche de l'exploitation (ferme), donc utilisation souhaitée
Commission : très difficile avec les agriculteurs, peu constructifs mais toujours importants car informés

- Que pouvez-vous me dire sur l'implémentation des zones tampon ? Comment l'estimation de espace.marais a-t-elle été utile ? Comment vont les zones tampon hydrique et biologique être implémentées ? Quels sont les difficultés ?

Focus sur les nutriments jusqu'à présent, déjà difficile
Clé mis en place
Actuellement 5-6 mètres par endroit, et 15 m à d'autres endroits, en fonction du bon vouloir des exploitants
Surfaces drainées, affectent également le marais
sol organique / minéraux
Pas de cartographie
"Politique du salami" : perception des agriculteurs

Études sur la qualité de l'eau
Sur cette base, d'autres mesures, base de négociation
Problème majeur, modifications des drainages et nettoyage de l'eau
Quelles surfaces pour la protection de la nature

Drainages
Pas d'accord des propriétaires,
si réparation des drainages, d'après la loi pareil que, nouveaux drainages
Contrats de protection de la nature (LPN), pas de renouvellement sans autorisation
Ne pas renouveler les drainages, grand projet, avant drainer autant que possible
Cartographie nécessaire et conversion en zone de protection de la nature

Quelle utilisation,
forte production laitière, difficile de parler d'autres cultures

- Implémentation peut-être seulement si imposée via le plan d’aménagement local

Appendix O: Interview mit Pius Thalmann – 26. Juni 2023

- Wie setzt sich die Korporation Romoos zusammen? Welche Interessen vertritt sie?

VR von 3 Personen
Korporationsgebiet
Alte Geschlechter die in Romoos gewohnt haben
Korporationsrat kann bestimmen, an Versammlung informiert

- Fläche? Grossteil des Inventars?

Gesamtfläche

- Wie läuft die Zusammenarbeit / der Austausch mit der UNESCO Biosphäre, Bauern und den kantonalen Behörden?

Letze Renaturierung
LAWA hauptsächlich Kontakt,
vom Kanton auf uns zu und Projekt vorgestellt, Problem erläutert
Bewirtschafter miteinbezogen
Gut funktioniert
Messsonden installiert, Wasserpegel (UNESCO)
Flächen extensiv und Streuwiese oberhalb, ihr Land nicht nässer werden

- Wie läuft die Umsetzung der Regenerationsmassnahmen? Genügend miteinbezogen?

Diesen Herbst, Seitengraben

Gut miteinbezogen und immer informiert

- Regenerationsmassnahmen bereits vor 10-15 Jahren geplant aber doch nicht, was Grund?

Vorgänger Bedenken, nicht so offen, Fläche zu sehr vernässt, Schäden, die niemand bezahlen, Durchfahrt

- Wie Moorschutz verbessern?

Sehr gut gemacht, gute Sache, bringt etwas
Miteinbeziehen von Grundeigentümerschaft und auch vor Ort Anschauung und erklären und Umsetzung zeigen

- Landkauf angeboten / denkbar?

Nicht im Interesse, langjähriger Besitz, finanziell der Bessere, hochwertig Moorfläche, gewisser Stolz

- Kontakt LW?

Einer der wollte sich etwas quer stellen, geben und nehmen
Verpachtete Mährechte, an LW in der Gemeinde Hasle

Appendix P: Schriftliches Interview mit Christina Jany – 10. Juli 2023

Die folgenden Fragen beziehen sich auf die Moorrenaturierung in der Schweiz

- Wie viele Moorrenaturierungsprogramme betreiben myclimate aktuell?

Es handelt sich um ein Programm in dem 8 Projekte bisher enthalten sind. Ein weiteres Projekt wird sehr wahrscheinlich noch dieses Jahr hinzukommen.

- Wie verhält sich die Nachfrage (Moorrenaturierungen zu finanzieren)? Kann myclimate (myc) dieser nachkommen? Falls nein, warum nicht?

Der Wunsch bei Unternehmen und Privatpersonen regionalen Klimaschutz vor allem auch mit naturbasierten Lösungen (Moorrenaturierungen, Waldumbau, naturnahe Landwirtschaft, etc.) zu unterstützen, nimmt immer weiter zu. Mit dem neuen Climate Impact Label von myc wird die Umsetzung von Klimaschutzprojekten in der DACH Region (Deutschland, Österreich, Schweiz) und somit auch von Moorprojekten einfacher. Den Unternehmenskunden ist klar, dass ein Beitrag keine Kompensation der eigenen Emissionen sondern ein allgemeiner Beitrag zum Klima- und Naturschutz bedeutet. Der Bedarf auf der Unternehmensseite regionale, naturbasierte Klimaschutzprojekte zu unterstützen, ist groß, aktuell stehen Angebot und Nachfrage aber bei uns im großen Ganzen in einem ausgeglichenen Maße. Wir können aber aktuell auch noch weitere Moorprojekte zur Finanzierung aufnehmen.

- Gibt es viele Kantone und Gemeinden, die sich für das Programm anmelden? Sucht myclimate auch aktiv nach Moorobjekten?

Derzeit gibt es Projekte in 6 Kantonen, mit denen wir zusammenarbeiten. Die Kantone wissen um unser Förderprogramme und können über unsere Internetseite Anträge für eine Förderung stellen. Das sind dann Projekte für die bereits Rahmenbedingungen existieren. Aber auch eine komplette Neuentwicklung von Moorprojekten in der DACH Region schließen wir zukünftig nicht aus. Im April haben wir ein neues Team zusammen gestellt, um naturbasierte Klimaschutzprojekte in Zukunft noch stärker zu unterstützen und zu entwickeln.

- Inwiefern war die Entwicklung des Standards max.moor hilfreich?

Der max.moor Standard hat die Finanzierung über den freiwilligen CO2 ZertifikateMarkt deutlich erleichtert. So werden die Berechnungen für die CO2 Senkenleistungen standardisiert und von unabhängigen Dritten verifiziert.

- Mit wem arbeitet myclimate für die Umsetzung der Moorrenaturierungen zusammen und wie läuft dies in der Regel ab? Wer ist für die Umsetzung verantwortlich?

Die Umsetzungspartner sind die entsprechenden Behörden auf Kanton- und Kommunalebene sowie Ingenieurbüros und spezialisierte Bauunternehmen. Wir prüfen vorab, ob die Projektkonzepte plausibel sind und die Faktoren vor allem der Zusätzlichkeit und der Permanenz bei den Projekten berücksichtigt werden. Die Verantwortung für die Umsetzung (Planung und Baumaßnahmen sowie das Monitoring) liegt bei den Projektpartnern.

- Wie gestaltet sich die Finanzierung dieser Projekte? Wie gross ist der Anteil der über myclimate finanziert wird?

Die Kosten für Moorrenaturierungsmaßnahmen sind sehr hoch. Deshalb haben alle Projekte in der Schweiz eine gemischte Finanzierung. Ein Teil wird von den Gemeinden/Kantonen sowie ein weiterer vom Bund gestellt. Je nach Projekt kommt ein weiterer Teil von weiteren Projektpartnern wie Naturschutzorganisationen und dann zusätzlich noch unser Beitrag durch die Finanzierung mithilfe von CO2- Zertifikaten. myclimate übernimmt immer die jeweilige Finanzierungslücke, die sich in diesem Konstrukt ergibt. Die kann je nach Projekt sehr unterschiedlich ausfallen.

- Inwiefern ist die CO2-Kompensation hilfreich in der Umsetzung von Moorrenaturierungen?

Das Konzept der CO2 Zertifikate im freiwilligen Kompensationsmarkt ist ein Finanzierungsinstrument. Es dient der Unterstützung von Klimaschutzmaßnahmen, die ohne diese zusätzliche Finanzierungshilfe nicht stattfinden würden. Es hilft außerdem den Unternehmen einen gewissen «impact claim» zu quantifizieren und ist deshalb besonders bei Unternehmen mit Nachhaltigkeitsberichten beliebt, da es besser zu kommunizieren und der jeweilige Beitrag in eine Relation zu bringen ist.

- Welche Schwierigkeiten trefft Ihr in der Umsetzung von solchen Projekten an? Wie können diese behoben werden?

Der Planungsprozess von Moorrenaturierungsmaßnahmen kann zu Weilen sehr langwierig sein. Es gibt Fälle in denen Teile eines zu renaturierenden Moorgebietes der Kommune gehören und ein anderer Teil in Privateigentum ist. In solchen Fällen muss der Privateigentümer zunächst mit Geld oder aber einer anderen Fläche entschädigt werden, bevor die Maßnahmen durchgeführt werden können.

- Wird eingeschritten insofern die Renaturierung nicht die erhofften Resultate erzielt?

Beispielsweise wegen veränderten Niederschlagsverteilungen oder unentdeckten Drainagen. Für die Planung zur Renaturierung eines Moores werden Fachingenieure hinzugezogen und bisher gab es m.E. keinen Fall bei dem bspw. unentdeckte Drainagen vorgekommen wären. Es wird jedoch jährlich überprüft, ob die Entwicklung des Moores auch der Planung entspricht. Dazu gehört z.B. die Installation einer Wasserstandsregulation mit dessen Hilfe eine zu schnelle Wiedervernässung, die das Ökosystem überfordern würde, vorgebeugt wird. So wird ein Moor über mehrere Jahre Schritt für Schritt kontrolliert renaturiert. Sollten die Zielvorgaben nicht erreicht werden, so wird bei einem Projekt nachgebessert.

Declaration of consent

on the basis of Article 30 of the RSL Phil.-nat. 18

Name/First Name:

Registration Number:

Study program:

Bachelor ☐ Master ☐ Dissertation ☐

Title of the thesis:

Supervisor:

I declare herewith that this thesis is my own work and that I have not used any sources other than those stated. I have indicated the adoption of quotations as well as thoughts taken from other authors as such in the thesis. I am aware that the Senate pursuant to Article 36 paragraph 1 litera r of the University Act of 5 September, 1996 is authorized to revoke the title awarded on the basis of this thesis.
For the purposes of evaluation and verification of compliance with the declaration of originality and the regulations governing plagiarism, I hereby grant the University of Bern the right to process my personal data and to perform the acts of use this requires, in particular, to reproduce the written thesis and to store it permanently in a database, and to use said database, or to make said database available, to enable comparison with future theses submitted by others.

Place/Date

Signature