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# Ecological networks and nature policy in central Russia

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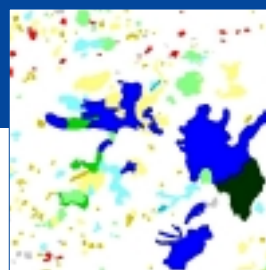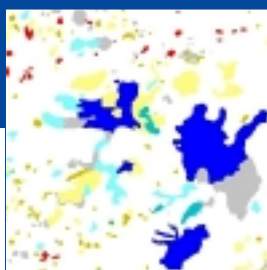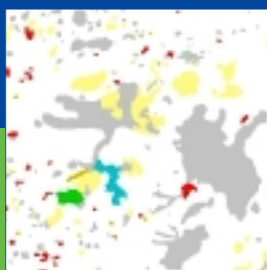
**Peat bogs in central and northern Meshera**

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ABSTRACT

In central and northern Meshera the habitat for many characteristic peat bog species now show a very fragmented pattern. Peat-mining and other human influences are the most important reasons. As a result the potentials for viable populations of characteristic peat bog species have decreased considerably. Of birds and butterflies, butterflies appeared to be most vulnerable.
To maintain and increase potentials for viable populations of characteristic species protection and restoration are very important. The most realistic restoration scenario, change partly disturbed peat bogs to undisturbed, shows a significant increase of the potentials for viable populations for many species, especially butterflies.
To bring protection and restoration measures forward, Local Environmental Action Programs (LEAPs) hold enormous promise.

Keywords: Birds, Butterflies, Ecological networks, Meshera lowland, peat bogs, protection, restoration, Russia

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# Contents

# Preface

This research has been carried out by the All-Russian Research Institute for Nature Protection (ARRINP, Moscow, Russia) and ALTERRA, Green World Research (ALTERRA, Wageningen, The Netherlands). The Dutch Ministry of Agriculture, Nature Conservation and Fisheries and the Dutch Ministry of Foreign Affairs provided financial support (MATRA Fund/Programme International Nature Management).

The project consisted of a study on peat bogs in Petushinski, Sobinski sub regions of Vladimirskaya region and Pavlovo-Posadski, Orekhovo-Zuevski, Egorievski and Shaturski sub regions of Moscovskaya region, an excursion to The Netherlands on peat bog conservation and restoration and a workshop on peat bog protection held in Sobinski sub region of Vladimirskaya region.

The project has been coordinated by R.O.Butovsky (ARRINP, Leading Research Scientist) and R. Reijnen (ALTERRA). For ARRINP contributions to the project have been made by R.O. Butovsky (butterflies, LARCH analysis), D.M. Otchagov (birds, peat bog types, LARCH analysis), G.S. Eremkin (birds, butterflies, LARCH analysis), G.M. Aleshenko (GIS, LARCH analysis), E. Melik-Bagdasarov (peat bog types), I.M. Esenova (botany), and for ALTERRA by R. Reijnen (excursion Netherlands, LARCH analysis) and M. van der Veen (excursion Netherlands).

Local administrations of sub regions provided organizational support during the field survey. Special thanks to administration of Sobinski sub region for hosting the seminar on peat bog conservation in Sobinka.

# Summary

In the Central Russian landscape peat bogs are one of the most characteristic ecosystems. Because of peat mining and transformation of peat bogs into agricultural land after drainage, suitable habitat for several characteristic species now show a very fragmented pattern. Many of the remaining areas might be not large enough or have a too low quality to support sustainable local populations. Probably, these species will only persist when populations in the individual areas are linked into a network system. Exchange of individuals between these local populations then will prevent that extinctions will occur. The results of a first explorative study in Petushinski sub region of Vladimir region in 1998-1999 shows that this problem should be taken seriously (Otgachov et al. 1999).

This study applies the network approach in central and northern Meshera, which is situated partly in Moscow region and partly in Vladimir region. The aim is to contribute to nature conservation plan of Meshera lowland by indicating and identifying peat bog areas where protection is needed and restoration measures are most effective.

At the end of the XIX century peat bogs covered 18 % of the study area. Of the total area of 189 000 ha 30% consisted of high and intermediate peat bog (bogs) and 70% of low peat bog (fens). Due to peat-mining and other human activities transformation of peat bogs which is almost irreversible occurred on more than 50% of the total area. Reversible transformation of peat bogs (partly disturbed) took place at about 62 000 ha. About 28 000 ha of peat bogs remained undisturbed.

The current potentials for viable populations of characteristic peat bog species are assessed with the LARCH model. LARCH (Landscape ecological Rules for the Configuration of Habitat) is designed as an expert system to evaluate ecological networks. LARCH works with standards for species and uses the habitat configuration for each species as a basis. It uses species specific parameters to assess which parts of landscape are habitat patches in the same network, based on dispersal characteristics. Carrying capacity information (maximum density possible) is used to assess the minimal size of habitat in a network needed for a viable population.
For practical reasons 17 indicator species were selected, nine butterfly species and eight bird species. These species represent differences in dispersal capacity and carrying capacity.

For 10 of the 17 indicator species current potentials for viable populations are not sufficient. Three butterfly species and two bird species show very low potentials for viable populations (only not viable networks) and four butterfly species and one bird species show medium potentials (one or more key populations in viable networks). For the other seven species viability is ensured under almost all circumstances (one or more key populations in strongly viable networks).

The potentials for viable populations per peat bog are presented by the number of species showing 'medium' and 'high' potentials (key populations in viable and strongly viable networks). The total area of peat bogs where species with key populations are present covers 123 000 ha. In only 16 600 ha (13.5%) of peat bogs the number of species with key populations is relatively high.

To maintain and increase potentials for viable populations of characteristic species of peat bogs protection and restoration are important measures. The current area of protected peat bogs is rather small (20 400 ha) and it is indicated what other peat bogs are also in need for protection. To identify where restoration of peat bogs will be most effective four restoration scenarios are analyzed with the LARCH model. The most realistic restoration scenario, change partly disturbed peat bogs to undisturbed, shows a significant increase of the potentials for viable populations for many species, especially butterflies.

In applying the results of this study one should consider that indicator species are chosen which are characteristic of undisturbed peat bogs and might be vulnerable to habitat fragmentation in the study area. The restriction to undisturbed peat bogs probably gives an incomplete view of the potentials for viable populations of peat bogs in general. Especially partly disturbed and flooded peat bogs sometimes can be very important for many bird species.

The next step will be to bring forward these recommendations. For this, Local Environmental Action Programs (LEAPs) hold enormous promise (Markowitz 2000). LEAPs are founded on meaningful public input in local governmental decision-making. With support from the Dutch Ministry of Agriculture, Nature Management and Fisheries and from the Dutch Ministry of Foreign Affairs (MATRA Fund/Programme International Nature Management) a LEAP is now being developed for part of the study area.

# 1 Introduction

## 1.1 Scope and objectives

In the Central Russian landscape peat bogs are one of the most characteristic ecosystems. Because of peat mining and transformation of peat bogs into agricultural land after drainage, suitable habitat for several characteristic species now show a very fragmented pattern. Many of the remaining areas might be not large enough or have a too low quality to support sustainable local populations. Probably, these species will only persist when populations in the individual areas are linked into a network system. Exchange of individuals between these local populations then will prevent that extinctions will occur. The results of a first explorative study in Petushinski sub region of Vladimir region in 1998-1999 shows that this problem should be taken seriously (Otchagov et al. 1999). Most of the studied species (15 out of 20, birds and butterflies) need ecological networks to support viable populations. For 8 species the present habitat network is probably not sufficient to survive in the long term and for two species the present habitat network can not support viable populations.

Up to now the network strategy is not considered in the nature conservation policy of (Central) Russia. Single natural protected areas are existing as nominated by different specialists for urgent conservation of threatened natural sites (species). The development of a scientific and methodological basis for creation of such networks has only started very recently. Furthermore, a serious problem is lack of understanding between legislative and executive bodies at the regional level, and by scientific recommendations and their implementation into practice. The relations between governmental and non-governmental organisations are also underdeveloped to result in weighed and well-thought nature protection decisions.

The short term objectives of this study are:
– to contribute to nature conservation plan of part of Meshera lowland in the Central Federal District of Russia (see figure 1.1) with respect to ecological network function of peat bogs by identifying sites that either are currently very important or are most favourable to take restorative measures;
– to start up a basis for understanding and implementation of network approach for scientists as well as decision makers at different levels;

For the long term it is aimed that the study will:
– initiate basic research on ecological networks by Russian scientists;
– lead to implementation of the network approach into practice in (Central) Russia;
– create a basis for the development and implementation of the Pan European Ecological Network (PEEN).

## 1.2 Nature policy in Russian Federation and Meshera lowland

Nature protection policy in Russia is based on federal and regional legislation. During last years several documents were adopted by Russian government, like Action plans of the government of Russian Federation (RF) on nature protection and use of natural resources for 1994-95 and 1996-97, which included more than 150 important activities (e.g. more than 80 federal target programs, about 30 normative acts etc.); concept on national safety of RF (Note of RF President signed December 17, 1996); National action plan on nature protection in Russian Federation for 1999-2001 (SCEP, Moscow, 1999). Till 1992 one federal zapovednik ('Okski') existed in Meshera region (category IA, IUCN). In 1992 two federal strictly protected natural areas (SPNA) - national parks 'Meshora' (Vladimirskaya region) and 'Mesherski' (Rjazanskaya region) (category II, IUCN) covering 222 000 ha were organized as a result of activities of various specialists, also members of the target group. In 1994 national park 'Mesherski' was nominated as wetland area of international importance. Besides there are about 30 SPNA at regional level (nature monuments and zakazniks) (categories III-IV, IUCN).

However, one can observe a certain gap between legislative and executive bodies as related to implementation of laws into practice. This gap is even more expressed between science and local decision-making. At the moment action plan for the development of Meshora region does not exist neither at federal level nor at regional level. Probably, one of the reasons is that the regions can not come to a common decision. In this respect the project bringing the bridges between regions and focusing them on the solution of the common problem seems to be highly relevant.

## 1.3 Study area

For practical reasons peat bogs of Northern and Central Meshera were chosen within the administrative borders of two sub regions of Vladimir region (Petushinski and Sobinski) and four sub regions of Moscow region (Pavlovo-Posadski, Orekhovo-Zuevski, Shaturski and Egorievski)(figure 1.2). The studied area is located 100-200 km to the east of Moscow. The total area occupies 10 100 square km. More than half of the area is covered by pine and birch forests with additions of fur, aspen, alder and oak. Peat land takes the second place after forest (Vilenski & Aphanasova 1961). The river Kljazma (the tributary of the Volga river, the width is of 50 m) crosses the region. The climate is moderate to continental, the mean air temperature is 3.8ºC, the annual precipitation 600-650 mm, the minimal winter temperature -45ºC (January), the maximal summer temperature +39ºC (July).

The northern part of study area (north of the towns Petuski and Sobinka) is a hilly area with some river valleys. The central and southern part is almost flat and contains a lot of lakes, located in groups and connected by channels. This part belongs to Meshera lowland.

More than 90% of all peat bogs belong to moderate zone of Northern Hemisphere. At initial stage of processing, this natural resource seemed to be inexhaustible. But the peat mining, started at the end of 19th century, resulted in the situation when at the centre of Russia peat mining disturbed most part of large peat bogs and many peat bogs were converted into agricultural lands after drainage. It has resulted in the drying of medium and small rivers; of many valuable and rare bird species the abundance decreased (white partridge, black grouse, crane etc.) (Otchagov 1990). The resources of cranberry, blueberry, blackberry and foxberry decreased significantly.

By the end of 20 century the status of natural peat bog communities of the study area did not differ significantly from many other Russian regions. Of the total area of about 189 000 ha by the end of the XIX century mote than half is almost completely disturbed. Undisturbed peat bogs cover about 28 000 ha.
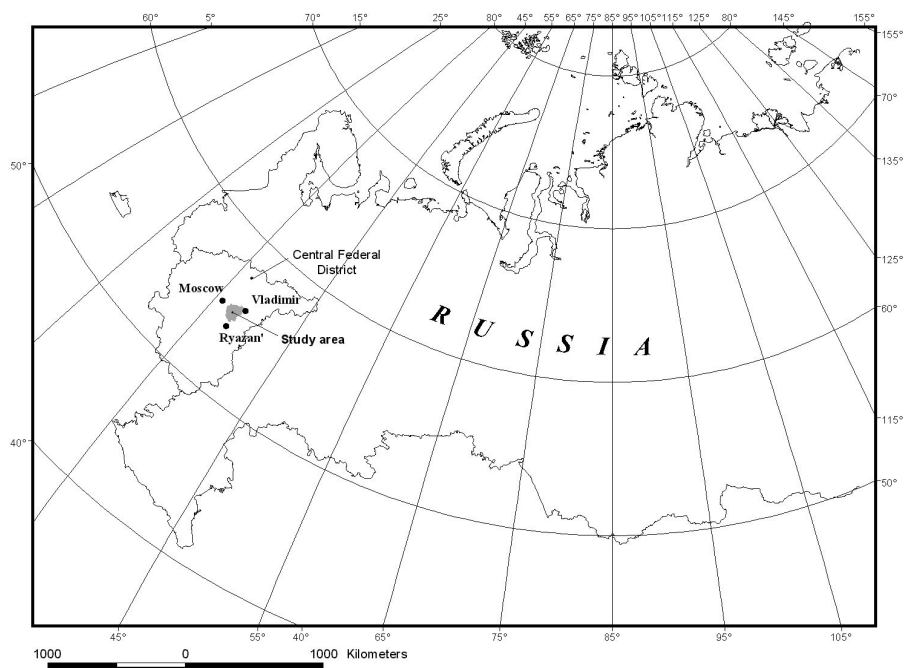


*Figure 1.1 Location of study area*

**Study area**
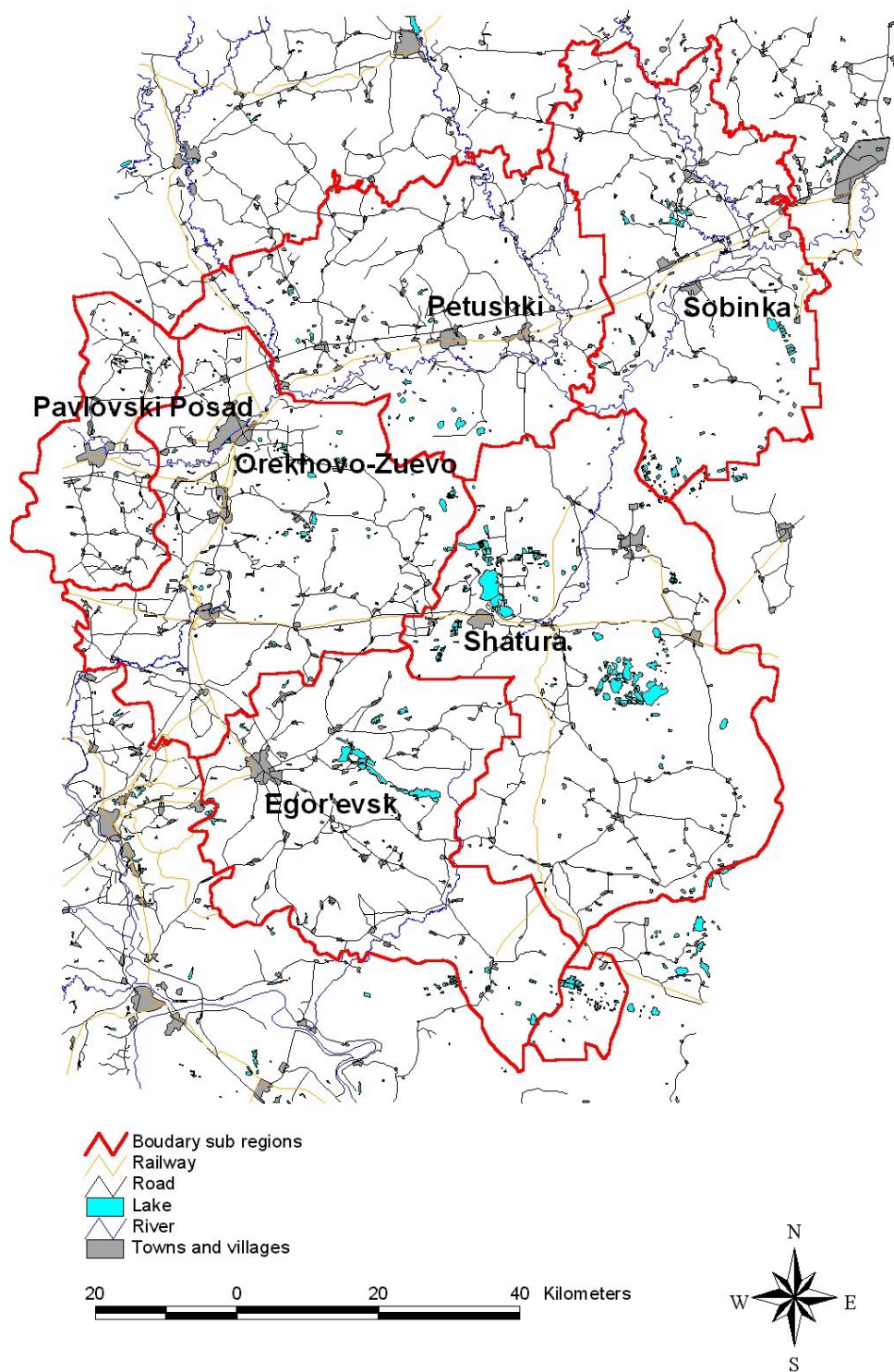


*Figure 1.2 Study area*

## 1.4 Outline of the study

To maintain and increase potentials for viable populations of characteristic species of peat bogs, protection and restoration are important measures. To identify sites where these measures will be most effective is the main aim of the study. For this, at first the current situation of peat bogs and the rate of disturbance is described and mapped (chapter 2). Then, for a number of characteristic species, the current potentials for viable populations in relation to habitat fragmentation are assessed by applying the LARCH-model (chapter 3). The results are used as a basis to increase the number of protected peat bogs. To identify peat bogs where restoration is most effective several restoration scenarios are analyzed with the LARCH-model (chapter 4). The discussion pays attention to uncertainties in the results of the LARCH-analysis and recommendations are made about implementation of study results in nature policy (chapter 5). During the study an visit to the Netherlands was organized to get informed about peat bog conservation and restoration (annex 1). The main results of the project were presented to and with discussed local and federal administrators in a workshop on peat bog conservation in Sobinka, Russia (annex 2).

# 2 Peat bogs and rate of disturbance

## 2.1 Introduction

This chapter describes the main bog types and their distribution (section 2.1), development and characteristics of disturbance (section 2.2), the actual rate and reversibility of disturbance (section 2.3) and peat bog types used for LARCH analysis (section 4.4). Peat bogs are mapped and characterised by using Russian land registry of peat bogs (see Otchagov et al., 1995), space images and a field survey.

## 2.2 Main peat bog types and distribution

According to peculiarities of water- and mineral nutrition the peat bogs are subdivided into (see Otchagov et al., 1995):
– High and intermediate (bogs). Only (high) or mainly (intermediate) swamping because of air deposits;
– Low (fens). Air deposit and groundwater, the soil layer of these peat bogs is much more swamped compared to peat bogs of group 1.

The low peat bogs are further divided in two categories according to the swamping conditions, altitude and distance from streams: watersheded and flooded.
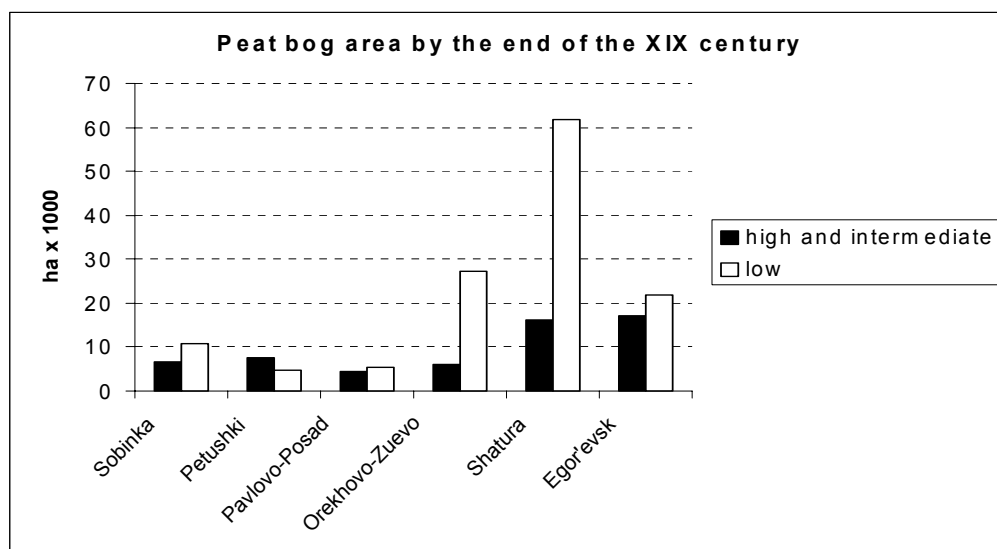


*Figure 2.1 Area of main peat bog types per sub region by the end of the XIX century*

By the end of XIX century peat bogs covered around 18% of the study area. Of the total area of 189 000 ha 30% consisted of high and intermediate peat bog and 70% of low peat bog. Almost all low peat bogs (90%) belong to the 'watersheded' type. In Shatura subregion the total area occupied by peat bogs was highest ( ca. 98 000 ha) and in Pavlovo-Posad subregion lowest (ca. 10 000 ha) (see figure 2.1).

## 2.3    Disturbance characteristics

The first large-scale peat-cutting started at Ozerezko-Nikolski peat bog located nearby Orehovo-Zuevo in 1865 using hand digging. By 1900 the number of processed peat bogs exceeded ten. The first application of machines (elevator method) was done in 1919 when Chistovsko-Belovodskoje peat bog was developed. Both methods did not allow to dig out peat completely and at the moment these areas are still peatbogs where peat accumulation takes place.

Use of peat as a fuel for obtaining electricity was performed in Orekhovo-Zuevo at the electric plant, constructed under supervision of engineer R.E. Klasson, who was the first in Russia to introduce hydropeat quarries. The total area developed by hydropeat quarries six times exceeded the area processed by digging and excavation methods. Hydropeat quarries method was intensively used in 1920-1960 especially in Shatura and Orekhovo-Zuevo regions.

In 1930 more effective frezer method was introduced and less than in 50 years the total area occupied by peat bogs decreased twice. This method was used intensively in 1950-1980 and at the same time peat started to be used in industry as a fuel, raw material in chemistry, medicine and as a fertilizer in agriculture. Frezer method is the most radical as it allows to destroy completely even large peat bogs. Most of such frezer areas are partly flooded (as in Petushinski and Sobinski sub regions), used for summer houses construction or as agricultural fields (as in Orekhovo-Zuevo, Egorievsk and Pavlovo-Posad sub regions).

Use of peat bogs for agriculture purposes has started a long time ago. After melioration peat bogs can be used as pastures and as agricultural fields. Uncontrolled agricultural use of peat bogs could be as radical as industrial influence although the total area disturbed by this influence is small.

Following our estimations more than 80% of the total area, initially occupied by peat bogs was transformed during peat-excavation, melioration or construction of summer houses. Most of transformed peat bogs are disturbed by frezer method (ca. 65%), melioration or construction without peat excavation accounts for ca. 12% and hydropeat, excavator, digging and elevator-methods for ca 23%.

## 2.4 Rate of disturbance and restoration potentials

Three categories of disturbance of peat bogs are distinguished:
– undisturbed;
– partly disturbed, disturbance reversible;
– (completely) disturbed, disturbance not or almost not reversible.

For each category type of disturbance is briefly described

### *Undisturbed*
Almost all peat bogs are subjected to antropogenous influence. The following types of disturbance are considered to cause no significant ecological change:
– mushroom and berry collection, fishering;
– development of secondary electricity (high-voltage) lines;
– development and exploitation of earth roads;
– small pastures;
– regulated hunting;
– old melioration which did not achieve results;
– old forest fires;
– solitary camp-fires;
– solitary car interventions;
– solitary cuttings.

### *Partly disturbed*
All peat bogs which are:
– developed by frezer method and later flooded;
– developed by hydropeat method;
– developed by hand, cutting or elevator methods;
– partly dried out without peat excavation and without ploughing or occupation by buildings;
– destroyed by forest fires;
– polluted;
– disturbed by recreation pressure, noise and air pollution;

### *Disturbed*
All peat bogs which were which were:
– developed by frezer method without further flooding;
– meliorated or occupied by agriculture and now are used as pasture, grazing or cultivation of agricultural plants;
– occupied by summer houses or villages (towns);
– destroyed by motorways, electricity lines, pipelines and other communications.

Figures 2.2 (area) and 2.3 (distribution) show the actual rate of disturbance of peat bogs. Transformation of peat bogs which is almost not reversible occurred on more than 50 % of the total area (about 100.000 ha). Reversible disturbance of peat bogs (partly disturbed) took place at about 62 000 ha. Almost all these partly disturbed peat bogs (high/intermediate and low) now are facing secondary flooding following the low type. Only a small number of peat bogs with total area of 1000 ha after disturbances taken part at the beginning of XX century now look like intermediate or sometimes high peat bogs. Possibly this area in the nearest 50 years can double when further transformation of peat bogs will be stopped. However, where the process of restoration of low peat bogs is predictable and does not take long time, the rehabilitation of intermediate and high peat bogs takes more time (100-500 years) and depends on many factors.
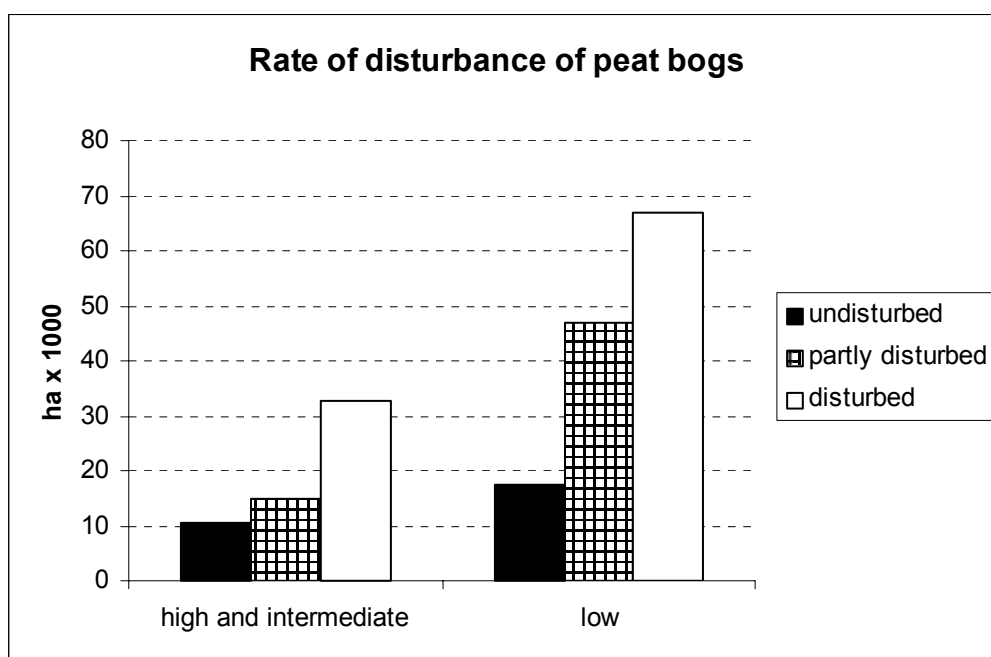


*Figure 2.2 Rate of disturbance of peat bogs in present situation. Area of disturbed, partly disturbed and undisturbed high/intermediate and low peat bogs.*

# Main peat bog types and rate of disturbance

Low watersheded peat bogs
- disturbed
- partly disturbed
- not disturbed

Low flooded peat bogs
- disturbed
- partly disturbed
- not disturbed

High peat bogs
- disturbed
- partly disturbed
- not disturbed

30          0          30   Kilometers

N
W   E
S
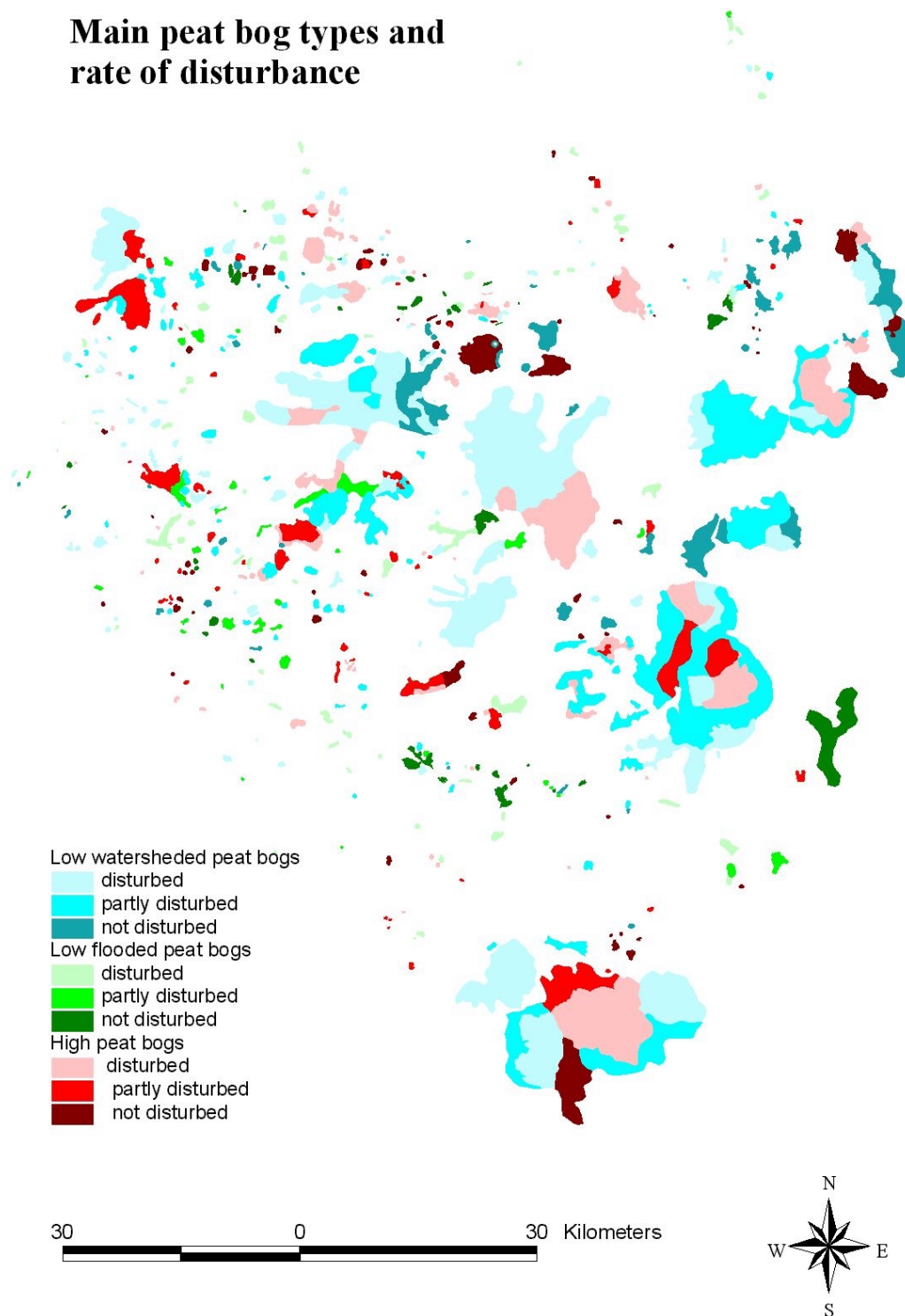
*Figure 2.3 Distribution of main peat bog types and rate of disturbance*

## 2.5    Peat bog types for LARCH

To apply LARCH peat bog types are needed that reflect differences in habitat suitability for the selected indicator species (see for species, section 3.3.1). For this some extra habitat features are distinguished and mapped (for complete typology see table 2.1):
− afforested with water;
− afforested without water;
− open with water;
− open without water.

*Table 2.1 Peat bog types used for LARCH analysis. In total 24 types are distinguished.*

| Main types | Rate of disturbance | Other habitat features |
|---|---|---|
| High (and intermediate) | Undisturbed | Afforested with water; Afforested without water; Open with water; Open without water. |
| | Partly disturbed | Afforested with water; Afforested without water; Open with water; Open without water. |
| | Disturbed | Afforested with water; Afforested without water; Open with water; Open without water. |
| Low watersheded | The same ….. | The same ….. |
| Low flooded | The same ….. | The same ….. |

# 3 Current potentials for viable populations in relation to habitat fragmentation

## 3.1 Outline

To assess the current potentials for viable populations of characteristic peat bog species the LARCH model is used (Pouwels 2000). The model is described in section 3.2 and application of the model in this study in section 3.3. The results are shown in section 3.4.1 for species and in section 3.4.2 for peat bogs.

## 3.2 Description of the LARCH model

### 3.2.1 Basis

Increasing habitat fragmentation leads to local population sizes, which are susceptible to extinction. Local populations may be become extinct purely by coincidence of demographic processes or by a combination of environmental disturbance and stochastic demographic processes (Goodman 1987; Leigh 1981; Verboom et al. 1993). When local populations are part of an ecological network there will be exchange of individuals between local populations (these movements are called dispersal) and extinction might be outbalanced by recolonizations (Levins 1970; Opdam 1990; Verboom 1996). This will occur when the ecological network meets the following conditions:
- the distances between habitat patches are well below the maximum dispersal distance;
- the landscape between the habitat patches does not hamper dispersal and barriers are absent (especially for ground-dwelling species);
- the total area of all linked patches is larch enough to support a viable population. The larger the degree of fragmentation the more area is needed (see figure 3.1).
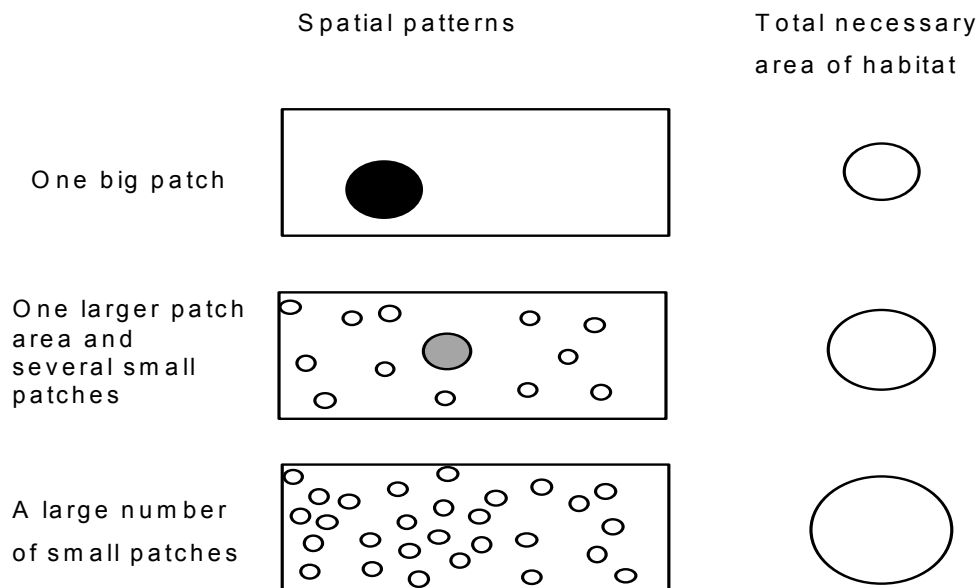
Figure 3.1 Spatial strategies for the viability of populations (Verboom et al. 1977)

### 3.2.2 Description of the model

LARCH (Landscape ecological Rules for the Configuration of Habitat) is designed as an expert system to evaluate ecological networks. LARCH works with standards for species and uses the habitat configuration for each species as a basis. It uses species specific parameters to assess which parts of landscape are habitat patches in the same network, based on dispersal characteristics. Carrying capacity information (maximum density possible) is used to assess the minimal size of habitat in a network needed for a viable population. Dispersal distances are based on expert knowledge and the literature (Reijnen et al. 1998) and thresholds for minimum viable size of networks are based on computer simulations with spatial structured mechanistic population models underpinned by empirical evidence (Verboom et al. 1997). LARCH has been used for evaluations of networks on various scale levels, for example 'the lower Rhine' (Reijnen et al. 1995), 'farm landscapes for biodiversity' (Landeconet 1997) and 'biodiversity assessment in fragmented European ecosystems' (Foppen & Chardon 1998).

LARCH consists of a number of modules each filled with specific data or calculating certain parameters. Some modules are simple spreadsheets or database files; other modules consist of comprehensive calculations using ARCINFO or ARCVIEW procedures or C++ computer programs.

The different steps to assess the viability of ecological networks for one species are (see also figures 3.2 and 3.3):
– Creating map of habitat units with carrying capacities. Available information on vegetation structure and other characteristics of the landscape is used to distinguish suitable habitat types and to determine which parts of the landscape are suitable habitat units. Data on maximum densities of species for habitat types are used to estimate the carrying capacity of each habitat unit.
– Creating map of local populations. Habitat units, which are connected by daily movements of a species (called home range), can be considered as one local population. For this available data on home range distances are used. Habitat units, which are separated by barriers, always belong to different local populations. This is especially important in ground-dwelling species. Two types of local populations are distinguished: key populations and small populations.
– Creating map of ecological networks. Local populations, which are connected by dispersal, belong to one network. It is assumed that this will be the case when the distance between local populations is <= 80% of the maximum dispersal distance. Data on dispersal distance are based on literature or expert knowledge. Local populations, which are separated by barriers, always belong to different networks. This is especially important in ground-dwelling species.
– Assessing the viability of networks. For a number of different spatial configurations (see figure 3) thresholds for the total carrying capacity of the network are used to assess the viability. Based on how many times the threshold for the viability is exceeded the following degrees of viability are distinguished: not viable, viable and strongly viable. For further explanation see table 3.1.
– Assessing the viability of local populations. Key populations are the most viable local populations in a network with an extinction chance of less than 5% in 100 years. Small populations have an extinction chance of more than 5%.

Averaging the results of all species per site or region can further process the results. The number of species for a region or per site which is not viable, viable or strongly viable indicates the potentials for biodiversity in relation to habitat fragmentation. The presence or absence of key populations can be used to make a further distinction in these categories.

*Table 3.1. Degrees of viability of network populations*

| | |
|---|---|
| Not viable | The habitat of a network population is not large enough and/or too much fragmented to reach a carrying capacity that is large enough for a viable population. Fluctuation in numbers caused by the influence of weather, diseases, disasters etc. cannot be buffered enough. In this situation the chance of extinction is estimated to be more than 5% in 100 years. |
| Viable | The carrying capacity is sufficient to buffer against disasters: the chance of extinction is less than 5% in 100 years. However, the carrying capacity is not large enough to take care of large changes in the configuration of the habitat. |
| Strongly viable | The carrying capacity is large enough to ensure viability under almost all circumstances. |
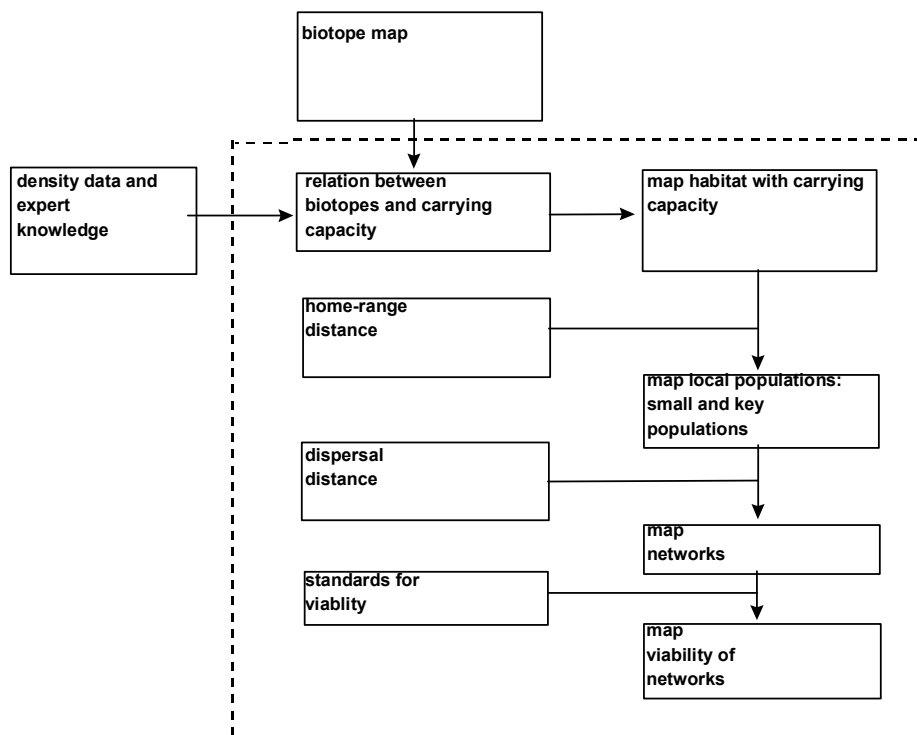
*Figure 3.2 Outline of LARCH approach for one species*
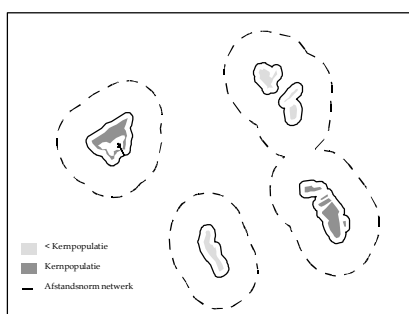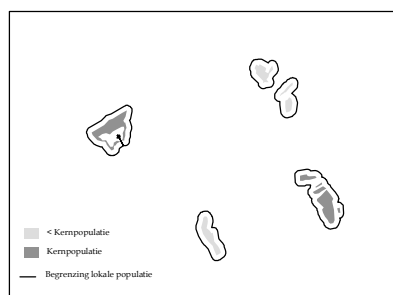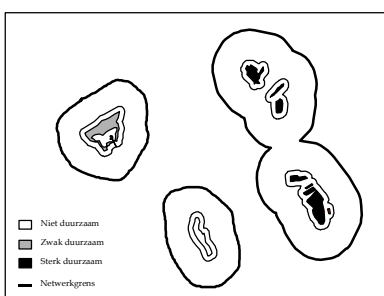


*Figure 3.3 Visual presentation of different steps in the LARCH approach for one species*

## 3.3    Applying LARCH for peat bogs in central Russia

Application of LARCH for the study area is largely based on the study of Otchagov et al. in 1998-1999 in Petushinski sub region.

Of the 20 indicator species selected by Otchagov et al. (1999) we left out one butterfly species and two bird species. It was expected that these three species would not show effects of fragmentation in the study area. To add more species, like ground-dwelling reptiles, appeared to be not possible because appropriate data were lacking. Table 3.2 shows the selected species and some important characteristics.
Carrying capacity information and species-specific standards to distinguish habitat networks are not or only slightly changed compared with Otchagov et al. (1999).

To describe differences in the potentials for viable populations for species the following categories are used:
– Very low: not viable
– Low: viable networks without key populations
– Medium: one or more key populations in viable networks
– High: one or more key populations in strongly viable networks

These categories are used to average the species data for the study area and per peat bog.

*Table 3.2 Selected indicator species of butterflies and breeding birds. Underlined species occupy also habitats outside peat bogs (less than 35% of the total carrying capacity of the study area). Species of the same dispersal category differ with respect to habitat requirements and carrying capacity. High peat bog includes intermediate peat bog.*

| Peat bog type | Species group | Dispersal capacity ➥ | | | | |
|---|---|---|---|---|---|---|
| | | 0-1 km | >1-4 km | >4-10 km | >10-20 km | >20-40 km |
| High | Butterflies | *Coenonympha hero* *Plebejus idas* | *Euphydryas maturna* *Arichana melanaria* *Vacciniinum optilete* | *Colias palaeno* | | |
| | Birds | | | *Lanius excubitor* *Tetra urogallus* | *Picoides tridactylus* | *Tetrao tetrix* *Tringa nebularia* |
| Low | Butterflies | | *Argynnis laodice* *Coenonympha tullia* | | | |
| High + Low | Butterflies | | *Boloria euphrosyne* | | | |
| | Birds | | | | *Motacilla cetriola* | *Grus grus* *Larus canus* |

## 3.4 Results

### 3.4.1 Species

Table 3.3 shows for each indicator species basic results of LARCH analysis and table 3.4 the potentials for viable populations. Five species have 'very low potentials', five species 'medium potentials' and seven species 'high potentials'. The category 'low potentials' is not present. The spatial pattern of potentials for viable populations is shown for one species of each category (figures 3.4, 3.5 and 3.6). The most important factors determining the potentials for viable populations are discussed.

**Butterflies**

All species suffer equally from rate of disturbance of peat bogs. Therefore, differences in potentials for viable populations between species are mainly determined by differences in carrying capacity and dispersal capacity.

- *Coenonympha hero* and *Vacciniina optilete* show <u>very low potentials for viable populations</u> and are restricted to high and intermediate peat bogs. The combination of a very low carrying capacity and a very low dispersal carrying capacity is the most important reason. The other five species restricted to high and intermediate peat bogs have either a higher carrying capacity or a higher dispersal capacity. Because of the low dispersal capacity it is expected that peat bogs situated nearby the study area will have no effect on the established potentials for viable populations for these species.

- Four species show <u>medium potentials for viable populations</u>. Three species are restricted to high and intermediate peat bogs. Compared with the two species which have 'no potentials' these species have a higher carrying capacity (*Arichana melanaria*), a higher dispersal capacity (*Colias palaeno,* figure 3.4) or both (*Euphydryas maturna*). *Argynnis loadice* is restricted to low peat bogs and has a medium carrying capacity and a medium dispersal capacity. In this category *Arichana melanaria* is the most vulnerable species with only one key population. Because of the rather low dispersal capacity it is expected that peat bogs situated nearby the study area will have no effect on the established potentials for viable populations for these species.

- Three species show <u>high potentials for viable populations</u>. All species are characterised by higher till much higher carrying capacities than the species of the other two categories. *Coenonympha tullia* is restricted to low peat bogs and *Plebejus idas* (figure 3.5) to high and intermediate peat bogs. *Boloria euphrosyne* is a species of high/intermediate and low peat bogs and shows the highest potentials.

**Birds**

Most species suffer equally from rate of disturbance of peat bogs. Only one species favours partly disturbed peat bogs. Therefore, in the LARCH-analysis differences in carrying capacity and dispersal capacity mainly determine the potentials for viable populations. However, some species also occupy habitat outside peat bogs and this can cause an underestimation of the potentials for viable populations.

- <u>Very low potentials.</u> The three species of this category have the lowest carrying capacity of all eight bird species. *Lanius excubitor* (figure 3.6) is restricted to high and intermediate peat bogs. Peat bogs nearby the study area probably will have

no effect on the potentials for viable populations, because the dispersal capacity is not very high (10 km). Moreover, to achieve viable network populations the carrying capacity of networks has to be increased about seven times or more. *Picoides trydactylus* prefer high and intermediate afforested peat bogs but also occupies habitats outside peat bogs. As a result different networks based on spatial pattern of peat bogs might be linked by habitat in between (dispersal capacity is 15 km). However, it is assumed that this will have no significant effect on the potentials for viable populations. Total carrying capacity of all networks is three times too low to achieve a viable network population and total carrying capacity in habitats outside peat bogs is expected to be lower than in peat bogs. Habitats (peat bogs and other habitats) nearby the study area probably also will have no effect on the potentials for viable populations. *Grus grus* occurs in all types of peat bogs and occupies also habitats outside peat bogs. Because of the high dispersal capacity (30 km), it is likely that the networks in the study area are part of much larger networks. Probably these larger networks are viable which means that *Grus grus* might has medium potentials for viable populations.

- Medium potentials. *Tringa nebularia* is the only species showing medium potentials for viable populations (one or more key populations in a viable network). Carrying capacity is low and high and intermediate peat bogs are the only habitats. Because of the high dispersal capacity it is likely that the network (there is only one network) is part of a larger network. This larger network probably will not be storngly viable, since in the study area the threshold for a viable network population is marginally exceeded.
- High potentials. Four species show high potentials for viable populations. These species have a higher carrying capacity than the species with 'no potentials' or 'medium potentials'. *Tetrao urogallus* and *Tetrao tetrix* prefer high and intermediate peat bogs but occupy also habitats outside peat bogs. *Motacilla citreola* prefers low peat bogs and can also be found in habitats outside peat bogs. This species is the only indicator species preferring partly disturbed peat bogs. *Larus canus* occupies all peat bog types.

*Table 3.3 Suitable habitat and number of key populations for indicator species in present situation.*

| Indicator species | Suitable habitat | | Number of key populations | |
|---|---|---|---|---|
| | Total area (ha) | Percentage in viable and strongly viable networks | Total | In strongly viable networks |
| **Butterflies** | | | | |
| *Coenonymoha hero* | 25 189 | | | |
| *Vacciniina optilete* | 25 189 | - | - | - |
| *Arichana melanaria* | 25 193 | 12 | 1 | - |
| *Argynnis laodice* | 17 603 | 73 | 3 | - |
| *Colias palaeno* | 25 189 | 58 | 4 | - |
| *Euphydras maturna* | 25 193 | 60 | 6 | - |
| *Coenonympha tullia* | 14 120 | 86 | 5 | 1 |
| *Plebejus idas* | 25 193 | 89 | 27 | 15 |
| *Boloria euphrosyne* | 80 499 | 97 | 72 | 64 |
| **Birds** | | | | |
| *Lanius excubitor* | 13 080 | - | - | - |
| *Picoides tridactylus** | 12 190 | - | - | - |
| *Grus grus** | 18453 | | | |
| *Tringa nebularia* | 9 445 | 100 | 1 | - |
| *Tetrao urogallus** | 16 268 | 71 | 5 | 2 |
| *Motacilla citreola** | 106 215 | 100 | 3 | 3 |
| *Tetrao tetrix** | 54 248 | 100 | 9 | 9 |
| *Larus canus* | 54 334 | 100 | 18 | 16 |

*occupies also habitats outside peat bogs

*Table 3.4 Potentials for viable populations for indicator species in present situation*

| Indicator species | Potentials for viable populations | | |
|---|---|---|---|
| | Very low | Medium | High |
| **Butterflies** | | | |
| *Coenonympha hero* | | | |
| *Vacciniina optilete* | | | |
| *Arichana melanaria* | | | |
| *Colias palaeno* | | | |
| *Euphydras maturna* | | | |
| *Argynnis laodice* | | | |
| *Coenonympha tullia* | | | |
| *Plebejus idas* | | | |
| *Boloria euphrosyne* | | | |
| **Birds** | | | |
| *Lanius excubitor* | | | |
| *Picoides tridactylus** | | | |
| *Grus grus** | | | |
| *Tringa nebularia* | | | |
| *Tetrao urogallus** | | | |
| *Motacilla citreola** | | | |
| *Tetrao tetrix** | | | |
| *Larus canus* | | | |
| **Total butterflies** | 2 | 4 | 3 |
| **Total birds** | 3 | 1 | 4 |
| **Total bird and butterflies** | 5 | 5 | 7 |

* occupies also habitats outside peat bogs

**Potentials for viable populations for *Colias palaeno***
**Present situation**



Small populations
- in strongly viable networks
- in viable networks
- not viable

Key populations
- in strongly viable networks
- in viable networks
- not viable

Too small

Not suitable

30          0        30  Kilometers
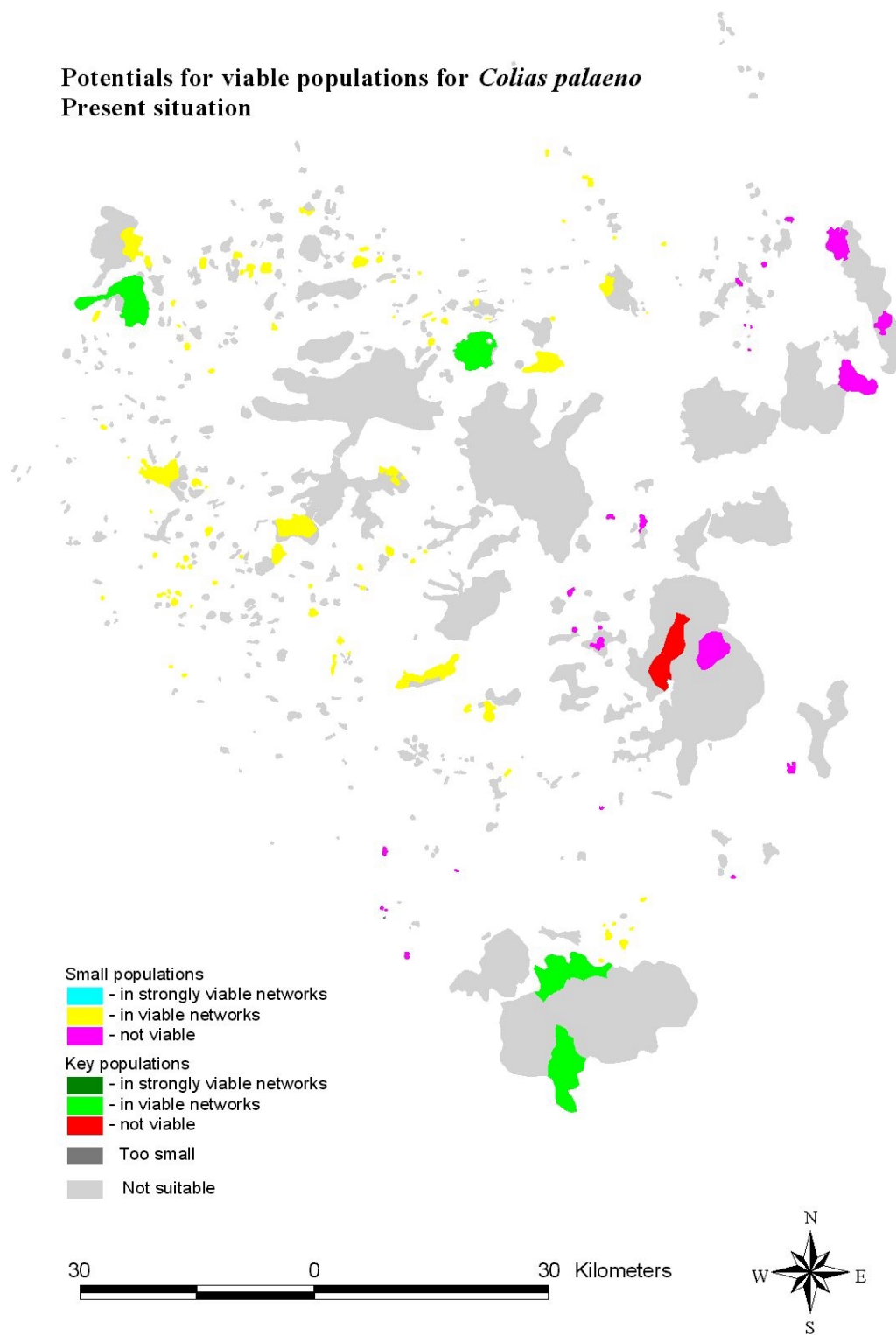
*Figure 3.4 Potentials for viable populations of Colias palaeno (medium potentials)*

**Potentials for viable populations for *Lanius excubitor*
Present situation**

Small populations
- in strongly viable networks
- in viable networks
- not viable
Key populations
- in strongly viable networks
- in viable networks
- not viable

Too small

Not suitable

30          0          30  Kilometers

N
W          E
S
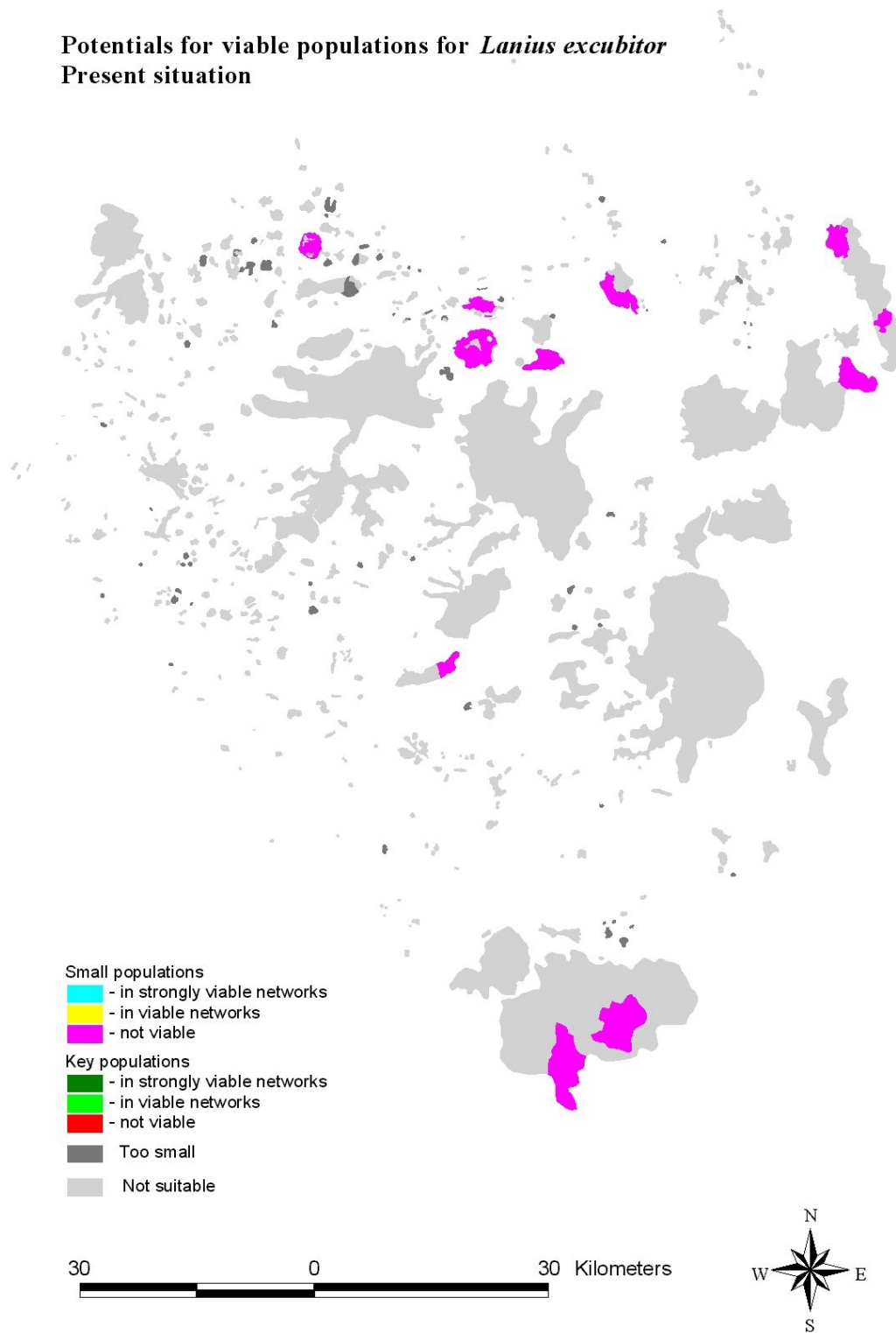
*Figure 3.5 Potentials for viable populations of Lanius excubitor (very low potentials)*

**Potentials for viable populations for *Plebejus idas*
Present situation**



Small populations
- in strongly viable networks
- in viable networks
- not viable

Key populations
- in strongly viable networks
- in viable networks
- not viable

Too small

Not suitable

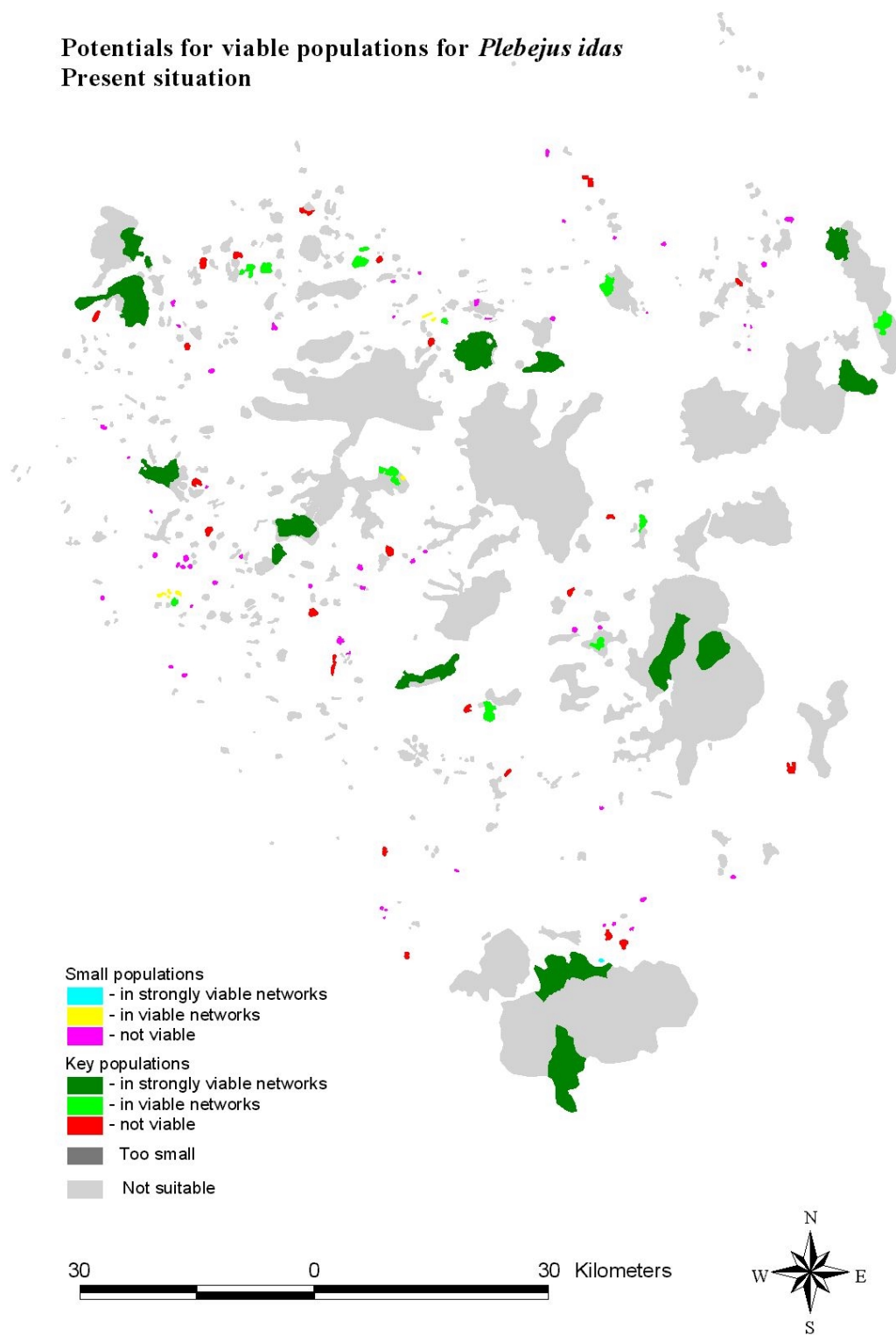30          0          30  Kilometers

N
W        E
S

*Figure 3.6 Potentials for viable populations of Plebejus idas (high potentials)*

### 3.4.2 Peat bogs

The potentials for viable populations per peat bog are presented by the number of species showing 'medium and high potentials' (key populations in viable and strongly viable networks). To obtain a correct interpretation high/intermediate and low peat bogs are separated because the number of indicator species in high and intermediate peat bogs is much larger than in low peat bogs. Table 3.5 shows the areas with different number of key populations. The spatial pattern for birds is presented in figure 3.7, for butterflies in figure 3.8 and for all species combined in figure 3.9.

*Table 3.5 Area (ha) and number of key populations in viable and strongly viable networks*

|  | Birds | | Butterflies | | Total | |
|---|---|---|---|---|---|---|
|  | Number | Area | Number | Area | Number | Area |
| Low peat bogs | 1 | 38 748 | 1 | 39 990 | 1-2 | 62 986 |
|  | 2 | 34 860 | 2 | 1 834 | 3-4 | 12 669 |
|  |  |  | 3 | 10 260 | 5 | 9 488 |
| High and intermediate peat bogs | 1 | 19 802 | 1-2 | 10 647 | 1-2 | 18 569 |
|  | 2 | 13 016 | 3-4 | 10 257 | 3-5 | 12 086 |
|  |  |  | 5 | 2 935 | 6-7 | 7 111 |

#### *Low peat bogs*
Low peat bogs provide suitable habitat for three bird species and three butterfly species. Only for butterfly species there are peat bogs that have key populations for all indicator species. It concerns three rather large partly disturbed peat bogs. Undisturbed peat bogs are too small and too isolated to support key populations for all species.
For birds the maximum number of key populations in a peat bog is two. It concerns large disturbed and partly disturbed areas, since for birds the undisturbed peat bogs are too small and too isolated.
For birds and butterflies combined the maximum number of key populations in a peat bog is five. It concerns three large partly disturbed peat bogs.

#### *High and intermediate peat bogs*
High and intermediate peat bogs provide suitable habitat seven bird species and eight butterfly species. No peat bogs exist that can support key populations for all bird species or all butterfly species.
The maximum expected number of key populations for birds is two. It concerns nine rather small peat bogs of which five are undisturbed and four partly disturbed.
For butterflies the maximum expected number of key populations in peat bogs is five. It concerns only one undisturbed peat bog at the southern edge of the study area. Five peat bogs have 3-4 species with key populations. One is undisturbed and four are partly disturbed. All other undisturbed and partly disturbed high and intermediate peat bogs are much smaller.
For birds and butterflies combined the maximum number of key populations in a peat bog is seven. It concerns the largest undisturbed peat bog at the southern edge of the study area. Two peat bogs have six species with key populations, of which one is partly disturbed and one undisturbed.

**Potentials for viable populations for bird species
Present situation**



Key populations in viable and
strongly viable networks
Low peat bogs
- 1 (cyan)
- 2 (blue)

Key populations in viable and
strongly viable networks
High and intermediate peat bogs
- 1 (green)
- 2 (dark green)

Small populations in viable and
strongly viable networks
- 1 - 3 (yellow)

Not viable populations
- 1 - 4 (red)

Not suitable (grey)

30    0    30  Kilometers

N
W    E
S
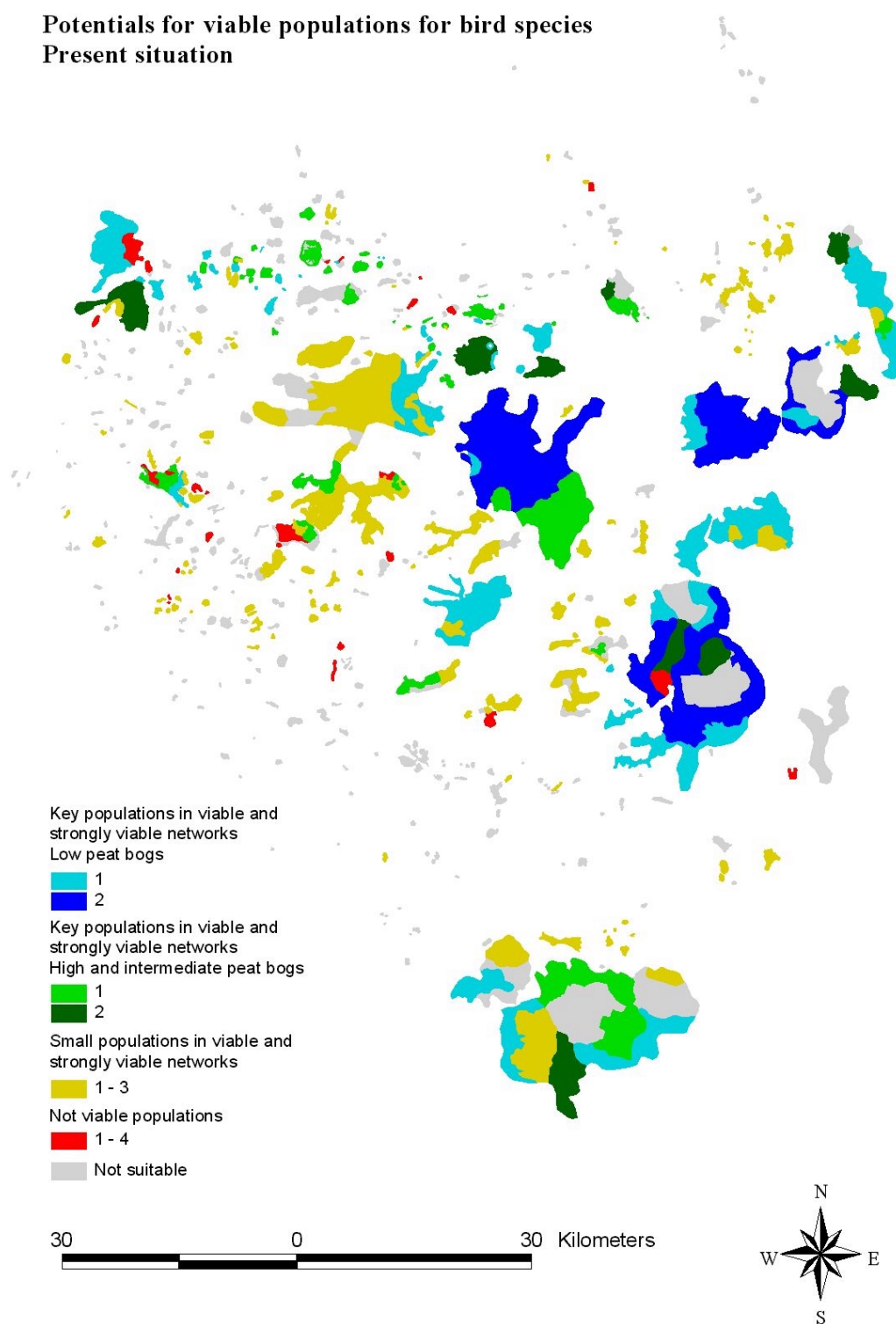
*Figure 3.7 Potentials for viable populations for birds*

**Potentials for viable populations for butterfly species
Present situation**

Key populations in viable and
strongly viable networks
Low peat bogs
◻ 1
◻ 2
◻ 3

Key populations in viable and
strongly viable networks
High and intermediate peat bogs
◻ 1 - 2
◻ 3 - 4
◻ 5

Small populations in viable and
strongly viable networks
◻ 1 - 4

Not viable populations
◻ 1 - 7

◻ Not suitable

30        0        30   Kilometers

N
W    E
S
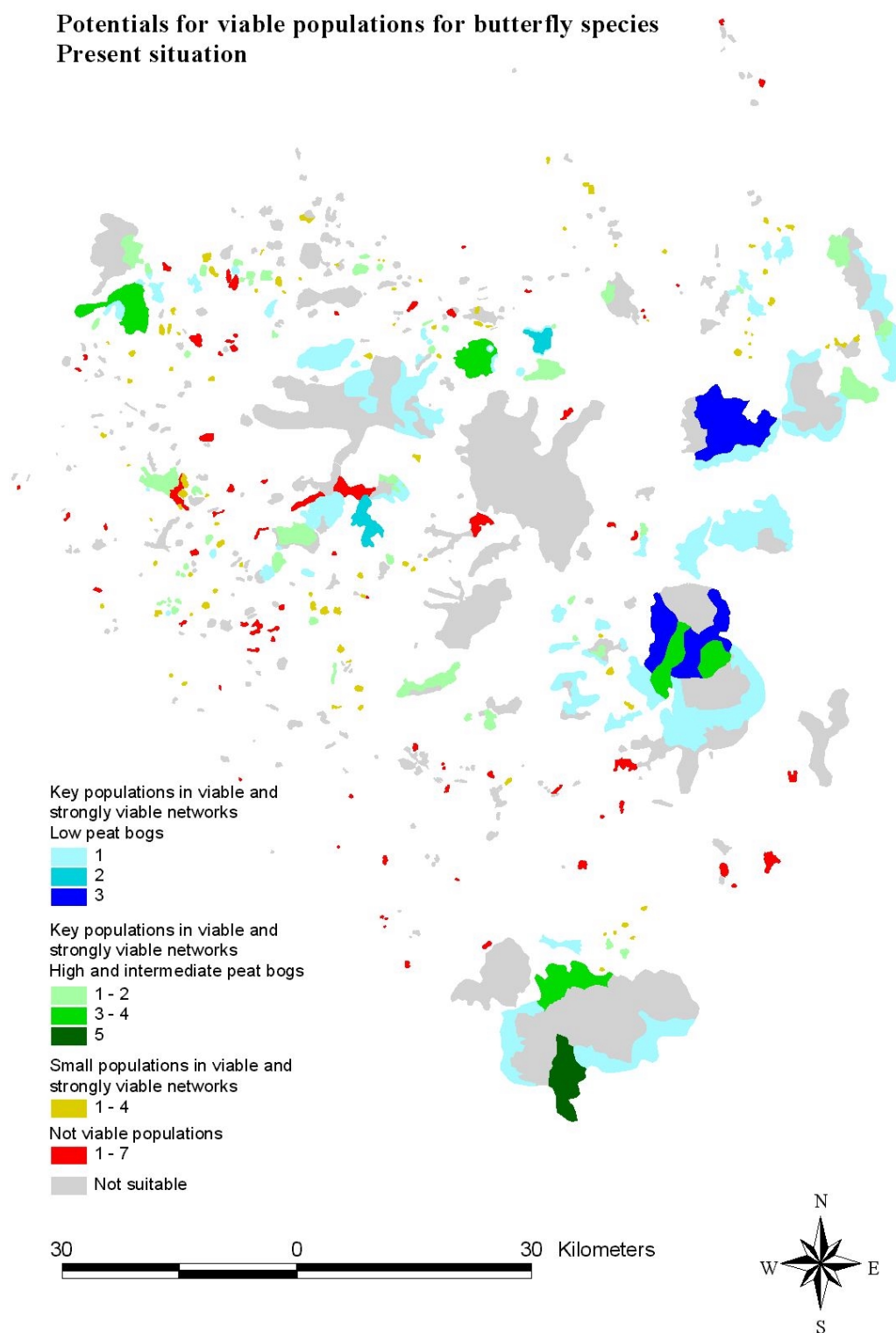
*Figure 3.8 Potentials for viable populations for butterflies*

**Potentials for viable populations for bird
and butterfly species
Present situation**



Key populations in viable and
strongly viable networks
Low peat bogs
- 1 - 2
- 3 - 4
- 5

Key populations in viable and
strongly viable networks
High and intermediate peat bogs
- 1 - 2
- 3 - 5
- 6 - 7

Small populations in viable and
strongly viable networks
- 1 - 6

Not viable populations
- 1 - 8

Not suitable

30          0          30   Kilometers

N
W    E
S

*Figure 3.9 Potentials for viable populations for birds and butterflies*

# 4 Indications for protection and restoration

## 4.1 Introduction

To maintain and increase potentials for viable populations of characteristic species of peat bogs protection and restoration are important measures. Section 4.2 gives the current area of protected peat bogs and indicates what other peat bogs are also in need for protection. Section 4.3 makes a first step to identify areas where restoration will be most effective. For this several general restoration scenarios are analysed.

## 4.2 Protection

The protected area of peat bogs in the study area covers about 20 400 ha (see figure 4.1). Many other important peat bogs, however, have not a protected status. To indicate which peat bogs have a priority for protection the following criteria are used (priority descending from 1 to 3):
1. Peat bogs with currently high potentials for viable populations;
2. Undisturbed peat bogs with currently medium potentials for viable populations;
3. Other undisturbed (small) peat bogs.

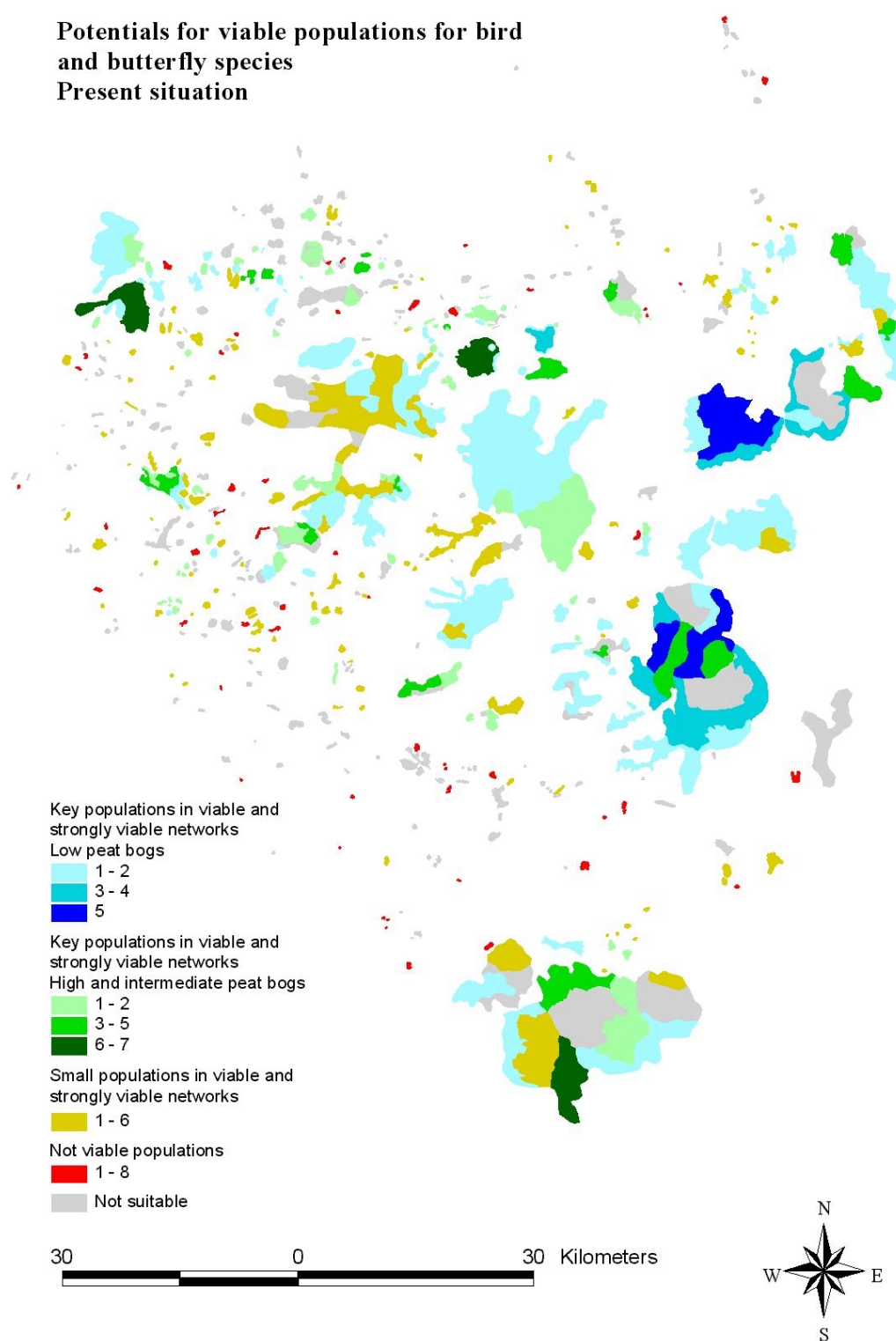Figure 4.1 shows the location of peat bogs who meet these criteria.

## 4.3 Identifying areas for restoration

### Restoration scenarios
To identify areas where restoration will be most effective four different restoration scenarios are evaluated with the LARCH-model:
- all disturbed low peat bogs change to partly disturbed;
- all disturbed low and high/intermediate peat bogs change to partly disturbed;
- all peat bogs change to undisturbed;
- all partly disturbed peat bogs change to undisturbed.

Scenario 3 represents the situation of peat bogs before disturbance and the results show the maximum potentials for viable populations possible. The result of the scenarios 1 and 2 will be of not much practical use, since restoration of disturbed peat bogs in general is not possible or requires much effort. Restoration of partly disturbed peat bogs (scenario 4) is most realistic.

**Protection of peat bogs**



Currently protected

Protection important :
High potentials for viable populations

Protection desirable :
Not disturbed with medium potentials
for viable populations

Other not disturbed peat bogs
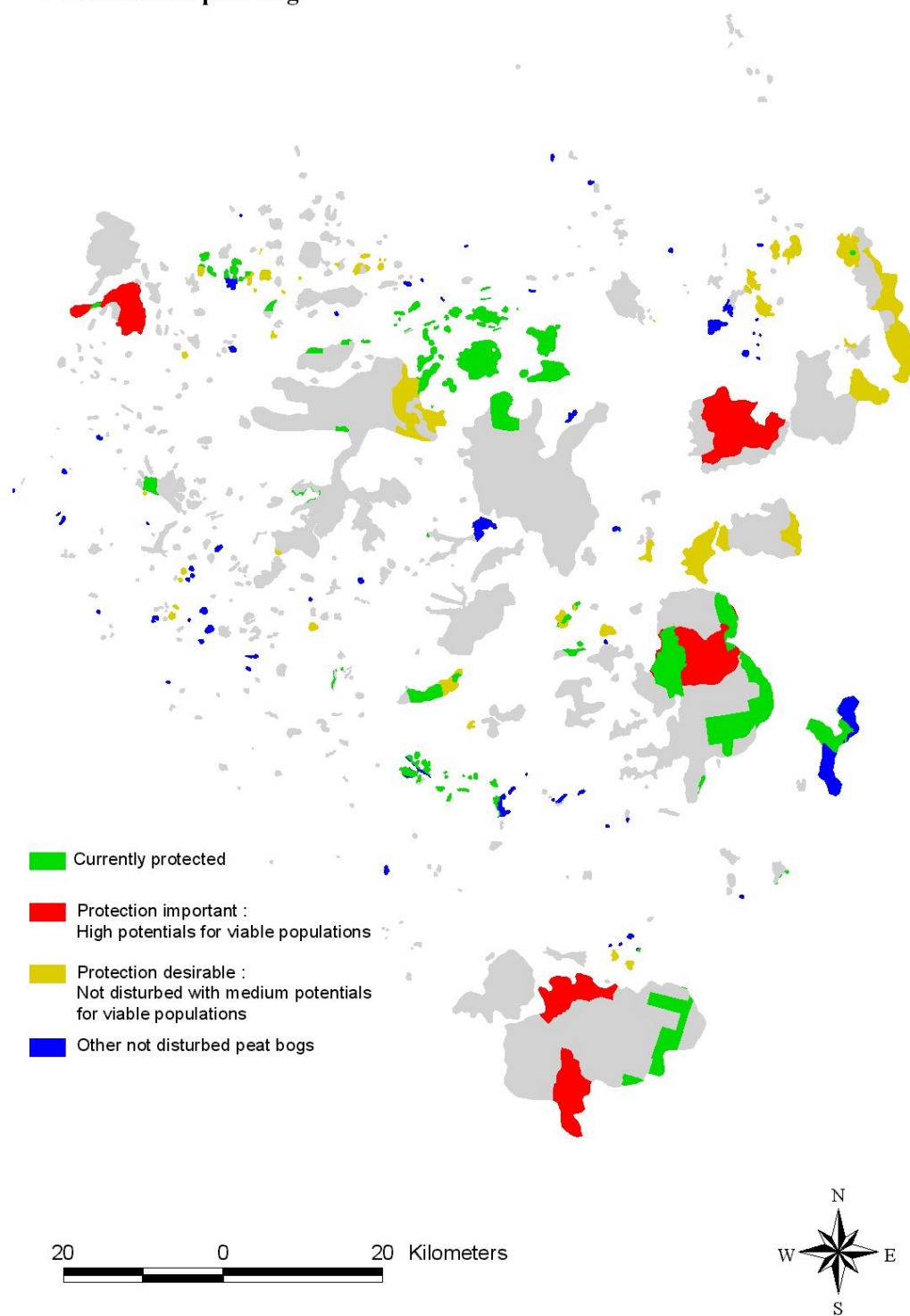
20    0    20  Kilometers

*Figure 4.1 Protection of peat bogs*

### Overall effect on species

Figure 4.2 shows the overall effect of the scenarios on the potentials for viable populations for the indicator species. Restoration of disturbed low peat bogs seems not very effective (scenario 1). A much better result is obtained when also high and intermediate disturbed peat bogs are included (scenario 2). The most realistic scenario (4: restoration of all partly disturbed peat bogs) shows an intermediate effect.

| Indicator species | Present Situation | Scenario 1 | Scenario 4 | Scenario 2 | Scenario 3 |
|---|---|---|---|---|---|
| **Butterflies** | | | | | |
| *Coenonympha hero* | | | | | |
| *Vacciniina optilete* | | | | | |
| *Arichana melanaria* | | | | | |
| *Colias palaeno* | | | | | |
| *Euphydras maturna* | | | | | |
| *Argynnis laodice* | | | | | |
| *Coenonympha tullia* | | | | | |
| *Plebejus idas* | | | | | |
| *Boloria euphrosyne* | | | | | |
| **Birds** | | | | | |
| *Lanius excubitor* | | | | | |
| *Picoides tridactylus\** | | | | | |
| *Grus grus\** | | | | | |
| *Tringa nebularia* | | | | | |
| *Tetrao urogallus\** | | | | | |
| *Motacilla citreola\** | | | | | |
| *Tetrao tetrix\** | | | | | |
| *Larus canus* | | | | | |

\* occupies also habitats outside peat bogs

### Potentials for viable populations

Very low — (red)
Medium — (light green)
High — (dark green)

*Figure 4.2 Potentials for viable populations of indicator species in present situation and for four different scenarios of peat bog restoration.*
*1: all disturbed low peat bogs change to partly disturbed*
*4: all partly disturbed peat bogs change to undisturbed*
*2: all disturbed low and high/intermediate peat bogs change to partly disturbed*
*3: all peat bogs change to undisturbed*

To identify areas where restoration will be most effective, for each scenario maps are created showing the increase of potentials for viable populations compared with the present situation (figures 4.3, 4.4, 4.5 and 4.6). In general to restore areas with the highest increase of potentials for viable populations will be most effective. However, one should consider that this increase of potentials for viable populations is based on restoring of many areas. If only one area is restored the expected effect can be lower. Sometimes restoration of partly disturbed peat bogs can also lower the potentials for viable populations. It concerns species (only birds) of which densities in partly disturbed peat bogs are higher than in undisturbed peat bogs.

Figure 4.3 Increase of potentials for viable populations for birds and butterflies. Scenario 1: all disturbed peat bogs change to partly disturbed.

**Increase of potentials for viable populations for bird and butterfly species**

Scenario 2: all disturbed high, intermediate and low peat bogs change to partly disturbed

Increase of key populations in viable and strongly viable networks
Low peat bogs
- -1
- 1 - 2
- 3
- 4

Increse of key populations in viable and strongly viable networks
High and intermediate peat bogs
- -1
- 1 - 3
- 4 - 6
- 7 - 9

No changes for key populations in viable and strongly viable networks
High, intermediate and low peat bogs

Small populations in viable and strongly viable networks
- 1 - 7
Not viable populations
- 1 - 8
- Not suitable

30          0          30   Kilometers

N
W        E
S

*Figure 4.4 Increase of potentials for viable populations for birds and butterflies. Scenario 2: all disturbed low and high/intermediate peat bogs change to partly disturbed.*

**Increase of potentials for viable populations for bird and butterfly species**

Scenario 3: all peat bogs not disturbed

Increase of key populations in viable
and strongly viable networks
Low peat bogs
- -1
- 1 - 3
- 4 - 5
- 6

Increase of populations in viable
and strongly viable networks
High and intermediate peat bogs
- 1 - 5
- 6 - 9
- 10 - 12

No changes for key populations in viable
and strongly viable networks
High, intermediate and low peat bogs

Small populations in viable
and strongly viable networks
- 1 - 7

Not viable populations
- 1 - 8

Not suitable

30          0          30   Kilometers

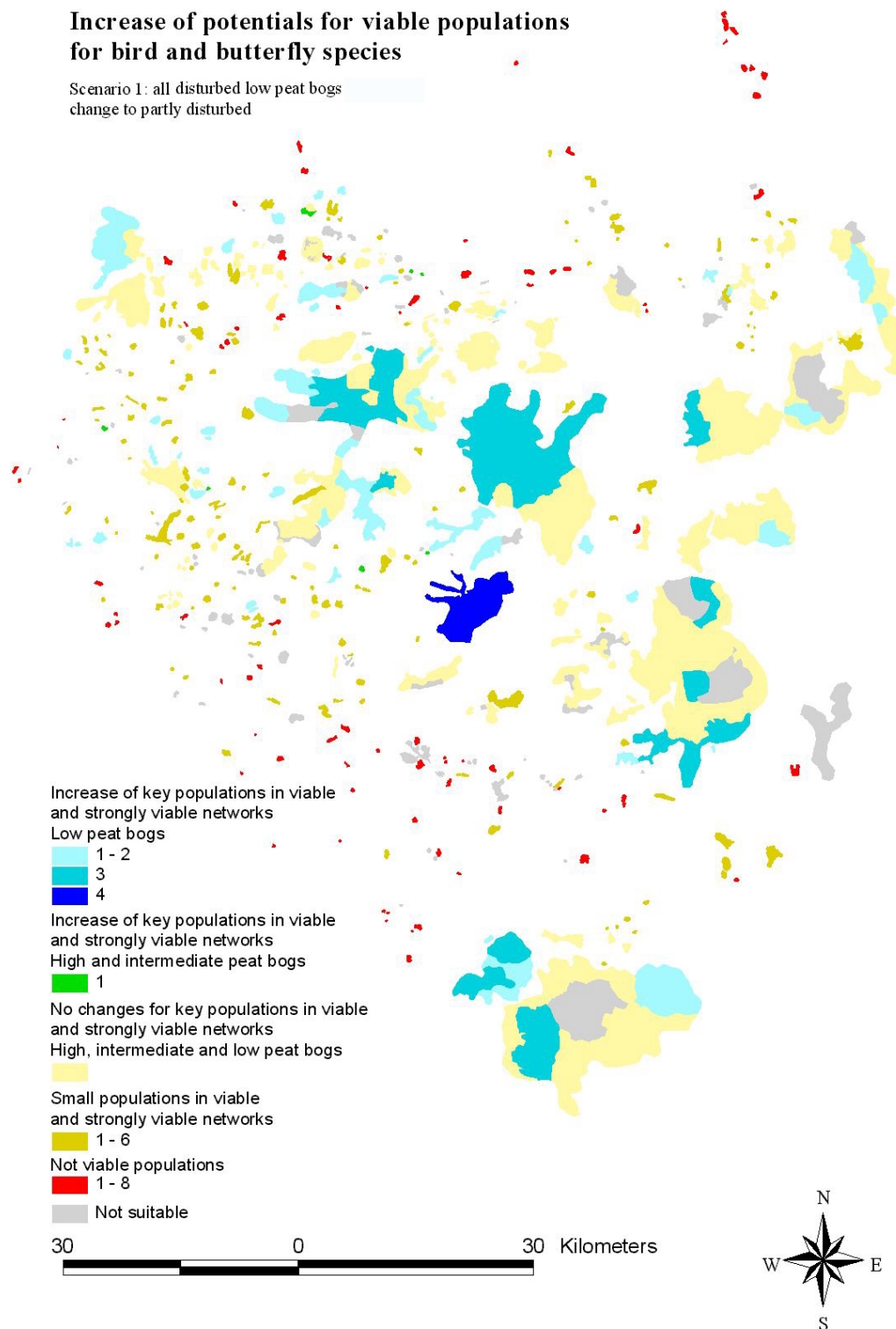*Figure 4.5 Increase of potentials for viable populations for birds and butterflies. Scenario 3: all peat bogs change to undisturbed.*

**Increase of potentials for viable populations
for bird and butterfly species**

Scenario 4: all partly disturbed high, intermediate
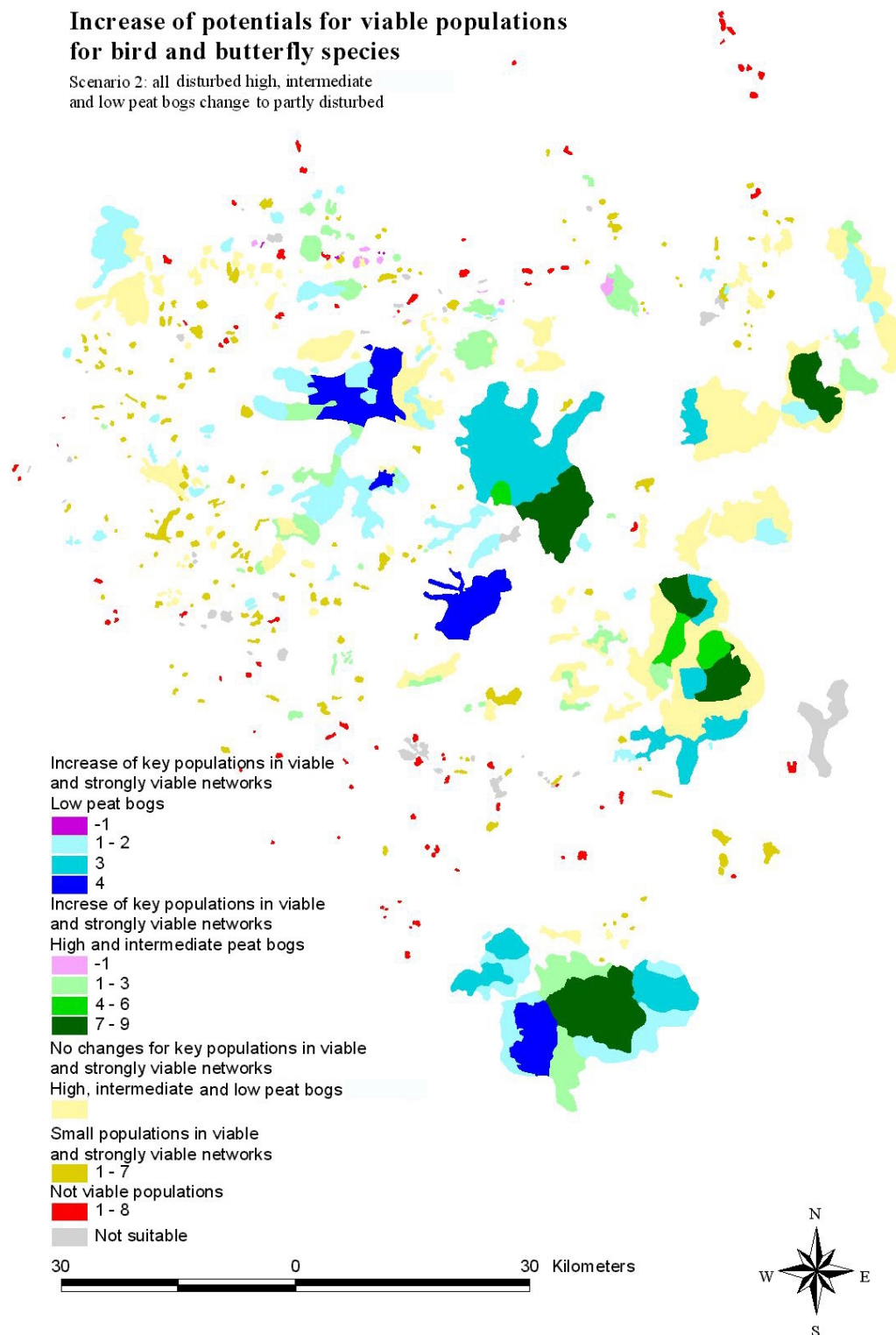and low peat bogs change to not disturbed

Increase of key populations in viable
and strongly viable networks
Low peat bogs
- -1
- 1
- 2

Increase of key populations in viable
and strongly viable networks
High and intermediate peat bogs
- -1
- 1 - 2
- 3
- 4

No changes for key populations in viable
and strongly viable networks
High, intermediate and low peat bogs

Small populations in viable
and strongly viable networks
- 1 - 6

Not viable populations
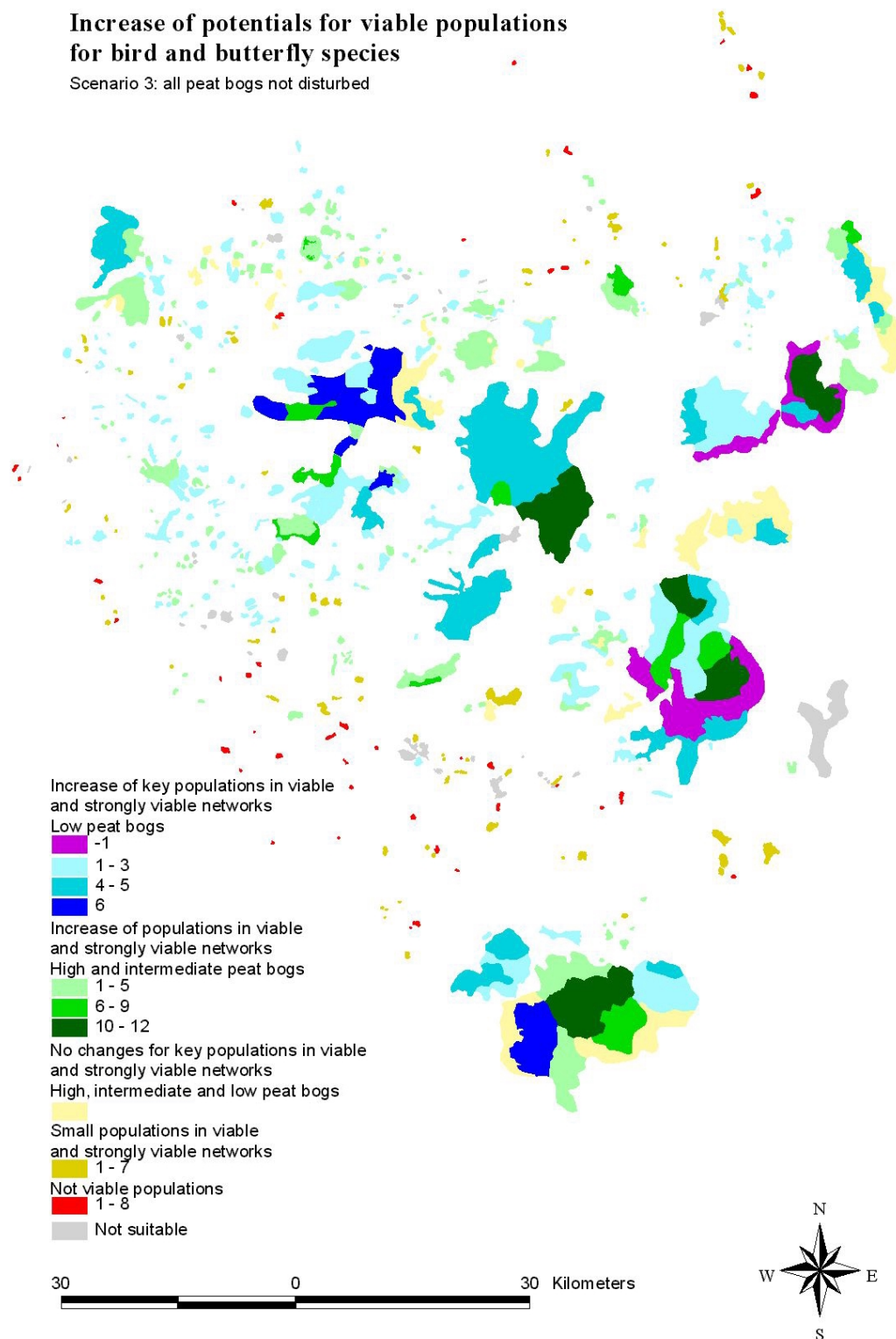- 1 - 8

Not suitable

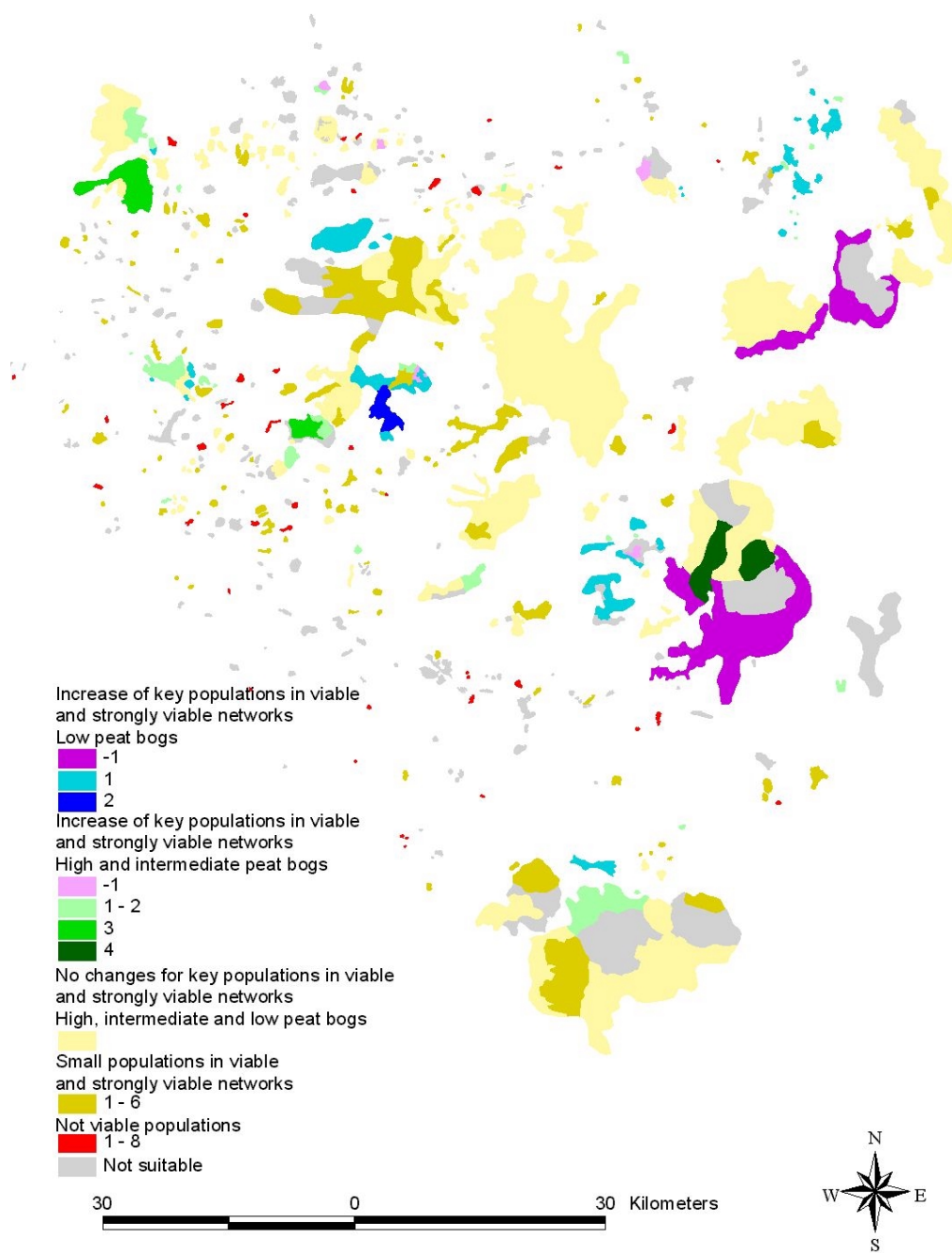30          0          30  Kilometers

*Figure 4.6 Increase of potentials for viable populations for birds and butterflies. Scenario 4: all partly disturbed
peat bogs change to undisturbed.*

# 5 Discussion and conclusions

## 5.1 Assessing potentials for viable populations with LARCH

*Selection of indicator species*
In this study indicator species are chosen which are characteristic of undisturbed peat bogs and might be vulnerable to habitat fragmentation in the study area. The restriction to undisturbed peat bogs probably gives an incomplete view of the potentials for viable populations of peat bogs in general. Especially partly disturbed and flooded peat bogs sometimes can be very important for many bird species. Another point of attention is that only bird and butterfly species are selected. Available data for other species groups were not sufficient to apply LARCH. Ground-dwelling species, particularly reptiles, can give valuable additional information, because roads and waterways can hamper the dispersal. However, the barrier problem of roads and waterways is probably not very important. Also, for reptiles most areas are large enough to support viable populations.

*Species data*
In this study data on carrying capacity and dispersal capability of species are largely based on expert knowledge. Accurate censuses in a variety of habitat types are needed to improve data on the carrying capacity. Availability of estimates for dispersal capacity is very scarce and is an important limiting factor for the selection of indicator species.

*Uncertainty of the results*
There are many sources that cause uncertainty in the output of the LARCH-analysis. Therefore the results have an indicative value. In this respect it is important to point out that expert systems like LARCH are extremely difficult to calibrate and validate and this implies that they preferably have to be used in a comparative way, e.g. by using different scenario settings.

## 5.2 Protection and restoration

To maintain and increase potentials for viable populations of characteristic species of peat bogs protection and restoration are important measures. This study indicates which peat bogs needs protection and where restoration of peat bogs will be effective. The next step will be to bring forward these recommendations. For this, Local Environmental Action Programs (LEAPs) hold enormous promise (Markowitz 2000). LEAPs are founded on meaningful public input in local governmental decision-making. With support from the Dutch Ministry of Agriculture, Nature Management and Fisheries and from the Dutch Ministry of Foreign Affairs (MATRA Fund/Programme International Nature Management) a LEAP is now being developed for part of the study area.

The study has also raised attention at a higher governmental level. The Department of Natural Resources for Central Federal District (CFD) of the Russian Federation Ministry of Natural Resources shows much interest to use the approach of the study for setting-up ecological networks over the territory of CFD, which includes 17 regions of the Russian Federation and Moscow City.

## 5.3 Conclusions

In central and northern Meshera the habitat for many characteristic peat bog species now show a very fragmented pattern. Peat-mining and other human influences are the most important reasons. As a result the potentials for viable populations of characteristic peat bog species have decreased considerably. Of birds and butterflies, butterflies appeared to be most vulnerable.

To maintain and increase potentials for viable populations of characteristic species protection and restoration are very important. The most realistic restoration scenario, change partly disturbed peat bogs to undisturbed, shows a significant increase of the potentials for viable populations for many species, especially butterflies.

To bring protection and restoration measures forward, Local Environmental Action Programs (LEAPs) hold enormous promise.

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## Annex 1 Excursion peat bog conservation, 12-18 june 2000, The Netherlands

*Program and organization*
From 12-18 June 2000 two scientists of All Russian Research Institute for Nature Protection (ARRINP) and three persons who are involved in nature protection on federal, regional and sub regional level visited The Netherlands.
The visit was organized and accompanied by Rien Reijnen and Marja van der Veen (both from Alterra). The main objective was to get informed about peat bog conservation and restoration in The Netherlands.

Three peat bog areas were visited: 'Engbertsdijksvenen' in the province Overijssel, 'Fochteloerveen' on the borderline of the provinces of Friesland and Drenthe and 'De Groote Peel' on the borderline of the provinces Noord-Brabant en Limburg.
In 'Engbertsdijksvenen' we were guided by Albert Hakkers and Fons Eysink from the State Forest Department. We started with a slide show in the visiting center and then had field trip by a small train and by foot.
In 'Fochterloerveen' dhr. Klok of the non-governmental nature conservation organisation 'Natuurmonumenten' gave an explanation in the visiting center. After that we visited the area by ourselves.
In 'De Groote Peel' a private guide, Henk Verheij, showed us the area and the visiting center.

In all peat bog areas we were provided with many materials, such as leaflets and maps.

*Main impressions*
Important differences between peat bog areas in The Netherlands and in Central Russia are:
− Existing remnants of peat bogs in The Netherlands are much smaller than in Central Russia;
− In The Netherlands peat bog areas are surrounded by agricultural land and in Central Russia by large forest areas.

Because of these differences peat bogs in Central Russia do not suffer from agricultural practice and hydrological problems are less important. Also in Russian forests no extended drainage system exists. As a result restoring of disturbed peat bogs is sometimes a natural process.

The restoration measures in The Netherlands drew much attention. Especially the system of flooding in compartments, to favour growth of Sphagnum. May be such system is also practicable in Russian situation, although it was experienced very artificial (especially in 'Fochteloer Veen'). In Russia flooding of peat bogs is a common process after peat-mining and making compartments could be useful.

In The Netherlands flooding of peat bogs are peat-mining, however, makes these areas very attractive for waterfowl, which can hamper the restoring process. In Russia flooded peat bogs also become attractive for waterfowl, but the numbers of birds are

much less than in The Netherlands (may be because of surrounding arable land) and there are still many flooded areas which do not attract many birds.

*List of participants*
- Dr Ruslan Butovsky. Leading research scientist. All Russian Research Institute for Nature Protection (ARRINP). Znamenskoye-Sadki, 113628 Moscow, Russia.
- Dr Dmitri Otchagov. Head of Laboratory of Protected areas. All Russian Research Institute for Nature Protection. Znamenskoye-Sadki, 113628 Moscow, Russia.
- mrs. Marina G. Burmistrova. Adviser for ecology. Department of Commerce-Econonomic collaboration. Ministry of Commerce of Russian Federation. Ovchinnikovskaja nabereznaja 18/1, g. Moscow, Russia.
- mrs. Galina D. Minaeva. Main specialist. Department of Governmental Ecological control. Environmental Committee of Vladimirskaja region. Lunacharskogo uliza 3,g. Vladimir, Russia.
- mrs. Liudmila I. Kuzmina. Chief inspector on environmental protection. Environmental Committee of Petushinsky sub region (Vladimirskaya region). Sovetskaja ploshad 5, g. Petushki, 601100 Russia.
- Mrs. M. van der Veen, research assistant, Alterra Green World Research, Wageningen, The Netherlands
- Dr R. Reijnen, senior researcher, Alterra Green World Research, Wageningen, The Netherlands.

# Annex 2    Workshop on peat bog conservation, 9-10 november 2000, Sobinka, Russia

The workshop was held November 9 -10, 2000 in Sobinski sub region of Vladimirskaya region (hotel 'Russian Forest'). The workshop was organized within the framework of the PIN-MATRA project: 'Ecological networks and nature policy in central Russia' implemented by All-Russian Research Institute for Nature Protection (ARRINP, Russia) and ALTERRA, Green World Research (The Netherlands).

*Main impressions*
Dr Butovsky R.O. - coordinator from the Russian side - briefly stated the objective and goals of the seminar as being the acquaintance of decision-makers with the results of scientific projects 'Ecological networks and biodiversity in Central Russia - a case study for peat bogs in Petushinski sub region' completed in 1999 and the project 'Ecological networks and nature policy in central Russia' which will be completed by March 31, 2001. Both projects provided the necessary ecological background for decision-making which could lead to different ways of peat bog management, including peat bog protection and restoration. At the moment the research team has started to implement new project called 'Local environmental action programs (LEAPs) for peat bog conservation' and the support from local administrations and NGOs is vitally important to implement this phase. Mr. Melik-Bagdasarov in his talk called 'Peculiarities of anthropogenous transformation of peat bogs in Meshera' has described the main threats to the peat bogs caused by anthropogenous impact. Two presentations were devoted to description of peat bog plant communities of the studied region. Dr Essenova presented the results of 'Geo-botanical study of peat bogs in Meshera' and Dr Shilov the results of study of 'Wetland complexes of of Sobinsky sub region'. Mr. Eremkin made a presentation on search for peat bog indicator species from birds and butterflies communities which were used for network modeling in the project.

Project GIS-operator Dr Aletchenko reported on 'Data processing and development of maps' and provided the necessary information on LARCH approach and its application for Russian needs. Dr Reijnen, who was the project coordinator from Dutch side, in his presentation demonstrated how the results of the project are used to indicate peat bogs which need protection and to identify peat bogs where restoration will be effective.

Dr Bondarchuk presented modern approaches to development of Local Environmental Action Programs (LEAPs) which could be useful in planning of time and resources for concrete nature protection actions. Dr Samoilov presented the results of efforts of Moscow government for conservation of peat bogs located on the territory of Moscow.

The presentations were discussed and the participants demonstrated great interest to the problem of peat bog conservation.

During the workshop better relations were established between project team and administrators of Petushinski and Sobinski sub regions of Vladimirskaya region, Egorievsk sub region of Moscow region, Ecological Department of Central Federal District and Moscow administration. It gives a solid foundation for successful development and implementation of LEAPs in the territory and dissemination of LARCH approach to the territory of Central Federal District.

The results of the workshop were published in mass media – popular everyday federal Russian newspaper Moscovskaya Pravda (November 23, 2000).

### *List of participants*

| | |
|---|---|
| Alechenko Gleb | Leading researcher, Faculty of Geography Moscow State University |
| Butovsky Ruslan | Leading researcher, ARRINP |
| Vyshkovskaya Nina | Journalist «Ecological problems» |
| Golubchikov Sergei | Editor of ecology, journal «Energy: economy, technique, ecology» RAS |
| Eremkin Gregory | Moscow Society of Nature Researchers |
| Essenova Inna | Head of sector of State Biological Museum named after K.V. Timiryasev |
| Lebedeva Natalia | Main specialist of Dept. for natural resources in Central Region |
| Meznev Anton | Senior researcher, State Center of Hunting Control |
| Melik-Bagdasarov Eugene | Faculty of Geography, MSU |
| Nesterkin Andrei | Head of Department of forest protection, Dept. for natural resources, Central region, Ministry for Natural resources. |
| Novikov Victor | Head of State Inspection for plant and animal conservation, Noscow State Committee for Nature Protection |
| Otchagov Dmitri | Head of laboratory for zapovedniks, ARRINP |
| Platonov Yuri | Deputy Head of Information-Analytical department for natural resources, Central region, MNR |
| Samoilov Boris | Head of laboratory for nature protection, Moscow, ARRINP |
| Sementovskaya Kristina | Main specialist, NIIPI Genplan, Moscow |
| Sivtsova Natalia | Secretary of the seminar |
| Subbotina Elena | Correspondent, newspaper 'Moscow pravda' |
| Khoroshev Pavel | Leading specialist, Ministry of ecology and nature protection Moscow region. |
| Shishkonakova Ekaterina | NGO 'Istritza', coordinator |
| **Orekhovo-Zuevo sub region** | |
| Alexeev Vladimir | Head of Dept. of zoology, Pedagogical Institute |
| **Egorievsk sub region** | |
| Zhukov Oleg | Head of Dept. for landuse, Administration |
| **Sobinksi sub region** | |
| Koripanov Andrei | Chief forester |
| Kuzhahmetova Nadejda | Head of ecological department, Central House for Tourism |
| Mikhailova Irina | Deputy Director, Central House for Tourism |
| Morozova Olga | Deputy Head of Dept. of landuses, Administration |
| Stolbov Sergei | State inspector for environmental protection, Vladimir region |
| Fedotova Tatiana | Head of Dept. fpr landuses, Administration |
| **City Ivanovo** | |
| Shilov Mikhail | Assistant Professor, Ivanovo Pedagogical University |
| **Vladimir region** | |
| Iphanova Maia | Head of Dept. for self-reproduction, State Committee for Nature Protection |
| Minaeva Galina | Leading specialist, Dept. for State control, Committee for Naturen Protection |
| Nemchenko Vladimir | Deputy Director, National park Meshora |
| Davydova Svetlana | Leading specialist, Ведущий специалист Committee for natural resources, Administration |

| **Petushinski sub region** | |
|---|---|
| Kuzmina Liudmila | State Committee for nature protection, Administration |
| Bredikhina Liudmila | Head of State Committee for nature protection, Administration |
| **Podolski sub region** | |
| Mazokhin Alexei | Committee for health protection and ecology, Administration |
| **The Netherlands** | |
| Rien Reijnen | Senior researcher, ALTERRA |