BIODIVERSITY MANAGEMENT
Action Plan

Contents:

1 Biodiversity Monitoring Programme

The Biodiversity Monitoring Programme will continue the initial inventory programme (Baseline Survey, EIA, BMP), focusing in the species and habitats of community interest and following procedures and approaches that meet the conditions required under the European norms, regulations and legislation. Moreover, the activities that aimed to identify the attributes related to biodiversity within the Project footprint will be extended to adjacent habitats with which the Compensatory Functional Ecological Network will be connected.

It will also study types of habitats of high bio-eco-cenotic value that will be reproduced or become models or the ecological restoration actions, such as the rockery habitats in the Trascau Massif area or Sighistelului Valley, with forest and steppe-type eremial habitats, respectively, that might become solutions in rehabilitating the settling pond depression area.

The following areas of concern will be committed to in this respect:

Item no.	Vertebrates	Invertebrates	Flora	Habitats	Hydro-biology
1	Monitoring	Monitoring	Monitoring	Monitoring	Monitoring
2	SOP	SOP	SOP	SOP	SOP
3	Reporting/ Compliance	Reporting/ Compliance	Reporting/ Compliance	Reporting/ Compliance	Reporting/ Compliance

2 Activities

2.1 Activity no. 1: Biodiversity Database

Description:

Create a database using a GIS platform that is compatible with the national Biodiversity Information Management System (BIMS). All the field data sets will be collected based on field protocols (SOPs) and entered into the database system.

- Selection of key species for biodiversity monitoring in the impact area and in sampling areas not affected by the impacts;
- Concluding monitoring protocols for the key species;
- Integrating the key species protocols into the biodiversity monitoring plans for the impact area as well as monitoring protocols for terrestrial and aquatic habitats.
- Implementing the key species monitoring protocols;

Reasons:

Surveillance of the state and development of the biodiversity indices is unthinkable without a primary data system, which should provide unbiased primary information fed in real time regarding the quality of the environmental media.

Use of the BIMS format will ensure full compatibility with the dedicated biodiversity database system nationally and internationally. The multiple capacities of conversion and import into other information systems guarantee data accessibility for all the interested parties.

The systems allows for real, objective and totally transparent documentation of the final data regarding he distribution, state, development of populations, and may be accessed on the Internet.

Moreover, the GIS system allows for the development of complex raw data modelling applications and their integration into complex ecological studies.

2.2 Activity no. 2: Detailed Biodiversity Inventory Focusing on the New EU Regulations in the Field

Description:

Monitoring of the flora and fauna communities within the Project implementation site needs to be supplemented with detailed information in accordance with the recently developed working format required by the European legislation in the field of biodiversity conservation management.

This activity will make use of strict field evaluation protocols and methodologies through which the information generated may be entered into a dedicated database (Action No. 1) enabling statistical interpretation and environmental modelling to assist the decision making process primarily in regard to the conservation management of biodiversity with concrete application in the implementation of the components of the proposed Compensatory Functional Ecological Network.

This time the studies will not be limited to the Project footprint, but will aim to reveal the valuable anchoring elements outside the Project boundary, in the adjacent ecosystem matrix, to which the Compensatory Functional Ecological Network will have to relate.

Natural capital evaluation actions will also affect the habitats of bio-eco-cenotic value and high stability still in a natural state of functionality and integrity.

Evaluation of some control natural habitats will facilitate the selection of a set of species of bio-indicator value based on which the biodiversity monitoring measured may be implemented with special focus on identifying the state o development of habitats subject to direct and indirect environmental restoration/rehabilitation action.

A detailed study o the communities within the forest habitats will target the communities associated to the three major levels (brush, medium level and canopy), so as to facilitate and document the forestry management steps aiming to support high biodiversity indices based on bio-indicator species and key species for every food chain.

In this regard, studies will be developed for three separate stations, for the three major forest types (deciduous, mix, conifers) all in a good bio-eco-cenotic state, old forest of high integrity level, only slightly affected by human impacts.

The studies will be developed in “sample markets”, using both the permanent site and grid-based work, to include the alpha and beta biodiversity parameters. Systematic studies will be supplemented by occasional observations, by target groups, using recognised working methodologies, in order to complete the species inventory.

Hydro-biological studies will be included under this action, with focus on the benthos species of remarkable bio-indicator value.

Species monitoring will be done in parallel with the monitoring of environmental factors to which the data will be related.

Of the flora and fauna species, a set will be selected for high bio-indicator value, which are representative of the habitats of concern and play a key role within such habitats, in order to document the entire set of biodiversity monitoring actions.

Biodiversity monitoring will also include an inventory of traditional crops and livestock species supported by the area.

Reasons:

Collection of biodiversity data so far summarised in the baseline study has aimed to illustrate the indices and attributes required for the technical-administrative stage of environmental impact assessment.

Given the complexity of the implementation stage and especially the need to neutralise the bio-strata “gap” effect induced by the Project, as well as the ambitious objectives of the environmental reconstruction actions of unprecedented complexity, as illustrated y the development of the Compensatory Functional Ecological Network, supported by the legislative requirements required under Directives 92/43/EEC and 79/409/EEC, respectively, this action has to be implemented.

In the absence of detailed knowledge of the parameters, indices and attributes in relation to the flora and fauna species, overlapped with the ecological observations, the entire set of compensatory measures involving environmental rehabilitation, environmental media monitoring and ensuring a really sustainable development may not be thoroughly documented and objectively justified.

Outputs:

- revision of the Systematic List of Plant Species in the Project impact area;
- monitoring of vegetation grids for the main plant associations or main sites studies within the Project impact area;
- grazing meadow rating in the Project impact area;
- monitoring and documentation of the main populations of valuable species;
- revision of the plant map in the Project impact area;
- GPS marking of the components of special relevance for biodiversity management;
- hydro-biological map of the Project impact area;

- description of the aquatic communities of flora and fauna;
- characterisation of the aquatic environment in the Project impact area;
- revision of the List of Species for the main groups of insects (coleopteran, ortopteran, lepidoptera, hymenoptera, arachnids) in the Project impact area;
- monitoring of environmental quality based on the information provided by the bio-indicator insects;
- monitoring of trends in the insect community with the change of habitats;
- highlighting the main communities and populations of valuable insects;
- revision of the Systematic List of Bird Species in the Project impact area;
- monitoring of environmental quality based on the information provided by the bio-indicator birds;
- highlighting the main communities and populations of valuable birds;
- revision of the Systematic List of Reptile and Amphibian Species in the Project impact area;
- monitoring of environmental quality based on the information provided by the bio-indicator amphibians and reptiles;
- highlighting the main communities of amphibians and reptiles;
- development of methods and monitoring of the environmental restoration;
- development of a consistent regional biodiversity conservation strategy;
- detailed development of the Compensatory Functional Ecological Network.

Educational Activities

- Implementation of a bird watching tour program in the Roşia Montană area;
- Preparing a photographic display of the biodiversity of Rosia Montana, to be organised at the Information Centre of Rosia Montana and itinerant exhibitions in the schools within the Project area.

3 Protocol for Plant Monitoring

The use of permanent sampling areas has always been recommended by most ecologists, as it has the advantage of conducting comparative studies.

Square-shaped permanent sampling areas are recommended in monitoring plant communities where there is no evident vegetation gradient caused by environmental factors (ecological an/or human-animal factors). Where vegetation gradients are present, the recommended method is that of permanent vegetation grids used throughout the monitoring program (these methods are recommended by UNESCO, the Man and Biosphere , MAP, Program).

The plant diversity monitoring protocol presented below is based on the use of square-shaped permanent sampling areas of various sizes, depending on the investigated vegetation type.

The other variables related to species behaviour or to the ecosystem functions, such as the blooming periodicity, the photosynthetic surface area, the reproductive potential (e.g. number of flower-bearing stems, date of blooming, quantity of seeds, seed viability, annual seedling and sapling density, respectively) will be monitored based on key species.

The following sampling areas will be used in the monitoring program:

- 1 ha (100 x 100 m) square-shaped permanent sampling areas for the monitoring of tree vegetation
- 0.025 ha (20 x 20 m) square-shaped permanent sampling areas for the monitoring of bush and brush vegetation
- 5 x 5 m permanent sampling areas for the monitoring of bush and praticola vegetation
- 1 x 1 m permanent sampling areas for the monitoring of praticola vegetation
- 10 m long, 1 m wide permanent grids
- 5 m long, 1 m wide permanent grids

1. Preparatory Stage

The observation and data collected from site visits will be the basis of all processing and interpretation, in order to obtain the most objective and scientifically valid results possible.

a) **Selection of the study area** will be in this case as requested by the Beneficiary. Once the study area has been defined, the areas to be visited will be established on a large scale map.

b) **The study of references** will be required in interpreting the composition of the vegetation cover depending on the physical-geographical conditions of the investigated area. It is recommended that archaeological and mediaeval and modern history references should be included, in order to document the history of human influence in the region (Cristea, 1991).

c) **Setting floristic and vegetation aspects** will involve, on the one hand, awareness of former contributions to the understanding of the composition of flora in the region, and on the other hand revision of the morphological and ecological features of the existing and potentially existing species in the region. The latest inventory of cormoflora in our country includes nearly 4000 plant taxons and infrataxons, which is why such setting will be an absolute necessity. Consulting works regarding vegetation may help select the sampling areas of concern, the number of such areas, and the best times to conduct observations.

d) **Preparing the necessary tools and equipment:**

- data recording: field forms and notebooks, writing tools, camera, laptop, etc.
- navigation: land survey map, compass, GPS
- soil sample collection: plastic bags, soil probe
- for micro-climate profiling: soil thermometer, psihrometer, evaporimeter
- for identification and collection of biological material: herbarium, determinator, chisel or spoon for plant extraction, plant sample box
- for quantitative determinations: dendrometer, calliper, metric sash, tape measure

e) On-Site Establishment of Permanent Sampling areas (Permanent Site Study)

As the areas need to be regularly visited and analysed, in locating them consideration will be given to the development of other activities, as well as to the possibility of inventorying and monitoring in the easiest and most systematic manner possible. Special attention will be paid to locating these sampling areas in the case where they need to be sampled from sites where vegetation at other levels is also monitored (case of the herbaceous cover). Also, if the sampling areas (samples) are included in larger sampling areas, they should not be laced in the corner, in order to avoid the edge effect.

Minimum Number of Quadrants (Sampling Areas): It will generally depend on the available resources, subsequent statistical processing, and the number o existing species. Establishment of the minimum number of sampling areas will be decided based on a pilot study which will record the number of species present in 20 quadrants of 1m x 1m. The number of species and the number of quadrants will help plot the area-species curve. The curve inflexion point will correspond to the minimum number of quadrants necessary for monitoring.

f) Survey-Development Stage

The most frequently used approach in studying vegetal associations is that of plant-sociology surveying, based on the model developed by Braun-Blanquet and Pavillard (1928). In conducting the survey, the investigated region is covered in such a way as to include all the types of sites and variations thereof, following given preset routes and itineraries. In selecting the sampling areas, ecoton portions must be avoided. The size of the sampling area will be established based on the investigated type of vegetation. Mathematically, this size is established by calculating the minimum area (area-species curve). Currently, the size of the sampling area may be established based on references (Table 1).

Table 1: Minimal Size of the Sampling Areas in Studying Different Plant Groups

Type of vegetation	Size of sampling area (m^2) according to the Cluj school
forests	400-1000
scrublands	50-100
medows	25-100
oligotrophic marsh	9-25
eutrophic marsh	25-50
ruderal vegetation	6-25
segetal vegetation	25-100
rockeries	1-25

All the data collected from these sampling areas will be recorded on the Field data sheet (please see template attached in the Annex) or in the notebook. In order to prevent omissions, model forms have been developed to include:

- date of the plant sociology survey; data on location and toponimy;
- size of the sampling area
- elevation, exposure, slope gradient
- biometric data: height and/or diameter
- extent of canopy consistency and/or plant coverage;
- outskirt density, notes on human activities in the area;

- abundance-dominance index for each present species, according to the scale in Table 2:

Table 2: Establishing the value of the abundance-dominance index AD

%	average	AD Index
75-100	87,5	5
50-75	62,5	4
25-50	37,5	3
10-25	17,5	2
1-10	5	1
0,1-1	0,5	+
0,01-0,1	0,05	r

g) Vegetation Horizontal Projections, Profiles and Grids

Development thereof will reveal the spatial structure of the phytocenoses, the relations between the plant populations, in the horizontal and in the vertical plane, the vertical phasing of different phytocenoses depending on the dynamics of the orographic factor.

a) Horizontal projections are done graphically on site, on the area considered to be typical for a given plant association. The metric frame is used in the case of meadows. With the help of preset landmarks, a large scale projection of the active parts for each plant population is represented.

b) Vegetation profiles (vertical projections) are developed in order to establish the horizontal succession and the vertical distribution of the components of a given phytocenosis, micro-spatial affinities and frequency of individual occurrence. These profiles are developed as follows:
   - Random units of length are established and defined within the phytocenoses (that may correspond to the size of a sampling area or not), usually 1 m long in the meadows and 20-100 m long for forests;
   - Horizontal distance to the point of origin of each individual occurrence is recorded, as well as the height of its active part or vegetative tip;
   - The results of these operations may be transferred in a scheme directly on site, but more often the data is processed in the laboratory, based on a two-coordinate system where he units of length and height, respectively, are represented. The signs used in this may be conventional or reflective of the habitus of the represented species.

c) Vegetation grids (sections of vegetation) are outlined on site after following an itinerary that crosses several plant groups in succession, located in relation to the edapho-climatic and human/animal impacting factors. At the same time, the contact points between the phytocenoses of two associations or between two different stages in the evolution of the same association are recorded on the land survey map (depending on elevation). The next step is conducted in a laboratory, where a section is outlined by unit of relief investigated, or by succession of different orographical units, and the place occupied by the individuals of each association is marked by conventional signs. The grid must work with the length and gradient of the slope, as seen from looking at the map on which the elevation curves are represented.

3.1 Habitats

Habitat inventorying is an action of primary importance, in developing biodiversity monitoring and management programs.

Given the spatial extent of the Project, covering a vast area of more than 1600 ha, compounded by the need to corroborate and extend the measures to adjacent habitats, the following assessment steps are propsed:

3.1.1 Identify the Major (Nemoral/Eremial) Habitat Types

At this stage, based on current imagery (aerial photograms, satellite imaging, perspective photographs, etc.), identify the main components of the local matrix.

Nemoral biomes (forests). For an objective reflection that facilitates the decision making process and overlaps the legislative process able to substantiate the implementation of certain actions, the definition of a *forest* was accepted to mean an area covered by wood vegetation of minimum 4 m height, and a total area of at least 0.1 ha, respectively.

Eremial biomes (forests). This category includes sites covered by grass vegetation on an area of at least 0.01 ha.

As secondary components, the following have also been defined:

a) Anthropogenic: habitation areas, active industrial functions, terrestrial communication networks, arable land.

b) Non-productive: areas degraded by human activities.
c) Riparian biomes: areas of linear development along watercourses, including of the temporary/runoff gulley type.
d) Cliffs and debris: areas totally/partially denuded of vegetation due to ecological conditions not directly related to the human factor.

The result of interpreting different types of habitats will be a map of land functions (*land-cover map*). In view of a more detailed representation of this primary map, a map of the main types of habitats will be developed, defined based on the usual habitat interpretation manuals.

Based on the existing correspondences between the fundamental types of forest, the forest sites with Natura 2000 habitats, a map of forest habitats according to the Natura 2000 designations will also be developed. For eremial habitats, as well as of cliff and riparian ones, the next step will be to identify the vegetal associations by means of the botanical survey method. By extrapolation, a map of the eremial habitats will be developed based on the criteria established for the designation of Natura 2000 sites, where they occur. At this stage, a primary map of the natural habitats can be developed in correspondence with the terminology used in the definition of Natura 2000 habitats.

3.1.2 Detailed Habitat Identification

For natural and semi-natural state habitats, based on the criterion species defined in the habitat interpretation manuals, development of a detailed map of the special relevance habitats will be possible, according to the descriptions and lists used for Natura 2000 habitats. For each type of habitat identified, an analysis will be conducted of:

a) fragmentation
b) representativity
c) integrity
d) baring capacity
e) ecosystem value defined by the associated biodiversity indices

The outcome of this stage will lead to the development of a cartographical plan of the ecosystem relevance of the habitats in the Project area of concern.

3.1.3 Micro-Habitat Identification

An analysis of the structure and morphology of micro-habitats (rockery, temporary ponds, dead wood, synusya, etc.) will be conducted for each major habitat in order to define association spectra and a distribution map thereof across the site.

3.1.4 Conflict Map Development

Based on superimposing the cartographical plan of habitat ecosystem relevance in the area of concern over the final development plan for the industrial facilities, a conflict map will result, to point out the areas of overlap between the two extremes of territorial management strategies. Those point areas will be the object of active management measures in view of minimising the impact on bio-eco-cenotic valuable elements.

4 Species Monitoring

In regard to the monitoring of terrestrial insect species, the task becomes even more difficult as, at least at in Romania, no complete studies, of sufficient complexity have been developed in order to allow access to efficient environmental assessment and management methodologies. Insects, in their overwhelming numbers of species and individuals, their incontestable bio-indicator value, their essential involvement in food and geo-chemical cycles, are a component without which environmental monitoring would remain at a declarative level.

Insect monitoring has developed a whole range of methodologies and protocols that allow for pertinent conclusions to be drawn about the state of the environment, the efficacy of management measures, etc. All the protocols are based on a very complex statistical interpretation that makes use of the existence of pertinent databases and a complex monitoring system.

Given the bio-geographical and ecological realities of Romania, of the mining Project implementation area in particular, a range of actions will need to be implemented. First of all, as there is no reference base, either regionally or nationally, for biodiversity, starting from complete inventories of biomes, control studies will need to be developed on restricted areas (in the order of tens of square metres), to initiate so-called total inventories for the most relevant taxonomic groups. Once the control terms are established for comparison, one may analyse which of

the statistical models used in assessing the biodiversity indices (α, Margalef, Berger-Parker, 1-D (Simpson), Shannon, etc.) will best reflect the objective realities, and which of the rapid assessment methodologies will prove efficient. The advantages of such an approach will consist of:

1. Creating a reference basis for the assessment of regional impacts (especially as a result of the GAP effect induced by the large area of the impact zone);
2. A standard for the calibration and development of assessment methods for the efficiency of biodiversity management measures;
3. Achievement of a national reference system to reflect the impacts, development and recovery of bio-eco-cenotic systems within the Project site area in an objective way;
4. An open interface to the academic environment in view of promoting collaborative programs.

In regard to the selecting a set of indicator value species, the following associated attributes will be considered, as follows:

1. Known taxonomic system, with no classification doubt, maximum accuracy taxon identification facility;
2. Well known natural history;
3. Easy monitoring and handling;
4. sufficient spread of the taxonomic group, at least at the national level;
5. Sufficient ecological plasticity;
6. Sufficient receptiveness and reactivity to disturbing actors;
7. Possibility to develop statistical studies;
8. Economic relevance.

For the main taxonomic groups of insects, the extended attribute table has been developed in order to argue the selection of bio-indicator groups with maximum relevance for the Project of concern.

4.1 Monitoring Methods

Considering the specifics of the Rosia Montana mining project, it was proposed to develop a complex invertebrate species monitoring system, so as to meet the objectives proposed for the documentation of decisions in creating the Compensatory Functional Ecological Network, environmental media monitoring, assessment of impact mitigation measures, etc. In this respect, for the invertebrate fauna, we have proposed the following methodologies/techniques:

4.1.1 Inventory of the Invertebrate Fauna

This is one of the most frequently used techniques in monitoring biodiversity. Although the list itself does not provide sufficient information in regard to the ecological attributes of a target site, it does provide some indication of the state of the environmental media, facilitating primary comparisons with other areas. In this regard, based on the protocols for the inventory of invertebrate fauna, using a computerised database, a list of invertebrate species will be developed and may be searched both in the systematic and in the alphabetical order of the taxons.

In view of this, a broad range of observation, collection/ capturing techniques will be used on a temporary, seasonal and circadian basis, as diversely as possible, in order to capture a broad selection of the range of species. According to general practice in this sense, the starting point will be a list of potential species (that may be present on the investigated site) to be developed based on published studies, indirect collection data, extrapolated information referring to the habitat structure and specific constellation.

Based on this primary list, newly encountered species will be added and those ascertained to be present will be confirmed. For species not yet encountered, investigation efforts will focus on the optimum characteristic habitats thereof.

For invertebrate species, based on the systematic list of plants identified in the study area, a list of potential species associated to them (especially plant eaters) may be developed.

Taxon identification will be done down to species level, given that the information on supra-specific taxons is not relevant (at least for the case in point) Thus, the list of species will only include the individuals identified with certainty down to the species level.

4.1.2 Monitoring in Parallel (Simultaneous) Grids

For some species of invertebrates (especially butterflies) monitoring may be done in parallel, or simultaneous grids. This method will involve an identification of the species, marking the potential special relevance species.

Parallel grids are meant to identify the detailed elements at the level of habitats (identification of micro-habitats, biomes, etc.), and the preference of some species or attributes associated to the target habitat (identification of species optimum). Thus, for one type of habitat, a number o parallel lines will be defined and walked during a preset unit of time, then the results will be statistically interpreted. This will allow for a comparative evaluation at the level of ecoton, central, marginal and other zones.

In the case of simultaneous grids, two (different, similar or identical) habitats will be selected, and similar routes will be established for both to be walked in the same preset unit of time, so that a simultaneous observation may be conducted and subsequently compared.

4.1.3 Monitoring by Rate of Encounter

This method is one of the simplest (elementary) ways of assessing the abundance of a species. However, given the characteristics associated to the invertebrate species, this method is only relevant for small groups, such as day butterflies. Still, the quality and quantity of information is very large compared to the level of effort, and makes it possible to develop comparative assessments of some species of outstanding relevance.

4.1.4 Development of the Species Discovery Curve

Habitat characterisation and association of biodiversity indices is still one of the primary tasks of biodiversity monitoring. Thus, plotting of the species discovery curve will provide precious data in the levels of biodiversity.

It is known that the number of species will increase in proportion with the level of effort (dedicated time) in studying a certain habitat. Thus, it will be difficult to compare biodiversity indices of habitats for which different time periods were allocated. In this respect, the date (time) will be recorded for each newly-identified species on the investigated site. A system of axes will represent on abscise the number of species and the unit of time (days, hours) on the ordinate. The resulting curve will tend to flatten, marking the time when continuing species inventorying efforts would become less relevant.

The statistical applications associated to this method (expressed logarithmically or exponentially) will distinctly mark this relationship and the time that would be sufficient to allocate to each individual type of habitat. Thus, the number of identified species in each period of time (e.g. one day0 may be expressed as $\log_{10}$; where the regression line crosses the *x* axis is relevant t the probable number of species associated to the respective habitat.

This method has particular relevance in the rapid assessment systems, which evaluate the probable number of species associated to a habitat by repeated identification at short intervals of time – e.g. 30 minutes; the inventorying stops in the 30 minutes interval where no new species has been identified. This method is especially suitable for small extent sites.

4.1.5 Species Inventories Developed for Units of Time

This method is a very valuable approach, in that it is very close to the accuracy of grid , or site observation methods, respectively, but the time required is much less.

The method relies on the fact that the common species are the first observed in a habitat, and continue to be identified during successive monitoring steps. Thus, a 60 minute hourly interval is divided into 6 ten-minute sections. For each 10 minute section, the observed species are recorded. Once recorded, a species will no longer be considered in the next intervals of time. In each segment, the identified species are rated on a scale of 6 to 0. Those observed in the first 10 minute interval are marked 6, species observed in the following interval are marked 5, ... and those observed in the last interval are marked 0. This will help reveal the species of the most common presence, or the rarest, respectively, in the habitats, without making reference to their abundance.

4.1.6 Recording Species Absence

Ironically, the absence of species is much more difficult to document, however, the ecological relevance of such information is very special. In this respect, statistical calculations are called for, to assess the total number of observations (No) where the species should be identified.

$$No = \frac{\ln(evel\ a)}{\ln(1-P)}$$

where *P* is the probability of finding the respective species based on site observation, and

the *a level* is the risk that the species should be present but present in the habitat, still, considered, however extinct (because of absence). Thus *level a* = 0 will occur where we are not sure that the species is extinct.

The identification probability may be evaluated by comparing the species in the habitats where it commonly occurs, by examining its probability of identification.

4.2 Monitoring Techniques

4.2.1 Collection by the "Mowing" System, Using an Entomological Net

In collecting certain species of invertebrate (especially insects) collection using an insect net is still a classic method. In this respect, the sampling areas are walked with an entomological net over a given distance, "mowing" the grassy vegetation with a fixed number of movements (e.g. 20 swings for a 25 m long grid). The insects collected in the net are then transferred to a jar with alcohol, then screened and processed in the laboratory.

4.2.2 The Barber Trap Monitoring System

The use of Barber traps is one of the most common methods used in inventorying the terrestrial (edaphic) invertebrate fauna (but not only), allowing for complex ecological observations.

4.3 Quantitative Monitoring

Under this methodology, the target groups are terrestrial, edaphic macro-invertebrates. Studies in this regard have revealed the bio-indicator value of the species of carabids (*Coleoptera: Carabidae*), staphilinids (*Coleoptera: Staphylinidae*), as well as of arahnids (*Arahnida: Araneea*), colemboles (*Colembola*), ants (*Hymenoptera: Formicidae*). The way they are placed is shown in Annex I. Barber trap placing is done in various patterns (randomised, grouped, by grids, etc.) For statistical studies, Barber traps are not baited, and the preservative liquid should preferably not have any antractant/repellent properties. In this way, capture is based on probability.

4.4 Qualitative Monitoring

This method is used in developing lists of species, fauna inventories, as well as for comparative studies such as rapid biodiversity assessments. Compared to the method presented above, Barber traps are baited, to attract as many o the target species, and on as extensive areas as possible.

The advantage of this method lies in the use of a few Barber traps, which makes much easier to screen, determine and process the material. Baited Barber trap placing is also randomised, grouped, by grids, with the possibility of placing isolated traps in certain areas.

5 Results of the 2010 Monitoring Campaign

5.1 Habitats and Plants Monitoring 2010-2010:

Assessing the Project impacts on the habitats and plant populations is based on three groups of methods: on-site assessment of the current distribution of significant habitats and significant (dominant, characteristic, of importance in natural regeneration) or rare plant populations, data processing (development of distribution maps), analysis and assessment of the level of impact and improvement opportunities. Since in all these cases, when a habitat or habitat fragment is not completely removed, the answer to human impact will decisively depend on the current state of conservation in the community, and the level and extent of impact may not be appreciated solely based on current field data (distribution, state of conservation), a strong accent was placed on describing the existing habitat fragments in as much detail as possible.

During on-site assessment, it was attempted to include in the grids all the habitats within the Project area, both in Rosia and in Corna Valleys. Site visits were conducted during the vegetation season of 2010: 3 days in June (23, 24, 25), five days in July (26-30), and 2 days in September (23, 24).

Overall, a number of 15 grids were covered in Rosia Valley and 9 in Corna Valley, and in less accessible areas selected habitats were assessed punctually, based on aerial photogram analysis (e.g. fragments of natural swamps). Grid length ranged from 335 m (Tr. No. 3) and 1,200 m (Tr. No. 9 and 10).

The grids were generally established perpendicular to the main valley (except for two grids in the Muntari-Corna and Corna-Bunta areas, i.e. the two grids in the area of the current pit). The types of habitats were recorded along the grids, and a filed data sheet was developed for each fragment, containing base data regarding the biotope (exposure, inclination, rock coverage, GPS point, water level – if applicable) and the dominant, characteristic, rare species. Separate species lists were also developed for each type of habitat.

The majority of species were identified on site (using the Ciocârlan, 2000 determinator) while those of uncertain determination, or unidentified ones were collected in a herbarium and determined using the Flora RPR-RSR (1952-1956) monograph.

The identified flora is not complete; in regard to habitat types these were identified according to Doniţa et al., 2005 (Habitatele din România) and Gafta& Mountford (2008), observing the codification for Romanian Habitats (R) and Natura2000 Habitats (Natura 2000 code).

As previous studies focused more on wood-type vegetation, this assessment aimed to assess in more detail, besides the mapping of habitat distribution in general, the meadows and fragments of swamps in the area. This research was conducted on the project site and adjacent areas already impacted by other, similar activities (Bucium valleys, Salistei Valley settling pond).

Four meadow areas were identified, of marked variety of plant species and well preserved habitats.

- Sulei area (N: 46.301885/E: 23.14903, N: 46.30566507/E: 23.14632956), respectively, with semi-natural edified meadows of *Brachypodium pinnatum* (Natura 2000 code : 6210 - Xerophile seminatural meadows and scrubland facies *Festuco-Brometalia*) in complex with cliff meadows – an area that conserves four rare species of the *Orchidaceae* Family;
- The western-north-western exposure slope above Balmosesti village (left-hand side of the valley) with mosaic hay-meadow vegetation with Sanguisorba officinalis, Meadows with *Molinia* on carbonatic, peaty and loamy soils (Natura 2000 code: 6410) and birch clearings (conservation area for species like *Parnassia palustris* and *Gladiolus imbricatus*);
- hay meadows with *Festuca pratensis* and *Arrhenatherum elatior*, i.e. the upper third of the slope, edified by *Brachypodium pinnatum*, above Bunta Village (southern-south-western exposure, on the right-hand side of the valley);
- partly abandoned hay meadows with *Molinia coerulea* and *Sanguisorba officinalis* , at the edge of the hornbeam forest, above Bunta Village (twards Bucium Village, on the left-hand side of the valley).

5.2 Invertebrate Monitoring 2010

Based on a review of the available information, it was concluded that the butterfly group (Lepidoptera) was very well studied at the expense of other invertebrate groups. Thus, it can be noticed that the groups of beetles (Coleoptera), dragon flies (Odonata) and grasshoppers/ Locusts (Orthoptera) are almost completely absent from the existing study.

Based on the conclusions derived from the old documentation, our research was directed primarily to these groups of invertebrates (Coleoptera, Odonata și Orthoptera), without totally neglecting other groups (Diptera, Heteroptera, Hymenoptera). This research was conducted on the project site and adjacent areas already impacted by other, similar activities (Selistei Valley landfill).

Several methods were used in developing this study: use of traps (Barber, interception, coloured) luminous screen, entomological net, grid observations.

- **Barber traps**, aiming to collect terrestrial invertebrates, were placed in a randomized pattern across the site, attempting to cover as many ecological niches as possible (sparse forest, old forest, young forest, water banks, meadows, old mines), 30 traps were placed (in 10 locations). They were baited using glycol antifreeze) solution (50/50) with added vinegar as attractant, the solution being changed every 10 days, along with the collected specimens.
- **Interception traps** (panel traps) aim to capture flying insects, 5 taps were placed in different forest habitats, using glycol solution (50/50) as preservative fluid, collection of material and change of fluid being done every 10 days. They were baited with glycol (antifreeze) solution (50/50).
- **Coloured traps** (coloured dishes filled with detergent solution) were used especially for the collection of dipterans and hymenopterans.
- Nocturnal collection/observations of invertebrates were also conducted using a **luminous screen** (this type of collection was used 10 times during the first study.
- **The entomological net** was typically used during the walking of **grids** in tandem with observation. Many grids were developed around the lakes within the investment area, with special focus on the dragon fly fauna. These grids were walked several times during the study. The grids included: lake contours (Tarina, Brazi, Cornei, Tapului, Cartus, Mare, Găuri, Anghel etc.) totalling about 6-7 km, hay meadows/meadows/pastures (areas of Corna, Bunta, Balmosesti, Rosia Montană, Tarina) about 5 km, roads in the pit/old landfill areas about 10 km (south and south-east of Rosia Montană), through forests about 8 km (Rosia Montană, Corna, Muntari, Bunta areas).

This study was conducted in 2010, in the period from June to September, when 6 field stages were done on site, each site visit lasting 3-4 days.

As already mentioned, the following groups of invertebrates were primarily targeted:

- Coleoptera (focusing on he families of Carabidae, Cerambycidae, Buprestidae and supra-family Scarabaeoidea)
- Odonata (observations/collections were also made regarding the larvae/exuviae)
- Orthoptera

Within the area of concern, all the existing habitats/areas were inventoried and analysed (forests, meadows, hay meadows, degraded areas spoiled by old mines, pits, lakes) where sampling was attempted for both special protection zones (where future impacts will be absent or minimal) and impacted areas. Also, near the project area, the Seliste Valley landfill was also researched in order to observe the invertebrate fauna in such an area.

Preliminary results (as only 40% of the material collected using **Barber** or **interception** traps has been processed to date) include:

- about 200 species of coleopterans
- about 25 species of dragon flies
- about 100 species of butterflies
- grasshopper/locust collected material is still being processed

It is also worth mentioning that due to the climate conditions this year (very rainy), when a lot of materials were lost from the traps due to heavy rain, we think that the species potential of the area is much higher.

In comparison with other similar areas of the country (in point o elevation/type of relief/ rock) the invertebrate fauna is qualitatively low (fewer species) due to the high disturbance caused by old mining operations. Still, the unique character of the zone is given by the large number of artificial lakes (some more than 200 years old) that included a large number of aquatic species for this elevation.

6 Monitoring Plan for the Main Vertebrate Species at Roşia Montană

Prepared by:

Wildlife Management Consulting

November, 2006

Background

This monitoring plan was developed in close correspondence with the biodiversity management plan for the Rosia Montana mining project.
It has been developed in order to provide a basis for the long-term assessment of the vertebrate species in the Rosia Montana area and of the efficacy of management activities aiming to protect biodiversity and landscapes around the project area and the success of impact mitigation actions.

A number of monitoring issues have been obtained from site studies, and broad discussions, including public consultation that reflected the need to determine whether the biodiversity of Rosia Montana area may be effectively maintained.

The questions that monitoring should help answer include the assessment of the biodiversity background in the area and the impact of future actions. Apart from assessing the state of the biodiversity resources over time, the monitoring plan will also provide an assessment of pressures and threats posed by the Project. However, the answers to the monitoring questions in this plan, regarding the state of biodiversity, will determine whether the management was effective in maintaining the key populations and habitats.

The monitoring questions were assessed based on their relative priority and a set of indicators was developed for each monitoring question. A protocol was developed for each indicator, including detailed time, personnel and resource requirements for its long-term implementation. Thus, protocols were developed for a minimum input of equipment and resources and take into account the personnel constraints, and even the future limiting of available funds for specialist consultants.

The protocols were developed so as to be pragmatic and adjustable, as well as thorough and repeatable. In order to maximise information generation, some protocols were designed as to involve the RMGC personnel (who will only need minimal elementary knowledge for identification). The protocols have reviewed the necessary data analysis approaches, which were incorporated in the design of sampling methods in the protocols.

Rosia Montana Monitoring Protocol 1
Small Mammals

Priority?

Monitoring Questions: Is the small mammal population maintained in the Project area?

Measure/ Indicator: small mammal populations

Justification: Small mammals are an essential component fo most terrestrial ecosystems. Monitoring is especially important in the case of this group, as some species are an important food source for protected raptor species (mammals and birds).

Attributes: Relative abundance of adults and proportion of young individuals in that population.

Sampling Protocols

Number of sites/ monitoring points:
10 monitoring areas will be selected within the mining site and in its immediate proximity.

Distribution and selection of monitoring sites/locations
The points will be located in the main habitats (spruce forest, deciduous forest, scrubland, clearings, meadows, hay meadows, etc.). In grove and forest areas, it is recommended that the span should be set at least 100 m from the forest edge.

Size of monitoring sites/locations:

The planned projects will be of different sizes.

Specific point location/marking

The GPS coordinates of the location will be marked on the map. Area corners will be marked on site by means of marked metal poles.
The same areas will be used every year. The boundaries of these routes will be described in writing.

Data collection protocols

Trap-like snares may be used, 49 traps within a 7x7 network covering 0.81ha.

The traps must be checked four times in 24 hrs, at midnight, at dawn, at noon and in the evening.

Baits may be wheat or oat flakes, pieces of toast with vegetable oil, pieces of lard, seeds (sunflower, wheat, maize, other cultivated plants), tinned pate.

The trapped animals will be handled with care, weighed, tagged and released. The age group, will be recorded, or at least whether it is an adult or a juvenile, or a pregnant female. Each team will search at least two grids.

Data collection forms

Standard forms will be used.

Quality Assurance mechanisms and standardisation

The same areas and the same methodology will be used every year, involving the same staff numbers. Field personnel identification skills will be checked. Whenever possible, the same personnel will be used in monitoring every year. Field personnel will have to demonstrate map reading skills (personal fitness should also be considered). In hiring new personnel, site visits and protocol application will be demonstrated. Any unusual or

unpredictable observations will be checked as soon as possible. The quality of the staff involved in the small mammal monitoring programme is very important.

Repeat monitoring frequency and scheduling

The study will be conducted in spring and summer. At least 2 nights/grid will be required.
Periods when bad weather is forecasted must be avoided.

The survey must be repeated on an annual basis.

Data management and analysis protocols

Data storage and information management

Responsibility for data storage and analysis shall lie with the WMC biologist. RMGC shall be the data owner. Areas of high or low density of small mammals will be integrated into a GIS system. Backup data copies will be kept in a different system. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

A database will be designed in Excel for small mammal species.

Data from similar habitats may be grouped in order to compare the use by type of habitat. Note that a low number of recorded individuals will determine an abnormal distribution of the data. An index of captures will be used in analysing the quantitative structure of each species.
Statistics software will help determine the estimated abundance, relative dominance, quantitative structure, territoriality and density index of some species.

Reporting format and process of submitting results to management

The small mammal survey will be summarised in the annual report in the progress of monitoring submitted to the RMGC Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded. Where significant changes are recorded, the data will be presented in bullet or graphical form, as necessary. If the results show statistical significance, the statistical data will be replicated and interpreted. The implications of such results will be highlighted in bullet form as recommended management actions and/or follow-up research.

Resource allocation protocols

A survey will last up to 40 days (20 in spring/summer and 20 in summer/autumn). This activity will require at least three people from WMC. Data recording and analysis will take 3 days of activity for the WMC researchers.

Necessary resources/equipment

The tem will require field/protective equipment (tents, sleeping bags, lanterns, etc.) and field notebooks. Maps and compass will also be necessary, as well as data sheets to be provided by WMC and RMGC.

Equipment maintenance or calibration

Equipment maintenance will be the responsibility of its owners.

Field monitoring data sheet for small mammals

Monitoring area no.………….. Operator: …………………

Habitat Code…………..

Species	Sex			Weight	Dimensions				Description of markings
	♂	♀							
		P	NP						

Description of weather conditions

Rain/snow			Wind						Temperature	Fog density;			% cloud cover
H	M	L	0	1	2	3	4	5		H	M	L	

Comments:

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……………………………………………………………………………………

Rosia Montana Monitoring Protocol 2
Squirrel (*Sciurus vulgaris*) Population Monitoring

Priority?

Monitoring Questions:

Is the local biodiversity maintained in general?

Are key species maintained?

Indicator:

Squirrel (*Sciurus vulgaris*) Population

Justification:

Squirrels (*Sciurus vulgaris*) are an important population in the area. Concerns were expressed during the public hearings regarding the future of the squirrel populations in the area. It is an excellent warning species that can be also used in the future foe practical educational activities.

Attributes*:*

Measured attributes must refer to the relative abundance and squirrel population densities in the areas surrounding the mining site.

Sampling Protocols

Number of sites/ monitoring points

Twelve short grids.

Distribution and selection of monitoring sites/locations

A survey monitoring area will first be selected, in any shape or size, but to include habitats such as forests, groves, gardens and the public park.
Each line should be 2,000 m long and located along inspection paths or alleys, or between rows of trees tat provide suitable squirrel habitat.
Grid distribution will be selected on a randomised basis.

Size of monitoring sites/locations:

Twelve short, 2 km grids.

Specific point location/marking

The grids will be marked on the map. The same fixed routes will be used every year. The routes and the location of the main monitoring points will be described in writing. Both ends will be marked on site and on GIS maps.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

A single observer will walk the line on pre-established days of the year, starting as soon as possible after sunrise, as squirrels are most active during this time of the day. The observer will stop every 100 m for 2-

3 minutes, covering the 100 m distance in about 5 minutes. Some observers may prefer to use binoculars, but this will not be essential. All the observed squirrels must be recorded, along with the time, place and observed behaviour. If the weather is bad, the survey will be postponed. Squirrels are not usually active in days of heavy rainfall, strong wind or very cold weather. The surveys will be repeated two-four times over a period of two weeks, to take into account weather and squirrel activity variations. The largest number of squirrels observed in one day will be recorded. The collected data will only refer to the brown squirrel individuals observed on the grid length and may be used as a relative population indicator in comparing data and sites. If the forest areas are small and fragmented, and do not allow for the organisation of a 500 m observation line, several forest areas of similar tree species and age distribution may be combined instead.

For a more exact estimation of density, the basic method will be combined with the "remote sampling" method.

This method is practically the same as the basic method, but is more accurate in estimating the perpendicular distance of each observed squirrel in relation to the observation line. This is done either by recording the perpendicular distance of each observed squirrel *V* from the observation line, or the distance between squirrel *V* and the observer (at observation distance *x*) and the angle of the squirrel direction from the observation line (observation angle á).
Perpendicular distance y may then be calculated as follows:

$$y = x \sin á$$

As it is difficult to appreciate distances or angles in the forest, it is good to measure a few distances with the help of a tape measure until the observer "trains his/her eye". However, this activity might disturb other squirrels n the same area. In planted forests, the equal distances between trees in the same row and between rows may be used as guidelines. The distances between the observation line and the animals will allow estimating the width of the observation "corridor". The corridor width on either side of the grid will depend on the habitat and will vary along the grid line depending on the habitat.

Data collection forms

The number of squirrels observed in each grid will be recorded in the field notebook.

Quality Assurance mechanisms and standardisation

All the involved personnel must be able to identify squirrels based on a preliminary test. Whenever possible, the same personnel will be used in monitoring every year. Field personnel will have to demonstrate map reading skills (personal fitness should also be considered). In hiring new personnel, observation point and protocol application will be demonstrated. Any unusual or unpredictable observations will be checked as soon as possible. *Field personnel distance estimation skills will be evaluated.*

Repeat monitoring frequency and scheduling

Ideally, surveys will be conducted on a monthly basis. If this is not possible, at least one survey every other month must be conducted.

The grids will be surveyed by the WMC biologists for three days.

Data management and analysis protocols

Data storage and information management

A squirrel database will be designed. WMC will be in charge of data management, high density squirrel areas will be integrated in the GIS system. RMGC will retain ownership of this data, but they will be made available to the national monitoring programs and to the scientific community based on WMC decision. Backup data copies will be kept in a different system. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

The number of observed animals may be used as a simple relative index of the population size.

Densities may be estimated by calculating the visual corridor in which animals were observed.
The width of corridor *w* may be estimated by a simple graphical method. Objectively, it may be taken as the distance where the number of observations declines to approximately half of the preceding interval.

Knowing the area of the investigated location, squirrel density *d* may be estimated by:

$$d = n/2wl$$

Where *n* is the number of observed animals, *I* is the grid length and w the width of distance d on both sides.

Reporting format and process of submitting results to management
The squirrel survey will be summarised in the annual report in the progress of monitoring submitted to the Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded. Where significant changes are recorded, the data will be presented in bullet or graphical form, as necessary. If the results show statistical significance, the statistical data will be replicated and interpreted. The implications of such results will be highlighted in bullet form as recommended management actions and/or follow-up research. If no population decline is observed, then the hunters; associations and forestry directorates will be notified.

Resource allocation protocols

Number of necessary personnel, roles and training thereof
The surveys will be carried out by WMC biologists together with one person from RMGC. Annually, a maximum 36 days (3/month) for the WMC biologist and RMGC delegate. The WMC biologists will be in charge of data processing, which will take less than 4 days a year. The WMC biologists will be responsible for planning and implementing the surveys.

Necessary resources/equipment
Binoculars, maps, compass, etc. to be provided by WMC and RMGC for its delegate.

Equipment maintenance or calibration
The equipment will be in the responsibility of their owners.

Rosia Montana Monitoring Protocol 3a
Deer (*Capreolus capreolus*) Population Monitoring

Priority?

Monitoring Questions:

Is the local biodiversity maintained in general?
Are key species maintained?

***Indicator*:**

PopuThe deer (*Capreolus capreolus*) population

***Justification*:**

Deer (*Capreolus capreolus*) are an important game species in the area.

Attributes:

Measured attributes include relative abundance of adults and proportion of young individuals in the respective population.

Sampling Protocols

Number of sites/ monitoring points

7 long grids to cover each (of the four) areas in which reasonable deer populations are known to exist.

Distribution and selection of monitoring sites/locations

The routes (grids) will be established across the deer areas and the effort for each grid will be recorded (distance covered and time). It may be necessary to use flexible grids (lateral paths may be used in exploring deer habitats) but it would be preferable to use the same paths and main roads every year. In some cases, the deer tracking routes may be compatible with those used for predator tracking.

Size of monitoring sites/locations:

The routes may be covered in about one day. The start and end points of observation will be defined depending on the areas known to be deer habitats.

Specific point location/marking

The grids will be marked on the map. The same fixed routes will be used every year. The routes and the location of the main monitoring points will be described in writing.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The observers will cover the indicated route at walking pace, looking for deer around them. Lateral paths may be explored in order to increase the umber of records, as long as this is accounted for in the calculated level of effort (distance and time). The number of observe deer will be recorded on a data sheet/ notebook (indicating the place, number of adult and juvenile individuals, distance from the path, behaviour, time and weather).

Data collection forms

See Annex

Quality Assurance mechanisms and standardisation

All the involved personnel must be able to identify deer based on a preliminary test. At least two people will be necessary for each grid, for reasons of safety and increased observation opportunity. Whenever possible, the same personnel will be used in monitoring every year. Field personnel will have to demonstrate map reading skills (personal fitness should also be considered). In hiring new personnel, observation point and protocol application will be demonstrated. Any unusual or unpredictable observations will be checked as soon as possible. Field personnel distance estimation skills will be evaluated.

Repeat monitoring frequency and scheduling

Surveys will be conducted during the summer months (June-August) and in winter (December-January). Whenever possible, the surveys will be distributed over a period of 14 days. Surveys will be conducted annually (twice: once in winter and once in summer every year).

Data management and analysis protocols

Data storage and information management

An Excel deer database will be developed to record the "total number of individuals per unit of level of effort (time or distance)" for each grid covered on every day of the survey. Furthermore, the proportion of young individuals in the total population will be evaluated annually. WMC will be in charge of data management, and high density deer areas will be integrated in the GIS system. RMGC will retain ownership of this data, but they will be made available to the national monitoring programs and to the scientific community based on WMC biologist decision. Backup data copies will be kept in a different system. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

The variables "individuals pet unit of search level of effort" will be filled out for all the years of monitoring (each route covered every year is considered a separate variable, therefore the places where the grids have been covered must be accounted for). Furthermore, the "Proportion of young individuals in the population" will be analysed for all the investigated areas every year and the time variation curves will be plotted. Data precision may be improved by detailing the distance at which deer are observed (e.g. 250 m away). This will also help estimate the densities in such areas. The average number of individuals per unit of level of effort (for all grids) will be used in representing the data graphically, in an easily understandable format. Moreover, the date will be entered into statistics regression analysis software for at least four years of data collected (if the data show that this is necessary). A level of $p<0.05$ will be considered a significant relation over time.

Reporting format and process of submitting results to management

The deer survey will be summarised in the annual report in the progress of monitoring submitted to the Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded. Where significant changes are recorded, the data will be presented in bullet or graphical form, as necessary. If the results show statistical significance, the statistical data will be replicated and interpreted. The implications of such results will be highlighted in bullet form as recommended management actions and/or follow-up research. If no population decline is observed, then the hunters; associations and forestry directorates will be notified.

Resource allocation protocols

Number of necessary personnel, roles and training thereof

The surveys will be carried out by WMC biologists together with one person from RMGC. Annually, a maximum 28 days (14 in winter, 14 in the summer months) for the WMC biologist and RMGC delegate. The WMC biologists will be

in charge of data processing, which will take less than two days a year. The WMC biologists will be responsible for planning and implementing the surveys.

Necessary resources/equipment

Binoculars, maps, compass, etc. to be provided by WMC and RMGC for its delegate.

Equipment maintenance or calibration

The equipment will be in the responsibility of their owners.

Deer observation data sheet,

The observers will cover the indicated route at walking pace, looking for deer around them. Lateral paths may be explored in order to increase the umber of records, as long as this is accounted for in the calculated level of effort (distance and time). The number of observe deer will be recorded on a data sheet/ notebook (indicating the place, number of adult and juvenile individuals, distance from the path, behaviour, time and weather).

No. of the area/grid
Name of the Observer:
Date:
Weather conditions and approximate temperature
For every individual observation, fill out a separate row of the table if no deer are observed; please record deer tracks (excrements).

Observation place	**Details on the observed animals**	**Oher information**
area code: (code marked on the map) Type of habitat % rocky terrain: % grass-cover: Time of observation	No. of deer Adult Juveniles Distance to the observer Behaviour: Grazing ❑ Alert ❑ Flight ❑ Other………………	Recent deer excrement observed No ❑ Yes ❑ If yes, please indicate where and approximate density (no./m^2) in a random grid ……………. /m^2 Recent tracks observed. No ❑ Yes ❑ If yes, please indicate how many animals left footprints
area code: (code marked on the map) Type of habitat % rocky terrain: % grass-cover: Time of observation	No. of deer Adult Juveniles Distance to the observer Behaviour: Grazing ❑ Alert ❑ Flight ❑ Other………………	Recent deer excrement observed No ❑ Yes ❑ If yes, please indicate where and approximate density (no./m^2) in a random grid ……………. /m^2 Recent tracks observed. No ❑ Yes ❑ If yes, please indicate how many animals left footprints
area code: (code marked on the map) Type of habitat % rocky terrain: % grass-cover: Time of observation	No. of deer Adult Juveniles Distance to the observer Behaviour: Grazing ❑ Alert ❑ Flight ❑ Other………………	Recent deer excrement observed No ❑ Yes ❑ If yes, please indicate where and approximate density (no./m^2) in a random grid ……………. /m^2 Recent tracks observed. No ❑ Yes ❑ If yes, please indicate how many animals left footprints

Rosia Montana Monitoring Protocol 3b
Boar (*Sus scrofa*) Population Monitoring

Priority?

Monitoring Questions:

Is the local biodiversity maintained in general?

Are key species maintained?

Indicator:

Boar (*Sus scrofa*) population

***Justification*:**

Boars (*Sus scrofa*) are an important game species in the area.

Attributes:

Measured attributes include relative abundance of adults and proportion of young individuals in the respective population.

Sampling Protocols

Number of sites/ monitoring points

7 long grids to cover each (of the four) areas in which reasonable boar populations are known to exist.

Distribution and selection of monitoring sites/locations

The routes (grids) will be established across the deer areas and the effort for each grid will be recorded (distance covered and time). It may be necessary to use flexible grids (lateral paths may be used in exploring boar habitats) but it would be preferable to use the same paths and main roads every year. In some cases, the boar tracking routes may be compatible with those used for predator tracking.

Size of monitoring sites/locations:

The routes may be covered in about one day. The start and end points of observation will be defined depending on the areas known to be boar habitats.

Specific point location/marking

The grids will be marked on the map. The same fixed routes will be used every year. The routes and the location of the main monitoring points will be described in writing.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The observers will cover the indicated route at walking pace, looking for wild boars around them. Lateral paths may be explored in order to increase the umber of records, as long as this is accounted for in the calculated level of effort (distance and time). The number of observed boars will be recorded on a data sheet/ notebook (indicating the place, number of adult and juvenile individuals, and distance from the path, behaviour, time and weather).

Data collection forms

See Annex

Quality Assurance mechanisms and standardisation

All the involved personnel must be able to identify wild boar based on a preliminary test. At least two people will be necessary for each grid, for reasons of safety and increased observation opportunity. Whenever possible, the same personnel will be used in monitoring every year. Field personnel will have to demonstrate map reading skills (personal fitness should also be considered). In hiring new personnel, observation point and protocol application will be demonstrated. Any unusual or unpredictable observations will be checked as soon as possible. Field personnel distance estimation skills will be evaluated.

Repeat monitoring frequency and scheduling

Surveys will be conducted during the summer months (June-August) and in winter (December-January). Whenever possible, the surveys will be distributed over a period of 14 days. Surveys will be conducted annually (twice: once in winter and once in summer every year).

Data management and analysis protocols

Data storage and information management

An Excel boar database will be developed to record the "total number of individuals per unit of level of effort (time or distance)" for each grid covered on every day of the survey. Furthermore, the proportion of young individuals in the total population will be evaluated annually. WMC will be in charge of data management, and high density wild boar areas will be integrated in the GIS system. RMGC will retain ownership of this data, but they will be made available to the national monitoring programs and to the scientific community based on WMC biologist decision. Backup data copies will be kept in a different system. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

The variables "individuals pet unit of search level of effort" will be filled out for all the years of monitoring (each route covered every year is considered a separate variable, therefore the places where the grids have been covered must be accounted for). Furthermore, the "Proportion of young individuals in the population" will be analysed for all the investigated areas every year and the time variation curves will be plotted. Data precision may be improved by detailing the distance at which the boars are observed (e.g. 250 m away). This will also help estimate the densities in such areas. The average number of individuals per unit of level of effort (for all grids) will be used in representing the data graphically, in an easily understandable format. Moreover, the date will be entered into statistical regression analysis software for at least four years of data collected (if the data show that this is necessary). A level of $p<0.05$ will be considered a significant relation over time.

Reporting format and process of submitting results to management

The boar survey will be summarised in the annual report in the progress of monitoring submitted to the Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded. Where significant changes are recorded, the data will be presented in bullet or graphical form, as necessary. If the results show statistical significance, the statistical data will be replicated and interpreted. The implications of such results will be highlighted in bullet form as recommended management actions and/or follow-up research. If no population decline is observed, then the hunters; associations and forestry directorates will be notified.

Resource allocation protocols

Number of necessary personnel, roles and training thereof

The surveys will be carried out by WMC biologists together with one person from RMGC. Annually, a maximum 28 days (14 in winter, 14 in the summer months) for the WMC biologist and RMGC delegate. The WMC biologists will be in charge of data processing, which will take less than two days a year. The WMC biologists will be responsible for planning and implementing the surveys.

Necessary resources/equipment

Binoculars, maps, compass, etc. to be provided by WMC and RMGC for its delegate.

Equipment maintenance or calibration

The equipment will be in the responsibility of their owners.

Wild boar observation data sheet,

The observers will cover the indicated route at walking pace, looking for wild boars around them. Lateral paths may be explored in order to increase the umber of records, as long as this is accounted for in the calculated level of effort (distance and time). The number of observed boars will be recorded on a data sheet/ notebook (indicating the place, number of adult and juvenile individuals, and distance from the path, behaviour, time and weather).

No. of the area/grid
Name of the Observer:
Date:
Weather conditions and approximate temperature
For every individual observation, fill out a separate row of the table if no boars are observed record boar tracks (excrements).

Observation place	Details on the observed animals	Other information
Area code: (code marked on the map) Type of habitat % rocky terrain % grass-cover: Time of observation	No. of boars Adults Juveniles Distance to the observer Behaviour: Foraging ❑ Alert ❑ Flight ❑ Other………………	Recent boar excrement observed No ❑ Yes ❑ If yes, please indicate where and approximate density (no./m^2) in a random grid ……………. /m^2 Recent tracks observed. No ❑ Yes ❑ If yes, please indicate how many animals left footprints
Area code: (code marked on the map) Type of habitat % rocky terrain % grass-cover: Time of observation	No. of boars Adults Juveniles Distance to the observer Behaviour: Foraging ❑ Alert ❑ Flight ❑ Other………………	Recent boar excrement observed No ❑ Yes ❑ If yes, please indicate where and approximate density (no./m^2) in a random grid ……………. /m^2 Recent tracks observed. No ❑ Yes ❑ If yes, please indicate how many animals left footprints
Area code: (code marked on the map) Type of habitat % rocky terrain % grass-cover: Time of observation	No. of boars Adults Juveniles Distance to the observer Behaviour: Foraging ❑ Alert ❑ Flight ❑ Other………………	Recent boar excrement observed No ❑ Yes ❑ If yes, please indicate where and approximate density (no./m^2) in a random grid ……………. /m^2 Recent tracks observed. No ❑ Yes ❑ If yes, please indicate how many animals left footprints

Rosia Montana Monitoring Protocol 4
Monitoring of Bat Species

Priority?

Monitoring Questions:

Are bat populations maintained on the mine site and surrounding areas?

Measure/ Indicator:

Bat Species

***Justification*:**

Bats are sensitive to habitat a roost changes and some species of conservation interest occur in the Rosia Montana area.

Attributes:

Number of bat species, general activity

Sampling Protocols

Number of sites/ monitoring points

At least 7 grids will be defined in the area.
The grids will be monitored at least twice, but ideally four times a year.

Distribution and selection of monitoring sites/locations

Long grids, of at least four km will be traced along the paths close to the central area of the mining project site and around it. The grids will have to cover all the important habitats.

Size of monitoring sites/locations:

The grids should be at least four km long. They will have to be of equal length. The length must be recorded.

Specific point location/marking

The grid route will be marked on the map and the exact start and end points will be marked on site by means of metal poles and in the GPS for full description.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The survey will start immediately before sunset, according to the sun tables. Survey inception time must be recorded. Rainy nights should be avoided. The observers will walk slowly, with even steps, at a constant rate, along the grid. Bat detectors will be moved along all the frequency bands (or maintained at broadband settings) in order to detect all the bats present. All the bat passages will be counted (as

signalled by the detector). Whenever possible, the species will be identified by tuning the bat detector to a certain frequency and recording the call type and behaviour of the bats. Observers may stop along the route in order to identify the bat species. The number of passages and detected species will be recorded separately at every 20 minute interval covered along the grid. The time when the survey ends will also be recorded along with the new value of the temperature reading. If bat activity is concentrated in some points, (e.g. over water bodies), these areas will be marked on the map. Any potential roosting place identified will be reported.

Data collection forms

To be developed

Quality Assurance mechanisms and standardisation

The observers must have some experience in using bat detectors and, if possible, proven species identification skills. The observers will be accompanied during their first visit to the site, to ensure that they have an exact knowledge of the grid (in the day time). All involved observers must have preliminary training in using the bat detector and identifying species. During surveys, inexperienced observes must only record bat activity, to avoid identification errors.

Repeat monitoring frequency and scheduling

The five grids will be covered once in spring (April-May), twice in summer (June and August) and once at the beginning of autumn (October).

Data management and analysis protocols

Data storage and information management

The total number of passages along the grid and the list of identified species will be computerised on a worksheet. This will be kept separate in a backup copy and the original data sheets will be also preserved.

Data analysis procedures and details on the statistical methods

Activity levels during each 20 minute interval covered along the grid will be averaged for every section of every grid and the numbers may then be compared to the dominant type of habitat in the respective section of the grid. Total bat activity for each grid will be averaged annually, to allow comparison of the changes in activity levels from one year to the next (plotted against time). The number of species detected during the surveys will be recorded for each year. If a species is not recorded for our consecutive years, additional surveys will be conducted in order to check whether the species richness in the area has declined.

Reporting format and process of submitting results to management

If significant changes occur in bat activity during a four year period, this will be reported to the RMGC Environmental Manager, together with an explanation of the implications of this finding.

Resource allocation protocols

Number of necessary personnel, roles and training thereof

The surveys will involve WMC biologists together with RMGC personnel. As work will be done at night, the teams will need escorts. The survey will probably last at least 20 nights for all the persons involved.

Whenever possible, bat specialists will be included to provide more in depth training and identify the species.

Necessary resources/equipment

GPS, maps, head torches, bat detectors (2), vehicle, adequate field gear. Current costs include torch batteries and fuel.
The equipment will be provided by WMC and RMGC.

Equipment maintenance or calibration

Torches will require regular maintenance, with separately stored batteries. The bat detectors will be kept safe, well maintained and stored with the batteries removed.

Rosia Montana Monitoring Protocol 5
Cave Bat Monitoring

Priority?

Monitoring Questions:

Are important cave bat populations maintained on the mine site and surrounding areas? Is the general biodiversity maintained?

Measure/ Indicator:

Key bat species

***Justification*:**

Small caves host populations of protected bat species. The caves are severely impacted by human activities.

Attributes:

Continued presence of these species in the caves they currently occupy; relative abundance of the key species.

Sampling Protocols

Number of sites/ monitoring points

Roosting places have been recorded in the local caves. If other roosting places are detected, they will have to be included in the survey.

Distribution and selection of monitoring sites/locations

In every case, the accessible parts of the caves will be investigated. The same cave sections will be visited every year.

Size of monitoring sites/locations:

Not relevant

Specific point location/marking

Caves are known and the position of roosting places is clearly marked by excrements (although bats do change roosts in the caves)

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The caves will be investigated using torches, in every crevice, with care not to disturb the bats (especially in winter). The total number of bats observed in every species will be recorded (if identification is possible by visual observation, otherwise, the bats will be classified by genus). During each visit, the

exact place of the bats and their distribution (group sizes) will be recorded. Censuses during hibernation will need to be performed with great care not to awaken the bats (in silence, not directing the torch light straight to the bats and without touching them). If possible, records may be taken in the area selected by the bats. Signs of human disturbance will also be recorded (including cave visitors in winter). If no bats can be found, the survey may need o be repeated to confirm their absence.

Data collection forms

The data sheet and database used in the National Bat Monitoring System will be used in the surveys. Copies of the cave maps will be made available so that the observers may mark the bat positions on them.

Quality Assurance mechanisms and standardisation

Field personnel identification skills will be checked. The participants will be asked to confirm understanding of the necessary behaviour during the surveys of wintering places.

Repeat monitoring frequency and scheduling

Surveys will be conducted once in summer, but not during the breeding period of these species, (months proposed: late May-July) and once in winter (December-February, January?) every time during the same month for every repeat of the count. This survey must be repeated on an annual basis.

Data management and analysis protocols

Data storage and information management

The records will be stored on computer with adequate backup copies.

Data analysis procedures and details on the statistical methods

The data will be examined in order to identify any significant change in abundance or distribution of the species on every site. Sudden changes will be rechecked on site.

Reporting format and process of submitting results to management

Any change in the abundance or abandoning of roosting places will be reported in writing to the RMGC Environmental Manager.

Resource allocation protocols

Number of necessary personnel, roles and training thereof

The WMC biologists will be in charge of the annual survey, for 5 days in summer and 5 days in winter. It will depend on the number and location of the sites.

Necessary resources/equipment

The biologists will need access to a vehicle (and associated fuel costs).
Torch batteries are a recurrent cost. Copies of the cave maps and identification guidelines will also be required. Protective helmets will be required for work within the caves.

Equipment maintenance or calibration

Equipment maintenance and calibration will be the responsibility of its owners.

Rosia Montana Monitoring Protocol 6
Winter Tracking

Priority?

Monitoring Questions:

Are medium and large size carnivore and other mammal populations maintained?

Measure/ Indicator:

mustelids, red fox, ungulates

***Justification*:**

Some species are included on special lists in Romania or internationally, and are of national or community importance.

***Attributes*:**

Relative abundance, range and use of habitats

Sampling Protocols

Number of sites/ monitoring points:

10 grids will be selected within the mining site and in its immediate proximity.

Distribution and selection of monitoring sites/locations

The routes (grids) will defined across the main habitats. It may be necessary to use flexible grids but it would be preferable to use the same visible paths and main roads every year. The grids will be connected by a route that may be covered in a working day.

Size of monitoring sites/locations:

The routes may be covered in about one day (about 7 km a day). The start and end points of observation will be defined depending on the areas known to be carnivore habitats. Every grid will be walked three times in winter, at intervals of at least one week and after a snowfall.

Specific point location/marking

The grids will be marked on the map. The same fixed routes will be used every year. The routes and the location of the main monitoring points will be described in writing.

Data collection protocols

The observers will cover the land so as to minimise disturbance along the route they will use every year. The observers will start walking along the preset routes until they find the first mammal track. On every investigated area, the grids will be visited after a snowfall, three times during each survey period, to assess the use of the area by the carnivores and their prey species. The best period to conduct the surveys will be immediately after a snowfall. The survey may start after at least 2 cm of snow cover the ground. A designated person will monitor the presence of mammal tracks during the survey period and will mobilise the observer teams as soon as possible after the snowfall. The surveys will be conducted a whole day after the snow has settled on the ground, to allow the animals to travel and leave tracks.

All the observed animal tracks on a distance of 5 m either side of the median line of the grid will be investigated in order to determine the species they belong to. The species will be recorded on grid data sheets.

Data collection forms

Standard forms will be used.

Quality Assurance mechanisms and standardisation

The same grids, with the same number of observers will be used every year. Field personnel identification and distance assessing skills will be checked. Whenever possible, the same personnel will be used in monitoring every year. Field personnel will have to demonstrate map reading skills (personal fitness should also be considered). In hiring new personnel, observation point and protocol application will be demonstrated. Any unusual or unpredictable observations will be checked as soon as possible. The quality of the staff involved in tracking is very important. Identification errors may occur between wolf, dog and fox.

Repeat monitoring frequency and scheduling

The study will be conducted during winter. The seasonal activity rates of different species will have to e accounted for. If the snow cover is deep, ungulates will congregate in feeding areas, usually in the valleys. There are, therefore, so-called "concentration points" that can be taken into consideration during the survey. The study will be conducted once/month during winter.
All the grids must be covered in one day, to avoid statistical complications. The interval in continuing a survey must be as short as possible.
Whenever possible, the surveys will be repeated on the same day every year, weather permitting. The weather conditions and depth of the snow cover are the main factors that influence the scheduled date and period.

Data management and analysis protocols

Data storage and information management

Responsibility for data storage and analysis shall lie with the WMC biologist. RMGC shall be the data owner. Areas of high or low density of mammals will be integrated into a GIS system. Backup data copies will be kept in a different system. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

A database will be designed in Excel for large mammal species.
The data will be organised by snowfall and by grid.
Data from similar habitats may be grouped per section of grid in order to compare the use by type of habitat. Note that a low number of recorded tracks will determine an abnormal distribution of the data. It is recommended that trend analysis should make use of non-parametric statistical procedures (e.g. the Kurskal-Wallis test for variation analysis or the Dunn multiple comparison test). To avoid temporal pseudo-repetition of the tracking data collected for every snowfall event, the average value of the observed number of tracks for every grid during the monthly survey will be used in the analysis.

Reporting format and process of submitting results to management

The mammal survey will be summarised in the annual report in the progress of monitoring submitted to the RMGC Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded. Where significant changes are recorded, the data will be presented in bullet or graphical form, as necessary. If the results show statistical significance, the statistical data will be replicated and interpreted. The implications of such results will be highlighted in bullet form as recommended management actions and/or follow-up research.

Resource allocation protocols

A survey will last up to 30 days in winter. This activity will require at least two people. Data recording and analysis will take 2 days of activity for the WMC researchers.

Necessary resources/equipment

The team will need access to binoculars, GPS and field/protective equipment. Maps and compass will also be necessary, as well as data sheets to be provided by WMC and RMGC.

Equipment maintenance or calibration

Equipment maintenance will be the responsibility of its owners.

SURVEY SHEET FOR WINTER TRACKING
Date:

Observer:

Grid Code	Snow	Snowfall

Sate of the snow cover	
State of the sky	

Point No.	Species	Number of tracks	Habitat code	Additional comments:

Incidental observations

Species	Number of records	Habitat code

Notes on filling out the data sheet

Grid Code:
Enter the grid code (e.g. grid No. 6)

Snow: Enter the visit number, one of three successive visits on the grid.

Day since snowfall: No. of days after the snowfall when the survey was conducted

State of the snow cover/sky Record the state of the sow cover (e.g. wet snow, dry snow, fresh snow) and the state of the sky (e.g. overcast, cloudy, slight snow).

Point No.: record the observation point on the map.

Species: record the name of the identified species along the observation path.

No. of individuals: Specify the number of tracks observed for each species.

Habitat code:
Use the following codes: 1 = young deciduous, 2 = young conifers, 3 = young mix, 4 = old deciduous, 5 = old conifers, 6 = old mix, 7 = riparian, 8= meadow, 9 = road/path.

Additional comments: Record the observations regarding the activity of the animal or any other relevant detail related to the observation

Incidental observations: In this field, record any other vertebrate or invertebrate species observed during the survey. In this field, record any other species than the target species observed on site. If possible, record the age, sex, and number of individuals as well as the place where the observation was made.

Rosia Montana Monitoring Protocol 7
Raptor Species

Priority?

Monitoring Questions:

Is the local biodiversity around the project site generally maintained?

***Indicator*:**

Raptor population

***Justification*:**

Several of the raptor species recorded in the area is classed as rare. Raptor species continue to be a target for hunters, shepherds and egg collectors throughout Romania.
As predator species, raptors provide an indication of the abundance of prey animals in the area, as determined by changes in the ecosystem.

Attributes:

Focus on breeding species.
Measured attributes include relative abundance and the number of raptor nests.

Sampling Protocols

6.1.1.1.1.1.1 Number of sites/ monitoring points

Data will be collected over several days/a week. Five different routes of about 1 day of walking will be defined (about 8 km).

6.1.1.1.1.1.2 Distribution and selection of monitoring sites/locations

Independent (not connected) routes (grids) will be distributed by key zones and habitats in the area around the mining sites. Randomisation methods will be used in determining the starting points of travel, but the existing paths will be followed.

6.1.1.1.1.1.3 Size of monitoring sites/locations:

The routes will be circular (or the raptor individuals will be counted in only one direction). The routes will be about 8 km long (abundance will be estimated for each km covered). The birds will be observed on distances of 250m from the observation points.

6.1.1.1.1.1.4 Specific point location/marking

The grids will be marked on the map. The same fixed routes will be used every year. The routes and the location of the monitoring points will be described in writing.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The observers will cover the indicated route at walking pace. The birds encountered on the way will be included in the survey. Counts will be conducted at fixed observation points marked on the map at intervals of about 1 km (about 40 minutes). The observers may reposition themselves at the next observation point to make the records, but they must stay in one point during the count at fixed points. The observers must record the visibility at each point (360, 180 or 90º). All the raptor individuals observed through the binoculars will be recorded. The observer will use their own judgement in determining the number of birds counted at every observation point. Counts at fixed points will be done for a period of 10 minutes after arriving at the observation point. Birds observed at a distance of more than 250m (where identification becomes less exact) will not be included in the survey. At every point, the information will be recorded on an appropriate data collection sheet. Chance observations of non-tracked raptors will also be recorded (roving or non-nesting species) as well as any incidental records of other key species.

Data collection forms

See Annex

Quality Assurance mechanisms and standardisation

All the involved personnel must be able to demonstrate basic raptor species identification skills based on a preliminary test. At least two people will be necessary for each grid, in order to confirm the identifications. Whenever possible, the same personnel will be used in monitoring every year. Field personnel will have to demonstrate map reading skills (personal fitness should also be considered). In hiring new personnel, observation point and protocol application will be demonstrated. Any unusual or unpredictable observations will be checked as soon as possible. The observers will be tested for distance assessment skills (and ability to distinguish between birds located <250m or farther)

Repeat monitoring frequency and scheduling

The studies will be conducted between 10 March and 10 June. The grids will not be covered on consecutive days. The surveys will be repeated on a monthly basis (March – June) every year.

Data management and analysis protocols

Data storage and information management

An Excel database will be developed to record the raptor bird observation and the "total number of individuals per km^2" or each target species, each grid covered every year of the survey (depending on the observation area (km^2)" defined for every count in fixed points performed. The WMC biologist will be in charge of data management, but high density raptor areas will be integrated in the GIS system. The data will remain the property of RMGC. Moreover, the data will be made available to the national databases. Backup data copies will be kept in a different system, at the WMC offices. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

The variables "individuals pet unit of search level of effort or km^2" for each species will be filled out for all the years of monitoring (each route covered every year is considered a separate variable, therefore an

ideal seven grids have to be considered – but may be reduced to four if absolutely necessary). Furthermore, "total raptors per unit of level of search effort" will also be considered. Conversion of the values to densities may be done using the entire investigated area (km^2) in order to estimate the densities on those areas. The data will be entered into statistical regression analysis software for at least four years of data collected. Moreover, the average number of individuals per km per year (for all grids) will be used in representing the data graphically, in an easily understandable format. A level of $p<0.05$ will be considered a significant relation over time.

Reporting format and process of submitting results to management

The raptor bird survey will be summarised in the annual report in the progress of monitoring submitted to the RMGC Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded. Where significant changes are recorded, the data will be presented in bullet or graphical form, as necessary. If the results show statistical significance, the statistical data will be replicated and interpreted. The implications of such results will be highlighted in bullet form as recommended management actions and/or follow-up research. Declining raptor populations will also be reported to the forestry directorates and hunter associations.

Resource allocation protocols

The surveys will be carried out by WMC biologists together with people from RMGC. Annually, 7 field days/month will be required (March-June) for the WMC biologists. The WMC biologists will be in charge of data processing, which will take 5 days a year. The WMC biologists will be responsible for planning and implementing the surveys.

Necessary resources/equipment

All the resources and equipment (e.g. binoculars, field guides, etc.) for the site survey will be made available by WMC for its biologists and by RMGC for its own personnel.

Equipment maintenance or calibration

The equipment will be in the responsibility of their owners.

Annex

Data collection protocols

The observers will cover the indicated route at a measured walking pace. The birds encountered on the way will be included in the survey. Counting at fixed points at half km intervals of route if they can be marked on the map (intervals of about 20 minutes). The observers may reposition themselves at the next observation point to make the records, but they must stay in one point during the count at fixed points. All the raptor individuals observed through the binoculars will be recorded. The observer will use their own judgement in determining the number of birds counted at every observation point. Counts at fixed points will be done for a period of 10 minutes after arriving at the observation point. Birds observed at a distance of more than half a km (where identification becomes less exact) will not be included in the survey. At every point, the information will be recorded on an appropriate data collection sheet. Chance observations of non-tracked raptors will also be recorded (roving or non-nesting species) as well as any incidental records of other key species (such as chamoix).

On the route map (see next page), mark the location of all the observation points (numbered from 1 to 16) if they are different from the marked observation points.

Name of the recorder and names of the observation team

Number of covered route (1-7):

Date: Approximate Temp. (ºC):

Weather conditions Wind speed (0-5):

Point 1,2,3…	Time: Habitat/vegetation (to confirm the marked point)
View ❑ 360º ? ❑ 180º ? ❑ 90º ?	No. of individuals oseved: *Chick* *Subad* *Ad.* *M* *F* *Tot* Species 1 Species 2 Species 3 …… Species "n" Total birds observed Behaviour

Other information

Birds observed over a radius of more than half a km
Notable habitat changes compared to the previous year?
Other key species observed?

Rosia Montana Monitoring Protocol 8
Nesting Birds

Priority?

Monitoring Questions:

Is the local biodiversity around the project area generally maintained?
How deeply will the birds living in the mining project impact area and around it be affected by the future activities?

***Indicator*:**

Populations of nesting birds

***Justification*:**

More than 60 nesting bird species registered in the area are listed in various annexes of the nature protection legislation in Europe and Romania. The birds are an excellent indicator of the changes of habitat and other impacts.

Attributes:

Focus on breeding species, especially passeriformes.
Measured attributes include relative abundance, densities and the presence/absence of certain species.

Sampling Protocols

Number of sites/ monitoring points

Seven grids.

Distribution and selection of monitoring sites/locations

A random stratified selection will be used, to include all the main types of habitats.

Size of monitoring sites/locations:

The routes will be linear, and about 3 km long.

Specific point location/marking

The grids will be marked on the map. The same fixed routes will be used every year. The routes and the location of the monitoring points will be described in writing. The start and end points will be marked on site by means of metal poles or coloured markings on trees.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The observers will cover a linear route on the specified selected days.
The grids will be covered as soon after sunrise as possible, avoiding he initial intense singing period.

The walking speed will depend on the number of birds present and on the difficulty of recording them all. In open habitats, a reasonable speed would be 2 km/hour. In more densely vegetated areas, with greater difficulty of recording all the birds, a reasonable speed will be twice slower. The observer speed will be standardised for every survey, to avoid the element of subjectivity in comparisons between years, observation sites of other data. (Bibby et al, 1992)
As passeriforme females are difficult to detect, only the “singing males” will be identified and an equal sex distribution will be assumed.
Distances will e estimated by corridor. Distance categories will be 0 -25 m 25-100 m and 100+.
The first two categories will be used in forest habitats and all three in open areas. Birds in flight will also be counted. Birds will be recorded on both sides of the grid, mentioning the side in the field notes.
A preliminary visit will be necessary to select the grids and describe the habitats in each section of the grid.

Data collection forms

See Annex

Quality Assurance mechanisms and standardisation

All the involved personnel must be able to demonstrate good visual and acoustic bird species identification skills based on a preliminary test. At least two people will be necessary for each grid, in order to confirm the identifications. Whenever possible, the same personnel will be used in monitoring every year.
Field personnel will have to demonstrate map reading skills (personal fitness should also be considered). In hiring new personnel, observation point and protocol application will be demonstrated. Any unusual or unpredictable observations will be checked as soon as possible.

Repeat monitoring frequency and scheduling

An initial visit will be required at the start (April-mid-May) and at the end (mid-May – June) in order to maximise the chance of recording local nesting individuals and late nesting migratory species.

Data management and analysis protocols

Data storage and information management

A nesting bird database will be designed. WMC will be responsible for the data management. The data will remain the property of RMGC. Moreover, the data will be made available to the national databases, by agreement between RMGC and WMC. Backup data copies will be kept in a different system, at the WMC offices. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

The *Distance 5.0* software will be used to determine the population densities of the observed birds.

Reporting format and process of submitting results to management

The nesting bird survey will be summarised in the annual report in the progress of monitoring submitted to the RMGC Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded. Where significant changes are recorded, the data will be presented in bullet or graphical form, as necessary. If the results show statistical significance, the statistical data will be replicated and interpreted. The implications of such results will be

highlighted in bullet form as recommended management actions and/or follow-up research. Declining raptor populations will also be reported to the forestry directorates and hunter associations.

Resource allocation protocols

The surveys will be carried out by WMC biologists together with people from RMGC. Annually, seven days will be required for the WMC biologists and the RMGC delegate, twice a year, in spring and early summer.
The WMC biologists will be in charge of data processing, which will take 4 days a year. The WMC biologists will be responsible for planning and implementing the surveys.

Necessary resources/equipment

All the resources and equipment (e.g. binoculars, field guides, etc.) for the site survey will be made available by WMC for its biologists and by RMGC for its own personnel.

Equipment maintenance or calibration

The equipment will be in the responsibility of their owners.

Field data sheet for the monitoring of nesting birds

Grid No….
Segment Nr …..
Habitat Code……..

Operator….
Time

Species	Corridors						
	0-25 m		25 – 100 m		100 +		In flight
	L	R	L	R	L	R	

Description of weather conditions

Rain/snow			Wind						Temperature	Fog density;			% cloud cover
H	M	L	0	1	2	3	4	5		H	M	L	

Rosia Montana Monitoring Protocol 9
Woodpeckers

Priority?

Monitoring Questions:

Is the forest and grove biodiversity around the project site generally maintained?

***Indicator*:**

Populations of woodpeckers

***Justification*:**

All the woodpecker species recorded in the area are classed as protected. Woodpeckers are affected by habitat loss in most of Romania, due to deforestation. Some species provide indications of changes in the forest or grove habitats.

Attributes:

Focus on breeding woodpeckers.
Measured attributes include relative abundance and densities.

Sampling Protocols

Number of sites/ monitoring points

Data will be collected over several days/a week. Ten different routes, seven in forest and grove habitats, three in orchards, gardens and wooded meadows of about 1 day of walking will be defined (about 8 km).

Distribution and selection of monitoring sites/locations

Independent (not connected) routes (grids) will be distributed by key zones and habitats in the forested area around the mining sites and other forests still standing on the mining site. The surveys will also include areas such as orchards, gardens and wooded meadows.

Size of monitoring sites/locations:

The routes will be linear. The routes will be about 8 km long (abundance will be estimated for each km covered). Fixed counting points will be established at every km. The birds will be observed on distances of 25-50m from the observation points in the forest and of 50-100 m in open areas.

Specific point location/marking

The grids will be marked on the map. The same fixed routes will be used every year. The routes and the location of the monitoring points will be described in writing.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The observers will cover the indicated route at walking pace. The birds encountered on the way will be included in the survey. Counts will be conducted at fixed observation points marked on the map at intervals of about 1 km (about 40 minutes). The observers may reposition themselves at the next observation point to make the records, but they must stay in one point during the count at fixed points. The observers must record the visibility at each point (360, 180 or 90º). All the woodpecker individuals observed through the binoculars will be recorded. All vocalisations, calls and pecking associated to a certain species will be considered viable data. The observer will use their own judgement in determining the number of birds observed/heard at every observation point. Counts at fixed points will be done for a period of 10 minutes after arriving at the observation point. Birds observed at a distance longer than the one established under this protocol (where identification becomes less exact) will not be included in the survey. At every point, the information will be recorded on an appropriate data collection sheet.

Data collection forms

See Annex

Quality Assurance mechanisms and standardisation

All the involved personnel must be able to demonstrate good visual and acoustic woodpecker species identification skills (including by pecking noise) based on a preliminary test. At least two people will be necessary for each grid, in order to confirm the identifications. Whenever possible, the same personnel will be used in monitoring every year.
Field personnel will have to demonstrate map reading skills (personal fitness should also be considered).
In hiring new personnel, observation point and protocol application will be demonstrated. Any unusual or unpredictable observations will be checked as soon as possible.

Repeat monitoring frequency and scheduling

The studies will be conducted between 10 March and 10 June. The surveys will be repeated on a monthly basis (March – June) every year.

Data management and analysis protocols

Data storage and information management

An Excel database will be developed to record the woodpecker observation and the "total number of individuals per km^2" or each target species, each grid covered every year of the survey (depending on the observation area (km^2)" defined for every count in fixed points performed. The WMC biologist will be in charge of data management, but high density woodpecker areas will be integrated in the GIS system. The data will remain the property of RMGC. Moreover, the data will be made available to the national databases. Backup data copies will be kept in a different system, at the WMC offices. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

The variables "individuals pet unit of search level of effort or km^2" for each species will be filled out for all the years of monitoring (each route covered every year is considered a separate variable, therefore an ideal seven grids have to be considered – but may be reduced to four if absolutely necessary). Furthermore, "total woodpeckers per unit of level of search effort" will also be considered. Conversion of the values to densities may be done using the entire investigated area (km^2) in order to estimate the densities on those areas. The data will be entered into statistical regression analysis software for at least four years of data collected. Moreover, the average number of individuals per km per year (for all grids)

will be used in representing the data graphically, in an easily understandable format. A level of $p<0.05$ will be considered a significant relation over time.

Reporting format and process of submitting results to management

The woodpecker survey will be summarised in the annual report in the progress of monitoring submitted to the RMGC Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded. Where significant changes are recorded, the data will be presented in bullet or graphical form, as necessary. If the results show statistical significance, the statistical data will be replicated and interpreted. The implications of such results will be highlighted in bullet form as recommended management actions and/or follow-up research. Declining woodpecker populations will also be reported to the forestry directorates and hunter associations.

Resource allocation protocols

The surveys will be carried out by WMC biologists together with people from RMGC. Annually, ten field days/month will be required (March-June) for the WMC biologists. The WMC biologists will be in charge of data processing, which will take 5 days a year. The WMC biologists will be responsible for planning and implementing the surveys.

Necessary resources/equipment

All the resources and equipment (e.g. binoculars, field guides, etc.) for the site survey will be made available by WMC for its biologists and by RMGC for its own personnel.

Equipment maintenance or calibration

The equipment will be in the responsibility of their owners.

Annex

Data collection protocols

The observers will cover the indicated route at a measured walking pace. The birds encountered on the way will be included in the survey. Counting at fixed points at 1 km intervals of route if they can be marked on the map (intervals of about 40 minutes). The observers may reposition themselves at the next observation point to make the records, byt they must stay in one point during the count at fixed points. All the woodpecker individuals observed through the binoculars will be recorded. Characteristic sounds made by the woodpeckers will be considered valuable data. The observer will use their own judgement in determining the number of birds counted at every observation point. Counts at fixed points will be done for a period of 10 minutes after arriving at the observation point. Birds observed at a distance of more than that where identification becomes less exact will not be included in the survey. At every point, the information will be recorded on an appropriate data collection sheet. Anecdotic observations of non-targeted woodpeckers will also be recorded as well as any incidental records of other key species.

On the route map (see next page), mark the location of all the observation points.
Name of the recorder and names of the observation team

Number of covered route (1-10):

Date: Approximate Temp. (ºC):

Weather conditions Wind speed (0-5):

Point 1,2,3… View ❑ 360º ? ❑ 180º ? ❑ 90º ?	Time: Habitat/vegetation (to confirm the marked point) No. of individuals oseved: *Chick* *Subad* *Ad.* *M* *F* *Tot* Species 1 Species 2 Species 3 …… Species “n” Total birds observed Behaviour

Other information

Birds observed over a radius of more than 1 km
Notable habitat changes compared to the previous year?
Other key species observed?

Rosia Montana Monitoring Protocol 10
Bird and River Monitoring

Monitoring Questions:

Is the local biodiversity maintained in general?
Do mining activities have a negative impact on the birds adapted to the river resources?

Indicator:

Grey wagtail (*Motacilla cinerea*), white wagtail (*Motacila alba*).

***Justification*:**

Wagtail food resources, especially of the grey wagtail, will depend on the water quality and the density variation of these species may be correlated to this parameter. During the public hearings some concerns were voiced in regard to severe cyanide pollution.

Attributes:

Measured attributes include relative abundance ad densities of the indicator species per km.

Sampling Protocols

Number of sites/ monitoring points

Five grids.

Distribution and selection of monitoring sites/locations

The last 6 km of the Corna and Rosia Valleys and three segments of the Abrud River: one 6 km upstream of the confluence of the Corna and Abrud, one between the confluences of The Rosia and the Corna with the Abrud, and one 6 km downstream of the Corna confluence.

Size of monitoring sites/locations:

Five grids, 6 km each.

Specific point location/marking

The grids will be marked on the map. The same fixed routes will be used every year. The routes and the location of the main monitoring points will be described in writing. Both ends will be marked on site.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The observers will cover a route along the river banks. All the birds observed on the river and banks must be counted and recorded. Data on the bird sex, breeding behaviour, age group (chicks, first summer, etc.) will be recorded. For each segment, habitat data will be noted.

Data collection forms

The observed data for each grid will be recorded in the field notebook.

Quality Assurance mechanisms and standardisation

All the involved personnel must be able to identify key species based on a preliminary test. Whenever possible, the same personnel will be used in monitoring every year. In hiring new personnel, observation point and protocol application will be demonstrated.

Repeat monitoring frequency and scheduling

Ideally, the surveys will be conducted twice a year at the start (April – mid-May) and end (mid-May – June) of each season.

The grids will be surveyed by the WMC biologists for five days and by the RMGC delegates twice / spring – early summer.

Data management and analysis protocols

Data storage and information management

A river/bird database will be designed. WMC will be responsible for the data management. RMGC will retain ownership of this data, but they will be made available to the national monitoring programs and to the scientific community based on WMC and RMGC decision. Backup data copies will be kept in a different system. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

The number of observed birds may be used as a simple relative index of the population size. Also, using the relative abundance per km index and distance calculation techniques, the relative abundance and density may be assessed.

Reporting format and process of submitting results to management

The river survey will be summarised in the annual report in the progress of monitoring submitted to the Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded. Where significant changes are recorded, the data will be presented in bullet or graphical form, as necessary. If the results show statistical significance, the statistical data will be replicated and interpreted. The implications of such results will be highlighted in bullet form as recommended management actions and/or follow-up research. If no population decline is observed, then the hunters; associations and forestry directorates will be notified.

Resource allocation protocols

Number of necessary personnel, roles and training thereof

The survey will be carried out by WMC biologists together with one person from RMGC. Annually, a maximum 10 days for the WMC biologist and RMGC delegate. The WMC biologists will be in charge of data processing, which will take 2 days a year. The WMC biologists will be responsible for planning and implementing the surveys.

Necessary resources/equipment

Binoculars, maps, compass, field guide, etc. to be provided by WMC and RMGC for its delegate.

Equipment maintenance or calibration

The equipment will be in the responsibility of their owners.

Roşia Montană Monitoring Protocol 11
Swifts

Priority?

Monitoring Questions:

Is the local biodiversity in the protected old architectural site generally maintained? Is the new village populated with the anthropofile species?

***Indicator*:**

The swift population

***Justification*:**

Swifts are wide ranging summer visitors in most of Europe, which covers less than half of their breeding territory.
The nesting population in Europe is large, but has declined over a large part of the European range – including among considerable populations in Turkey, France and Germany – and probably underwent moderate decline overall (>10%). Therefore, this formerly non-problematic species is currently assessed as declining. No national monitoring scheme has been developed for Romania, but specialists consider the population to be stable. Rosia Montana hosts an important population, of a few hundred nests in the older part of the settlement.

Attributes:

Focus on swift nests in the old part of Rosia Montana.
Measured attributes should refer to the absolute abundance of viable nests in the old village and absolute abundance of viable nests in the new village.

Sampling Protocols

Number of sites/ monitoring points

All the houses in the old and new settlements will be studies during the following breeding season, or in the first breeding season after new village construction. All the houses with more than 3 nests will be surveyed on an annual basis.

Distribution and selection of monitoring sites/locations

The houses will be selected based on the number of viable nests.

Size of monitoring sites/locations:

All the houses with more than 3 nests will be surveyed.

Specific point location/marking

The selected houses will be marked on the map.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The number of viable nests will be collected. The collected information will include the number of chicks, but this should not involve nest destruction.
A photographic survey may be designed.

Data collection forms

See Annex

Quality Assurance mechanisms and standardisation

All the involved personnel must be able to demonstrate basic raptor species identification skills based on a preliminary test. This type of survey will involve at least two people. In hiring new personnel, observation point and protocol application will be demonstrated.

Repeat monitoring frequency and scheduling

The studies will be conducted annually, between 10 May and 10 June.

Data management and analysis protocols

Data storage and information management

An excel database will be designed for swifts, specifying the nest/colony location (house no., GPS coordinates) the number of viable nests, other information (e.g. number of adults, threats, disturbance).

The data will remain the property of RMGC. Moreover, the data will be made available to the national databases. Backup data copies will be kept in a different system, at the WMC offices. The original data sheets will also be kept.

Data analysis procedures and details on the statistical methods

The number of viable nests will be the variable.

Data regarding presence/absence will be used in evaluating house use. The number of observed colonies will be averaged at every location and every year and any changes will be used in assessing the potential population changes (note, however, that these are considered to be a poor predictor for population change).

The data will be entered into statistical regression analysis software for at least four years of data collected. Moreover, the average number of nests/colony will be used in representing the data graphically, in an easily understandable format. A level of $p<0.05$ will be considered a significant relation over time.

Reporting format and process of submitting results to management

The swift survey will be summarised in the annual report in the progress of monitoring submitted to the RMGC Environmental Manager. If no significant change is detected, this will be stated as such. Any problems related to survey accuracy will also be recorded.

If no swift colony will take residence in the new village, RMGC **w**ill support an artificial nest building program to start 3 years after construction.

Resource allocation protocols

The surveys will be carried out by WMC biologists together with people from RMGC. Annually, six field days will be required for the WMC biologists. The WMC biologists will be in charge of data processing, which will take 2 days a year. The WMC biologists will be responsible for planning and implementing the surveys.

Necessary resources/equipment

All the resources and equipment (e.g. binoculars, field guides, etc.) for the site survey will be made available by WMC for its biologists and by RMGC for its own personnel.

Equipment maintenance or calibration

The equipment will be in the responsibility of their owners.

Annex

Data collection protocol

Swift nest monitoring

Weather conditions:

House no. GPS coordinates	No of colonies/ house	No of nests/ colony	No of viable nests/ colony	No. of chicks/colony	Average chicks/ colony	Threats

Rosia Montana Monitoring Protocol 12
Amphibian Monitoring

Priority?

Monitoring Questions:

Are populations and amphibian species distribution maintained in the area around the Project site and in the residual ponds of the mining site?

Measure/ Indicator:

Amphibian and species, relative abundance of each species

Justification:

Amphibians are sensitive to changes in the terrestrial and aquatic habitats. This group are protected at the European level. Changes of population size may indicate habitat deterioration.

Attributes:

species composition, relative abundance:

Sampling Protocols

Number of sites/ monitoring points

During the first year of monitoring, the pond areas will first be defined on the map. This will mean mapping all the permanent ponds and areas where semi-permanent ponds may be formed. These areas will be checked during the breeding season in order to identify what areas are currently used by the amphibian species. Once the potential amphibian areas have been identified, a number of up to 15 representative ponds will be selected as a long term monitoring basis.

Distribution and selection of monitoring sites/locations

Based on the baseline study, the most representative permanent and semi-permanent ponds will be selected. The survey will include ponds in various areas of the site.

Size of monitoring sites/locations:

All the representative and semi-permanent ponds will be looked for. A maximum 15 will be used in long-term monitoring.

Specific point location/marking

GPS and map records will be made for each permanent and semi-permanent pond to help re-identify it in future years. Directions to reach each of these sites will be included.

Data collection protocols

Detailed information on the data collected on site and how they will be collected

The location of each permanent/semi-permanent pond will be checked during the daytime and its position will be confirmed. Pond size will be estimated (diameter and circumference) and recorded together with the surrounding habitat and any sign of disturbance. Frogs, toads and newts observed in the daytime will be identified and counted (best during the breeding season). Any trace of eggs and the number of egg clusters (egg sacs) will be recorded (these are visible during the mating season, but occur in maximum number at the end of the breeding season). Repeat visits will be considered during the daytime at various stages of the mating season. The circumference of each pond will be walked in search of adult frog individuals at the water side, or migrating between ponds. These will be recorded by species.

Data collection forms

Quality Assurance mechanisms and standardisation

Identification of amphibian species and any confusion will have to be checked by personnel training. A sufficiently slow searching pace must be standardised. If other salamander species are found in the same area, a revision may be necessary to confirm identification and capturing techniques will be used (this will require training, and regular inspection of the traps, to avoid deaths).

Repeat monitoring frequency and scheduling

Salamander populations are typically best assessed during the mating and post-mating season. The survey must be repeated on an annual basis.

Data management and analysis protocols

Data storage and information management

Data regarding the position of amphibian ponds will be kept confidential (in case of risk of stirring collectors' interest). The GIS system will be updated to track past and present records of salamander distribution. The locations and numbers of individuals will be entered in the computer. The computerised records will be stored in backup copies and the original data sheets will also be preserved.

Data analysis procedures and details on the statistical methods

Wherever necessary, the density of the observed salamanders at different locations will be calculated based on the surveyed area (area visible in the torch light range). Density in these ponds may be monitored over time, and trends may be established. Moreover, the total number of amphibians observed and the number of ponds occupied over time will also be recorded and the negative trends identified.

For frogs, data regarding presence/absence will be used in evaluating pond use. The number of egg sacs will be averaged at every location and every year and any changes will be used in assessing the potential population changes (note, however, that these are considered to be a poor predictor for population change). The number of adult frogs observed during a standardised survey will be used in analysing the changes of population over a string of years.

Reporting format and process of submitting results to management

Reports will be short and include bullet points and graphical information that might document adequate action taken by the environmental management.

Resource allocation protocols

Number of necessary personnel, roles and training thereof
The WMC specialist will require 10 days in early spring for the mapping of all the suitable monitoring sites.

Annually, 10 days/year will be required for the survey of the ponds selected for monitoring.
Data entry and analysis will require a further 3 days a year.

Necessary resources/equipment

GPS, torches, vehicle, and adequate field kit. Transport to the site and equipment for the RMGC personnel will be provided by RMGC.

Equipment maintenance or calibration

WMC and RMGC will be responsible for their respective equipment.

Amphibian Monitoring Data Sheet

Date:	Start:	End:	Observer(s):	
Locality:	Place name:		County:	Geogr. (GPS) coordinates:
Land survey map:	Scale:	Lat:	Long:	Elev.:	Attachments:
Was all the area investigated? Yes ….. No	If not, please indicate: m from bank; m^2 of habitat			

Amphibian and reptile species	Adult M	Adult F	Juv. M	Juv. F	Vocalisations	Larvae	Clutch	Methods used 1. Visual 2. Acoustic 3. Hoop net 4.Traps 5. Manual collection
					Yes No			1. 2. 3. 4. 5.
					Yes No			1. 2. 3. 4. 5.
					Yes No			1. 2. 3. 4. 5.
					Yes No			1. 2. 3. 4. 5.
					Yes No			1. 2. 3. 4. 5.
					Yes No			1. 2. 3. 4. 5.
					Yes No			1. 2. 3. 4. 5.

Other animals present:	
	Insects:
	Fish:
	Reptiles:
	Birds:
	Mammals:

Physical-chemical characteristics of the investigated area (please use the remaining space for additional measurements):

Weather: Clear, Rain, Sleet Fog Snow, Clouds(%):			Wind: Gentle Strong Absent
Air temperature (^oC):	Water temperature (^oC):	% ice cover	Turbidity: Clear Murky
pH:	Conductivity:	Alkalinity:	Water colour:

Description of the habitat and of the surrounding area – consider the area of relevance to the study of amphibian populations.

Ecosystem: Aquatic Terrestrial	Origin: Natural Man-made	Habitat: Temporary Permanent	Drainage: Permanent Occasional Absent
Description: Lake Pond Puddle Canal Ditch Forest Reeds Scrubland Meadow Hay meadow Ecoton Swamp Mere Stream Other: …….		Substrate/Soil: Caly/Silt Sand Gravel Litter Other:	Exposure: Slope (%): Shaded (%):
Length (m):	Width (m):	Perimeter (m):	Maximum Depth: <1 m 1-2 m >2 m

Vegetation in and around the pond:			
% veg. cover on the bank: % grassy: % woody:	% veg. cover of the water surface: % algae: % macrophytes:	% veg. outside the pond 25m): % grassy: % woody:	submerged veg. % algae: % macrophytes:
Characteristics of the northern bank: Shallow areas: Yes No Emergent vegetation: Yes ….. No			
Description of surrounding area: forest scrubland rushes meadow hay meadow cliff debris farmland other:			
Main plant species:			Distance to the forest edge (m):
Human impact: Human settlements Industry Crops Fisheries Livestock Forest plantations Roads Canals Waste Other:			

Observations regarding the micro-habitat (description, outline, etc.):