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FINANCIAL INTERIM REPORT

Covering the project activities from 01.09.2004 to 01.03.2006

Reporting Date

31/03/2006

LIFE PROJECT NAME

IMPLEMENTATION OF MIRE HABITAT MANAGEMENT PLAN FOR LATVIA

Data Project

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(75%) of total costs

(100%) of eligible costs

Data Beneficiary

Latvian Fund for Nature

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EXECUTIVE SUMMARY

The project „Implementation of Mire Habitat Management Plan” aims in realising the priority conservation and management activities set by the Mire Habitat Management Plan for Latvia elaborated in 2003. It is the first habitat management plan for Latvia and outlines the priority areas in urgent need of management activities - Cena, Stikli, Klani and Veseta Mires that are included in the project. The sites are nationally and internationally important as include habitats and species of EU Concern as well as protected habitats and species of Latvia. Cena Mire and Stikli Mires are included in the list of Important Bird Areas of Europe.

Objectives of the project:

- Secure the best possible conservation status of priority habitats and species of Community importance;
- Involve local society and stakeholders in the conservation and management activities;
- Raise public awareness and enhance the understanding of the current nature conservation issues, habitats of EU importance and Natura 2000 network.

List of key deliverables and outputs:

- Four management plans and regulatory documents elaborated and approved;
- Technical designs for building dams on drainage ditches elaborated;
- Active raised bog (7110*) restoration measures implemented in the 3 project sites;
- Transition mires and quaking bogs (7140) and Fennoscandian mineral-rich springs and spring fens (7160 maintained);
- Western taiga (9010*) and *Tetrao urogallus* leks managed;
- Habitat and hydrological monitoring points established to ensure the successful restoration activities of these prospective Natura 2000 sites;
- seminars for all interest groups and an International seminar “Raised bog conservation and management” organised to present the project results;
- Informative materials and guidelines on habitat management and conservation published;
- People educated about the conservation and nature values of the project sites;
- Knowledge exchanged and lessons learnt, especially for protected area managers.

The Financial Interim Report includes the following chapters - Executive Summary, Introduction, LIFE-project framework, Progress and Results, Evaluation and Conclusions, 63 Annexes and Financial Report.

In the Introduction background of the project is presented and the main conservation issues addressed, as well as the expected results mentioned. In the next chapter - LIFE-project framework, an overview of the project actions and planning of actions is given. In the Progress and Results chapter action by action the progress of the project action is described. Results of the elaboration of the management plans are described as well as overview about the hydrological studies in the project sites and elaboration of technical designs for building of dams on the drainage ditches are discussed.

Finally, evaluation of the project is presented that includes short description of the project management results, comparison against the project objectives, socio-economic effects.

INTRODUCTION

Background to the Project

Due to drainage and peat extraction that was carried out in Latvia between 1930s and 1980s and still continues, half of the total area of mires is influenced by human activities. The previous intact mires that included raised bogs and fens are replaced by peat fields, agriculture lands and forestry plantations.

The project includes 4 especially protected nature areas that are also Natura 2000 sites - Cena, Stikli, Klani and Veseta Mires. Three of the sites include raised bogs; only Veseta Floodplain Mire has fens and floodplains. The project sites are nationally and internationally important as include habitats and species of EU Concern as well as protected habitats and species of Latvia. Cena Mire and Stikli Mires are included in the List of Important Bird Areas of Europe. The total area of the project sites - Cena, Stikli, Klani and Veseta Mires Nature Reserves comprises 10808 ha.

The targeted habitats - in total 14 habitats (7110*, 7120, 7140, 7160, 3130, 3160, 9010*, 91D0*, 9080*, 3260, 6410, 6210, 6430, 6450) and 14 species of the EC Habitat Directive Annex I and Annex II are known in the project sites, including 4 priority habitats (7110*, 9080*, 91D0*, 9010*). Habitats harbour 28 species in the EC Birds Directive Annex I from which 2 are priority bird species (*Crex crex*, *Aquila pomarina*).

The main conservation issues addressed as follows:

- Negative influence from drainage, peat extraction and fire;
- Degradation and consequent loss of raised bog habitats;
- Overgrowing of transition mires by shrubs and pine;
- Unfavourable succession in valuable forest habitats of Western taiga;
- Uncontrolled recreation activities;
- Lack of awareness about nature conservation issues.

Socio-economic context

The Project sites are located in different regions of Latvia within 10 municipalities and have different stakeholders, as well as number of inhabitants and private landowners. Riga Forest Agency is the main stakeholder for Cena Mire, State Joint-Stock Company “Latvia’s State Forests” is the main stakeholder Stikli Mires and Klani Mire Nature Reserves, State Forest Service is the stakeholder of Veseta Floodplain Mires Nature Reserve. Cena Mire Nature Reserves do not include any inhabitants that live permanently in the territory of the nature reserve. The situation differs in the other project sites - Klani Mires has 10, Stikli Mires – 57, Veseta Mire – 2 private landowners.

Expected results:

- Four management plans and regulatory documents elaborated and approved;
- Active raised bog restoration measures implemented in 3 project sites (320 ha of raised bog restored),
- In total 4,9 ha of transition mires and quaking bogs, Fennoscandian mineral-rich springs and spring fens maintained;
- In total 61 ha of Western taiga managed;
- People educated about the conservation and nature values of the project sites;
- Knowledge exchanged and lessons learnt, especially for protected area managers.

In the realization of the project activities 16 partners that include Riga Forest Agency, State Joint-Stock Company “Latvia’s State Forests”, Forest Research Station, Nature Protection Board, Ventspils Regional Environmental Board, 8 municipalities, Latvian State Forestry Research Institute “Silava”, Olaine Museum of History and Art are involved.

LIFE - PROJECT FRAMEWORK

The project is realised by the experts of the Latvian Fund for Nature (LFN) that is a non-governmental organization. The experts working for the LFN have an experience in elaboration of management plans, mapping of habitats and managing projects.

During the report time the following activities are carried out:

1. Elaboration of management plans and regulatory documents (A1)
2. Hydrological investigations for the preparation of technical designs for building dams (A2)
3. Elaboration of technical designs for nature trails and watching towers (A3)
4. Organization of price quotation (A4)
5. Making agreements and signing contracts (A5)
6. Management of forest habitats (C4)
7. Monitoring site hydrology and the effects of management measures on habitats and species (D1)
8. Organization of seminars (E1)
9. Preparation and publishing of informative booklets about the project sites and the LIFE Project (E2)
10. Establishment of information boards (E4)
11. Creation and updating of the home page of the Project (E5)
12. Production of audio-visual materials (E6)
13. Elaboration of educational pack for teachers (E8)
14. Participation in study tours, seminars and other meetings (E10)
15. Project administration (F1).
16. Independent audit of the project (F2).

To implement the Project activities the Project team was established. The members are responsible for certain project actions.

Regularly, every week, the progress of the project actions, as well as problems are discussed and solved during the project meetings and actions. At the end of 2005, the results of the project actions were evaluated. At the beginning of 2006 the detailed Time schedule for the actions was prepared and discussed with the project team and experts.

During the elaboration of management plans a number of meetings were held for the project experts involved in the elaboration of the management plans where the management actions were planned and discussed as well as with the project partners, stakeholders and private landowners. Similarly, also the other management actions, like building of dams on the drainage ditches and planning of nature trails and watching towers were discussed, including the field trips and site discussions.

The Project is realized in co-operation with the 16 project partners. The partners have participated in the project actions, like, elaboration of the management plans for the project sites, organization of seminars, discussions during the elaboration of technical designs for building of dams on the drainage ditches.

PROGRESS AND RESULTS

Summary of the activities during report period

The Project „Implementation of Mire Habitat Management Plan” was started in September 1, 2004.

In this Interim Report action by action the progress of each activity from September 1, 2004 until March 1, 2006 is described.

In the report period most of the work has concerned the elaboration of management plans (A1), hydrological investigations for the preparation of technical designs for building dams (A2), monitoring site hydrology and the effects of management measures on habitats and species (D1), raising public awareness on raised bog and fen values, including organizing seminars and meetings with the 16 project partners and private landowners. Home page has been regularly updated with the latest events of the Project.

From September 1, 2004 until March 1, 2006 the work was carried out for 16 project actions from the total of 24 of the project. Some of the project actions are just started, some in progress, some are already completed.

Summary of project actions, milestones and deliverable products is shown in Tables 1.-3.

Additional information, like published articles and informative leaflets, copy from the TV shot is attached (Annex 1 – 63).

Table 1. Summary of the project actions

Action	Number of action	Time plan	Status in March 2006
Elaboration of management plans and regulatory documents	A.1.	I 2005 – II 2006	3 management plans are completed for Cena Mire, Veseta Floodplain Mire and Klani Mire and approved by Regulations of the Minister of Environment of Latvia, 1 management plan for Stikli Mires Nature Reserve is currently finalized
Hydrological investigations for the preparation of technical designs for building dams	A.2.	IV 2004 – III 2005	3 technical designs for Cena Mire, Stikli Mires and Klani Mire are completed
Elaboration of technical designs for nature trails and watching towers	A.3.	I - IV 2005	2 technical designs for nature trails and 2 technical designs for watching towers are completed
Organization of price quotation	A.4.	IV 2004 – I 2005; I 2006; I – III 2007	Accomplished in July 2005, 3 price quotations are carried out concerning building of dams, nature trails and a tower, next planned to be delivered in time
Making agreements and signing contracts	A.5.	IV 2004 – I 2005	16 agreements signed with the project partners and 5 with subcontractors
Construction of dams and restoration of natural raised bog hydrology	C.1.	II – IV 2006; II – IV 2007; II – 2008	-
Construction of watching towers	C.2.	III – 2006; III – 2007	-

Removing shrubs and pine	C.3.	III – 2006	-
Management of forest habitats	C.4.	II – III 2006	Selection of Forest management areas are currently finalized
Construction of nature trails	C.5.	III 2006; III 2007	-
Monitoring site hydrology and the effects of management measures on habitats and species	D.1.	II 2005 – IV 2008	120 groundwater wells are installed and 130 monitoring relevés made
Organization of seminars	E.1.	IV 2004 – II 2005; III 2006; II 2007; I – III 2008	Accomplished in February 2005, next planned to be delivered in time
Preparation and publishing of 5 informative booklets about the project sites and the LIFE project	E.2.	II 2005; III 2006; I 2007; III 2007; I 2008	1 st booklet - February 2005, (in Latvian) August 2005 (in English), next planned to be delivered in time, Preparation of the booklets about Klani Mires and Cena in progress
Arrangement of nature trails	E.3.	II – III 2006; II – III 2007	-
Establishment of information boards	E.4.	II – III 2006; II – III 2007	Preparation of the text, tables, maps for the information boards and signs is started
Creation and updating of the home page of the project	E.5.	IV 2004 – IV 2008	Home page regularly updated with the latest information about the project actions
Production of audio-visual materials	E.6.	II – III 2005; II – III 2006; I – III 2007; II – IV 2008	Film is currently produced about the project sites and actions, the TV shot on Cena Mire has been completed
Organizing Raised Bog Conservation Day	E.7.	III 2007	-
Elaboration of educational pack for teachers	E.8.	IV 2006 – I 2007	Information on species, habitats of the project sites is currently summarized
Preparation and publishing of Guidelines on habitat and species conservation and management	E.9.	II – III 2008	-
Participation in study tours, seminars and other meetings	E.10.	IV 2004; II – III 2005; II 2006; III 2007; III 2008	4 study tours organized in Latvia and 3 abroad, participation in 3 international seminars and 3 conferences
Preparation of Layman's report	E.11.	III – IV 2008	-
Project administration	F.1.	IV 2004 – IV 2008	Project team established and all the actions carried out
Independent audit of the project	F.2.	IV 2005; I 2007; III – IV 2008	From November 8 until January 10 preliminary inspection of the project documentation was carried out by the Auditor

Table 2. SUMMARY OF PROJECT MILESTONES

Milestone	Number of actions	Planned	Date of completion
Price quotation organized for Action A2	A4	October 2004	November 2004
Agreement made and contracts signed for Action A2	A5	November 2004	January 2005
Seminar in Riga organized	E1	December 2004	December 2004
Steering Committee established	F1	January 2005	January 2005
Information for the web page prepared	E5	January 2005	October 2004
Seminar in Ventspils organized	E1	January 2005	February 2005
Seminar in Jaunkalsnava organized	E1	February 2005	February 2005
Price quotation organized for Action E6	A4	April 2005	June 2005
Agreement made and contracts signed for Action E6	A5	May 2005	October 2005
Price quotation organized for Action C1	A4	April 2006	March 2006
Agreement made and contracts signed for Action E3	A5	April 2006	-
Agreement made and contracts signed for Action E4	A5	April 2006	-
Agreement made and contracts signed for Action C1	A5	May 2006	-
Price quotation organized for action C2	A4	July 2006	-
Price quotation organized for Action C5	A4	July 2006	-
Agreement made and contracts signed for Action C2	A5	August 2006	-
Agreement made and contracts signed for Action C5	A5	August 2006	-
Interim Seminar in Riga organized	E1	September 2006	-
Nature trail in Cena Mire completed	E5	October 2006	-
Watching tower built in Cena Mire	E4	October 2006	-
Information boards placed in Cena Mire	E4	October 2006	-
Mid-project Seminar organized	E1	May 2007	-
Nature trail in Stikli Dizpurvs Mire organized	E5	September 2007	-
Watching tower built in Stikli Dizpurvs Mire	E4	September 2007	-
Raised Bog Conservation Day organized	E7	September 2007	-
Price quotation organized for Action E9	A4	April 2008	-
Agreement made and contracts signed for Action E9	A5	May 2008	-
International Seminar on bog restoration organized	E1	June 2008	-

Table 3. SUMMARY OF DELIVERABLE PRODUCTS

Product	Number of actions	Planned	Date of completion
The first booklet published (in Latvian and English)	E2	June 2005	February and August, 2005
3 technical designs for the raised bog hydrology restoration prepared	A2	November 2005	November and December 2005
Management plan for Cena Mire prepared	A1	February 2006	February 2006
Management plan for Veseta River Floodplain Mire prepared	A1	February 2006	January 2006
Management plan for Stikli Mires prepared	A1	March 2006	-
Management plan for Klani Mires prepared	A1	March 2006	March 2006
2 technical designs for the watching towers prepared	A3	January 2006	March 2006
2 technical designs for nature trails prepared	A3	January 2006	March 2006
The second booklet published	E2	September 2006	-
Educational pack for teachers prepared	E8	February 2007	-
The third booklet published	E2	March 2007	-
The fourth booklet published	E2	September 2007	-
The fifth booklet published	E2	March 2008	-
Guidelines on habitats and project sites published	E9	August 2008	-
One video film produced	E3	August 2008	TV shot about Cena Mire is completed
Layman's report published	E9	September 2008	-

A. Preparatory actions, elaboration of management plans

ACTION A.1: Elaboration of management plans and regulatory documents

Time plan: I 2005 – II 2006

Progress: Management plans for the project sites are prepared in accordance with the Latvian legislation “Law on Specially Protected Nature Territories” (02.03.1993.), Regulations of the Cabinet of Ministers “On the General Protection and Use of Specially Protected Nature Territories (No 415/ 22.07.2003), Instructions of the Ministry of Environment “Recommendations for Development of Nature Conservation Plans” (No 120/ 04.07.2002).

According to Latvian legislation the procedure for the elaboration of management plans has several stages. The Management plan Advisory Groups were organized by the Nature Protection Board to monitor the process of the elaboration of management plans. Participants from Municipalities, Regional Environmental Boards, Nature Protection Board, forestry’s, stakeholders, private landowners, NGOs, other interested persons or institutions were included in this group.

Elaboration of the management plan for Cena Mire Nature Reserve was started in December 2004 when the First Introductory seminar for the Project and management plan was organized. Management plans for the other 3 project sites – Stikli, Klani Mires and Veseta Floodplain Mire Nature Reserves were started in February 2005.

Information for press about the project actions, including the elaboration of management plans and informative meetings has been prepared. Before the Management Plan Advisory Group meetings with the help of press releases, the regional mass media was informed. Depending on the type of the activity the press releases were sent to central and regional mass media (printed and electronic media or published on the home page of the Latvian Fund for Nature. Special attention was paid to regional media. There is an agreement about regular cooperation with two Project partners (local municipalities) that in their local publications the Project education activities will be revealed.

Until March 1, 2006 there have been 22 publications in the printed mass media, 2 TV shots and more than 20 publications in news agencies and internet portals. The number of contacts in printed media increases 903`560. Most of the printed papers include photos (Annex 41).

During the elaboration of the management plans **Informative meetings** were held for Cena Mire on 21.12.2004 (34 participants), Veseta Floodplain Mire on 22.02.05 (21 participant), Stikli Mires on 21.02.2005 (31 participants), and Klani Mire on 21.02.2005 (31 participants).

Participants of the meetings were introduced with the EC LIFE Project „Implementation of Mire Habitat Management Plan for Latvia” and the main activities, other LIFE projects in Latvia, elaboration of management plans in Latvia. The management plan experts introduced with the main nature values of the project sites. Project partners told about their interests and contribution to the project.

According to management plan elaboration instructions all the known information about territories was summarized and inventory of species and habitats was carried out. According to the agreements with the Project partners who finance the elaboration of the management plans, the first **Draft Management plans** about the progress of the elaboration of the management plans were submitted for all the Project sites. The next Draft Management plans were submitted to the project partners and beneficiary after the field work was completed and the new information added to the Draft Management Plans.

In the Draft management plans the management actions for the project sites are described and were discussed in the meetings of the Management Plan Advisory Groups.

The management plans include information on legislation, evaluation of biodiversity values, factors influencing the site and management activities.

The management activities are shown on maps of Project sites and habitat maps are prepared (Annex 2-7).

Every management plan was guided by the **Management plan expert** who summarized the information from the field experts. The inventories have revealed new species and habitats, especially for invertebrates which have not been found before. New species of EU importance were found in the Project sites - 3 in Veseta River Floodplain Mire, 3 in Klani Mires, 1 in Stikli Mires. In total 14 habitats (7110*, 7120, 7140, 7160, 3130, 3160, 9010*, 91D0*, 9080*, 3260, 6410, 6210, 6430, 6450) and 14 species of the EC Habitat Directive Annex I, and II are known in the project sites, including 4 priority habitats (7110*, 9080*, 91D0*, 9010*) (Annex 14).

Field work was started in 01.03.2005 by the ornithologist and was continued until September, 2005 by other experts. Reports from field experts were submitted until 15.08. and 01.10.



*Excursion of the Klani Mires Management Plan Advisory Group in Klani Mires Nature Reserve
(Photo by M. Pakalne)*

According to the Latvian legislation at least 3 meetings of **Management Plan Advisory Groups** for each of the Project sites must be organized. The Draft Management plans prepared by the management plan experts were sent to every participant of the Management Plan Advisory Group one week before the meeting. All the private landowners were personally invited the meeting by sending invitation letters.

For Cena Mire Nature Reserve Management Plan there were 4 Management plan Advisory Group meetings on 04.07.2005 (22 participants); 28.09.2005 (13 participants); November 16, 2005 (15 participants); December 22, 2005, (9 participants). The meetings were held in Marupe Municipality and in the Ministry of Environment.

For Stikli Mires Nature Reserve Management Plan 3 Management plan Advisory Group meetings in 08.07.2005 (30 participants), Stikli Mires Nature Reserve 07.10.2005 (26 participants), 27.02.2006., 22 participants. The meetings were held in Puze Municipality in the area where the site is located.

For Klani Mire Nature Reserve Nature Reserve Management Plan 3 Management plan Advisory Group meetings were held in 07.07.2005 (28 participants); 06.10.2005 (16 participants); 28.02.2006.(13 participants). The meetings were held in Pope Municipality in the area where the site is located.

For Veseta Floodplain Mire Nature Reserve Management Plan there were 3 meetings on 05.07.2005 (22 participants); 04.10.2005 (13 participants), November 21.11. 2005 (13 participants). The meetings were held in Forest Research Station in Jaunkalsnava.

During the meetings the participants were introduced with the progress of the elaboration of the management plans. Suggestions and objections of private landowners and stakeholders were discussed and explanation of various problems was given. The main subject of discussion was the management activities in the territories and forestry management restrictions.

At the end of the last Management Plan Advisory Group meetings of the Management Plan Advisory Group for all the 4 project sites – Cena Mire, Stikli Mires, Klani Mire and Veseta Floodplain Mire the participants signed the protocol that the elaboration of

management plan is completed and all the participants have been informed about the process of the elaboration of the management plans.

After the last Management Plan Advisory Group meetings the management were handed to the Nature Protection Board and to the Ministry of Environment of Latvia.

Drafts of Regulations of Individual Protection and Use of Specially Protected Nature Territories for Klani Mire, Cena Mire and Stikli Mires are a part of the management plans. Copies of the completed management plans are added to the Interim Report (Annex 19-21).

According to Order of the Ministry of Environment “Recommendations for Development of Nature Conservation Plans” (No 120/ 04.07.2002) the **Public hearings** about management plans must be organized if the territory has more than 5 private landowners. In Klani Mire there are 8 private landowners but in Stikli Mires 57. Two weeks before meetings the information about it was published in regional newspapers. Information about public discussions in Stikli Mires and Klani Mire was published in regional newspapers “Ventas Balss” in 06.01.2006. and in “Talsu Vestis” in 07.01.2006.

Public hearing for the Stikli Mires Nature Reserve management plan was held on 24.01.2006 (37 participants). The main subjects of discussion were - increase of the border of the territory in the future - experts suggested to add Seme Mire (active raised bog which borders with Stikli Mires) to the protected territory although peat extraction has been planned there. It was concluded that according to the Latvian legislation Environment Impact Assessment is needed before any peat extraction can be carried in the nearby area of Stikli Mires Nature Reserve.

Public hearing on the management plan of Klani Mire was held in 25.01.2006 (19 participants). The main subjects of discussion were - management of potential *Tetrao urogallus* leks; management of forests; compensation mechanism to private landowners.

Management plans for the project sites

Until March 1, 2006 the 3 management plans for the project sites – Cena Mire and Veseta Floodplain Mire and Klani Mire Nature Reserves were completed; Stikli Mires management plan will be accomplished in April, 2006.

The 3 management plans for Veseta Floodplain Mire, Cena Mire and Klani Mire are also approved by the Regulations of the Minister of Environment of Latvia - Veseta Floodplain Mire on January 16, 2006 (Regulation Nr 16); Cena Mire on March 17, 2006 (Regulation Nr. 112) and Klani Mires on March 27, 2006 (Regulation Nr. 133).

The common structure of the all management plans is as follows:

Introduction – short background why the especially protected nature area was established, aims and objectives of the management plan, legal basis for conservation and the list of experts involved in the elaboration of management plan.

Summary – short overview about the management plan, the main problems, their solutions, short-term and long-term aims for the protection of the site, main management actions.

1.1. Legislation – the main laws and regulations are mentioned that concern the site 1) Latvian legislation, 2) International legislation (Conventions, Directives of the EC). The stakeholders and the private landowners are named.

1.2. General information about the territory

Location of the site, coordinates, management structure, short history of earlier management, short cultural and historical characteristics of the site, information about the

cartographical sources. Short geographical characteristics of site (climate, geology, hydrology and soils) are given.

1.3. Biological characteristics of the territory

The level of the studies carried out in the site is described. In separate chapters, flora, fauna, habitats are characterized. Special stress is on species and habitats of Habitats Directive Annex I and II as well as protected species of Latvia.

2. Evaluation of nature conservation, social and economic values, estimation of threats and factors that influence the site.

The main nature values of the site are described and stated the positive and negative factors influencing it.

3. Short and long-term aims for the conservation of the territory are formulated for each of the site depending what nature values are found there and in clear connection with the management actions needed in the territory.

4. Management actions are planned according to the conservation aims of the site. They are grouped into categories - priority, essential and desirable. Date of completing is mentioned, planned costs, finance sources and indicators for accomplishment. Here also the zonation is mentioned if it is necessary for the territory.

5. Implementation of management plan. Information is given about the time span the management plan actions have to be implemented. If necessary, individual regulatory documentation for the territory is elaborated (Cena Mire, Stikli Mires and Klani Mire). If not, necessary as in case of Veseta Floodplain Mire, general regulations are applied.

Annexes – include summarised data about the studies in the sites, maps with species localities, mapped habitats, zonation and management actions for the sites.

Management plan for Cena Mire Nature Reserve

The project management plan expert and other expert studies give new information about the site, nature values and the species of EU importance that occur there.

Plants: The raised bog habitats of Cena Mire harbour both the plant species of western distribution in Latvia (*Trichophorum cespitosum*), as well as of eastern distribution (*Chamaedaphne calyculata*). The vascular plant flora has the typical species composition, but especially rich is bryophyte flora, especially in *Sphagnum* species. In total 34 bryophyte species are known there, from which 11 are *Sphagnum* species. The rarest bryophytes include *Sphagnum pulchrum* and *Splachnum ampullaceum*. Also in Cena Mire one locality of *Betula nana* (protected species in Latvia) is known – it is a species that in Latvia reaches the southern border of distribution. In Cena Mire 4 for especially protected plant species of Latvia occur as well.

Fungi: In Cena Mire about 60 species of agaricoid fungi are known. One of the rarest is *Suillus flavidus* that is a protected fungi species in Latvia and a rare one in Europe. In Annex 15 protected species and habitats of EU importance and of Latvia are listed.

Birds: In total 26 species of Bird Directive and protected in Latvia are known in the site. Mostly bird species concentrate near the large raised bog pools and near Skaists Lake. The breeding cranes can reach 20-25 pairs, but not breeding can be hundreds.

Cena Mire is an important overnight place for *Anser albifrons* and *A. fabalis*– during winter migration time about 1000-5000 specimens were counted. In 2-3 areas also *Tetrao tetrix* has been observed (10-15 specimens). About 5-15 pairs of *Pluvialis apricaria* were observed. Quite often also *Tringa glareola* and *Lanius collurio* were noticed.

Invertebrates: In total 6 rare and especially protected species were found, from them 1 from Habitats Directive Annex II - *Leucorhinia pectoralis*. The rarest species in Latvia *Anax imperator* was found in the north-west part of Cena Mire near the raised bog pools.

Mammals: In total 12 species were found. Cena Mire is regularly visited by 1-3 specimens of *Canis lupus*, often *Lutra lutra* and *Castor fiber* is observed (Habitats Directive Annex II and IV species). *Castor fiber* lives on mire margins in the drainage ditches in such a way paludifying the nearby spruce forest plantations. Also the traces about the *Lynx lynx* in the territory were observed.



Raised bog pools in Cena Mire from air (Photo by M. Pakalne)

Habitats: In total 5 habitats of Habitats Directive Annex I are known in Cena Mire; from them 2 are priority habitats (7110*, 91D0*). Raised bog covers about 84 % from the total area. In the vicinity of drainage ditches the raised bog habitats have become degraded (7120) or influenced by drainage. Valuable is the transition mire vegetation are in the middle of the raised bog (7140). On the mire margins there is bog woodland (91D0*) and Skaists Lake is a systrophic lake (3160).

Factors that negatively influence Cena Mire

- Change of the hydrology of Cena Mire due to drainage that was started from 1933.
- Peat extraction in the areas bordering with Cena Mire Nature Reserve.
- Agricultural lands and their management in the close vicinity of Cena Mire.
- Recreation (trampling, waste, fire possibility etc.).

Management actions are subordinated to the short-term aims of the protection of the territory. In total 6 there are the short-term aims. To achieve them 32 management actions are planned from which the main include:

1. Maintenance of raised bogs without any disturbance to allow the natural processes to proceed in the area;
2. Restoration of the degraded raised bog habitats) and those influenced by drainage. It includes hydrological studies and elaboration of technical designs for building of dams on the drainage, control of the functioning of the dams;
3. Securing favourable conditions for the breeding and migrating bird species (establishment of seasonal protection reserve and marking it in Nature with information signs, bird shooting prohibition);
4. Building of a nature trail (1,6km) and a watching tower (6 m high), according to the elaborated technical designs, geological and topographic studies along the route of the trail;
5. Establishment of information boards and signs;
6. Publishing of informative materials about Cena Mire Nature values and management actions;
7. Producing of a film;
8. Monitoring the effects of management actions;
9. Bird monitoring.

Cultural and historical values: traces of the wooden road from the I World War.

Zonation of the territory: Seasonal zonation in the area of 130 ha (from 01.04.-01.11.) Increase of the area of the site has been suggested as in certain places the border crosses valuable raised bog habitats that are not included in the protected area protected Nature, approximately up to the area of an Internationally Important Bird Area.

Management plan for Klani Mires Nature Reserve

Expert studies have contributed to the information about the nature values species and species and habitat diversity in the site.

Plant species: Flora of the territory has been studied 20 years ago when 527 vascular plant species were described and 158 bryophyte species. During the elaboration of the management plan the inventory of the habitats was carried out and the protection regime evaluated. From the earlier known 38 protected and rare vascular plant species 28 were found, but at the same time new species of Habitats Directive Annex II *Liparis loeselii* was discovered. Once again, 20 specimens of *Cypripedium calceolus* Habitats Directive Annex II were found. After the fire in 2001 near Klani Lake *Lycopodiella inundata* has not been found, but *Lycopodium annotinum* occurs quite often (Habitats Directive Annex V). In Annex 17 information about the protected species and habitats is given.

Invertebrates: In total 14 rare and especially protected species were found, from them 2 species of Habitats Directive Annex II which were not known before in the territory – *Euphydryas aurinia* and *Leucorhinia pectoralis*. In 2005 a new dragonfly species for Latvia was found there – *Orthethum brunneum*.

Mammals: In total 15 species were found. In the territory *Lutra lutra* and *Castor fiber* (Habitats Directive Annex II and IV species); sometimes the footprints of *Canis lupus* and *Lynx lynx* were observed. *Castor fiber* with its dams helps to maintain an optimal water level for plant species in Klani Lake.

Birds: Bird fauna has been studied in separate periods, starting already from 1980-ties. In the territory 22 protected species of Latvia and Bird Directive have been observed. Still, not every year nests *Ciconia nigra*. As a breeding place, the site is used by such species of Bird Directive, like *Aquila pomarina*, *Pandion haliaeetus*, and *Haliaeetus albicilla*. At the same often *Bonasa bonasia* and *Caprimulgus europaeus* are observed. The territory is highly suitable for *Picoides tridactylus* and *Dryocopus martius*. Two areas with Western taiga habitats were discovered that suitable *Tetrao urogallus* (one known from the project application, another is new). Management actions are planned to favour the establishment of *Tetrao urogallus* leks.

Habitats: In total 9 habitats of Habitats Directive Annex I (from them 4 are priority habitats (7110*, 9080*, 91D0*, 9010*)) and 10 protected habitats of Latvia were found in the site. Active raised bogs cover about 25 % from the total area. Still, due to drainage the raised bog vegetation has become degraded, especially near the ditches. Special value have the Fennoscandian deciduous swamp forests (9080*) as well as bog woodland (91D0*).



Influence of drainage to Cena Mire
(Photo by A. Indriksons)

An outstanding value has Klani Lake, where habitat of EU concern Oligotrophic to mesotrophic standing waters with vegetation of the *Liitorelletea uniflorae* and/or *Isoëto-Nanojuncetea* (3130) with *Lobelia dortmanna* and *Myriophyllum alterniflorum* occurs. Here also the increase of rare and protected plant species, such as, *Lobelia dortmanna*, *Eleocharis multicaulis* and *Rhynchospora fusca* was observed. The territory includes also forest openings where 2 habitats of EU importance were found (6410, 6210).

Conclusions about the negative factors influencing the territory:

Forests

- Digging of a canal in the 20-30-ties of the 20th century that caused drainage of forests;
- Forest and raised bog drainage that was carried out in 50-60-ties of the 20th century. As a result 35% of the forests were drained.

Raised bogs

- Drainage was carried out in 50-60-ties of the 20th century. As a result one of the raised bogs of Klani Nature Reserve (Dziru Mire) was transformed into a forest; at least 80 ha of the mire became degraded;
- Renovation of the drainage ditches.

Forest openings – meadows

- Termination of grassland mowing

Klani Lake

- Digging of a canal in the 20-30-ties of the 20th century that caused lowering of the water level in the lake and a faster overgrowing as the lake became shallow;
- Spontaneous fires on the northern shore of the lake;
- Driving with motor vehicles along the shores of the lake;
- Lake changes more to a dystrophic type that can not be influence due to the geographic location of the lake.

Management actions are subordinated to the short-term conservation aims of the territory. In total 11 short-term aims that include 35 management actions are planned from which the main are:

1. Maintenance of raised bogs without any disturbance and allow the natural processes to proceed in the area;
2. Restoration of the degraded raised bog habitats and those influenced by drainage. It includes hydrological studies and elaboration of technical designs for building of dams on the drainage, control of the functioning of the dams;
3. Long-term maintenance of biologically valuable forests;
4. Long-term maintenance of the rare and protected habitats near Klani Lake, including hydrological monitoring, control of beaver activities in the canal, prohibition of beaver shooting;
5. Management of forest habitats suitable for the *Tetrao urogallus*;
6. Restoration and maintenance of valuable habitats for the invertebrates, mainly by mowing of forest openings and cutting of shrubs;
7. Establishment of information boards and signs, preparation of an informative booklet about the site, producing a film;
8. Monitoring the effects of the management actions on raised bog habitats;
9. Hydrological monitoring in the degraded and intact part of Klani Mire;
10. Lake water quality monitoring;
11. Monitoring of lake terrestrialization and the habitats of rare species near the lake ;
12. Monitoring of the habitat of *Cypripedium calceolus*.

Management plan for Stikli Mires Nature Reserve



Vasenieki Mire
(Photo by M. Pakalne)

The expert studies have given new and valuable information about the protected species of EU importance in the project site.

This is the largest raised bog complex in the Western Latvia. The especially protected Nature area includes 5 raised bogs, 7 lakes and large forest areas.

Plants: Flora of the Nature has been studied since 1983. In total, 486 vascular plant and 148 bryophyte species are known in the site. The territory holds 28 protected vascular plant species and 25 bryophyte species of Latvia. There are species of Habitats Directive Annex V.

Birds: Stikli Mires Nature Reserve can be considered as one of the most prominent sites for bird species in Latvia. In 2003 monitoring of bird species was started. In total in this site 28 species of European importance and protected in Latvia are known. In the forests 15 species of Bird Directive are known, especially the species of *Falconiformes* (*Pandion haliaeetus*, *Haliaeetus albicilla*), *Galliformes* (*Bonasa bonasia*, *Tetrao urogallus*, *Tetrao tetrix*), *Piciformes* (*Picoides tridactylus*, *Dryocopus martius*) and *Strigiformes* (*Glaucidium passerinum*, *Aegolius funereus*). In the territory of the Nature reserve in the forests of 5 *Tetrao urogallus* leks are known. In the raised bogs breeds *Pluvialis apricaria* (14 pairs), *Tringa glareola* (10 pairs), *Grus grus* (at least 15 pairs). In the leks of *Tetrao tetrix* there are about 25 specimens.

Invertebrates: In total 21 rare and protected species of Latvia were observed there, from them 2 are of Habitats Directive Annex IV - *Coenonympha hero* and *Lopinga achine*. The Annex II species was found outside the territory but could be observed also in the territory in the places where large oaks occur.

Mammals: Many typical mammal species of Latvia are known in the territory, from them 4 are protected in Latvia and of European concern - *Castor fiber*, *Lutra lutra* and *Canis lupus*. There is also information about *Lynx lynx* in the territory.

Amphibians: From the Habitats Directive species there are known 2 species - *Rana lessonae* and *Rana arvalis*.

Habitats: In the mire vegetation raised bog habitats dominate (7110*), part of them are degraded due to drainage. Here occur also transition mires and quaking bogs (7140). In forests there are 3 habitats (9010*, 91D0*, 9080*) of Habitats Directive Annex I that are priority ones. The largest areas cover bog woodlands 91D0*. From the 7 lakes 2 are considered as dystrophic lakes (3160).

Factors that negatively influence the territory:

- Change of the hydrological regime due to the drainage;
- Invasion of spruce in the Western taiga habitats that is a place for *Tetrao urogallus* leks;
- Water level in the lakes has risen due to the activities of *Castor fiber*, as a result several protected plant species of Latvia (*Lobelia dortmanna*, *Isoetes lacustris*, *Eleocharis multicaulus* etc.) have disappeared;
- Lake eutrophication;
- Recreation (berry picking, trampling, waste, danger of fires);



Drainage ditch in Vasenieks Mire (Photo by M. Pakalne)

- Intense forest cutting before 1999 when the protected nature area was established;
- Ceasing of grassland management, as a result *Molinion* meadow (6410), has overgrown but it can be restored.

Management actions. In total there are 9 short-term aims for 33 management actions are planned:

1. Maintenance of intact raised bogs without any disturbance ;
2. Maintenance of biologically valuable forests;
3. Restoration of hydrology in Vasenieki Mire by building dams on the drainage ditches, hydrological studies in the site;
4. Restoration of *Molinia* meadows;
5. Management of 4 *Tetrao urogallus* leks;
6. Building of a nature trail (2,7 km) and a tower (6 m), topographical and geological studies along the route of the nature trail;
7. Setting of information signs and boards;
8. Publishing of informative materials about the site;
9. Monitoring the effects of the management actions;
10. Bird monitoring;
11. Lake quality monitoring.

Zonation: 4 functional zones are planned:

Zone of regulated regimen (617 ha – 9,4 %)

Nature reserve zone (4686 ha – 71 %)

Nature park zone (1245 ha – 18,8 %)

Neutral zone (50 ha – 0,8 %)

Management plan for Veseta Floodplain Mire



Fern vegetation in Veseta Floodplain Mire (Photo by M. Pakalne)

Plants: Veseta Floodplain Nature Reserve includes valuable transition mire and spring fen habitats that holds a high diversity of orchid species and bryophytes. This is the habitat for the largest population of *Saxifraga hirculus* in Latvia and *Hamatocaulis vernicosus* – species of habitats Directive Annex II. In the territory 18 protected vascular plant species and 10 bryophyte species were discovered but the total number of vascular plants reaches 325 species and 112 bryophytes. In 18 protected species of EU importance and Latvia are listed.

Birds: This is a relatively small area that can not be a habitat for numerous bird species. Still, here several bird species characteristic for floodplain habitats occur. Also wet forests are suitable for bird species. Several pairs of *Pernis apivorus*, *Grus grus*, *Porzana porzana*, *Circus aeruginosus* breed here. In total 13 bird species of EU importance were found in the site.

Invertebrates: Due to the great diversity of habitats there are many invertebrate species, from which 14 are protected species of Latvia. From them 3 are Habitats Directive Annex II species: *Ophiogomphus cecilia* and *Lycaena dispar*, but in the river *Unio crassus* was found. In 2005 in the forests *Prionus coriarius* was found that is the second locality of the species in Latvia.

Mammals: Species Habitats Directive Annex II and IV *Lutra lutra* and *Castor fiber* occur in the site that has here very suitable habitats. Near the river 4 protected bat species of Latvia were discovered. Footprints of *Lynx lynx* and *Canis lupus* were observed.

Habitats: In total 8 habitats of Habitats Directive Annex I and 3 protected habitats of Latvia are known in the Project site, from them 3 are priority ones (91D0*, 9080*, 9010*). The most valuable habitat here are spring fens, although forests, transition mires (7140) and floodplain meadows occur as well.

Factors that negatively influence site:

- Overgrowing of transition mires and spring fens by shrubs and trees;
- Overgrowing of floodplains by shrubs and tall vascular plant species;
- Earlier forest drainage carried out in the project territory and outside;
- Change of the Veseta River bed in 19th century that can not be evaluated as totally a negative influence as in the new part natural river meanders and where also habitats of EU importance occur. In the old-river beds many protected species occur.

Management actions are subordinated to the short-term aims for the protection of the territory. In total for their realization 22 actions are planned from which one of the main is the management of transition mires and spring fens. The others include setting up information signs and boards, publishing of informative materials.

Zonation of the territory: Not necessary.

Cultural and historical objects from the II World War.

On February 14, 2006 at the meeting of the Latvian Fund for Nature the results of the elaboration of the management plans were presented. At the start of the meeting Valda Baronina gave an overview about the status of the elaboration of the 4 management plans.

The second presentation was given by Baiba Bambe – the management plan expert for Veseta Floodplain Mire. The third presentation was about Cena Mire Nature Reserve and was given by Inese Silamikele – the management plan expert.

Preparation of the management plans is the duty of the main habitat expert and management plan experts. Field experts (ornithologist, botanist and habitat expert etc.) are involved in the data collection for the management plans.

One portable computer was bought for the preparation of management plans. Four-wheel drive car is used for the site visits during the data collection for the 4 management plans.

Variations/complications/delays: Due to the presence of valuable forest habitats of EU Habitats Directive in the process of the preparation of the List of the prospective Natura 2000 sites the total area of the two project sites has been increased in 2003/2004 – Veseta Floodplain Mire from 121 ha to 424 ha and Klani Mire from 1057 ha to 1615 ha. Therefore, the management plans for these areas are elaborated for larger area. Still, this does not need additional finances for these project sites as the total area of this LIFE project has not increased.

Additional information: Annex 2-7. Management plan actions for the project sites. Annex 8 - 13. Habitat maps in the project sites. Annex 14. Species and habitats in the project sites. Annex 15-18. Protected species and habitats in Cena Mire, Stikli Mires, Klani Mires, Veseta Floodplain Mire. Annex 19-21. Copies of the management plans. Annex 22. Programs of the management plan Advisory Group meetings, Annex 23-24.

Programs of the Public hearings. Annex 25. Program of meeting with local people in Stikli School. Annex 26. Copies from the Power Point presentations about the results of the management plans. Annex 46. Press review. Annex 47-49. Photos of the Project team, project sites and project actions.

ACTION A.2: Hydrological investigations for the preparation of technical designs for building dams

Time plan: IV 2004 – III 2005

Progress: In order to carry out the restoration of the active raised bog in the drained parts of Cena Mire, Vasenieku Mire from Stikli Mire Complex and Klani Mires, the existing bog hydrology was assessed. Hydrological studies were carried out in the areas where the dams will be built. Estimation of groundwater flow directions in the raised bog was carried out by analyzing the topographic maps and the levelling of the mire surface. For elevation purposes the Trimble GIS equipment was used. In total, 120 groundwater observation wells were established. From them – 52 in Cena Mire, 28 in Stikli Mires and 40 in Klani Mire. The perforated plastic tubes with the lengths of 2 m and diameter of 10 cm are used as a material for the wells. Aerial maps and GIS (Geographical Information Systems) for the site management are used as well.



*Groundwater wells in Cena Mire
(Photo by M. Pakalne)*

Dutch expert Jan Streefkerk from the Netherlands was invited from June 24-26, 2005 as a consultant and expert in building dams. Several field trips were organised to Cena Mire and the possible ways of mire restoration discussed as well as the techniques of building dams on the drainage ditches.

Hydrology of Cena Mire, Klani Mire and Vasenieki Mire

The fieldwork to evaluate the hydrology of the project sites was carried out in late 2004 and during 2005 and continued in 2006. The maps of water flow directions were prepared (Annex 29-32).

The project sites are influenced by drainage and peat extraction that finds reflection also in the present hydrology of the sites. Before the peat extraction started in Cena Mire, it was one largest raised bogs of Latvia with the total area over 8500 ha. At present, only over 2000 ha have left, from which state protected are 2133 ha.



*Drainage ditches on the margins of
Cena Mire (Photo by M. Pakalne)*

Cena Mire Nature Reserve is surrounded by large drainage ditches that do not allow the further growth of the mire. The raised bog habitats in the margins are influenced by drainage and peat extraction and are degraded but central part of this raised bog acts like a sponge accumulating large amount of water in its body. There are more than 140 larger raised bog pools with a depth of 3 m (with area more than one hectare) and also *Skaists* Lake with an area of 18.5 hectares. The watershed crossing Cena Mire has a semicircle-shaped form dividing the water flowing in north direction to Rivers Nerina

and Dzilnupe; in west direction to Rivers Miglupite and Cena and south-east direction to River Misa. Historically, the flat land surface around the Mire has been gratifying for the bog expansion, intensity of which can reach 10 m per year by given conditions. However, digging the contour ditches around the raised bog area has stopped the further growth of the mire. The length of natural slopes from bog centre to the margins in Cena Mire is between 1 and 2 km. The biggest height difference between bog dome and margins is 7 m, in average – 3m. Since the July of 2005, the surface height measurements using the Trimble GPS two-frequency equipment were carried out. The purpose of those measurements is to construct the 100 x 100 m grid for estimation of water flow directions.

Klani Mire Nature Reserve is strongly affected by hydro-technical drainage carried out in 50-ties and 60-ties of last century. Nowadays, the runoff from drainage systems proceeds via channel connecting Klani and Busnieku Lakes. The old topographical maps show that natural water flow direction was north-oriented. Also the intact part of bog is exposed to northwest direction. Some traces of old watercourse supplying the water from lake to drainage system are also to find in northern side of Klani Lake.

Vasenieki Mire from Stikli Mires Nature Reserve is a raised bog where building of dams on the drainage ditches is planned. Therefore, hydrological studies were carried out there. During the 70-ties and 80-ties, the western and northern part of the mire has been intensively drained for the peat extraction. It is the area where degraded raised bog habitats have replaced the natural raised bog vegetation.



*Degraded raised bog in Vasenieki Mire
(Photo by M. Pakalne)*

The central part Vasenieki Mire includes also intact raised bog vegetation. The round-shaped raised bog ecosystem in its intact area is highly water saturated; especially wet is the northern part of the raised bog. The highest dome is placed in the central part of the raised bog. The medium size and smaller pools are distributed in circle around the dome. The peat layer thickness in average varies between 2 and 3 m. Under the peat layer, at the bottom of the raised bog there is sand, loamy sand and cley. Therefore, certain possibilities for water movement via the border horizon between mineral and peat layers exist, as is observed it in the drainage ditches. The

natural water flow follows the west direction. There is also forested depression with a natural rivulet. The flow in drainage systems also follows the west direction. Beaver, which role for bog hydrology is still not fully studied, mostly blocks drainage ditches.

Numerous hydrological investigations in **Veseta River floodplain Mire area** have been carried out since 60-ties of the last century, but mainly outside the present protected nature area. The floodplain as such, is influenced by river processes and has a special water flow regime. Both banks of floodplain area are steep and project in the surrounding relief. Veseta River has been used for floating of timber during the last centuries. At the end of 19th century the river was straightened for floating purpose. The artificial island between new and old riverbeds was established. On the banks of old river bed, the tall sedge fen and reed vegetation has developed. River Veseta has, at least, 5 riverbeds. The water has surface runoff over the entire valley. In spring the water is almost totally covering the valley surface. In the left side of river, there is transition mire and spring fen vegetation with a high number of endangered plant and bryophyte species. The water level in river and groundwater regime is important for successful management of given area. Considerably high impact on the floodplain water regime has a beaver.

Elaboration of technical designs for the project sites

Technical designs for building dams on drainage ditches were prepared in accordance with the Cabinet of Ministers regulations Nr. 382 “The order of building of melioration systems and hydro-technical constructions”. Technical designs were elaborated by the sub-contractor “Meliorprojekts”, supervised by the manager of the main activities.

For the elaboration of the technical designs for building dams, the official procedure was followed. First of all the tasks for the elaboration of technical designs were set up, then technical regulations for building were obtained, then environment technical regulations were obtained from the nature protection boards and finally – the permissions for building of dams on the drainage ditches. Only when all these documents were obtained from, then official permissions could be obtained.

At present, technical designs for building of dams on the drainage ditches are elaborated for all the planned project areas in the 3 project sites - Cena Mire, Vasenieku Mire from Stikli Mires Nature Reserve and Klani Mire. The technical designs include maps with the location of dams and information about their construction and size.

Technical designs were elaborated by “Meliorprojekts” State Ltd. It is an institution that has a license for the elaboration of technical designs if the change of site hydrology is planned. The process of the elaboration the technical designs included both field investigations in the project sites, as well as elaboration of technical designs for building dams on drainage ditches. The studies in the sites include the levelling of the ditches with the aim to determine the size and the number of the dams. The places of the planned dams were also marked in the field with a number of each of the dams. Maps with the location of the dams were prepared for Cena Mire, Vasenieku Mire and Klani Mire. Copies of the technical designs are added to the Report (Annex 33-35).

In comparison with the number of the dams planned in the project proposal, there are only very small changes – 4 dams more than in the project proposal. According to the results of the technical designs, 128 dams are planned (124 in the project proposal), but the small damming places – 257 (in the proposal, 250).

The comparison between the results of the technical projects and that was planned before is as follows:

- Cena Mire – in the technical design in total 70 peat dams and 4 peat dams with wood constructions and 140 damming places (according to the project proposal 52 peat dams and 33 wooden dams);
- Vasenieki Mire from Stikli Nature Reserve - in the technical design 18 peat dams and 117 small damming places (according to the project proposal 11 peat dams and 15 wooden dams);
- Klani Mires - in the technical design 36 peat dams (according to the project proposal 21 peat dam and 4 wooden dams).

The changes in the number of the dams are connected with the detailed studies in the field.

Building of peat dams is preferred to the wooded dams. Such conclusions were made after the study tour to Finland where the LIFE project sites were visited where the mire restoration work has been successfully carried out by building of peat dams. It was possible to observe that in Finland in such areas already on the next year after filling of the ditches totally, the *Sphagnum* species had appeared that indicate that the mire restoration process has started. Also the discussions with the Dutch and Irish experts that have an experience of building dams on the drainage ditches supported this idea.

As a result, the technical designs include more peat dams that could be more effective and should stay longer in comparison with the wood dams. Wood dams are planned in the places near larger lakes and bog pools as an addition for the safety of these peat

dams. The wood constructions would be inside the peat dam and in such a way will be safeguarded from decay. These measures were planned to guarantee the longer maintenance of these dams as well as to reduce the maintenance costs.

Variations/complications/delays: After organizing of the price quotation for the preparation of the technical designs for building dams, the cost was slightly lower than it was planned in the project.

Additional information: Annex 2. Management Actions in Cena Mire. Annex 4-6. Management actions in Stikli, Klani and Veseta Floodplain Mire. Annex 29-32. Diagrams of hydrological studies in Cena Mire and Stikli Mires. Annex. Maps of the groundwater flows in the project sites. Annex 33-35. Copies of technical designs for building dams in the project sites. Annex 49. Photos of the project activities.

ACTION A.3: Elaboration of technical designs for nature trails and watching towers

Time plan: I - IV 2005

Progress: Under this action 2 technical designs for building of nature trails in Cena Mire and Vasenieku Mire from Stikli Mires Nature Reserve and 2 technical designs for building 2 watching towers are completed in February 2006.

Field trips were carried out to evaluate the best route for the nature trails in Cena and Vasenieku Mire from Stikli Mires Nature Reserve. Representatives from Project partners and experts participated in this work.

The field studies and expert suggestions have revealed that the best route in Cena Mire would be on the southern part of Cena Mire, near Skaists Lake not to disturb the bird species. The route includes also raised bog and fen habitats. The nature trail is on the margin of Cena Mire to avoid damaging the most vulnerable area of the sites. For the safe location of the nature trails, geological studies, including the peat depth to evaluate the exact location of the nature trails and watching towers, have been started along the routes of the nature trails.

In Cena Mire the nature trail is planned 1,6 km long and the watching tower 6 m high but in Vasenieki Mire the nature trail - 2,7 km long and the tower 6 m high.

Variations/complications/delays: After the discussions with the Project Partners and the field work carried out by project experts - ornithologists, habitat experts it was suggested to change the route of the nature trails in Cena Mire Nature Reserve and Stikli Mires Nature Reserve because in this case the raised bog habitats and bird species would be least disturbed. Now both the routes are planned on the raised bog margins and the contrast between the degraded and intact raised bog habitats is clearly observed for the public. In Vasenieku Mire at the route it will be possible to observe the restoration of raised bog hydrology as it passes the area where the dams will be built on the drainage ditches.

Additional information: Annex 2. Management Actions in Cena Mire. Annex 4-6. Management actions in Stikli, Klani and Veseta Floodplain Mire. Annex 36-37. Copies of technical designs for building of nature trails in Cena Mire and Vasenieku Mire. Annex 38-39. Technical designs for building 2 watching towers.

ACTION A.4: Organization of price quotation

Time plan: IV 2004 – I 2005; I 2006; I – III 2007

Progress: The first price quotation was organized for Action A2 (Hydrological investigations for the elaboration of technical designs) from 22.11.2004. till 17.12.2004. Invitations were sent to three institutions – “Meliorprojekts”, “Hidro – Laveri” and “VISKO”. All these institutions have a license of hydrology and designing of hydrological buildings and registration card. Only one organization responded to our invitation – “Meliorprojekts”. Two institutions – “Hidro – Laveri” and “VISKO” did not respond. “Meliorprojekts” was the organisation who won the price quotation and prepared the 3 technical designs for building dams on drainage ditches in the 3 project sites – Cena Mire, Stikli Mires and Klani Mires Nature Reserves.

The second price quotation was organized before the action E6 (Production of audio-visual materials). Film Studio „elm media” and Kaspars Goba with the co-producers won it and now are working for film. For the price quotations Terms of Reference were prepared and contained a set of requirements needed for the actions to be carried out.

In February 2006, the third price quotation was organised for the Action C1 (Construction of dams on the drainage ditches). Terms of reference were prepared and sent to 3 institutions – “RKU Piejura” Ltd, “Meliorceltnieks” Ltd. and “Melioracija” Ltd. From all the 3 organisations responses were received to the price quotation. All the responses to the prices quotation were evaluated. From the three organizations the lowest price for building dams on the drainage ditches has “Melioracija” Ltd. The price reaches 129 128, 88 Euro for all the 3 sites where building of dams is planned. It is slightly less than in the project proposal (130 000 Euro).

The next two price quotations terms of reference are currently prepared for the following actions: Construction of watching towers (C2) and Construction of nature trails (C5).

Variations/complications/delays: No

Additional information: Documents of the 1st and 2nd price quotations have been handed in with the First Progress Report. Annex 40. Copies of documentation for price quotation for building dams on drainage ditches in the project sites – Cena Mire, Stikli Mires and Klani Mire Nature Reserves.

ACTION A.5: Making agreements and signing contracts

Time plan: IV 2004 – I 2005

Progress: During the period, from October 2004 till May 2005, 16 agreements were drawn up and signed with the project partners. Preparation of the agreements was assisted by a lawyer.

In total four agreements were prepared and signed also with the sub-contractors for the following actions A2 (elaboration of technical designs for building of dams on drainage ditches), E6 (production of audio-visual materials). Agreements with sub-contractors are prepared after receiving the proposals from the price quotations.

Agreement has been prepared with the Dutch expert Jan Streefkerk to help for Action A2 – hydrological studies and building of dams on the drainage ditches.

Variations/complications/delays: No

Additional information: Copies from the agreements with project partners and sub-contractors are added to the First Progress Report. Annex 41. Copy of the agreement with the expert from the Netherlands in raised bog hydrology and restoration of hydrological regime.

C. Non-recurring management

ACTION C.1: Construction of dams and restoration of natural raised bog hydrology

Time plan: II – IV 2006; II – IV 2007; II – 2008

Progress: No

Variations/complications/delays: No

Additional information: No

ACTION C.2: Construction of watching towers

Time plan: III – 2006; III – 2007

Progress: No

Variations/complications/delays: No

Additional information: No

ACTION C.3: Removing shrubs and pine

Time plan: III – 2006

Progress: In January, 2006 the management plan for Veseta River Floodplain was completed. It includes the management actions that should be carried in this project site. One of them is removing of shrubs and pine in transition mire and quacking bog area.

Variations/complications/delays: In 2005 during the elaboration of the management plan for Veseta Floodplain Mire, the project management plan expert has studied in detail and mapped the habitats of this especially protected nature area. The precise area of all the habitats, including transition mires and quacking bogs was determined.

The experts have concluded that the area of transition mires and quacking bogs where removing of shrubs and pine, differs from the area that was determined for the project proposal from the existing topographic maps. Now it is 4, 9 ha instead of 90 ha that was mentioned in the project proposal. It could be due to the overgrowing of fens by trees.

Still, in this area management of transition mires and quacking bogs is needed to maintain the habitat of 2 species of EU importance – *Saxifraga hirculus* and *Hamatocaulis vernicosus*. The transition mire and quacking bog habitats border also with 2 priority habitats of EU Habitats Directive – Bog woodland (9010*) and Western Taiga (9010*) where no management is planned.

Therefore, the Action E4 (Removal of shrubs and pine) can be carried out only in the area of 4, 9 ha instead of 90 ha that was planned in the project proposal.

Due to the increase of the petrol price there is also an increase in the cost of the project actions. Therefore, the financial resources allocated for this action could be used for the other project actions that have become more expensive. The management action will be carried out later this year.

Additional information: Annex 7. Management actions in Veseta River Floodplain Mire Nature Reserve.

ACTION C.4: Management of forest habitats

Time plan: II – III 2006

Progress: During the elaboration of management plans for Stikli Mires Nature Reserve and Klani Mires Nature Reserve the Western taiga forest habitats and *Tetrao urogallus* leks were studied. Management of Western taiga forest habitats with *Tetrao urogallus* leks is needed in 4 from the 5 *Tetrao urogallus* leks are located in Stikli Mires Nature. In these areas invasion of spruce (*Picea abies*) takes place. The overgrowing by spruce in these *Tetrao urogallus* leks disturbs them. During the lekking time the male specimens of *Tetrao urogallus* need open areas to have an overview to more wider surrounding area to see the predators if their appear, or hear the concurrent or females. The management of these leks will include the removal of the small spruce trees until the diameter of 16 cm. Western taiga forest habitat management is planned also in Klani Mires Nature Reserve. The total area of forest management in Stikli and Klani Mires reaches 61 ha. In spring 2006, the precise location of forest management areas will be finalised but the action will be carried out in autumn 2006 according to the methodology developed by the project experts. Action will be organized by the main stakeholder State Joint-Stock Company “Latvia’s State Forests”.

Variations/complications/delays: No

Additional information: Annex 3. Provisional map of forest management in Stikli Mires Nature Reserve. Annex 6. Management actions in Klani Mires Nature Reserve.

ACTION C.5: Construction of nature trails

Time plan: III 2006; III 2007

Progress: No

Variations/complications/delays: No

Additional information: No

D. Recurring management

ACTION D.1: Monitoring site hydrology and the effects of management measures on habitats and species

Time plan: II 2005 – IV 2008

Progress: Habitat and hydrological monitoring is carried out were all the project sites where building of dams and habitat management is planned as well in the transition mires where removing of pine and shrubs is planned. The methodology described in the Handbook for Mire Monitoring in Latvia is applied that is based on plant species and structure monitoring in permanent plots. In 2005 (July - September) permanent plots were established next to hydrological monitoring plots, in places where vegetation changes are most likely to occur before the planned management actions take place in 2006. There are 38 monitoring plots on ditches in the raised bogs, twenty monitoring plots in raised bogs (7110*, 7120) and four monitoring plots in transitional mire (7140). The number of permanent plots depends on the size of management area in each site. Monitoring scheme includes also control plots. Plant species composition and the percentage cover are evaluated. The size of the plots is 1x1 m. There are 3-5 plots within the larger 10x10 m relevé. The wetness of the sites was recorded and includes surface water evaluation; identification of adjacent pools and *Sphagnum* dominated vegetation. In total there are 130 monitoring plots.

The hydrological monitoring in **Cena Mire** was begun in January of 2005. In the project sites in total, 120 groundwater observation wells were established. From them – 52 in Cena Mire, 28 in Stikli Mires and 40 in Klani Mire. The hydrological monitoring area is located in the degraded raised bog habitats, between the ditches in drained area in the intact area of the raised bogs for the control of the success of the management activities. The groundwater wells are placed along transects – in an average 10 wells along transect. Groundwater level is measured manually by tape. The frequency of measurements was dependent from meteorological conditions.

From the results of the hydrological monitoring several conclusions were drawn:

- The groundwater level in drained margins of Cena Mire in year 2005 was in average 15 cm lower than in the intact area of the raised bog;
- The fluctuations of the groundwater level in the intact and drained areas of bog are synchronous and, most likely depend from the meteorological conditions, e.g., the amount of precipitation;
- The range of groundwater fluctuations is wider in the drained part of bog, most likely, because of impact of drainage ditch network;
- The low groundwater level and range of fluctuations are one of the causes for changes in the natural raised bog vegetation.

The plots of ground vegetation monitoring are placed near transects of groundwater observation wells.



Groundwater monitoring in Vasenieks Mire (Photo by M. Pakalne)

In **Vasenieku Mire from Stikli Mires Nature Reserve** the groundwater observation wells for the hydrological monitoring were installed in July of 2005. Twenty-eight wells, mostly between the drainage ditches, were established. Systematic groundwater level measurements were started from middle of November of 2005.

In Klani Mire Nature Reserve the establishment of hydrological monitoring sites was carried out in July of 2005. In total, 40 groundwater wells were established in the intact and drained parts of bog.

Hydrological and habitat monitoring is integrated. In the plots, water level measurement is carried out. Habitat expert together with hydrologist monitors the habitats analyses the hydrological data on the groundwater level measurement.

Habitat changes are also be monitored using on-site photographs taken in order to compare the state of habitats before and after management. Observation points for habitat and ground water level measurements will be marked by GPS (Geographical Positioning System).

Variations/complications/delays: No

Additional information: Annex 27-28. Diagrams of hydrological studies in the project sites. Annex 29-30. Groundwater flows in the project sites. Annex 50. Monitoring plots in the project sites.

E. Public awareness and dissemination of results

ACTION E.1: Organization of seminars

Time plan: IV 2004 – II 2005; III 2006; II 2007; I – III 2008

Progress: At the beginning of the project, 3 one-day introductory seminars were organized in the three project areas (Riga, Ventspils and Jaunkalsnava). During the seminars the participants were informed about the start of the project, its objectives and planned activities as well as contacts established between all the stakeholders and partners who are involved in the various project activities. Seminars were organized in co-operation with the partners of the project – Riga Forest Agency, Ventspils Regional Environmental Board and Forest Research Station who provides the facilities for the seminars. In seminars participants were informed about the start of the elaboration of the management plans for all the 4 project sites – Cena Mire, Stikli Mires, Klani Mire, and Veseta Floodplain Mire.

There were also discussions about tourist guides for the nature trails, hunting mammals and birds and the changes of borders for Cena Mire Nature Reserve.

- 1) **In December 17, 2004** the First Introductory Seminar was organized for the stakeholders and the project partners of Cena Mire Nature Reserve.
- 2) **In February 21, 2005** the Second Introductory Seminar was organized for the stakeholders of Veseta River Floodplain Mire Nature Reserve.
- 3) **In February 22, 2005** the Third Introductory Seminar was held in Ventspils for the stakeholders of Stikli Mires Nature Reserve and Klani Mires Nature Reserve.

The **First Seminar** of the project was held in Marupe Municipality and was attended by 34 persons from 16 institutions. Representatives from the following institutions participated in the meeting - Nature Protection Board, Marupe Municipality, Olaine Museum of History and Art, Babite Municipality, Riga Forest Agency, Joint Stock Company „Olaines Kudra”, University of Latvia, Ltd „Ergla ligzda”, Nature Link International, Latvian Museum of Natural History, Latvian Ornithological Society, Babite Forestry, Tirelu Forestry, Riga Regional Environmental Board, Latvian Fund for Nature.

The **Second seminar** of the project was held in the Forest Research Station (Jaunkalsnava). The following representatives participated in the meeting (21 persons from 12 institutions): Nature Protection Board, Madona Regional Environmental Board, Forest Research Station, Latvian State Forestry Research Institute „Silava”, Vietalva Municipality, Aiviekste Municipality, Kalsnava primary school, administration of Teici Strict State Reserve, The State Forest Service, Aizkraukle District Council, Latvian Fund for Nature. This seminar was organized as introductory of project and as information to the stakeholders and to the project partners of Veseta Floodplain Mire. All the project partners informed about their activities in the project.

The **Third Seminar** of the project was held in Ventspils Regional Environmental Board. The following representatives attended the meeting (31 persons from 19 institutions): Nature Protection Board, State Joint Stock Company „Latvia’s State Forests”, Ventspils Regional Environmental Board, Pope Municipality, Puze Municipality, Usma Municipality, The Ministry of Environment of the Republic of Latvia, Pope Forest District, Usma Forest District, University of Latvia, Talsi District Council, Targale Municipality, The State Forest Service, Latvian Ornithological Society, Slitere National Park, household „Ievakalni” (private land owner) and Latvian Fund for Nature.

Variations/complications/delays: No

Additional information: Annex 51-53. Programs of the 1st, 2nd and 3rd seminars in the project sites.

ACTION E.2: Preparation and publishing of 5 informative booklets about the project sites and the LIFE project

Time plan: II 2005; III 2006; I 2007; III 2007; I 2008

Progress: In February, 2005 the first informative booklet about the LIFE Project was published (5 000 copies in Latvian). The booklet includes information about the LIFE project, aim and objectives, main actions and expected outcomes, as well as nature values of the Project sites, habitats, flora and fauna and threats.

The Latvian version of the booklet was distributed to the project partners, stakeholders, local inhabitants of the projects sites during all the project seminars, Management plan Advisory Group meetings and project Steering Group meetings.

The English version of the Project booklet was issued in August 2005 before the LIFE Co-op seminar that took place in Latvia in August 22-23, 2005. It was distributed to more than 100 participants from 13 countries. It was distributed in other international seminars and conferences - W3M Conference for Wetlands: Monitoring, Modelling and Management”, September 22-25, 2005 in Poland and 1st Annual Meeting of the Society of Wetland Scientists – Europe “Integrating our approaches to Wetland Science”, January 5-7, 2006, Bangor, Wales, UK. The English version was printed in 2000 copies.

Both the information leaflets are also available in electronic format in the home page of the Latvian Fund for Nature.

Preparation of the next project booklets about Klani Mires Nature Reserve and Cena Mires Nature Reserve is in progress. Information that was collected during the elaboration of management plans is now summarised for the booklets. The booklets will include general data about the project sites, plant and animal species, habitats and species of EC concern, maps of the sites as well as information about the management actions carried out in Cena Mire and Klani Mires Nature Reserve.

Variations/complications/delays: The First informative booklet was delivered earlier than planned – already in February 2005, but second in English - in August.

Additional information: Annex 54 - Informative booklets of the project in Latvian and English.

ACTION E.3: Arrangement of nature trails

Time plan: II – III 2006; II – III 2007

Progress: No

Variations/complications/delays: No

Additional information: No

ACTION E.4: Establishment of information boards

Time plan: II – III 2006; II – III 2007

Progress: Preparation of the text and maps for the information boards and signs has been started.

Information summarised for the project posters “Vegetation studies, habitat monitoring and managements in Cena Mire” and “Hydrological and vegetation studies in LIFE “Mire” project in Latvia”, which were prepared for the participation in international seminars (Action E.10), was also used for the preparation of information boards and signs.

The information boards and signs for the project sites will include the new data collected during the elaboration of the management plans. Preparation of the text and maps for the information boards and signs has just been started.

The large-size information boards will be located both at the borders of the project sites. The small-size information boards and signs will be located along the route of the nature trail in Cena Mire Nature Reserve.

Based on the relief maps for the project sites, the 3-Dimensional Models for were prepared for Cena Mire, Klani Mires and Stikli Mires using the ArcScience9, ArcMap9 and ArcView 3.2 programmes. Also these maps with the placed on the information boards as reveal the spatial structure of the raised bogs.

The information boards will include general information about the LIFE project and the project sites, maps and text about habitats, species, both typical and those of EU concern.

Variations/complications/delays: No

Additional information: Annex 42-45. Three-Dimensional Model for prepared for Cena Mire, Klani Mires and Stikli Mires Nature Reserve. Annex 51. Posters of the project.

ACTION E.5: Creation and updating of the home page of the project

Time plan: IV 2004 – IV 2008

Progress: Information about the project and its sites – Cena Mire, Stikli Mires, Klani Mire and Veseta Floodplain Mire, as well as habitats and species of EU concern (active raised bogs, Western taiga, transition mires and quaking bogs, etc), their management and monitoring activities is prepared for the home page of the Latvian Fund for Nature (<http://www.ldf.lv>).

In the home page there is also information about current actions of the project, Project Steering Group meetings and the Management Plan Advisory Group Meetings and new plant and animal species of EU importance found in the project sites during the elaboration of the management plans in 2005.

In the home page there is also the information about the meeting at the Latvian Fund for Nature when the project management plan experts informed about the results of the elaboration of the management plans for the project sites and the TV shot for Cena Mire was shown for the first time.

The home page is regularly updated with the information about project activities, photos of the habitats and species of EU Importance.

Information is prepared both in Latvian and English.

Home page is linked with the home pages of other protected areas, the Ministry of Environment, project partners and co-financiers, nature conservation and forest authorities and other Latvian LIFE-Nature projects.

Variations/complications/delays: No

Additional information: Annex 55. Printouts from the home page of the Latvian Fund for Nature.

ACTION E.6: Production of audio-visual materials

Time plan: II – III 2005; II – III 2006; II – III 2007; II – IV 2008

Progress: The production of the video film about the Project has been started. The aim of popular science film is to show that mires are significant part of the nature diversity, as well as that mires are the only possible habitat for many species of plants, animals, birds and insects. The goal of the film is to educate society about diversity of the mire habitats and their role in nature, about habitats of European importance, necessity of their protection. The film is intended as documentary story about the variety of mire habitats in Latvia.

The stress in the film is on priority habitats – active raised bogs 7110*. The film will include also the information on transition mire and quaking bog (7140), Fennoscandian mineral-rich spring and spring fen (7160), alkaline fen (7230), lake (3130, 3150, 3160) and forest (9010*, 91D0*, 9140*), *Molinia* Meadow (6410) habitats as well as plant species – *Saxifraga hirculus*, *Liparis loeselii*, *Hamatocaulis vernicosus*.

Use of aerial photographs, combined photographs and 3D graphics* in combination with regular follow up to LIFE project activities, interviews and other materials the film will become an educational work which will tell about the variety of mire habitats in Latvia, the necessity of their protection, about problems which influence the mires negatively and about possible solutions for those problems.

The film will consist of several separate parts, telling both about the Latvian mires in general, types of mires, habitats observed there, factors influencing mires and possible problem solutions, and also a detailed look at the 4 LIFE project sites – Cena Mire, Veseta Floodplain Mire, Stikli Mires and Klani Mire. The film is prepared in two languages – Latvian and English and will be completed at the end of the project in September 2008, allowing the producers of the film to follow all LIFE project activities in all project territories.

In 2006 the TV shot in the length of 18 minutes about Cenas Mire Nature Reserve was prepared and for the first time shown at the meeting of the Latvian Fund for Nature on February 14, 2006 devoted to the results of the elaboration of management plans in the project sites.

The TV shot about Cena Mire includes the information about the LIFE project and project actions, threats to the project sites and the possible solutions to reduce the drainage influence.

Variations/complications/delays: No

Additional information: Annex 63. TV shot about Cena Mire Nature Reserve.

ACTION E.7: Organizing Raised Bog Conservation Day

Time plan: III 2007

Progress: No

Variations/complications/delays: No

Additional information: No

ACTION E.8: Elaboration of educational pack for teachers

Time plan: IV 2006 – I 2007

Progress: Information about the project sites – Cena Mire and Stikli Mires, plants, animals, habitats found there is currently summarized for the materials for the teachers and schoolchildren.

Variations/complications/delays: No

Additional information: No

ACTION E.9: Preparation and publishing of Guidelines on habitat and species conservation and management

Time plan: II – III 2008

Progress: No

Variations/complications/delays: No

Additional information: No

ACTION E.10: Participation in study tours, seminars and other meetings

Time plan: IV 2004; II – III 2005; II 2006; III 2007; III 2008

Progress: Four Study tours to the LIFE projects in Latvia were organized:

- 1) In November, 2004 the first one-day visit to the Teici Nature Reserve was organized where the LIFE Nature Project „Measures to ensure the nature conservation management of Teici Area” (LIFE00 NAT/LV/007127) is successfully carried out;
- 2) In April, 2005 one-day visit to the Kemeri National Park to the LIFE project “Conservation of wetlands in Kemeri National Park, Latvia” (LIFE02 NAT/LV/008496), to know about the management actions carried out within this LIFE project;
- 3) In May, 2005 one-day visit to the Pape LIFE project „Lake Pape-Conservation, Preservation and Evolution” (LIFE03 NAT/LV/000081) where mire restoration actions are planned. Information about building of nature trails and towers was obtained;
- 4) In July, 2005 one-day visit to Lubana LIFE project „Management of the Lubana Wetland Complex” (LIFE03 NAT/LV/000083). During the study visit information was obtained about the project management, building of towers, nature trails, building of dams in Lubana Wetland Complex.

In August 17, 2005 an excursion for the expert group consisting of 25 people from the Polish LIFE project “Conservation of Baltic raised bogs on Pomerania, Poland” (LIFE04 NAT/PL/000208) were guided to Cena Mire by the project manager Mara Pakalne and manager of the main activities Juris Nusbaums. During the excursion, there were discussions and experience exchange on mire restoration methods in Poland and Latvia.

There were also 3 Study tours organized abroad for the Project staff and representatives from the Project partners:



Study tour in Kamanos Nature Reserve in Lithuania (Photo by S. Sprainaityte)

- 1) In May, one-day visit was organized to the Nigula State Nature Reserve, Häädemeste, Tolkuse and Maasika Bogs where LIFE-Nature project was carried out. The trips included visits to the area where nature trails and towers are already built in Estonia.
- 2) From June 2 – 5, 2005 study tour to Lithuania was organized. During the study tour several protected areas were visited, like Kamanos Nature Reserve, Dzūkija National Park, Zuvinto Biosphere Reserve and Cepkelius Nature Reserve. Experience learned in building of dams in Kamanos Nature Reserve.

- 3) From July 11-17, 2005 a study tour was carried to Finland. It was for the project team to visit the LIFE-Nature project sites where the successful restoration of the active raised bogs was carried out in. Project team members (4) and representative from the project partner organization – Nature Protection Board participated in the study tour. The trip was guided by Dr. Tapio Lindholm and included various LIFE project sites, such as LIFE project „Management of Wetlands along the Gulf of Finland. Migratory flyway (2003 – 2007)” (LIFE03 NAT/FIN/000039), Seitsemien National Park, LIFE project „Restoration of Active Raised Bogs, Aapa Mires and Bog Woodland (1996 – 1999)” (LIFE96 NAT/FIN/003025), visit to Lakkasuo Mire, Vihriäisenneva and Konilammensuo restoration sites, field trip to Siikaneva, Liesjärvi National Park, Soukonkopi restoration object, visit in the exhibition of mires at Hämeen luontokeskus, field trip to Torronsuo National Park, Puurijärvi – Isosuo National Park (birds watching tower and problems of succession in wetlands). During the trip in Finland the LIFE Project sites where mire restoration is carried out were visited. For more details see the home page of the Latvian Fund for Nature.



Project experts in Finland in a restored mire (Photo by M. Pakalne)

Participation in seminars

1. First workshop of the LIFE coop Project "Dissemination of ecological knowledge and practical experiences for sound planning and management in raised bogs and sea dunes" (LIFE2003NAT/CP/NL/000006) in Aalden, the Netherlands, October 5-8 October 2004 (<http://www.barger.science.ru.nl/life/>). In the workshop Project manager Mara Pakalne participated and gave the presentation about the LIFE Project. Over 60 people, involved in nature management, policy making and scientific research in different disciplines, from 12 European countries participated. Information on the long term effects of threats raised bogs, as well as current ecological knowledge, perspectives, and solutions to nature management problems were discussed.

2. Second workshop of the LIFE co-op Project "Dissemination of ecological knowledge and practical experiences for sound planning and management in raised bogs and sea dunes" in Latvia and Estonia August 22-26, 2005. During the seminar on August 22

presentation about Cena Mire and activities of the LIFE project was given by the project manager Mara Pakalne but on August 23 the excursion was guided to the site where over



Discussions about the management actions in Cena Mire during the LIFE Co-op seminar (Photo by I. Salna)

70 participants from 13 countries participated, including The Netherlands, Belgium, Ireland, Great Britain, France, Lithuania, Estonia, Latvia, Belarus, Germany. In total 13 experts - zoologists, geologists, habitat experts and botanists participated in guiding the excursion in Cena Mire Nature Reserve. Field Guide was prepared for the excursion participants. It includes general information about Cena Mire and management actions. A poster was prepared for this workshop by Mara Pakalne and Aigars Indriksons under the title “Hydrological and vegetation studies in LIFE “Mire” sites in Latvia.

3. 14th Workshop European Vegetation Survey, Rome (Italy), from March 11-14, 2005. Two staff members – Project manager Mara Pakalne and Project assistant Iluta Luce took part there. Mara Pakalne gave a presentation about the LIFE Project under the title „Monitoring and habitat management in the „Mire” LIFE Project sites in Latvia”. A poster about Cena Mire was also presented in the workshop.

4. W3M Conference for Wetlands: Monitoring, Modelling and Management”, September 22-25, 2005. in Wierzba, Poland Mara Pakalne and Iluta Luce participated in this Conference (<http://levis.sggw.waw.pl/wethydro/>). Presentation under the title „Habitat management in the „Mire” LIFE Project sites in Latvia” was given by the Project manager Mara Pakalne.

5. 1st Annual Meeting of the Society of Wetland Scientists – Europe “Integrating our approaches to Wetland Science”, January 5-7, 2006, Bangor, Wales, UK. Mara Pakalne participated in the conference with the presentation about LIFE project under the title “Raised bog habitat management and monitoring in Latvia”.

6. 64th Annual Scientific Conference of the University of Latvia, Section “Mires”, February 3, 2006, Riga, Latvia. Project experts presented results of geological, hydrological, habitat and plant species studies collected for the management plans of the project sites. In total 5 project experts had papers under the following titles – Laimdota Kalnina “Paleovegetation of the raised bogs in Latvia”, Stella Alukevica “Paleovegetation of Cena Mire”, Inita Daniele “Fungi species in Cena Mire”, Aigars Indriksons “Hydrological monitoring in the raised bogs”, Mara Pakalne “Mire studies in LIFE project “Implementation of Mire Habitat Management Plan For Latvia”.

Variations/complications/delays: In the Project the study tour to Finland was planned in 2006 but it was organized in July 2005 as it was important for the project to get to know about building of dams and restoration of mire habitats already in the planning stage before the start of these actions.

Additional information: Annex 56. Programs of the Study tours, Annex 57. Copy from the Power Point presentation at the 1st Annual Meeting of the Society of Wetland Scientists – Europe “Integrating our approaches to Wetland Science”, January 5-7, 2006, Bangor, Wales, UK.

ACTION E.11: Preparation of Layman’s report

Time plan: III – IV 2008

Progress: No

Variations/complications/delays: No

Additional information: No

F. Overall project operation and monitoring

ACTION F.1: Project administration

Time plan: IV 2004 – IV 2008

Progress: To implement the Project activities the Project team was established that consists of the project manager (Mara Pakalne), manager of the main activities (Juris Nusbaums), main habitat expert (Valda Baronina), project assistant (Stella Alukevica), expert in public relations (Ilze Salna) and financial assistant (Liga Bernane). Project organigram is shown in Fig. 1.

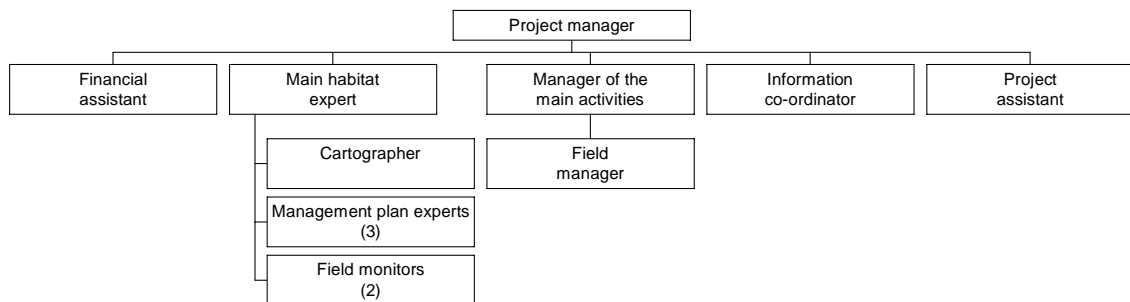


Fig. 1. Project organigram

Project manager coordinates the overall project performance, controls and monitors the whole project and team work, participates in the elaboration of management plans.

Project assistant keeps the documentation of the project, organizes correspondence with project partners, stakeholders and Ministry of Environment, organizes meetings of the Steering group, organizes study tours; participates in the organization of seminars.

Main habitat expert has prepared the management plan for one of the sites and organized the field work of the other management plan experts, collected data for the management plans on plant species and habitats that are needed for habitat maps of the project sites. The other 3 management plan experts summarized all the existing information about the project sites as well as planned the management actions. The management plan experts worked under the guidance of the main habitat expert.

To elaborate the management plans for the 4 project sites in total 18 experts were hired to collect the necessary information on fauna, flora, habitats, hydrology and geology. The experts also mapped the habitats in the project sites.

The cartographer prepared all the maps for the project sites. The 2 field monitors collected and summarised the information on the site hydrology and habitats as well as set up the monitoring plots.

The manager of the main activities worked together with the field manager – planned the practical actions, like building of dams, nature trails, watching towers.

Financial assistant keeps the accounts of the project and prepares the financial reports.

Public awareness co-coordinator (expert in public relations) organizes publishing of booklets, seminars, meetings with stakeholders, and sends out information letters about seminars and meetings.

For the successful management of the project, office equipment (2 personal and 2 portable computers, computer programs, 2 printers, 6 GPS, digital camera, scanner, bureau furniture, two 4x4 wheel drive cars) were bought. The cars are used for the actions related to the site visits during the elaboration of management plans, habitat and hydrology monitoring, mire habitat management activities, as well as overall project management and organizing the work with the 16 project partners.

In March 1, 2005 the First Project Steering Group was organized and the meeting held. The representative from the Ministry of Environment Dace Ozola chaired the Steering Group meeting. The Steering group includes representatives from the project partners and other institutions and municipalities. The First Steering Group meeting was held in Olaine History and Art Museum that is the project partner. The following representatives attended the meeting (19 participants from 12 institutions): The Ministry of Environment of the Republic of Latvia, Nature Protection Board, The State Forest Service, Riga Regional Environmental Board, State Joint Stock Company „Latvia’s State Forests”, Marupe Municipality, Olaine Museum of History and Art, Aizkraukle District Council, Forest Research Station, Riga Forest Agency, Targale Municipality, Latvian Fund for Nature.

In First Steering Group meeting Project manager Mara Pakalne informed about project aim and actions which were in progress and planned as well. The main habitat expert Valda Baronina informed about the start of the elaboration of management plans of the projects sites. Project expert in hydrology Aigars Indriksons and manager of the main activities Juris Nusbaums informed about their current and planned activities. Participants of the Project Steering Group advised to have more cooperation with private owners and mass media that has been taken into account in the further work. At present a 16 papers have been written for the mass media and more contacts established with the landowners.

In October 12, 2005, the Second Steering Group meeting was held Olaine History and Art Museum. The meeting was attended by 29 participants from 20 institutions. During the meeting the project manager Mara Pakalne informed about the progress of the project and the main results of the 12 actions that are carried out during the first year of the project.



Second Steering Group meeting of the project (Photo by G. Balodis)

Project habitat expert Valda Baronina told about the status of the elaboration of the management plans. Ilze Salna informed about public relations in the project. The manager of the main activities Juris Nusbaums told about the results of the elaboration of the technical designs for building dams, nature trails and towers. Project hydrologist Aigars Indriksons told about the results of hydrological studies. Project monitoring expert Liene Salmina informed about the results of the monitoring action in all the project sites.

The Project is realized in co-operation with the 16 project partners. The project partners participated in the project actions, like, elaboration of the management plans for the project sites, organization of seminars, discussions during the elaboration of technical designs for building of dams on the drainage ditches. The project partners have also taken part in the LIFE co-op seminar in August 2005 - both in the conference and the field trip to Cena Mire that is a project site.

The First Progress Report of the project was prepared for the time period from September 1, 2004 until October 31, 2005.

Variations/complications/delays: Steering group meetings are held every 6 months. In between there have been 8 Management Plan Advisory Group meetings where the progress of the project activities has been discussed as well. In the project it was planned to buy one 4X4 wheel drive car and another car. To carry out successfully both the habitat, hydrological and mire restoration activities it was decided to buy two 4X4 wheel drive cars that both are used for the field work and organizing contacts with the 16 project partners.

Additional information: Annex 47. Photos of the project team and experts. Annex 54. CV of the project manager. Annex 59-60. Programs of the 1st and 2nd Project Steering Group meetings. Annex 61. Copies of the Power Point presentations of the Second Project Steering Group meeting. Annex 62. List of Partners data.

ACTION F.2: Independent audit of the project

Time plan: IV 2005; I 2007; III – IV 2008

Progress: From November 8, 2005 until January 10, 2006 a certified Auditor SIA “Revidentu serviss” got acquainted with the project documentation.

Variations/complications/delays: No

Additional information: No

EVALUATION AND CONCLUSIONS

Project implementation

➤ The process

The LIFE project “Implementation of Mire Habitat Management Plan for Latvia” was started in September 1, 2004 and will last until December 1, 2008.

During the report period from the start of the project until March 2006 all the planned project actions were carried out. There are neither major problems nor delays in the Project actions.

One of the most complicated actions of the project was the elaboration of the technical designs for building dams on the drainage ditches according to the new legislation of Latvia. The procedure included obtaining of a number of permissions from the Regional Environmental Boards and Building Commissions.

In Latvia experts have little experience in hydrological studies in the raised bogs, restoration of raised bog hydrology and the practical aspects of building dams on drainage ditches? To overcome the lack of knowledge in this respect study tours were organised to learn the experience of the other LIFE projects, both in Latvia and abroad, as well as experience was gained during the contacts with experts from other countries while participating in International conferences, seminars and meetings.

➤ The project management, the problems encountered, the partnerships and their added value

The project team has worked in co-operation with the project partners that have participated in such project actions, like elaboration of management plans for the project sites as well as participation in seminars, including the International LIFE Coop seminar in August 2005. The project partners from Marupe and Babite Municipality, as well as

Olaine Museum of History and Art have regularly informed the public about the activities of the project in the local newspapers.

➤ **Success and failures**

The 3 management plans for Cena Mire, Veseta River Floodplain Mire and Klani Mires are completed earlier than planned in the project proposal. They are already approved by the Regulations of the Minister of Environment of Latvia that allows starting the site hydrology restoration actions in Cena Mire and Klani Mires as well as building of a nature trail and a watching tower. The fourth management plan for Stikli Mires Nature Reserve is finalised and will be completed in April, 2006.

Inventory of species and habitats in the project sites in 2005 has given valuable information about the species and habitats of EU importance in the project sites.

In 2005 a new dragonfly species for Latvia was found by the project expert – entomologist near Klani – now the 59th dragonfly of Latvia - *Orthetum brunneum*.

In Veseta Floodplain Mire also two insect species of EU importance *Lycaena dispar* and *Coenonympha hero* were discovered. The forests of Veseta Floodplain Mire are the second known locality of *Prionus coriarius* in Latvia.

In 2005 in Stikli Mires Nature Reserve the project ornithologist discovered once again the largest eagle of Latvia *Haliaeetus albicilla*. It means that the one aims of the protected nature areas has been fulfilled – *Haliaeetus albicilla* appreciates peace and silence that is maintained thanks to the status of the especially protected nature area. Stikli Mires Nature Reserve can be considered as a valuable site also thanks to the fact that there is a relatively high number of *Aegolius funereus* – are at least 10 pairs. There are few sites in Latvia with such a high density of this species.

In December, 2005 all the 3 technical designs for building dams on drainage ditches in Cena Mire, Stikli Mires and Klani Mires Nature Reserves were completed. These are the first technical designs for building dams on drainage ditches prepared according to the new legislation of Latvia. The elaborated technical designs will allow the start of practical management actions in the project sites, like restoration of site hydrology and building of nature trails and watching towers.

➤ **Comparison against the project objectives**

During the elaboration of the management plan for Veseta Floodplain Mire, the precise area of the transition mires and quacking bogs was determined. It differs from the area that was determined for the project proposal from the existing topographic maps.

From the field work and habitat mapping the management plan expert has concluded that in Veseta Floodplain Mires Reserve Nature the transition mires and quacking bogs cover only 4,9 ha. It is less than was determined before from the existing topographic maps 90 ha. Most probably such a great difference is because part of the area has overgrown by trees. Still, in this area management of transition mires and quacking bogs is needed to maintain the habitat of 2 species of EU importance – *Saxifraga hirculus* and *Hamatocaulis vernicosus*. Therefore, the Action E4 (Removal of shrubs and pine) can be carried out only in the area of 4, 9 ha instead of 90 ha that was planned in the project proposal.

Due to the increase of the petrol price there is also an increase in the cost of the project actions. Therefore, the financial resources allocated for this action could be used for the other project actions that have become more expensive. The management action will be carried out later this year.

Concerning the management Action A2 (Preparation of technical designs for building of dams in comparison with the project proposal, there are only very slight changes in the number of dams to be built in the project sites (4 more as planned before).

According to the technical designs for building dams on the drainage ditches, 128 dams are planned (124 in the project proposal), but the small damming places – 257 (in the proposal, 250). The comparison between the results of the technical projects and that was planned before is as follows:

- Cena Mire – in the technical design in total 70 peat dams and 4 peat dams with wood constructions and 140 damming places (according to the project proposal 52 peat dams and 33 wooden dams);
- Vasenieki Mire from Stikli Nature Reserve - in the technical design 18 peat dams and 117 small damming places (according to the project proposal 11 peat dams and 15 wooden dams);
- Klani Mires - in the technical design 36 peat dams (according to the project proposal 21 peat dam and 4 wooden dams).

These changes in the change of the number of the dams is conned with the detailed studies in the field.

➤ **Environmental benefits, policy and legislation implications**

The elaborated management plans for the project sites foresee the best possible conservation status for the priority habits of EU importance as well as species of EU concern as include the necessary management actions that would not be possible if there is no management plan for the project sites.

The technical designs for the restoration of site hydrology will allow for building of dams on the drainage ditches in Cena Mire, Stikli Mires and Klani Mires Nature Reserve and will allow stopping the further degradation of the raised bog habitats.

Management plans for the project sites are prepared in accordance with the Latvian legislation “Law on Specially Protected Nature Territories” (02.03.1993.), Regulations of the Cabinet of Ministers “On the General Protection and Use of Specially Protected Nature Territories (No 415/ 22.07.2003), Instructions of the Ministry of Environment “Recommendations for Development of Nature Conservation Plans” (No 120/ 04.07.2002).

Technical designs for building dams on drainage ditches are prepared in accordance with the Cabinet of Ministers regulations Nr. 382 “The order of building of melioration systems and hydro-technical constructions”. For the elaboration of the technical designs for building dams, the official procedure was followed.

➤ **Innovation, demonstration value**

There is a good experience in Latvia to build wood dams on the drainage ditches in Teici Nature Reserve. Still, there is another possibility to build peat dams in the areas which can be accessed by excavator. This is method that is applied in other countries within the LIFE project but not in Latvia before. So, it will be a new method applied in the restoration of site hydrology in the mires of Latvia.

➤ **Socio-economic effects**

The project sites are located within various municipalities of Latvia and have different stakeholders. Also the number of the private landowners is different.

During the realisation of the project activities many meetings have taken place where the project actions, like restoration of site hydrology was discussed. There was also a meeting in Stikli School situated within Stikli Mires Nature Reserve. In the meeting the

project experts told the local people and schoolchildren about the project, Stikli Mires and activities carried out there.

Private landowners the private landowners were personally invited to the Advisory Group meetings of the Management plans and actively participated in the discussion of the management plan actions as well as in the 2 the public hearings organised as part of the elaboration process of management plans Stikli and Klani Mires Nature Reserve. The local people got involved in the planning of the management actions in their area. Their ideas were incorporated in the management plans for all the project sites.

➤ **The future: sustainability**

The elaborated management plan foresees the conservation and management of habitats in the next 10-15 years and favours the sustainability for the conservation of protection habitats and species of EU importance.

➤ **Long-term indicators of the project success**

The project management actions in the project sites will favour the conservation of the raised bog habitats that is a priority habitat as well as stop the further degradation.

Building of the peat dams in the drained areas of the project sites will ensure the long-term restoration of the drained areas and stopping of the degradation of the raised bog habitats in the future.

Raising of water level in the degraded parts of the project sites should lead also to the return of typical raised bog species in the areas damaged by drainage and filling of the drainage ditches with *Sphagnum* species.

PLANNED PROJECT PROGRESS

In April, 2006 the next Project Steering Group Meeting is planned and will be organised together with the project partner – Olaine Museum of History and Art.

After the price quotation for Action C1 contract will be signed to carry out building of dams on the drainage ditches. The next price quotations for building nature trails and watching towers in Cena Mire and Vasenieki Mire from Stikli Mires Nature Reserve will be completed and agreements prepared.

In 2006, building of dams on the drainage ditches will be started in the project sites as well as building of a nature trail and a watching tower in Cena Mire and Vasenieki Mire from Stikli Nature Reserve (Action C2 and C5).

In the following months the next information booklets about the two project sites - Cena Mire and Klani Mires will be published in Latvian and English. In 2006 information boards will be set up in Cena Mire Nature Reserve.

Press releases and publications about the project will be prepared. Home page will be continuously updated about the last actions of the project.

Film production about the project sites will be continued to follow the next project activities.

From May 19-26 the Study tour to Ireland is planned to visit the raised bog restoration sites there within the LIFE projects, to see the practical building of dams there.

It is planned to complete the next Progress Report 2 until March 31, 2007.

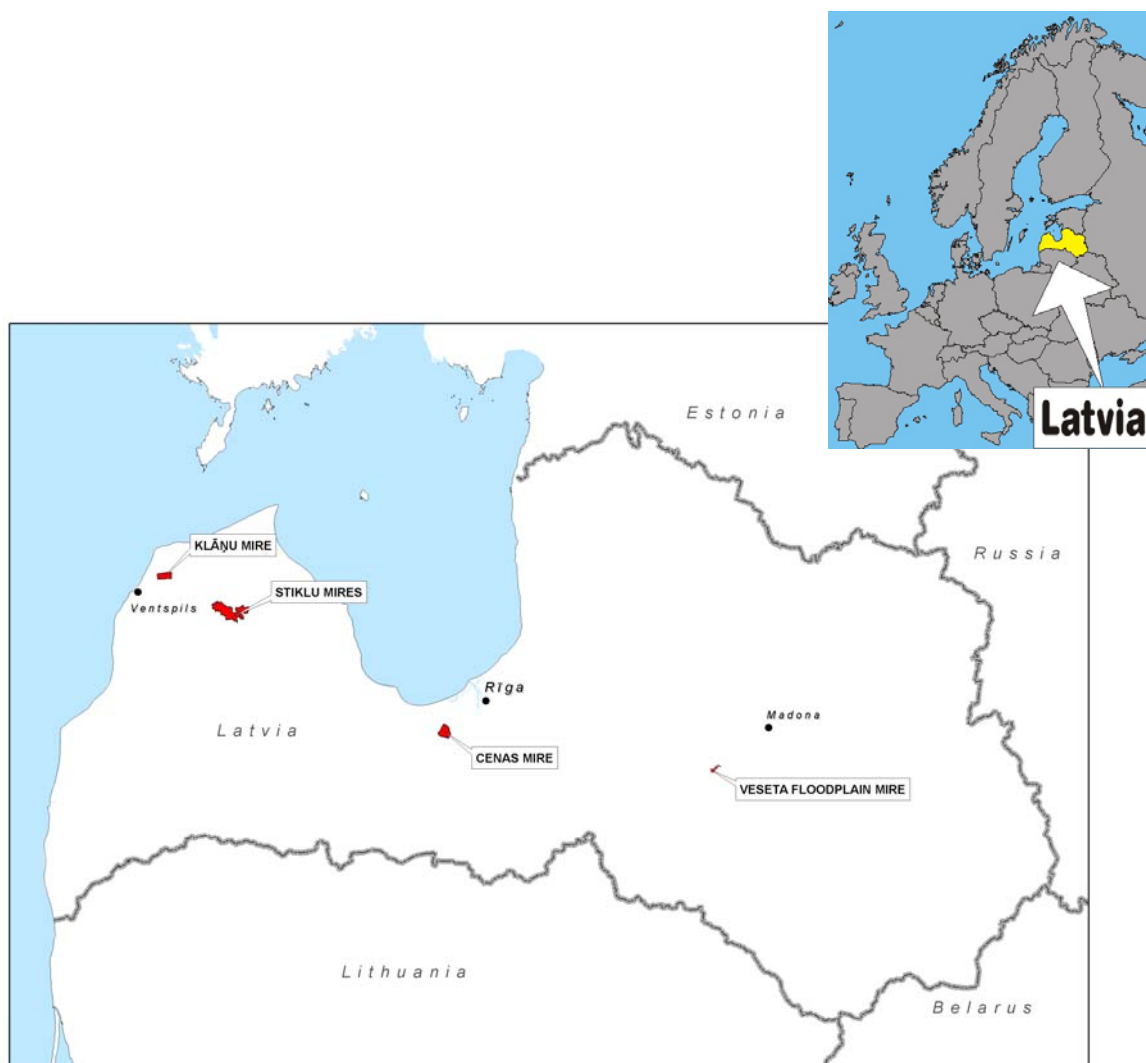
COMMENTS ON FINANCIAL REPORT

The Financial Report is an essential part of this Interim Report. Until present 8 project partners have contributed financially as well as been involved in the project actions.

State Joint-Stock Company „Latvia’s State Forests” finances the elaboration of management plan for Stikli Mires Nature Reserve; Nature Protection Board - for Klani Mire and Veseta Floodplain Mire Nature Reserves; Riga Forest Agency for Cena Mire Nature Reserve.

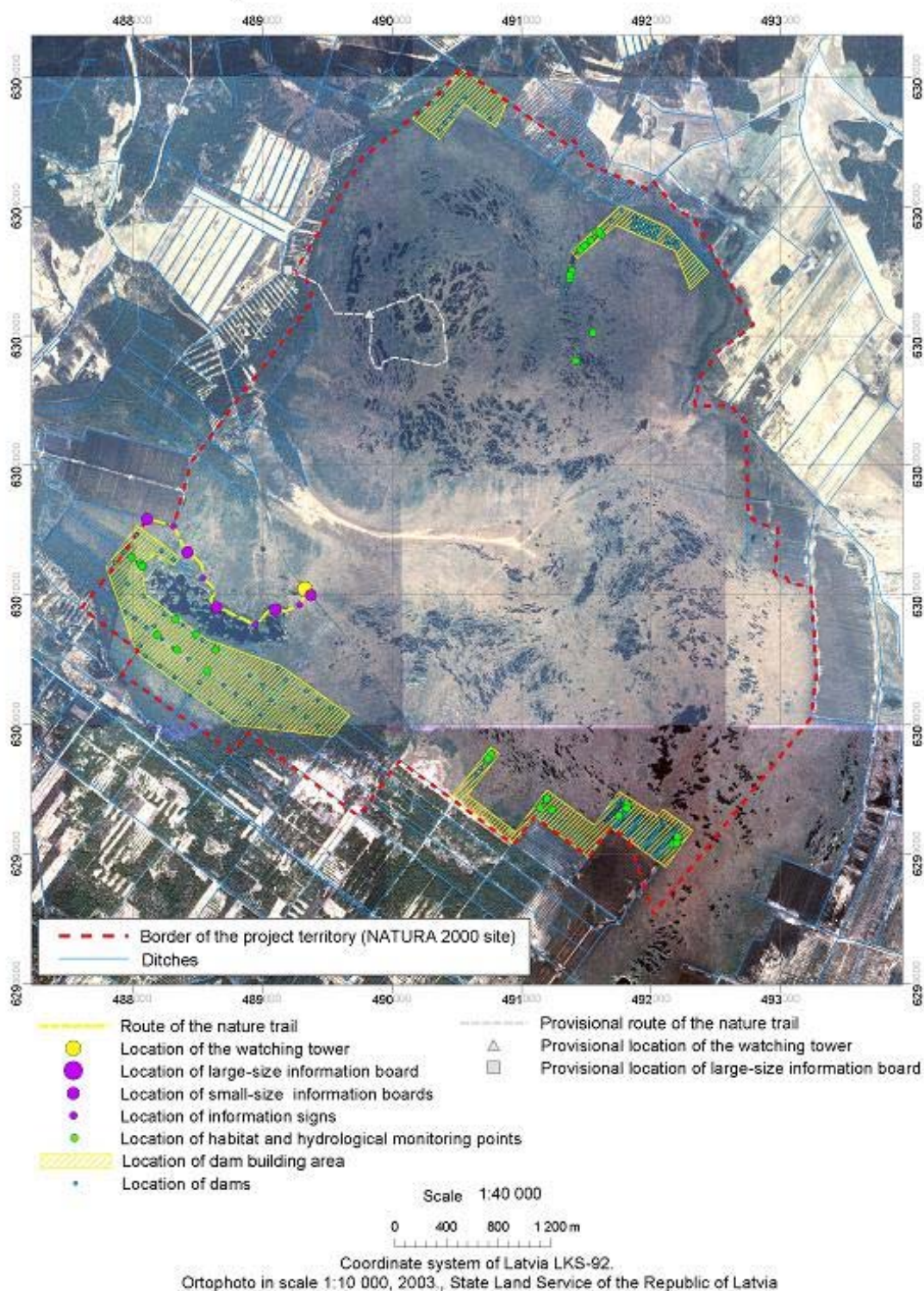
During the last year after the accession to EU there has been an increase in petrol price. It may lead to the increase of the costs for some project actions that include travel expenses, like building of nature trails and towers in the project sites as well as the increase of the cost for producing a film about the project.

ANNEX 1. MAP OF THE PROJECT SITES

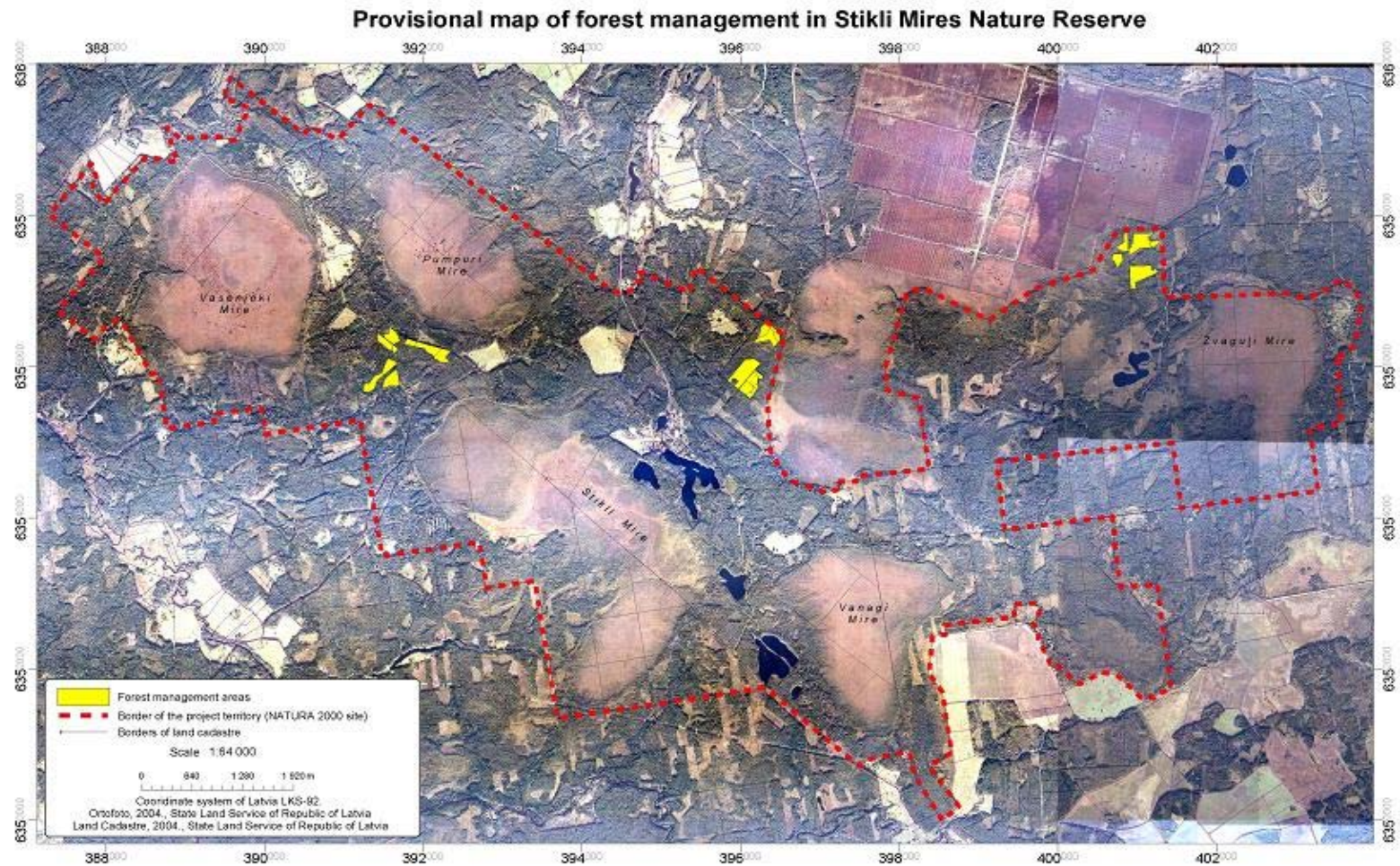


ANNEX 2. MANAGEMENT ACTIONS IN CENA MIRE

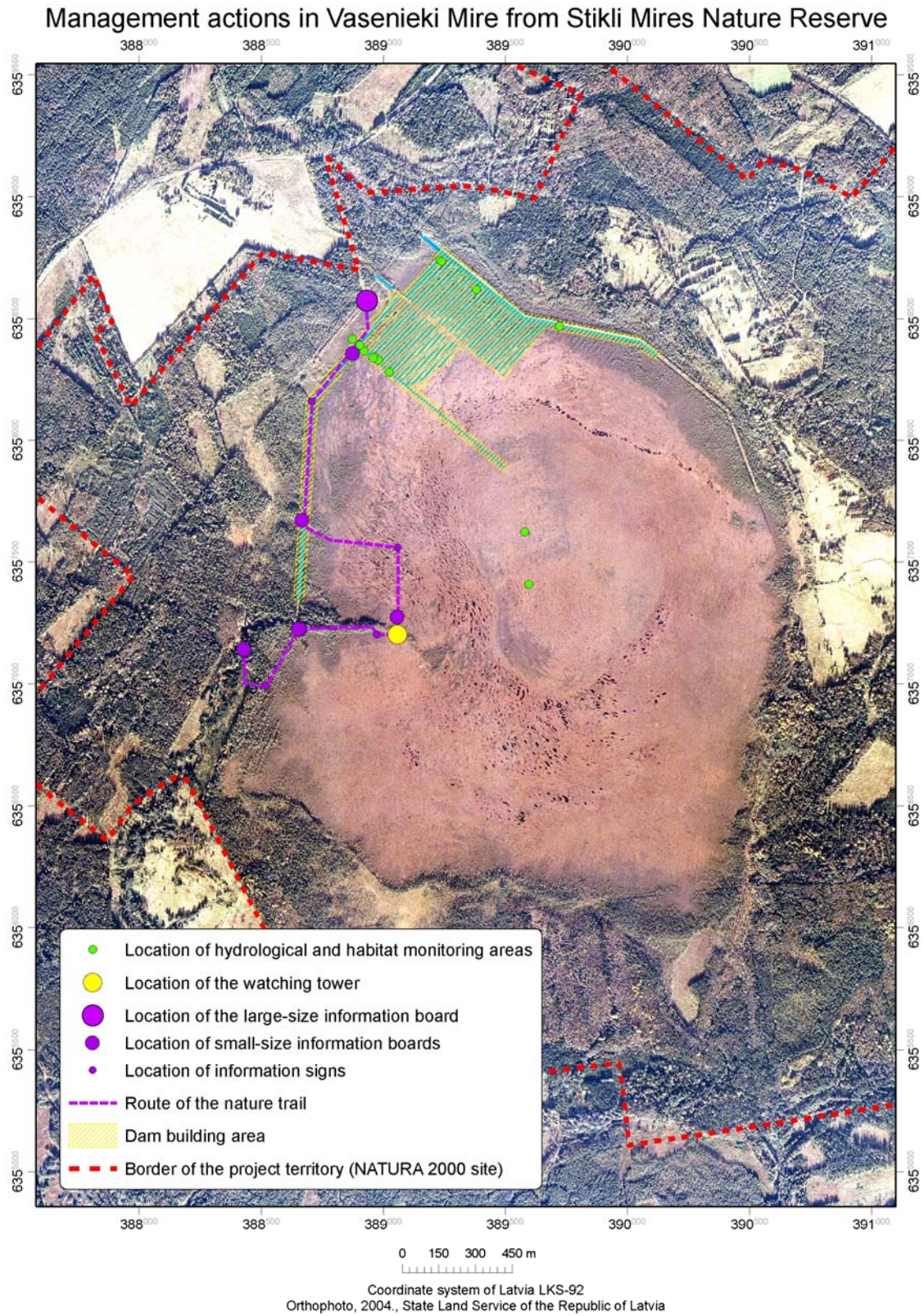
Management actions in Cena Mire Nature Reserve



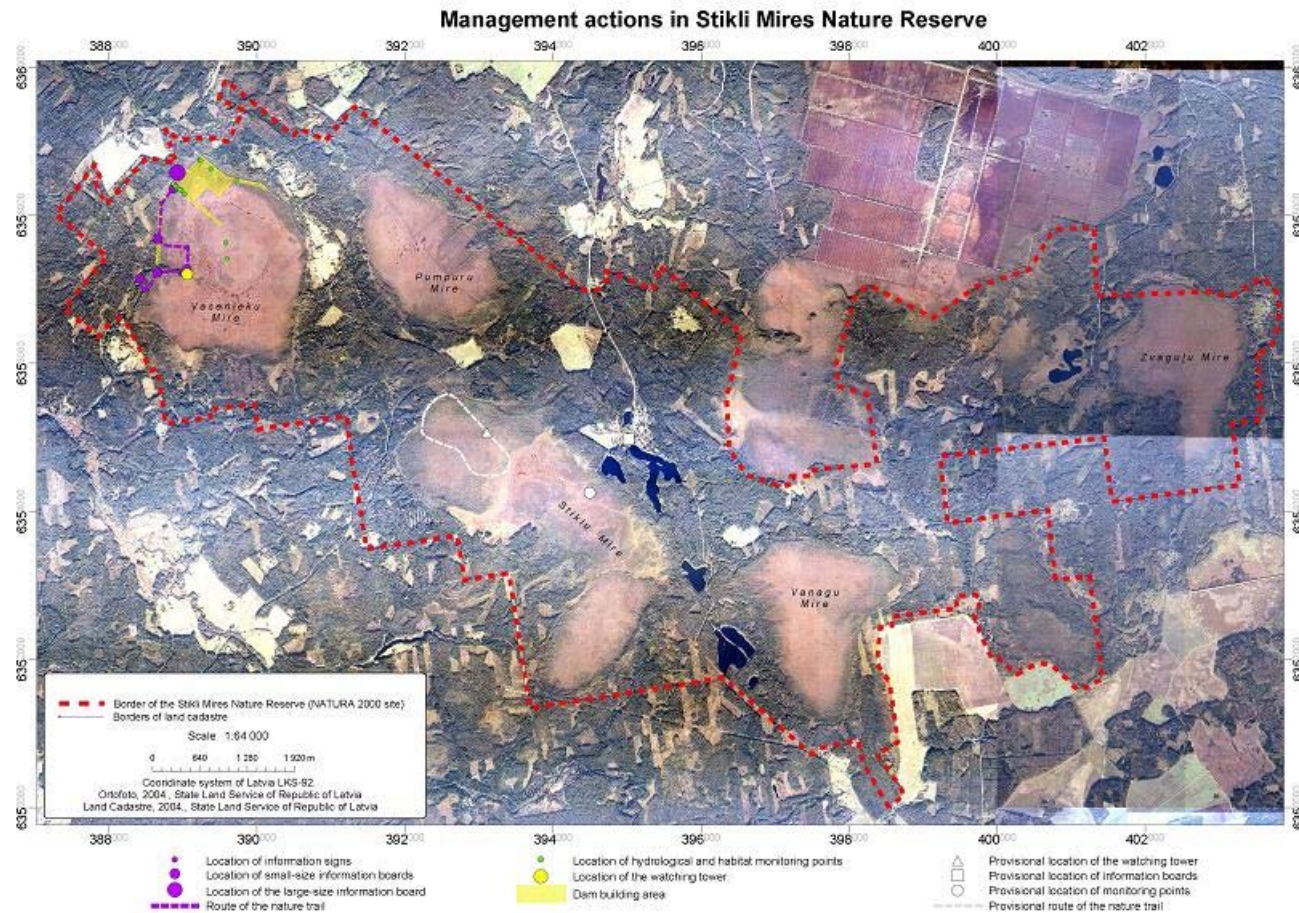
ANNEX 3. PROVISIONAL MAP OF FOREST MANAGEMENT IN STIKLI MIRES



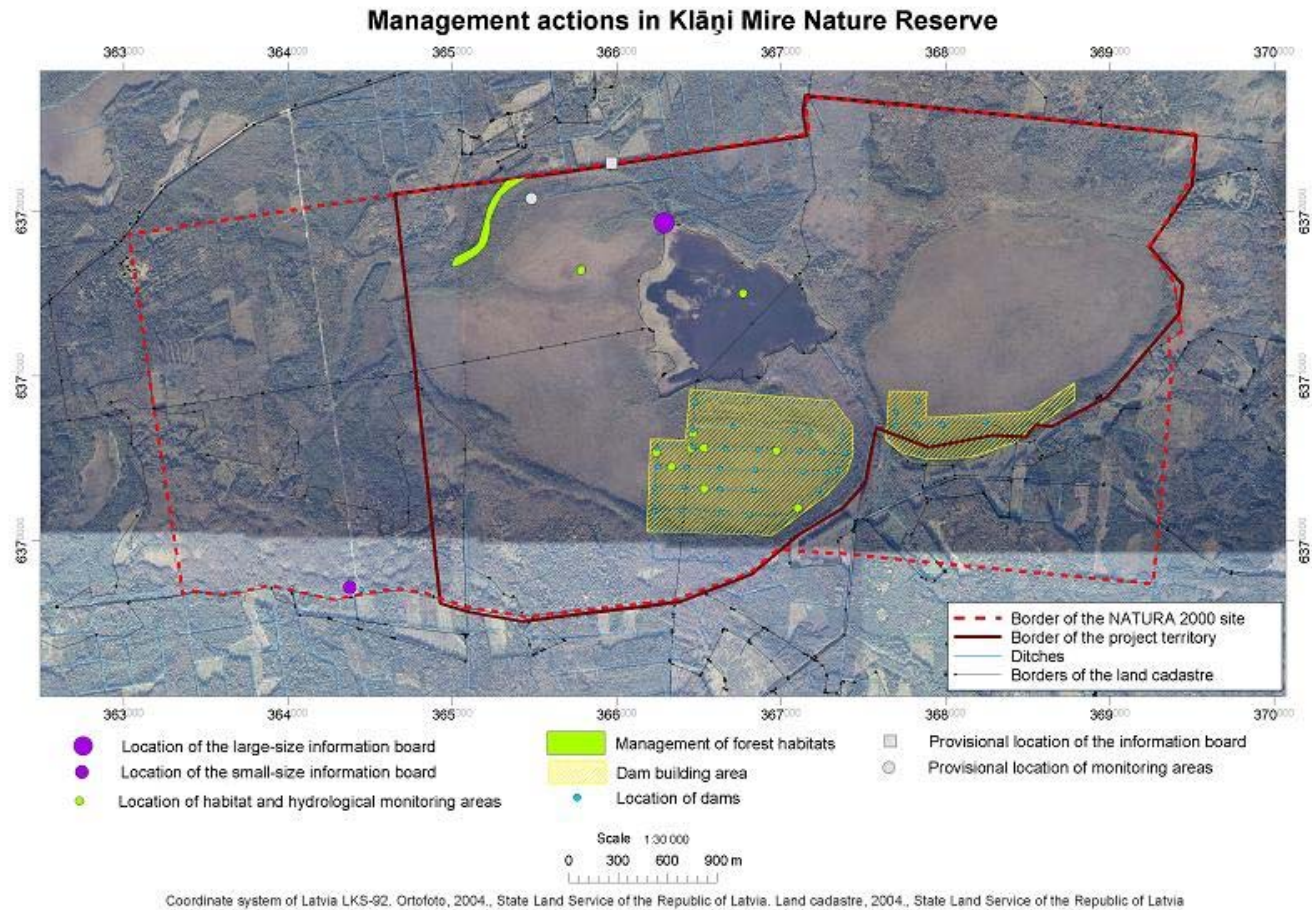
ANNEX 4. MANAGEMENT ACTIONS IN VASENIEKI MIRE FROM STIKLI MIRES



ANNEX 5. MANAGEMENT ACTIONS IN STIKLI MIRES

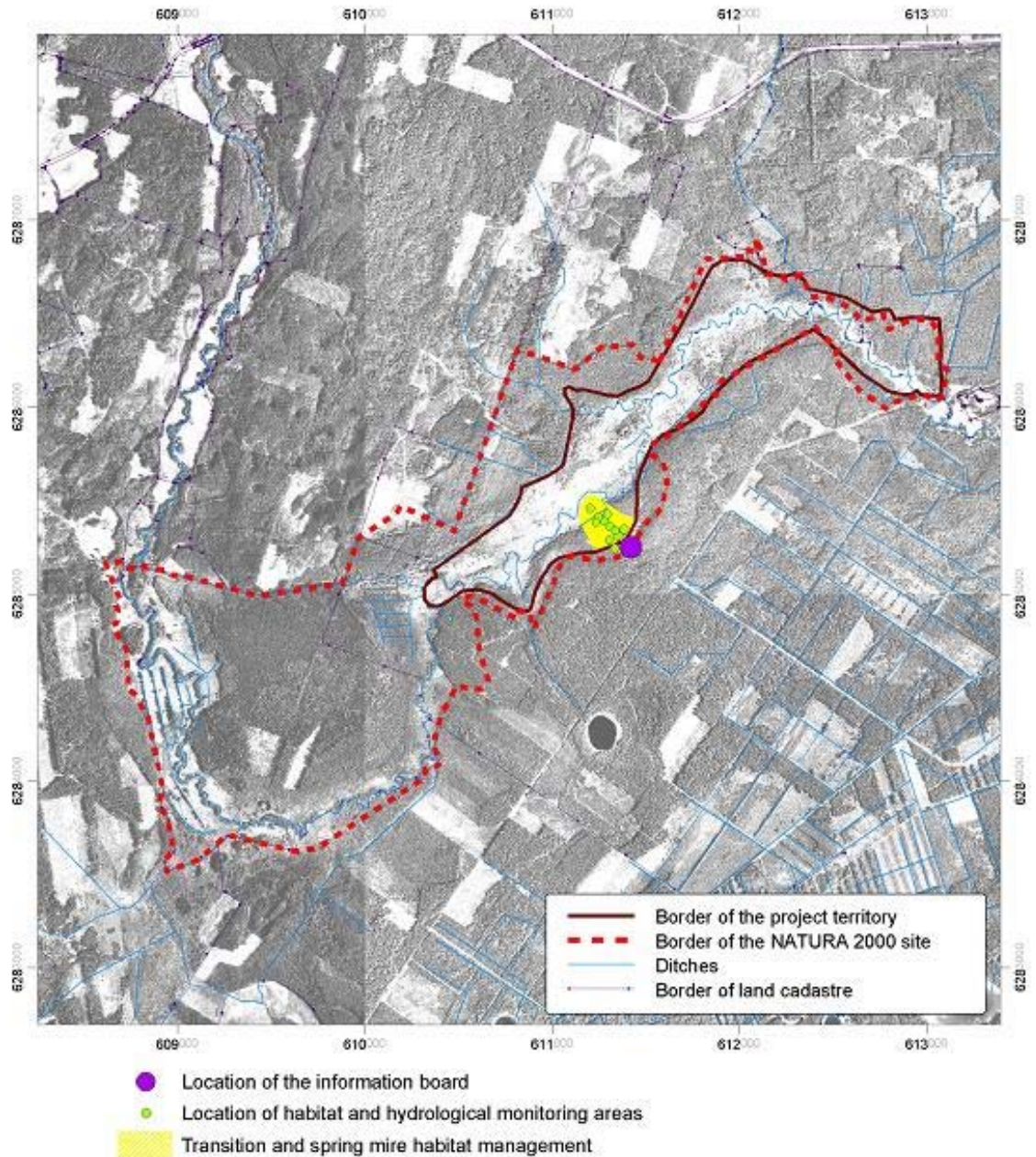


ANNEX 6. MANAGEMENT ACTIONS IN KLĀNI MIRE NATURE RESERVE

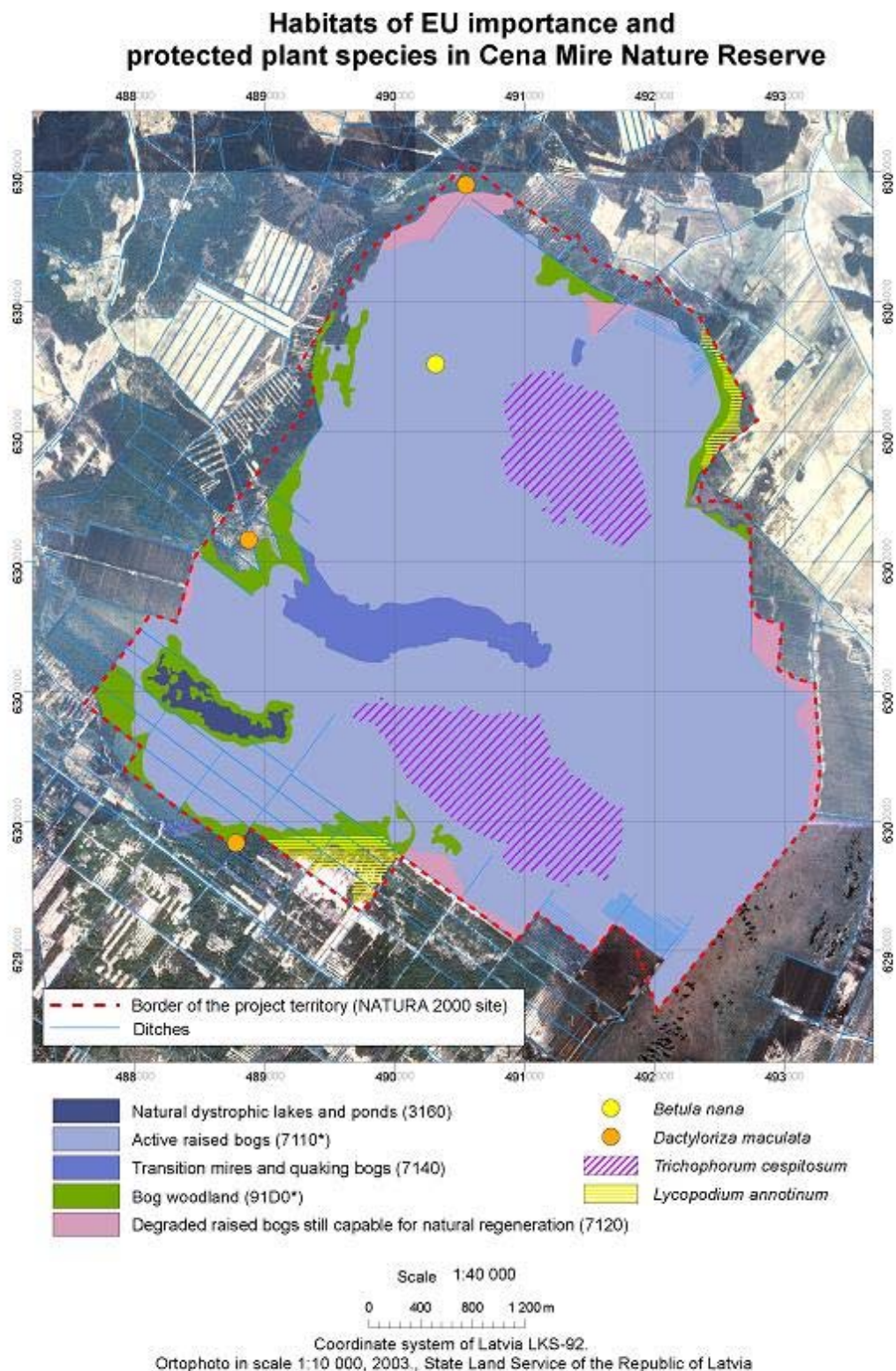


ANNEX 7. MANAGEMENT ACTIONS IN VESETA FLOODPLAIN MIRE

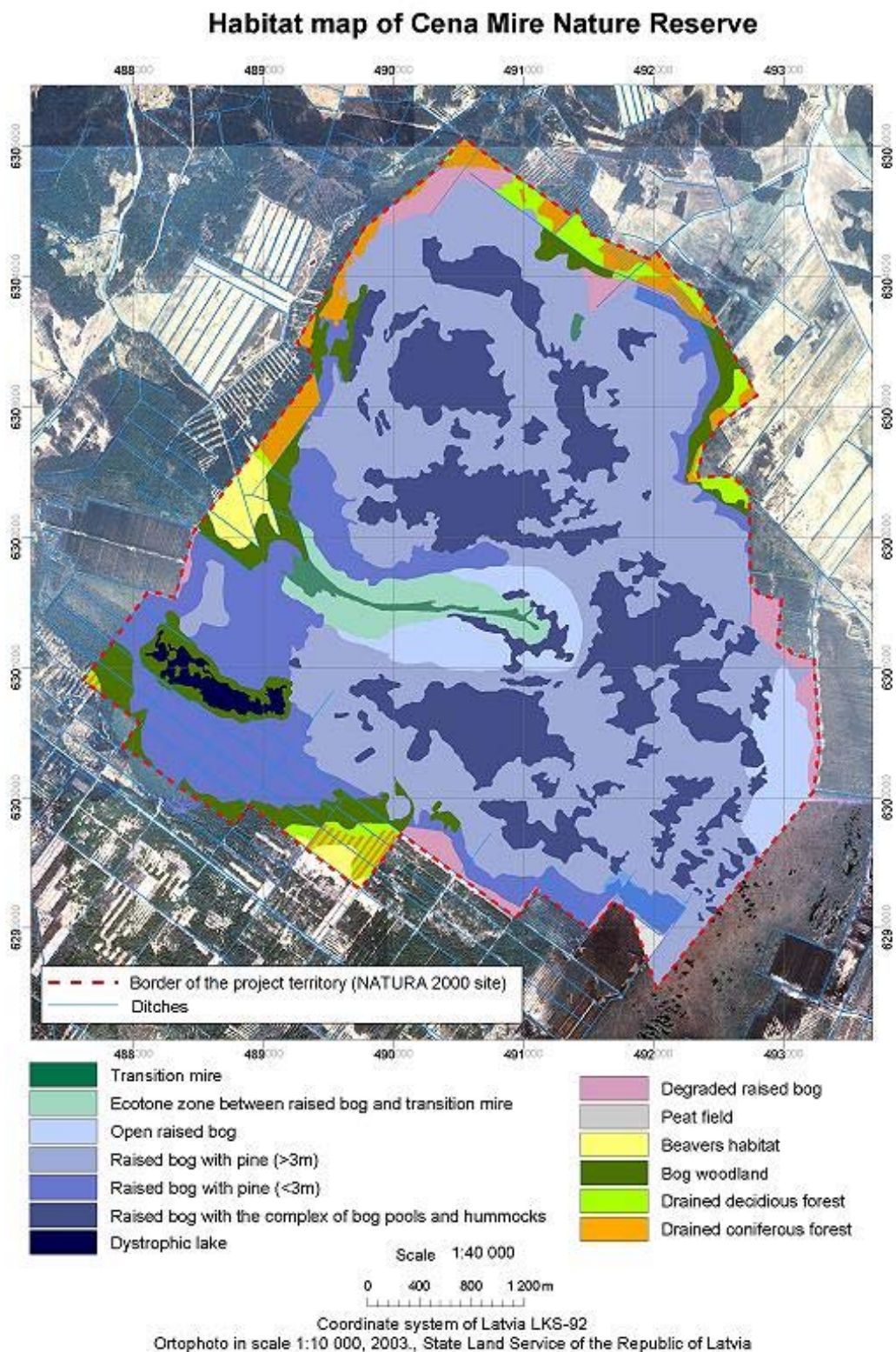
Management actions in Veseta River Floodplain Mire Nature Reserve



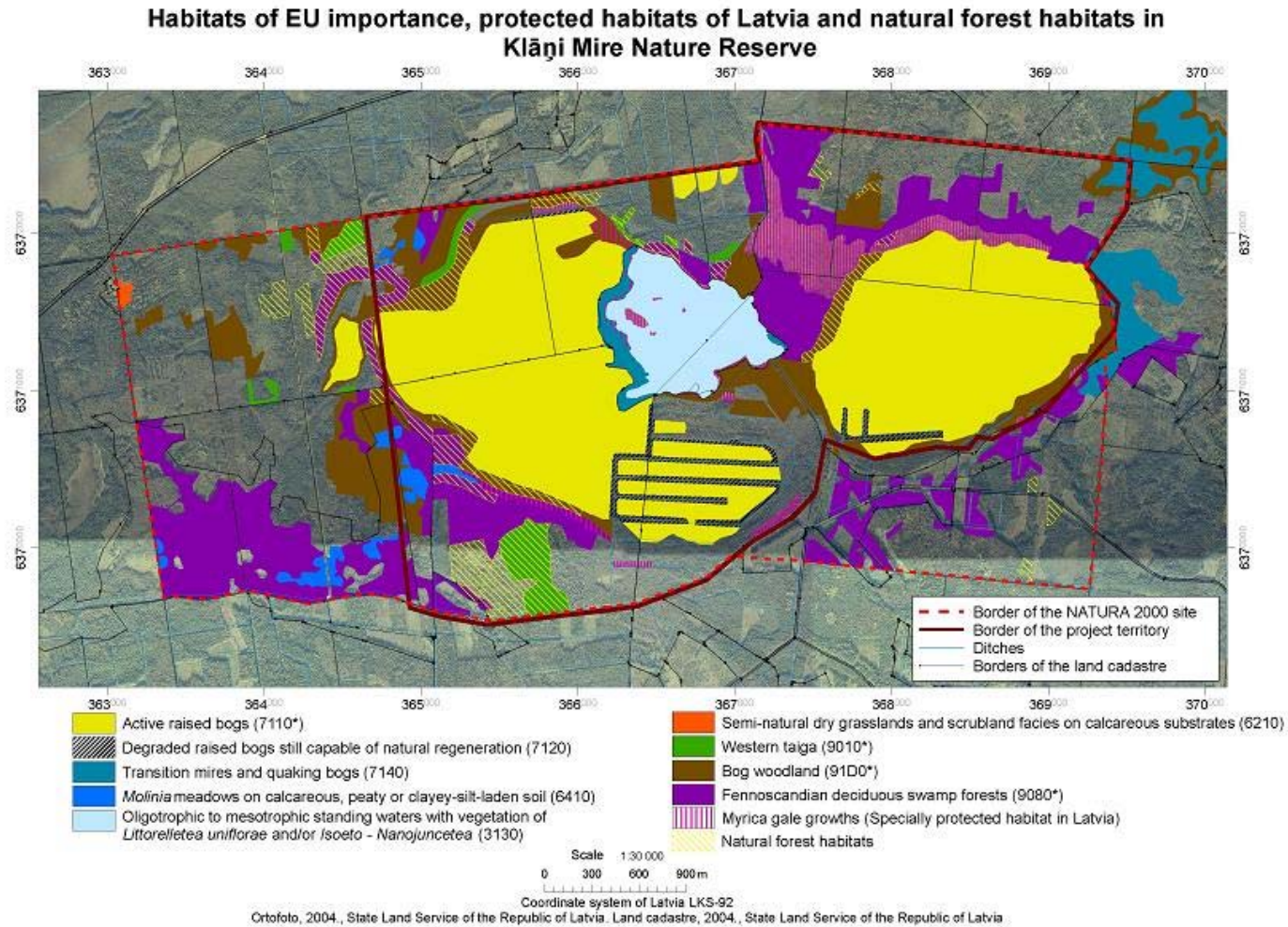
ANNEX 8. HABITATS OF EU IMPORTANCE AND PROTECTED PLANT SPECIES IN CENA MIRE



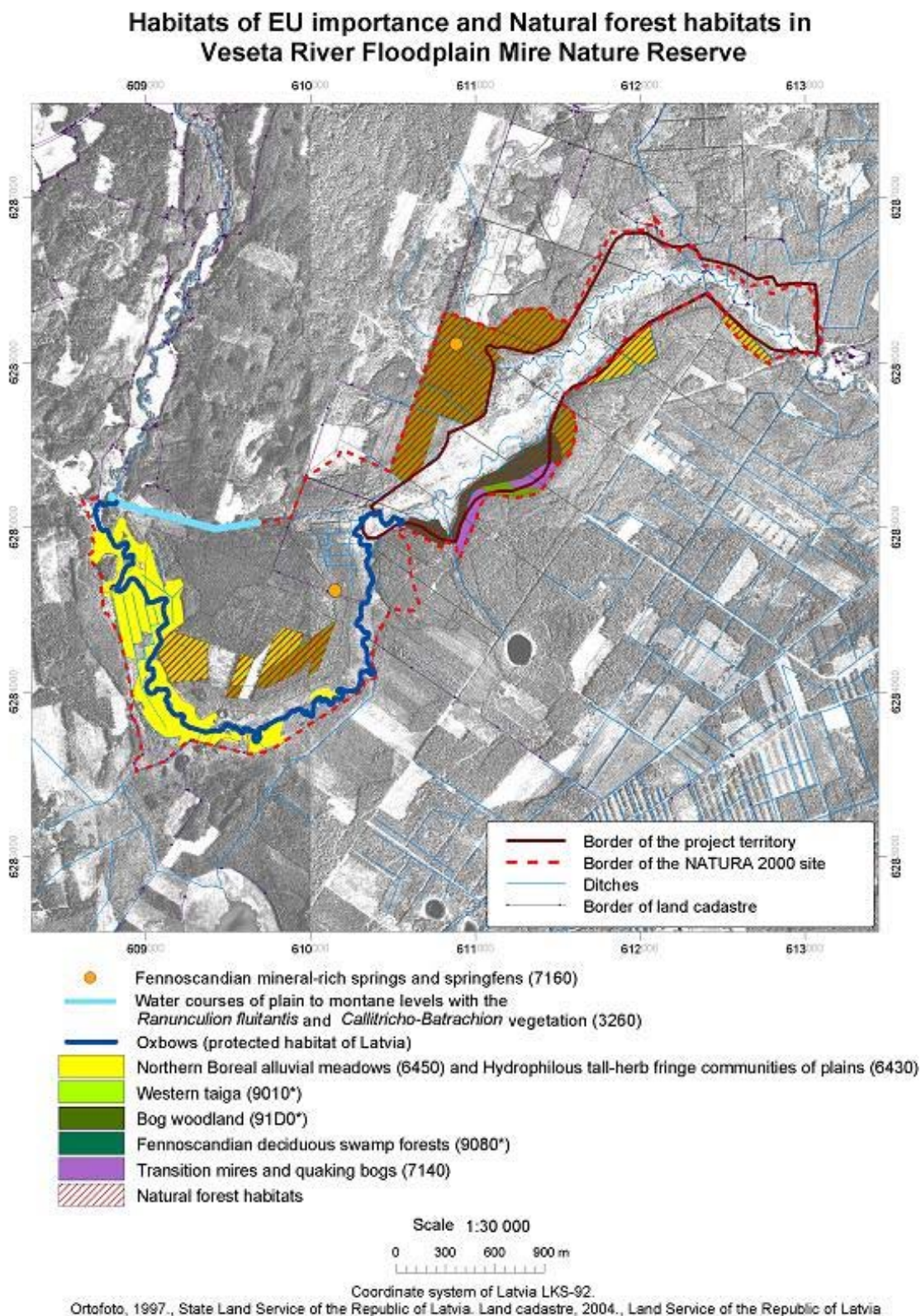
ANNEX 9. HABITAT MAP OF CENA MIRE NATURE RESERVE



ANNEX 11. HABITATS OF EU IMPORTANCE, PROTECTED HABITATS OF LATVIA IN KLĀNI MIRE

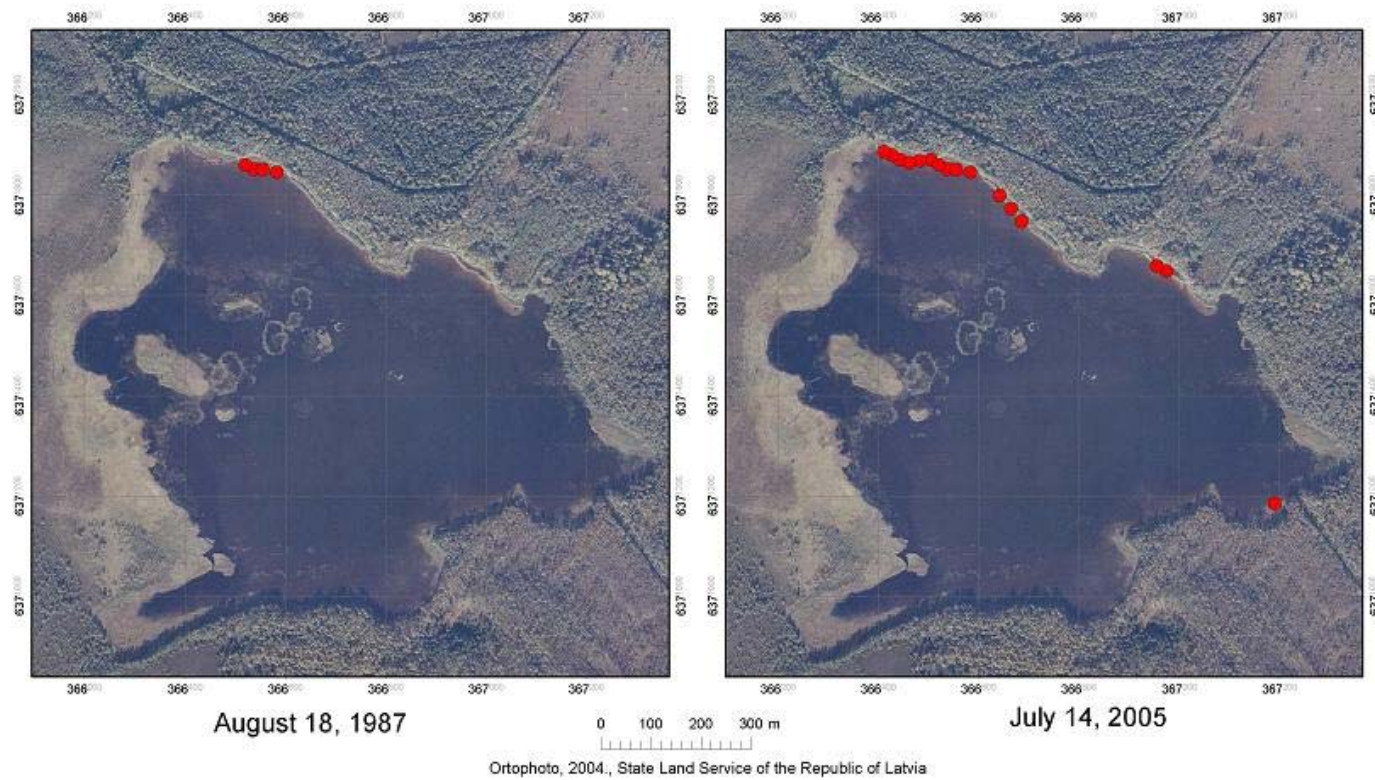


ANNEX 12. HABITATS OF EU IMPORTANCE IN VESETA FLOODPLAIN MIRE

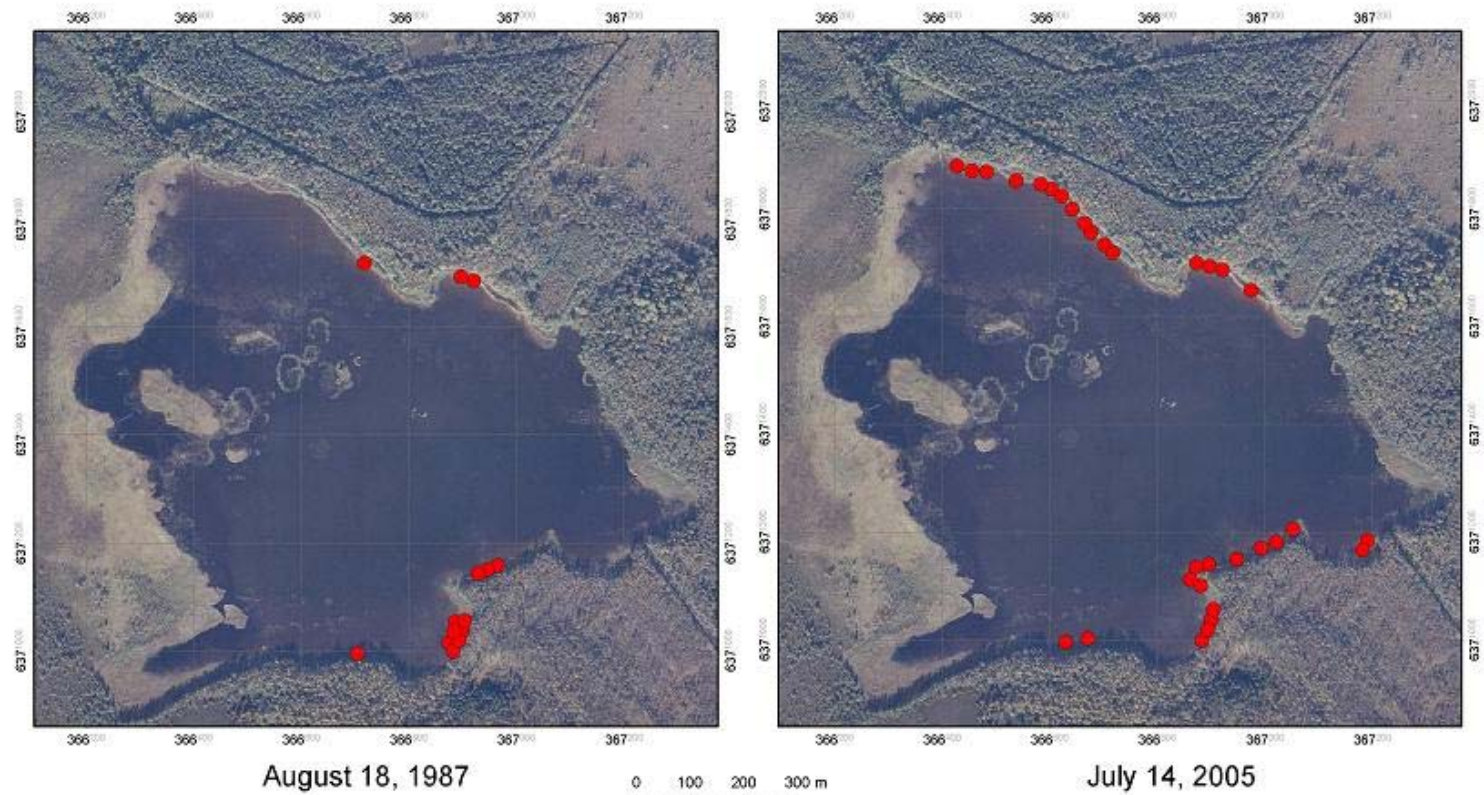


ANNEX 13. INCREASE OF THE DISTRIBUTION OF THE PROTECTED PLANT SPECIES NEAR KLĀŅI LAKE

Distribution of *Rhynchospora fusca* near Klāņi Lake

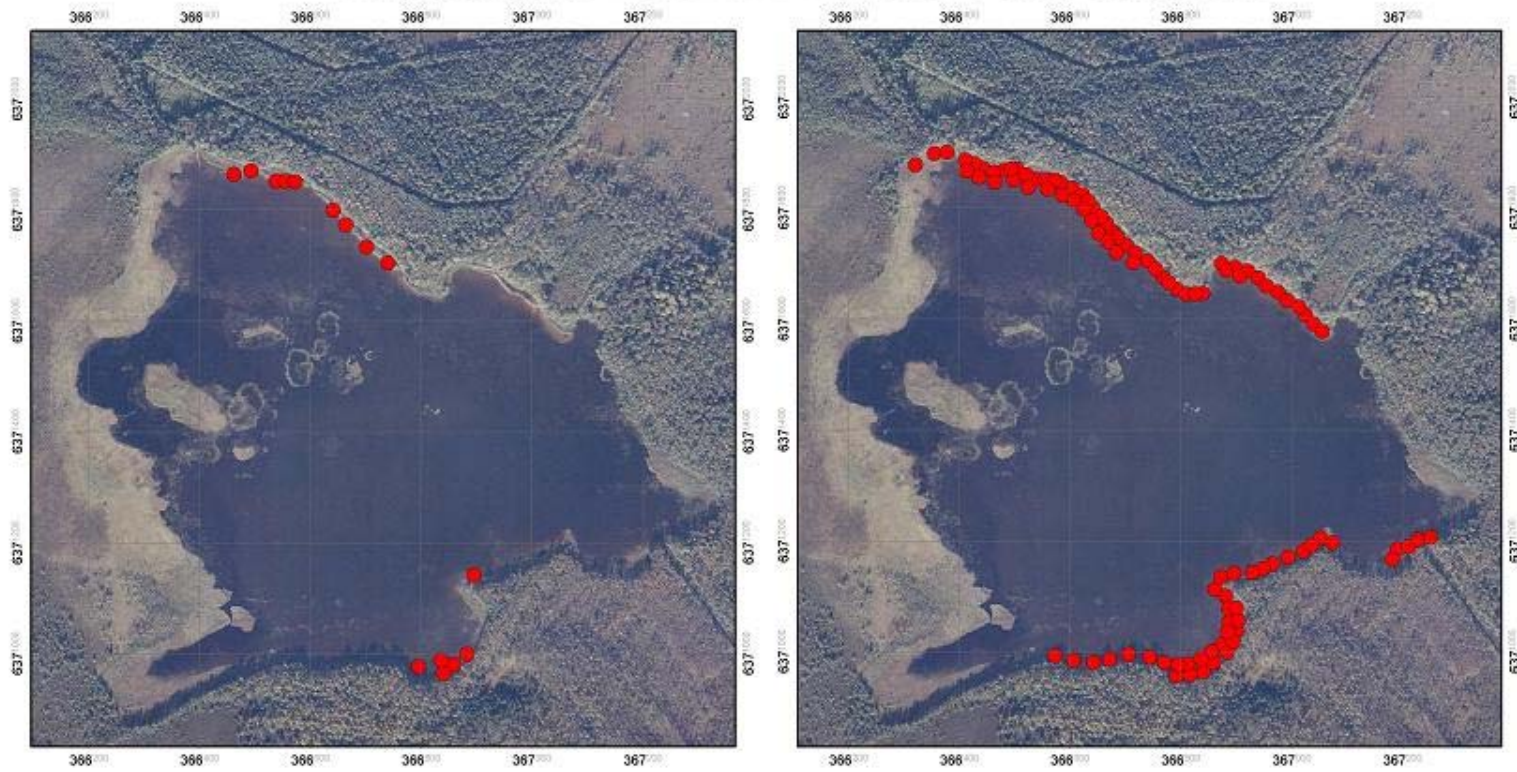


Distribution of *Lobelia dortmanna* near Klāņi Lake



Orthophoto, 2004., State Land Service of the Republic of Latvia

Distribution of *Eleocharis multicaulis* near Klāņi Lake



August 18, 1987

July 14, 2005

0 100 200 300 m

Ortophoto, 2004., State Land Service of the Republic of Latvia

ANNEX 14. SPECIES AND HABITATS OF HABITATS AND BIRD DIRECTIVES IN THE PROJECT SITES

	Klani Mire	Stikli Mires	Cena Mire	Veseta Mire
Plants	<i>Cypripedium calceolus</i> (II) <i>Liparis loeselii</i> (II)	-	-	<i>Saxifraga hirculus</i> (II) <i>Hamatocaulis vernicosus</i> (II)
Invertebrates	1) <i>Euphydrias aurinia</i> (II) 2) <i>Leucorrhinia pectoralis</i> (II, IV), 3) <i>Leucorrhinia albifrons</i> (IV)	1) <i>Osmoderma eremita</i> (II, IV), 2) <i>Coenonympha hero</i> (IV), 3) <i>Lopinga achine</i> (IV)	1) <i>Leucorrhinia albifrons</i> (IV)	1) <i>Coenonympha hero</i> (IV), 2) <i>Lycaena dispar</i> (II,IV), 3) <i>Ophiogompha cecilia</i> (II, IV), 4) <i>Unio crassus</i> (II,IV) 2) <i>Acrolaxus lacustris</i> (II)#
Amphibians	<i>Rana arvalis</i> (IV) <i>Rana lessonae</i> (IV)	<i>Rana arvalis</i> (IV) <i>Rana lessonae</i> (IV)	<i>Rana arvalis</i> (IV) <i>Rana lessonae</i> (IV)	<i>Rana lessonae</i> (IV)
Mammals	<i>Lutra lutra</i> (II, IV) + <i>Lynx lynx</i> (II, IV) <i>Castor fiber</i> (II) <i>Canis lupus</i> (II,IV,V)	<i>Lutra lutra</i> (II, IV) + <i>Lynx lynx</i> (II, IV) <i>Castor fiber</i> (II) <i>Canis lupus</i> (II,IV,V)	<i>Lutra lutra</i> (II, IV) + <i>Lynx lynx</i> (II, IV) <i>Castor fiber</i> (II) <i>Canis lupus</i> (II,IV,V)	<i>Lutra lutra</i> (II, IV) + <i>Lynx lynx</i> (II, IV) + <i>Canis lupus</i> (II,IV,V) <i>Castor fiber</i> (II)
Birds	<i>Aegolius funereus</i> * <i>Aquila pomarina</i> * <i>Bonasa bonasia</i> <i>Ciconia nigra</i> * <i>Cygnus cygnus</i> <i>Dendrocopos leucotos</i> * <i>Haliaeetus albicilla</i> * <i>Pernis apivorus</i> <i>Sterna hirundo</i> <i>Tetrao urogallus</i> <i>Caprimulgus europaeus</i> <i>Circus aeruginosus</i> # <i>Circus pygarrus</i> # <i>Dryocopus martius</i> <i>Grus grus</i> <i>Lanius excubitor</i> <i>Numenius arquata</i> <i>Pandion haliaetus</i> # <i>Picoides</i>	<i>Haliaeetus albicilla</i> <i>Lullula arborea</i> <i>Sterna hirundo</i> <i>Aegolius funereus</i> <i>Anser albifrons</i> <i>Anser fabalis</i> <i>Aquila pomarina</i> * <i>Bonasa bonasia</i> <i>Caprimulgus europaeus</i> <i>Ciconia ciconia</i> <i>Ciconia nigra</i> * <i>Circaetus gallicus</i> # <i>Circus aeruginosus</i> # <i>Columba oenas</i> <i>Crex crex</i> <i>Cygnus cygnus</i> <i>Dryocopus martius</i> <i>Ficedula parva</i> <i>Glaucidium passerinum</i> <i>Grus grus</i> <i>Lanius collurio</i>	<i>Pernis apivorus</i> <i>Aquila pomarina</i> * <i>Anser albifrons</i> <i>Anser fabalis</i> <i>Caprimulgus europaeus</i> <i>Ciconia ciconia</i> <i>Ciconia nigra</i> * <i>Circus aeruginosus</i> # <i>Crex crex</i> <i>Dryocopus martius</i> <i>Emberzia hortulana</i> <i>Grus grus</i> <i>Haliaeetus albicilla</i> # <i>Lanius excubitor</i> <i>Numenius arquata</i> <i>Numenius phaeopus</i> # <i>Pandion haliaetus</i> # <i>Pluvialis apricaria</i> <i>Tetrao tetrax</i> <i>Tetrao urogallus</i> <i>Tringa glareola</i> <i>Tringa totanus</i> #	<i>Bonasa bonasia</i> <i>Caprimulgus europaeus</i> <i>Circus aeruginosus</i> <i>Pernis apivorus</i> <i>Porzana porzana</i> <i>Tetrao tetrax</i> <i>Grus grus</i>

	<i>tridactylus</i> <i>Pluvialis</i> <i>apricaria</i> <i>Tetrao tetrrix</i>	<i>Larus canus</i> # <i>Numenius</i> <i>arquata</i> # <i>Pandion</i> <i>haliaetus</i> <i>Pernis apivorus</i> <i>Picoides</i> <i>tridactylis</i> <i>Picus canus</i> * <i>Pluvialis</i> <i>apricaria</i> <i>Tetrao tetrrix</i> <i>Tetrao urogallus</i> <i>Tringa glareola</i> <i>Tringa totanus</i> *		
Biotopes	6210 7120 7110* 7140 91D0* 9080* 9010* 3130 6410	3160 7120 7140 3130 7110* 91D0* 9010* 9080*	7110* 7120 7140 91D0*	3260 6430 6450 9010* 7140 91D0* 7160 9080*

Details

- + traces of activities observed
- observed in the site, but nest not found

in red are marked the new species and habitats

ANNEX 15. PROTECTED SPECIES AND HABITATS IN CENA MIRE

Plants, fungi

Species	Species of EU Directive	Protected species of Latvia
<i>Betula nana</i>		+
<i>Trichophorum cespitosum</i>		+
<i>Dactylorhiza maculata</i>		+
<i>Lycopodium annotium</i>	V	+
<i>Calypogeia sphagnicola</i>		+
<i>Odontoschizma denudatum</i>		+
<i>Suillus flavidus</i>		+

Invertebrates

Species	Species of EU Directives	Protected species of Latvia
<i>Anax imperator</i>		+
<i>Leucorrhinia albifrons</i>	IV	+
<i>Leucorrhinia pectoralis</i> (-)	II, IV	+
<i>Carabus nitens</i> (-)		+
<i>Biston lapponaria</i> (-)		+
<i>Eudia pavonia</i> (-)		

(-) was not found in 2005. Data from 2003.

Birds, mammals, amphibians

Species	Species of EU Bird and Habitat Directives	Protected species of Latvia
<i>Numenius arquata</i>	BD II	+
<i>Tringa totanus</i>	BD I	+
<i>Pandion haliaetus</i>	BD I	+
<i>Ciconia nigra</i>	BD I	+
<i>Aquila pomarina</i>	BD I	+
<i>Grus grus</i>	BD I	+
<i>Tetrao tetrix</i>	BD I/II	+
<i>Numenius phaeopus</i>	BD II	+
<i>Pluvialis apricaria</i>	BD I/II/III	+
<i>Lanius excubitor</i>		+
<i>Caprimulgus europaeus</i>	BD I	+
<i>Circus aeruginosus</i>	BD I	+
<i>Tringa glareola</i>	BD I	+
<i>Dryocopus martius</i>	BD I	+
<i>Pernis apivorus</i>	BD I	+
<i>Anser fabalis</i>	BD II/I	+
<i>Anser albifrons</i>	BDII/III	+
<i>Ciconia ciconia</i>	BD	+
<i>Canis lupus</i>	HD II/IV,V	+
<i>Castor fiber</i>	HD II, IV	+
<i>Eptesicus nilssonii</i>		+
<i>Lutra lutra</i>	HD II,IV	+
<i>Martes martes</i>	HD V	+
<i>Lynx lynx</i>	HD II,IV	+
<i>Rana arvalis</i>	HD IV	+
<i>Rana lessonae</i>	HD IV	+

Habitats

Code	Habitats
7110*	Active raised bogs
7120	Degraded raised bogs still capable of natural regeneration
91D0*	Bog woodland
7140	Transition mires and quaking bogs
3160	Natural dystrophic lakes and ponds

ANNEX 16. PROTECTED SPECIES AND HABITATS IN STIKLI MIREŠ

Plants

Species	Protected species of Latvia	Species of EU Habitat Directive
<i>Botrychium multifidum</i>	+	
<i>Cardamine flexuosa</i>	+	
<i>Carex buxbaumii</i>	+	
<i>Carex paupercula</i>	+	
<i>Carex scandinavica</i>	+	
<i>Cladium mariscus</i>	+	
<i>Dactylorhiza baltica</i>	+	
<i>Dactylorhiza fuchsii</i>	+	
<i>Dactylorhiza incarnata</i>	+	
<i>Dactylorhiza maculata</i>	+	
<i>Eleocharis multicaulis</i>	+	
<i>Gymnadenia conopsea</i>	+	
<i>Hammarbya paludosa</i>	+	
<i>Huperzia selago</i>	+	V
<i>Isoetes lacustris</i>	+	
<i>Juncus bulbosus</i>	+	
<i>Juncus squarrosus</i>	+	
<i>Listera cordata</i>	+	
<i>Littorella uniflora</i>	+	
<i>Lobelia dortmanna</i>	+	
<i>Lycopodiella inundata</i>	+	V
<i>Lycopodium annotinum</i>	+	V
<i>Lycopodium clavatum</i>	+	V
<i>Orobanche pallidiflora</i>	+	
<i>Platanthera bifolia</i>	+	
<i>Trichophorum cespitosum</i>	+	
<i>Trifolium dubium</i>	+	
<i>Viola uliginosa</i>	+	
<i>Antitrichia curtipendula</i>	+	
<i>Barbilophozia attenuata</i>	+	
<i>Bazzania trilobata</i>	+	
<i>Calypogeia sphagnicola</i>	+	
<i>Ephemerum serratum</i>	+	
<i>Frullania tamarisci</i>	+	
<i>Geocalyx graveolens</i>	+	
<i>Helodium blandowii</i>	+	
<i>Hypnum pratense</i>	+	
<i>Jamesoniella autumnalis</i>	+	
<i>Jungermannia leiantha</i>	+	
<i>Leucobryum glaucum</i>	+	V
<i>Metzgeria furcata</i>	+	
<i>Neckera complanata</i>	+	
<i>Neckera pennata</i>	+	
<i>Odontoschisma denudatum</i>	+	
<i>Odontoschisma sphagni</i>	+	
<i>Plagiothecium undulatum</i>	+	
<i>Pogonatum dentatum</i>	+	
<i>Riccardia chamaedryfolia</i>	+	
<i>Riccardia palmata</i>	+	
<i>Scapania irrigua</i>	+	
<i>Scapania paludicola</i>	+	
<i>Sphagnum compactum</i>	+	
<i>Sphagnum lindbergii</i>	+	

Invertebrates

Species	Species of EU Directive	Protected species of Latvia
<i>Clausilia bidentata</i>		+
<i>Cordulegaster boltoni</i>		+
<i>Libellula fulva</i>		+
<i>Pyrrhosoma nymphula</i>		
<i>Dolomedes plantarius</i> *		
<i>Aromia moschata</i> *		
<i>Ergates faber</i> *		+
<i>Necydalis major</i>		+
<i>Osmoderma eremita</i>	II, IV	+
<i>Apatura ilia</i>		
<i>Coenonympha hero</i>	IV	+
<i>Limenitis populi</i>		
<i>Lopinga achine</i>	IV	+
<i>Laphria flava</i>		
<i>Laphria gibbosa</i>		+
<i>Carabus nitens</i>		+
<i>Lasius fuliginosus</i>		+

Birds

Species	Protected species of Latvia	Bird Directive
<i>Botaurus stellaris</i>	+	+
<i>Ciconia nigra</i>	+	+
<i>Cygnus cygnus</i>	+	+
<i>Pandion haliaeetus</i>	+	+
<i>Pernis apivorus</i>	+	+
<i>Haliaeetus albicilla</i>	+	-
<i>Circaetus gallicus</i>	+	+
<i>Circus aeruginosus</i>	+	+
<i>Aquila pomarina</i>	+	+
<i>Tetrao tetrix</i>	++	+
<i>Tetrao urogallus</i>	++	+
<i>Bonasa bonasia</i>	++	+
<i>Grus grus</i>	+	+
<i>Crex crex</i>	+	+
<i>Pluvialis apricaria</i>	+	+
<i>Numenius arquata</i>	+	-
<i>Tringa glareola</i>	+	+
<i>Sterna hirundo</i>	+	+
<i>Columba oenas</i>	+	-
<i>Glaucidium passerinum</i>	+	+
<i>Aegolius funereus</i>	+	+
<i>Caprimulgus europaeus</i>	+	+
<i>Picoides trydactylus</i>	+	+
<i>Lullula arborea</i>	+	+
<i>Dryocopus martius</i>	+	+
<i>Picus canus</i>	+	+
<i>Lanius collurio</i>	+	+
<i>Lanius exubitor</i>	+	-
<i>Ficedula parva</i>	+	+

Mammals

Species	Species of EU Directive	Protected species of Latvia
<i>Neomys fodiens</i>		
<i>Eptesicus nilssonii</i>		+
<i>Pipistrellus nathusii</i>		+
<i>Lepus timidus</i>		+
<i>Canis lupus</i>	II; IV; V	+
<i>Lutra lutra</i>	II; IV	+
<i>Martes martes</i>	V	+
<i>Lynx lynx</i>	II; IV	+

ANNEX 17. PROTECTED SPECIES AND HABITATS IN KLANI MIRE

Plant species

Species	Protected species in Latvia	Species of Habitats Directive	Dates when species was discovered (first and last)
<i>Agrimonia pilosa</i>		II, IV	Tabaka u.c., 1991
<i>Cardamine flexuosa</i>	+		Tabaka, 1985*
<i>Carex buxbaumii</i>	+		Baronina, 2005
<i>Carex demissa</i>			Baronina, 2004
<i>Carex paupercula</i>	+		Eglite, 1987*
<i>Carex scandinavica</i>	+		Baronina, 2001; Baronina 2005
<i>Corallorhiza trifida</i>	+		Tabaka u.c., 1991; Baronina 2005
<i>Cypripedium calceolus</i>	+	II, IV	Tabaka, 1984; Baronina, 2005
<i>D. fuchsii</i>	+		Tabaka u.c., 1991; Baronina 2005
<i>D. maculata</i>	+		Tabaka u.c., 1991; Baronina 2005
<i>Dactylorhiza incarnata</i>	+		Eglite, 1988*; Baronina 2005
<i>Dentaria bulbifera</i>	+		Eglite, 1984*; Baronina 2005
<i>Eleocharis multicaulis</i>	+		Tabaka., 1971*; Baronina, 2005
<i>Gymnadenia conopsea</i>	+		Tabaka, 1988*; Baronina, 2005
<i>Galium trifidum</i>			Susko, 1987
<i>Huperzia selago</i>	+		Tabaka, 1984*; Baronina 2005
<i>Hydrocotyle vulgaris</i>	+		Tabaka u.c., 1974; Baronina, 2005
<i>Juncus bulbosus</i>	+		Talla, 1972 *; Baronina, 2005
<i>Juncus squarrosus</i>	+		Tabaka u.c., 1991; Baronina 2005
<i>Liparis loeselii</i>	+	II, IV	Susko, 2005
<i>Listera cordata</i>	+		Tabaka, 1988*; Baronina 2005
<i>Littorella uniflora</i>	+		Susko, 1992, 2005
<i>Lobelia dortmanna</i>	+		Reinfelds, 1968; Baronina, 2005
<i>Lycopodiella inundata</i>	+	V	Susko, 1987*
<i>Lycopodium annotinum</i>	+	V	Tabaka u.c., 1991; Baronina, 2005
<i>Lycopodium clavatum</i>	+	V	Tabaka u.c., 1991
<i>Myosotis ramosissima</i>	+		Tabaka, 1984*
<i>Myrica gale</i>	+		Reinfelds, 1968; Baronina, 2005
<i>Myriophyllum alterniflorum</i>	+		Tabaka, 1972*; Baronina, 2005
<i>Nuphar pumila</i>	+		Eglite, 1983*, Susko, 2005
<i>Pinguicula vulgaris</i>	+		Eglite, 1984*; Baronina 2005
<i>Platanthera bifolia</i>	+		Eglite, 1984*; Baronina 2005
<i>Potamogeton rutilus</i>	+		Eglite, 1984, Susko, 1987
<i>Primula farinosa</i>	+		Tabaka, 1984*; Baronina, 2005

<i>Rhynchospora fusca</i>	+		Tabaka, 1971*; Baronina, 2005
<i>Schoenus ferrugineus</i>	+		Tabaka, 1984*; Baronina 2005
<i>Trichophorum cespitosum</i>	+		Tabaka, 1983*; Baronina, 2005
<i>Barbilophozia kunzeana</i>	+		Abolina, 1991
<i>Bazzania trilobata</i>	+		Abolina, 1991
<i>Calliergon trifarium</i>	+		Abolina, 1991
<i>Dicranum leioneuron</i>	+		Abolina, 1991
<i>Fossombronia foveolata</i>	+		Susko, 1992, 2005
<i>Frullania tamarisci</i>	+		Abolina, 1991
<i>Lejeunea cavifolia</i>	+		Abolina, 1991
<i>Leucobrium glaucum</i>	+	V	Baronina, 2005
<i>Neckera crispa</i>	+		Abolina, 1991; Baronina 2005
<i>Neckera pennata</i>	+		Baronina 2005
<i>Orthotrichum lyellii</i>	+		Abolina, 1991
<i>Preisia quadrata</i>	+		Susko, 1992, 2005
<i>Ricardia plamata</i>	+		Abolina, 1991
<i>Riccardia chamaedryfolia</i>	+		Susko, 1992, 2005
<i>Riccardia multifida</i>	+		Abolina, 1991
<i>Scapania nemorea</i>	+		Abolina, 1991

Invertebrates

Species	Bern Convention	Species of Habitats Directive	Protected species of Latvia
<i>Clausilia cruciata</i> *			+
<i>Cochlicopa nitens</i>			
<i>Cochlodina orthostoma</i>			
<i>Clausilia dubia</i>			
<i>Clausilia bidentata</i>			
<i>Leucorhina albifrons</i>	II	IV	+
<i>Leucorhina pectoralis</i>	II	II, IV	+
<i>Libellula fulva</i>			+
<i>Pyrrhosoma nymphula</i>			
<i>Callimorpha dominula</i> *			
<i>Lasius fuliginosus</i>			+
<i>Apatura iris</i>			
<i>Euphydryas aurinia</i>	II	II	+
<i>Necydalis major</i>			+

Mammals

Species	Species of Habitats Directive	Protected species of Latvia
<i>Neomys fodiens</i>		
<i>Eptesicus nilssonii</i>		+
<i>Lepus timidus</i>	V	+
<i>Canis lupus</i>	II, IV, V	+
<i>Lutra lutra</i>	II, IV	+
<i>Martes martes</i>	V	+
<i>Lynx lynx</i>	II, IV	+
<i>Castor fiber</i>	II, IV	

Especially protected species bird species

Species	Protected species	Bird Directive
1. <i>Ciconia nigra</i>	+	+
2. <i>Cygnus cygnus</i>	+	+
3. <i>Pandion haliaeetus</i>	+	+
4. <i>Pernis apivorus</i>	+	+
5. <i>Haliaeetus albicilla</i>	+	-
6. <i>Circus aeruginosus</i>	+	+
7. <i>Circus pygargus</i>	+	+
8. <i>Aquila pomarina</i>	+	+
9. <i>Falco tinnunculus</i>	+	-
10. <i>Tetrao tetrix</i>	+	+
11. <i>Tetrao urogallus</i>	+	+
12. <i>Bonasa bonasia</i>	+	+
13. <i>Grus grus</i>	+	+
14. <i>Sterna hirundo</i>	+	+
15. <i>Aegolius funereus</i>	+	+
16. <i>Caprimulgus europaeus</i>	+	+
17. <i>Dendrocopos leucotos</i>	+	+
18. <i>Picoides trydactylus</i>	+	+
19. <i>Dryocopus martius</i>	+	+
20. <i>Picus canus</i>	+	+
21. <i>Lanius exubitor</i>	+	-
22. <i>Ficedula parva</i>	+	+

Habitats of Habitats Directive

Habitats Directive	Protected habitat in Latvia
7110* Active raised bogs	-
7140 Transition mires and quaking bogs	-
7120 Degraded raised bogs	-
91D0* Bog woodland	-
9080* Fennoscandian deciduous swamp forests	-
9010* Western taiga	-
6410 <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caerulea</i>)	+
6210 Semi-natural dry grasslands	+
3130 Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or <i>Isoëto - Nanojuncetea</i>	+

ANNEX 18. PROTECTED SPECIES AND HABITATS IN VESETA FLOODPLAIN MIRE

Vascular plants

Species	Species of Habitat Directive	Protected species of Latvia
<i>Aconitum lasiostomum</i>		+
<i>Carex atherodes</i>		+
<i>Carex paupercula</i>		+
<i>Conioselinum tataricum</i>		+
<i>Corallorhiza trifida</i>		+
<i>Dactylorhiza fuchsii</i>		+
<i>Dactylorhiza incarnata</i>		+
<i>Dactylorhiza maculata</i>		+
<i>Dactylorhiza russowii</i>		+
<i>Gymnadenia conopsea</i>		+
<i>Hammarbya paludosa</i>		+
<i>Huperzia selago</i>	+	+
<i>Listera cordata</i>	+	+
<i>Lycopodium annotinum</i>	+	+
<i>Malaxis monophyllos</i>	+	+
<i>Platanthera bifolia</i>	+	+
<i>Saxifraga hirculus</i>	+	+
<i>Stellaria crassifolia</i>	+	+
<i>Anastrophyllum hellerianum</i>	+	+
<i>Calypogeia suecica</i>	+	+
<i>Geocalyx graveolens</i>	+	+
<i>Hamatocaulis vernicosus</i>	+	+
<i>Hypnum pratense</i>	+	+
<i>Leucobryum glaucum</i>	+	+
<i>Lophozia rutheana</i>	+	+
<i>Neckera pennata</i>		+
<i>Paludella squarrosa</i>		+
<i>Trichocolea tomentella</i>		+

Birds

Species	Protected species	Species of Bird Directive
<i>Ciconia nigra</i>	+	+
<i>Pandion haliaeetus</i>	+	+
<i>Pernis apivorus</i>	+	+
<i>Grus grus</i>	+	+
<i>Crex crex</i>	+	+
<i>Porzana porzana</i>	+	+
<i>Circus aeruginosus</i>	+	+
<i>Caprimulgus europaeus</i>	+	+
<i>Tetrao tetrix</i>	+	+
<i>Bonasa bonasia</i>	+	+
<i>Picus canus</i>	+	+
<i>Dryocopus martius</i>	+	+
<i>Picoides trydactylus</i>	+	+

Invertebrates

Species name	Species of EU Directive	Red Data book of Latvia
<i>Unio crassus</i>	II, IV	+
<i>Ancylus fluviatilis</i>		+
<i>Libellula fulva</i>		+
<i>Ophiogomphus cecilia</i>	II, IV	+
<i>Pyrrhosoma nymphula</i>		+
<i>Aromia moschata</i>		+
<i>Ceruchus chrysomelinus</i>		+
<i>Necydalis major</i>		+
<i>Peltis grossa</i>		+
<i>Prionus coriarius</i>		+
<i>Limenitis populi</i>		+
<i>Lycaena dispar</i>	II, IV	+
<i>Coenonympha hero</i>	IV	+
<i>Laphria flava</i>		+

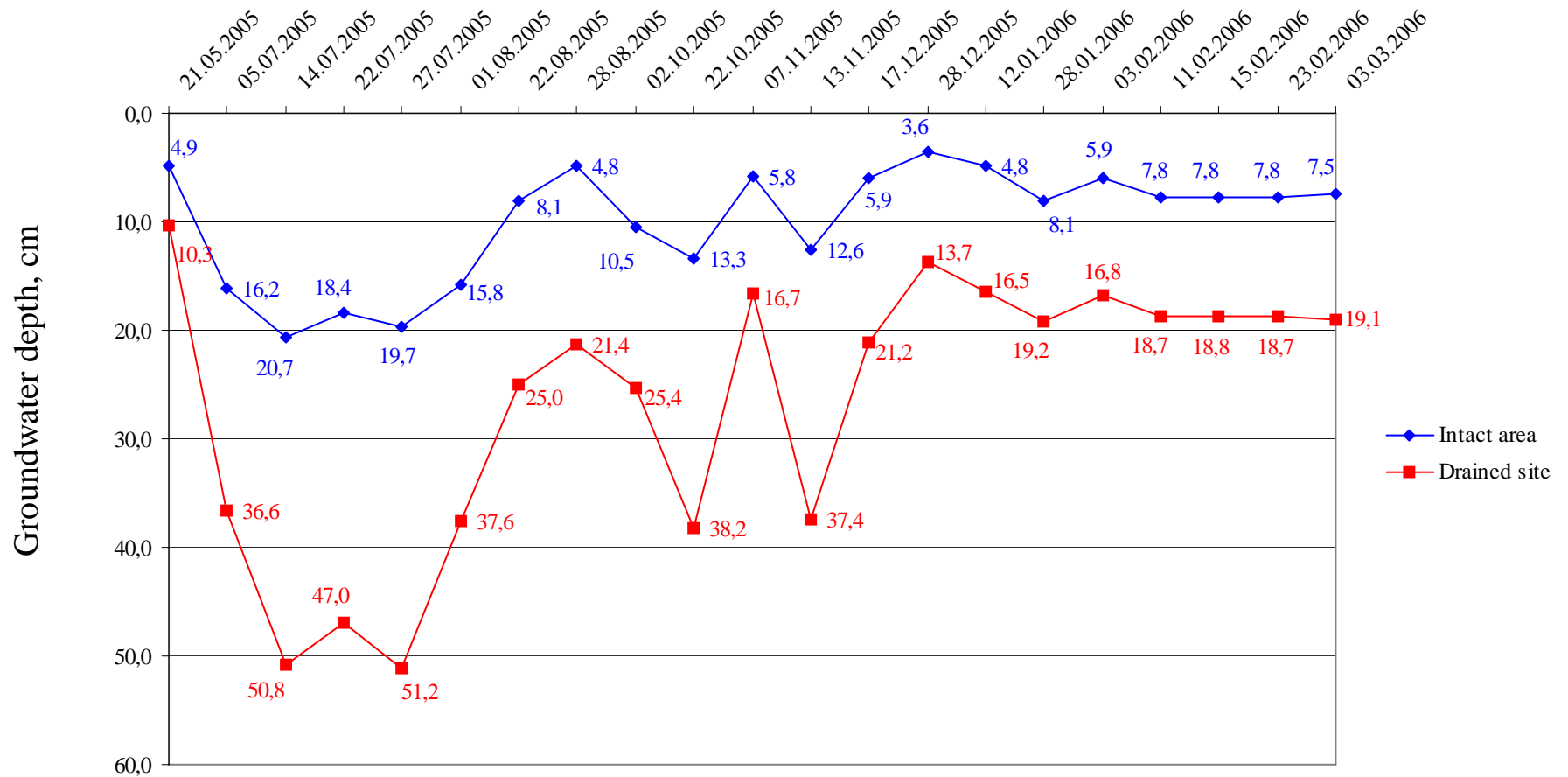
Mammals

Species	Species of EU Directives	Protected species of Latvia
<i>Eptesicus nilssonii</i>		+
<i>Myotis daubentonii</i>		+
<i>Pipistrellus pipistrellus</i>		+
<i>Pipistrellus nathusii</i>		+
<i>Lepus timidus</i>	V	+
<i>Castor fiber</i>	II, IV	+
<i>Canis lupus</i>	II, IV, V	+
<i>Lutra lutra</i>	II, IV	+
<i>Martes martes</i>	V	+
<i>Lynx lynx</i>	II, IV	+

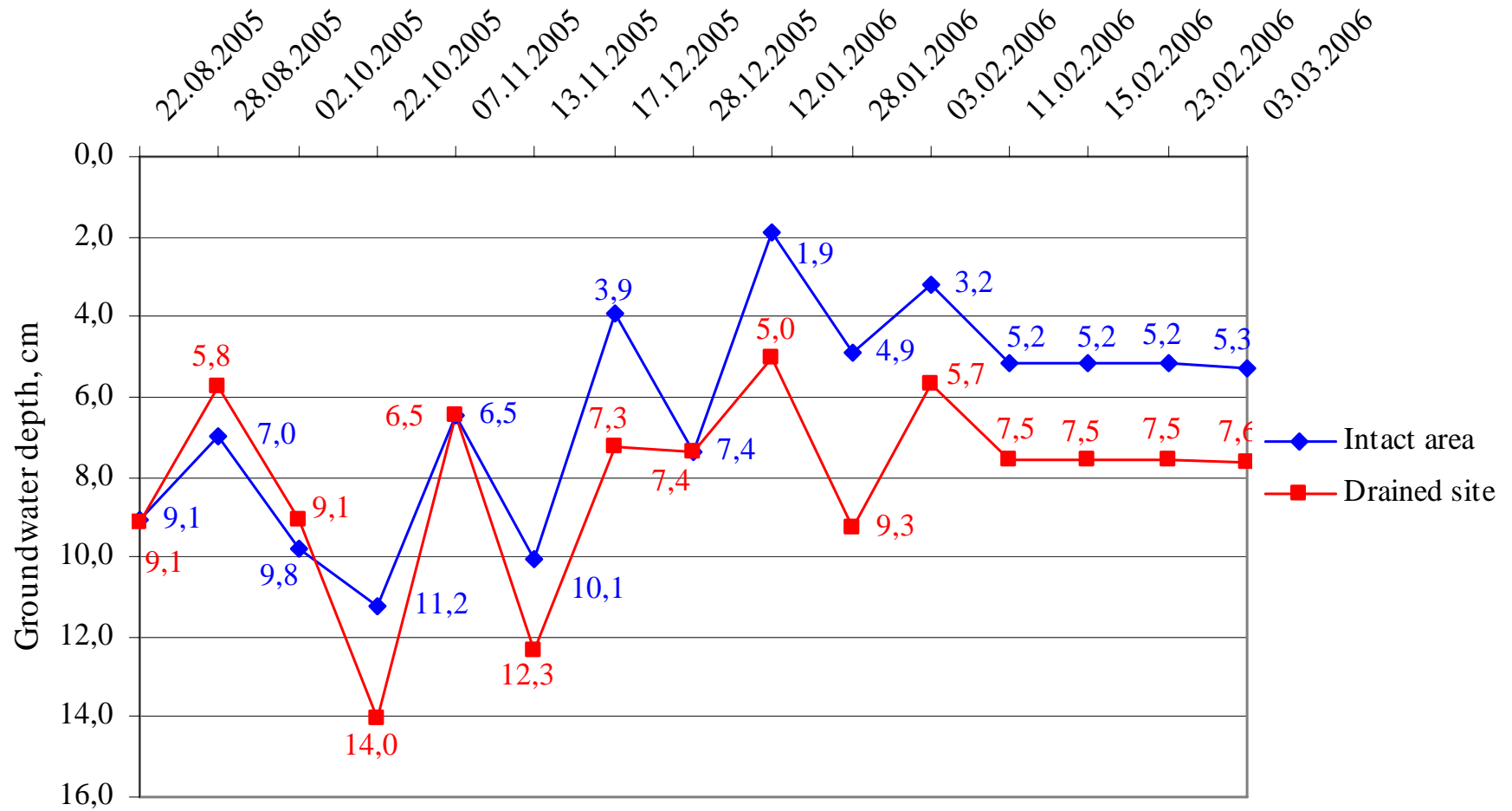
Habitats

Habitat	Biotopes of EU Directive	Protected habitat of Latvia
Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitriche – Batrachion</i> vegetation	3260	+
Old river beds		+
Hydrophilous tall-herb fringe communities of plains and of the montane to alpine levels	6430	
Northern Boreal alluvial meadows	6450	
Transition mires and quaking bogs	7140	
Fennoscandian mineral-rich springs and springfens	7160	+
Western taiga	9010*	
Fennoscandian deciduous swamp forests	9080*	
Bog woodland	91D0*	

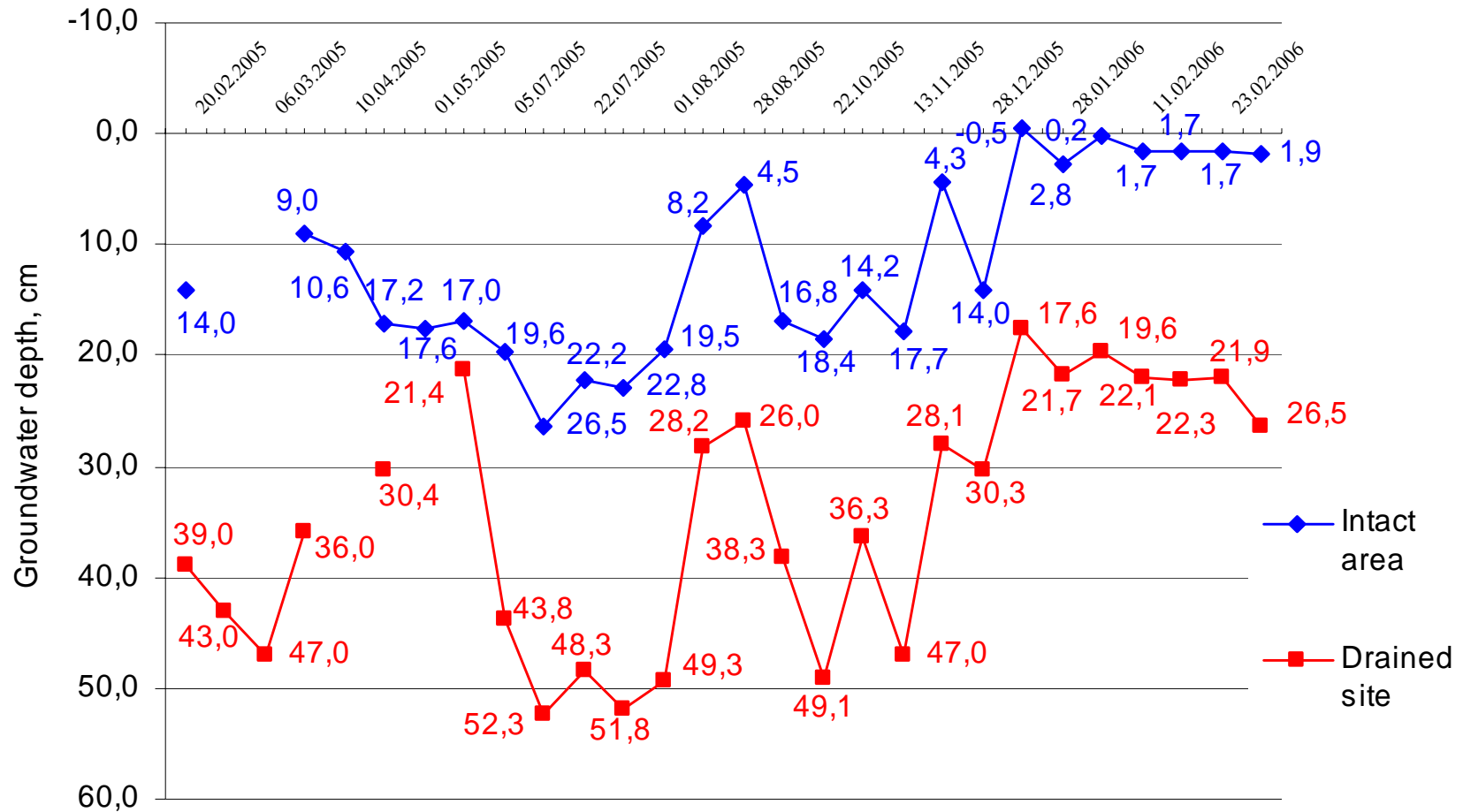
ANNEX 27. DIAGRAMS OF HYDROLOGICAL STUDIES IN CENA MIRE



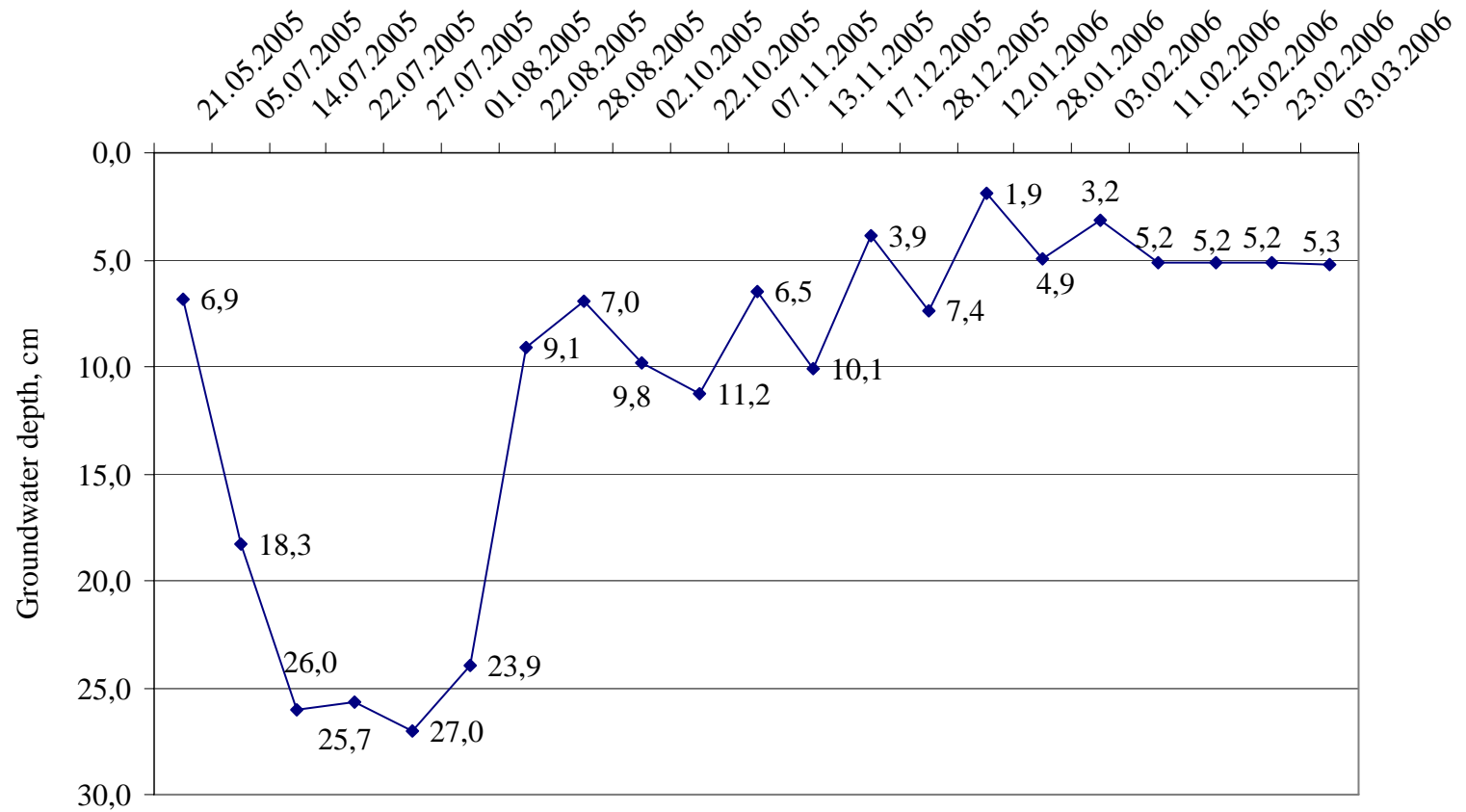
Groundwater depth in intact and drained sites in northern part of Cena Mire



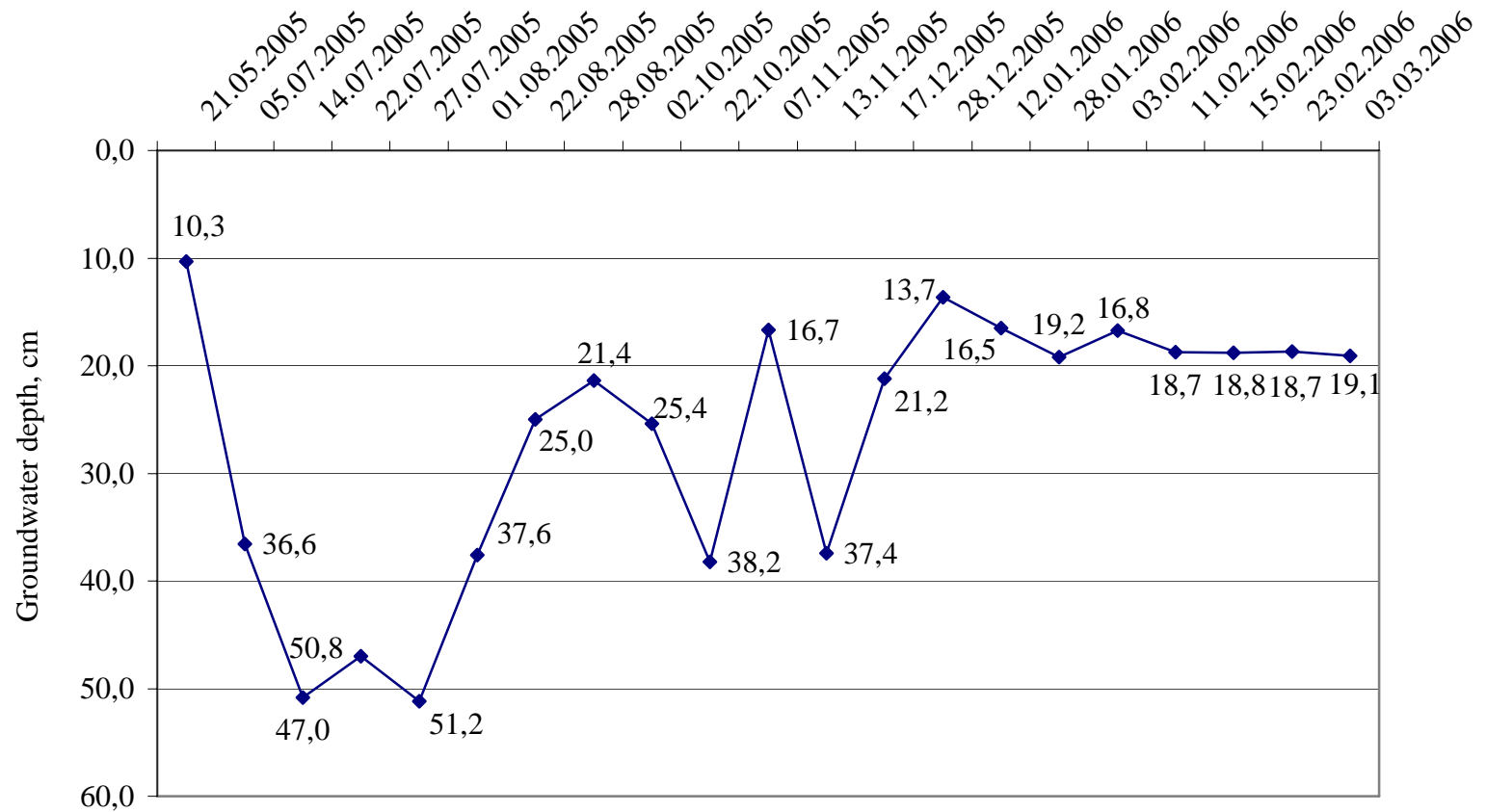
Groundwater depth in intact and drained sites in south-eastern part of Cena Mire.



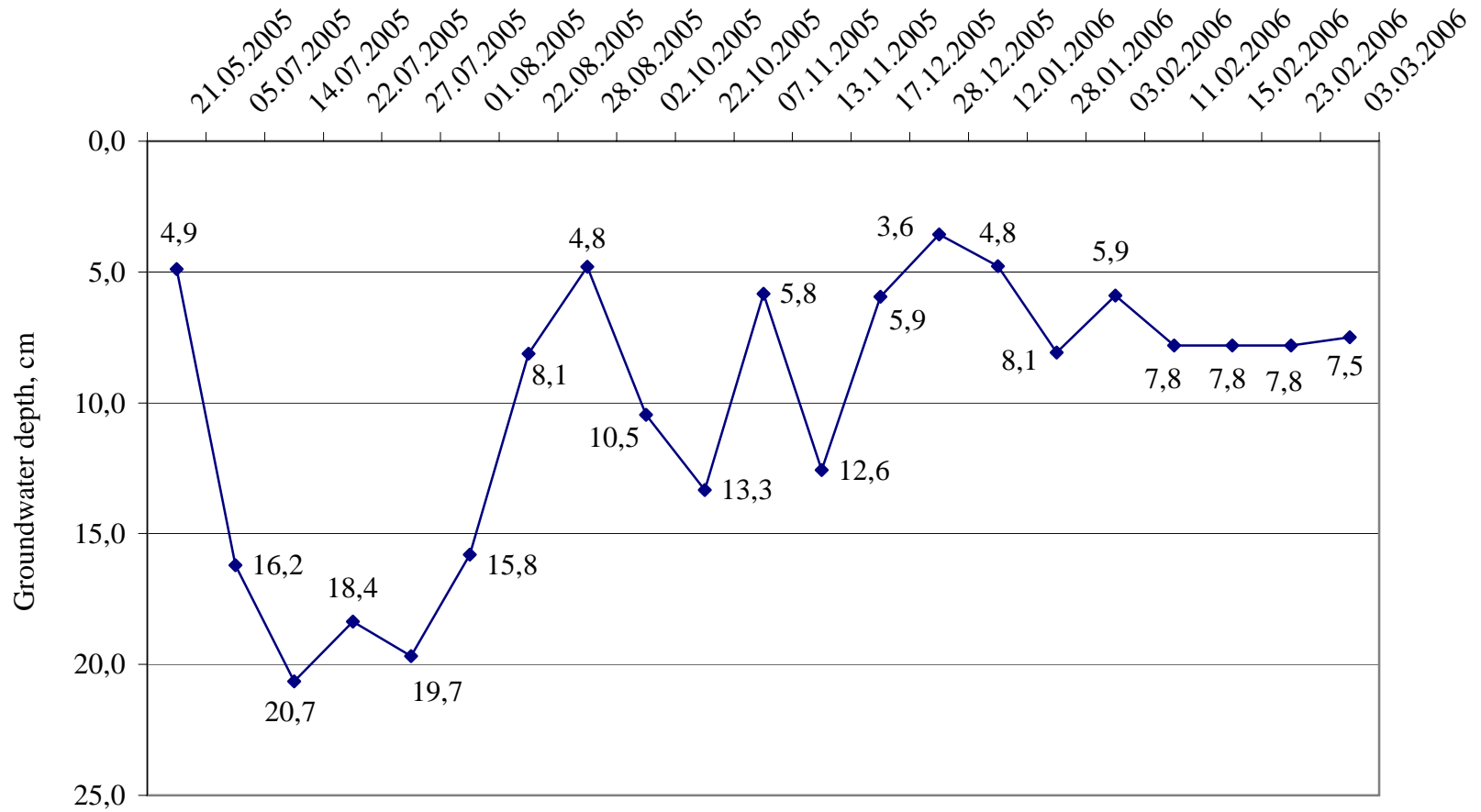
Groundwater depth in intact area and drained forested site in northern part of Cena Mire



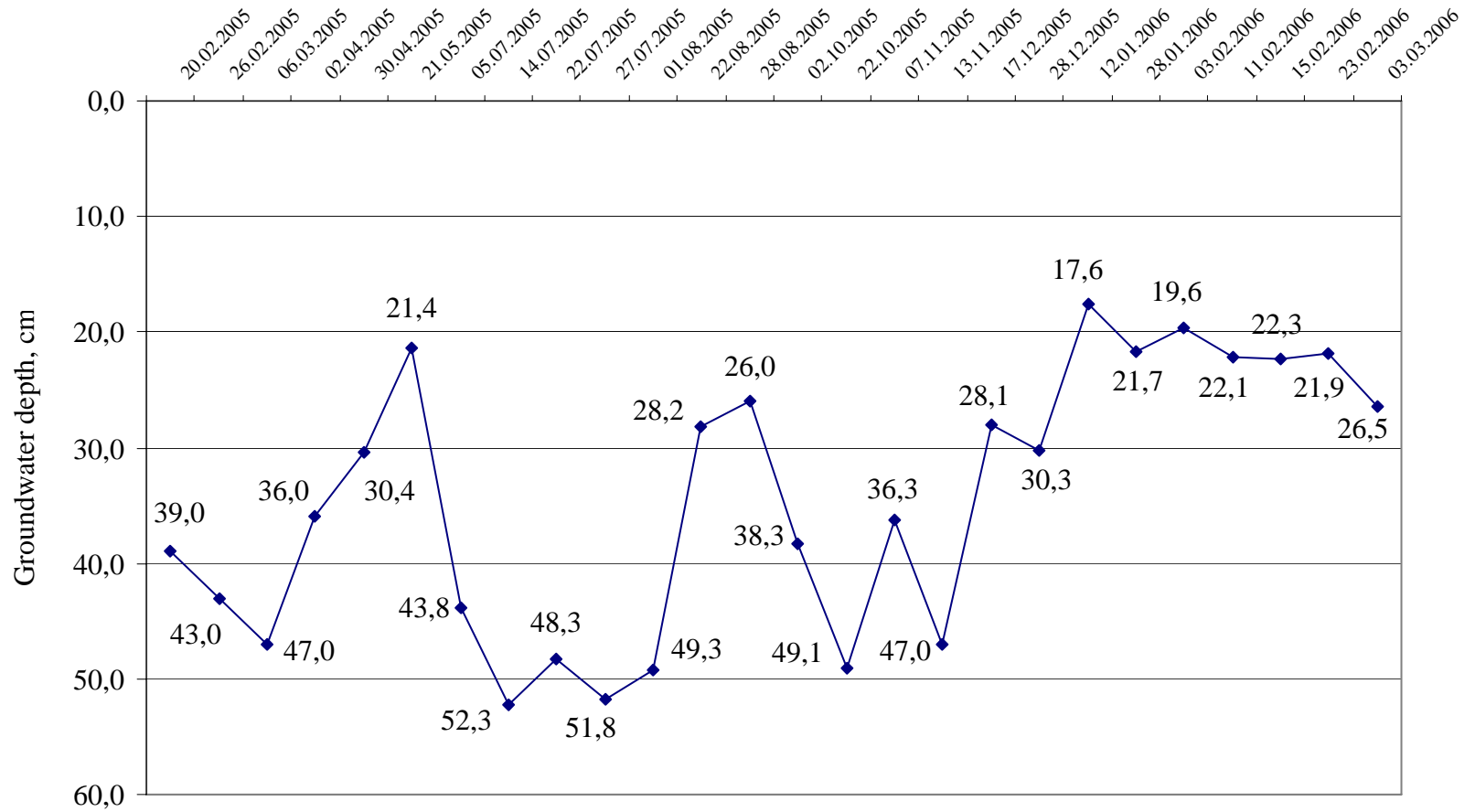
Groundwater depth in intact site in south-western part of Cena Mire



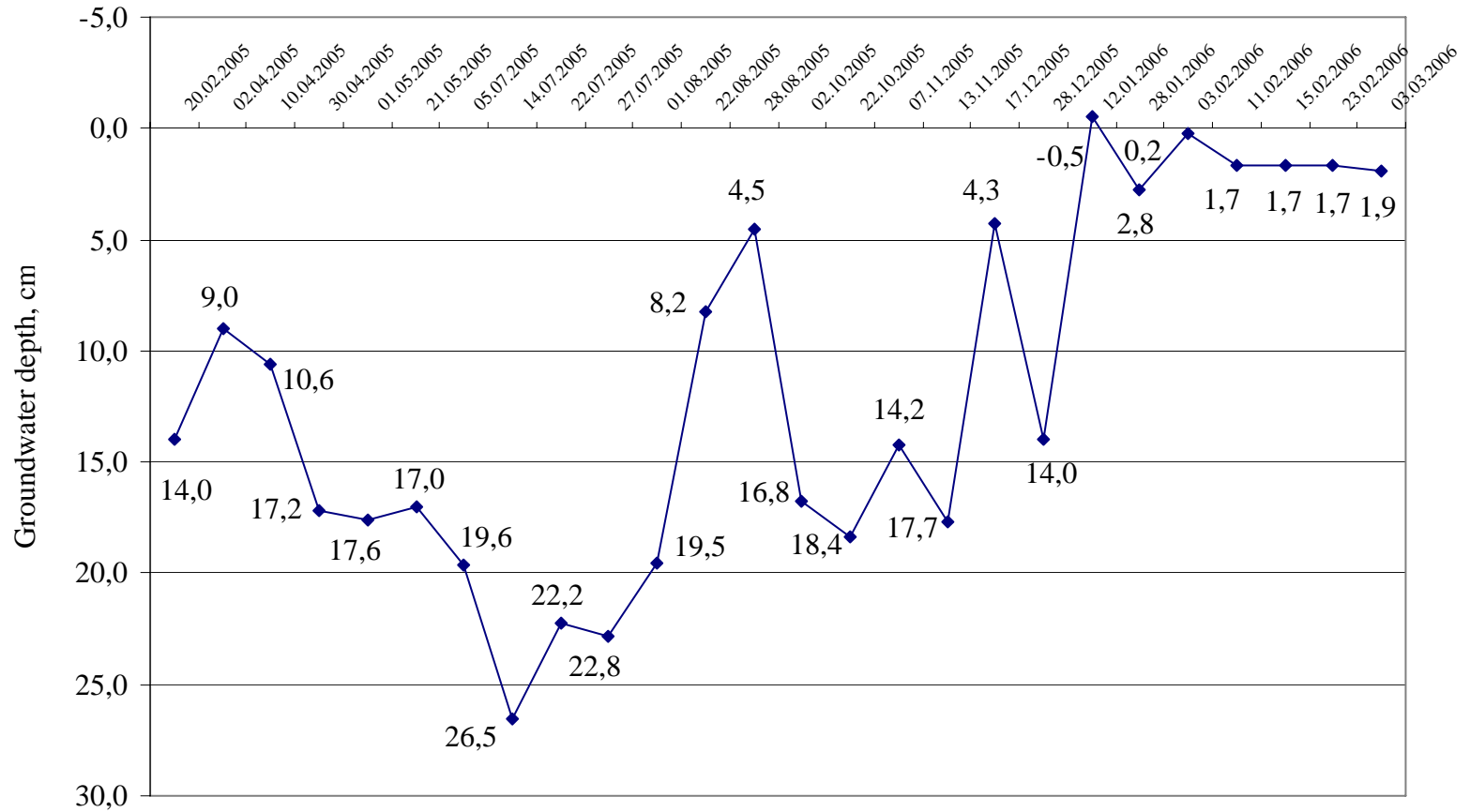
Groundwater depth in drained site in northern part of Cena Mire



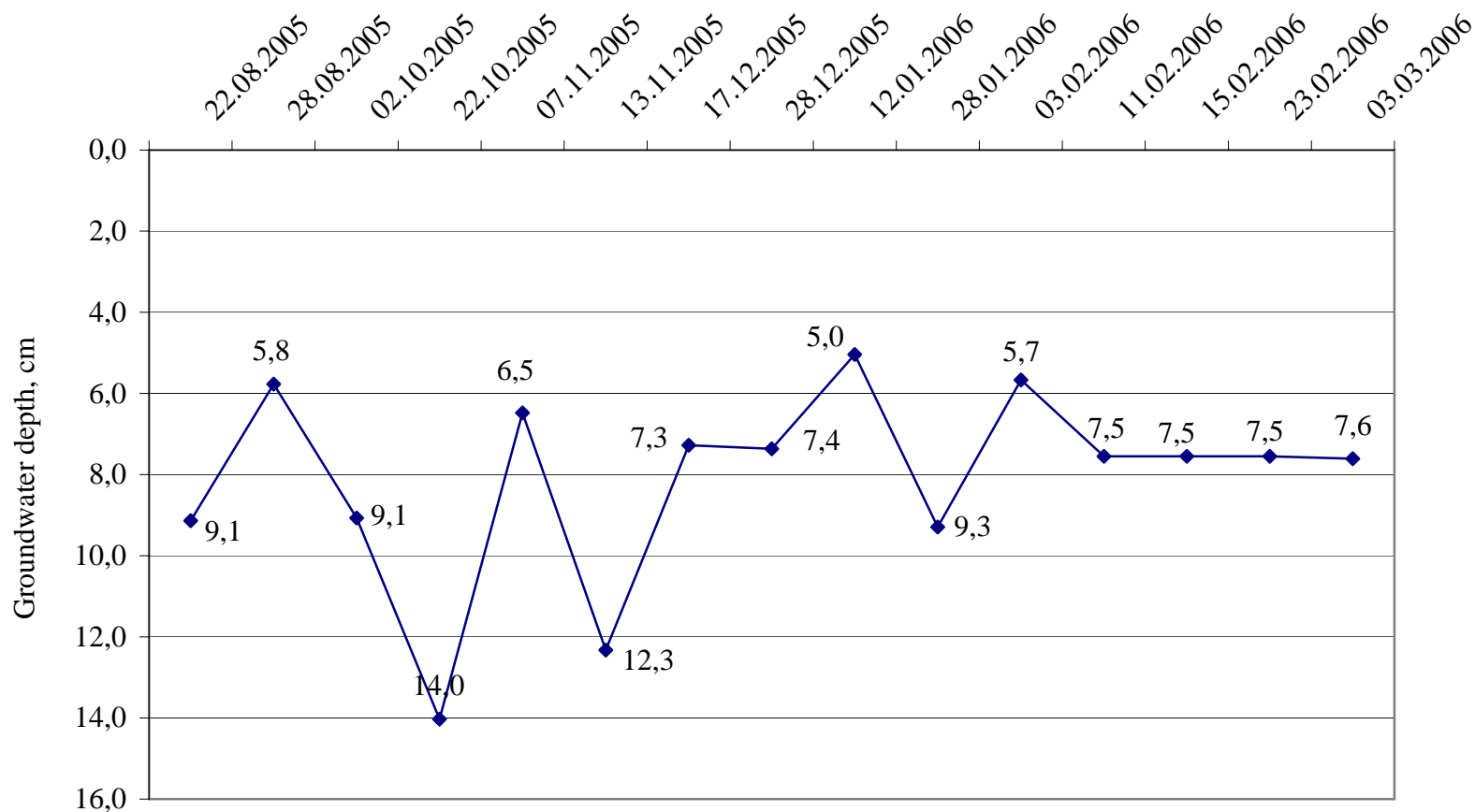
Groundwater depth in intact site between the pools in northern part of Cena Mire



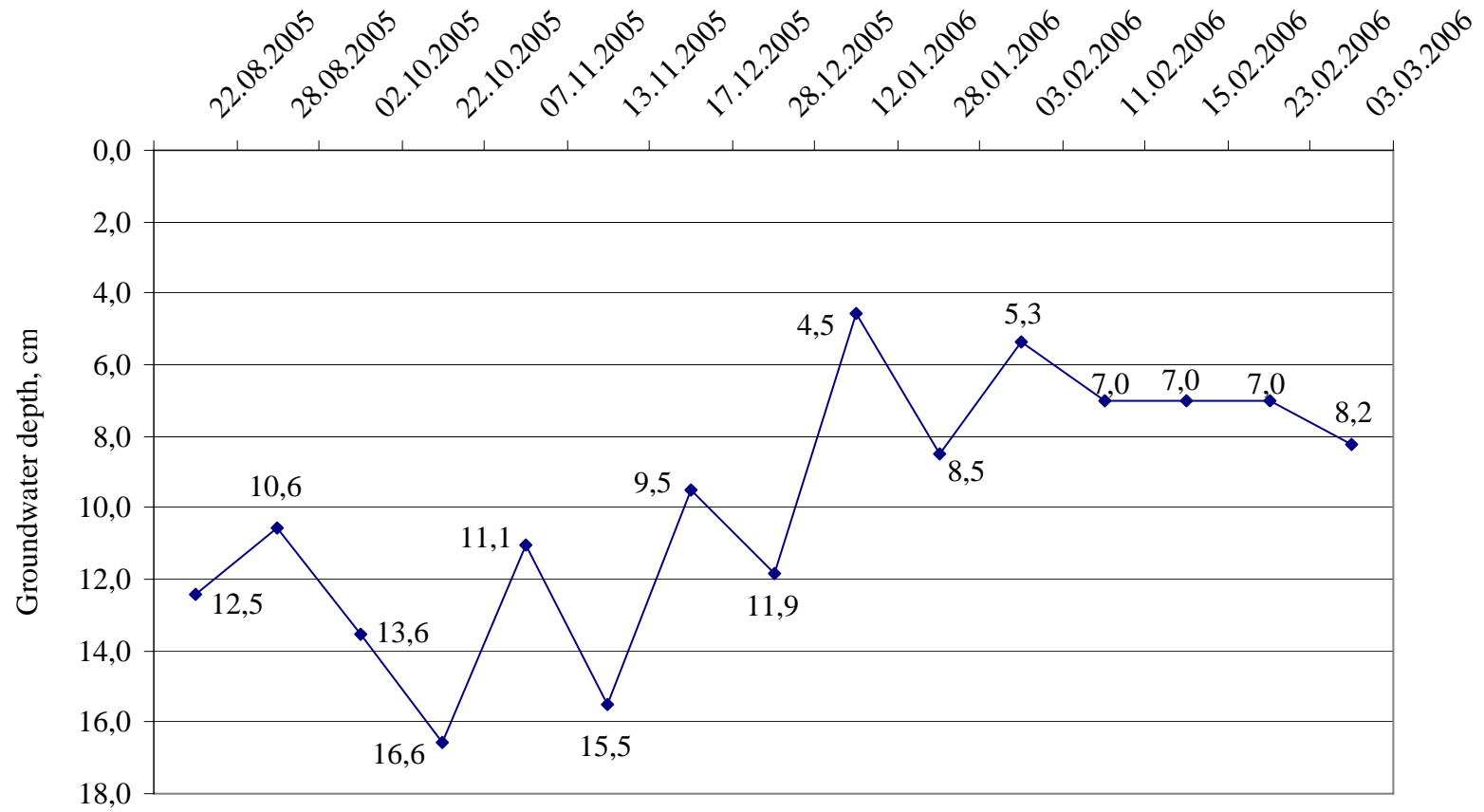
Groundwater depth in drained forested site in northern margin of Cena Mire



Groundwater depth in drained forested site in intact site in northern part of Cena Mire

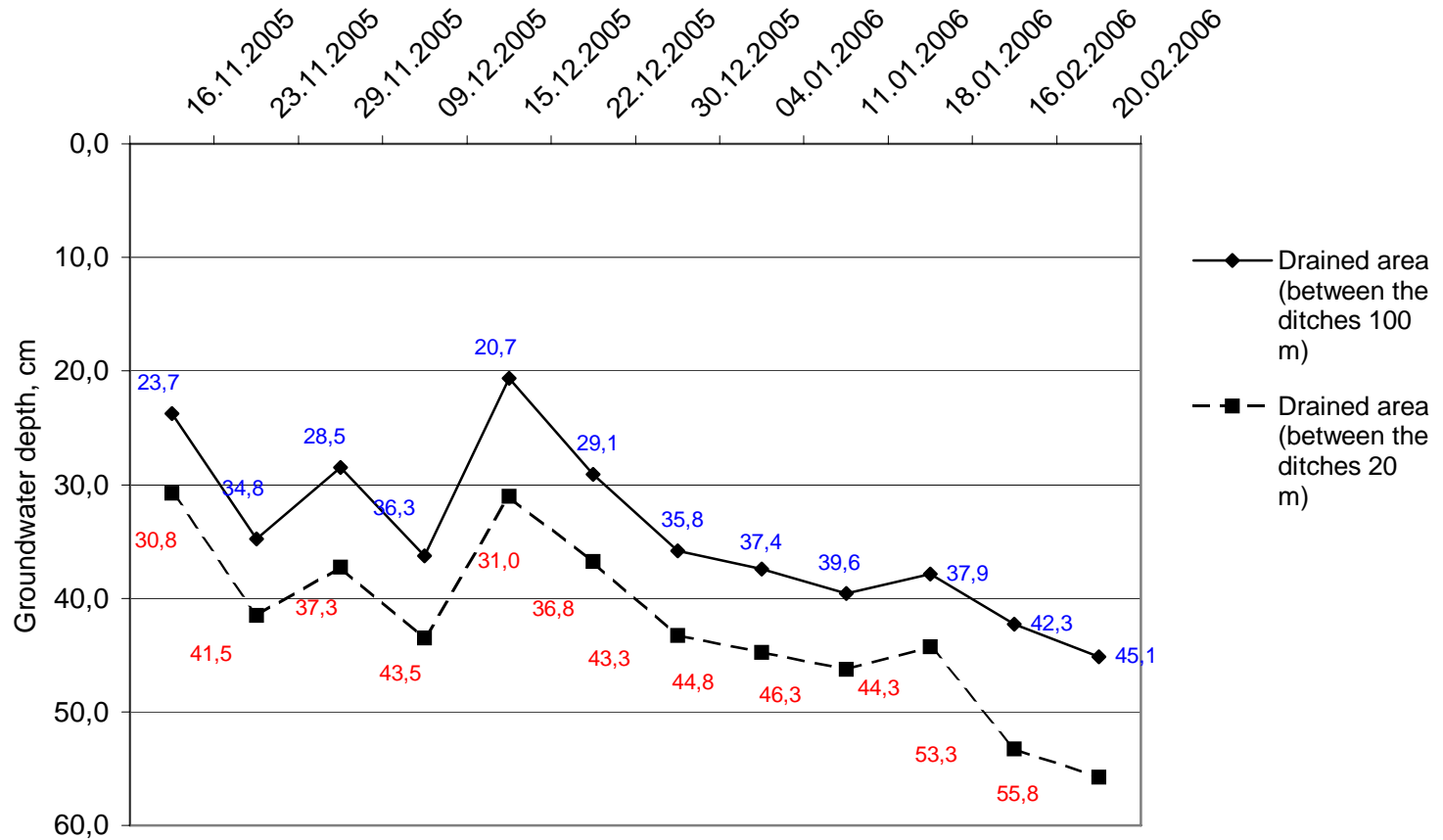


Groundwater depth between the ditches in south-western part of Cena Mire



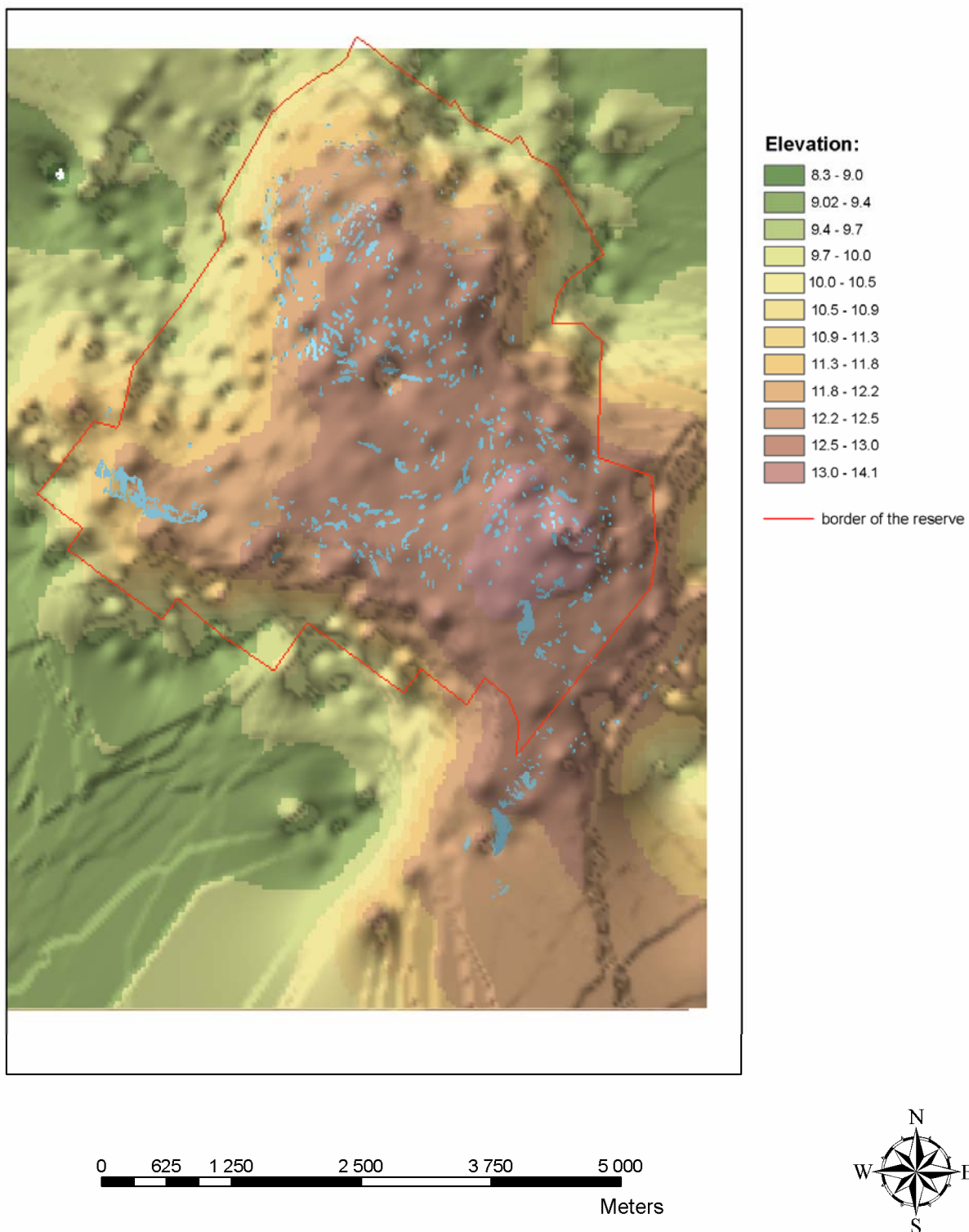
Groundwater depth near the ditch draining the lake Skaists from the western side in Cena Mire

ANNEX 28. DIAGRAMS OF HYDROLOGICAL STUDIES IN STIKLI MIRES

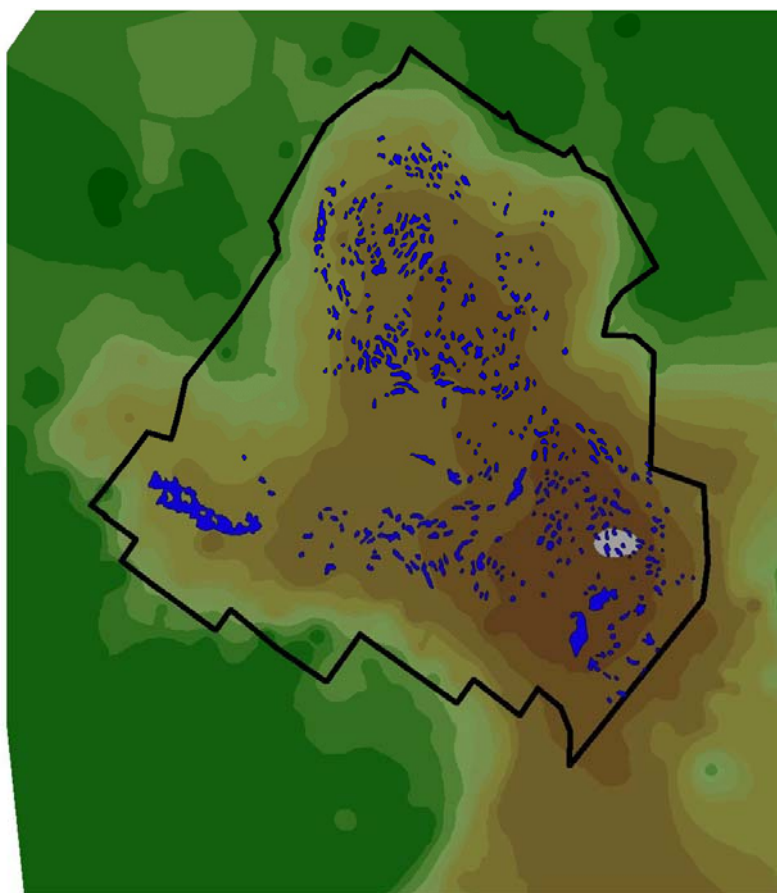


Groundwater depth in drained sites in western and northern parts of Vasenieki Mire (Stikli Mires Nature Reserve).

ANNEX 42. THREE-DIMENTIONAL MODEL FOR CENA MIRE



ANNEX 43. RELIEF MAP FOR CENA MIRE



Keys

- lakes
- the border of protected area

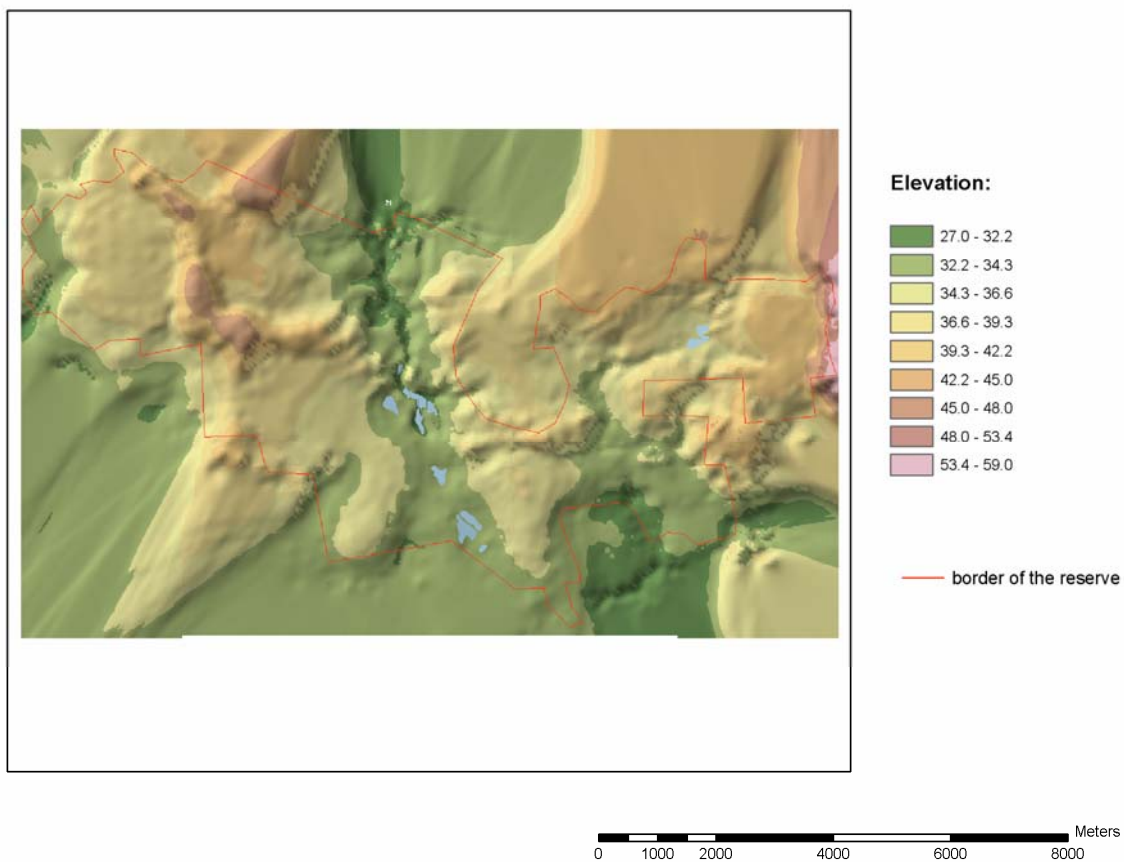
Elevation range

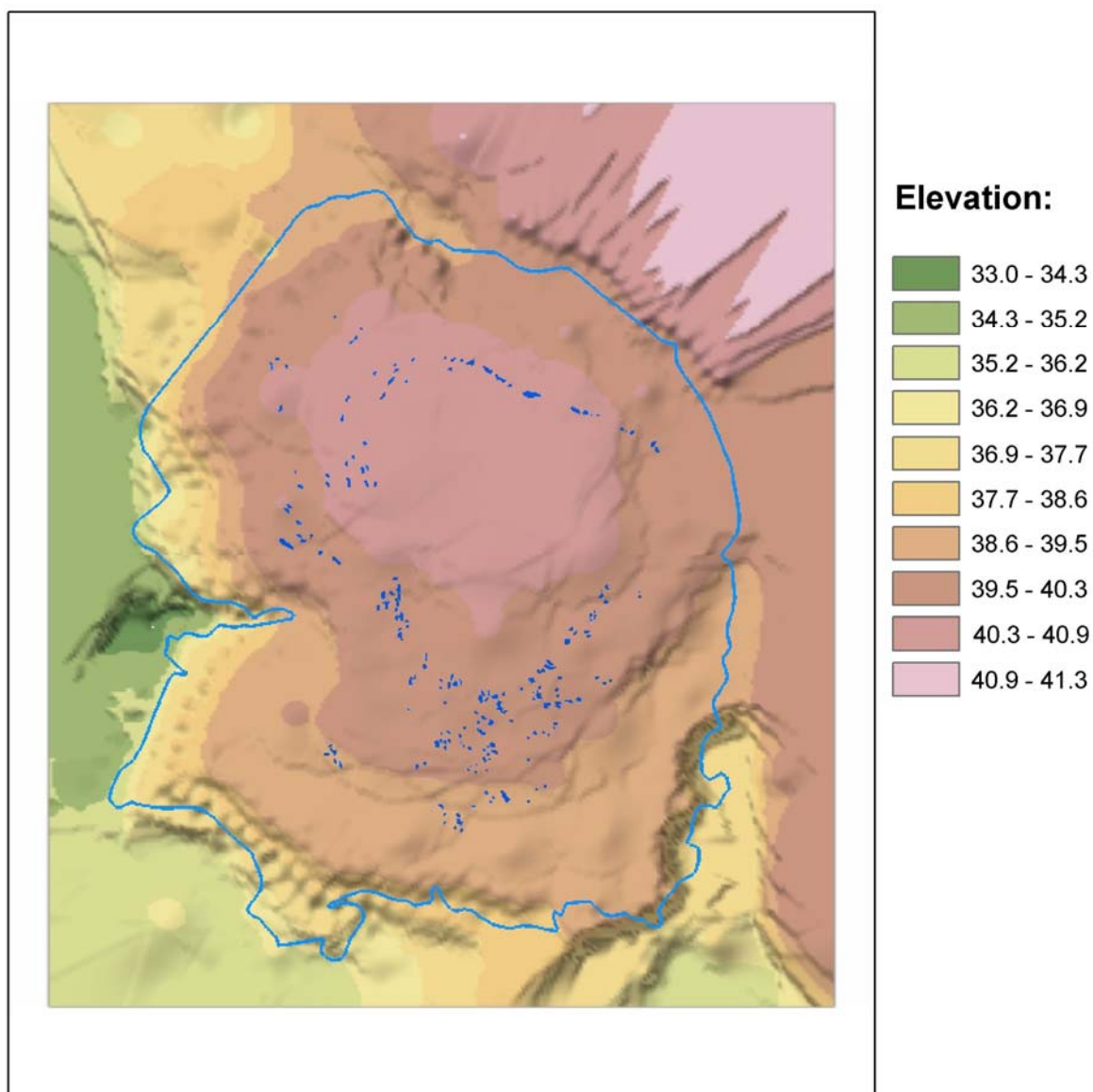
- 7 - 7.4
- 7.4 - 7.7
- 7.7 - 8.1
- 8.1 - 8.4
- 8.4 - 8.8
- 8.8 - 9.2
- 9.2 - 9.5
- 9.5 - 9.9
- 9.9 - 10.3
- 10.3 - 10.6
- 10.6 - 11
- 11 - 11.3
- 11.3 - 11.7
- 11.7 - 12.1
- 12.1 - 12.4
- 12.4 - 12.8
- 12.8 - 13.2
- 13.2 - 13.5
- 13.5 - 13.9
- 13.9 - 14.3

0.5 0 0.5 1 1.5 Kilc

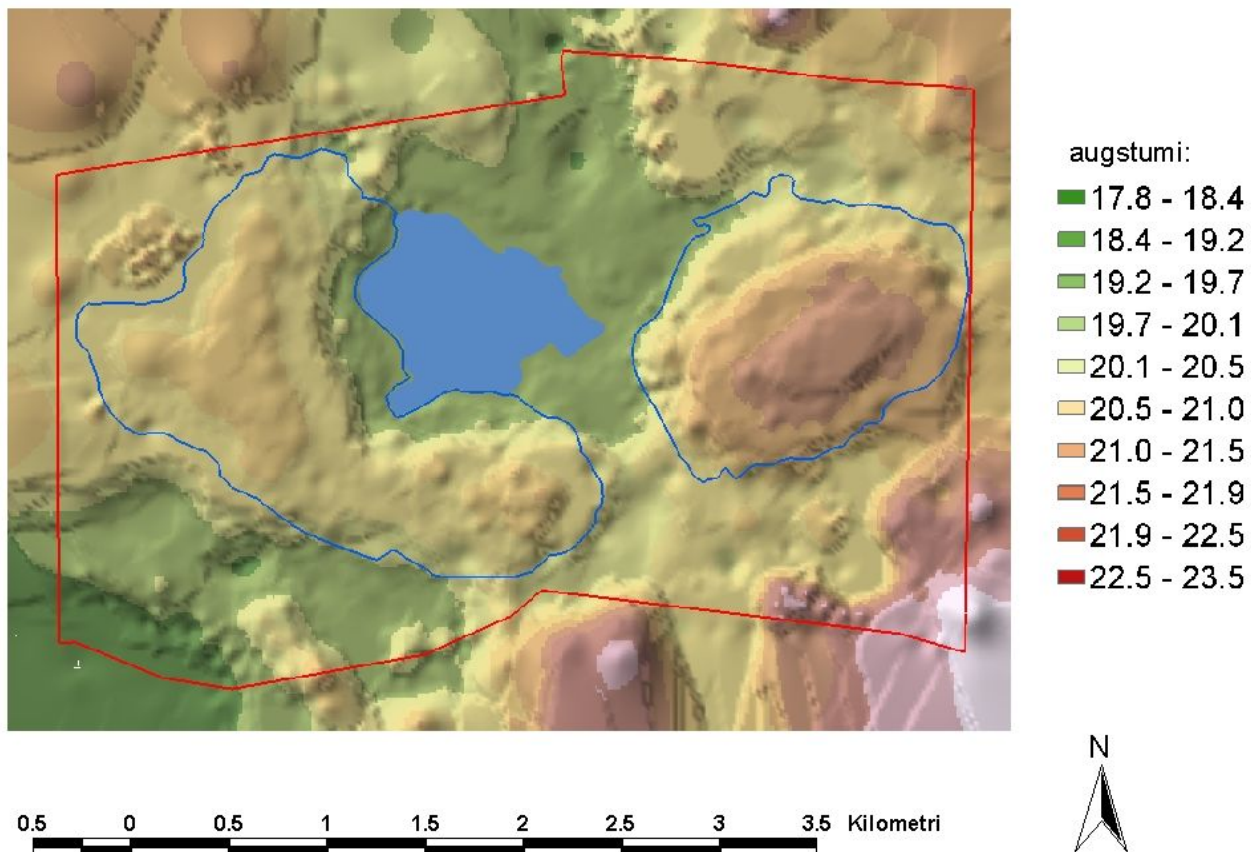


ANNEX 44. THREE-DIMENSIONAL MODELS FOR STIKLI MIRES NATURE RESERVE AND VASENIEKI MIRE





ANNEX 45. THREE-DIMENSIONAL MODEL FOR KLANI MIRE



ANNEX 50. MONITORING PLOTS IN THE PROJECT SITES

<i>Site, mire type</i>	<i>Degraded raised bog</i>			<i>Active raised bog</i>	
<i>Raised bog</i>	<i>10x10m</i>	<i>1m2</i>	<i>On ditches</i>	<i>10x10m</i>	<i>1m2</i>
Cena Mire	5	15	25	2	10
Vasenieku Mire	4	12	6	2	6
Klani Mire	1	3	7	2	6
Total:	10	30	38	6	22
Transitional mire					
<i>Transitional mire</i>	<i>Shrub and tree removal</i>			<i>Control</i>	
Veseta Floodplain Mire	1	5	-	1	5
Reed cutting					
Veseta Floodplain Mire	1	5	-	1	5
Total:	2	10	-	2	10
Total:					
Total:	12	40	38	8	32

ANNEX 54. POSTERS OF THE PROJECT AND INFORMATIVE BOOKLETS

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Vegetation studies, habitat monitoring and management in Cena Mire (Latvia)

Introduction

Latvia is located at the coast of the Baltic Sea and the Gulf of Riga (Fig. 1). The natural conditions and biological diversity of Latvia are determined by its geographical location beside the Baltic Sea (55° 40' and 58° 05' northern latitude and 20° 58' and 28° 14' eastern longitude), the variable geological conditions, relief, hydrology and climate. Latvia lies on the south-east eastern coast of the Baltic Sea. Its coastline exceeds for almost 500 km. Total area of Latvia reaches 64 636 km².

From September 2004 until December 2008 the LIFE project on Latvian mires is carried out financed by the European Commission. The project includes 4 sites - Cena, Sīkai, Kiani and Veseta Mires with the total area of 10808 ha (Fig. 2). The vegetation of the project sites includes the raised bog and fen vegetation of *Oxycocco-Sphagneteta*, *Scheuchzerio-Caricetea fuscae*, as well as forest *Vaccinio-Piceeta*, *Alnetea glutinosae*, lake vegetation of the *Utricularietea uniflorae*. Vegetation, hydrological, paleobotanical studies are carried out in the project sites, as well as management plans are elaborated that is the basis for all the management actions.

The LIFE project includes management actions, like rising of the water level, removing of shrubs and management of boreal forest habitats. The management actions will be carried out in the raised bogs, transition mires as well as spring fens and forests. Monitoring of the habitat and site hydrology as well as of the management actions has been started.

Study area

Cena Mire is a specially protected nature area (Nature Reserve) with the total area of 2133 ha. It is on an important Bird Area (IBA) with the total area of 2826 ha (Fig. 4, 5). The site is included in the list prospective Natura 2000.

Cena Mire is located in the Coastal Lowland of Latvia and is a raised bog of coastal type. Geological studies reveal that Cena Mire has originated in the Baltic Ice Lake Plain about 6000-5500 years ago. Spore-pollen analysis reveals that mire vegetation originated and has been developing since the second half of Atlantic Time until nowadays.

In the deepest place peat depth reaches almost 6 m, but medium depth is 3 m. Cena Mire includes raised bog vegetation of the *Oxycocco-Sphagneteta* and fen vegetation of the *Scheuchzerio-Caricetea fuscae*. Bog pool system has a concentric pattern and is located on both sides of transition mires. The protected part of Cena Mire borders with peat extraction fields and drainage ditches (Fig. 6).

The natural part of the raised bog in Cena Mire has several domes that are separated by transitional mire vegetation.

Fig. 1. Location of Latvia

Fig. 2. Location of the project sites in Latvia

Fig. 4. Anser abalions in Cena Mire

Fig. 5. Tringa glareola in Cena Mire

Fig. 6. Satellite image from Cena Mire
1. Raised bog vegetation
2. Fen vegetation
3. Labyrinth of bog pools

Fig. 7. Human impact on the vegetation of Cena Mire
1. Regeneration of mire vegetation after fire
2. Drainage ditches
3. Peat extraction fields

Results

Raised bog vegetation has typical hummock-hollow complex with *Sphagnum* species in the bryophyte layer. Bog pools have a concentric pattern and are located on both sides of the soak area that comprises transition mire vegetation. Cena Mire is surrounded by bog woodland and pine forests.

Hummocks are the driest place in the mire expanse and include *Calluna vulgaris*, *Oxycoccus palustris*, *Andromeda polifolia*, *Drosera rotundifolia*, *Empetrum nigrum*, *Eriophorum vaginatum*, *Oxycoccus palustris*, *O. microcarpus* and *Drosera rotundifolia* in the herb layer and *Sphagnum magellanicum*, *S. rubellum*, *S. fuscum* in the bryophyte layer. The other species on hummocks include *Dicranum affine*, *Pleuronotum schreberi*, *Mylia anomala*, *Calypogeia sphagnicola*, *Kuzia pauciflora* and *Pohlia sphagnicola*. *Cladonia stygia*, *C. nilis*, *C. porteriata* appear on higher hummocks.

In hollows *Rhynchospora alba*, *Andromeda polifolia*, *Oxycoccus palustris* and *Drosera anglica* are common, while in the bryophyte layer *Sphagnum cuspidatum*, *S. flexuosum*, *S. tenellum* and *Cladopodiella fluitans* are common.

Raised bog communities, like *Sphagnetum magellanicum*, *Empetrum nigrum-Sphagnetum fuscum*, *Rhynchosporietum albae* are common in Cena Mire, while *Caricetum lasiocarpae* and *Caricetum rostratae* occur in the transitional mire vegetation. *Mnysia illex trifida* is common species there (Fig. 8).

In the centre of the ordination diagram relevés of the raised bog hummocks are grouped; in the upper right corner – the vegetation of bog pools with *Sphagnum cuspidatum*, but in the lower right corner – transition mire vegetation is grouped (Fig. 9).

Fig. 8. *Mnysia trifida*

Photos: Māra Pakalne, Armands Pundurs.
Austra Abolna, Alvars Petriņš
Design: Linda Lavīna
Printed: Mc Abols

Fig. 9. PC - Ord ordination diagram of vegetation relevés of Cena Mire

The central part of Cena Mire is in a natural status, but the margins in some parts are influenced by drainage and due to the changes in hydrology soil erosion takes place.

Cena Mire is a unique raised bog because it is one of the few raised bogs of Latvia that possess the features of the coastal raised bog type as it includes *Trichophorum cespitosum*, and also the features of the eastern bog type as it is the habitat for *Chamaedaphne calyculata*.

Cena Mire is the habitat for 4 protected vascular plant species of Latvia – *Betula nana* (Fig. 10), *Dactyloctenium maculatum*, *Trichophorum cespitosum* and *Eriophorum gracile* and 2 bryophyte species – *Calypogeia sphagnicola* and *Sphagnum pulchrum*.

Fig. 10. *Betula nana* in Cena Mire

Conclusions

- Cena Mire started to develop in the second half of the Atlantic Time in the area of a well meadow when with the rise of the groundwater level wood-sedge peat developed.
- At present, the area of Cena Mire includes both natural raised bog habitats as well as those influenced by various human activities, like drainage, peat extraction and fire. Therefore, activities re-instating the mire hydrology are planned.
- At present, the area of Cena Mire includes both natural raised bog habitats as well as those influenced by various human activities, like drainage, peat extraction and fire.

Hydrological and vegetation studies in LIFE “Mire” sites in Latvia

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In Latvia mires cover about 4.9% of the total land area. In Latvia pristine and undamaged mire complexes are still found, most of which now are state protected. On the other hand, about half of mires are influenced by various human activities and the degradation of the mires influenced by drainage continues. Therefore, to stop the degradation of mire and diminish the influence of desiccation caused by drainage of mires of at least some of Latvian mires that are located in the protected nature areas, restoration of mire hydrology and habitats is carried out within the project financed by the European Commission LIFE-Nature project LIFE04NAT/LV/000196 “Implementation of Mire Habitat management plan for Latvia”



Fig.1. Location of project sites.

PROJECT SITES

Cena Mire Nature Reserve (2133 ha). Cena Mire located about 12 km SW from Riga. Its development has started about 6000 years ago by land paludification. Previously, Cena Mire has been one of the largest raised bogs in Latvia but at present due to drainage and peat extraction only small part has remained.

Klāņi Mire Nature Reserve (1615 ha). The site is located about 9-12 km south from the Baltic Sea and includes 2 raised bogs of a coastal type of Latvia. The intact part of Klāņi Mires has a typical vegetation of raised bogs with hummocks, hollows, lawns and carpets, but in on mire margins the drainage influence is observed in mire vegetation.

Stikļi Mires Nature Reserve (6636 ha). It is the largest raised bog complex in Western Latvia. The value of the site lies in the wide range of habitats of EU importance – raised bogs, transition mires, old-growth forests and 7 lakes. The raised bogs have the hummock-hollow complex. At the same time the mire margins are damaged by drainage ditches where the restoration of site hydrology and mire habitats will be carried out.

Veseta River Floodplain Mire Nature Reserve (424 ha). The site includes peculiar spring mire vegetation and reed beds that have developed in the river floodplain. It is surrounded by alder swamps. It is a small area but very rich with rare and protected plant and animal species that possesses one of the largest populations of very rare plants in Latvia – *Saxifraga hirculus*, *Liparis foeseili* and *Hamatocaulis vernicosus*.



Fig 2. Pool system in Cena Mire.

In June/July 2005 permanent plots for monitoring of habitats and site hydrology have been established to monitor the changes in the plant cover and hydrology of raised bog habitats resulting from damming in Cena Mire, Stikļi and Klāņi Mires.

In Veseta River Floodplain Mire, monitoring plots are set up to follow the effects of management activities in the transition mire and quaking bog habitats as well as in Fennoscandian springs and springfens and to check their success of limiting invasion of pine and birch.

In the raised bogs, relevés are located near the ditches that are going to be dammed. The vegetation in the drained part is compared to that in the intact area. In the plots, water level measurement will be carried out. Plant species composition and the percentage cover is evaluated. The size of the plot is 1x1 m. There are 3-5 plots within the larger 10x10 m relevé.

The relevés are set up to monitor the *Sphagnum* and other plant species invasion in the ditches after building of dams on drainage ditches. The wetness of the sites is recorded. At the dry points, the records about tree, shrub or *Calluna* dominated vegetation is made as well as for adjacent ditches.

As the raised bog and fen habitats respond relatively slowly to the environmental change, habitat monitoring of the sites is carried out during summer before and after the restoration work is carried out.

The water levels in the surface and ground waters will be measured by piezometers at various sites. To achieve best results hydrological and habitat monitoring is integrated.

In the project sites (Cena Mire, Vasenieku Mire and Klāņi Mire) there are 3 large areas in each of the sites and also small places where the damming of ditches is planned. In these areas, depending on their size, about groundwater wells are set up. The depth of the groundwater is up to 2m. Groundwater level is measured before and after the damming of ditches. In all the project sites habitat and site hydrology monitoring will be carried out at the same time.

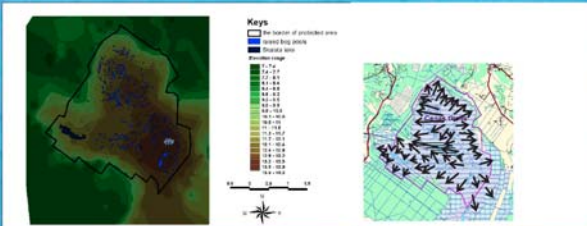


Fig. 3. Elevation range of Cena Mire.

Fig. 4. Water flow directions in Cena Mire.



Fig. 5. A three-dimensional model of Cena Mire.

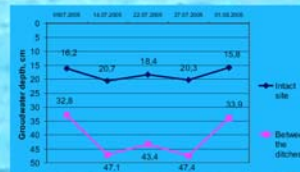


Fig. 6. Groundwater depth in July of 2005 in intact and drained sites of Cena Mire.



Fig. 7. Groundwater level observation wells in Cena Mire.

- The tasks of hydrological studies are:
- To elaborate the recommendations for dam construction and blocking of drainage ditches.
 - To calculate the frequency of dams.
 - The leveling of bog surface in dam construction areas. The construction of 100 x 100 m grid for leveling.
 - The estimation of surface and groundwater fluxes in bog area.
 - The establishment of long-term monitoring in renovated territories. Installation of groundwater observation wells.
 - Estimation of phreatic water level optimal for *Sphagnum* growth.

- Groundwater observation wells are installed in transects in following sites:
- in the *Sphagnum* growth area;
 - in the bog pool system area – between the pools;
 - between the drainage ditches;
 - in the pine forest near the lake.