



LIFE Project Number
LIFE05 NAT/DK/000151

After LIFE Conservation Plan

As an output of the LIFE-ASPEA-project a management strategy plan for the future conservation of *Euphydryas aurinia* (Marsh Fritillary) shall be generated. It is based on the experience and knowledge collected in the LIFE-ASPEA-project. It contains an updated status on the *Euphydryas aurinia* in Denmark, an evaluation of their habitats and recommendations to future management and activities.

The LIFE-ASPEA-project was highly successful in terms of actual management improvement, discovery of new *Euphydryas aurinia* population and not least in creating a large awareness and interest for *Euphydryas aurinia* conservation amongst landowners and the public in general. The re-establishment and continuation of management has resulted in an over-all improvement of the butterfly's conservation status.

Status

Euphydryas aurinia has specific demands to its habitat. *Succisa pratensis* is a very important as forage plant for *Euphydryas aurinia* larvae. Direct sunlight, shelter from wind and weather and rejuvenation of *Succisa pratensis* populations are also requisite. The typical habitat of *Euphydryas aurinia* is an open, management dependent site on nutrient poor soils. Maintenance such as clearing of scrub, harvesting of hay and grazing to control the succession is necessary for the survival of the butterfly.

Euphydryas aurinia needs

- Moist or transition zone between moist and dry and vegetation to a height of 5-25cm or with space openings.
- Diverse vegetation with a large and stable population of *Succisa pratensis*.
- High density of flowering nectar plants
- Many closely connected suitable habitats without barriers.

Euphydryas aurinia has been declining in Denmark and the surrounding EC Member States. Since the end of the 1980'es the species has only been found in the northern part of Denmark, and in 2008 only registered on the locations mentioned below.

Table 1. Locations where *Euphydryas aurinia* has been observed in 2008 or are part of the LIFE-ASPEA-project.

Location	Area in hectares	Observations of larval webs in 2008	Comments
FX115			
Kærsgård Strand, Vandplasken and Liver Å		0	LIFE-ASPEA-project-area, but no larval webs or imago have been detected since 1992. The field survey performed for this project did not record the species. It is therefore believed to be locally extinct.
FX120			
Store Vildmose		0	LIFE-ASPEA-project-area, but no larval webs or imago detected since 1990 or 1991. After the surveys in the early nineties the monitoring of <i>Euphydryas aurinia</i> was discontinued for a period of years. Neither larval webs nor the butterfly were found in connection with the monitoring of the LIFE-ASPEA-project.
FX123			
Skrædderengen		0	LIFE-ASPEA-project-area, but no larval webs or imago detected since 2000. In 2000 27 larval webs was recorded.
FX127			
Himmerlandske Heder	46	67	
○ Lundby hede			The population has been triplet on Lundby hede from 2007 to 2008, probably because of the selective harvest of hay.
○ Brusådalen			Immigrated in 2006 and seem to be stabilized.

○ Oustrup Østhede			Immigrated in 2007 from Brusådalen and seem to be stabilized in 2008.
FX342			.
Napstjært Mose og Jerup Hede	50	262	Stabile population since 2007. In some areas new populations has been recorded and in other areas the population has vanished because of tall vegetation.
Napstjært enge mv.	17	223	A reduction in the grazing pressure from 2007 to 2008 resulted in a positive effect on the population on the grazed part, while the population decreased on the hay meadow probably due to too high vegetation.
Råbjerg Mose	15	94	
○ Blæsebjergvej			The population has been declining from 2006 because of overgrown.
○ Granly			In 2008 the population has been declining because of overgrown.
○ Store Rød			Observed first time in 2006 and seem to be stabilized.
Tolshave-, Råsig Mose	60	28	Observations have been made many places within the area from 2000 to 2008, and the population was stabile until 2007. There has been a decline in the population in 2008, probably because of overgrown.
Rendborg	20	28	Observed first time in 2005 and seem to be stabilized. The results of the monitoring are not exact.
Jennet Gunger	2	Not done	A few imago seen most years (also 2008), but only larval webs two years (not monitored 2008)
FX113			
Strandby	14	126	The population seems to be stabile, but the areas outside the fence are in risk of overgrown.
FX005			
Syd for Råbjerg Mile* (Lodskovvad, og Simon Skriveres Klit)	5	1	In 2005 3 larval webs were found, in 2008 1 larval web was found just out side the area
FX274			
Tranum skydeterræn*	125	#	An area of almost 5000 ha – consisting of many smaller habitats with an estimated distribution on 1-5% of the total area (including Tranum Klitplantage and Sandmosen outside the Natura2000 area. They are mentioned below).

Outside natura2000-areas			
Tranum Klitplantage*	#	Not done	East of FX274 3 to 4 (sub)populations were found in 2005 and 2006
Sandmosen*	#	Not done	South of FX274 In 2006 200 larval webs were recorded and in 2007 136 webs (no monitoring in 2008).
Hjeds Kær*	3	Not done	East of FX123. In 2000 49 larval webs were recorded, 109 in 2004 but only 1 larval web were found in 2006.
Aalbæk Klitplt.*	8	3	North of FX342 Registration in this area is new, 2008 is the first year of monitoring. The monitoring only covered a part of the potential habitat. More mapping of potential habitat and actual occurrence of the butterfly is necessary to give a complete picture of the site
Jerup Strand*	8	46	East of FX342 Observed first time in 2007

*Locations outside the LIFE-ASPEA-project areas.

The LIFE-ASPEA-project has focused on nine of the sites mentioned in table 1, where the number of larval webs has been monitored in the period from 2000 to 2008. The observation period is short and the methods within the period have been variable. The population of *Euphydryas aurinia* is known to undergo fluctuations. Accordingly, the observation period must be longer in order to show significant population trends. If one looks for trends in the eight-year observation period, the registration shows a stabilisation or minor increase in the population since 2000. However, *Euphydryas aurinia* is still endangered and threatened by extension.

All the locations where the *Euphydryas aurinia* was observed in 2008 are small and fragmented. Many of the habitats are threatened by change in management. When grazing or hay-cropping ceases natural succession takes over, the vegetation changes and the area will be overgrown. The populations of light demanding species like *Succisa pratensis* (Devil's bite Scabious) decrease and the life conditions for *Euphydryas aurinia* deteriorate.

As a part of the National monitoring scheme for the species listed in Appendix II in the Habitat Directive a survey of *Euphydryas aurinia* will continue every second year with monitoring of the population, condition of its life-space and national distribution.

Management objectives of the LIFE-ASPEA-project sites

Euphydryas aurinia is registered on the Danish red list as an endangered species and is also listed on appendix II in the Habitat directive and on appendix II on the Bern-convention.

Most of the existing and potential *Euphydryas aurinia* habitats are included in Natura 2000, Sites of Community Importance (DK00FX005, DK00FX113, DK00FX115, DK00FX120, DK00FX123, DK00FX127, DK00FX274, and DK00FX342) or they are protected by national legislation.

At the moment plans for all Natura2000 areas are being prepared. The purpose of the plans is to secure and re-establish habitats for rare or endangered species in the European Union. The master-plan obliges the Danish government and municipalities to extend and connect all habitats and potential habitats for *Euphydryas aurinia*:

“Suitable habitats for *Euphydryas aurinia* shall be secured through support of large and stable populations of *Succisa pratensis*. Operations, management and actions shall be made to create optimal conditions for *Euphydryas aurinia*, within and outside the Natura2000 areas. Corridors must be established wherever possible”.

The municipalities are by the Natura2000 plans obligated to make action plans that ensures fulfilment of the Natura2000 master-plan, and they are committed to manage their areas in a sustainable and optimal way with the objective to maintain and improve conditions for existing and potential habitats for *Euphydryas aurinia* inside and outside the Natura2000 areas.

The municipalities with habitats for *Euphydryas aurinia* are Vesthimmerland, Aalborg, Rebild, Frederikshavn and Jammerbugt. The municipalities are aware of their responsibilities and have made temporary operational plans for the management for the ASPEA areas

The management necessary to fulfil the maintenance and improvement of habitats can be funded in different ways. Most of *Euphydryas aurinia*-sites are included in Environmental Sensitive Areas, where the owners can be compensated for agreements on environmentally friendly agricultural practices. Agreements have been made for about 500 hectares and new contracts may be signed in 2009. If the areas are maintained by continuous grazing for a period of 5 years the owner receives 1400 DKK/hectare/year as subsidies. If the areas are kept by hay-cropping or by a combination of hay-cropping and grazing for a period of 5 years the landowner receives 800 DKK/hectare/year (2008 figures). These subsidies are vital for the motivation of landowners to carry out the necessary management in the future. LIFE-ASPEA-project has drawn attention to the existence of the subsidies for Environmental Sensitive Areas (ESA) and pointed out that they may contribute to a sustainable management economy.

The municipalities can pay for the operations through their public funding, but most of the habitats are located in private areas and operations have to be approved by the owner.

As an example, Frederikshavn municipality has entered contracts with the majority of the involved landowners to supplement individual and binding agreements within the ESA subsidy framework. Similarly, Vesthimmerland municipality has signed a contract with private landowners, concerning maintenance of the habitats by hay-cropping on 50 hectares in a period of 5 years from 2008 to 2013 and by burning 20 hectares in 2009. The municipality defrays the costs, and expects to spend 40,000 DKK in 2009 on mowing.

If the landowner does not approve of the operations and does not want the municipality to operate on their land, a public acquisition or a nature area protection with financial compensation is possible.

During the two year running of the LIFE-ASPEA-project focus on *Euphydryas aurinia* has led to the discovery of a number of new *Euphydryas aurinia* –sites (Tables 1 and 2). These sites should be drawn into the overall conservation strategy plan for *Euphydryas aurinia*. Some of the new sites are situated outside the Natura2000 areas. The sites should ideally be included in the natura2000 areas in order to secure the sites and their management.

Awareness rising amongst the involved landowners as well as the public general has been a substantial part of the LIFE-ASPEA-project. It is important for the success of the *Euphydryas aurinia* conservation work to engage the named groups in actively in the process. In particular meeting and excursions with direct contact between landowners, NGO's, the public general, politicians and administration officers have had a paramount effect on the awareness building. The project web-site, newsletter and pamphlets have been important for stimulating interest and driving partaking in the conservation work. Distribution of the LIFE layman's report will further engage stakeholders in the ongoing process for maintain habitats for *Euphydryas aurinia*.

Details for further actions to be carried out

Maintenance of suitable habitats is absolutely necessary to secure the survival and increase of the *Euphydryas aurinia* population. Population monitoring shows that extensive hay-cropping or grazing combined with clearing of scrub may accomplish this. Whereas the Environmental Sensitive Areas subsidies may contribute to a sound economy in the maintenance management of the habitats, they offer no subsidies for clearing of scrub. The LIFE-ASPEA-project has contributed economically to solve initial management involving scrub clearance. In the future a revised Agriculture Act will properly contain rules obliging landowners to clear scrub on agriculture areas.

Hay-cropping

Mowing at the end of June is optimal for most meadows. If vegetation height is about 25-30 cm *Euphydryas aurinia* larvae might live in the upper part of the vegetation and an early mowing might be detrimental to the management objectives and should be postponed till end of September. The cut must be made 10 cm above the ground and in a two to three year rotation, where only a part of the area is harvested each year. It must be done to secure the survival of eggs and larvae. The harvest must be performed by light cutting tools. The hay must be dried and collected. This may be difficult on moist areas, but collection optimises the conditions for stable populations of *Succisa pratensis*.

Grazing

Extensive grazing in the summer period with cattle or horses is optimal. Spatial variation in the height of the vegetation is important. The vegetation must be at least 8 cm high. Sheep are not suitable on *Euphydryas aurinia* habitats as they cause the population of *Succisa pratensis* to decrease. Too high grazing pressure is detrimental to the survival of *Euphydryas aurinia*, but too low grazing pressure will suppress the forage plants of the larvae.

Clearing

Clearing should take place from October to February and shelter must be maintained on the location to support survival of the larvae.

Re-establishment of habitats

If a habitat is totally deteriorated and has to be re-established a major operation is necessary. This can be in the form of clearing, re-establishment of wet and moist areas, reduction of nutrients etc. If such a major action must be taken, it must be stepwise, in order observe that the operations have the required effect and to adjust follow-up maintenance operations.

Re-introduction of *Euphydryas aurinia* populations

Re-introduction in habitats made suitable for *Euphydryas aurinia* might be considered to increase number of habitats and population stability. A genetic study of the existing populations (Sigaard 2006) concludes, as many individuals as possible (25) be introduced to suitable sites from areas with large populations. Furthermore, Sigaard recommends that re-introduction should be supplemented by individuals from other populations the following years until a stable population is established at the re-introduction site. Re-introduction should be made on sites that are similar to the donor-site. If the re-introduction is to succeed the recipient site must fulfil the habitat demands of *Euphydryas aurinia*, and the site must be large enough for the build-up of a meta-population. A feasibility-study on reintroduction conducted by ASPEA in FX115 and FX120 (Jensen 2007) concluded that the present status does not support a suitable habitat for *Euphydryas aurinia*.

References:

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Recommendations for the LIFE-ASPEA-project areas

Location	Present management state	Recommendation for future management
FX115		
Kærsgård Strand, Vandplasken and Liver Å	<p>A varied duneland landscape along the west coast of Jutland with many different habitat and sub-habitat types. The dunes are calcareous. The probably highest concentration of red listed species in Denmark is found within a large fenced area in the southern part of the site.</p> <p>The site was included in the Feasibility study on reintroduction of <i>Euphydryas aurinia</i> (Jensen 2007). Four potential sub areas have been examined as potential habitats of <i>Euphydryas aurinia</i>. The over all conclusions are, however, that only a small area is suitable.</p>	<p>Re-establishment of larger areas, which meet the habitat demands of <i>Euphydryas aurinia</i>. The re-establishment plan should in part be adjacent to existing suitable sites in part connect these. Management should include scrub clearance followed up by extensive grazing and hay-cropping.</p>
FX120		
Store Vildmose	<p>This site is part of an old raised bog. The bog is highly influenced by drainage and has degraded in most parts.</p> <p>The site was included in the Feasibility study on reintroduction of <i>Euphydryas aurinia</i> (Jensen 2007). Six potential sub areas have been examined. The over all conclusion is that there is no suitable habitats in the site.</p>	<p>Re-establishment of suitable habitats on large connected areas within the site. Management should include scrub clearance followed up by extensive grazing and hay-cropping, conditionally raising of water-tables.</p>
FX123		
Skrædderengen	<p>Largely abandoned, formerly grazed and hay cropped, and is thus dominated by willows, tall herbs and grasses.</p> <p>A minor part of the area was grazed in 2000, but of risk for overgrowing is eminent.</p>	<p>Re-institution of grazing and hay cropping management</p>
FX127		

Himmerlandske Heder: Lundby hede Brusådal Outtrup Østhede	A large hilly heathland area with a mixture moist and dry areas carrying mire, grassland and heathland vegetation Frequency of <i>Succisa pratensis</i> : Occasional to Frequent Large parts of the area is grazed, primarily with cattle, to a lesser extend with sheep. In periods in particular in dry years the grazing impact has been too high. Exclusion of livestock for shorter periods has been beneficiary for the <i>Succisa pratensis</i> as well as the <i>Euphydryas aurinia</i> -population. An accidental fire on a large heathland area a few years ago resulted in a significant increase of <i>Succisa pratensis</i> . A large part of the heathland is overgrown with woody species and the heathland vegetation is in poor condition. Smaller areas adjacent to <i>Succisa pratensis</i> stands have been mown since 2000, and the latest two years mowing has been extended to small mire areas. Tracks and pathways carry <i>Euphydryas aurinia</i> on Outtrup Hede, but need regular management	Extensive grazing, preferable with hardy cattle breeds Decrease of the stocking rate in periods of drought Periodic hay cutting on mires If possible strip or mosaic burning of a part of the heathland Management by cutting of track and pathway verges
FX342	The Habitat-area is 4,000 hectares in size. It consists of elevated sea floor. The top of the old drift lines (rimmer) is heathland dominated by various dwarf-shrubs, while the depressions (dobber) consist of poor fens, quaking bogs and ponds.	.
Napstjært Mose og Jerup Hede	Substantial clearance of scrub has been made within the LIFE-ASPEA-project to improve and connect the <i>Euphydryas aurinia</i> life-space. <i>Succisa pratensis</i> has not colonised the cleared areas as yet. The grass-herb vegetation on the open part is high and nutrient rich and in need of management.	Extensive cattle or horse grazing on the open part including the cleared areas. Continued hay cropping on the meadowland. Continued, gradual clearing of scrub, leaving some shelter to provide warm microhabitats. Left piles of wood debris from clearance should be either removed or burned.
Napstjært enge mv.	Natural and improved meadowland with grazing and hay cropping. In the later years the stocking rate has gone down. Frequency of <i>Succisa pratensis</i> : Frequent	Continued grazing with low stocking rate Continued hay cropping
Råbjerg Mose	Large mire. Most of it is abandoned and growing over with scrub. Minor areas in the perimeter of the mire remain managed. Frequency of <i>Succisa pratensis</i> : Variations from abundant, frequent to occasional Frederikshavn municipality is planning elevation of the water table on former arable land on Store Rød by filling-in ditches.	Continued, gradual clearing of scrub, leaving some shelter to provide warm microhabitats. Continued harvesting of hay. Mowing of grassland vegetation along tracks and pathways. Completion of ditch-filling at Store Rød
Tolshave-, Råsig Mose	Consist of a mosaic of meadowland, heathland, mire and woodland. A part of the former hay-meadow and pastureland has been abandoned and becoming overgrown by woody species. Frequency of <i>Succisa pratensis</i> : Occasional Substantial scrub clearance has been made under the LIFE-ASPEA-project. A large proportion of	Re-institute former management methods of cattle grazing and hay cropping. Modify grazing impact as appropriate to general demands for sustaining a good <i>Succisa pratensis</i> and <i>Euphydryas aurinia</i> -habitat.

	the cleared area has subsequently been re-established to hay meadow.	Clear or burn the scrub gradually, leave some shelter to provide warm microhabitats.
Rendborg	Consist of meadowland, heathland and scrub in a mosaic patchwork of arable land. The open land is growing over with woody species. Frequency of <i>Succisa pratensis</i> : Occasional to Frequent	Annual mowing. Gradual clearing of scrub, leaving some shelter to provide warm microhabitats.
Jennet Gunger	Heathland Many <i>Succisa pratensis</i> along tracks and pathways	Mowing along tracks and pathways to <i>Succisa pratensis</i> habitat open.
FX113		
Strandby	A coastal site with alternating dry and wet habitats - from dry dunes and salt-marsh along the coastline to extensive moist meadowland and heathland behind the dunes. Frequency of <i>Succisa pratensis</i> : Frequent but only occasional on the heath Cattle graze the meadowland. The stocking rate is high. To protect <i>Euphydryas aurinia</i> a part of the meadowland is only grazed every second year. The heath is subject to slow overgrowth from among others <i>Pinus pinus</i> and <i>Betula spp.</i> Minor scrub clearance has been carried out.	Continued cattle grazing with grazing only every second year of the main <i>Euphydryas aurinia</i> -habitat. Alternately, annual grazing with reduced stocking rate. Continued clearance of scrub, keeping in mind the need for some scrub to provide sheltered and warm microhabitats. Burning of heathland.
FX005		
Syd for Råbjerg Mile* (Lodskovvad, og Simon Skrivens Klit)	Large mosaic of duneland, heathland and mire	Check afforestation Re-establish higher water-tables
FX274		
Tranum skydeterræn*	A large area of duneland on elevated sea floor along the North Sea shore. <i>Euphydryas aurinia</i> habitats are found in the eastern part of the duneland on mowed firebreaks	Re-establish higher water-tables Continue scrub clearance and mowing
Outside Natura2000 areas		
Tranum	The <i>Euphydryas aurinia</i> -habitats are found along broad track- and pathway verges	Mowing with removal of the cut material

Klitplantage*		
Sandmosen*	Mosaic of mire, heathland, scrub and arable	Scrub clearance and grazing
Hjeds Kær*	The <i>Euphydrys aurinia</i> habitat area is small and tall herbs and scrub cover suitable, adjacent areas.	Management consisting of clearance and cutting or grazing can easily be established on adjacent areas.
Aalbæk Klitplt.*	The <i>Euphydrys aurinia</i> -habitats are found along broad track- and pathway verges Frequency of <i>Succisa pratensis</i> : Abundant	Moving with removal of the cut material
Jerup Strand*	The <i>Euphydrys aurinia</i> -habitat is found just outside the NATURA2000 area in a dune area	Scrub clearance

*Locations outside the LIFE-ASPEA-project areas.

The **After LIFE Conservation Plan** was elaborated for the Danish Forest and Nature Agency, Himmerland, by M. Sc. Rita Merete Buttenschøn and M. Sc. Anne-Kirstine Lauridsen, Forest & Landscape, University of Copenhagen