TABLE OF CONTENTS **PAGES**

TABLE OF CONTENTS **PAGES**

LIST OF ACRONYMS

FFI	Fauna & Flora International
EPA	Environment Protection Agency, Guyana
GMTCS	Guyana Marine Turtle Conservation Society
PA	Protected Area
TG	Tiffany Gricks
SN	Shyam Nokta
RL	Ramesh Lilwah
DrR	Dr Ramdass
WP	Waldyke Prince
APA	Amerindian People's Association
CI	Conservation International
CDC	Community Development Council
CRI	Chelonian Research Institute
CEW	Community Environmental Worker
CREP	Caribbean Regional Environment Programme
DEMTOCO	Demerara Tobacco Company
EPA	Environmental Protection Agency
GFC	Guyana Forestry Commission
GGMC	Guyana Geology and Mines Commission
GOIP	Guyana Organisation of Indigenous Peoples
IUCN	International Union for the Conservation of Nature
MOAA	Ministry of Amerindian Affairs
NPC	National Parks Commission
PA	Protected Area
PAS	Protected Area System
RDC	Regional Democratic Council
SB	Shell Beach
TAAMOG	The Amerindian Action Movement of Guyana
WWF	World Wildlife Fund

1. OVERVIEW OF WORKSHOP

This workshop is one in a series of workshops delivered jointly by the Environmental Protection Agency, Guyana (EPA), and Fauna & Flora International, as part of a Darwin funded project. This project is supporting the EPA in developing the Protected Area system in Guyana, using the Shell Beach area as a case study, through a series of training and support activities.

At this stage in the project, the Shell Beach area is being considered as a potential Protected Area. Justification for the gazettement (legal establishment), and management of a Protected Area requires the availability of scientifically collected biological data. Therefore, it is now necessary to undertake this type of assessment at Shell Beach.

A technical team of biologists will be carrying out surveys of the biodiversity of Shell Beach in the months following this workshop. However both the time and resources available are limited for this survey. This workshop was therefore designed to support the technical team and management team in designing and delivering an appropriate survey. This workshop took the team through a process to plan the survey with the assistance of local stakeholders in the decision-making processes. The presence of local stakeholders, and other stakeholders (from EPA, GMTCS, local communities) at the workshop also enabled a wider group of people to become familiar with the project, the need for scientific biodiversity surveys, and to gain a background on general survey issues.

At the workshop, the participants drafted aspects of the survey plan and discussed management issues. These decisions are recorded in this document, as well as recommendations from the facilitator on how to use these decisions in the upcoming survey.

2. WORKSHOP DETAILS

2.1. Title

Planning for Biodiversity Rapid Assessment -A focus on Shell Beach

2.2. Dates

15th and 16th April 2004

2.3. Workshop Aims

- To draft a plan to manage and implement the rapid assessment of Shell Beach
- To increase the confidence of participants in developing and managing rapid assessments.
- For participants to learn about adapting protocols (survey methods) for rapid assessments, and mangroves

2.4. Planned outputs / outcomes

Specific outputs for the Shell Beach survey:

- Draft aim statement
- Literature review
- Draft prioritisation of information gaps
- Draft objectives

Specific outcomes for the technical team

- Increased confidence in designing rapid biological surveys
- Greater understanding of issues relating to managing of surveys (development process, budget, work plan, resource needs etc)
- Increased confidence in choosing, and adapting survey methods for rapid biological assessment and mangal habitats

Specific outcomes for all the participants

- Improved understanding of the need for scientific biological survey in potential PAs.
- Improved understanding of the methods used in biodiversity surveys.
- Improved understanding of the process undertaken when designing surveys.
- General understanding of how to design a monitoring programme

2.5. Invitees and attendance

No.	Name	Organisation	Day 1	Day 2	Field visit
1	Dr Indarjit Ramdass	EPA	✓		
2	Ramesh Lilwah	EPA	✓	✓	
3	Richard Persaud	EPA	✓	✓	✓
4	Andrea Mahammed	EPA	✓	✓	
5	Pratima Doodnauth	EPA	✓	✓	
6	Waldyke Prince	EPA technical team leader	✓	✓	✓
7	Romeo de Frietas	EPA technical team /GMTCS	✓	✓	✓
8	Jackie Arjoon	EPA technical team	✓	✓	✓
9	Michel Patterson	EPA technical team	✓	✓	
10	Cathie Prince	EPA technical team	✓	✓	
11	Norman Whitaker	Regional Chairman Region 1	✓	✓	
12	Arnold Benjamin	Community Representative	✓	✓	✓
13	Annette Arjoon	GMTCS	✓	✓	
14	Aliesha Narain	GMTCS	✓	✓	
15	Shyam Nokta	FFI	✓	✓	
16	Tiffany Gricks	FFI	✓	✓	✓

2.6. Programme

Day 1

Session 1 Introductions

(SN, RL, TG, IR)

Session 2 The need for the rapid assessment at Shell Beach

2.1 Introduction to rapid biodiversity assessments (TG)
2.2 Framework for developing rapid assessments (TG)
2.3 Issues raised by participants
2.4 Group exercise 1 –setting your aim
2.5 Identifying the existing literature on Shell Beach
2.6 Group exercise 2 –identifying gaps in information

Session 3 Setting priorities and Objectives

3.1 Group exercise 3 –constraints and opportunities
3.2 Setting priorities
3.3 Group exercise 4 –setting priorities
3.4 Writing objectives
3.5 Group exercise 5 –writing objectives

Day 2

Session 4 Setting protocols for rapid biodiversity assessments

4.1 Introduction to biodiversity data collection
4.2 Bird surveys
4.3 Amphibian and reptiles surveys
4.4 Mammal surveys
4.5 Fish surveys
4.6 Habitat classification

Session 5 Managing surveys

5.1 Developing a work plan
5.2 Budget preparation

Session 6 Introduction to monitoring programmes

3. WORKSHOP SUMMARY

Session 1 Introduction

Introductions by

- Shyam Nokta (FFI –In Country Officer)
- Ramesh Lilwah (EPA –workshop chairman)
- Tiffany Gricks (FFI –workshop facilitator)
- Dr Ramdas (EPA –Director of Protected Areas)

Session 2 The need for the rapid assessment of Shell Beach

2.1 Introductions to rapid biodiversity assessments

Where does a rapid biological assessment generally fit into the development of a protected area?

Protected Area status	Information on biodiversity
Area unprotected	Local knowledge of species presences, and distribution Adhoc data collection by scientists
Area identified as potential protected area	*Rapid assessment carried out (with variety of possible aims)*
Area gazetted as protected area	Baseline survey (to feed into management plan and monitoring programme)
Management plan developed	Adapted according to information from ongoing monitoring programme

There are no 'off the shelf' guidelines or technologies to rapid assessments

Techniques for assessment and monitoring are varied, and for whole ecosystems they are almost non-existent.

What and how to survey must be determined according to the local situation, constraints and opportunities.

However it is important not to reinvent the wheel –this applies for existing information on an area, existing survey techniques, and bearing in mind future monitoring.

Rapid assessments are most useful in information poor areas. For well-studied landscapes, it is possible to use sophisticated conservation tools (e.g. gap analysis, single species assessments etc)

In this workshop I will take you through a structured process to develop a survey. You may feel that already be experienced in designing surveys. In this case, I hope that by going through this structured process, you will become more conscious of the

decisions you are making at every stage of your survey design (therefore be better at adapting your survey, and communicating your decisions to others).

I also hope you will see from the process of designing this survey, that you can use the same process to design a systematic rapid or baseline survey of any area.

Some of the following characteristic defines a rapid assessment:

Speed This is often a requirement because basic site information is needed; before a site is altered/damaged, for informing decision makers that an area is worth protecting, or managing, because costs are limited etc.

Careful Planning Careful planning in the beginning saves both money and time.

Different levels of assessments Rapid assessments are often undertake at the landscape level, (through habitat mapping, remote sensing), and species level (through field surveys)

Scientific documentation Classification, sampling, and survey methods are all developed and refined to help carry out biodiversity assessments in a short period of time.

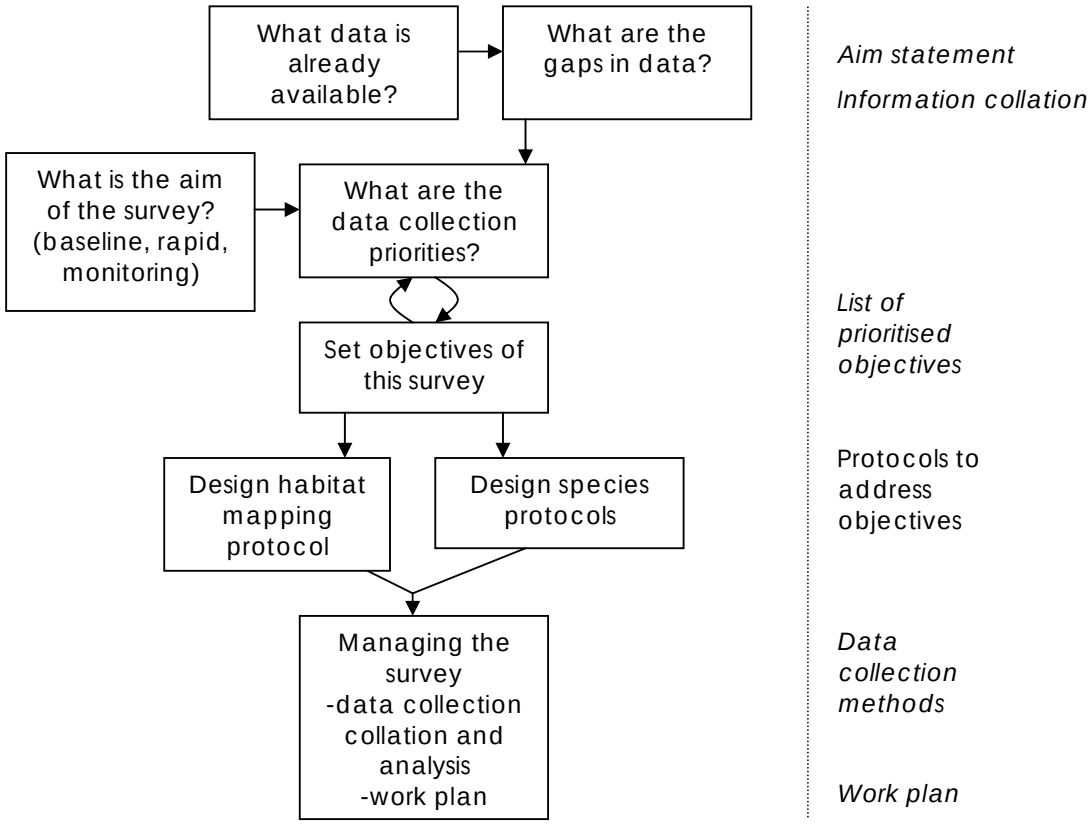
Use of local experts/capacity building Some methodologies take account of local capacity, and work with local partners to undertake surveys, or train local partners in survey techniques.

The following are some internationally recognised methods of rapid assessments

REA (Rapid Ecological Assessments) the Nature Conservancy –Relies on remote imagery interpretation to delineate landscape level biodiversity features, which are then characterized and samples for species-level elements of biodiversity. This builds local capacity to carry out survey.
RAP (Rapid Assessment Programme) Conservation International –Simple, very rapid approach, based on multidisciplinary team of renowned experts who conduct surveys at predetermined locations and write up their list-orientated results with conservation recommendations.
BioRaps Used extensively in Australia. Computer intensive methodology the employs complex spatial modelling software, and derives several environmental and biodiversity data sets, which are then analysed to select priority sites for conservation.
Taxonomic minimisation (Beattie and Oliver 1994) is a survey approach that emphasizes the use of taxonomic ranks instead of species identification. Also this is not taxonomically 'resolved' method, it can be more rapid, and less expensive.
ATBI (All Taxa Biodiversity Inventory, Janzen and Hallwachs 1994) a species level inventory of a large site. Based on 'parataxonomy', in which technicians are trained to collect and prepare specimens for formal taxonomic analysis.
Most of these assessment techniques require you to have greater time and resources than is available here; therefore we are going to need to develop our own

plans. However, you may find these systems useful references points when designing more in-depth studies here or elsewhere.

2.2 Framework for developing biological assessments



2.3 Issues raised by participants:

Norman Whitaker, and others raised the question of the involvement of people in the project, both in terms of addressing peoples opinions on the project, including them in the process, and using their knowledge about the biodiversity in the area.

> Points following discussions: Project -Local people are integrated at all stages and levels of the Darwin project. This survey -Information on people and resources use in the area will be addressed in a survey at some time this year, but this survey will be concentrating on collecting biological information. This may involve using the local knowledge on what species are present, and perhaps involve the employment of local people as non-technical members of the survey team.

2.4 Group exercise one –Setting your aim

It is helpful in planning your survey to have an aim written down but this is not a requirement.

The aim (and objectives) is important,

- keeps your survey on track
- will ensure that everyone involved in the planning of the survey is working towards the same goal.

Things to think about for your aim:

- why you are doing your survey and therefore what type of assessment you are doing?
- are you going to focus on any particular issues?
- what geographical area are you are going to tackle
- consider writing so that it can be used as a 'statement of intent' for awareness raising (i.e. try to write it without too much 'jargon')

Aim statement examples (real):

'to conduct an initial assessment of biodiversity of the Golden Stream Corridor, Belize, concentrating on threatened species and indicator taxa, their geographical distribution, to provide key biological information for conservation management'

'to conduct a baseline survey of Piatra Craiului National Park, Romania, to inform the development of the protected area management plan and biodiversity monitoring programme'

Summary of group results

Three groups presented back their aim statements –

1.To collect and assess biodiversity information on Shell Beach for decision making for the development of a protected area.

2. To conduct an initial assessment of eco-system and geographic distribution of bio-diversity for the development of Moruka-Shell-Beach –Waini areas as a Protected area.

3. To conduct a Rapid Biological Assessment of Shell Beach to compliment existing biological data and generate additional info on taxa and eco-system, that will be used to support the Justification of shell beach as a protected area.

Discussions of the specific wordings of these aims as a whole group lead to the agreement on the following aim:

Aim: To conduct a systematic survey of the ecosystems and key species in the Shell Beach area, in order to inform the protected area decision making process

2.5 Identifying the existing literature on Shell Beach biodiversity

It is important before planning methodologies, to research all the work that has been done in the area to date. Time and resources are always limited; therefore we want to make sure that:

- the survey is not replicating existing information
- that we are making use of existing information (for example tried and tested methods, knowledge of species present, and their distribution, understanding the vital areas to survey)
- that we are including this information in our final report (if it contributes to the aim)

Potential types of information

- Maps of the area -any would be good, however basic, or complicated. - consider looking for ones with human use, habitats, topography, geology, river systems
- Any records or information on current/ past management in the area
- Any records or information on species/ habitat information (e.g. books, scientific literature, student projects, local knowledge)
- Any species lists made by ecotourism operators (e.g. Wings in the USA, Ornit holidays in the UK)
- Any reports on fish species by FAO, or national bodies on the general area.
- Info on museum specimens collected from the area (historical information, but may be useful), including specimens not on display.
- Aerial photos, remote sensed data.

Presentation by Waldyke Prince outlined the following literature currently available on the Shell Beach area:

- Report of Shore-birds Survey on Almond Beach (1997) – Waldyke Prince et al
- A Preliminary Survey of the Herpetofauna of Luri Beach, Shell Beach (2001) – Michelle Kalamadeen
- General Report for GMTCS for time at Almond Beach (June 23-July 11, 2001) – Geer This report includes faunal data that was collected before by Wiltshire Hinds & David Finch, and other researchers.
- The draft Shell Beach Protected Area Situation Analysis (2003) – WWF team of consultants
- Community NGO Partnership – developing Eco-tourism as a Conservation Management Tool (2003) – Jemima Roberts
- Financial Feasibility Assessment for Tourism Development at Shell Beach (2002) – Jemima Roberts
- The Socio-economic Impact of closed season on residents of Almond Beach (2002) – Imran Khan
- Interviews conducted at Shell Beach (2002) – Imran Khan
- Social Survey of Almond Beach (2002) – Michael Oliver

In the subsequent discussion and exercises, the following sources of information on Shell Beach were also identified:

- Aerial photographs (although uncertainty over rights of EPA to these)
- Basic topography maps
- Basic ecosystem and soil maps

2.6 Group exercise 2 - Identifying gaps in information

In groups the participants brainstormed all the possible types of information that could contribute to the aim. This ensures that we consider everything at this stage. The results of this group session are given in session 3, therefore are not repeated here.

Session 3 Setting priorities and objectives

3.1 Group exercise 3 –Constraints and opportunities

As a whole group, the workshop brainstormed the constraints and opportunities of the survey. It is often necessary to do this when working in a group like this, as it ensures that everyone is aware of the practical limits to the survey, and also to ensure that you are taking advantage of any opportunities when developing the protocols.

Results of the opportunities and constraints brainstorm are shown in the table below

Opportunities	**Constraints**
Existing reports on butterflies	Time –Project has to be completed in 3 months.
People have a wide knowledge base on the area	Cost
Ability to use GIS spatial analysis	Technical staff limited: Insects, Mammals Fish, Birds, Plants, Bats.
Aerial photographs (possible)	Area
Photos	Access/communication
Smithsonian Information	Logistics
Stakeholder representation	Limited statistical experience
Management system	Limited equipment

How do you overcome the constraints?

Prioritise surveys carefully, adapt protocols to make them simple and realistic, and put in place contingency plans for when things go wrong!

3.2 Setting priorities

Why set priorities?

Limited time and resources mean that only a certain amount of what you would like to do, can actually be done. Setting priorities here will have two main uses:

- Informing decisions on what to survey this time, and what to leave out
- Inform decisions if the survey needs to be adapted once it has been started (in the case of increased or decreased resources)

When setting priorities –

Be realistic about what you can achieve

If resources or personnel are limited you may be able to do less than you wish, therefore concentrate on the most important targets only

Try to remember your aim –why are you doing this survey –what do you want the end result to show, and to whom?

3.3 Group exercise 4 –Setting priorities

The groups used the gaps in information they identified in the first session, to priorities the information that should be collected for this survey. The top priority data gaps identified were:

- Wildlife Harvesting
- Migration routes
- Mammals
- Fishes
- Amphibians & Reptiles
- Birds
- Habitat types (including vegetation)
- Soils
- Water Quality
- Rainfall
- Water level/drainage patterns
- Local cultures/languages

Other gaps identified for future work were (note, many of these should be considered for the social survey):

Habitat zoning
Natural resources reserve
Soil type -geomorphology
Mineral resources
Meteorological data, Climate El Nino
Info on type of Agricultural crops, Agricultural systems
Drainage and River flows
Microorganisms
Invasive foreign species
Non-timber products
Fungi
Surveys of extracting businesses e.g. gold mining
Economic activities
Social data – cultural languages, local names of flora and fauna, indigenous tribes
Demographics
Seasonal variation of bio-div
Transient resources
Wildlife harvesters
Coastal Zone Dynamics e.g. erosion, accretion tides
Fishing activities.
Topography
Cultural Anthropology –sacred sites
Patterns of movement
Land tenure – land ownership, hunting grounds, land use zones.
Infrastructure –roads
Demography
Main farming areas
fishing areas
Hunting areas
Minerals
Migration routes/seasonal movement of fauna

3.4 Writing objectives

There are many survey techniques to choose from when designing a survey. The technique you choose depends on the 'question' you are asking. The objective sets the 'question'. Furthermore, by ensuring your survey technique fulfils the objective you can be sure to achieve the overall aim of the project.

Other reasons to set objectives:

- So that all the surveyors understand why they are doing their survey, and how it relates to the overall aim of the project.
- So that the project manager, and surveyor are thinking along common lines (important in case of changes in protocol etc).

Remember:

- Objectives are focussed on outcomes not actions classify
- All objectives must contribute to achieving the aim.
- The sum of the objectives must achieve the aim.

What is a **SMART** objective?

Specific –they should provide a clear target –not just express a vague wish

Measurable –it should be possible to measure and proves if they have been achieved

Adjustable –it should contain enough flexibility to enable adjustment and adaptation

Realistic –they should express what is really possible, based on your evaluation

Timed –The default time for achieving the objective is the timescale of the plan, but if they are to be achieved in a shorter period, this should be made clear.

How would you write an objective?

Consider including the following aspects in your sentence:

What will be done?
Action word: an objective should include an appropriate and accurate action word, for example, reduce, develop, analyse, detect, complete, compare, prepare, etc.

Why is it being done?
Result or output: an objective should state a result or output, for example, a species list, an abundance comparison.

How will anyone know it is being/has been done?
Performance indicator: how will you or anyone else know that the objective has been achieved? For example, a timetable, a report or other written material, collection of data, and data on the computer, plant specimens collected and stored for future reference (a herbarium).

3.5 Group exercise 5 –writing objectives

The groups divided the priorities between them, and wrote objectives to reach these aims. The groups presented the following objectives:

- To determine the various species of mammals that can be found within the area.
- To determine the population sizes of mammals (visual encounter of area).
- To determine the species distribution habitats e.g. the fishes, birds (with exception of migration of birds)
- To determine the various species population sizes and distribution. To determine roosting and feeding sites within the area.
- Wildlife harvesting–
    - To determine the various types of animals that are harvested /traded.
    - To determine the percentage share earned by harvesters
    - Identify harvesting sites
- To determine types, distribution, uses, density in the area and the different habitats.
- To geo-reference migration routes of avi-fauna and mammals of the Shell Beach area.
- To document the diversity of fresh water fish species in the Shell Beach area.
- To document and compare the diversity of Amphibians and reptiles within the major habitat types in the Shell Beach Area.
- To conduct an inventory of the commercial species of tree species in the Shell Beach Area.
- To determine the soil types and its characteristic vegetation within the Shell Beach Area.
- Rainfall (NA)
- To document the local names and uses of flora and fauna and their locations within the Shell Beach Area.
- To collect and analyse water samples in order to gauge down-stream effects, of economic activities.
- To identify sites to measure water level fluctuation and quality and possible changes in drainage patterns.

Building on these objectives and from discussions during the field trip, I would suggest the team try to achieve the following objectives:

To compare the diversity and distribution of **mammal** species in the main habitat types of the Shell Beach area

To compare the diversity, density and distribution of **bird** species in the main habitat types of the Shell Beach area.

To compare the diversity, density and distribution of **reptile and amphibian** species in the main habitat types of the Shell Beach area.

To compare the diversity of **fish** species in the main river/creek systems of the Shell Beach area

To classify the **vegetation** (structure and species composition) of the main habitat types of the Shell Beach area

To collect information on the **environmental variables** (including where possible water height, soil type, pH, rainfall, water quality) at every sample site.

To determine the status of **key species** (endemic, economically important, threatened) present within the Shell Beach area (at important sites).

To document the **local names and uses** of flora and fauna and their locations within the Shell Beach area

Session 4 Setting protocols for the rapid biodiversity assessments

4.1 Introduction to biodiversity data collection

Note: The notes in this section give only a brief outline of the protocols and issues discussed in this session. There are many references available that give detailed accounts of the methodologies used to survey each of the taxa described below, and these should be consulted when planning surveys.

The session was started with discussions on the differences between qualitative and quantitative survey:

- Qualitative (such as species inventories) give an overall impression of the complement of species in your area.
- Quantitative (such as biodiversity comparisons statistically analysed) give an idea of how one site may differ from another. If you are going to carry out basic habitat mapping, these comparisons can be extrapolated to guess the nature of other areas.

The point to take from this, is that whatever your final survey technique is, be sure to continually be noting any species (where, when and what, and any interesting behaviours, groupings etc) that you come across during your field visit

Several participants requested further explanation for the need for survey by external biologists. The need to quantify species richness scientifically for decision makers was explained by TG and SN. This would involve comparing the biodiversity of different areas by keeping all the different factors that affect biodiversity the same at each site (e.g. length of time you look for different species, time of day, surveyor skill, weather conditions etc).

Site Selection

To study an area scientifically (to be able to make firm statements about the biodiversity in an area) is important to determine how you are going to select sites within your area to study. There are many different ways of doing this; the method you chose will be dependent on various conditions of your survey (most notable your aim, time, resources and accessibility of the land).

The three main methods of sites selection (random sampling, stratified and best guess) were discussed in some depth. The group decided due to the logistical and time limitations that they would have to use best guess (decisions to be made following the field visit on which sites and habitats to concentrate on)

Other site considerations discussed included:

- size of plot/transect at each site
- number of iterations
- setting up permanent plots
- number of plots (coverage) of each habitat type

4.2 Bird data (WP)

Waldyke outlined the use of three techniques that could be used, or adapted for use as rapid assessments.

Play back
For use for certain species of birds that are difficult to see, useful to increase species list of an area

Mist nets
A fixed number of mist nets can be used to collate species lists and compare communities in different habitats. Mist nets are opened early in the morning when birds are active and cannot see the net, and birds are caught when they fly into the fine mesh of the net. Nets capture mainly under story birds. The nets can open for set time periods to produce data that can be analysed to statistically compare the bird communities of different habitats.

Transects
Transects can be set-up along a 1km stretch of area. The surveyor would walk along the transect in the morning (when birds are active) and the number and type of species are recorded along the length. Transects can either be walked for a fixed time, a fixed length, or a series of point counts can be taken along the distance. This type of data will allow statistic analysis of the different bird communities between habitats.

Waldyke felt that Point Count sampling along a transect would be an appropriate sampling technique in mangrove forests. Transects at night would also be considered to survey nocturnal birds.

4.3 Amphibians and Reptiles (JA)

VES
Visual Encounter surveys will be used to collect data on amphibians and reptiles. Surveys of a set time would be carried out along pre-cut transect lines at night (6-8pm). A transect time allowing a surveyor to cover 1-2 km would be used. Strong torches are used to find and identify the creatures. Time at which organisms are seen, and location is also noted. If the surveyor cannot identify the species during the survey, samples may be taken for later identification.

Pit fall traps
Pit fall traps set into the ground, with drift nets to direct organisms into the traps, can also be used to identify small species present in an area.

The importance of temperature on the survey results was emphasised by a participant.

4.4 Mammals (JA, MP)

Pit fall traps
As described as above can be used to survey the presence of small mammal species. Other traps (e.g. Longmans) can also be used to survey other small

mammal species. As long as the conditions are the same (number of traps, length set, weather etc), traps can be used to statistically analyse the different species composition between habitats.

Mist nets
These can be used to trap bats if opened between 6 and 8pm.

Transects
Although it is difficult to directly observe mammals, transects can be used to survey mammals, through the identification of signs and tracks of mammals (spore, tracks, fur). As with birds, the methods of walking the transects must be the same to enable comparisons between habitat types.

4.5 Fishes (JA)

Roten
This poison is now banned in Guyana, therefore can not be used to sample fish

Seines and gill nets
Nets of different sizes can be used to sample different size species

Hook and lines
These are used to sample for bigger fish species

Other methods to consider include baskets, physically moving rocks and cast nets. Most fishes caught are returned back to the water, however in some cases, specimens will be kept for accurate identification, education, and future reference. Fish surveys should be conducted during both the day and the night to sample the whole fish community.

4.6 Habitat classification (TG, MP)

Habitat classification should be done at every site surveyed. Existing habitat classifications should be used wherever possible. Other aspects of habitats should also be measured as well as general habitat classification. Those discussed included:

Species and Density of trees, girth at breast height (to estimate above ground biomass), light reading (to measure photosynthesis), seedlings (smaller than 1m), soil pH and type, water height, species of understory plant (measured in subplots, using the ACFORN scale)

Plot size
A plot of 10x10 meters (40-100 trees) for mangroves is suggested.

ACFORN
Abundant
Common
Frequent
Occasional
Rare
None

Session 5 Managing Surveys

5.1 Developing work plans

Timing

- How long do you have to carryout your survey?
- Are you going to make repeat visits, or undertake a survey in blocks of time?
- Do you need to consider weather conditions, seasons?

Equipment

- What equipment are you going to need?
- Do you have all the equipment (does your protocol need adapting to take into consideration the equipment you have?
- Is it available all the time?

Staffing

- How many surveyors do you need to carry out a survey?
- Do they need to be qualified or licensed?
- Do they need training? (how long will this take?)
- How many people do you have to help you carry out the survey?
- Could you be using other members of the technical team to help you?

Location

- How many sites are you going to survey?
- how much iteration are you going to do at each site?
- Are you sites related to anyone else's (if so, should you be developing work-plans together, could you be helping carry out someone else's protocols)?

General

- Does anyone need to sign off on your protocols?
- If the team is working in the field together, how are you going to make final decisions on where/ what and how to work together?

Work plans can be written or drawn in various ways. Gant chants is a popular method; see below for an example of how to set out a basic work plan outline.

Activity	Responsible person	Month			
		1	2	3	4
Decide on aim	JA				
Literature search	TG				
Plan technical aspects and logistics	SN				
Implement survey	RF				
Analyse data					

5.2 Budget preparation

It is important to budget carefully because:

- Budget Lines may not be flexible – Sometimes funds cannot be moved from one area to another
- You may not have a second chance to change budgets in time, or move money between budget lines

Budget must be realistic!

Steps in Preparing the Budget

1. Identify survey activities
2. Identify location of activities
3. Identify technical equipment required
4. Determine the cost of technical equipment (including, freight & duty)
5. Identify the camping equipment required
6. Cost camping equipment (remember most would be available locally)
7. Identify transportation movements (number of trips, from where to where, dates) – Cater for flexibility. Plan how you will move, how much time per month.
8. Identify fuel needed – Consider the number of people in a team before looking at amount of fuel needed
9. Cost fuel
10. Always include a 10% or 5% under each budget line for changes in prices - He noted that this would cover any extra miscellaneous costs.
11. Include a miscellaneous budget line in case of emergency

General Budgets for Biodiversity Assessment

A monthly approach for the budget is a good plan (use a monthly work plan to cost out the budget). At the current stage of this project, it is difficult to prepare a detailed budget. Below is a template budget for a survey.

Item Description	Quantity	Unit Cost/Day	Duration	TOTAL
Technical Equipment				
Camping Equipment				
Food Supplies				
Fuel				
Miscellaneous				
TOTAL GUYANESE $				
TOTAL US$(@ 1: 190)				

Session 6 Developing Monitoring Programmes

Monitoring vs. Inventory

Inventory –finding out what species there are in a particular site

Good inventory techniques allow large areas to be covered, and long species lists to be produced.

Monitoring – (tracking changes over time)

Strictly monitoring implies assessing changes against some target valued or threshold.

A Key feature of monitoring is *consistency*:

- Need to be able to repeat the same kind of data collection at same place at same time
- Means can only survey small area, or threatened or indicator species/taxa
- Suitable methods are those that can be repeated easily (remember may be different people)
- Absolute abundance measures are unnecessary –just need relative measures.

Monitoring programmes can serve:

- to determine status of key natural resources or environmental levels, particularly in relation to pre-determined standards. e.g. air quality),
- to evaluate impacts economic and use activities,
- to provide long-term studies of specific anthropogenic impacts,
- to provide early-warning systems for broader environmental change, and
- to evaluate the impacts and level of management activities conducted.

Brief introduction to developing monitoring programmes

Monitoring is question driven:

Monitoring should have a specific purpose and so should address a particular, well-defined question or issue. Monitoring cannot just be collection of data for "I'll know it when I see it". However, while monitoring may suggest cause and effect (e.g. of action and biological response), these inter-relationships or correlations cannot be further confirmed without experimental research.

The PSR framework:

The P-S-R framework is becoming a frequently used approach to considering monitoring programmes, based on the need to record not only the condition of biodiversity (**state**) – but the threats to it (**pressures**), and the level of action taken to counter negative effects (**responses**). Any monitoring programme should be designed to look across the pressures, state and responses relating to a particular issue.

Examples of **pressure** indicators might include:

- extent of resources extraction
- rate of land degradation

- levels of pesticide application

Examples of **state** indicators might include:

- Number of species with steady or increasing populations
- Areas of primary (or natural) forests in the country
- Water quality in key catchment areas

Examples of **response** indicators might include:

- Areas under protection
- Number of individuals involved in nature conservation
- Number of hunting permits issued annually
- Investment allocated in the protected areas system

For different monitoring questions or issues, it may be difficult to assess change directly –particularly when the issue addressed is a complex or multi-faceted question – such as the status of the protected areas system. Even simpler issues can be difficult to monitor in such cases, a number of surrogates or 'indicators' can be used to reflect likely changes in the real issues addressed. Such indicators are generally considered as *some aspect of the environment that is measurable or quantifiable and whose value is indicative of environmental conditions beyond its own measurement*. Thus a good indicator would clearly reflect the status and dynamics of the larger system.

Indicators are closely associated with broader trends – such that changes in the indicator parallel the changes in the broader system, perhaps by representing one element of that system – in this way an indicator provides a measurement for complex underlying trends. Indicators are specific to a particular question – and can relate to a condition, change of quality or change of something that is the real target for monitoring. Generally, use of indicators will reduce the number of measurements that are needed and thus simplify data collection and ultimately the communication process.

Choosing indicators and Key species to monitor

Indicators should be

→ *Specific* – i.e. have dynamics that parallel those of the ecosystem or particular component of interest or which clearly relate to natural cycles or anthropogenic stress

→ *Sensitive to change* – i.e. provide an early warning system, rather than lagging behind other changes

→ *Persistent* and naturally stable – i.e. have low natural variation or variability and be able to be continuously assessed over a wide range of stresses

→ *Widely* distributed and relatively common – indicators should be relatively abundant

→ *Easily identified* – so confusion with other groups or species can be avoided

- → Relatively cheap and *easy to measure*
- → *Unaffected* to any great extent by the monitoring process
- → Measurable in ways that are *accurate and precise* – thus results can be representative and repeatable between personnel
- → Able to provide measurements that can easily be *interpreted and explained*
- → *Scientifically credible* – i.e. the robustness of the indicator can be defended or validated

In addition to 'indicator species', targets for monitoring are frequently selected from among **key species**, including:

- → Common species that dominate community structure
- → Species with designated or legal status (e.g. endangered species)
- → Endemic species
- → Exploited or resource species
- → Alien (exotic or invasive) species
- → Heroic or charismatic ('flagship') species (which the general public cares about)

4. DESCRIPTION OF OUTPUTS

Outputs of the workshop included the following:

- Draft aim statement (see 2.4)
- Literature review (see 2.5)
- Prioritised information gaps (see 2.6, 3.2)
- List of draft objectives (see 3.4)
- Basic descriptions of protocols to be used for each taxa (see session 4)

By the end of the field visit, the team, together with the project team, had developed the following:

- Scientific equipment list (budgeted)
- Camping equipment list (budgeted)
- Suggested work plan including:
    - Start dates
    - list of specific sites to survey
    - base camps
    - logistical details
    - organisation of statistical analysis

(This information is still being finalised, and can be provide by Shyam Nokta)

5. FIELD VISIT

Day 3	**Travel Overland to Santa Rosa**
9:00	Depart Georgetown
10:00	Arrive Parika
11:00	Arrive Supenaam
12:00	LUNCH
1:00	Depart Charity
3:30	Arrive Santa Rosa – Acquero
Day 4	**Travel Overland to Luri Beach**
7:30	Depart for Luri Beach though the rivers
10:30	Brief Visit to Luri Creek
11:00	Brief Visit to Baramanni Lake
1:00	Short Stop-Over at Almond Beach
3:00	Arrive Luri beach – turtle nesting camp
Day 5	**Luri beach**
	Familiarisation with ecosystems
	Discussion of work planning
	Introduction to statistical analysis
Day 6	**Travel to Mabaruma**
8:00	Depart for Almond Beach
10:00	Visit to community centre and nearby areas
12:00	Depart for Mabaruma and areas of interest
4:00	Arrive Mabaruma
7:00	Breakfast
Day 7	**Travel to Georgetown**
8:00	Meeting with Mr Whitaker (RC)
11.00	Depart Mabaruma for Georgetown

6. CONCLUSIONS & RECOMMENDATIONS

The workshop outlined the process that would be undertaken when developing a biodiversity survey of an area. This increased the understanding of participants not familiar with scientific survey methods, and increased the confidence of those members already familiar with biodiversity surveys.

At several points during the workshop, the importance of the social survey was highlighted. It is recommended that a similar structured approach be taken to designing this social survey to ensure the data collection is appropriate for the needs. It will be important to ensure that the biological and social surveys are complimentary, to ensure all relevant data is collected.

It was also apparent that there is a need for greater community engagement, explaining the objectives of this survey (and the larger Darwin project).

Recommendations on aims and objectives are given in the previous sections of this document, however these should be finalised, and clearly communicated to the technical team.

The technical team are clearly expert at the protocols necessary for their specialist taxa. It is important to ensure that the detailed survey techniques are recorded in the final report, along with any obstacles, or changes in protocol that was necessary.

Statistical analysis of data is an issue to the technical team. Training in basic statistical methods is recommended, as this would increase the capacity of biologists to carryout their own surveys, and understand how protocol design, and changes in protocols impact the value of the data they collect.

Many participants were interested in developing monitoring programmes. Please contact TG or SN for a more detailed FFI document introducing this subject.

References

The Conservation Handbook **
W.J. Sutherland
2000 Blackwells
ISBN: 0 632 053 445
[*N.B. Attempts to give an overview of skills needed from conservation planning and site selection, to management, monitoring and community participation. While some sections are sketchy, there is a large section on monitoring which is useful in terms of context and approaches*]

Data Analysis in Community and Landscape Ecology
Eds: R.H.G. Jongman, C.J.F Ter Braak and O.F.R. Van Tongeren.
1995 (reprinted 2000) Cambridge University Press.
ISBN: 0521 47574
[*N.B. Rather dense mathematical approach*]

Ecological Census Techniques **
W.J. Sutherland
1996 Cambridge University Press
ISBN: 0 521 478 154
[*N.B. Good review of survey techniques for different taxa – focusing on how to assess, and detect change in, population's sizes*]

Ecological Data. Design, Management and Processing.
W.K. Michener and J.W. Burnt.
2000 Blackwells Academic Press
ISBN: 0 682 05231 7
[*NB. Focusing more of managing datasets – more relevant to BIMS*]

Ecological Methodology **
C.J. Krebs
1998 (New edition) Longman
ISBN: 0 32 102 1738
[*N.B. The classic text on design and analysis of ecological data, extremely useful for techniques such as mark-recapture*]

Ecological Methods **
T.R.E. Southwood and P.A. Henderson
2000 (New edition) Blackwells
ISBN: 0 632 05477 8
[*N.B. Classic text on ecological data collection for different taxa along with survey and sampling techniques, linked to key analyses*]

Expedition Field Techniques Series **
Various Authors/Royal Geographical Societies.
[N.B. Information and ISBN numbers for these will be sent separately. I will send/bring a sample copy]

Global Biodiversity Assessment
UNEP
1995. Cambridge University Press.
ISBN: 0 521 56481 6
[*N.B. Focusing on explaining the biodiversity concept and biodiversity assessment at a global level, but with a couple of chapters giving a global framework to monitoring and data management programmes*]

Measuring and Monitoring Biodiversity
R. Heyer and M. Donnelly.
1994. Smithsonian Institution.
ISBN: 1 560 982 845
[*N.B. a series of handbooks focusing on different taxa. In depth guide to potential methodology, but focused on research rather than more pragmatic assessments. The same techniques are covered in the RGS Expedition guides (see above) – which are a fraction of the price*]

Vegetation Description and Analysis.
M. Kent and P. Coker
1994 John Wiley and Sons
ISBN: 0471 948 101

Aims and Methods of Vegetation Science.
Mueller-Dombois and Ellenberg
1974 John Wiley and Sons, New York

Wildlife Survey Techniques for Ecological Assessment

Hone J, Williams D, Osborne W, Georges A, and Stoutjesdijk R
1992 Wildlife Ecology Group, University of Canberra

(Titles marked ** are recommended.)

Rapid Biodiversity Assessment Examples

'Nature in Focus, Rapid Ecological Assessment' Edited by Roger Sayre et. al.
Year 2000
Book description -Rapid Ecological Assessment (REA) is a methodology developed by The Nature Conservancy to provide comprehensive and reliable information about biodiversity resources in situations where time and financial resources are limited. This is an in-depth guide to the theory and practice of REAs, offering a detailed approach for assessing biodiversity in a rapid and integrative manner.
Paperback 82 pages, illus, figs, tabs, maps.
Island Press, USA
Price £27.50 (from www.nhbs.com)

A Rapid Field Survey of Five Sites in Bac Kan, Cao Bang and Quang Ninh Provinces, Vietnam. A Review of the Northern Indochina Subtropical Forests Ecoregion. Tordoff, A. W., Vu Van Dung, Le Van Cham, Tran Quang Ngoc and Dang Thang Long. 2000.
Downloadable at http://www.wing-wbsj.or.jp/~vietnam/ (report Number 14)

Terrestrial examples from Conservation International can be downloaded at http://www.biodiversityscience.org/xp/CABS/publications/cabs_publ_research/rap_bulletins/terrestrial_rap_bulletins/terrrapbulletins.xml

1. APPENDIXES

Appendix 1 –Brief glossary

Rapid Assessment –a *quick* survey of an area. Carried out in areas with low levels of biological information, and with few resources (time and money). See more in-depth information on rapid assessment below this box.

Baseline/Comprehensive Survey – An in-depth survey of an area. Often carried out to provide in-depth biological information for management planning, or to prioritise conservation activities

Monitoring –Detecting change in biodiversity overtime. This requires repeated surveys, of specific areas, and indicators. Often used to inform people managing the area if their management techniques are having the desired effect and if there is anything they should be better or more actively managing.

N.B. These terms are used interchangeably by different people. It is important therefore to have a clear aim of your survey, so that it is not misinterpreted.

Protocol –The written scientific methodology used to survey specific species groups (taxa)

Gazette –To gazette an area, is to give it legal status as a protected area

Appendix 2 -Notes on habitat mapping

Why map habitats?

- Predicting distribution, density and numbers of species in un-surveyed areas
- Providing an understanding of the nature of the relationship between a species and its habitat
- Predicting possible consequences of future changes in land use

Different studies at different scales can help answer these questions to a different extent.

What features to map?

This is a trade-off between the kind of features that are possible to map, and those that you may think are significant.

- Physical features (Altitude, gradient, soils etc)
- Forest/habitat structure –(forest type, canopy cover, tree size, density, biomass etc)
- Other vegetation
- Human factors –extremely important for many species, and management issues

Sources of data

Satellite images. Good for drawing broad-brush habitat maps that show major differences between forest and grasslands. 'top of the range', but expensive to purchase and process.

To be meaningful, satellite images need 'ground truthing' in order to ensure accuracy, and increase information available. Because they are handled on GIS, lend themselves to analysis of habitat.

It is often cheaper to obtain false colour printed photographs. Obviously these cannot be used for sophisticated GIS application, but they can be use to show major boundaries between habitats.

Aerial photos. Generally easier to interpret at a broad level (especially if viewed as stereo pairs). They present much smaller areas at higher resolution. Therefore better at mapping plots of up to hundreds of square kilometres. Often easier to find satellite images, and don't require sophisticated analysis.

Pre-existing maps. There may be a range of pre-existing maps. Consider if these have any political significance, are too out of date, or are inaccurate.

Field surveys. This may be your only option for determining the geographical distribution of habitats. Use existing maps and local knowledge of the area to determine best how to use field surveys to map habitats. Consider the use of GPS to input features and boundaries into future GIS systems.

Appendix 3 Notes on species surveys

Consider the following when selecting, which endangered or threatened species to survey:

Conservation value –why is the species important? Is it threatened globally? Is it important to local cultures? Is it a local endemic? Is it hunted in some areas to the extent that its abundance at the site will provide a metric to the level of hunting occurring?

Environmental indicator value –is it susceptible to some environmental influence, and therefore indicates factors perturbing the local ecosystem? (such as water level, fire)

Ecosystem value -Does the species provide a key ecosystem function (such as seed dispersal, predation)

Detectability **-**Will the sampling effort available for the assessment be realistically sufficient to survey the distribution and abundance of the target species?

Consider the following when selecting which alien species to survey:

Conservation threat –does the presence of the species threaten or potentially threaten the population of a desirable species.

Environmental indicator value –does the presence of the species indicate that some undesirable environmental change is in process? Does the presence of the species cause fundamentally important ecosystem processes to be disrupted.

Detectability –can the species be surveyed efficiently?

Appendix 4 –notes on developing protocols

Once you have decided on your objectives, you will need to set specific protocols describing the plan of actions to be followed to collect the data.

Below is a list of suggestions to consider (and record) when developing your protocol. At each stage consider all the different options and which are the easiest ways to precede. Think about how all the protocols are to be combined or integrated where this is necessary, or helpful for their final outcome.

Sampling protocols

- Number of plots/sites

How many will you need? What sample size will you need for analysis? How many replicates will you need?

- Distribution and selection of plots/sites

Will you use randomised plots? What habitat variation might need to be incorporated into sampling design? How will you randomise – what selection will you use?

- Size of plots/sites

What sorts of data will you collect and what would be an appropriate base plot?

- Location/marking of specific plots

How will you locate and relocate plots over time (consider the implications of human interference)

Data collection protocols

- Detailed information on what data is collected, and how

Based on previous experience (or the baseline survey) what data should be collected, and how should field survey be conducted?

- Data collection formats

Do you need to develop some form of data form to ensure precision in data collection and easy data entry?

- Quality assurance and standardisation mechanisms

How will you evaluate the precision and accuracy of data? How will you assess bias linked to changes in personnel?

Data management and analysis protocols

- Data storage and management information

Who will be in charge of data management, and who will have access to the data?

- Data analysis procedures and details of statistical methods to be used

What statistical tests will be used on the data? What level of probability will be accepted to determine change? Will data need to transformed or checked prior to testing? Will data be parametric or non-parametric?

- Report format and process for communicating results to management

Who do results need to be communicated to? What format should be used to present information, and what are the key headings for any report?

Resource allocation protocols

- Number of staff involved, roles and training requirements

Who will collect and/or process the data? How long will it take and when do they need to be available? What are their responsibilities, and what training do they need?

- Resources/equipment required

What resources or equipment is required? Are there any consumable items that need to be reordered every year? Will the necessary equipment be available when you need it?

Remember:

- There is no right or wrong way –you should collect the information you need in the way you think is right for your area
- Be realistic
- If the protocol is too complicated or time consuming -simplify it
- If the equipment is not available –try to find another way of doing it
- If the statistics are too complicated, use a different approach

Appendix 5 Baseline surveys for protected areas

This section explains a little of the process needed to collect the basic biological data to assist protected area planning processes, and from which to design a monitoring programme.

A biodiversity survey is an inventory of the biodiversity, including species and habitats, of an area. A range of survey protocols are suitable for different taxonomic groups, and there are some key reference materials that can guide on this, notably the baseline survey manual (produced by Komex for the BCMP – *Baseline survey designs for Retezat National Park, Piatra Craiului Natural Park and Vanatori Neamt Forest Park – operational manual.* Produced by Komex International and CEH (Dee Patriquin, Jo Treweek, Lori Petruskevich and Owen Mountford), May 2000).

Aims of baseline surveys

Basic information on the biological values of an area is essential to guide planning for protected area management. In general the location of protected areas will have been initially informed by the presence of rare or unusual species, or important or pristine habitats, and there is generally some legacy of biological information relating to any designated protected areas.

In order to plan how to manage, and monitor, a protected area you will generally need to know:

- What is there (in terms of habitats and species)
- Where things are (distribution of habitats and species)
- How much there is (in terms of areas of habitats and populations of species)
- Some indication of the relationship between different biological elements

Mapping the habitats and species of a whole protected area in detail would be a long and complex exercise, and such a level of detail is generally unnecessary prior to protected area management planning. It is more important to use the information available to ensure timely management planning proceeds, on the understanding that gaps in knowledge, and improved understanding of the ecological status (from further focused surveys or ongoing monitoring), can be used to upgrade the plan as necessary.

The information collected under the baseline survey should be directly relevant to the information needs identified for the management planning process (see Output Box 3 of the BCMP Management Planning Manual).

The general aim of a baseline survey is to provide an overview of the biodiversity of the park at that point in time, in order to identify key habitats or sites of importance within the park (particularly those under threat and requiring protection), to identify

the priority species of interest in the park (their location and some indication of their status), and to identify any general threat factors affecting the conservation status of the park. ***The baseline survey does not always require extensive research or a full understanding of the complex ecology of habitats within the protected areas at this stage.***

Approaches to baseline surveys

Baseline surveys to protected areas can be interpreted in a number of ways. The first stage is to assess what is already known – through consultation with key individuals (within the staff, the scientific committee and from relevant scientific institutions).

1. **Literature search.**
   Following initial consultations it is a useful to pull together an outline bibliography of scientific documents relating to the biodiversity of the protected area. This should not be an exhaustive exercise initially, but should be seen as an ongoing information-gathering process, as a library on the biodiversity of the park is gradually built up. It is useful to extract key facts from the existing literature in order to develop a species list for the park, with any historical information on species distributions and populations, along with any general information mapping the habitats of the park.

   As well as the direct biological information (i.e. what plants and animals have been recorded, and where from) it will be useful to collect data on:
   - The history of land use in the park
   - The current use and management regime of the land
   - What, if any surveys have already or what are being done
   - Any maps/ aerial photos of the area showing different aspects like vegetation geology, soil, rainfall, infrastructure etc

   It is useful to organise basic information on the park in relation to headings which relate to the site description in the management plan.

2. **Designing a baseline survey**

Prior to designing specific data collection protocols you need to spend time clearly determining what information you need, how much and in what form.

- What do you already know about the area you have chosen to survey? *You need to consider what surveys have already been completed – you do not want to waste effort repeating research that has already been conducted, however if this was done several years ago you may wish to update it, and see if the situation has changed.*

- What are the gaps in the information? *In reviewing the information you already have, what are the gaps in the information – either because it is out of date, or because there has never been any data collected on particular parts of the park or on particular taxonomic groups.*

- What resources are you going to have available to you for the initial survey?

These three factors will determine the scope of your survey and will help you to define:

- What groups/habitats to survey
- Where to focus the survey
- When to survey; and
- How to survey

At its most basic, the key information for management planning will include:

- Any rare, threatened or characteristic (e.g. zonal) species that are present (i.e. those species for which the park is regarded and was designated) and the key locations for these species, along with any information on their population status. Where, possible this information should be complemented by a more comprehensive species list for the park.

- The basic distribution of key habitat types, including some assessment of the species composition of important or threatened habitats, or those which are particularly characteristic for the park, or whose status is uncertain (i.e. habitats undergoing change or those under direct threat, such as over grazing).

3. Rapid biological assessment

Where there is little general information on the protected area (for example if there is no information on large areas of the park, or there are only in-depth studies on particular species) it is worth conducting a rapid biological assessment of the park. There are various approaches to rapid biodiversity assessments (often known as “RAPs”), but in principle this is a less rigorous or structured approach to surveying that allows you to collect a wide range of information from a wide area in a relatively short time (for further references, see below).

Most rapid assessments involve sending out a core team of experts, including specialists in a number of key taxonomic groups, to collect information on species presence, relative encounter rates (as a indication for abundance) and to assess general habitat type and quality in the areas visited. This approach involves large scale transects, often chosen in a qualitative manner (based on interpretation of map or remote sensing data, the presence of biologically important habitats or from a general overview of the area focusing on what are recognised as likely to be the most biologically interesting sites). The data collected on rapid assessments tends to be more extensive than more rigorous sampling approaches, but is in no means comprehensive or representative of the park. However this is generally considered an appropriate method to provide an overview of some of the key areas of biological interest within a protected area, and to place some relative conservation values on different sites and to identify areas where further more in depth research is required.

In practice the person organising a rapid assessment would identify a suitable team, and would provide a briefing on the information required and on particular gaps in knowledge regarding the park (in terms of species distribution information or lack of information from particular sites) to ensure that information collection is well targeted to the needs of park management, and to avoid undue replication. The survey team would then be allowed to design their own general transects and survey protocols, based on simple encounter and recording procedures.

4. Focused studies and assessments

Where there is some initial general information on the area, and budgets allow, there is an opportunity to conduct more in-depth and rigorous assessments to properly characterise the biodiversity of the park. In such cases a sampling approach is recommending to define a series of ***plots or study sites***, to provide data that can represent the ecological situation across the whole protected area.

Size of study plots?
The area of sample plots studied will depend on the type of information being collected. The Komex manual recommends study plots of 500m x 500m, with assessments being conducted at smaller scales within these sample areas.

How many samples?

This is not a question with a standard answer, as the number of samples you need, will depend on the size and environmental complexity of the survey area, how you wish to analyse and use the data and time and resource constraints. It is important to try and capture all the major variation (i.e. habitat types) within your sample, and the Komex manual recommends a survey that covers 10% of the overall park area, although for large parks this may be impractical.

Where to sample?
In order to ensure that your sample of study sites is representative of the habitats across the park, a ***stratified sampling*** approach is recommended. This involves undertaking a basic characterisation of the major habitat or ecosystem types in the park, and allocating a number of sample plots to these – in direct proportion to the relative coverage of that ecosystem type. This ensures that the data across the plots is representative of the balance of habitats present in the park. For statistical reasons there should be at least four sample sites in any major habitat type. For sampling to be effective, the choice of study sites or plots should be made at ***random*** (for example using random number tables to identify co-ordinates on a grid), taking into account the proportion of study sites to be located in each habitat.

Further details on stratified random sampling are provided in the Komex Baseline Survey manual, although these may need to be adapted pragmatically to take into account the topographical situation in many Romanian parks – for example, where sample plots are allocated to steep gradients or otherwise inaccessible areas, these plots would need to be reallocated to adjacent accessible areas).

Data collection and methodologies

There are a range of appropriate approaches to collecting data on the distribution and population of wildlife, and on documenting habitats. A range of reference materials is listed at the end of this document to provide guidance on developing appropriate technique to collect data on different groups of animals and plants. Since every survey has different aims and needs, it is difficult to provide general rules for surveying that will be applicable in every park. However, the Komex manual (which was designed specifically to collect data from three protected areas in Romania) provides a useful structure for data collection, and some importance guidance on data collection for the main groups of species that may be of interest in Romania parks.

In any survey the main issue is ***standardisation***, and it is important that you develop very clear survey protocols and recording forms to ensure that data from different sites, or collected by different people, is compatible. If methods are not the same across the whole area, it may reduce the usefulness of your results. Any changes in collection methods should be fully documented. The Komex manual provides some very useful examples of protocols and data collection forms, although these may need to be adapted to suit the need of your survey.

Ensuring consistency and accuracy of data collection is particularly important if you have different people carrying out parts of the survey in different areas. Some basic rules to ensure consistency between surveyors include:

- Ensure everyone understands and can carry out the survey methods to a high standard.
- Before the survey, ensure everyone is using the same identification guides, and that they have adequate identification skills
- Ensure all results area recorded in full, and extra comments are recorded, including any problems or uncertainties of identification.
- Ensure you compile and collate all your data sheets at the end of each survey day.
- Check consistency throughout the survey, such as sheets being completed accurately, and the correct methods being followed.
- Collect specimens or photographs as a permanent record where you need conformation of identification (ensure you have a licence to do this if necessary)

Using the data collection protocols from the Komex manual

If you decide to refer to the data collection protocols in the Komex manual, this can save you a lot of time and effort. However, be sure that any protocols you use is directly related to the information you need (as identified through the survey design

process), and you are not collecting low priority information for your park, just because it is listed in the manual. ***Be pragmatic and realistic when planning your survey!*** The information presented below provides comment and feedback on the use of the Komex manual protocols as learnt from their application in the field at the three parks.

Sampling design and plot locations - these are clearly outlined in the Komex manual and provide useful guidance. However they should be interpreted pragmatically – be aware you may need to relocate plots which fall in accessible sites, and that the target if 10% coverage may not be realistic for some of the larger parks.

Survey schedule – The Komex manual proposes a standard 2-3 year survey cycle, based on full coverage of the key indicator groups and involving significant inputs of time and resources (feasible under the BCMP funding). This should be adapted to the situations of individual parks, focusing only on the surveys that are considered most important under the survey design in that park, but taking into account the need to not to over commit limited personnel resources in any year.

Birds surveys – the point-based transect surveys suggested by the Komex manual are appropriate for certain bird groups (passerines etc) and may be particularly useful in some habitats (open woodland etc.). However, in practice certain bird groups were not well captured with this approach (e.g. birds of prey), and it was suggested that some open transects be used to focus on increasing the bird list (especially if done in relation to key habitat types), prior to the more focused point based surveys, which concentrate on determining relative abundance.

Vegetation surveys – the standard quadrat-based methodology for recording plant species composition in the Komex manual appeared to work well under field conditions, and was particularly useful when related to surveys determining the status of meadows at risk from overgrazing. However much of the analysis proposed in the Komex manual for vegetational samples was not necessarily appropriate to the information needed for park management.

Large mammal surveys – these were not greatly successful, although the winter track survey for carnivores appeared to be successful when the weather conditions were appropriate and given sufficient manpower.

Small mammal surveys – the proposed small mammal trapping methodology in the Komex manual, which outlines trapping grids and trap/night requirements were tested in the field, and while the specifics had to be adapted to local conditions, it generally appeared to be appropriate. In addition, specialists undertaking transects with bat detectors, and searching suitable structures for roosts undertook bat surveys.

Invertebrate surveys – these provided limited information beyond presence/absence. These may be a good way to increase species lists, but should only be a priority where the invertebrate fauna of the park is thought to be

particularly significant (for example the butterfly fauna at Retezat is internationally important)

Incidental observations – these are an important way to maximise data collection, and should be encouraged from a wide range of staff or volunteers working in the park, as long as some rigor is applied in checking the information.

How much information do you need?

The general term "***sampling effort***" is used to describe the amount of work done at each site to record species. Determining the acceptable number of samples to be taken, to measure the presence, or abundance of species is a key decision to make. Sampling effort is measured in different units for different survey methods. For example plant surveys survey effort is calculated by the number and size of quadrats; for small mammals by the number of traps and the number of nights they are set.

As sampling effort increases there comes a point where extra effort yields no significant increase in the number of species detected. This point will vary according to the nature of habitat, and the species studied. The Komex manual provides information on suggested sampling effort for different groups. However consistency is most important - the greatest value comes from biodiversity surveys where sampling effort is constant across all sites, as this ensures you are comparing like with like.

Getting help from Experts

You may find that you have the opportunity to use experts to help you with the survey design, data collection or data analysis. Experts can be used to ensure your methods reach the highest possible standards, enhance the credibility of results and strengthen the conclusions that can be drawn from them. They may also help you when researching past scientific activity in the area.

You are unlikely to find one-person expert in all areas of your survey. It is best to find a person who you communicate well with, and who has the interest and time to contribute to your survey. It is often useful to find people with knowledge of the local area, for example from the local university. It is important to be clear with the experts from the start, explaining the aims and objectives of your survey, what your requirement is from them, what the data will be used for and where the data will end up. It is appropriate to acknowledge any advice and support given by scientific experts in any literature produced as a result of the study.

Analysis and Reporting

At the stage of the baseline survey it is not necessary to undertake highly complex analyses. You need to report what was there, where it was, and how many – and if possible give some indication of relative populations or densities across different areas or habitats. Reporting the results of your survey serves a multitude of purposes. The aim and objectives of your survey should be able to guide you as to the type of report you could produce, and what to do with it. When you present you data, you should include complete and accurate description of the methods used.

You may wish to disseminate you survey out to a number of different places (e.g. park management, financial backers, local authorities, scientific publication, local communities) you may therefore need to adapt the report to suit the audience. ***Remember***: who your target audience is, what your message is to that audience, and what evidence you need to supply to support that message.

Appendix 6 workshop evaluation