

**Biodiversity Conservation & Economic Growth
(BCEG) Project**

**Development and Implementation
of an Ecological Monitoring System for
Rila and Central Balkan National Parks**

Report

Submitted by:

**Dimitrina Boteva, Biodiversity Specialist
BCEG Project**

Bulgaria Biodiversity Conservation and Economic Growth Project

is a collaborative initiative between the

**United States Agency for International Development
and the
Government of the Republic of Bulgaria**

implemented by
Associates in Rural Development, Inc.

Project Number LAG-I-00-99-00013-00, Task Order 01

Table of Contents

Acronyms	iii
Preface	iv
1.0 Executive Summary	1
2.0 Context	3
2.1 Existing Legal Framework Provisions and the Lack of an Operational Biodiversity (and Ecological) Monitoring System	3
2.2 Monitoring Requirements of the Management Plans of Rila and Central Balkan National Parks	5
2.3 Bulgarian Institutions and Organizations Experienced in Developing and Implementing Aspects of Ecological Monitoring Systems	5
2.3.1 <i>The Executive Environmental Agency</i>	5
2.3.2 <i>The Bulgarian Academy of Sciences</i>	6
2.3.3 <i>Ministry of Agriculture and Forests: the National Forestry Board</i>	7
2.3.4 <i>Agrolesproject PLC</i>	7
2.3.5 <i>Clearing House Mechanism – within the National Nature Protection Service</i>	7
2.3.6 <i>DANIDA -DANCEE PROJECT: Conservation of Species and Habitats in Bulgaria: EU approximation</i>	7
3.0 Goals of a National Parks Ecological Monitoring System	9
3.1 What do We Monitor and Why?	9
3.2 Types of Information - Characteristics of the Monitoring System for the Parks	9
3.3 The Management Plan: Framework for the Park Eco-Monitoring System	10
3.3.1 <i>Significance</i>	10
3.3.2 <i>Zones, Regimes and Norms</i>	10
3.3.3 <i>Threats</i>	10
3.4 Application of the Results of the National Park Ecological Monitoring System Implementation on a National Level	11
4.0 The BCEG Project Support for Ecological Monitoring System in Rila and Central Balkan National Parks	13
4.1 Participants and Organization	13
4.2 Approach	13
4.3 Existing Experience of Rila and Central Balkan National Parks in Ecological Monitoring	13
4.3.1 <i>Existing Activities</i>	13
4.3.2 <i>Previous Studies</i>	15

4.4 Steps in the Development of an Eco-Monitoring System for Rila and Central Balkan National Parks	17
4.4.1 <i>Situation Analysis</i>	17
4.4.2 <i>Principles Developed by the Parks for Developing and Implementing the Eco-Monitoring System in the National Parks</i>	17
4.4.3 <i>Criteria for the Selection of Monitoring Objects and Sites</i>	18
4.4.4 <i>Practical Issues Affecting the Design of Eco-Monitoring in High Mountain Parks</i>	19
4.4.5 <i>Park Directorate Roles and Responsibilities: Experts, Section Heads, Rangers</i>	19
4.4.6 <i>Partners: Their Roles and Responsibilities</i>	20
4.4.7 <i>The Role of GIS and GPS Technology in the Parks</i>	21
5.0 The National Parks Eco-Monitoring Matrix: Contents of the Monitoring System	23
6.0 Defining the National Parks Eco-Monitoring System: the Bankya Workshop	25
6.1 Ecological Monitoring Matrix for Rila National Park	26
6.2 Ecological Monitoring Matrix for Central Balkan National Park	30
7.0 Monitoring Activities and Results till the End of October, 2002	33
7.1 Forest Monitoring	33
7.2 Bird Monitoring	33
7.3 Medicinal Plants Monitoring	34
7.4 Bear Monitoring	34
7.5 Souslik Monitoring	34
8.0 Conclusions, Recommendations and Future Challenges	35
8.1 MOEW/NNPS	35
8.2 National Park Directorates	36
Bibliography	39

Appendices:

Appendix 1	Minutes of the meeting with experts from CBNP Directorate, held February 2, 2002, in Gabrovo
Appendix 2	Minutes of the meeting with experts from Rila NP Directorate, held March 6, 2002, in Blagoevgrad
Appendix 3	List of Participants in the Workshop, Bankya, April 8-9, 2002 on Development and Implementation of an Ecological Monitoring System for Rila and Central Balkan National Parks

Acronyms

ARD	Associates in Rural Development, Inc.
BAS	Bulgarian Academy of Sciences
BCEG	Biodiversity Conservation and Economic Growth Project
BSBCP	Bulgarian-Swiss Biodiversity Conservation Program
CBNP	Central Balkan National Park
CHM	Clearing House Mechanism
EEA	Executive Environmental Agency
EU	European Union
FI	Forestry Institute
GEF	Global Environment Facility (note the acronym “GEF” is also used generically in Bulgaria for the USAID/GEF Biodiversity project)
GIS	Geographic Information System
GPS	Global Positioning System
IUCN	World Conservancy Union (formerly International Union for the Conservation of Nature)
MOAF	Ministry of Agriculture and Forests
MOEW	Ministry of Environment and Waters
MOU	Memorandum of Understanding
NFB	National Forestry Board
NGO	Non-Government Organization
NNPS	National Nature Protection Service (of MOEW)
NP	National Park
NPD	National Park Directorate
PMU	Project Management Unit
PS	Park Section
RIEW	Regional Inspectorate of Environment and Waters
RNP	Rila National Park
SCI	Site of Conservation Importance (Natura 2000)
SPA	Special Protection Area (Natura 2000)
UNDP	United Nations Development Program
USAID	United States Agency for International Development

Preface

The Biodiversity Conservation and Economic Growth (BCEG) Project is funded by the United States Agency for International Development, (USAID), as part of its strategic support to the Republic of Bulgaria. The Project is sponsored by USAID in conjunction with the Government of Bulgaria – the Ministry of Environment and Waters (MOEW). The Project is governed by a Memorandum of Understanding (MOU) between the two governments, and its implementation covers the period: May 2000 – March 2003.

This Project is a logical evolution of earlier USAID assistance to biodiversity conservation in the country. It follows some 10 years of assessment, technical assistance and financing of Bulgaria's biodiversity conservation strategic development, new protected areas legislation, and new national park institutions. The Project is designed to capitalize on the achievements of the Bulgaria Global Environmental Facility (GEF) Biodiversity Project (implemented during the period June 1995-April 2000), and builds on lessons learned.

The BCEG Project addresses six specific contract themes known as tasks or “contract result packages”. The BCEG Project includes the finalization and implementation of two national park management plans, the development of a new management plan for Rila Monastery Nature Park. It assists in the development of financial mechanisms and strategies to ensure the solvency of national parks. The Project pilots economic growth activities with select target groups around two Bulgarian national parks. And it continues to build on the principles of strong public information and awareness as stepping stones for informed public engagement and promotion of biodiversity conservation and protected area management activities.

This Project is issued as a Task Order (Contract Number LAG-I-00-99-00013-00) under the USAID Global Biodiversity and Forestry Indefinite Quantities Contract (IQC); and is implemented on behalf of USAID by Associates in Rural Development, (ARD) Inc., of Burlington, Vermont, USA.

The Project is implemented through a Project Management Unit (PMU) based in Sofia, and includes a Team Leader, three Bulgarian technical specialists, and support staff. Project activities are coordinated through two mechanisms –

- (a) Project Coordination Group – serves as a steering committee for Project planning and monitors implementation. This consists of the National Nature Protection Service of the MOEW, and national park directors, the PMU and USAID;
- (b) Project Counterpart Team – PMU staff working with MOEW/NNPS counterparts.

The Project is largely implemented through the Directorates for Rila and Central Balkan National Parks. Additional technical assistance is provided by Bulgarian and international consultants, and is based on specific terms of reference.

1.0 Executive Summary

Biodiversity monitoring is a key component of the National Strategy for Biological Diversity Conservation, as well as for Bulgaria's compliance with key EU legislation and Directives. As of today, Bulgaria has no unified biodiversity monitoring system established. However, the Bulgarian Environmental Protection Act, the Protected Areas Act and the Medicinal Plants Act prescribe the development and establishment of a monitoring system that allows the nation to monitor biological diversity and its conservation.

This paper presents a summary of those institutions in the country, which have a key role to play in the development of the national ecological network and the development of a national ecological monitoring system as part of it. National Parks have a key role to play in these systems. Their development of an ecological monitoring system for national parks is viewed as providing important direction and content to this national system. These monitoring systems are also an important requirement of recently approved national park management plans.

This paper presents the coordinated efforts of Rila and Central Balkan National Parks to define ecological monitoring in a national park context, to describe its attributes, and to define the parameters of a system when applied to both Parks. The results of this work are expected to drive the implementation of a long-term ecological monitoring system in each park, and to ensure data collection and analysis are conducted in an organized and unified manner.

This paper represents the cumulative efforts of Rila and Central Balkan National Parks technical experts to develop an ecological monitoring system. The system is supported and launched with BCEG Project assistance in summer and fall of 2002.

There are many challenges still remaining if this system is to prove effective. These include: the regular, annual financing of eco-monitoring activities begun with BCEG Project support; the development of protocols for the collection, storage, reporting and sharing of this data, and a coordinated vision for how this information will be maintained and used at national levels. Perhaps the most critical matter still outstanding is the development of an institutional practice of using this information for "adaptive management" practices within each of the national parks.

Recommendations have been provided at the end of the body text, for organizing the ecological monitoring system at practical levels. They emphasize the most critical things to be done in order to establish the system, streamline and operate it, and to ensure its links with national institutions.

Finally, this paper presents the results of the first national workshop on national parks and ecological monitoring (April 2002) and its outputs. It also presents a brief summary of ecological monitoring work done to date in each of the Parks.

2.0 Context

2.1 Existing Legal Framework Provisions and the Lack of an Operational Biodiversity (and Ecological) Monitoring System

Bulgaria has committed itself to a host of international instruments in the field of biodiversity conservation, which, however, cannot be implemented in the absence of a unified system for monitoring and analysis of its condition within the whole network of protected areas. To date, Bulgaria is signatory to a series of international conventions. Among them are:

- The Biological Diversity Convention;
- The Convention on the Conservation of European Wildlife and Natural Habitats (The Bern Convention);
- The Convention on Wetlands of International Significance, Especially as Water Fowl Habitats (The Ramsar Convention);
- The Migratory Animal Species Conservation Convention (The Bonn Convention);
- The World Natural and Cultural Heritage Convention.

Alongside with these are the requirements of the European Union to harmonize Bulgarian and European legislation. Bulgaria has undertaken to comply with Directive 92/43/EEC on the protection of natural wildlife habitats and with Directive 79/409/EEC on the protection of wild birds. These two directives are among the most important for biodiversity conservation.

An effective mechanism for attaining these legislative goals is to set up a protected areas network. Consequently, there are 6 categories protected areas in Bulgaria (as per the Protected Areas Act (1998) and IUCN protected area classifications):

- National park;
- Nature park;
- Nature reserve;
- Maintained reserve;
- Protected site;
- Natural landmark.

Protected areas in Bulgaria cover total of 515,478.5 hectares, or 4.64 percent of the country's territory. For the network of protected areas to be managed adequately and for biodiversity in them to be given proper protection, monitoring of the environmental components must be provided. Subsequently, monitoring activities and their databases, must be organized, operated and maintained.

Pursuant to the newly adopted Environmental Protection Act (2002) the National System for monitoring of the environment covers the whole country and includes national networks for monitoring of the forests and the protected areas, biological monitoring and monitoring of series of abiotic components.

The National Park Directorates provide for the implementation of the national policy of environmental protection on a regional level together with the Regional Inspectorates of the

Environment and Waters (RIEWs) as well as the Water Basins Directorates. All these regional units fall under the Ministry of Environment and Waters. They also carry out control functions on environmental components and they must address the factors that influence these components on a regional level.

Pursuant to Article 50 of the Protected Areas Act, the National Park Directorates are required to provide monitoring of the quality of environmental components. The Regulation on structure and activities of the NP Directorates (2000) states that:

“Park Directorates perform monitoring of:

- The state of natural ecosystems and communities, as well as of the state of populations of rare and protected plant and animal species;
- The state of other environmental components: air, soils, waters;
- Tourist pressure.”

Pursuant to the Environmental Protection Act, *environmental monitoring is the gathering, assessment and summarizing of information about the environment by means of continuous or periodic observation and sampling of certain qualitative and quantitative indicators reflecting the state and condition of the environmental components, as well as changes therein as a result of natural and anthropogenic factors.*

Other instruments of national legislation addressing the biodiversity monitoring issue are the 1998 National Biodiversity Conservation Strategy, the 2000 National Biodiversity Conservation Plan, and the requirements found in the Medicinal Plants Act (2000).

Despite the provisions of both Bulgarian and international legislation, Bulgaria does not yet have in place a unified, structured monitoring system of the biodiversity and its protected areas. No formal monitoring system exists that would enable the tracking of changes in biodiversity or its individual components over time. The objects and methods of monitoring, the parameters monitored, and the frequency of their use are not determined and agreed. A project for a National Bio-monitoring Program for Bulgaria was developed in 1993 at the request of the Ministry of the Environment and Waters, within EU/PHARE Program. A collection of quick and promising bio-monitoring methods was published. This methodology now lies as the basis of the National Biodiversity Conservation Plan developed with the support of UNDP. And yet, the detailed development and systematic implementation of such a monitoring system is yet to become a fact on the ground.

The lack of an unified system for monitoring, information gathering and analysis creates problems for Bulgaria in tracking the changes in the status of the biodiversity in the protected areas system as well as in fulfilling country's commitment to report to the respective Convention Secretariats. At the same time, the numerous environmental threats, the use of certain technologies and certain environmental impacts do not comply with conservation requirements. They are causing negative changes in the protected areas system, particularly in the small areas that include some reserves, sites and landmarks. These sites in particular suffer from deterioration, degradation, and in some cases, even loss of habitats of valuable species of conservation significance.

2.2 Monitoring Requirements of the Management Plans of Rila and Central Balkan National Parks

In compliance with the provisions of Bulgarian and international legislation, the management plans for Rila and Central Balkan National Parks provide for the development of a monitoring system. An ideal goal in the management of these parks is:

To provide an optimum amount of information on the state of biodiversity and ecological processes in the Park through the establishment and operation of a long-term monitoring system.

The information gathered in the course of ecological monitoring will help decision-makers in the making of informed, appropriate management decisions regarding the actions in support of environment components and the mitigation of visitor impacts inside the Parks. The prescriptive part of each management plan envisions the establishment of a system for monitoring the natural components – forests, pastures, and species of conservation significance, medicinal plants etc. – as well as the tourist flow, distribution and impacts. The inclusion of ecological monitoring in the management plans is evidence of the recognition by the competent government agencies of its significance in park management. It also demonstrates the commitment of the Ministry of the Environment and Waters/National Park Directorates to the long-term fulfillment of this task. Monitoring thus becomes a principal duty of the Park Directorates, to be funded directly by the State Budget.

The National Park management plans also prescribe that the Park Directorates are to implement the ecological monitoring program in close collaboration with other governmental and non-governmental agencies and organizations.

2.3 Bulgarian Institutions and Organizations Experienced in Developing and Implementing Aspects of Ecological Monitoring Systems

The national entities with experience in the conduct of monitoring programs, as well as managing information accumulated over time regarding the state of environment components, including biodiversity, are:

2.3.1 The Executive Environmental Agency (EEA)

Pursuant to the Environmental Protection Act, the national system for monitoring of the environment is realized under the leadership of the Executive Environmental Agency (EEA) under the Minister of Environment and Waters. The EEA is responsible for the creation and functioning of a national, automated system for environmental monitoring – a computerized base for the national system for monitoring of the environment. The EEA must also provide for the methodological guidance of all environmental monitoring activities.

Monitoring of the quality of the principal environmental components (air, soils and waters) - observation, measurement, and testing is performed on a regional level by the Regional Inspectorates of the Environment and Waters. The relevant information is gathered, summarized and stored on a national level by the Executive Environmental Agency. The EEA

and the RIEWs support the national system for monitoring of the environment, which encompasses a set number of data gathering points throughout the country. These are used as points from which a large number of biotic as well as abiotic indicators are monitored. At present, there are no points/sites from the national environmental monitoring system within national parks.

EEA and the RIEWs have at their disposal specially equipped labs and experts to analyze the data gathered as a result of such monitoring of the quality of air, soils and waters in Bulgaria. These monitoring efforts conform with established and approved methods of analysis. The data obtained from monitoring environmental components are summarized and published in quarterly issues of the EEA Yearbook. The Agency also issues summarized reports on the basis of the said data, e.g. the State of the Environment Report (the Green Book).

As the umbrella organization supervising and coordinating the activities of both the National Park Directorates and the EEA/RIEWs, the Ministry of the Environment and Waters must take the necessary steps to ensure the adequate funding of both institutions for the purposes of monitoring of the environmental components: air, waters and soils within the National Parks.

2.3.2 *The Bulgarian Academy of Sciences*

The Bulgarian Academy of Sciences (BAS) is an agglomeration of some 30 individual scientific research institutions, of which the following perform research and monitoring of the environment: the Institutes of Botany, Zoology and Ecology; the Forestry Institute and the National Hydrology and Meteorology Center.

BAS employs qualified specialists capable of supervising and providing expert assistance in the development and setting up of a monitoring system for the National Parks. Specialists in different fields should therefore become involved on a long-term basis in cooperating with the government authorities in data gathering and processing as part of the monitoring effort. They should be engaged to provide consultation to the Park Directorate experts in developing concrete solutions for the park management based upon the available information.

In addition, BAS institutes compile and maintain specialized databases on biodiversity, as well as specimen collections that can be used as a source of basis information.

The Central Laboratory of General Ecology (under BAS), in conjunction with other academic institutions, is implementing a project envisioning the establishment of a BULBIONET information network especially designed for biodiversity in the Republic of Bulgaria. The BULBIONET network will function as a de-centralized, open-type, national information system operated by the Bulgarian Academy of Sciences and connected to the Internet through its own web site. The main terminals are envisioned to be placed at the Institute of Zoology, the Institute of Botany and the Central Laboratory of General Ecology, as well as at the Institute of Marine Studies and the Forestry Institute. There will be a link between this network and the Clearing House Mechanism (CHM) within the Ministry of Environment and Waters.

2.3.3 Ministry of Agriculture and Forests: the National Forestry Board

The Ministry of Agriculture and Forests possesses a well-organized system for operational information gathering. The Ministry operates a system of *forest resources accounting*, both on an annual basis and once every five years. Part of the data is published in the Statistical Yearbook. Statistical accounting of forest resources has been practiced for a long time in Bulgaria. It includes the completion of seven basic, standard forms, of which # 1 (general distribution of the forest territory by type of soil and type of forest) and #5 (forest use) are filled in every year. The remaining forms Nos. 2, 3, 4, 6, and 7, (representing, respectively, the distribution of wooded areas, and the available timber resource by type, density, growth rate and forests overall condition) are filled every five years.

2.3.4 Agrolesproject PLC

Is a former State agency with a long-standing involvement in drawing up forest inventories and management plans for protected areas; in addition, it is quite possibly the only source in Bulgaria of maps of the national forest estate. Agrolesproject possesses extensive information about the existing protected areas, scientific research papers and concrete projects for the management of these areas (e.g., park management plans). Every new assignment necessitates all-new and/or further studies to complement or update the existing information, which is then processed into the respective document (e.g., a park management plan or a forest inventory).

2.3.5 Clearing House Mechanism – within the National Nature Protection Service (MoEW)

The project is based in the National Nature Protection Service of the Ministry of Environment and Waters. The work on CHM development for Bulgaria is part of the national compliance with the Convention on Biological Diversity. The Convention is a joint project of the MOEW and UNDP, and is financed by GEF. The title of the project is *Needs Assessment and Development of CHM in Bulgaria*. It started in February 2001. The needs assessment was conducted with support from the BCEG Project, and designed to complement the work of the UNDP and MOEW.

In January 2002, a Project Coordinator was employed and a national working group established in August 2002. The NNPS is responsible for the daily tasks implementation on starting up the Bulgarian CHM.

The CHM aims to provide a streamlined node for the exchange of information on biodiversity at a national level. Its key responsibility is to become a national resource center for the organization and structure of national (and international sources) of information on biodiversity and its conservation.

2.3.6 DANIDA -DANCEE PROJECT: Conservation of Species and Habitats in Bulgaria: EU approximation

The project is also based in the NNPS. It works closely with the Ministry of Agriculture and Forests, the Ministry of Regional Development and Public Works and local authorities. It has started in mid-2002. Scientists and local NGOs will carry out many of the activities as sub-contractors, especially the many surveys (inventories) of flora and fauna in the country.

The immediate objective of the Conservation of Species and Habitats in Bulgaria Project is to assist Bulgaria in ensuring that natural habitats and species of wild flora and fauna of national and European interest are sufficiently represented in areas designated for biodiversity conservation. This calls for a systematic approach to biodiversity conservation and is in accordance with the recently adopted Biodiversity Act (2002), which aims at implementing Bulgaria's international obligations.

The overall objective of the project is to assist Bulgaria in protecting its biodiversity. This includes:

1. Establishment of a national Natura 2000 network of SPAs and SCIs;
2. development of a national GIS database containing information on species and habitats represented in the sites;
3. preparation of draft legal declarations for designating Natura 2000 sites; and
4. preparation of documentation for submission to the Standing Committee of the Bern Convention and the European Commission respectively.

The project will also build capacity in nature protection, enhance regional and local participation in preparing monitoring programs and management plans of the sites, and increase awareness of biodiversity issues. By doing so, the project will furthermore assist Bulgaria fulfilling EU-requirements regarding the EU Birds and Habitats Directives.

3.0 Goals of a National Parks Ecological Monitoring System

3.1 What do We Monitor and Why?

Ecological monitoring systems in the National Parks are aimed at:

1. Providing **long-term monitoring and regular gathering of all relevant information as may be necessary for assessing the state of environmental components and changes therein**, as a result of the impact of natural and anthropogenic factors.
2. Gathering **sufficient and relevant information for the adaptive management of parks, enabling the rapid mobilization of resources and measures** in response to changing circumstances.
3. Eco-monitoring in the National Parks is focused on the **conservation of protected items – habitats and species** – in their natural condition.
4. Ultimately, the eco-monitoring system aims to provide part of the information necessary for **assessing the effectiveness of the management plan**, as well as arguments in favor or against change (in the broadest sense) of zones, regimes and norms over the next ten-year period.

3.2 Types of Information - Characteristics of the Monitoring System for the Parks

In order to attain these goals and objectives, it is necessary that information gathering proceed in three main directions:

- **Basic Data:** Gathering of basic abiotic and biotic data regarding the components/indicators monitored in the Parks. These may include threats and trends towards the occurrence of different ecological processes. The results of basic data processing and analysis may prompt some specific data gathering and/or scientific research.
- **Conservation Monitoring:** The Park's role in biodiversity protection and its contribution to the national ecological network is important. Specific information about the state and condition of specific populations of important biodiversity species. This is important for species with a conservation significance at a local, national, regional and world level.
- **Limits of Acceptable Use:** Successful visitor and human impact management is a priority within our Parks. Monitoring of impacts is important for defining and implementing zones, regimes and norms – information that, following expiry of the 10-year term of validity of the Management Plan, would enable an assessment of their applicability and correctness.

In order to work and attain these goals, an eco-monitoring system must be **practically oriented** and must enable and assist in the **making of concrete managerial decisions**, based upon the results of applied research. The main challenge is to create a program that sets itself attainable objectives in light of the absence of significant numbers of qualified personnel and the limited financial resources allocated to the Parks' all-round management. **The biodiversity monitoring system must be effective and informative, and at the same time, simple to use, low-cost and easy to apply, featuring clearly distinguishable indicators and assessment criteria.**

3.3 The Management Plan: Framework for the Park Eco-Monitoring System

Management plans are the principal tools guiding the development of a park ecological monitoring system and defining its structure. The scope and goals of ecological monitoring are determined in view of three specific aspects of the management plan:

3.3.1 Significance

The first ecological assessment within the Management Plan identifies components unique or significant for biodiversity conservation on a local, national, regional (Balkan), European and world level. Ideally, monitoring data serve as evidence that the management goals of the Park concerning the protection of the natural heritage within it, are attained. These goals, in the broadest sense are: conservation of biodiversity within the Parks, conservation of species and conservation of habitats.

3.3.2 Zones, Regimes and Norms

Zoning is the first management tool used to ensure the conservation of species, communities, and habitats in the Parks. Each zone represents a geographically defined area aimed at restricting or, conversely, focusing certain park management activities. The ecological monitoring system should take into account the specific features, characteristics and requirements of each zone within the Park. It should also help in assessing their effectiveness in terms of geographic location, regimes and norms.

3.3.3 Threats (what we are trying to manage and mitigate)

Ecological monitoring within the National Parks must be primarily oriented towards monitoring the extent to which each threat identified in each of the Parks manifests itself, especially those of anthropogenic origin. The monitoring system should determine the methods of monitoring, prompt data collection and estimation of the treats in both time and space. The information gathered shall then be used in assessing the effectiveness of actions taken.

Threats fall in two groups: those over which the Park managers have no direct control and those that can be controlled and mitigated.

Threats of the first type: global warming, long-range air pollution, pollution involving heavy metals, water catchments and deviation.

Threats of the second type: overcrowding (excessive concentration of people at the same place and at the same time, e.g. in the Seven Lakes area in Rila National Park).

Knowing whether the Park managers can control the threats would allow us to prioritize those about which urgent measures could be taken in order to mitigate or eliminate them. The prioritizing of threats enables eco-monitoring planners to select those monitoring activities that would be cost- and time-efficient for the Park. Additional monitoring activities can then be allocated to partners.

3.4 Application of the Results of the National Park Ecological Monitoring System Implementation on a National Level

The information collected as a result of ecological monitoring in the National Parks should form an important part of the National Environmental Monitoring System and should be linked to the data of the EEA. National Park ecological monitoring and the information that is collected should serve several purposes:

- To complement the existing information on the state of the environment in Bulgaria. National Parks can serve as back-ground control zones regarding the state of biodiversity on the level of species, populations and ecosystems;
- To help assess the state of biodiversity of key components and sites of the protected areas system in Bulgaria. This, in turn, should facilitate the fulfillment of the country's obligation to report to the Secretariats of the International Conventions to which it is a party;
- To help accumulate experience and expertise in the setting up of a comprehensive system of biodiversity monitoring in the system of protected territories.
- The findings, data and experience accumulated will also be of use in making assessments and in developing legislation, by-laws and other such administrative acts in the field of environmental conservation: inventories, management plans and ordinances, etc., as well as in developing the all-round government policy towards environmental conservation.

4.0 The BCEG Project Support for Ecological Monitoring System in Rila and Central Balkan National Parks

4.1 Participants and Organization

One of the main areas in which BCEG Project collaborates with the Directorates of both National Parks and the National Nature Protection Service is to assist with the development of the methodology and financing of priority activities towards implementing the Management Plans. The work on ecological monitoring system development is one element of this support. The assistance is supervised and coordinated through the BCEG Project's biodiversity specialist. The Directorates are represented in this joint effort by experts in different fields: forestry, fauna, flora, tourism, GIS, as well as by their directors and deputy directors.

4.2 Approach

The methods used for the review, assessment, and selection of ecological monitoring indicators and the monitoring methodologies are assisted by BCEG Project-hired short-term consultants. These consultants are from the BAS, the Forestry University, and the Department of Biology of the University of Sofia. The National Park Directorates participate in the identification and selection of these consultants. The work of the Project, the Directorates and these short-term consultants consists of a series of working meetings and workshops:

- Meetings in each park directorate to discuss and formulate the vision of the expert staff about the monitoring system in the park;
- Working meetings between the respective park experts and the short-term consultants to develop the specific monitoring methodologies.
- Workshop to launch the monitoring system development
- Development and field testing of the proposed methods through selection and setting up of monitoring sites;
- Training of selected Park employees relative to the specific monitoring feature –each park is adopting a strategy for individual guards to specialize in subject matter of the monitoring system within each park section. The relevant expert in the park directorate supervises these groups of guards.

4.3 Existing Experience of Rila and Central Balkan National Parks in Ecological Monitoring

4.3.1 Existing Activities

According to the annual reports of Rila and Central Balkan NP regarding the scientific research and monitoring activities performed in their territory during 2001:

1. Each National Park Directorate performs annual monitoring of the state and size of the populations of large carnivores, ungulates and bird species. These include the counting of: chamois, roe, deer, wolf, bear, wild cat, grouse, partridge, nocturnal birds of prey, etc. Together with taking part in the annual censuses, each park ranger is obliged to report on a monthly basis to the Fauna expert in the Directorate, on encounters with specimens of

fauna species during day to day guarding activities. Each expert in the Directorates keeps the collected information in electronic formats, most often on Word or Excel format. A hard copy is kept as well. These data have not been included in the parks digital models, and the collection and storage of data has not been unified. The results of the annual censuses for the game species are reported to the National Nature Protection Service and through it to the National Forestry Board. There is no fully established structured protocol of archiving data, regular analysis, storage and sharing of information.

2. A study is being performed of the *souslik* population in Central Balkan NP, aimed at mapping its natural range and estimating its population size. Specialist with the Biology Department of the University of Sofia supervise the study. The information gathered will be used as the basis for developing methods for monitoring the overall state of the species. These data has not been included in the park's digital model yet.
3. Monitoring of the state and condition of the forest by monitoring stations of the Forestry Institute (FI), BAS. - Under contract between the National Park Directorates and the FI, park rangers perform specialized monitoring at the Institute's stations deployed in the two Parks: at the Jalna locality, of Central Balkan, and at the four stations in Rila NP – Parangalica, Govedartsi, V. Serafimov, Buzenishki dol. Measurements are performed of solar radiation and precipitation, the data being collected by the park rangers and fed to the Forestry Institute. The Park Directorates have full access to the processed and summarized data. Up to now information has not been requested by the parks. There is no procedure to incorporate the collected data into a unified ecomonitoring system.

Together with the monitoring of forests in the FI stations, the Parks' Directorates are obliged to provide information for the forests in the parks territory for the system of *forest resources accounting* of the National Forestry Board under the Ministry of Agriculture and forests. It includes the completion of the seven basic standard forms, two of which are filled in every year and the other five are filled every five years.

4. Attempt by the NP Directorates to monitor the tourist flow on an annual basis. The basic inventory information about the tourism flow has been collected during the socio-economic studies of GEF Biodiversity Project in the period 1997-2000. (See below). The current evaluation of the number of tourists and tourism flow in the parks is based on the information from rangers' observations and the statistical data of numbers of tourists and overnights from overnight huts in each Park. These statistics unfortunately do not provide information about day visitors, who make up a significant number of the tourists in the park.

An attempt was made in 2001 by the Central Balkan National Park Directorate to monitor the tourist flow and its dynamics. The objectives of the monitoring have been to collect information on the fluctuation of the tourists' number in the park on a monthly basis and according to specific days of the week. A simple method was implemented by the park rangers on the major entrance points and tourist trails.

A schedule for the elaboration of the census has been prepared by the Tourism expert for CBNP, and the exact points of observation has been selected together with the park section heads. The monitoring included counts for one week (Monday to Sunday) each month for a year.

The proposal turned out to be too ambitious and after several weeks of implementation it was stopped. The Park could not afford the manpower needed for such an extensive and regular undertaking. The scheme however, suggests opportunities for cooperation with partners of the park. These are being examined by the Directorate.

4.3.2 Previous Studies

USAID-GEF Project Biodiversity Inventories for Central Balkan and Rila National Parks

Under the USAID-GEF Project for Biodiversity Conservation in Bulgaria, an important database was developed. It included:

Biodiversity: data regarding the diversity of higher plants, medicinal plants, mosses, algae, macrofungi, plant communities, invertebrates, small vertebrates, birds and large mammals in each Park. The data was compiled during field exercises supporting the development of a resource base inventory for park management planning. These studies were conducted between 1996 and 1998. They are largely an inventory the two parks' biodiversity resource base was conducted. The data also included literature reviews. The scientific teams on fauna and flora biodiversity worked independently and there is no full coincidence between the areas and transects visited by the zoologists and botanists. The absence of overlap in some instances reduces the ability of each Park to conduct a more comprehensive analysis of the inter-relationships between flora and fauna. The goals of the inventory, while complementing the goals of monitoring must not be confused with eco-monitoring. The resource base inventories do however; represent a solid base for the monitoring system establishment. This inventory data would eventually help in selection of the features and areas for monitoring.

Socioeconomic studies: tourist flow, eco-tests (mini environmental impact assessments) of selected chalets and trails, areas of non-timber resource extraction were also evaluated. As part of the same resource based inventory, these field studies were undertaken in 1997-1999, and again in 2000. The results contributed to the development of each park's management plan, and again prove useful for establishment of a ecological monitoring system for each Park. These studies are published in collections of scientific reports, as well as in the People and the National Parks publication (see Bibliography).

Digital models of the parks: The information collected under the GEF project is organized and stored in a Geographical Information System of each of the parks. Each park has its database of an attribute data in Access 97. The graphical part associated with the database is represented in AutoCAD Map 2000™. Each Park operates and maintains this database. In addition, copies of this data are kept with the National Nature Protection Service.

The digital models of the parks contain different geographical objects grouped in classes – 49 object classes for CBNP and 45 for RNP. The digital model for each Park was created from different sources of information:

1. The data collected under the Treeless High-Mountain Zone in Central Balkan National Park Project of the BSBCP has been transformed in a digital format and are included in the CBNP digital model. Digital data from OM2 Project for the Rila NP territory have been included in the NP Rila GIS. The available data are stored in map sheets in the nomenclature for 1:25000 scale in coordinate system 1970 in formats for RNP – ArcInfo .e00 and .dwg and for CBNP in .dwg.
2. Digital models for both parks for the forest fund territories in .dxf format received from Agrolesproject PLC. They include graphical data as well as attribute data separated according to Forestry enterprises where the territories of the parks felt in the past. The attribute data include information from the forest inventories of the particular areas.

3. Data – graphical and attributes for the plant and animal biodiversity in the parks collected under the GEF Biodiversity Project, presented on maps 1:25000 scale and digitized. Each attributes database comprises of 3 main parts: Plant diversity, Macromycetes biodiversity and Zoological diversity. The Plants component has 3 modules – Higher and medicinal plants, Mosses, and Fresh water algae.
4. Socioeconomic data in SPSS format collected in the period 1997-2000 under the GEF Project. From the socioeconomic data in the database have been included the huts and other rest homes with their location and name, the tourist trails, areas used for collection of non-timber resources. In the digital model of CBNP from the BSBCP are included also data about high-mountain pastures in three categories – prohibited pastures, seasonal pastures and supervised pastures with the limits of grazing animals.

BSBCP-Treeless High-Mountain Zone Project

Study by the Bulgarian-Swiss Biodiversity Conservation Program (BSBCP), commenced in 1994 under the auspices of MOEW, with the participation of a number of NGOs involved in environmental conservation. The program was financed by the Swiss Agency for Development and Cooperation. The BSBCP comprised seven regional projects, among which the Treeless High-Mountain Zone in Central Balkan National Park Management Plan. The monitoring performed under this Project serves as the basis for both planned and ongoing activities in the Central Balkan National Park.

The BSBCP report of 1999 for this area aimed at the development of monitoring stations in Central Balkan NP, but focused exclusively on the high-mountain, treeless zone. It includes a description of the monitoring objects and sites selected and the sampling intervals. Below are the principal monitoring objects:

- juniper succession;
- state of the populations of the rarest and most vulnerable species;
- changes in the succession within high-mountain pasture communities;
- zones of high conservation significance;
- monitoring of invertebrates.

The information collected during the implementation of the monitoring program under the BSBCP Project in Central Balkan has not been inputted in the digital model of the park. These are the data collected after 1998.

OM2 Rila Massif Project

The results of the work of Mussala High-mountain Observatory, under the OM2 Bulgarian-French project in Rila National Park are also pertinent. The Observatory was established as a result of the efforts of the Institute of Nuclear Research and Energy (BAS) and has been operational since 1993. The aim of the OM2 Project was to set up around Mussala, the highest peak in the Balkans, a zone of comparative observations and monitoring of changes in the environmental parameters of Rila National Park. The monitoring program under this project includes:

- Physical,
- Meteorological and hydrological,

- Chemical,
- Biological, and
- Socioeconomic monitoring.

The data gathered have been published in a number of scientific reports issued by the project, under the joint title: *OM2 Mussala High-mountain Observatory*.

There is no system of regular sharing of data between the Rila NPD and the Mussala High-mountain Observatory. Additional data gathered there is not incorporated into the digital model of the park and the attribute database. Hence, there is no information collected by the Observatory after 1999, included in the park's GIS.

4.4 Steps in the Development of an Eco-Monitoring System for Rila and Central Balkan National Parks

4.4.1 Situation Analysis

The first step in the process of developing an ecological monitoring system were the two working meetings held at the Park Directorates: on 14 Feb. 2002 in Gabrovo, and on 5 Mar. 2002 in Blagoevgrad, respectively. These workshops discussed the views and expectations of experts from the two National Parks regarding the content and structure of the eco-monitoring system. The minutes of both meetings are attached as Appendices No 1 and 2. The following issues were addressed:

1. Previous experience with ecological monitoring and the available information for each Park;
2. Assessment of the needs and priorities, initial selection of monitoring objects and sites: Who? What? Where? When? – all in conformity with the declared goals and provisions of the Management Plan;
3. Roles and responsibilities of the NP Directorates: experts, heads of section, rangers;
4. Partners of the NP Directorates in developing and implementing the eco-monitoring system;
5. Identifying information gaps and sources that may be used to fill them;
6. Development of park-specific action plan for the development of an eco-monitoring system.

As a result of the discussions, a provisional matrix of the monitoring objects and sites for each of the Parks took shape; and the needs for additional information were identified. Specific methods for monitoring individual biodiversity components were identified as the most pressing problem. The working meetings with the participation of experts from the Park Directorates also discussed and determined the basic principles of eco-monitoring in their territories.

4.4.2 Principles Developed by the Parks for Developing and Implementing the Eco-Monitoring System in the National Parks

1. **Practical orientation:** the monitoring effort should contribute towards the direct, adaptive management of the Park and the making of concrete management decisions.
2. **The Management Plan as the framework of the monitoring system:** the results of the implementation of the Management Plan should also be monitored in order to assess its effectiveness.

3. **Complex yet differentiated approach:** monitoring a number of indicators (species, communities, infrastructure components, etc.) throughout the Park territory, while using a differential approach in monitoring separate populations of the species as characterizing individual Park sections. For example, while it is important to develop a monitoring system that is representative of the whole Park, we also need to monitor the viability and status of individual populations, e.g. the souslik (*Spermophilus citellus*) population in the Belmeken area (Belovo Park Section, Rila NP); the only population of Balkan silene (*Silene balcanica*) in Central Balkan NP, etc.
4. **Cost efficiency:** the indicators, locations, objects and sites, and the monitoring methods should be informative, effective and should fit into the Park employees' routine in such a way as to require minimum additional funding of the monitoring activities.

4.4.3 Criteria for the Selection of Monitoring Objects and Sites

The main tool guiding the selection of monitoring objects and sites are the Management Plans of Rila and Central Balkan National Parks. The following criteria were used in selecting specific sites and in developing the monitoring matrix for each Park:

1. Species/habitats at risk;
2. Species/habitats of high conservation significance;
3. Control areas – areas free of anthropogenic impact;
4. Tourist sites in the pilot areas: rest sites, observation points, camp sites;
5. Areas of high tourist pressure (e.g., the Seven Lakes in Rila NP);
6. Species/habitats constituting sufficiently representative indicators of changes in several monitored environmental components;
7. Sites for which there is available information as a result of systematic studies in the past;
8. Sites that are subject to monitoring at present;
9. Representative monitoring sites and areas: where possible comprehensive monitoring areas should be selected in such a way as to be representative of the entire Park territory.

For the purposes of comprehensive monitoring for RNP and CBNP, four “complex”: areas have been selected for each of the National Parks. They have been selected in accordance with the principles and criteria developed by parks for selecting areas and objects for monitoring. These include: accessibility, constitute, as much as possible, part of the Park rangers' daily “beat”, or routine patrol responsibilities etc.

In these four areas, priority will be given to the identification and marking of concrete objects for monitoring - populations of conservation-valuable species, forests plots, pastures, tourist trails, rest and view points etc.

The exact methodology will depend on the specifics of the indicator monitored and generally will be either transect or sample plots or combination of the two.

There are exceptions to this general scheme:

- **When the objects of the monitoring are animal species**, these are generally monitored throughout the parks' territory. These include chamois, bear, and red deer for example. In these cases, the priority for setting the sampling spots still falls within the 4 areas of complex monitoring, but the observations should expand and be undertaken park-wide.

- **When the objects of monitoring are unique examples of their kind** – For example when single populations of animals and plants species - for example birds nests, localities of endemic plants, the population of the souslik in the Belmeken area, RNP, etc

4.4.4 Practical Issues Affecting the Design of Eco-Monitoring in High Mountain Parks

The following practical issues should be addressed and find solution in the process of developing the eco-monitoring system:

- Selecting a limited number of suitable indicators:
 - of the state of natural ecosystems and the state and condition of populations of protected and rare plant and animal species;
 - of the anthropogenic impact and tourist pressure.
- Selection of a set of methods, techniques and tools suitable for information gathering in mountainous terrain;
- Determining the zones for observation and monitoring for each indicator, and setting the time table for monitoring;
- Development and adoption of standard forms to be used in reporting the data from all measurements or observations, as well as forms and methods for information storage and retrieval;
- Development and adoption of standard forms for presenting the summarized results and assessments of the quality and ecological condition of the Park territories;
- Defining the roles and responsibilities of the partners taking part in the eco-monitoring effort.

4.4.5 Park Directorate Roles and Responsibilities: Experts, Section Heads, Rangers

The Rila NP and Central Balkan NP are divided in management administrative units *Park sections* - seven in CBNP and nine in RNP. Each park section has a section head and 4 to 6 rangers. Every park section has an office in a community adjacent to the parks' territories. Each National Park has a headquarters in which subject matter specialists are based.

The monitoring activities should be organized and headed by experts in different fields: flora, fauna, forestry, tourism, GIS etc., employed with the NP Directorates. Their functions in implementing the monitoring system include:

- Participation in selecting the objects to be monitored;
- Defining the monitoring sites and areas;
- Planning and organizing the information gathering at appropriate intervals: coordination and supervision of the work of sections heads and the rangers and enforcement of deadlines and methods;
- Primary processing, analysis and summarization of data;
- Ensuring the proper information storage and retrieval;
- Coordinating the participation of Park partners in the monitoring activities.

Over the long term, the best way to implement the monitoring system is by training the Park rangers to apply methods of observation and primary information gathering in the field. Groups of rangers are to specialize and be responsible for performing regular observations on

various monitoring objects and sites. The results of the field observations have to be reported to the park expert on a regular bases, according to the methodological requirements for analyses, summarization park wide, and subsequent processing for storage. The park experts should prepare the necessary information for institutions who are the recipients of this information, e.g. NNPS, EEA.

4.4.6 Partners: Their Roles and Responsibilities

The establishment of an eco-monitoring system in the National Parks requires the joint efforts of specialists in different fields, with different qualifications and expertise. For this goal to be attained successfully, it is necessary that its implementation involves the NP Directorate as well as all other partners and stakeholders.

Key partners of Park Directorates are the Regional Inspectorates of the Environment and Waters, the EEA, the Institutes of BAS, Universities (the Department of Biology and the Department of Geography, University of Sofia; the Forestry University, Sofia; the South-Western University, Blagoevgrad, etc.); the Bulgarian Tourism Union; the Mountain Rescue Service; BSBCP, the “Friends of Park” clubs; State Forest Enterprises; visitor centers, Each of these partners can have a specific role and possibilities for collaboration with the National Park Directorates. This can include the methodological supervision and selection of monitoring objects and sites, periodic data processing and analysis, all the way to retrieval and presenting of information and direct participation in, and/or organizing activities pertinent to the implementation of the monitoring system in the Park territory.

Specific examples of different kinds of collaboration are:

1. Invertebrate Monitoring

The monitoring of invertebrate species would require the participation of a specialized research unit (The BAS Institute of Zoology; the National Museum of Natural History) to identify the data gathered in the field and analyze the findings. The National Park Directorates can provide for the regular gathering of samples. A long-term cooperation agreement should be used to state clear-cut rules and obligations of the parties and would ensure mutually beneficial collaboration. Such formal relationships could also yield information and data as may be necessary for both the research institutions and the bodies responsible for managing the Park.

2. Abiotic Indicators and their Monitoring

National Park Directorate employees can be involved in sample gathering in the field as part of the monitoring the quality of soils and waters, as well as the heavy-metal content in these and in other abiotic components of the environment. The samples should be sent for analysis to EEA/RIEW, which have the necessary equipment. The results shall then be sent back to the NP Directorate, and copies thereof to EEA for storage. The number of samples and the intervals between samples taking should be agreed in advance, so as to give MOEW/EEA enough time to provide the necessary funds and the overall budget for the following fiscal year.

There are no sampling points from the National System for Environmental Monitoring in the territories of the NPs. In order to include such sampling points and to provide the requisite funds from the state budget, it is necessary to have a written statement and proposal to that

effect co-signed by the Rila and Central Balkan Park Directorates and the local RIEWs at Blagoevgrad and Veliko Tarnovo respectively, or by the EEA.

The inclusion of sampling points within the NPs in the comprehensive monitoring system would provide, on the one hand, very good background sampling stations to the national environmental monitoring system, while on the other, would supply data to the Park Directorates necessary for their day-to-day management work. Since the national eco-monitoring system constitutes a large number of sampling points throughout the country, the number of sampling sites within the Park territories included in the national system must be limited.

Should a larger number of sampling points be needed to supply data to the Parks, especially data regarding the quality of waters in the NPs, it would be expedient to reduce the number of indicators monitored as compared with the respective number for the national network sampling points, since the environment pollution level within the NPs is supposed to be low or non-existent anyway. This would reduce the cost of and speed up monitoring the basic components of the environment, while maintaining their effectiveness and information value.

For selecting the sampling points for monitoring the state of abiotic components in the territories of Rila and Central Balkan NPs, as well as for providing the requisite funds and personnel, it is necessary to have in place interdepartmental agreements and pro-active collaboration between the NP Directorates and the EEA/RIEW.

4.4.7 The Role of GIS and GPS Technology in the Parks

Geographic Information Systems (GIS) are a crucial tool in the establishment of a national parks ecological monitoring system. Each of the monitored objects and sites that can be geographically located as a point, line or area (polygon) sampling transects/areas, locations, trails, infrastructure facilities – should be entered in the digital model of the Park. Individual elements should be grouped in thematic layers. The data gathered as a result of field studies and/or the summarized information should be stored in an attribute databases allowing quick and effective retrieval, processing, analysis and visualization of the results.

A great deal of the field information can be gathered and updated using GPS units, which allow location data to be collected together with attribute data of the site and entered directly into the digital model of the Park.

Specialists in different fields should joint their efforts with the GIS expert of the respective Park Directorate in order in compiling the content and determining the structure of the individual sections of the eco-monitoring database(s) in order to meet most fully the needs of the NPs. Once the content and functions of the database are clearly delineated, external professionals can be hired to build it.

The GIS experts shall be responsible for:

- supervising the development, updating and maintenance of the database(s) in accordance with the NPs' needs;
- assisting in the planning and organization of field work for the gathering of data and the use of GPS transmitters in implementing the monitoring system. In this, they should

provide suitable data glossaries and should coordinate the proper use of the GPS units in terms of personnel, location, time and purpose;

- maintaining the digital model of the Park and performing, in coordination with the other experts, all necessary checks, summaries, spatial information analyses and generating the thematic maps.

GIS and GPS technology application in Rila and Central Balkan National Parks

The two National parks have GIS digital models that were designed and developed under the GEF Project.

Under the BCEG Project the Directorates were supplied with GPS terminals Trimble GeoExplorer 3 and the relevant software for data processing - Trimble Pathfinder Office. Together with collection of location coordinates, the receivers provide for the collection of attribute data in the field and their update. The model of the attribute data is defined in advance by the operator (the GIS expert), organized according to object classes in an appropriately designed data dictionary. This gives the opportunity to collect data in a structured way directly in the field and is very useful in implementing periodical observations on selected objects.

At the end of the year 2001, training courses were organized for the two parks' Directorates staff as well as participants from NNPS in using the GPS receivers. Ten employees of CBNP were trained from the experts and rangers staff and 11 for Rila NP. Two experts from each park and one expert from NNPS were subsequently trained in processing of the data collected in the field with the Pathfinder Office software.

The GeoExplorer 3 terminals collect coordinates of the terrain geo-referenced in WGS 84 coordinate system. In order to transform the coordinates into the 1970 coordinate system used by the parks, transformation programs were developed for the territories of both parks. The *RNP* and *CBNP* software are in fact black box converters, which use transformation models designed especially for the territory of the two parks under a contract with GEOHIDE Ltd. The *CBNP* and *RNP* software operates in MS Windows 95/98/NT/2000/XP environment and is designed in a very user-friendly way. A program was developed as well for automatic transformation of coordinates using *RNP* and *CBNP* software and data input in AutoCAD environment in order to facilitate the parks' GIS experts in including data collected on the field into the digital models.

Based on the existing GPS terminals and the relevant software the park experts and rangers are able to implement very diverse activities on field data collection and update in a very short time and directly to input and use the data in the digital models of the parks for thematic maps production, reports development, special analysis, etc.

5.0 The National Parks Eco-Monitoring Matrix: Contents of the Monitoring System

At meetings held with experts from both NP Directorates, a discussion arose regarding the initial selection of monitoring objects and sites: **who** should watch **what**, **where** and **when** in order to meet the provisions and requirements of the Management Plan.

It became clear, therefore, that the specific monitoring objects, their locations, the available methods etc. should be determined first. The following table was developed as a tool for presenting the findings:

Monitoring object	Justification	Location within the Park	Methods, indicators	Period (yrs.)	Notes

6.0 Defining the National Parks Eco-Monitoring System: the Bankya Workshop

An important step towards the development of an eco-monitoring system in the National Parks was the Workshop held in the town of Bankya on April 8-9, 2002, with experts from NNPS, the Rila, Central Balkan and Pirin NP Directorates, EEA, as well as with experts and consultants from BCEG Project – a total of 33 participants. (See Appendix No 3)

Goals and Participants in the Workshop

The Workshop was organized with the following goals:

1. To launch work on the development and setting up of an eco-monitoring system in the two National Parks by means of

- Reaching a common understanding of the content and goals of the proposed eco-monitoring system;
- Summarizing the experience of the NP Directorates and their partners in organizing and performing monitoring in the Park territories;
- Defining the role and responsibilities of NP Directorates and their partners in seeking the commitment of all stakeholders to joining in the implementation of the eco-monitoring system.

2. To plan the efforts and subsequent steps of the NP Directorates/NNPS by means of:

- Determining the priorities towards launching the eco-monitoring program for each of the Rila and Central Balkan NPs during the current year 2002;
- Developing and adopting an action plan for the next steps in elaborating the monitoring system.

3. To discuss the form and content of the management plans for medicinal plants in the territories of both Parks, as well as the methods and means for development thereof.

The development of an eco-monitoring system aims to achieve the following three results:

- A set of guidelines for performing ecological monitoring with a matrix of the monitoring objects and sites for each Park and a collection of descriptions of monitoring methods with all their basic characteristics, incl. time pattern, interval, technical equipment, activities, forms for recording information, participants, etc.;
- A network of sampling sites for monitoring different objects distributed throughout the territory of each Park;
- A database/s (of graphic and attribute data) for information storage and management.

Another expected result of the development of the eco-monitoring system is the signing and implementation of agreements for mutually beneficial cooperation between the NP Directorates and various partners that would ensure the long-term operation of the system. Such bilateral agreements could be concluded between the NPs and, respectively, RIEWs, EEA, the BAS Institutes (of Botany and Zoology), Universities (of Forestry, the Sofia University, etc.), and the National Museum of Natural History.

Two ecological monitoring matrixes for the two Parks were presented and completed at the Workshop.

6.1 Ecological Monitoring Matrix for Rila National Park

The following areas within Rila NP are proposed for complex monitoring:

1. **The Seven Lakes:** from Vada roadman's lodge – the Seven Lakes up to Damga Peak (the seventh lake); the territory belongs to Dupnitsa and Govedartzi Park Sections (PS);
2. **Mussala Peak:**
 - 2.1 From Mussala Peak to Mussala Chalet, Borovets PS
 - 2.2 From Mussala Peak to Third Window, Beli Iskar PS;
3. **Parangalitza:** Parangalitza Nature Reserve – on both sides along the Bistrizta river valley up to Makedonia Chalet, Blagoevgrad PS;
4. **Malyovitza:** from Yavorova Polyana – Malyovitza complex – Malyovitza Chalet – Malyovitza Peak, Govedartzi PS;
5. **Granchar Chalet:** *Djanka – Granchar Chalet – Nechtenitza – Ropalitza river – Djanka, Yakoruda PS;*
6. **Belmeken:** *The area around Belmeken Reservoir – the road from the dam to Pomochena Polyana – the road from the counter-dam to Kaldaritza river, Belovo PS;*
7. **Semkovo:** *from Semkovo – Vapski Lakes – Vapski Cirque and up to the mountain ridge, Belitza PS.*

Areas ## 1 through 4 are given priority in launching the monitoring program in 2002. Areas ## 4 to 7 are to be added at a later stage; to be used as testing grounds for the methods and expertise accumulated in implementing the monitoring program in the first four areas.

Monitoring Object	Location within the Park	Period (yrs.)	Methods, Indicators	Notes
1. Soils	Samples from monitoring sites within the forest estate and pastures in areas 1-4	5	Analysis for pH, Corg , total N, P, K Ca, Mg, heavy-metal and radiation content as per established methods applied by RIEW/EEA	NPD has sampling methods available. Analyses to be performed by RIEW/EEA
2. Precipitation	Samples from the existing stations at Mussala Peak (Nuclear energy and research Institute) and in Parangalitza Reserve (Forestry Institute, BAS)	Continuous	Data collected about precipitation quantities and pH using established methods approved by RIEW/EEA	
3. Quality of flowing and stagnant waters: saprobe content	Samples of river and lake waters from sampling points around Mussala, Malyovitza and the Seven Lakes chalets	Continuous, during and after tourist season	As per established methods applied by RIEW/EEA	Samples taken with NPD assistance. Analyses to be performed by RIEW/EEA

Monitoring Object	Location within the Park	Period (yrs.)	Methods, Indicators	Notes
4. Forests	Transects with minimum 3 sampling plots in each of the selected monitoring areas 1 through 4	1 (5)	Sanitary condition of forests: - defoliation, - discoloration Self-regeneration potential of forests - seed germination rate - undergrowth No comprehensive monitoring methodology conforming with Park needs	Full taxation/inventory of the sample plots every five years. Annual assessment of the sanitary condition
5. Animal species: ▪ chamois ▪ bear ▪ red deer ▪ roe ▪ wolf	In the entire Park territory	0.5	Taxation/inventory: distribution, population size, age and gender structure, population growth rate. No comprehensive monitoring methodology conforming with Park needs.	Information and expertise available from annual taxonomic surveys of these animals by the State Forest Enterprise prior to the designation of NP
6. Animal species: ▪ <i>Salmo trutta fario</i> ▪ <i>Triturus alpestris</i> ▪ <i>Hyla arborea</i> ▪ <i>Lacerta vivipara</i> ▪ <i>Tetrao urugalos</i> ▪ <i>Alectoris graeca</i> ▪ <i>Aquila chrysaetos</i> ▪ <i>Circaetus gallicus</i> ▪ <i>Falco peregrinus</i> ▪ <i>Falco cherrug</i> ▪ <i>Bubo bubo</i> ▪ <i>Spermophilus citellus</i>	Observations to be performed at a limited number of appropriate sites, first in areas 1 – 4. In a limited number of cases the populations are endemic to other areas and will be subject to differential monitoring	1	Distribution, population size, age and gender structure (where possible). No comprehensive monitoring methodology conforming with Park needs	All species listed are of high conservation significance
7. Plant species: ▪ <i>Rhodiola rosea</i> ▪ <i>Gentiana lutea</i> and <i>G. punctata</i> ▪ <i>Rheum rhaponticum</i> ▪ <i>Iris reichenbachii</i> ▪ <i>Vaccinium myrtillus</i> ▪ <i>Rhododendron myrtifolium</i>	Populations to be observed on a priority basis in areas 1-4. Some species have only one known population within the Park territory. Bilberries are to be observed in Yakoruda PS and Belitza PS on a priority basis	1	Population size, phenological phase, state of location, threats. No comprehensive monitoring methodology conforming with Park needs	Species are either of conservation significance or a natural resource subject to intensive annual use

Monitoring Object	Location within the Park	Period (yrs.)	Methods, Indicators	Notes
8. Grazing impact	Pastures subject to different levels of animal pressure to be selected in areas 1-4	1	# of animals, % of compacted ground, % of exposed topsoil, composition of plant species. No comprehensive monitoring methodology conforming with Park needs	
9. Tourist pressure tourist trails, resting and observation points, camp sites, chalets	Selected sites of the tourism zone in areas 1-4: <ul style="list-style-type: none"> ▪ Vada Chalet – the 7 Lakes – Makedonia Chalet – Chakalitzha Chalet – Predela. ▪ Semkovo – Makedonia Chalet – Urdin Circus. ▪ Malyovitza Chalet – Mussala Peak. ▪ Borovetz – Saraguol – Zavrachitza Chalet. ▪ Belmeken Dam. ▪ The Chavcha river valley ▪ Lovna Chalet – Rilski Ezera Chalet. ▪ Nechtenitza – Polenitza – Yakorudski Lakes 	1	Current # of visitors. % of damaged vegetation cover per unit of area (trampling, etc.) % of exposed topsoil per unit of area. # of nyctophilic/anthropophyte/ exotic plant species. # of damaged infrastructure components. # of items of solid waste per unit of area. No comprehensive monitoring methodology conforming with Park needs	Pilot ecotourism areas are monitored on a priority basis
10.State of lakes and lakeside habitats	The lakes of the Seven Lakes area, Malyovitza Chalet and Mussala Peak	1	% of damaged hydrophilic vegetation, solid waste quantities, illegal camp sites, clogging of the lake bottom with debris. As per established methods applied by RIEW/EEA. No comprehensive monitoring methodology conforming with Park needs	
11.State of rocky habitats	The rocky habitats in the Malyovitza section	1	# of rock climbers, pollution level, impact on rocky vegetation and bird nests. No comprehensive monitoring methodology conforming with Park needs	Observations to take place during and after the tourism season
12.Post-forest fire succession	Permanent monitoring areas: the Malyovitza section, the grounds devastated by the 2000 forest fire	1	Natural regeneration; pioneer species. No comprehensive monitoring methodology conforming with Park needs	

Monitoring Object	Location within the Park	Period (yrs.)	Methods, Indicators	Notes
13. Control of anti-erosion measures	Sites in areas 1-4 where anti-erosion measures have been taken	1	Condition and effectiveness of the facilities. Established methods for assessment of such measures. No comprehensive monitoring methodology conforming with Park needs	These monitoring activities may coincide in part with the tourist trails erosion monitoring
14. Compliance with regimes in the different zones	All zones in areas 1-4	Continuous	Number and description of regime violations in each zone within areas 1-4	This monitoring is part of the law enforcement monitoring for the entire Park

6.2 Ecological Monitoring Matrix for Central Balkan National Park

For the territory of Central Balkan National Park, the following areas are proposed for comprehensive monitoring:

1. The Vezhen Chalet – Benkovski Chalet area
2. The Beklemeto area
3. The area around Botev Peak
4. The area around Taja Chalet

Monitoring Object	Location within the Park	Period (yrs.)	Methods, Indicators	Notes
1. Precipitation	Data are gathered from existing stations at Botev and Vezhen Peaks and the BAS Forestry Institute station at Zhalna	Continuous	Data collected about precipitation quantities and pH using established methods approved by RIEW/EEA	
2. Forests	Transects across 3 sampling sites minimum in each of the selected monitoring areas 1 through 4	1 (5)	Sanitary condition of forests: - defoliation, - discoloration Self-regeneration potential of forests - seed regeneration rate - undergrowth No comprehensive monitoring methodology conforming with Park needs	Full inventory of sample plots once every 5 years. Annual assessment of the sanitary condition
3. Animal species: ▪ chamois ▪ bear ▪ red deer ▪ wolf	Throughout the Park territory	0,5	Taxonomic description: distribution, population size, age and gender structure, population growth rate, migration of species subject to observation. No comprehensive monitoring methodology conforming with Park needs	Information and expertise available from annual taxonomic surveys of these animals by the State Forest Enterprise prior to the designation of NP

Monitoring Object	Location within the Park	Period (yrs.)	Methods, Indicators	Notes
4. Animal species: <ul style="list-style-type: none"> ▪ <i>Salmo trutta fario</i> ▪ <i>Bonasa bonasia</i> ▪ <i>Alectoris graeca</i> ▪ <i>Aquila chrysaetos</i> ▪ <i>Aquila heliaca</i> ▪ <i>Buteo rufinus</i> ▪ <i>Dendrocopus leucotos lifordi</i> ▪ <i>Falco cherrug</i> ▪ <i>Falco peregrinus</i> ▪ <i>Bubo bubo</i> ▪ <i>Glaucidium passerinum</i> ▪ <i>Strix uralensis</i> ▪ <i>Tichodroma muraria</i> ▪ <i>Pyrrhocorax graculus</i> ▪ <i>Spermophilus citellus</i> 	Observations to be performed at a limited number of appropriate sites, first in areas 1 – 4. In a limited number of cases the populations are endemic to other areas and will be subject to differential monitoring	1	Distribution, population size, age and gender distribution (where possible). No comprehensive monitoring methodology conforming with Park needs	All species listed are of high conservation significance
5. Plant species: <ul style="list-style-type: none"> ▪ <i>Leontopodium alpinum</i> ▪ <i>Gentiana lutea and Gentiana punctata</i> ▪ <i>Silene balcanica</i> ▪ <i>Iris reichenbachii</i> ▪ <i>Lilium janke</i> ▪ <i>Rhododendron myrtifolium</i> ▪ <i>Daphne blagayana</i> ▪ <i>Vaccinium myrtillus</i> ▪ <i>Drosera rotundifolia</i> ▪ <i>Rhodiola rosea</i> ▪ <i>Primula frondosa</i> 	Populations to be observed on a priority basis in areas 1-4. Some species have only one known population within the Park territory. Bilberries are to be observed in Klisura PS on a priority basis	1	Population size, phenological phase, state of location, threats. No comprehensive monitoring methodology conforming with Park needs	Species are either of conservation significance or a natural resource subject to intensive annual use

Monitoring Object	Location within the Park	Period (yrs.)	Methods, Indicators	Notes
6. Grazing impact	Pastures subject to different levels of animal pressure to be selected in areas 1-4: Bulovanya, Zhalna-Lepenyat, Russaliite among them.	1	# of animals, % of compacted ground, % of exposed topsoil, composition of plant species. No comprehensive monitoring methodology conforming with Park needs	
7. Tourist pressure tourist trails, resting and observation points, camp sites, chalets	Selected sites of the tourism zone in areas 1-4: <ul style="list-style-type: none"> ▪ Trails: Dermenka Chalet – Dobrila Chalet; ▪ The Two Bridges – The Stone Gate; ▪ Beklemeto - Dermenka; ▪ Karnare - Dermenka; ▪ Kalofer – Rai Chalet; ▪ Karlovo – Levski Chalet – 	1	Current # of visitors. % of damaged vegetation cover per unit of area (trampling, etc.) % of exposed topsoil per unit of area. # of nyctophilic/anthropophyte/ exotic plant species. # of damaged infrastructure components. # of items of solid waste per unit of area. No comprehensive monitoring methodology conforming with Park needs	Pilot ecotourism areas are monitored on a priority basis
13. Control of anti-erosion measures	Sites in areas 1-4 where anti-erosion measures have been taken	1	Condition and effectiveness of the facilities. Established methods for assessment of such measures. No comprehensive monitoring methodology conforming with Park needs	These monitoring activities may coincide in part with the tourist trails erosion monitoring
14. Compliance with regimes in the different zones	All zones in areas 1-4	Continuous	Number and description of regime violations in each zone within areas 1-4	This monitoring is part of the law enforcement monitoring for the entire Park
10. Accumulation of heavy metals in plant species: blackberry, St. John's wort	Areas 1-4		Samples are gathered from the cited species. The concentration of heavy metals is tested Established methods approved by RIEW/EEA	
11. Monitoring of the <i>Juniperus sibirica</i> succession				Monitoring as per the BSBCP to continue

7.0 Monitoring Activities and Results till the End of October, 2002

The following activities were completed between June and October to establish ecological monitoring system for Rila and Central Balkan National Parks:

7.1 Forest Monitoring

Associate Professors Georgi Kostov and Stefan Mirchev of the Forestry University, Sofia, were contracted and developed a methodology for monitoring and assessment of the general and sanitary condition of forests and their reproductive and regenerative potential. The methodology is based on the existing forestry monitoring and management practices in the country and in Europe.

Implementing the methodology provided transects with a certain number of sampling plots for performing observations and data gathering were selected for each of the National Parks. In Rila NP two transects have been selected – one in Yakoruda PS and one in Blagoevgrad PS.

The transect in Yakoruda PS is situated in the Sofan locality (area number 5 selected for complex monitoring) and consists of four sampling plots at 1650; 1750; 1850 and 1950 m altitude. The third sample plot at 1850 m altitude has been described and the measurements were taken following the methodology requirements. In the Blagoevgrad PS the selected transect falls in Parangalitsa reserve (area number 3 selected for complex monitoring) and consists of three sample plots at 1500, 1550 and 1650 m altitude. The methodology has been applied in measuring the third sample plots.

Simultaneously with the setting up of the transects in the field, training course in applying the methodology were conducted for the Forestry & Monitoring expert in the NPD, for the GIS expert, as well as for park sections heads and rangers. A total of 8 park employees have been trained.

In Central Balkan National Park one transect has been selected in Teteven PS above Ribaritca village (area number 1 selected for complex monitoring). It consists of 4 sample plots on regular distance between 900 and 1500 m altitude. Three sample plots have been measured and described. Six employees of CBNP Directorate have been trained including Forests, Monitoring and GIS experts.

The coordinates of the sampling plots along the transects were determined with GPS for entry into the digital models of each Park. A one-day training in field data analysis with the forestry experts of both Parks is planned for finalization of the work on forest monitoring for 2002.

7.2 Bird Monitoring

A methodology was developed for monitoring the bird species selected for each Park (see Parks' ecological monitoring matrices above) by Senior Research Assoc. Bojidar Ivanov of the BAS Institute of Zoology after consultations with the Fauna experts of the relevant NP Directorates, Anton Stanchev (CBNP) and Krassimir Andonov (RNP). Also taking part in the

discussions were engineers Svetoslav Todorov and Roumen Kolchagov. The methodology thus proposed includes:

- Description of the observation method: steps, intervals, equipment, participants, etc.;
- Selection of park sections and areas within them for observation of each separate species;
- Designing standard forms for data gathering and storage.

Training has not been planned for the bird species monitoring methodology implementation under the BCEG Project during the year of 2002. It has been recommended for Feb-Mar 2003.

7.3 Medicinal Plants Monitoring

A methodology for phenological monitoring of medicinal plants and a standard form for data gathering and storage has been designed. The methodology was developed by Research Associate, Chavdar Gushev of the Institute of Botany, BAS, consultant for non-timber natural resources to BCEG Project.

Training courses for the application of the methodology were organized in May for the relevant personnel: experts, park section heads and rangers – 16 in total from Central Balkan and 24 from Rila NP. As part of their training course, Park employees were familiarized with species of medicinal plants of conservation significance and those allowed for commercial extraction pursuant to the Management Plans of both Parks.

The phenological observation methodology was first applied in Klissura PS (Central Balkan) and Yakoruda and Belitza PSs (Rila) for monitoring of the bilberry (*Vaccinium myrtillus*) populations (see Parks' ecological monitoring matrices above) .

The next annual cycle task is to select concrete medicinal plants populations of *Gentiana lutea*, *Gentiana punctata* and *Rhodiola rosea* species of high conservation significance (see Parks' ecological monitoring matrices above), to be monitored in the four areas selected for complex monitoring in both NPs together with the monitoring on the development of the bilberries populations.

7.4 Bear Monitoring

A set of Terms of Reference have been drawn up and a short-term contract for consultancy services has been signed with Engineer Raicho Gunchev to develop a methodology for monitoring the brown bear and train Park personnel in using it. The training will involve 2 days theory and fieldwork for the Fauna expert and selected park staff that is going to be assigned to implement the bear monitoring methodology.

7.5 Souslik Monitoring

A set of Terms of Reference have been drawn up and a short-term contract for consultancy services is developed with Assist. professor Vladimir Stefanov, of the Department of Biology, University of Sofia, for developing a methodology for monitoring the souslik population and training Park employees in its implementation. There are still conducting activities under the monitoring plan for 2002. They will be completed by the end of December.

8.0 Conclusions, Recommendations and Future Challenges

There are still a number of actions to be taken by different national and regional players before the system of ecological monitoring becomes viable, consistent, efficient and useful. These include: the regular, annual financing of eco-monitoring activities; the development of protocols for the collection, storage, reporting and sharing of this data, and a coordinated vision for how this information will be maintained and used at national levels. Perhaps the most critical matter still outstanding is the development of an institutional practice of using this information for “adaptive management” practices within each of the national parks.

8.1 MOEW/NNPS

1. The National Nature Protection Service must ensure the regular financing of the monitoring activities of each park. Monitoring must form part of the annual budgets of the parks, with adequate money devoted for monitoring purposes. These include: field data collection, processing and data analysis including outside consultancy, storage of information, sharing of information.

Special attention should be given to the development of a strategy, and a short and long term future financial plan in the NNPS for maintenance and upgrade of the existing software and hardware and the created digital models.

At present the reduction of the Park’s budgets, is most often done at the expense of monitoring.

Financing monitoring in the parks has to be done through financing not only the NPDs itself directly, but also through financing the relevant RIEW and the (EEA) as well. These departments are key to effective integration of park-based monitoring systems in the national network. In addition, there must be an agreement between the parties on what, where, when, who and how data will be collected and analyzed. Concrete calculations must be done on an annual basis for the money needed for monitoring schemes per park territory – travel, accommodation, materials used etc. These budgets should be prepared by the NPD and RIEW (EEA) together and submitted to the MOEW by the particular RIEW (EEA), supported by the NPDs letter of agreement.

2. The NNPS must review, agree and officially approve all eco-monitoring methodologies being developed, as well as the ones that will be developed in the future. It must be stressed especially that the forms and formats for reporting and storage of information are addressed as a priority.

They have to be published as an official Regulation/Guidebook in order to provide for compatible, comparable and consistent data to be collected in the parks as well as the other zones forming part of the National Ecological Network.

3. The NNPS should create and agree with interested parties, on the protocols for collection, use, storage, reporting and sharing of information and its formats between inter ministry organizations – EEA, NPD, RIEW, different Departments of MOEW.

This will clarify the responsibilities and rights of each of the entities and will exclude double collection of data and unnecessary expenditures. It will as well streamline the

information flow and facilitate the public sharing of information. The protocols/agreements must be in writing specifying roles and responsibilities.

4. Protocols and formats for sharing information with organizations/institutions outside of the structures of the MOEW such as MOAF/NFB; Institutes; Universities are also crucial for insuring efficient collection and storage of information on a national level. These efforts must be linked with the CHM development in Bulgaria.

An important example with respect to information flow and management between parties is the process of deciding on steps, formats and financial responsibilities between MOEW and MOAF on cleaning up and setting the cadastre of the protected areas based on the digital models of the Land commissions. The process has been driven by a working group of representatives of the two ministries. The converters developed under the BCEG project for transforming ZEM files into CAD and vice versa are going to play a major role in this process. The MOEW structures – NNPS, NPD are using AutoCAD GIS format and this transformation software because information provided by MOAF is in ZEM format. This conversion necessitates extra time and expense.

Decision and agreement on protocols and formats for data sharing will also facilitate the use of information collected by NFB and stored in Agrolesproject PLC as the former sole organization collecting information about forests status.

Another example of thematic information that is shared between ministries is the annual reporting on game species and the 7 forests basic condition forms being provided by NPDs to NFB through NNPS for the statistical accounting of forest resources.

5. NNPS must develop and maintain a program of human resources development oriented to provide trained employees to conduct ecological monitoring at different skills and job levels. This includes primary and secondary trainings, job descriptions development, and criteria for selection of staff and staff development.
6. The MOEW should ensure that the EEA is the focal point for all collection, storage and distribution of data gathered from national parks eco-monitoring, as well as for all protected areas, in general. The data should be updated on a regular basis, and maintained in EEA. Together with the laboratories and data collected by RIEW on regional level, EEA should take care of the digital models (cadastre) of the protected areas on a national level under the supervision of the NNPS.

EEA has to be responsible for providing the NNPS and MOEW with reports, analysis, and prognosis on national level. It should also become a resource center for information for international organizations.

8.2 National Park Directorates

1. Should continue to establish and develop the eco-monitoring system and fulfill the monitoring matrices. Parks need to make their model reality.
2. Consulting contracts must be established with the monitoring methodology authors for providing periodic training of the park staff. Such contracts may also include assistance with the analysis of collected data and recommendations on practical management decisions, helping Park management to make adaptive management decisions. This is particularly important for management of the anthropogenic impacts and limits of acceptable use for the Park.

3. Short-term standardized contracts should be used for development of a particular elements of the monitoring system such as specific databases or inventories if necessary.
4. Mid term and long-term contracts are recommended for giving responsibilities on monitoring to partners like RIEW, BAS, Universities, NGOs which to provide copies of the results to NPD on a regular bases.
5. The park directorates must continue to build capacity and train park experts and rangers. This is particularly important for developing groups of selected rangers to perform regular, specialized tasks as part of monitoring schemes Park wide.
6. Every Park directorates expert (according to his/her field of specialization and responsibilities) should prepare an annual calendar of activities for each of the monitored components – what, when, where and who is monitoring according to the methodologies developed. Each expert should coordinate their monitoring activities park-wide and coordinate the activities performed by the specialized groups of rangers. This will help develop better budgeting and organization of activities in time and space, and help to control activities conducted by rangers in the field.
7. Protocols of information flow between the NPDs hierarchy must be clarified. A system of organized information sharing between rangers, section heads and experts must be developed according to the monitoring methodologies. This includes the collection, reporting, analysis and summarization, storing and sharing of data.
8. The experts in different fields together with the GIS expert should insure data collection and incorporation into the digital models in regular and standard manner. Each monitoring object must have a different thematic layer for storage on the geo-referenced graphic information linked with the attribute database. This approach should aim at fast use and update of information, maps production and spatial analysis. The use of GPS technology, coordinated by the GIS experts, should become routine for the majority of the specialized park staff.
9. Protocols on rights and responsibilities for inputting, update and retrieving of the digital information has to be specified in writing as well as any changes in software and hardware equipment of the Directorates.
10. NPD should assist NNPS in developing and implementing protocols for data sharing and information storage and update with other entities inside the MOEW as well as outside.
This includes developing forms and timetables for summarization and reporting on the monitoring information collected on a regular bases.

Work on a basic ecological monitoring program for Rila and Central Balkan National Park clearly illustrates the need for their integration within a national ecological monitoring and reporting system. The Biodiversity Act points to this challenge. The establishment of the National Ecological Network appears an excellent framework for park-based ecological monitoring, and the new DANCEE sponsored project should be the tool to support this unification and integration of information.

Bibliography

Biodiversity Act - State Gazette N 77/09.08.2002

Biodiversity Support Program. 1994. *Conservation Biological Diversity in Bulgaria: The National Biodiversity Conservation Strategy*. Washington, D.C: Biodiversity Support Program c/o World Wildlife Fund

Environment Protection Act – State Gazette 91/ 25.09.2002

Kountchev I., M. Mintchev, T. Ranguelov, D. Boteva; 2002; *Combining the GPS and GIS Technologies for Elaboration and Management of Rila and Central Balkan National Parks digital Models*, Proceedings of International symposium on “Space Information – Technologies, Acquisition, Processing and effective Application”, Sofia

Kountchev, I. 2001 *Needs Assessment for Maintenance and Use of the Existing Digital Models of the Territory of RNP and CBNP*, BCEG Project Report

Medicinal Plants Act - State Gazette N 29/07.04.2000

Meshinev T., A. Popov (Edt.).2000.*Treeless High-Mountain Zone in Central Balkan National Park. Biodiversity and conservation problems*. Sofia, BSBCP, 590 pp.

Central Balkan National Park Management Plan – 2001-2010, accepted with decision N 522 on 04.07.2001 from the Council of Ministers

Rila National Park Management Plan – 2001-2010, accepted with decision N 522 on 04.07.2001 from the Council of Ministers

National Biodiversity Conservation Plan 2000, Sofia, UNDP, GEF, MOEW, 59 pp.

Peev D., S. Gerassimov; 1999; *Express and Long-term Methods for Biological Monitoring; National Bio-monitoring Program of Bulgaria*, EU/Phare Program MOEW, Sofia; 240 pp.

Project BUL98/G31. *Needs Assessment and Development of CHM for Bulgaria* – documents accepted on the First meeting of the CHM National Coordination Group, October 2002

Protected Areas Act – State Gazette N 133/11.11.1998

Regulation on structure and activities of the NP Directorates 2000 – State Gazette, N 68/18.08.2000

Sakalian M. (Managing Editor) 2000. *Biological diversity of Rila National Park- collections of scientific reports*, USAID

Sakalian M. (Managing Editor) 2000 *Biological diversity of Central Balkan National Park - collections of scientific reports*, USAID

Vulchev P. 2000 *People and the National Parks – Attitudes, practices and prospects in Bulgaria*, USAID

APPENDICES

Appendix 1

**Eco-Monitoring System Establishment – CBNP
Workshop – 14.02.2002, Gabrovo
Summary of the Meeting**

Present:

1. Nela Rachevits – Director of CBNP
2. Svetoslav Todorov - Chief Expert, Monitoring and Resources Conservation
3. Rumiana Ficheva - Chief Expert, Mountain Ecosystem Maintenance
4. Anton Stanchev - Chief Expert, Fauna
5. Gencho Iliev - Chief Expert, Geographical Information Systems
6. Dimitrina Boteva – Biodiversity Specialist, BCEG Project
7. Dimitar Peev – Consultant, BCEG Project

Topics of discussion:

1. Eco-monitoring experience so far and available information
2. Needs and priorities – Who? Where? What? When?
3. Directorate role – experts, park section heads, rangers
4. Partners
5. Lacking information, sources
6. Action plan

I. Eco-monitoring experience so far and information available

- Monitoring under the BSBCP program of the junipers succession, high mountain pastures and of rare and vulnerable species
- Monitoring of invertebrates
- Monitoring of the condition of the forest – national system of test areas of 16 km grid.
- GEF Biodiversity Project researches
 - Biodiversity
 - Tourists' flow
- Climate information – compendium containing results of Hydro-Meteorological Stations
- NPD experience in the annual observation and taxation of mammals (deer, wild goat) and birds.

II. Needs and priorities - Who? Where? What? When?

Monitoring stations and test areas

1. Vezan chalet – Benkovski chalet region
 - Bolovania pasture – opportunity for use of the defined by BSBCP areas for observation of the succession of the junipers - site 1 and 2 of the transect in the region of Benkovski hotel, *Vaccinium murtillus*
 - The first runway – *Lilium jankae*

2. Beklemeto
 - Orlovo gnezdo shelter – souslic, *Galanthus nivalis*, *Vaccinium myrtillus*, area with high nature – guarding significance according to BSBCP
 - Dermenka chalet
 - East end of Kozia stena reserve
Monitoring of invertebrates
3. Botev peak
 - Rai Chalet – Botev
 - Marinka shelter
 - Botev shelter – *Alchemilla spp.*
Invertebrates monitoring
4. Taza chalet
 - Rusaliite site – *Rhododendron spp*, *Primula frondosa*, *Silene balkanica*
 - Taza chalet – Maragidik peak
 - Taza chalet – Triglav peak

Common monitoring species

Vaccinium myrtillus

Hypericum perforatum

Fagus sylvatica

Rupicapra rupicapra

Cervus elaphus

Insect, mushroom

The proposal given by Dr. Peev was that samples should be taken for exploration of the content of heavy metals in the first two plant species, in one small mammal species and one mushroom species for each test area once or twice a year.

The populations' condition of these species is going to be observed according to definite number of parameters.

Observation of the tourism impact:

The expert team of NPD strongly supports that it is necessary tourist flow to be observed – characteristics of the tourists, routes and chalets preferred activities on the park territory. At this stage the opinion is that there are no considerable changes in the elements of the environment (in the biodiversity in particular too) as a result of the tourists' flow.

Offered are the following sites for observation of the tourism impact

Pleven and Vezen chalets

Tracks where test areas for monitoring of biological objects are defined.

III. Role of the Directorate – experts, park section heads, guards

Participation in the process of choosing the features (indicators) that are going to be observed
Defining of the areas for observation
Organizing of the gathering of information process – coordination, management and supervision for periods and methods application
Primary summary and analysis of the information
Coordination of the park partners participation in the monitoring activities
Storing of the information

IV. Partners

RIEW, EEA, BAS, Forestry University, Mountain rescue service, Bulgarian tourism union, State Forest Units, Visitor centers, “Friends of the park”

V. Lack of information, sources

1. BSBCP monitoring results – BSBCP, Boriana Mihova
2. Monitoring of invertebrates results – Zoology institute, BAS, Hristo Delchev
3. Monitoring scheme and results of the forest monitoring program in the National 16km grid – EEA, Madlena Pavlova; Forestry University, Katia Pavlova
4. Methods for observation and assessment of the tourism impact – Petia Kovacheva
5. Limits of acceptable change, indicators
6. Climate data – Hydro-meteorological compendium

VI. Action plan

Appendix 2**BUILDING UP AN ECO-MONITORING SYSTEM FOR
RILA NATIONAL PARK***Blagoevgrad Workshop, March 6, 2001***Participants:**

1. Mimi Pramatarova, Director of Rila NP
2. Vassil Patrov, Deputy Director;
3. Tatyana Maleshevska, Chief Expert, Information Technology;
4. Krassimir Andonov, Expert, Fauna;
5. Verka Ivanova, Expert, Forestry;
6. Lachezar Ivanov, Chief Expert, Maintenance and Restoration;
7. Dimitrina Boteva – Biodiversity Specialist, BCEG Project
8. Dimitar Peev – Consultant, BCEG Project

Discussion topics:

1. Current experience in eco-monitoring and available information;
2. Needs and priorities: Who? What? Where? When?;
3. Role of the Directorate: experts, section chiefs, rangers;
4. Partners;
5. Information gaps; sources;
6. Action Plan.

The proposed monitoring system should cover the all-round state of biological diversity within the Park. It should be designed so as to **meet the management goals and principles as laid down in the Management Plan** and should provide information necessary for **dealing with practical issues in the management of the Park.**

I. Current experience in eco-monitoring and available information

- Monitoring the state and condition of the forest: the national 16-sq.km. sampling grid; sampling ground in Parangalitzta Nature Reserve;
- Monitoring the state and condition of the forest: sampling stations of the Bulgarian Academy of Sciences' Forestry Institute;
- Findings and data gathered by the Mussala High-Mountain Observatory engaged in the following types of monitoring:
 - Physical;
 - Meteorological and hydrological;
 - Chemical;
 - Biological;
 - Socioeconomic;

- Surveys under the GEF Biodiversity Project:
Biodiversity;
Tourist flow;
- The Park Directorate's experience in annual monitoring and taxonomic classification of large predators, hoofed animals and birds;
- The Park Directorate's experience in annual monitoring of the tourist flow;
- Climatic information: a Climate Reference Manual to compile the data of the Hydro-meteorological (weather) stations.

II. Needs and priorities: Who? What? Where? When?

Monitoring stations and sampling sites

The following areas and sites were proposed for comprehensive monitoring:

1. The Seven Lakes
2. Maussala Peak
3. Parangalitza
4. Malyovitza
5. Granchar Chalet
6. Belmeken

Species subject to Park-wide monitoring:

A certain number of species are to be made subject to monitoring Park-wide, while a differential approach is to be used in monitoring the populations of certain section-specific species (e.g. the hamster population in the area of Belmeken, in Belovo Park Section)

Monitoring of tourist pressure:

The advisory body of Rila National Park Directorate is aware of the need to monitor the tourist flow, on terms of tourist profile, preferred itineraries and accommodation, activities performed in the Park territory. The following **monitoring sites** are proposed as suitable for monitoring tourist pressure:

1. The Seven Lakes Chalet area;
2. Recreation sites, rest areas, camp sites, observation points, camping sites;
3. The area uphill from Semkovo and the short rest areas in Kostenetz Park Section, as per the Management Plan;
4. Trails and sites (rest areas, camp sites, etc., where available) where there are designated sampling and monitoring sites for biological objects.

III. Role of the Directorate: experts, section chiefs, rangers

All monitoring activities shall be initiated, organized, coordinated and supervised by the experts for the respective monitoring field.

Functions:

- Participation in selecting the objects to be monitored;
- Selection and designation of monitoring sites;
- Data gathering coordination and supervision; deadline enforcement and methodology control;
- Primary data processing and analysis;
- Coordination of Park partners' participation in monitoring activities;
- Supervision of data storage and retrieval.

IV. Partners

The Regional Inspectorates of the Environment and Waters; the Executive Environment Agency, the Bulgarian Academy of Sciences, the Forestry University, other Universities, the Mountain Rescue Service, the Bulgarian Tourism Association, the State Forest Enterprise, visitors' centers, the Friends of the Park Club.

V. Information gaps; sources

1. Monitoring scheme and findings of the forest monitoring program under the national 16-sq.km. sampling grid: Madlena Pavlova, EEA; Katya Pavlova, Forestry University;

2. Monitoring methods developed under the Phare Program: MOEW;

3. Tourist pressure monitoring and assessment methods;
4. Limits of acceptable change; indicators;
5. Climatic data: the XM Guide

VI. Action plan

Appendix 3**WORKSHOP**

Development and Implementation of Ecological Monitoring System
for Rila and Central Balkan National Parks

Bankya, April 8th-9th

List of Participants

From Central Balkan National Park:

1. Nella Rachevitz, Director;
2. Ivailo Nikolov, Deputy Director;
3. Anton Stanchev, chief expert, Fauna;
4. Gergana Staneva, chief expert, Flora;
5. Gencho Iliev, chief expert, Geographic Information Systems;
6. Svetoslav Todorov, head of Resource Monitoring and Conservation Sector;
7. Roumyana Filcheva, chief expert, Mountain Ecosystems;
8. Petya Kovacheva, chief expert, Tourism;
9. Nanko Minkov, section chief, Kalofer Park Section, Ecotourism Pilot Project;
10. Marin Kostov, section chief, Klissura Park Section, Non-timber Resources Pilot Project;
11. Ivan Georgiev, chief expert, Transportation.

From Rila National Park

12. Mimi Pramatarova, Director
13. Vassil Patrov, Deputy Director;
14. Krassimor Andonov, expert, Fauna;
15. Verka Ivanova, expert, Forestry;
16. Todor Serezliisky, chief expert, Infrastructure and Tourism;
17. Tatyana Maleshevska, chief expert, Information Technology;
18. Lachezar Ivanov, chief expert, Maintenance and Restoration;
19. Roumen Kolchagov, mobile security chief;
20. Vladimir Chapkanski, section chief, Beli Iskar Park Section, Ecotourism Pilot Project;
21. Philip Zaikov, section chief, Yakoruda Park Section, Non-timber Resources Pilot Project;
22. Mitko Ivanov, driver.

From the National Nature Protection Service

23. Raina Hardalova, expert;
24. Petar Dobrev, expert;
25. Ivailo Zafirov, expert.

From the Executive Environmental Agency

26. Madlena Pavlova, expert

From Pirin National Park

27. Ivailo Ikononov, expert

From BCEG Project

28. Peter Hetz, Project Director;

29. Dimitrina Boteva, biodiversity expert;

30. Kamelia Georgieva, head of Ecotourism and Use of Natural Resources pilot projects;

31. Dimitar Peev, consultant;

32. Chavdar Gushev, consultant;

33. Boyan Damyanov, translator/interpreter.