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- I: Evaluation report, management of amphibian habitats (in Danish, with English summary)
- J: DVD, project video (in Danish and in English)
- K: Photo documentation (paper copies and CD-ROM)
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- M: List of grazing agreements, with examples
- N: Official press releases and newsletters (in Danish)
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Keywords: Dune heath habitats, Danish West Coast, favourable conservation status, Natura 2000, amphibian habitats, natural hydrology, tree encroachment, mosaic burning, *Pinus mugo*, *Pinus contorta*, *Cladonia* sp., *Bufo calamita*.

Acronyms:

- CAP: Common Agricultural Policy (of the European Union)
- DFFE: Direktoratet for Fødevarer Erhverv (Directorate for Food, Fisheries and Agricultural Business)
- EUCC: European Union for Coastal Conservation
- LIFE: Financial Instrument for the Environment of the European Commission
- NERI: National Environmental Research Institute
- NJA: Nordjyllands Amt (County of Northern Jutland)
- OKS: Camp Oksbøl (Ministry of Defence)
- RIA: Ribe Amt (County of Ribe)
- SNS: Skov- og Naturstyrelsen (Danish Forest and Nature Agency)
- SJA: Sønderjyllands Amt (County of Southern Jutland)
- VIA: Viborg Amt (County of Viborg)

The report is divided into 3 sections: Technical Report, Annexes to Technical Report, and Financial Report, It has been compiled by district secretary Charlotte Røge Frost (financial report), forest ranger Henrik Schjødt Kristensen (maps), and project manager Hanne Stadsgaard Jensen (report text etc.). All files are also included in PDF-format on CD-ROM in each section.



Executive summary

This is a revised version. Changes and revisions as compared to the original are highlighted in red.

Dune heath habitats are rare on a European scale, but the Danish West Coast is rich in this nature type. Generally, they are however threatened by overgrowth and overstabilisation, caused by invasion of non-native conifers and a dramatic decrease in the impact of natural dynamics. The conservation status of these habitats is not considered favourable, and in many areas quite big investments need to be made in order to regain a favourable conservation status. Close cooperation between landowners, conservation authorities, scientists and practitioners is necessary in order to counter the negative development.

This project selected more than 7000 ha of dune heath habitats in 11 SCIs (Natura 2000 areas) for management actions, varying from clearing of dense plantations to mosaic burning of overstabilised dunes, and including important elements of public awareness and scientific research. Project partners included four counties, two scientific research institutions and two ministries. Over a period of 4 years, management of dune heaths in various stages of overgrowth took place using a variety of methods. During the project implementation period, some areas were withdrawn (mainly by private owners) and others were added, and management methods originally planned for specific locations in many cases proved to be unsuitable upon closer inspection. The end result is therefore different from what was originally planned. But more than 8700 hectares of dune heath have been managed, at a total cost less than the original budget, and invaluable experience has been gained by site managers, scientists and administrators. All project activities were completed, and the project has contributed quite significantly to the process towards regaining a favourable conservation status of the Danish dune heath habitats, at a lower total cost than budgeted for.

The overall project objective was to regain a more favourable conservation status of the Danish dune habitats. This was to be obtained through clearing of 264 ha of non-indigenous conifer forest (plantations), clearing of 542 ha of dense overgrowth, removal of tree encroachment on 3452 ha, burning, grazing and mowing more than 2800 ha of overstabilised dunes, and restoration of natural hydrology on 3 sites. Furthermore, securing suitable habitats for the amphibian fauna in the project areas and land swaps on the island of Rømø were included in the field activities.

Key deliverables and outputs were:

- Detailed work plans for management of breeding localities for amphibians, primarily *Bufo calamita*;
- Guidelines and instructions for the long-term management to secure viable populations of *Bufo calamita* and *Rana arvalis*
- Project description for restoration of natural hydrology at Lyngbys Hede (site 72);
- Folder describing the dune habitats and the restoration project;
- Information boards and guided tours;
- International workshop and workshop report;
- Layman's Report;
- Project video/DVD;
- Monitoring report, extensive monitoring;
- Monitoring report, intensive monitoring;
- Best Management Practice guidelines;
- Land swaps on the island of Rømø (site 78)
- After-LIFE Conservation Plan (added during project implementation).

1. Introduction

Generally, the objectives have been achieved. All the planned activities have been completed, more hectares than initially planned have been managed, and the conservation status for more than 8000 ha of dune heaths has been improved. The total costs of the project are lower than the original budget.

A few activities were delayed, particularly the restoration of natural hydrology at Lyngbos Hede (site 72), but all planned activities were implemented. Due to reforms of the CAP introduced during project implementation, grazing agreements were more difficult to obtain than initially foreseen. Information activities and research activities were very successful, and the management activities for amphibians gave promising results.

The overall impression of the project is successful. Obstacles met were primarily of an administrative character and generally beyond the control of the project management. Very positive evaluations of the activities in the field have been received, public awareness is generally higher, and the experiences gained by administrators as well as practitioners are very valuable for the continued efforts to maintain a favourable conservation status for the Danish dune heaths.

1.1 Project background

Maintaining a favourable conservation status of priority habitat types is an increasingly important challenge for nature managers in Europe. In many cases, only limited experience in the application of appropriate management methods exists. Therefore, gaining experience through practical implementation on a larger scale, and close monitoring of the effects, are important tools on the endeavour to continuously increase the efficiency of the management methods applied. Partly based on the experience gained in two previous LIFE-supported projects aimed at restoring Danish coastal dune heath habitats (LIFE94NAT/DK/000492 and LIFE96NAT/DK/003000), this project is larger in scale and covers a wider range of habitat mosaics and project participants and partners.

In Denmark as well as in the rest of Europe, dunes and coastal dune heaths are considered threatened and vulnerable habitats. The conservation status of these habitats is not favourable. The aim of this project was to improve the conservation status for coastal dune habitats on 11 Sites of Community Interest in Denmark. The sites cover more than 24.000 hectares within the Natura 2000 network, and were mainly selected based on the presence of priority habitat types 2130* (Fixed grey dunes) and 2140* (Decalcified fixed dunes with *Empetrum nigrum*).

At the onset of the project, the following three general threats were identified:

1. Invasion of non-native species, particularly *Pinus mugo* and *Pinus contorta*
2. Lack of natural dynamic processes (over-stabilisation of dunes)
3. Ammonium deposition/eutrophication.

Overgrowth by trees may change the ecology of the dune heaths completely, in particular due to the shadowing effect of the canopy and the forest climate induced changes of nutrient circulation and microclimatic conditions. These changes do not only influence the flora, but also the fauna of these habitats. Of particular interest in this project are the Annex IV-species *Bufo calamita*, *Rana arvalis*, *Lutra lutra* and *Triturus cristatus*, and the rare birds *Grus grus* and *Tringa glareola* (Annex 1 in the EU Birds directive), which are all present in one or several of the project areas. Furthermore, site-

specific threats were identified, including drainage, tourism pressure, and barriers to habitat management related to land ownership patterns.

1.2 Overall and specific objectives

The overall objective of the project was **to regain a more favourable conservation status of the Danish dune habitats.**

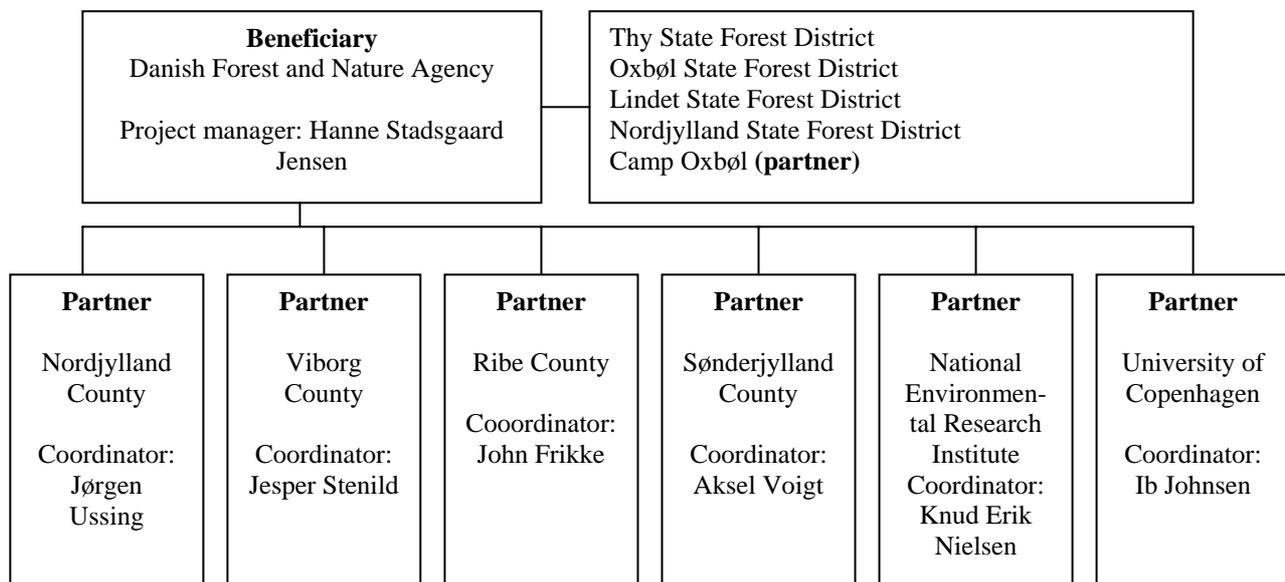
The specific objectives of the project, as outlined in the project application document, were:

- Restoration of 264 ha of dune heath habitats, i.e. conversion (through clearing) of non-indigenous conifer forest to priority habitat types 2130* (Fixed grey dunes) and 2140* (Decalcified fixed dunes with *Empetrum nigrum*). These areas were categorised as overgrowth degree IV-V.
- Clearing of 542 ha of dense overgrowth (overgrowth degree III).
- Removal of tree encroachment on 3452 ha (overgrowth degree II).
- Management activities on more than 2800 ha in order to counter threats from nutrient enrichment and lack of natural dynamics (overgrowth degree I).
- Restoration of natural hydrology on site 72 (Lyngbo Hede) and site 78 (Fanø), and restoration of dune heath on site 184 (Stenbjerg).
- Land swaps on roughly 36ha on site 78 (Rømø), in order to remove land-ownership related barriers to habitat management.
- Securing of viable populations of amphibians, primarily *Bufo calamita* and *Rana arvalis* in the project areas containing decalcified fixed dunes with a mosaic of humid dune slacks.

The project includes both state-owned and privately owned areas in the 11 Natura 2000 sites containing the priority habitat types 2130 and 2140 included in the project. The state owned areas are managed by the local state forest districts, and the privately owned areas are managed by the Counties. Generally the areas are sparsely populated and the main income generating activities are tourism and agriculture. Most of the state owned areas were acquired by the Government in the late 19th century and early 20th century to combat sand drift which was a serious threat to the livelihoods of the inhabitants, and large areas of dunes and dune heath were converted into plantations, mainly using non-indigenous coniferous species such as *Pinus mugo* and *Pinus contorta*. The sand drift has long ago been halted, and the plantations are of very little economic value, except for hunting interests.

2. LIFE project framework

The project activities were undertaken by the beneficiary and the 7 partners in a common framework. The beneficiary, the Danish Forest and Nature Agency under the Ministry of Environment, carried out the site management work in the field on the state owned areas through the local state forest districts, and the 4 counties (Nordjylland, Viborg, Sønderjylland and Ribe) implemented the management efforts on privately owned areas, in agreement with the respective owners. The two partner research institutions, University of Copenhagen and National Environmental Research Institute, conducted the intensive and extensive monitoring of the status and developments in the project areas, respectively. The last partner, Ministry of Defence, only provided access to management of areas owned by the ministry, which were managed by one of the participating forest districts. This can be summarised in the following organigram (names as of project end date):



A number of external contractors were engaged during project implementation, primarily for providing specific services such as management plans for amphibian habitats, layout and printing of information boards and folders, production of project video, and writing of layman's report.

The project activities were divided into 6 categories: Preparatory Actions (Action A1-A4), Land Purchase (Action B1), Non-recurring Management (Actions C1-C7), Recurring Management (Actions D1-D2), Public Awareness and Dissemination (Actions E1-E9) and Project Operation and Monitoring (Actions F1 – F4).

Due to a general restructuring of the beneficiary organisation, the original 5 participating state forest districts were reduced to 4 in 2004, as one of the districts (Hanherred) was closed down and the staff and areas divided between two of the other participating districts (Thy and Nordjylland). These changes did not affect the overall organisational set-up of the project. An Additional Clause was granted on 7. June 2005 to accommodate reductions in the project areas for Ribe and Sønderjylland Counties and additional areas in Nordjylland County, plus a few other budget changes.

3. Results

3.1 Overview

The ambitions for area related management at project start-up have been more than accomplished. In spite of delays due to budget cuts, difficult land swaps, hesitant private landowners and so on, the total number of hectares of dune heath managed and brought back to a favourable conservation status exceeds the goal set up at the start-up of the project. In some sites, more detailed surveys led to a redefinition of which actions types were the most appropriate in specific areas, and therefore a diversification of action types took place in several sites.

In general, private landowners were reluctant to enter into management agreements, and this led to withdrawal of project areas on several sites. At the same time, a private fund (Aage V. Jensens Fond), which owns large nature areas with the specific purpose of nature conservation and animal protection, actively asked for inclusion of additional dune heath areas in the project activities on site 2 (Råbjerg Mile). Overall, the withdrawal of areas (mainly privately owned) was more than compensated for by the inclusion of other areas, both private and state owned.

Most of the managed areas were mapped using GPS equipment, meaning that the documentation of the extent of the managed areas is generally very precise. Figures were rounded of to one decimal.

The original plan for all actions in total was to manage 7132 ha of dune heath (some areas were to be managed under more than one action type). The final result is that 8786,8 ha have been managed, which is 23% more than initially planned. Some areas are still managed under more than one action type, but the degree of overlap has not increased.

Table 1: Actions (area related management) per site (hectares) by project end date. Targets are the original figures at project start-up. For more details, please see Section C-D and Tables 7, 8, 9, 11, 12 and 13

Action	C1		C2		C3		C7		D1		D2	
	Target	Final	Target	Final	Target	Final	Target	Final	Target	Final	Target	Final
78	66,4	84,8	28,3	18,3	33,0	235,7	265,6	181,5	79,8	90,0	270,3	50,1
73	0,8	26,8	266,0	267,2	1055,6	1044,2			1292,9	1332,8		
72					237,8	237,8			237,8	239,0		
184	96,5	101,0	20,3	20,3	550,2	1156,0	22,9	15,9	278,5	369,1	0,9	11,2
26	7,2	2,1	17,5	11,0	164,1	226,8	5,1	13,5	14,0	299,0	0,4	18,2
185	5,5	5,5		16,9	7,7	390,3	30,1	26,0	60,1	0,0	102,1	62,1
16		29,4	66,4	44,9	54,7	462,6	38,3	22,9	42,3	35,5	30,7	16,5
13			16,6	3,7		94,4	6,8	22,0			94,5	
193					1000,8	600,8				95,7		8,5
2	65,6	116,2	119,9	121,3	321,6	497,5						
10	22,3	22,3	7,1	12,8	26,7	26,7						
Total	264,3	388,1	542,4	516,4	3452,2	4972,8	368,8	281,8	2005,4	2461,1	498,9	166,6
%	100	147	100	100	100	144	100	76,4	100	123	100	33,4

Milestones during project implementation

Compared to the deadlines indicated in the application, several activities were delayed during project implementation. Particularly, numerous difficulties related to the restoration of natural hydrology at Lyngbo Hede (Actions A1 and C4) were experienced, but eventually overcome, and

with a very good end result (see section 3). Also, the co-operation with other projects had a difficult start, but eventually took off.

Table 2: Milestones during project implementation

Product/milestone	Action no.	Deadline	Date of completion
Kick-off seminar, including training of nature management staff on management of breeding localities for <i>Bufo calamita</i>	A2, A4	01.06.2002	02.05.2002
Tender: production of video	E2	01.08.2002	September 2002
Advertising campaign in local newspapers	E3	31.08.2002	October 2002
Finalised mounting of map tables/notice boards	E1	31.12.2002	February 2003
Launching of project website	E7	31.12.2002	31.12.2002
Visits to other projects (study tour)	E9	31.12.2002	October 2004
Tender: "Restoration of natural hydrology at Lyngbo Hede"	C4	31.01.2003	17.12.2004
Land swaps on Rømø	B1	31.06.2003	24.09.2003
Workshop (EUCC)	E4	01.10.2003	11.09.2003
Finalised "Restoration of natural hydrology at Lyngbo Hede"	C4	31.12.2003	06.04.2005
Finalised "Restoration of natural hydrology – closing of drainage trenches"	C5	31.10.2005	31.10.2005

Deliverable products during project implementation

Apart from the deliverables related to the restoration of natural hydrology at Lyngbo Hede, no considerable delays were experienced. During the last year of project implementation, an additional deliverable, namely an "After-LIFE Conservation Plan", was added.

Table 3: Deliverable products during project implementation

Product	Action no.	Deadline	Date of completion
Project proposal "Restoration of natural hydrology at Lyngbo Hede"	A1	31.10.2002	01.08.2004
Detailed work plans for management of breeding localities, primarily for <i>Bufo calamita</i>	A3	31.08.2002	20.12.2002
Press releases about the LIFE-Nature project	E3	31.06.2002	09.07.2002
Folders describing the dune habitats (the flora and fauna) and the restoration project	E5	01.06.2003	01.01.2004
Workshop report	E4	31.12.2003	17.11.2003
Video	E2	30.06.2005	01.08.2005
Layman's report	E8	31.12.2005	14.11.2005
Monitoring report – extensive monitoring	F1	31.12.2005	22.12.2005
Monitoring report – intensive monitoring	F2	31.12.2005	14.12.2005

Best Management Practice guidelines	F2	31.12.2005	14.12.2005
Guidelines and instructions for the long-term management to secure viable populations of <i>Bufo calamita</i> and <i>Rana arvalis</i>	F3	31.12.2005	15.11.2005
After-LIFE Conservation Plan	(added)	31.12.2005	28.03.2006

Activity reports

At the request of the project holder, the deadline for handing in the Interim Report and Payment Request was postponed for 3 months. This was in order to allow more time for handling difficulties in financial reporting, due to implementation of a new economy system and a new system for the registration of working hours in the beneficiary organisation. Other activity reports were delivered timely.

Furthermore, an additional clause was granted in June 2005. The project modifications applied for were mainly due to withdrawal of privately owned areas in two of the participating partner counties, redefinition of management actions, and inclusion of additional areas in a third partner county.

The final report with financial statement and final payment request was due to be handed in to the Commission on 1. March 2006, but primarily due to difficulties with compiling the required documentation for expenses incurred by the beneficiary, an additional month for preparing the report was applied for and granted by the Commission.

Table 4: Activity reports during project implementation

Report	Deadline	Date of completion
Progress Report 1	15.01.2003	15.01.2003
Interim Report (with financial statement and payment request)	15.01.2004	15.04.2004
Progress Report 2	15.01.2005	15.01.2005
Final Report	01.03.2006	01.04.2006

Statement of expenditure **REVISED**

The statement of expenditure below (Table 5) is given as an overview of actual costs as seen against the budget approved in the First Additional Clause. For details, please see the Financial Report.

The total expenditure is only 81,8 % of the budget. Generally, expenses were lower than expected in almost all activities and expense categories. There is however a small excess of expenditures in Categories 3 and 4. These are counterbalanced by low expenditures in the other categories. Detailed comments on the expenditures and financial report are given in Section 5.

The total project income (from selling wood-chips) amounts to 216.254 Euro (not included in the tables. For details, please see the Financial Report.



Table 5: Statement of expenditure (overview) *REVISED*

Budget item	Accepted budget (First Additional Clause)		Actual Costs		% of budget	% of total
	DKK	Euro	DKK	Euro		
1. Personnel	18.908.726	2.534.546	16.600.714	2.225.177	87,8	58,2
2. Travel	828.373	111.036	600.122	80.441	72,5	2,1
3. External assistance	3.657.954	490.316	4.266.394	571.872	116,6	14,9
4. Durable goods	150.417	20.162	160.000	21.447	106,4	0,6
5. Land purchase/lease	706.328	94.677	440.800	59.085	62,4	1,5
6. Consumable materials	8.249.114	1.105.720	5.746.694	770.293	76,6	20,1
7. Other costs	100.342	13.450	54.672	7.328	54,5	0,2
8. Overheads	2.282.062	305.890	678.590	90.959	29,7	2,4
TOTAL	34.883.316	4.675.797	28.547.985	3.826.602	83,6	100

Exchange rate: 1 Euro = 7,460400 DKK (ECB 1. March 2006)

The exact expenditure for each action is given under the description of the individual actions in section 3.2, and summarised in Table 6 below.

Unfortunately, it is not possible to provide a comparison between the budget for each action and the actual expenditure, as the partners (counties) did not draw up detailed budgets for C and D-actions after the granting of the Additional Clause.

Table 6: Expenditure per action, in DKK and Euro *REVISED*

Action	Expenditure	
	DKK	Euro
A1: Restoration of natural hydrology at Lyngbo Hede, preparatory project	154.393	20.695
A2: Kick-off seminar, training of project personnel	51.454	6.897
A3: Work plans for the management of herpetofauna	122.597	16.433
A4: Training of project personnel in the management of herpetofauna habitats	26.902	3.606
B1: Land swaps on Rømø	488.992	65.545
C1: Conversion of non-indigenous conifer forest	6.719.717	900.718
C2: Clearing of dense overgrowth	4.669.628	625.922
C3: Removal of tree encroachment	8.470.285	1.135.366
C4: Restoration of natural hydrology at Lyngbos Hede – construction project	708.156	94.922
C5: Restoration of natural hydrology – closing of drainage trenches	634	84
C6: Restoration of breeding localities for herpetofauna, primarily <i>Bufo calamita</i>	87.257	11.696
C7: Establishment of grazing	327.310	43.873
D1: Mosaic burning	1.336.568	179.155
D2: Cutting and removal of material	407.606	54.636
E1: Mounting of map tables/notice boards	326.437	43.756
E2: Production of video	255.399	34.234
E3: Dissemination to and co-operation with local communities	58.504	7.842
E4: International workshop	85.243	11.426

E5: Production of folders	51.410	6.891
E6: Guided visits and events	4.984	668
E7: Production and maintenance of project web site	574	77
E8: Production of layman's report	40.003	5.362
E9: Networking with other projects	6.065	813
F1: Monitoring of coastal dune heaths – extensive monitoring	992.151	132.989
F2: Monitoring of coastal dune heaths – intensive monitoring	653.292	87.568
F3: Evaluation of management of herpetofauna breeding localities and elaboration of guidelines for the future management	176.998	23.725
F4: Project management and coordination	2.333.874	312.835
TOTAL	28.556.434	3.827.735

(Exchange rate: ECB rate 1. March 2006:1 Euro: 7,4604 DKK)

The small discrepancy between the totals in Table 5 and Table 6 is due to small variations in values in the Personnel-category expenses which come out slightly differently when the figures are distributed according to which action they were incurred under. Rounding off amounts when converting from DKK to Euro is probably also contributing to the small deviation.

3.2 Detailed report of activities

A. Preparatory actions

Action A1 – Restoration of natural hydrology at Lyngbo Hede, preparatory project

A 1 kilometre long, up to 3 metres deep and 3 metres wide drainage trench from the 1960s traversed Natura 2000-site 72, Lyngbo Hede, and drained the dune heath and the nearby holiday cottage area. A preparatory project was needed in order to establish the exact effects of the drainage trench and the most feasible way to restore the natural hydrology on the dune heath, without negative effects on the holiday cottage area. Groundwater measurements at 22 points within the project area showed that, contrary to general beliefs, the trench did not have an effect on the holiday cottage area except from during extreme weather situations. At the same time, the trench had a significant drainage effect on the south-western part of the heath, lowering the groundwater table up to 1,5 m in the summer and thus having a significant effect on the low-lying wet areas. The preparatory project was considerably delayed, but in the summer of 2004 it was finalised by the external contractor (Johansson & Kalstrup A/S) and constituted the basis for the outline of the construction project, Action C4.

The preparatory project was annexed to the Second Progress Report, and can also be found in Annex S (in Danish).

The action was completed, with a total cost of 20.695 Euro.



Action A2 – Kick-off seminar, training of project personnel

The kick-off seminar was combined with a training day for project personnel. This action took place in the beginning of the project implementation, on 2 May 2002. The objective was to give a thorough introduction to the goals of the project, and to create a better understanding and “team spirit” in the project group. The seminar and training was mainly aimed at site managers and forest workers/ nature conservation workers. Around 80 people participated in the training, which took place on site 73 (Kallesmærsk Hede, Kærgaard Plantage and Fiilsø Hede). The day started with a joint session for all participants, with introduction to project objectives and management of dune heath habitats in general. After this, two groups in turn completed field sessions on management of dry and wet dune habitats, respectively.

The action was completed, with a total cost of 6.897 Euro.

A surplus of 7.404 Euro (as seen in relation to the original budget) was requested allocated to action C6, which was granted by the Commission.

Action A3 – Work plans for the management of herpetofauna

An external contractor was selected to develop management plans for selected amphibian species, primarily *Bufo calamita*, *Pelobates fuscus*, *Rana arvalis* and *Triturus cristatus* (all Annex II or Annex IV species). The purpose of the work plan was to select and prioritise suitable areas for management efforts targeting these species.

The field survey concluded that bigger populations of *Bufo calamita* were only found in two of the sites (site 2 and 13). On these sites, the natural dynamics near the moving sand dune Råbjerg Mile (site 2) and anthropogenic pressure from sand digging and livestock grazing (site 13) created good breeding and foraging habitats for the species, and therefore the populations on these sites were considered viable on a long term perspective. In all other project sites, the natural dynamics were found to be insufficient for the maintenance of viable populations of *Bufo calamita*. *Rana arvalis*, which is less dependent on a dynamic landscape, was only found in sparse populations, and in general the amphibian species would benefit from management activities undertaken for *Bufo calamita*. After the clearing of plantations and dense overgrowth on Fanø (site 78) was finalised, the project areas on this island were surveyed again, and recommendations for actions were given.

The external contractor, Amphi Consult, developed a work plan for management of herpetofauna in the project sites, complete with maps, guidelines for field work and prioritisation of the efforts. This plan was finalised by December 2002 (detailed plans for site 73, 184, 26 and 2 were ready by April 2003, and a supplement for Fanø (site 78) was produced in 2005), and constituted the basis for management efforts throughout the project. The report was annexed to the First Progress Report, and the report plus supplements can also be found in Annex P.

The action was completed, with a total cost of 16.433 Euro.

The external contractor agreed to allocate some of the consultant hours (corresponding to 3.194 Euro) from this activity to Activity C6, in order to provide on-site advice in connection with fieldwork. This was accepted by the Commission in connection with the First Progress Report.



Action A4 – Training of project personnel in the management of herpetofauna habitats

Training of project personnel in the management of herpetofauna habitats and wet biotopes was conducted as part of the kick-off seminar on 2. May, 2002. The ecology of *Bufo calamita* and basic knowledge on the amphibian species targeted by the project was introduced through handouts and video, followed by demonstration of wet biotopes and discussion of management activities in the field.

The action was completed, with a total cost of 3.606 Euro.



B. Land purchase

Action B1 – Land swaps on Rømø

On the island of Rømø, long and narrow strips of privately owned dune heath areas on site 78 are a barrier to coherent management efforts. The Directorate of Food, Fisheries and Agricultural Business (DFFE) under the Ministry of Food, Agriculture and Fisheries had holdings on the island outside the Natura 2000 area, and agreed to acquire the private lots as part of a larger land consolidation scheme, which also involved the municipality and Sønderjylland County. 20 different private owners were involved, and the transactions were complicated and eventually also slightly delayed. DFFE first swapped the lots inside the SCI with areas outside, and the National Forest and Nature Agency then purchased these and other land lots in the SCI from DFFE. The areas thus acquired or swapped constitute a total of 176,37 ha. Of these, 37,78 ha were purchased from private owners, and were thus eligible for co-financing. The title deeds were registered on September 24, 2003. Lindet State Forest District, being responsible for the management of the areas, is currently developing a management plan for the newly acquired areas as part of the general district management plan, which lays out the long-term management perspectives for the site.

Detailed maps of the areas involved in the land swap action were annexed to the Second Progress Report. They can also be found in Annex U, along with a map indicating the position of the acquired areas in relation to the boundaries of the Natura 2000 site. Some of the individual areas are very small, and therefore somewhat difficult to see on the land swap maps. The areas have now been assigned to other title numbers in the land registry.

In a land swap activity, no title deeds as such are involved; the new ownership is merely registered in the Land Registry (copies of unofficial Land Registry Certificates included, in Annex U). The areas were already under a Nature Conservation Order issued in the 1940's, reserving them for nature conservation purposes. This Order is still in force and not influenced by the change of ownership.

The action was completed, with a total cost of 65.545 Euro.



C. Non-recurring management

For project purposes, the degree of overgrowth was categorised in five degrees. These were:

- I: Over-stabilised dune
- II: Approximately 10% cover of trees and bushes
- III: Approximately 50% cover of trees and bushes
- IV: Approximately 80% cover of trees and bushes
- V: Approximately 100% cover of trees and bushes, typically an old plantation.

Management actions were assigned to project areas according to the overgrowth category. During project implementation, some areas, which were originally assigned to one management action, at closer inspection turned out to belong to a different overgrowth degree, and were consequently managed in a different way. Other areas appeared to have a mosaic character of overgrowth degrees, and the management actions were consequently diversified. Some areas (primarily privately owned) were withdrawn from the project, and others were added. The detailed registration of all project areas with GPS-equipment after the project end date also gave rise to several modifications of the number of hectares actually managed as seen in relation to the original plans. All in all, these modifications mean that the number of hectares managed under each action is different from what was originally planned.

In the First Progress Report and the Mid-Term Report, the Commission's approval of modifications in the number of hectares managed under the actions C1, C2, C3, C7, D1 and D2 on some of the project sites was requested. None of these were substantial changes requiring an Additional Clause, as they were mainly diversifications of management methods on the sites managed by the beneficiary, or additional areas which could be managed within the budget. The changes to area management granted in the Additional Clause (granted 7. June 2005) were of a more substantial character, as they involved significant transfers of project expenses between project partners.

In this section, and in section D (Recurring management), the number of hectares managed on each site and by each project participant are given as a) the project target set out in the application; b) the project target adjusted according to changes approved in the First Progress Report, Mid-Term Report and Additional Clause, and c) the actual number of hectares managed as registered at the project end date. A few minor inconsistencies between the number of hectares managed for each site and action reported in earlier reports and the figures given in this final report can be found. These are due to corrections in which action some areas are assigned to, and clarification of earlier misunderstandings.

These data are also illustrated in the maps found in Annex A. For each site, the original site management target as outlined in the application, and the adjusted target as adjusted according to reports and the Additional Clause, is outlined in one set of maps. The final results, with delineation of action and responsibility (beneficiary/partner) are outlined on a second set of maps, also in Annex A.

The total number of hectares managed is higher than initially planned, and the flexibility in management actions has meant that each area has been managed in the most appropriate way.



In Annex K, a collection of photos taken before and after the management actions on each project site can be found, along with a separate section of photo documentation of activities under Action C6 – Restoration of breeding localities for Herpetofauna. A selection is printed on paper, and a larger collection, plus a slide-show of selected photos, is included on a CD-ROM.



Clearing of conifer forest, Råbjerg Mile (Site 2). Photo: Erling S. Christensen

Action C1 – Conversion of non-indigenous conifer forest

Forests stands (overgrowth degrees IV – V) were selected for conversion through felling, chipping and removal of the material. These areas were mainly old plantations of *Pinus mugo* and *Pinus contorta*, which were planted in order to halt the sand drift, a practice which started more than 100 years ago along the Danish west coast. Conversion of these plantations back to dune heath is part of an overall strategy to gradually increase the area of priority habitat types where it is socio-economically feasible and where the multiple uses of these areas permit such actions. The areas selected for felling were often protruding as narrow strips into the dune heath, and removal of these plantations created a much more coherent dune heath landscape. High priority was given to clearing of stands in low-lying wetter areas, as this is believed to give the highest return in terms of biodiversity benefits, also for birds and amphibians.

The trees were felled either by machinery or motor-manually, according to the local conditions. The trees were then converted to wood chips, and typically sold to district heat plants. The income from selling the chips is included in the financial report. In some areas, the felled trees unfortunately had to remain on the site for some time before the chipping machinery was available. This was not an optimal situation, since quick removal of the biomass and nutrients is considered very important to the dune heath restoration process.

As can be seen in the table below, most of the areas included under this action were managed according to plan. However, Viborg County faced problems with getting consents from the private owners, and eventually had to give up felling 5,5ha on site 26. On the other hand, the private owner of areas managed by Nordjylland County on site 2 agreed to include an extra 53,1ha of plantation to be cleared, and 25,4ha on site 73 upon closer inspection turned out to belong to this overgrowth category instead of the category they were initially assigned to. Furthermore, additional areas on site 16 were included. The original target was to manage 264,3ha under this action, and the end result of 388,1ha managed is therefore very satisfactory.

The specific location of areas managed under this action can be found on the maps in Annex A.

Table 7: Summary of actions under Action C1 (application target and target adjusted according to approved changes is included for comparison)

Action	C1				
Site	Organisation	Application target (ha)	Adjusted target (ha)	Completed (ha)	Comments
78	SNS	66,4	78,8	84,8	Additional areas
	SJA	0,0	0,0	0,0	
73	SNS	0,8	1,4	1,4	
	OKS	0,0	0,0	0,0	
	RIA	0,0	0,0	25,4	Converted from C3
72	SNS	0,0	0,0	0,0	
184	SNS	95,2	95,8	99,7	Additional areas
	VIA	1,3	1,3	1,3	
26	SNS	1,7	2,1	2,1	
	VIA	5,5	5,5	0,0	Owner did not consent
185	SNS	5,5	5,5	5,5	
	VIA	0,0	0,0	0,0	
16	SNS	0,0	8,5	29,4	Additional areas
	VIA	0,0	0,0	0,0	
13	SNS	0,0	0,0	0,0	
193	SNS	0,0	0,0	0,0	
2	SNS	41,1	40,7	40,7	
	NJA	25,4	75,4	75,5	
10	SNS	22,3	22,3	22,3	
Total		264,3	337,3	388,1	

The action was completed, with a total cost of 900.718 Euro.

Action C2 – Clearing of dense overgrowth

Areas where tree encroachment had taken place over a period of up to 50 years were assigned to overgrowth degree III and selected for clearing. The trees were felled motor-manually and transported out of the area. In hilly terrain or wet areas, where the use of machinery would be too damaging, the trees were collected in small heaps and burned. In flat areas, smaller trees and bushes were destroyed using a tractor-mounted mulcher.

The total number of hectares managed under this action is very close to the original target, but the exact areas are not all the same. Some of the areas originally assigned to this overgrowth category were during the project implementation redefined to C3. On site 73 the landowner changed his mind about including some of his land in the project activities, and consequently some hectares had to be withdrawn. At the same time, some hectares of the same owners' areas turned out to belong to this overgrowth category instead of what they were originally assigned to, and a few additional hectares were added during the last project year. A few hectares were added on site 2 and 10, and on site 193, two small areas were overlooked in the general rush to finish, but will be cleared by the state forest district in 2006.

The specific location of areas managed under this action can be found on the maps in Annex A.

Table 8: Summary of activities under Action C2 (application target and target adjusted according to approved changes is included for comparison)

Action	C2				
Site	Organisation	Application target (ha)	Adjusted target (ha)	Completed (ha)	Comments
78	SNS	18,3	18,3	18,3	
	SJA	10,0	0,0	0,0	Unwilling landowners
73	SNS	140,4	133,5	133,5	
	OKS	16,0	16,0	16,0	
	RIA	109,6	78,4	117,7	Converted from C3, some additional areas
72	SNS	0,0	0,0	0,0	
184	SNS	0,0	0,0	0,0	
	VIA	20,3	20,3	20,3	
26	SNS	0,0	0,0	0,0	
	VIA	17,5	17,5	11,0	Owner did not consent to full area
185	SNS	0,0	0,0	16,9	Redefinition of action in C3-areas
	VIA	0,0	0,0	0,0	
16	SNS	66,4	89,7	44,9	Redefinition of action to C3 (44,8 ha)
	VIA	0,0	0,0	0,0	
13	SNS	16,9	3,7	3,7	
193	SNS	0,0	4,9	0,0	Will be cleared in 2006
2	SNS	43,8	40,8	45,2	Additional areas
	NJA	76,1	76,1	76,1	
10	SNS	7,1	7,1	12,8	Additional areas
Total		542,4	516,3	516,4	

The action was completed, with a total cost of 625.922 Euro.

Action C3 – Removal of tree encroachment

In areas with overgrowth degree II, self-sown trees (mainly non-native species, primarily *Pinus mugo* and *Pinus contorta*) were felled and removed, or mulched. The trees have invaded the dune heath from nearby plantations, and removing them at this early succession stage reduces the risk of significant biodiversity loss. It also reduces the cost of future management efforts to keep the dune heath in a favourable conservation state. Solitary trees were felled and collected in heaps, which were burned. Smaller trees growing in patches on flat areas were removed by a tractor-mounted mulcher.

During project implementation, additional hectares were included under this activity, in several places at no extra cost. Particularly on site 184, where the number of hectares managed is more than twice as much as originally planned. A large area on site 193 was withdrawn, as it turned out to be impossible to manage the total area on this military site, mainly due to the risk of stepping on

unexploded ammunition. Additional areas on the privately owned part of site 2 were included during the last project year, at no additional costs.

In the application, 3.452,2 ha were expected to be managed under this action. This figure was increased to almost 4000ha during project implementation. The end result of 4.972,8 ha managed is therefore very satisfactory.

The specific location of areas managed under this action can be found on the maps in Annex A.

Table 9: Summary of activities under Action C3 (application target and targets adjusted according to approved changes are included for comparison)

Action	C3				
Site	Organisation	Application target (ha)	Adjusted target (ha)	Completed (ha)	Comments
78	SNS	8,2	137,4	222,6	Additional areas (50ha on Rømø formerly privately owned)
	SJA	24,8	0,0	13,1	Additional area (owner agreed late in project)
73	SNS	236,1	236,1	247,7	Additional areas
	OKS	449,0	456,2	456,2	
	RIA	370,5	370,5	340,3	Areas converted to C1 and C2, but also some additional areas
72	SNS	237,8	237,8	237,8	
184	SNS	497,4	515,1	1.098,2	Additional areas
	VIA	52,8	52,8	57,8	5 ha D1 converted to C3
26	SNS	91,7	79,2	154,4	25ha converted from C7, 50,2ha additional areas
	VIA	72,4	72,4	72,4	
185	SNS	3,6	326,5	386,2	Redefinition of action to C2 (16,9 ha), additional areas (42,8ha)
	VIA	4,1	4,1	4,1	Area managed, then sold to SNS
16	SNS	38,5	311,8	445,5	Additional areas (67,3ha), C2-actions redefined to C3 (44,8ha), and 21,6ha D2 converted to C3
	VIA	16,2	16,2	17,1	Redefinition of actions (0,9 ha C7 to C3)
13	SNS	0,0	94,5	94,4	
193	SNS	1.000,8	600,8	600,8	
2	SNS	135,5	147,0	147,0	
	NJA	186,1	283,2	350,5	Additional areas
10	SNS	26,7	26,7	26,7	
Total		3.452,2	3.993,1	4.972,8	

The action was completed, with a total cost of 1.135.366 Euro.



Action C4 – Restoration of natural hydrology at Lyngbos Hede – construction project

The construction project was considerably delayed due to various unforeseen circumstances. The preparatory project took longer than initially foreseen, and the discussions between the various authorities and other stakeholders also took a long time. However, the preparatory project (see also Action A1) demonstrated that the drainage trench did not have a significant drainage effect for the holiday cottage area, except for in extreme conditions, while the effect on the heath was more substantial. Therefore, the restoration was done by laying down pipes in the trench on a 630m stretch, including outlet mechanisms for extreme conditions, ensuring that the holiday cottage area is not negatively affected by the restoration, while the drainage effect on the heath is significantly reduced. The pipes were covered, ensuring that the natural undulating landscape was maintained, and without addition of materials from outside the heath.

Necessary permits from the Nature Conservation Board, the Municipality and the County were given in January 2005, and the construction project started soon after that. The permissions were given on certain conditions, related to ensuring that the impact of the work of the contractor was minimal. The actual fieldwork only lasted a few weeks, and was finalised on April 6, 2005. The contractor was very skilled, and the end result is excellent.

For the duration of the sub-project C4, a local steering committee has guided the work. The committee comprises representatives from Henne Strand Houseowners' Association, Ribe County, Blaabjerg Municipality, The Danish Society for Nature Conservation, and Oxbøl State Forest District. The action was evaluated at a meeting in late August 2005, where it was agreed that Oxbøl State Forest District would continue to register the groundwater level in the area, and keep an eye on the water level in the remaining ditch.

Photos of the fieldwork and end results can be found in Annex B.

The costs of this action were initially set to 67.204 Euro. During project implementation, it appeared that the costs were likely to become somewhat higher, and surplus funds from other activities (20.000 Euro from Action E1 and 6.672 Euro from reduced activities in Ribe County) were proposed transferred to this action. This was granted in the Additional Clause.

The action was completed, with a total cost of 94.922 Euro.

Action C5 – Restoration of natural hydrology – closing of drainage trenches

On two of the project sites (78 and 184), drainage trenches were closed in order to restore natural hydrology, and thereby expand the wet habitats on the dune heath, which is important to the natural dynamics and mosaic pattern of microhabitats in these areas.

A shallow trench on site 78 (Fanø) was closed in 2005. The main result of this is that surface water is retained in the area for a longer period in the summer, and the raised water table is assisting in keeping the area clear of invading trees.

On site 184 (Stenbjerg-Lodbjerg), several trenches were closed. As expenses turned out to be much lower than initially foreseen, it was decided to include other sites in this action. Additional trenches were closed on site 26 (Ålvand). Given the good experiences gained during the project, more drainage trenches will be closed on site 184 in 2006.

The maps showing activities under this action on sites 184 and 26 annexed to the Second Progress Report were unfortunately drawn in a scale where the closed trenches were very difficult to see, and trenches closed outside the project area (using other funds) were visible instead. In Annex C, maps clearly showing the location of the closed trenches on site 78 (Fanø), 184 and 26 and the flooding effect can be found.



Wet dune heath after closing of drainage trenches, site 26. (Photo: Henrik S. Kristensen)

The action was completed, with a total cost of 85 Euro.

The very low level of expenses recorded can be attributed to the fact that the closing of drainage trenches was undertaken by the forest workers as part of other activities in the field, and separate registration of the hours spent and the machinery used was seen as too complicated.

Action C6 – Restoration of breeding localities for herpetofauna, primarily *Bufo calamita*

The main problems related to the status of breeding localities for amphibians in the dune heaths are identified as the overgrowth of foraging localities and lack of suitable breeding ponds. The challenge is therefore to keep the vegetation low, and to provide shallow breeding ponds. Under Action A3, the status of amphibian species populations on the project sites was evaluated, and management plans and suggestions for actions in order to restore and manage breeding and foraging sites for *Bufo calamita* and other amphibians were developed by an external consultant, Amphi Consult. These recommendations were sought implemented under this action.

The action had two elements:

- a) restoration of breeding localities for herpetofauna; and
- b) on-site advice from herpetologists on the practical management of existing breeding localities and/or the creation of new breeding localities.

After the first project year, the budget for this action was increased using surplus funds and savings from Action A2 and Action A3. This was in order to accommodate for the wish of site managers to have better possibilities to use the expertise of the external contractor, Amphi Consult, when designing and managing breeding and feeding sites.

Management actions suitable for restoring breeding and feeding habitats were diverse and included cutting or burning vegetation, scraping, digging new ponds, mowing and establishment of grazing,

according to local conditions. The activities were from the outset limited to the state owned part of the sites, but private areas on site 73 were included during the last project year (activities under action D2 were modified to also be of potential value to herpetofauna).

On site 78, no activities under this action were initially planned on the island Fanø, as it was not possible to evaluate the potential for re-establishing amphibian habitats until the dense plantations and overgrowth of *Pinus mugo* was removed (Action C1 and C2). After 3 project years, the clearings were largely completed and the external consultants visited the area again. It appeared that the area had great potential for connecting the populations of *Bufo calamita* north and south of the project area, and recommendations for cleaning low-lying dune slacks and scrapings in order to restore breeding and feeding habitats were made. All the recommended actions were implemented by the state forest district, using surplus funds from herpetofauna activities on site 73 (under the same forest district).

In Table 10 below, an overview of activities under this action is given. Action Recommended is a summary of the actions outlined in the management plans developed under Action A3, while Action Completed outlines what was actually possible. Many of the actions were in line with management activities under other actions on the same site, as for example the scrapings performed by Ribe County on site 73 and the grazing on site 185, and the expenses were therefore for practical reasons included under these. On some sites, recommended management actions were not undertaken during the project, but will be implemented later. Photo documentation of the activities can be found in Annex K.

Table 10: Overview of activities under Action C6

Site	Action recommended	Action completed	Comments
78	Scraping (2 areas, Rømø)	Scraping/cleaning of dune slacks (51 sites, Fanø)	Additional scraping on Fanø recommended after clearing of plantations and dense overgrowth.
73	Scraping (8 sites), vegetation cutting (2 sites), digging (1 area)	Scraping (3 sites), vegetation cutting (1 site), digging (4 sites). RIA: Scraping (10 sites)	Actions revised after closer inspection. Ribe County performed scraping on private areas
72	(none)		
184	Scraping (1 site), vegetation cutting (8 sites), burning (3 sites)	Scraping or vegetation cutting (9 sites), burning (3 sites)	
26	Scraping (2 sites), grazing (1 site), vegetation cutting (2 sites)	Scraping/closing ditch (2 sites), vegetation cutting (2 sites)	Grazing not feasible, very remote area
185	Grazing (1 area), mowing (1 area)	Grazing (1 area), mowing (1 area)	
16	Scraping (2 sites), grazing (1 area)	Grazing (1 area)	Scraping will be performed on 2 sites in a private area in 2006
13	Scraping (2 areas)		Not feasible
193	Scraping (4 areas), vegetation cutting (2 areas)	(postponed to after project)	
2	Clearing (1 area), digging (4 areas)	(postponed to after project)	
10	(none)	(none)	

The action was completed, with a total cost of 11.696 Euro.



Action C7 – Establishment of grazing

In some of the areas designated as overgrowth degree I, low-intensity grazing was introduced or extended in selected areas. In order to maximise the nutrient removal, no additional fodder was provided for the livestock. The costs were mainly related to fencing. On state owned land, the grazing rights were leased out to local farmers, but as the grazing value was very limited, no profits were gained from this. The attractiveness to livestock owners of this kind of grazing is however generally very sensitive to the current and foreseen possibilities for EU farming subsidies under the CAP, and given the fact that subsidy reforms were introduced during project implementation, farmers turned out to be more reluctant to enter into grazing agreements than foreseen at the beginning of the project. On state owned land, leasing agreements are normally signed for 5 -10 year periods, but the uncertainties in the transition period often forced the forest districts to accept 1-2 year agreements, which will then last until the level of future subsidies are known (at the end of 2005). It was however decided that entering into short term agreements was better than not having the areas grazed at all. A list of the agreements made during the project can be found in Annex M.

In 2006, many of the state owned project areas suitable for grazing will be included in a general round of invitations to public tender, where grazing rights will be leased to the highest bidder. At that time, the future subsidy status will be known for the areas, and as the subsidies go to the farmer holding the grazing rights, no problems in leasing out the areas are foreseen. The forest districts are however aware that they may have to lease out the grazing rights for free in some of the most remote and poor grazing areas.

On Rømø (site 78), many farmers chose to receive grazing subsidies under CAP (around 260 Euro per hectare) instead of having the LIFE-project pay for the fencing of their dune heath areas. The dune heath areas have consequently largely been grazed as initially planned, but not as part of this project. At the same time, some additional areas of state owned land was included under this action, and some areas where converted from action D2 to this action.

On site 13, the state forest district signed up a contract for grazing of some of the area with a local farmer and fenced the area, but the farmer did not fulfil his part of the agreement, and the contract was terminated. The areas will be included in the general round of invitations to public tender in 2006.

On site 16, the same local farmer entered into agreements with the state forest district on grazing of several areas in 2002, but in 2005 the agreements had to be terminated as the farmer did not fulfil his part of the contracts. These areas will also be included in the general round of invitations to public tender in 2006.

Unfortunately, 27,9ha on site 26 added to this action at the time of the Mid-Term Report on closer inspection appeared to be outside the Natura 2000 area, and have therefore been taken out of the project accounts.

Therefore, the total number of hectares managed under this action was lower than initially expected. The areas not managed by grazing were however in many cases transferred to either Action D1 or Action D2.



On site 16 and 184, initially only oral agreements were made with the owners of the private areas which were fenced and grazed. Written agreements (for 5-10 year periods) were however made after the project end date, and this will ensure that the efforts are continued.

The specific location of areas managed under this action can be found on the maps in Annex A.

Table 11: Overview of activities under Action C7 (application target and targets adjusted according to approved changes are included for comparison)

Action	C7				
Site	Organisation	Application target (ha)	Adjusted target (ha)	Completed (ha)	Comments
78	SNS	115,6	115,6	135	48 ha not grazed, some areas converted from D2. Some overlap with Action D1
	SJA	150,0	0,0	46,5	Owner agreed late in project
73	SNS	0,0	0,0	0,0	
	OKS	0,0	0,0	0,0	
	RIA	0,0	0,0	0,0	
72	SNS	0,0	0,0	0,0	
184	SNS	0,0	11,4	11,4	
	VIA	22,9	4,5	4,5	
26	SNS	0,0	66,4	13,5	25 ha managed under C3 instead, not possible to get grazing agreement. 27,9 ha outside Natura 2000 area
	VIA	5,1	0,0	0,0	
185	SNS	26,0	26,0	26,0	
	VIA	4,1	4,1	0,0	Area sold to SNS, grazing not suitable
16	SNS	29,9	19,8	19,8	
	VIA	8,4	8,4	3,1	Owner did not consent, 0,9 ha redefined from C7 to C3
13	SNS	6,8	25,3	22,0	Reduction in area, not possible to get agreement
193	SNS	0,0	0,0	0,0	
2	SNS	0,0	0,0	0,0	
	NJA	0,0	0,0	0,0	
10	SNS	0,0	0,0	0,0	
Total		368,8	431,5	281,8	

The action was completed, with a total cost of 43.873 Euro.

D. Recurring management

Nutrient deposition (ammonium) and nutrient enrichment of the dune heaths with overgrowth degree I can be counteracted by removal of biomass, which at the same time rejuvenates the vegetation. This can be done through grazing, by burning or by cutting and removing the vegetation cover. Burning is seen as particularly effective, as nitrogen and mineral nutrients are lost to the atmosphere and at the same time the exposure of topsoil leads to increased leaching of nutrients. In some areas, burning is however not feasible, and cutting and removing the vegetation in smaller patches may be used instead. These types of management may be applied to large dune heath areas in a rotation scheme, ensuring that a mosaic of succession stages is present at any time, and hence imitating the old management regimes, which were part of the background for the creation of the dune heath habitats.

Action D1 – Mosaic burning

According to Danish experience, burning dune heath in a mosaic pattern of small irregular patches is in many places a very efficient management tool, also in very undulating terrain. In order to control the fire, the vegetation is usually cut (with a tractor-mounted mulcher) in a narrow belt around the areas to be burned. Thereafter, on the lee side of the belt a small counterfire is started, before the actual fire is started on the windward side. The shape of the burned areas is undulating and set according to the local conditions, also in order to achieve a more “natural” look. Burning mainly takes place in February and March, and only outside the breeding season of birds and other inhabitants of the dune heath. The weather is therefore also a factor to be taken into account, as only certain weather conditions are suitable for burning. Some delays were experienced due to wet spring weather, but these delays were largely compensated for by ideal conditions the next season. The areas selected for burning were at project start 2005,4 ha, and the end result of 2.461,1ha is therefore very satisfactory.

For project purposes, an area was considered treated when 20% had been burned. For reporting purposes, not all partners and forest districts used this calculation method in the first reports, meaning that the number of hectares reported as treated was much lower than the actual figures. This was not brought to the attention of the project management until late in the project. Consequently, what seems to be a fast run-up in management activities under this action, when the final number of hectares managed is compared to the number of hectares reported in the Second Progress Report, is to a large extent a reflection of a correct calculation of hectares managed earlier in the project.

A spin-off of the mosaic burning actions of the project is an increased experience among site managers with this method. The initial scepticism has to a large extent been overcome, and the method is applied with increased confidence and skill. Even on project sites very close to residential or holiday cottage areas, burning has taken place without any incidents. Great care was taken to inform the local people about the action. Several nature managers from other institutions, and even from other countries, have expressed interest in receiving training in mosaic burning methods.

The specific location of areas managed under this action can be found on the maps in Annex A.

Table 12: Overview of activities under Action D1 (application target and targets adjusted according to approved changes are included for comparison)

Action	D1				
Site	Organisation	Application target (ha)	Adjusted target (ha)	Completed (ha)	Comments
78	SNS	34,2	49,2	90,0	Many of the original areas (Rømø) too wet to burn, will be managed by mulching instead. Areas converted from action D2 to this action, some areas overlap with action C7
	SJA	45,6	30,0	0,0	26 ha sold to SNS as part of land swap, owner of remaining 4 ha preferred other subsidies
73	SNS	347,8	340,9	365,9	Additional areas
	OKS	465,0	472,2	480,2	Additional areas
	RIA	480,1	448,9	486,7	Additional areas
72	SNS	237,8	237,8	239,0	Additional areas
184	SNS	273,5	316,1	369,1	Additional areas
	VIA	5,0	5,0	0,0	Converted to C3
26	SNS	14,0	299,0	299,0	
	VIA	0,0	0,0	0,0	
185	SNS	60,1	60,1	0,0	Areas too wet to benefit from burning, managed under C3 as well
	VIA	0,0	0,0	0,0	
16	SNS	42,3	22,1	35,5	Additional areas
	VIA	0,0	0,0	0,0	
13	SNS	0,0	0,0	0,0	
193	SNS	0,0	63,2	95,7	Additional areas
2	SNS	0,0	0,0	0,0	
	NJA	0,0	0,0	0,0	
10	SNS	0,0	0,0	0,0	
Total		2.005,4	2.360,1	2.461,1	

The action was completed, with a total cost of 179.155 Euro.

Action D2 – Cutting and removal of material

In areas where the terrain is very flat, cutting and removing the vegetation by using tractor mounted harvesters was applied. In some areas, all the vegetation had to be cut, while in most of the selected areas a mosaic pattern was applied, meaning that only 20% of the area was directly cut. At the onset of the project, a large part of the project area on site 13 was assigned to treatment under this action, but during project implementation, other management methods were seen as more appropriate. Therefore, the target area was reduced. On site 78 (Rømø), the private owners to a very large extent preferred to receive support from the EU Land District Programme for management activities instead of engaging in the LIFE-supported activities, where the management was carried out for them but they did not receive any subsidies. And on the state owned areas of the site, it turned out not to be feasible to manage the areas through the methods in this action. Therefore, the number of hectares managed by the project on site 78 is considerably lower than planned; many of the private areas initially included in the project have been managed anyway, but using other funding sources.

The specific location of areas managed under this action can be found on the maps in Annex A.

Table 13: Overview of activities under Action D2 (application target and targets adjusted according to approved changes are included for comparison)

Action	D2				
Site	Organisation	Application target (ha)	Adjusted target (ha)	Completed (ha)	Comments
78	SNS	70,3	70,3	0	Not feasible to manage by this action, some areas converted to C7, remaining will be grazed later or burned
	SJA	200,0	115,0	50,1	Owners preferred other subsidies, 1 additional hectare added. Some overlap with action C7
73	SNS	0,0	0,0	0,0	
	OKS	0,0	0,0	0,0	
	RIA	0,0	0,0	0,0	
72	SNS	0,0	0,0	0,0	
184	SNS	0,0	10,3	10,3	
	VIA	0,9	0,9	0,9	
26	SNS	0,4	24,4	18,2	6,2 ha outside Natura 2000 area
	VIA	0,0	0,0	0,0	
185	SNS	102,1	62,1	62,1	
	VIA	0,0	0,0	0,0	
16	SNS	30,7	38,1	16,5	21,6 ha converted to C3
	VIA	0,0	0,0	0,0	
13	SNS	94,5	3,2	8,5	Additional areas
193	SNS	0,0	0,0	0,0	
2	SNS	0,0	0,0	0,0	
	NJA	0,0	0,0	0,0	
10	SNS	0,0	0,0	0,0	
Total		498,9	409,3	166,6	

Unfortunately, 6,2ha on site 26 added to this action in connection with the Mid-Term Report appeared to be outside the Natura 2000 area, and the costs have consequently been withdrawn from the accounts. On site 78, the state owned areas unsuitable for management by tractor mounted equipment will be managed by grazing or burning instead. And on site 16, 21,6ha were too overgrown and were converted to management under action C3. The total number of hectares managed under this action is therefore only 1/3 of what was originally planned, but this reduction is more than compensated for by additional areas under other actions.

The action was completed, with a total cost of 54.636 Euro.

E. Public awareness and dissemination of the results

A wide range of activities was implemented in order to disseminate the project objectives and results to the general public. Map tables with information about the project in general, and the specific site in particular, were set up on 30 locations, and a folder was produced for distribution at the map tables. The project website was set up at the beginning of the project, and was used for publishing reports, news and other materials. A layman's report was produced at the end of the project, local newspapers often published special stories about project activities, and a range of guided tours were conducted. An international workshop was held towards the end of the second project year, with 40 participants, of which 13 were from other countries. The project also participated in a LIFE-Coop project with other dune and heathland management projects.

Action E1 – Mounting of map tables/notice boards

At the 11 sites included in the project, a total of 30 key localities were selected, and a map table was mounted at each of these localities. Each map table contains information about the dune heath habitats in general, the specific site/locality in particular, and the actions undertaken under the project to restore the dune heath. The contents of each map table were carefully selected through a consultative process with the local site managers, and the design and layout was carried out by a professional external consultant. Two sets of map tables were printed, in order to be able to replace map tables subject to vandalism or weathering, but at the project end date replacement had not yet been necessary. The map tables were mounted in the early spring 2003. Copies of the information boards were annexed to the mid-term report, and can also be found in Annex R. Due to the size of the files, only a sample of 1 board is included in the electronic version of the report.

The action was completed, with a total cost of 43.756 Euro.

Action E2 – Production of video

The purpose of producing a video was to disseminate the project background, objectives, activities and results to a wider audience. The producer of the video was selected through a public tender, where 14 producers were invited to participate, after a screening of the market for potential producers with previous experience in producing audio-visual materials on nature issues. 3 producers were invited for separate interviews, and TV/Midt-Vest was finally selected. This company is a regional, self-governing TV-station for the mid-west of Jutland (around 500.000 inhabitants), and broadcasts on the TV2-Denmark frequency. The station produces a wide range of programme types, including news, and is well known for high-quality programmes on nature and environment.

The contract was signed in December 2002. During the next 2½ years, the station made a number of takes of various project activities and dune heath management related subjects. Short programmes (8 programmes of 30 minutes, 11 programmes of 10 minutes) based on these takes were broadcast as part of the regular and popular programme "Naturriget". Furthermore, 8 programmes of 30 minutes and 8 programmes of 10 minutes were broadcast on two other regional stations, covering the population in the project areas in southern and northern Jutland. This ensured a wide audience for information on the activities. The 22-minute video (in DVD format) was finalised in Danish and in an English version in late July 2005, and was also broadcast in full length in mid-August 2005.

Copies in DVD-format (in Danish and English) of the video are annexed to the report (Annex J). It can also be viewed in both versions on the project website. The master tape is kept by the project holder at Thy State Forest District.

The action was completed, with a total cost of 34.234 Euro.

Action E3 – Dissemination to and co-operation with the local communities

At the beginning of project implementation, this action was only planned to take place during the first year of the project. The main purpose was to provide local inhabitants with knowledge and understanding of the nature values in the Habitat areas, and thereby increase the local acceptance and understanding of the project. However, at the time of the first progress report, a request was made to the Commission to accept that dissemination activities were ongoing throughout the whole implementation period, in order to be able to keep the public continuously informed about project progress, special events and new developments. This was granted.

Press releases and press contacts

The start-up of the project was announced through a press release in early July 2002, which resulted in contacts from 2 national and 2 regional newspapers, 3 regional TV stations and the national radio. Two weeks later, an article on the project was published in the official newsletter from the beneficiary, “Skov og Natur”, which again resulted in interviews on regional and national TV and radio. During the Danish presidency of the EU in the second half of 2002, a meeting was held for all Nature and Forest Directors of EU and acceding countries in the vicinity of some of the project sites, and a guided tour focusing on dune restoration and management included the press. This resulted in coverage from national TV and regional newspapers. Throughout the rest of the project implementation period, the press was often invited to various events, and the local site managers were on many occasions interviewed or asked for information for articles. News about project progress and subjects of special interest were regularly published in the newsletter “Skov og Natur”. Towards the end of the project, the project manager was interviewed by the regional radio station. Copies of articles and other materials have been annexed to progress and mid-term reports. Articles etc. from the fourth project year can be found in Annex D, and printouts of press releases and relevant issues of “Skov og Natur” can be found in Annex N.

Information campaign and guided visits

A number of guided visits to the project areas were conducted as part of the information campaign in the newspapers at project start (see also Action E6). The possibility for synergy between information and the opportunity to come and see the project areas and actions was thus used, and a total of over 220 people participated in these guided trips. During the rest of project implementation, guided visits were included in the semi-annual list of guided nature trips published by the counties (see also Action E6).

Workshop for landowners on Rømø (site 78)

In order to facilitate the project activities on the island of Rømø, private landowners from the project area were invited to a workshop at Oxbøl State Forest District, where the project objectives and activities were demonstrated. Of special interest were the effects on hunting opportunities. Clearing of non-indigenous conifer forest and mosaic burning was demonstrated as part of the field visit. The landowners were representing both those who were suggested for inclusion in the land swap process (Action B1), and those who were invited to have their land managed via the County. The concerns of the first group were apparently adequately addressed, as the land swap process

proceeded without any major problems. On the other hand, the private landowners were still reluctant to participate, but this was also due to the fact that subsidies from the EU Land District Programme were more attractive than what the project could offer.

Travelling exhibition

At the beginning of the project, a travelling exhibition was prepared. It consists of 11 posters (in English), presenting the dune heath habitats, the threats against them and the objectives and activities of the project. The exhibition was used for the first time at the meeting for Nature and Forest Directors in October 2002. It has also been used at the international workshop (Action E4) in September 2003, and in the central department of the beneficiary in Copenhagen. Copies of the posters were annexed to the First Progress Report, and can also be found in Annex T.

The action was completed, with a total cost of 7.842 Euro.

Action E4 – International workshop

In September 2003, an international workshop was held in Vigsø, close to Hanstholm and several of the project areas, organised by the beneficiary. 40 participants from 5 different countries were present. Unfortunately, no one from EUCC or the Commission was able to participate. The list of participants included both scientists and practitioners/site managers, and many of them were involved in other LIFE-funded projects. Project managers from the LIFE-projects “A conservation strategy for the sand dunes of the Sefton Coast, north west England”, “Conservation and re-establishment of southern Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix* and dry coastal heaths with *Erica vegans* and *Ulex maritimus* in south west England and north west France”, and “Protection and management of coastal habitats in Latvia” participated. The workshop included presentations of various subjects and sites, plenary as well as group discussions, a short excursion to an amphibian habitat plus a one day field excursion to various dune heath sites. Exchange of knowledge and best practices were very useful to all participants, and some valuable contacts were made.

The workshop report was annexed to the Mid-Term Report, and also posted on the website, along with a collection of photos from the event. The workshop report can also be found in Annex Q.

The action was completed, with a total cost of 11.426 Euro.

Action E5 – Production of folders

Folders describing the dune habitats and the restoration actions undertaken under the project were produced during the second project year. The action was delayed for a few months. At project onset, the plan was to produce 5 different folders, one for each region. But due to the relatively limited funds set aside for this action, it was seen as unrealistic to produce so many different folders and still have sufficient funds to print an adequate number of folders. Instead, the project group decided to produce one single folder covering the whole project area, and print it in large numbers. Also in order to reduce costs, the text was written by project staff in close co-operation between the project holder and the partners, and only the layout and printing was taken care of by external contractors. Many features from the map tables (Action E1) were re-used, in order to get a good coherence between these two means of dissemination. The first issue (distributed in January 2004) was 30.000 copies, and in the fourth project year another 10.000 copies were printed and distributed. The folders were placed in boxes at the map tables, and judging from the fact that the folders in most places quickly disappeared, they were very popular among visitors to the sites. In

fact, at the time of the writing of the final report, additional copies of the folder had to be made for annexing to the report, as almost all copies had been removed from the folder boxes in Thy district. Once the folders have all been distributed, the boxes will be removed, or used for other folders with relevance to the specific area, in order not to disappoint the visitors. A copy of the folder was annexed to the mid-term report, and can also be found in Annex O. The folder can also be found on the project website.

The action was completed, with a total cost of 6.891 Euro.

Action E6 – Guided visits and events

In the project application, it was stated that 25 guided visits in the SCIs would be carried out by the forest districts during the project implementation. The aim of the visits was to provide the visitors with knowledge and understanding of the nature values of the particular site, and at the same time inform about the goals, tools and background for the project. Guided visits were generally announced in the semi-annual list of guided nature visits published by the counties, and in the local newspapers. In Table 14 below, a summary of the number of guided visits and the number of participants throughout the project implementation period can be found. (Hanherred District was closed down in 2004, and the areas and staff divided between Nordjylland and Thy districts).

Table 14: Overview of guided visits

Forest district	Number of guided visits	Number of participants
Nordjylland	8	169
Hanherred (until 2004)	4	61
Thy	10	230
Lindet	7	133
Oxbøl	7	350
Total	39	943

As can be seen from the table, the total number of guided visits exceeded the number initially planned for. The total number of participants is also very satisfactory.

The action was completed, with a total cost of 668 Euro.

The very low level of expenses recorded under this action is due to a general failure to register working hours spent on guided visits to areas included in the LIFE project separately.

Action E7 – Production and maintenance of project web site

During the first project year, the project web site was launched by the beneficiary. The website is an integrated part of the website of the beneficiary. A description of the project objectives, activities and sites provides the potential visitor with background information, and links to reports, folders and other materials provides those who are interested in more information with good possibilities. The website was continuously updated during the project, and will still be maintained for some time after the project has come to an end. A few months before the project end date, the homepage was moved to a new server, and visitor statistics are therefore split into two periods, namely 1. January 2002 – 25. July 2005, and 26. July 2005 – 31. October 2005. An extract of the visitor statistics reports are presented in tables 15 and 16 below.

Table 15: data from old server: (1. January 2002 – 25. July 2005)

Total number of hits	145.172
Average number of hits per day	103
Total number of visits	24.479
Average number of visits per day	17
Average length of visit	8 minutes 53 seconds
Total number of page views	37.989
Average number of page views per day	27
International visits	62,65 %
Most popular pages	Start page (21,46%), Nature (6,21%)
Most popular downloaded documents	Workshop Report (3.945, 30,36%), First Progress Report (3.871, 29,79%)
Visitors visiting once	6.212
Visitors visiting more than once	1.631
Most active day of the week	Wednesday
Top search keywords	Dune (4,52%), traktor (3,13%), dunes (2,33%)

Table 16: data from new server: (26. July 2005 – 31. October 2005)

Total number of hits	1.715
Average number of hits per day	5
Total number of visits	749
Average number of visits per day	2
Average length of visit	5 minutes 54 seconds
Total number of page views	1.715
Average number of page views per day	5
International visits	72,63%
Most popular pages	Start page (22,33%), Contact (7,40%)
Most popular downloaded documents	(not possible to detect on new server)
Visitors visiting once	182
Visitors visiting more than once	89
Most active day of the week	Sunday
Top search keywords	Klithede (26,66%), hede (20,00%), Kallesmærsk (20,00%)

The website can be found at the following address:

<http://www.skovognatur.dk/Emne/Naturbeskyttelse/Naturpleje/Naturprojekter/Klithede/>
News and reports are posted in Danish and/or English.

The action was completed, with a total cost of 77 Euro.

Again, the very low level of expenses registered is due to a failure to register working hours spent on updating the website separately. It was not until after the project end date the forest district housing the project management was granted direct access to updating the project website, and consequently most of the daily work on the website has been registered as general service provided to the forest districts in the timesheets of the webmasters in the central department of the beneficiary.



Action E8 – Production of layman’s report

Production of a layman’s report is compulsory to LIFE-Nature projects. The objective is to create a better understanding of the nature restoration project and to increase public awareness on nature management in general. The target group for the layman’s report is not quite as broad as for the folder (Action E5), but provides a good overview of the values of and threats to the dune heaths, the actions taken during the project to counter these threats, and the future management needs. Proper reference is made to LIFE-Nature and the Natura 2000 network. It was decided to make a 12-page report in both Danish and English, using an external contractor for writing, designing and printing the report, while the project management provided most of the background materials, photos etc. The external contractor, VIsKon Aps, was selected after inviting 4 consultant companies to tender. The report was finalised soon after the project end date, printed in 200 copies, and posted on the project website. All project partners have a limited number of printed copies. A copy can be found in Annex E.

The action was completed, with a total cost of 5.362 Euro.

Action E9 – Networking with other projects

At the start-up of the project, no definitive plans or contacts had been made for this action. A study tour was planned for the fall of 2002, but turned out not to be feasible due to other activities. The project entered into a bid for a LIFE- CO-OP project in June 2002, in cooperation with two ongoing projects in Estonia and one finalised project in UK. Unfortunately, the project proposal was not accepted for financing by the Commission.

In 2003, the project was included in another bid for a LIFE CO-OP project, which was accepted by the Commission in January 2004. The project, LIFE2003NAT/CP/NL/000006: “Dissemination of ecological knowledge and practical experiences for sound planning and management in raised bogs and sea dunes”, under the leadership of Stichting Katholieke Universiteit Nijmegen, the Netherlands, includes projects in Estonia, Ireland, Latvia, the Netherlands, Denmark, United Kingdom and Germany, and had a starting date of April 1, 2004. The first workshop was held in the Netherlands in October 2004, and the project manager of this project was one of the 65 participants from 12 countries who presented their projects, participated in group discussions and excursions to dune habitats and raised bogs. The second workshop was held in Estonia and Latvia in August 2005, with 109 participants from 13 countries, but due to other commitments the project manager unfortunately did not manage to participate. However, the PROMME-concept developed by the CO-OP-project (decision support system assisting in formulating clear and realistic objectives for restoration projects, see <http://www.barger.science.ru.nl/life/>) will be a very useful tool in future management decisions, also in other Natura 2000 areas and habitat types.

The project manager and the coordinator from one of the project partners (NERI) participated in the 9th European Heathland Workshop in Belgium in September 2005. The project was presented in general terms by the project manager, and the extensive monitoring programme (Action F1) was presented by NERI. Some very good discussions on the management methods used in the project and the results of these followed the presentations, and initial contacts were made with various people who were interested in learning more about the methods for mosaic burning used, and the possibility for networking on producing a practical guide was discussed.

Also in September 2005, a delegation from a newly initiated dune management project (LIFE05NAT/NL/000124: “Restoration of dune habitats along the Dutch coast”) in the Netherlands



(the island of Texel) visited some of the project areas. Again, the methodology for mosaic burning was of great interest to the visiting delegation, and twinning of Natura 2000 areas in Texel and in Thy State Forest District through EUROSITES is likely to be initiated in early 2006.

The experiences gained in the project have been used by one of the project partners (Viborg County) in their participation in two other LIFE-Nature projects (LIFE05NAT/DK/ 00150 and LIFE04NAT/DK/0000020). The first coordinator in Viborg County is now the project manager for one of the projects.

The action was completed, with a total cost of 813 Euro.



F. Overall project operation and monitoring

Monitoring of trends in the status of nature types is essential to sound management planning. In order to get a good understanding of the driving forces behind the observed changes in dune heathlands it is essential that basic parameters such as soil types, hydrology, nitrogen deposition and present and former land use are taken into account, and that biotic and abiotic parameters are combined. Monitoring can be divided into extensive, intensive and effect-monitoring. *Extensive* monitoring (Action F1) provides an overall status of all areas, and will on a long-term perspective also detect trends. Extensive monitoring is mainly carried out through the use of parameters deductible from aerial photos (dominant vegetation types etc), but also through monitoring of the status of various parameters on selected points. *Intensive* monitoring (Action F2) more thoroughly investigates relations between trends, pressures and the conservation status of a given area, using reference points and permanent plots. Registration of non-dominant vegetation, particularly the dynamics of cryptogams and characteristic species, is an important tool. *Effect* monitoring (integrated in Actions F1 and F2) investigates the effect of management or restoration activities applied to a given area. The correlation between management practices and changes in vegetation and biodiversity is investigated, also as an invaluable tool for optimising the timing and extent of future management efforts.

Action F1 – Monitoring of coastal dune heaths – extensive monitoring

The responsibility for coordinating extensive monitoring of all nature types in Denmark lies with the National Environmental Research Institute, NERI. In order to gain a favourable conservation status of a given habitat type, it is essential to possess thorough background knowledge of the status and the parameters affecting this. The Department of Terrestrial Ecology of NERI has performed extensive monitoring on the project sites in 4 different areas.

The major objectives of the extensive monitoring carried out under the project were to:

- Provide a status of selected project areas
- Test and evaluate the suggested parameters defining “favourable conservation status” for the coastal dune habitats included in the project
- Investigate whether the proposed conservation objectives for the coastal habitats is or will be fulfilled
- Develop, test and evaluate a common standard for monitoring.

During the first 2 years of project implementation, extensive monitoring was performed on site 184 (dune heaths between Stenbjerg and Lodbjerg) and site 78 (Fanø and Rømø). In order to test the robustness of the monitoring programme, the monitoring of plant composition as well as plant nitrogen content was repeated in 2004.

The main conclusions emanating from this work:

- Conservation status for all the investigated sites is not favourable
- The experience from the research on the conservation status of 4 major dune heath habitats in this project will be used to design a terrestrial monitoring programme for natural habitats specifically aimed towards the needs specified in the Habitats directive
- In order to provide scientifically sound evaluations of the development of nature types as defined in the Habitats directive, it is fundamental that the monitoring is based in reproducible sampling of data and that sampling strategies are based on representative principles

- Chemical criteria are easier to set than biological criteria, which are much more variable
- Vegetation composition criteria should comprise the entire variation expected for each specific habitat type, and the types should be broadly interpreted
- C/N ratio transcends the proposed criteria, and is a parameter which integrates deposition history and changes in land use. Assessment of conservation status should rely strongly on this parameter
- Nitrogen content of shoot and lichen thalli is another useful parameter which reflects short-term changes
- The end of the growing season (August-September) is the optimal time of year for sampling
- Quantitative registrations in cover of grasses and cryptogams are important in order to document long-term changes and construct ratios between various species and plant groups
- The criteria proposed are preliminary and will be adjusted as knowledge increases. However, they are valuable as an operationalisation of the formulation of “favourable conservation status” in a way that ensures a systematic monitoring of state and development trends as related to an objective
- Monitoring programmes should be designed to detect changes in conservation status for species and habitats, as well as to provide information about how the changes have happened, involving habitat-related parameters
- The monitoring programmes developed in Denmark seek to bridge the gap between traditional biodiversity monitoring and monitoring of effects of air pollution
- Choice of criteria should enable diagnosis as well as prognosis for the conservation status of a given habitat
- Registration of a value outside the acceptable limits set out in the criteria for a location should trigger restoration work.

A thorough presentation of the results of the extensive monitoring programme can be found in the report in Annex F. Of specific interest is the list of criteria and information needed to be sampled in the field in order to evaluate and monitor the conservation status of the 3 particular habitat types mainly found in the project areas (2130: Grey dunes, 2140: decalcified fixed dunes with *Empetrum nigrum*, and 2190: Wet dune slacks).

The action was completed, with a total cost of 132.989 Euro.

Action F2 – Monitoring of coastal dune heaths – intensive monitoring, and preparation of Best Management Practice Guidelines

The University of Copenhagen, Botanical Institute, Department of Physical Ecology, has undertaken the intensive monitoring under the project. The main purposes of the monitoring activities were to:

- Gather and optimise the use of botanical experience in relation to management of coastal heaths in Denmark (Best Practice Characterisation)
- Provide an overview of acceptable management methods, as seen from a plant ecological standpoint
- Clearly define the rationale behind the choice of management methods
- Clarify plant ecological demands to the practical implementation of management methods, i.e. their time pattern, frequency and subsequent follow-up measures.



The monitoring was partly based on experiences gained in a previous LIFE-project on Hulsig Hede just south of site 2 (LIFE96NAT/DK/003000: “Nature Conservation on Hulsig Hede”), and was carried out using permanent plots on various project sites. The areas on Hulsig Hede were managed in 1996-2002, and were ideal for comparison and for investigations of long-term development and succession of the vegetation on the dune heaths as a result of the application of various management methods. Thorough botanical inventories were made on a wide range of sites in order to gain sufficient knowledge for a correct positioning of the various permanent plots representing the different management methods.

The experience from this project combined with LIFE-projects at Hulsig Hede and Anholt suggest the following succession processes after clearing:

A: Starting point: Old *Pinus mugo* with well-developed organic topsoil layer, flat terrain:

Wavy Hair Grass and Sand Sedge dominate for the first 10 years, after which *Calluna vulgaris* and reindeer lichens migrate to the area; after 18 years the original type of vegetation is yet to be fully developed.

B: Starting point: Old *Pinus mugo* on sandy base, thin organic topsoil layer, flat terrain: Sand Sedge is almost completely dominant for the first 5-10 years, and acrocarpous mosses such as *Dicranum scoparium* and reindeer mosses begin to appear after about 2 years. After 18 years the grey dune/dry sand heath is more or less re-established.

C: Starting point: Old *Pinus mugo* with well developed organic topsoil layer, south-facing slopes: Crowberry, Sand Sedge and pioneer lichen communities migrate into the area and establish open vegetation. In the course of 18 years, the grey dune community is practically re-established.

D: Starting point: Old *Pinus mugo* with well-developed organic topsoil, north-facing slopes: moss dominance disappears after about 5 years, and is replaced by organophilic lichen communities and reindeer mosses belonging to the subgenus *Cladonia* appear within 5 years.

Overall conclusions (extract):

1. Invasion of *Pinus mugo* on dune heath habitats and the development towards forest dramatically changes the bio-geochemical banks and ecological cycle of the heath, resulting in an accumulation of organic matter. In particular, the dwarf shrub vegetation is suppressed and a more uniform forest habitat develops. This development towards a more productive ecosystem is in part bolstered by air pollution with nutrients. In the new forest habitat, the greatest species variation is found among epiphytic lichens on the pine trunks and branches.
2. Re-establishment of the original grey dune or dune heath requires removal of the accumulated organic matter, and a prevention of the return of *Pinus mugo*. It is particularly important that needle-carrying branches are removed, while roots and stumps can be left. The succession towards the original vegetation begins immediately, but the length of the reestablishment period is particularly dependent on the age and exposure of the *Pinus mugo* stands.
3. When old, dense plantations of *Pinus mugo* are removed, the dwarf shrub heath with *Cladina* spp. needs more than 15-18 years to regenerate. On the other hand, areas where open, self-propagated thickets with gaps are cleared regenerate within 10 years.

4. Clearing of young, self-sown stands of *Pinus mugo* is the best starting point for a quick regeneration of the dune heath. Therefore it is important that clearing takes place at a very early state, and on an ongoing basis, in order to prevent re-establishment of *Pinus mugo*.
5. Generally, re-establishment of the original Atlantic coastal heath after clearing of *Pinus mugo* may last between 5 and 15 years, depending on the density and age of the stands. Furthermore, recovery is inhibited in areas neighbouring intensively farmed agricultural land.
6. The succession after clearing of *Pinus mugo* usually follows a sequence of 3 steps: I) Open flats with pioneer species of plants, lichens, bryophytes and fungi; II) Flats dominated by *Carex arenaria* and *Salix repens*; III) Dominance of *Calluna vulgaris* and *Descampsia flexuosa* with scattered cover of *Cladonia* spp. and acrocarpous bryophytes.
7. The distribution and vigour of 4 species of lichens, which are considered ice age relics, is rapidly declining. This trend may to some extent be countered by clearing of self-sown species of *Pinus* and *Picea* on coastal dune heaths.
8. Grey dune and dune heath vegetation can be regenerated after clearing and other management efforts. The dune heath has been demonstrated to be an ecosystem which possesses a high degree of reversibility. Nature conservation therefore makes sense in these areas, provided that major external impacts do not alter the basic conditions for the vegetation.
9. The conservation initiatives taken during the project have been successful, and throughout the project areas a development towards the regeneration of the original dune heath ecosystems is taking place.
10. At present, the effect of atmospheric deposition of nutrients can not be ascertained precisely. In addition to this, the effect of climatic changes may play a hitherto unknown role in the succession currently taking place.
11. It is crucial that follow-up actions to the conservation initiatives taken during the project are followed up; clearing of *Pinus mugo* and continued monitoring of the vegetation is particularly recommended.
12. The use of mosaic burning is recommended for areas affected strongly by nutrient and mineral resources, i.e. dune heaths receiving high levels of nutrients from the sea, with short vertical distance to moraine deposits and/or with short horizontal distance to agricultural land. Mosaic burning may counteract the otherwise rapid succession towards closed shrub and forest vegetation. In such areas, grazing by cattle and/or sheep should also be considered after clearing.

The full report can be found in Annex G.

The Best Management Practices Guidelines included in the report have been extracted and combined with recommendations from the Extensive Monitoring (Action F1). This can be found in Annex H. The Guidelines will also be translated to Danish and distributed among project partners and participants, as well as to other interested parties, and posted on the website.

The action was completed, with a total cost of 87.568 Euro.

Action F3 – Evaluation of management of herpetofauna breeding localities and elaboration of guidelines for the future management

Management plans for selected amphibian species were developed under Action A3, and training of project personnel and site managers in implementing management activities was carried out under



Action A4. The effects of these actions were evaluated by the same external contractor (Amphi Consult) who carried out the preparatory activities.

The main conclusion of the evaluation is that activities initiated during the project need to be continued and expanded. *Bufo calamita* has started breeding in and has thus successfully colonised two new breeding ponds at Grærup Strand (site 73), and the species has also colonised an area at Lodbjerg (site 184) where the vegetation has been removed, though so far without breeding success. *Rana arvalis* is successfully breeding in large numbers at site 184 and site 26 where the vegetation has been mowed, and at site 185 and 78 where grazing has been introduced. Furthermore, *Triturus cristatus* has been found breeding on site 184 in an area where the vegetation has been cut down around a small pond. This habitat is a bit unusual for the species, but it is hoped that the population will remain in the area.

Guidelines for future management (2006-2025) have been developed for each project site where amphibian populations were present, plus some additional Natura 2000 sites and sites outside the network. The addition of more sites is done in order to stress the importance of creating dispersal corridors for amphibians, as a means of expanding the range of possible breeding habitats and thereby increasing the possibilities for survival of small populations. This is particularly important for *Bufo calamita*, but other species will also benefit from management actions aimed at this species. Generally, the scattered occurrence of *Bufo calamita* along the Danish West Coast is seen as one single fragmented population, and the ultimate goal is to reunite these fragments.

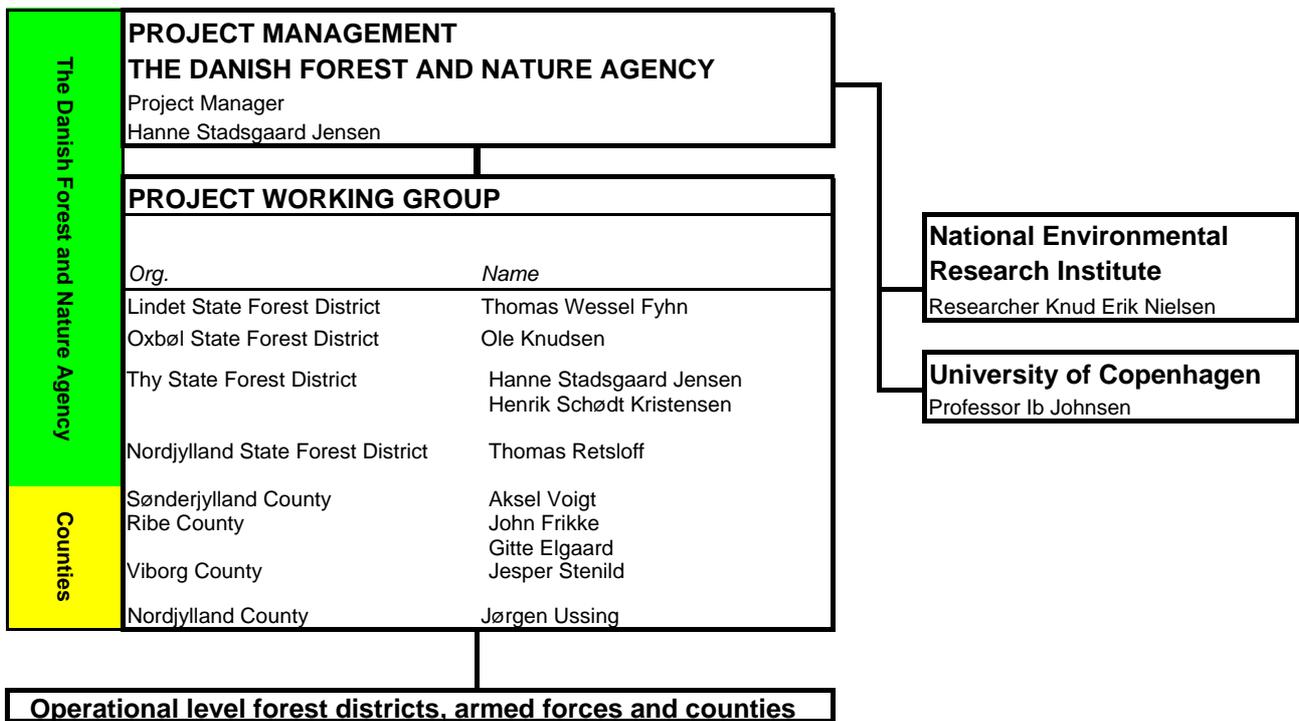
The evaluation report can be seen in Annex I. It is also available on the project website.

The action was completed, with a total cost of 23.725 Euro.

Action F4 – Project management and coordination

The overall responsibility for the project implementation was placed with the beneficiary, the Danish Forest and Nature Agency of the Ministry of Environment. The project involved 7 partners and a range of external contractors. Daily project management was placed with an employee of the Agency, located in Thy State Forest District.

A project group consisting of the beneficiary and the partners was formed. The project manager, staff members from the participating State Forest Districts and Counties constituted the basis of the group, while the two research institutions were associated members, and the last partner, the Ministry of Defence (Camp Oksbøl), was represented by Oxbøl State Forest District. Project group meetings were held throughout the project implementation with suitable intervals (1-2 meetings per year), and task related meetings with a limited participation and field visits were conducted when needed. Particularly the restoration of natural hydrology at Lyngbos Hede required several additional meetings between the project management and local stakeholders. The organigram below, which outlines the project management group at the time of the project end date, is revised compared to the organigram in the application in order to reflect the changes in personnel and the organisational changes which took place during project implementation.



Due to restructuring, staff reductions, retirements, job changes and so on, the membership of the project group changed quite a lot during project implementation. The first project manager, Mr. Søren Korsholm, was asked to take up a position in the Division of Economics in the Danish Forest and Nature Agency from March 2003, and a new project manager, Ms. Hanne Stadsgaard Jensen, was appointed and took up the position on 1. April 2003. From 19. April 2004 to 1. February 2005, Ms Jensen was on maternity leave, and Ms Lena Bau held the position as project manager in her absence. One of the participating state forest districts, Hanherred District, was closed down in 2004, and the staff and areas divided between Thy and Nordjylland State Forest Districts.

An information officer was employed for 3 months in the beginning of the project. Otherwise, none of the project partners appointed additional staff in connection with the implementation of the project.

As previously mentioned, the First Progress Report was submitted 15. January 2003. The Mid-term Report with payment request was submitted on 15. April 2004 (after the Commission approved a 3 month extension of the deadline), a revised version of the Mid-Term Report was submitted 24. August 2004, and the Second Progress Report was submitted on 15. January 2005.

The action was completed, with a total cost of 312.835 Euro.

4. Evaluation and conclusions

A: The process from project start up to final end date has been long and fruitful, but also at times tedious and very time-consuming. A wide range of people with very different starting points and agendas have been working together towards a common goal, and from the perspective of the conservation status of the habitats in question the process holds great promises for the future. All participants have gained a lot of valuable experience, the cooperation between the participants has worked well, and the interdisciplinary character of many of the activities has broadened the reference base for all project partners. An important lesson learned is however that the number of individual actions (27) may have been a little too high. The many actions and the administrative burden this placed on many of the project participants in terms of keeping track of where to register which expenses and how in an ever-changing administrative environment means that many expenses have been transferred several times, and generally made it difficult to adequately document the expenses incurred.

B: The project management has faced many challenges during project implementation, the majority imposed on the project by external forces and beyond the control of the project management. Particularly the beneficiary experienced substantial changes in the organisational set-up, staffing situation and framework for conducting the financial management, which were implemented for the entire organisation and not just the sections involved in the project. 3 different project managers have been employed, and many of the people who were involved in the design and start-up of the project were laid off, retired or transferred to other tasks during the project. The situation was more stable for the partners, but towards the end of the project the upcoming structural reform in Denmark (effective 1. January 2007) started to influence the ability to plan for the future in the 4 partner counties, and several key staff members have changed jobs. The importance of continuity in the organisational and financial management framework has been very obvious, but the project management has done its best to overcome these very demanding challenges.

However, the partnerships have generally been very fruitful. The counties and the state forest districts have worked closely together, and have benefited from the pooling of experience and skills. The research institutions have also contributed positively to the process through qualified inputs to the discussions on how to implement the best possible management actions under the given circumstances.

C: Successes and failures of methodologies applied in the fieldwork will not be entirely clear until some years after the project end date. However, the monitoring reports from the intensive as well as the extensive monitoring activities indicate that the methods applied have generally had a positive impact on the conservation status of the dune heath areas involved in the project activities.

In general, private landowners were reluctant to enter into management agreements, and this forced two of the counties to withdraw project areas. An important lesson from the project is therefore that written agreements with private landowners, clearly stating terms and obligations for participation in the project, will be very useful in future projects involving actions on privately owned land. Since a private landowner in Denmark by law can not be forced to accept nature management activities on his/her land, an agreement between the authorities and the owner is needed.

Establishment of grazing turned out to be more difficult than initially foreseen. The CAP-reform in subsidies introduced during the project made landowners and stockowners reluctant towards



entering into grazing agreements and leasing contracts. Furthermore, a very large stockowner holding several grazing and leasing agreements on state owned land failed to comply with the provisions of the contracts, and the agreements had to be terminated prematurely.

D: Project objectives have been met, all activities have been completed, and the number of hectares managed even exceeds the original objective by 23%. According to the monitoring reports, the conservation status of the dune heath areas involved in the project activities has generally improved, but there is still some way to go before a favourable conservation status is accomplished. Clearing of plantations and invasive non-indigenous trees is however seen as crucial to regaining a favourable conservation status of the dune heaths, and given the fact that clearing trees was one of the main activities of the project, it is safe to say that it has been a success. However, in order to obtain the maximum effect of the clearings, and remove as many nutrients from the areas as possible, coordination of clearing and removal, which is not always carried out by the same entities, should be improved.

E: Environmental benefits, policy and legislation implications: The management efforts undertaken during the project on more than 8700 ha of dune heath habitats in 11 Natura 2000 areas have very remarkable environmental effects. Particularly the areas where plantations and dense overgrowth and tree encroachment have been cleared (more than 5800 ha) have taken a substantial step forward towards a favourable conservation status. The environmental benefits of the activities implemented to improve breeding sites for amphibians are also remarkable, and the restoration of natural hydrology which has taken place on several sites also contributes to a diversification of the dune heath habitat niches and the natural dynamics, which are key components of these habitats and vital for the flora and fauna.

The use of grazing as a management tool in marginal areas such as these is faced with financial constraints due to the reforms in the CAP, which have reduced the incentives to farmers and stockowners to let their animals graze nature areas. Very few commercial farmers are willing to enter into grazing agreements without accompanying subsidies, and there are very few hobby-farmers on the Danish West Coast. One of the results of this may be that the state forest districts will be forced to allow stockowners to graze the areas free of charge.

Spin-off effects have been noticed even before the project came to an end. The methodologies applied and the experience gained in the project has also been used on other dune heath areas, private as well as state owned, inside Natura 2000 areas as well as outside.

F: Innovation and demonstration value: The project has had a significant effect on the confidence with which nature managers engage in dune heath restoration activities. The project has demonstrated that even a relatively modest effort in clearing invasive non-indigenous conifers and small-scale burning has a clearly visible effect. In some areas, hunters have been very sceptical towards the negative effects the clearings would potentially have on particularly the red deer, but as the animals have been demonstrated to actively seek out the newly cleared and burned areas for foraging, the scepticism has been reduced. Several private landowners both inside and just outside some of the Natura 2000 areas included in the project have actively asked for management activities on their land, which is attributed to the demonstration effect of the project. The beneficiary as well as the partner counties have gained valuable practical experience and have refined their methods during the project, which will benefit the future management efforts on areas included in the project as well as similar areas. Nature managers from other EU countries have expressed interest in the

methodologies applied, particularly clearing of plantations and mosaic burning. Co-operation has been established with Dutch and Swedish entities.

G: Socio-economic effects: Marginal areas as the sites included in this project generally generate no or very little income. However, the income from tourism is becoming more and more important, and as many tourists come to the Danish west coast with the purpose of experiencing the vast open areas and unspoiled nature, rehabilitation of dune habitats can also be seen as an investment. Two of the Natura 2000 sites included in the project (184 and 26) are part of the area currently undergoing political discussions to become designated as one of the first Danish national parks, which are to be established in 2008, and socio-economic analysis conducted in connection with the development of the proposal indicate that establishment of a national park in the area will have significant income generating effects, particularly in the tourism sector. Leasing out hunting rights is a major income source for private as well as public landowners, and recent tenders suggest that the prices are not going down despite the scepticism towards clearing of trees expressed by some hunters. In fact, the highest bid at a recent public tender for hunting rights in an area including some of the state owned project areas on site 184 was 100% higher than the rent paid by the previous holder of the hunting rights.

H: The future: sustainability. As outlined in the After-LIFE Conservation Plan, all participating parties have considered the continuation and follow-up on the project. The organisational framework is however going to change as of 1. January 2007, when the Danish counties cease to exist as an administrative level and the responsibilities for managing privately owned nature areas is transferred to new and enlarged municipalities. The counties are presently doing their best to establish a framework for a smooth and efficient handover process, among others through elaborating long-term management plans and establishing firm agreements with private landowners. The Forest and Nature Agency and other parts of the Ministry of Environment are involved in the transition process and the detailed delineation of the future responsibilities, and all entities are aware of the great challenge lying ahead of them.

At the field level, the impact of nutrient deposition from the atmosphere on the dune heath nature is still a relatively unquantifiable factor in the range of threats which must however be taken into account. This is also the case for climatic changes. Monitoring of the dune heaths will continue, and registration of an unfavourable development in a particular area will trigger implementation of restoration activities as soon as possible. Due to the difficulties experienced in getting grazing agreements with stockowners, some areas where grazing would be the optimal management activity may have to be managed through mosaic burning and mowing instead.

I: Long term indicators of project success: The conservation status of the dune heath habitats in Denmark is undergoing continuous evaluation according to criteria set up by NERI during the project, and the status reports from this monitoring will constitute the basis for the assessment of the development in the areas. Breeding success of amphibians, particularly in the areas where breeding and feeding sites have been restored as part of the project, will also be monitored, and the populations and breeding success of rare birds such as *Grus grus* and *Tringa glareola* which are already present on some of the sites will also be used as indicators.

5. Comments on financial report **REVISED**

In accordance with article 27 in the Standard Administrative Provisions, an audit of the project accounts for the Government institutions (Danish Forest and Nature Agency, Ministry of Defence, National Environmental Research Institute and University of Copenhagen) was carried out by the Danish Auditor General. The accounts for the partner counties were also audited by independent auditors, **and the statements from these audits were approved by the Auditor General.**

In section 3.1, a statement of expenditure overview table (Table 5, repeated below) and an overview of expenditures per action (Table 6) were provided. Table 16 below provides an overview of expenses for the beneficiary and partners as seen against the budget approved in the Additional Clause.

Table 5: Statement of expenditure (overview) **REVISED**

Budget item	Accepted budget (First Additional Clause)		Actual Costs		% of budget	% of total
	DKK	Euro	DKK	Euro		
1. Personnel	18.908.726	2.534.546	16.600.714	2.225.177	87,8	58,2
2. Travel	828.373	111.036	600.122	80.441	72,4	2,1
3. External assistance	3.657.954	490.316	4.266.394	571.872	116,6	14,9
4. Durable goods	150.417	20.162	160.000	21.447	106,4	0,6
5. Land purchase/lease	706.328	94.677	440.800	59.085	62,4	1,5
6. Consumable materials	8.249.114	1.105.720	5.746.694	770.293	69,7	20,1
7. Other costs	100.342	13.450	54.672	7.328	54,5	0,2
8. Overheads	2.282.062	305.890	678.590	90.959	29,7	2,4
TOTAL	34.883.316	4.675.797	28.547.985	3.826.602	81,8	100

Exchange rate: 1 Euro = 7,4604 DKK (ECB 1. March 2006)

Table 16: Total costs budget (Euro) (as approved in the First Additional Clause) and actual costs (Euro) per participant **REVISED**

Participant	Budget	Actual costs	% of budget
SNS (beneficiary)	3.121.505	2.482.428	79,5
Nordjylland County (partner)	429.391	603.094	140,5
Viborg County (partner)	198.074	208.385	105,2
Ribe County (partner)	345.264	238.978	69,2
Sønderjylland County (partner)	26.369	5.798	21,9
Univ. of Copenhagen (partner)	119.086	87.568	73,5
NERI (partner)	135.662	132.989	98,2
Camp Oksbøl (partner)	300.446	67.363	22,4
TOTAL	4.675.797	3.826.602	81,8

As it was also briefly commented on in Section 3.1, the total costs are less than budgeted for, and the actual incurred costs for each expense category and for each action category are different from what was originally outlined. The discrepancies are explained and elaborated on below.

At the same time, it is suggested that the two partners who have spent in excess of the budgeted amount can be allocated the 60% EC contribution of the total eligible expenses and not just the

budgeted amount. This is made possible by the fact that all other project participants have documented eligible expenses below the budgeted amount.

Generally, the project participants have not been consistent in assigning expenses to particular actions. This accounts for the fact that several actions have very low expenses (C5 (closing of drainage trenches), E6 (guided tours) and E7 (homepage) in particular). Two of the project partners have assigned all project management activities to the actions in the field (C1-C3, C7, D1 and D2) and none to action F4 (project management and coordination).

The accounts for the beneficiary show that only 81,8 % of the budgeted amount has been spent. The actual expenses may well be higher, but due to the many changes in computer based economy systems and systems for handling timesheets in the beneficiary organisation, it has not been possible to extract all the necessary information and adequate documentation in order to enable an inclusion of all the actual expenses for activities undertaken by the staff and machinery of the beneficiary in the accounts. In particular, despite very intensive efforts, it was not possible to obtain comparable and unambiguous data for all 4 project years for some of the components of the staff salaries, and these expenses have therefore been left out. Consequently, the final accounts for the first 2 project years differ from the accounts handed in with the Mid-Term Report. However, in relation to the First Final Financial Report, the revised report shows that a recalculation of the annual number of working hours and the application of an overall rate for social costs in the beneficiary organisation, has levelled out this difference.

Furthermore, adequate and unambiguous documentation for expenses incurred under Category 6 was also difficult to obtain, and many expenses have consequently been left out. Calculations of expenses for machinery in the beneficiary organisation are carried out using the general methodologies used in the organisation and approved by the Danish Ministry of Finance.

The total expenses in Category 3 (External assistance) are higher than budgeted for, particularly for the beneficiary. One of the main reasons behind this is that the organisation was forced to use external contractors for clearing and other fieldwork in a much higher degree than initially planned, as the internal capacity was not sufficient. This is partly due to the storm on January 8 2005, where large areas of forest were brought down, meaning that much of the available machinery had to be redirected to other tasks in other parts of the organisation. The result is therefore that expenses for management activities particularly under actions C1, C2 and C3 were to a large extent incurred as Category 3 expenses instead of Category 1 (Personnel), 6 (Consumable materials) and 8 (Overheads) as originally planned.

However, in relation to the first Final Financial Report, many of the expenses have been reassigned to Category 6. The methodologies applied in the beneficiary organisation for invoicing internal transactions between the state forest districts and the Enterprise- and Machinery Regions of the beneficiary regions mean that all services rendered by the Regions to the Districts are invoiced as internal transactions, regardless of whether the services have been performed by internal machinery and staff or by external contractors. This fact has been used to extract the costs for services rendered by external contractors through the internal Regions, and reassign these to Category 6.

The tractor mounted mulcher purchased by Oksbøl State Forest District during the project is still part of the district machinery and will continue to be used for nature management, in project areas as well as elsewhere.



Nordjylland County (partner) has spent 40,5% more on the project activities than budgeted for. The additional expenses incurred are primarily related to the fact that the county in 2005 decided to do follow-up work on areas cleared in the beginning of the project period. However, the county is prepared to fully cover the additional expenses incurred, if it is not possible to transfer more of the EC contribution to the partners.

The partner Viborg County spent 5,2 % more than originally budgeted for. The additional expenses are mainly incurred in Category 1 (Personnel), as the number of working hours spent on project management and coordination is 3 times higher than budgeted for. This was necessary as the negotiations and discussions during project implementation with private landowners were very time-consuming. At the same time, income from selling of wood chips was higher than expected. The county is prepared to fully cover the additional expenses, if it is not possible to transfer more of the EC contribution to the partners.

The total expenses incurred for the partner Ribe County are 30% less than budgeted for. The county has completed management of all the hectares included in the revised plan, but many hectares have been managed using less costly methods than initially planned for.

The expenses for the partner Sønderjylland County are also considerably less than budgeted for, only 22,9% of the funds set aside for the project activities have been spent. This is mainly due to difficulties in obtaining agreements with private landowners, meaning that the number of hectares managed is less than budgeted for, even after the withdrawal of project areas in connection with the Additional Clause. Difficulties in correctly documenting expenses account for the remaining difference between the budget and the incurred expenses.

University of Copenhagen, Botanical Institute (partner) conducted the intensive monitoring. The total expenses for this partner are only around 75% of the budgeted amount. Expenses have been kept down through efficient work, which was made even more necessary as the ordinary workload of the coordinator increased substantially during the project implementation period.

The total expenses for the partner National Environmental Research Institute, who conducted the extensive monitoring, came very close to the budgeted amount. No further comments are needed.

Camp Oksbøl, the last partner, only incurred 22,4 % of the expenses budgeted for, even though they completed all the activities as planned. This may be attributed to application of more efficient working methods, but most likely also partly to a general failure to register some of the activities undertaken as LIFE-related.