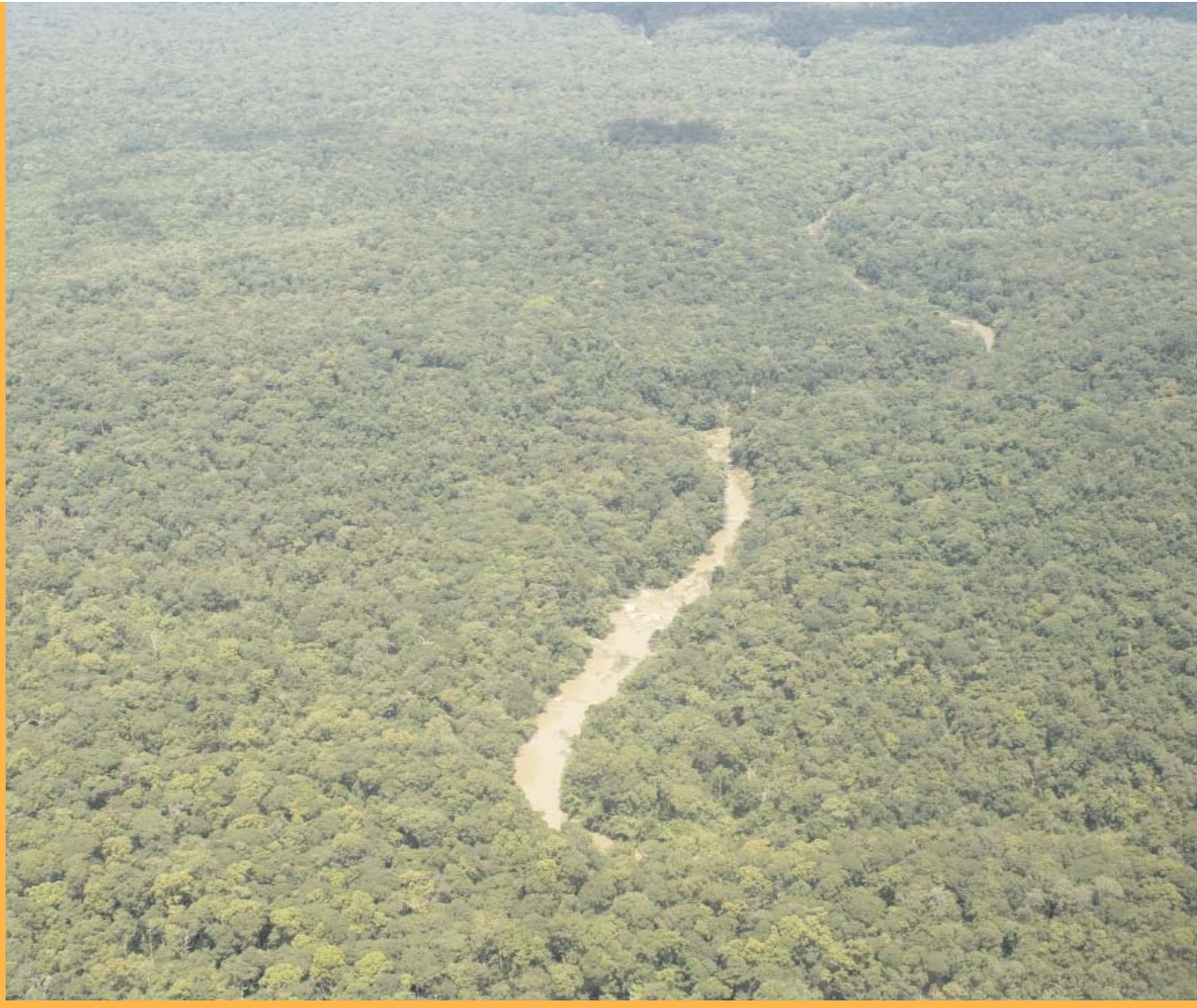

WWF GREATER MEKONG
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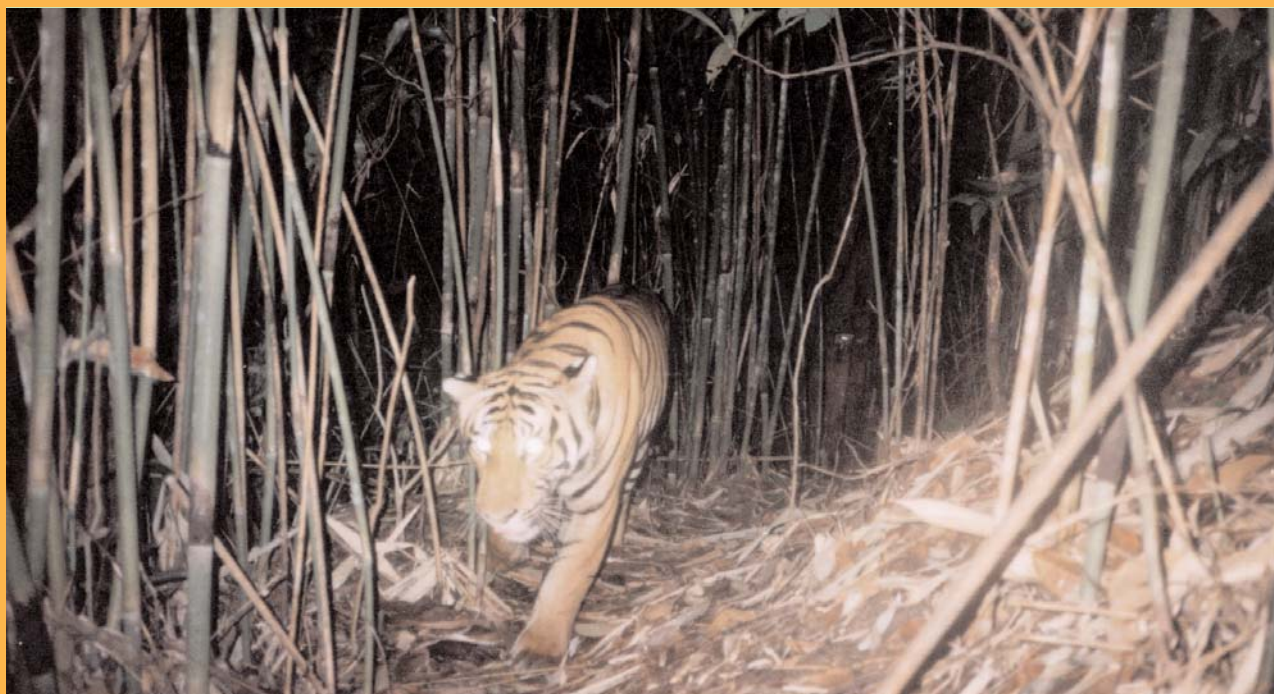
MIST SPECIALIST - EVALUATION REPORT



Srepok Wilderness Area Project
Technical Paper Series - No. 2

WWF GREATER MEKONG
CAMBODIA COUNTRY PROGRAMME

MIST SPECIALIST - TECHNICAL REPORT

Srepok Wilderness Area Project
Technical Paper Series - No. 2

Written by
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March 2007

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INTRODUCTION

The consultant was appointed by WWF Greater Mekong Cambodia Country Programme on a short-term consulting contract for the period 29th January until the 15th of February (14 days). The consultant's role was to audit the set-up of MIST within the Srepok Wilderness Area (SWA) Project and provide further training to the GIS database team, as well as make recommendations. Below is the specific list of tasks for the engagement:

(i) Assess the set-up of MIST together with the GIS Manager.
(ii) Where possible repair or modify any problems identified together with the GIS Manager
(iii) Train the GIS Manager in trouble shooting and repairing-/modifying of software.
(iv) Assess data input process and train data assistants where the process can be improved.
(v) Train data assistants on how to identify when field rangers are trying to cheat the system by entering false data.
(vi) Train data assistants in identifying individual rangers whose data recording is of a lower quality and assist them in setting up a method of keeping records pertaining to individual rangers with data recording problems.
(vii) Assess data accumulated and train in report generation.
Formulate using Microsoft Access software some templates which will assist staff in evaluating the following:
a. Evaluation of each management sector and which patrol blocks (as permanagement section map) are patrolled and which are not (per centage of area cover age);
b. ratio of wild cattle species (Banteng vs. Gaur vs. Wild Water Buffalo).

1 ASSESS MIST SET-UP

- Asked the team about equipment, data collection & problems
- Studied the databases
- Produced a list of observations available in the database look-up tables
- Decide on observation master list

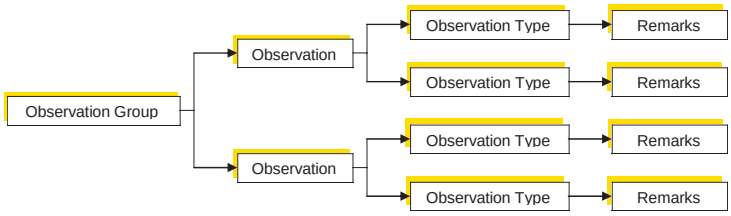
The review of MIST implementation started with a discussion with WWF Cambodia's Martin von Kaschke, Technical Adviser, Huy Keavuth, Geographical Information System (GIS) and Data Manager, Att Sreynak and Nay Sikhoeun, both Data Project Assistants. The role of Huy Keavuth is to support the assistants in database management and replication, while Att Sreynak and Nay Sikhoeun are responsible for the day to day use and maintenance of MIST databases. Huy Keavuth has a very good knowledge and experience of GIS but received no specific training related to MIST and has limited expertise in relational databases.
Att Sreynak and Nay Sikhoeun received training from the Wildlife Conservation Society (WCS) MIST-GIS Database and Training Officer, Sorn Pheakdey. The consultant originally trained Sorn Pheakdey and he has now been using MIST for the past two and a half years.

MIST has been implemented in two Protected Areas (PA) where the WWF Programme works in collaboration with the Cambodian government: Mondulkiri Protected Forest (MPF) and Phnom Prich Wildlife Sanctuary (PPWS), respectively under the jurisdiction of the Ministry of Agriculture, Forestry and Fisheries (MAFF) and Ministry of Environment (MoE). Att Sreynak is responsible for the MPF database and Nay Sikhoeun is responsible for the PPWS database. MPF has five ranger stations and PPWS six. One team was allocated to each station. The teams use three different types of Global Positioning System (GPS): Garmin™ eTrex®, Garmin™ GPS 12 and Garmin™ GPS 72. The rangers use the same standardised datasheets as WCS and MoE use in Kulen Promtep Wildlife Sanctuary. They record ecological and human activities data while carrying out ground patrols.

MIST software version 1.04 (Ecological Solution) was installed by Sorn Pheakdey in late 2005 and a database was first created for MPF. MPF database currently stores data from September 2005 to the present and PPWS database from mid-July 2006 to the present. When the consultant joined the project the team had created seven databases for MPF and six for PPWS. The reason behind the creation of such a large number of databases can be attributed to bugs known in that version of the software and the lack of expertise of the team. Firstly the function allowing the replication of a single PA within the database did not work in MIST 1.04, causing problems when the database stored data for more than one PA. Secondly the team did not know how to install the database on WWF Cambodia's local area network meaning that both assistants could not work on the database at the same time. It was thus decided to create one database per PA. Later the management team requested to summarise the data per ranger station. Mist 1.04 did not allow to record that value, leading the team to create a single database per station and per PA. One of the teams requests was to combine those different databases into a single WWF Cambodia database.

All users in WWF's Phnom Penh and provincial offices, have access to MIST through stand-alone computers. The databases from the PAs are synchronised with the central MIST database through manual updates using a USB flash drive.
The assistants travel to the field stations on a monthly basis and collect the rangers datasheets and GPS records. Once back in Phnom Penh office they enter the data into the system, using the ground patrol data entry form, and produce reports. The reports are printed and submitted to the Technical Advisors and Project Managers. In MIST, data entry is made through data downloaded from a GPS and the use of look-up tables. Those tables must be defined before data entry; that process is an essential component of the system implementation.

In MIST the observations are organised following a certain hierarchy, which can be illustrated using a tree-shaped diagram:



The consultant's second task was to look at MIST 'look-up' tables in each database. It should be noted that to combine all databases into a single one, those look-up tables should follow the same structure, i.e. all available observation groups, observations, observation types and remarks should match. When Att Sreynak started using MIST she did not know how to set up remarks. She therefore decided to create a detailed list of observations, covering each possible field situation. For example, if the rangers come across the remains of a killed elephant Sreynak would record the activity under "hunting elephant". If the rangers reported the evidence of a hunting activity but did not specify the species targeted; she would enter the record as "hunting". This structure does not allow an easy analysis of the data. For example the query "how many hunting activities were recorded during the last six months" is not straightforward because the different cases can not be combined. Aware of this problem, Sreynak decided to modify the look-up tables in March 2006. To do this she created a new database, this time following the structure developed by WCS, and started entering data. Data from September 2005 to mid-March 2006 and data from mid-March 2006 to the present were therefore entered following a different structure and could not be analysed together. A spreadsheet showing a list of observations available in MIST look-up tables for both databases, is available in Appendix 1, 2 & 3.

This document was sent to Martin von Kaschke and after discussion with the team it was decided to keep the latter structure, converting and importing data from the original database into the latest.

2 FIX PROBLEMS TRAIN GIS MANAGER

- Tested new version of MIST using WWF data
  - -Checked if known problems were fixed
  - -Looked at new functionalities (reports & GIS analysis)
- Evaluated feasibility for upgrading to MIST new version
- Trained the GIS Manager

2.a Fix problems

MIST version 1.04 was known to have several bugs. The problems reported by the WWF team upon my arrival had already been addressed to the developer in 2004 and 2005 both by the Biodiversity and Protected Areas Management Project (BPAMP) carried out by the Department of Nature Conservation and Protection of MoE and the WCS Cambodia Programme. Knowing that a new version of MIST (V2.2.2.3) was released in 2006 and is freely available for download at http://www.ecostats.com/software/mist/mist.htm, The consultant decided that it was not worth losing time on those issues and suggested trying the new version as bugs were supposed to be fixed and new functions available. The consultant decided to test the new version of MIST using WWF data to evaluate if it was worth upgrading and if it would be feasible.

A quick test showed that we could not simply open the WWF database using the new version of MIST. Small alterations made to the database structure created conflicts when opening a database created with the old version of MIST. A solution was to empty the relevant tables in the demonstration database provided with the software and refill them with data exported from the Programme databases. The following tables were emptied using Interbase® IBConsole version 1.0.0.326:

- Tables related to Rangers Ground Patrols (seeAppendices 2 and 3)
- Tables related to look-up tables and fundamental lists (table name starts with "LK" or "RMK")
- Tables related to the report templates (table name starts with "QUERY")
- Tables related to the map (table name starts with "GIS")
- PROTECTED_AREAS

Data were exported from the old database to the new one using EMS Interbase/FireBird Manager Version 3.5.0.1. As explained above and shown in appendix 1 & 2, the look-up tables in the first database, created for MPF, and the last one held different types of observation options. Before combining data from both databases I therefore had to modify the observations and observation types entered in the oldest database. MIST allocated a unique identification number to each type of observation, observation type, remark, employee and patrol. I had thus to also change those IDs to match the new database and avoid losing data when filling up the new database tables. I made these modifications using Microsoft Excel.

Since no remarks were entered in the old database, the MPF assistant could now go through the data books covering patrols from September 2005 to March 2006 and check if any observation remarks could be added to the database.

The team also requested to have MIST installed on WWF Cambodia's server, however due to a lack of space on the server the IT manager advised that this was not possible. It was decided to keep MPF and PPWS as two separate databases to allow both assistants to continue working on their respective databases simultaneously.

2.b. Train the GIS Manager

The consultant provided a short training to the team and particularly to the GIS manager on how to create a new database using an existing database. This included how to empty tables, import and export data. Following the team's request the consultant

provided them with a diagram showing which tables related to the ground patrols and how they were linked to each other (Appendix 4). The consultant also produced a document providing a short description of those table fields (Appendix 5).

The team was shown how to export spatial data created by MIST to ESRI ArcView GIS and how to export tables to software of the Microsoft Office family. The training was concluded with an overview of the new version of MIST. The team requested a new guide book adapted to this version but the consultant did not have the time to develop such a manual during the length of the present contract.

3 ASSESS IMPROVE DATA INPUT

- Discussed problems with Data Project Assistants
- Checked if data follows guidelines
- Looked at waypoints & patrol routes
- Produced MIST tasks schedule

3.a. Assess Quality of Data

A way to assess the quality of data is to check whether the rangers are following the guidelines they were given during training sessions. During their patrols, the rangers should take a waypoint in each of the following situations:

- when starting and finishing a patrol;
- when stopping for a break;
- when making a relevant observation;
- if changing means of transport (e.g. from car to foot);

In addition to these specific events, even if nothing special happens, they should still regularly take a waypoint; at least every 30mins when they are walking or using an elephant (or two waypoints within an hour if the forest cover does not allow to receive a signal). When patrolling with a vehicle, waypoints should be taken more often, for example every 15mins. However, the actual frequency of recording needs to be tested under field conditions. The idea is to be able to calculate the distance patrolled by the rangers with good accuracy. You could for example compare the distance calculated with a GPS using the track option with the distance calculated by MIST.

Then, using MIST we can draw the route followed by the ranger for any specific patrol and overlay all waypoints recorded. MIST draws the ranger's patrol routes by linking the waypoints belonging to a single patrol following their chronological order. For this reason the rangers should not change the waypoints name on the GPS. If they do, the waypoints will not be downloaded in chronological order and the route drawn by MIST will not reflect reality. Map 1 shows an example of a dataset that appears to be following data collection guidelines. Figure 1 compares the route calculated using a good dataset (a) with that created using a bad dataset (b). You can see that route (b) seems highly unlikely compared to route (a) The implication of the error shown by route (b) is an over-estimation of the distance patrolled.

Map 1: Route calculated for patrol ID 640

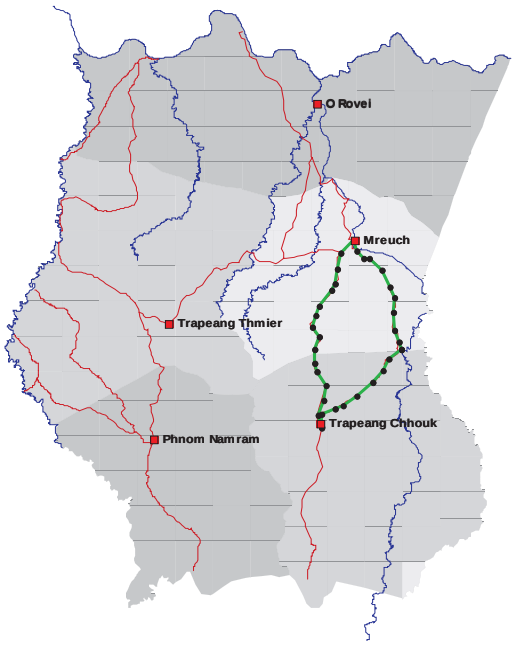
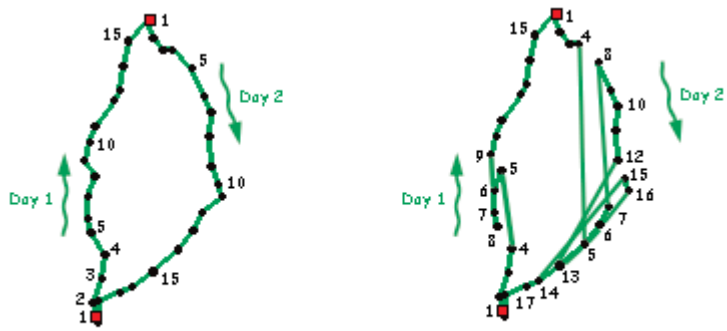


Figure 1: Comparison of a good dataset with a bad dataset.



a. Good example

b. Bad example

Whenever the assistants encounter a route looking like example (b) they should check the order of the waypoints against the time each was recorded. The example below shows a case of waypoints not entered in chronological order.

Waypoint ID	UTM X	UTM Y	Time
1	757393	1419088	08:38
2	757606	1422970	09:34
3	756875	1420837	09:04

← not in chronological order!

A review of MPF data seems to indicate that the rangers follow the guidelines listed above. However, a few points were located outside the PA (and even the country!). This could be due to the rangers entering a waypoint manually in the GPS and making a mistake such as entering the wrong UTMs or UTM zone, or the assistant inserting a waypoint manually in the database. When entering manually UTMs in the data entry form, MIST converts those coordinates to Lat-Lon. In the old version of MIST it was known that UTM coordinates were sometimes assigned to the wrong UTM zone, causing errors in the conversion (Mannion & Sokhakun, 2005). Mannion and Sokhakun describe one possible way to fix this in their user guide book.

In PPWS the problem is different. The rangers do not seem to follow the guidelines at all. They only take a waypoint when they make an observation. Many patrols only have one waypoint or two waypoints taken a couple of hours apart. In this case MIST can not calculate a meaningful distance patrolled and the survey effort can not be represented. In this area the rangers need further training.

3.b. Assess Data Project Assistant Capacities

Having assessed the quality of the data, the consultant also wanted to assess the abilities of the assistants. Both showed a good knowledge of MIST functionalities (data entry and report and map production) and only requested further help on very specific points. Time being limited, the consutant decided to provide training on a demand basis rather than setting a proper training course covering all points.
One specific problem was noted regarding additions to the look-up tables. When the rangers record a new type of observation, i.e. not included in the look-up tables, the assistant's update those tables and include the new type of data. However the logic and structure of the tables is not always respected. The consultant came across a specific example: the rangers reported destroying a house built illegally in the Srepok Wilderness Area Project (SWAP) core area. The assistant added a new value to the look-up table as follows:

Observation Group	Observation	Observation Type
Human Activity	Direct Observation	Destroyed house

"Destroyed house" is therefore at the same level as "Hunting" or "Fishing" (refer to list of available observations in appendix 1 & 2). In the way MIST was set-up, the observations and observation types describe, as their name indicate, an observation and not an action from the rangers. In this case the consultant therefore understood that the rangers saw people destroying a house and not that the rangers destroyed a house. In MIST the remarks section allow to enter more information on the record including actions from the rangers. The tables should therefore have been updated as follows:

Observation Group	Observation	Observation Type
Human Activity	Sign	House built in core zone

Then, you can use the remarks section to enter the action taken by the rangers, which is "destroyed house".

The consultant suggests the Data Project Assistants should consult the management team before updating the look-up tables (human activities and features related records only). If the management team is not available at the time, they should leave the observation and observation type as default (Position) and write down in Form A (see appendix 6) a list of records (including patrol number, patrol day, waypoint number and time) for which that observation was made together with a short description of the observation. The database can be updated later, once a decision has been taken with the management team.

3.c. Improve Data Input

In terms of data entry I believed that the best way to improve the quality of data is to set up a schedule the assistants will have to follow every month (see box 1). They should also fill in the forms provided in appendix 6 & 7 to report any problems as well as the day to day use and maintenance of the database.

Box 1: MIST monthly schedule

FIELD VISIT

- √ Collect rangers data book
- √ Discuss any problems rangers may have or that you notice during previous cycles.
- √ Provide additional training if required
- √ If possible print a copy of the previous month report for field station and go through it with the rangers.
- √ Bring MIST backup

DATA ENTRY

- √ Enter data into MIST using GPS & databooks.
- √ If you need to empty GPS before you can import data into MIST, download records in GARMIN MapSource®. When you are ready to enter data into MIST; upload data from MapSource® to GPS then download in MIST.

DATA QUALITY ASSESSMENT

- √ For each patrol check if way points are recorded according to guidelines (start point, end point, point at least every 30mins for foot patrol, 15mins for vehicles and only 1 type of observation per-record)
- √ Prepare a map showing all way point are recorded during the month using the "All waypoints" report. Then using the Query Wizard option
- √ Patrolled Areas" add the patrol routes (one at a time). Study each route and look for potential problems (the route should be a continuous curvy line, straight lines are suspicious and indicates waypoints are not in order or there are not enough waypoints).

BACKUP

- √ Create backup of the database and save in 2 different locations (example: hard drive of your computer and network). As a team you should decide whether to archiveor delete old backup.

  Example:
  PPWS_20070101.zip
  MKPF_20061201.zip

REPORTING

- √ If problems with data entry or recording appear fill in appropriate forms
- √ Create MIST monthly report and submit to management team
- √ Fill out forms indicating when MIST was updated and backup and report created

4 Monitoring of Ranger Activity

- Difficulty to differentiate between cheating & a lack of knowledge or even just a mistake
- Importance of data quality
  - Respect of guidelines
  - Check patrol routes
  - Record which team is responsible for problem data
- Limits in detection

This issue is a bit delicate because, without any evidence, it is difficult to say from the data if any potential problem is due to dishonesty amongst the rangers, a lack of knowledge or a genuine mistake made while using the GPS. The consultant would therefore prefer to talk about data quality and refer to the previous chapter. The main point here is to check that the rangers do follow the guidelines. As we saw earlier, common problems include wrong UTMs and waypoints not in chronological order. A ranger could have forgotten to take a waypoint but record the data on his datasheet and try later to add manually a waypoint in the GPS. Mistakes do happen, he can type in the data incorrectly. Alternatively a ranger could be cheating and entering data in the GPS while staying at the station, or in his favourite hiding place. Without, say, random spot checks of rangers on patrol, this kind of behaviour is difficult to quantify.

So what can you do about it? First, assuming that all waypoints are in order, you could check the total distance patrolled per day for each individual ranger. This can be easily deducted from MIST Ranger reports: MIST gives the total distance patrolled and the total number of patrol days per ranger. If you divide the distance by the number of days you have an average distance walked per day. You can check if this number makes sense compared to other rangers or with your personal field experience. This being said you should keep in mind that rangers patrol in teams and the data provided by MIST are in fact data recorded by the team and not individual rangers. This means that you might not be able to detect problems with a single ranger but only with a team. On this matter, it is important to get the rangers to understand that if one of them is cheating, the whole team could suffer the consequences, i.e. be replaced. The rangers could thus be encouraged to police themselves.

After drawing the patrol routes on the map and displaying each individual waypoint; you can also measure the distance between two consecutive waypoints (chosen randomly) using the ruler available in MIST and check how long it took them to cover that distance.

Each time the assistants encounter a patrol with problematic data they should write down the name of the rangers who participated in that particular patrol. Then they could compare if the team (or individual ranger if the rangers do not always join the same team) responsible for problem data are always the same. But again the consultant would recommend to be careful and not necessarily assume that this is due to an act of cheating.

The consultant would like to add a last word about the fact that it might not always be possible to detect cheating by simply looking at the data. If a ranger is very good at reading maps and has good field experience; theoretically he should be able to make up a possible route from the map and pick UTMs along this route at intervals that he believes can be walked in half an hour.

5 RANGERS PERFORMANCE

- Team versus individual rangers
- Distance patrolled
- Ranger stations Statistics

AS we saw in the previous chapter, since the rangers walk in teams; the numbers given, in terms of distances patrolled, are attributed to a team and not an individual ranger. If the rangers belong to a specific team and always carry out patrols together, then the distance patrolled each month per ranger will be equal for each team member. However, if the rangers are not always in the same group it might then be interesting to check the distances patrolled per individual ranger and to calculate in how many patrols an individual ranger participated in. The technical advisor also requested to be able to calculate the number of staff who actively patrolled per Ranger Station.

The new version of MIST allows users to enter a ranger station for each patrol. Using this new feature I created a new procedure and associated report, which can be selected either from the Report Builders (figure 2) or from the Query Wizard (figure 3). This report gives a list of patrol IDs carried out during the requested period together with their associated field station and participating rangers (see example in figure 4). This report can be saved and opened in Microsoft Excel to easily create a quick summary report using Excel Pivot tables. Microsoft Excel offers several possibilities to present information; for examples, see figures 5 & 6. For more information on Microsoft Excel Pivot tables visit the Microsoft Office Online website at http://office.microsoft.com/en-us/excel/HA010346321033.aspx.

Figure 2: Report Builders

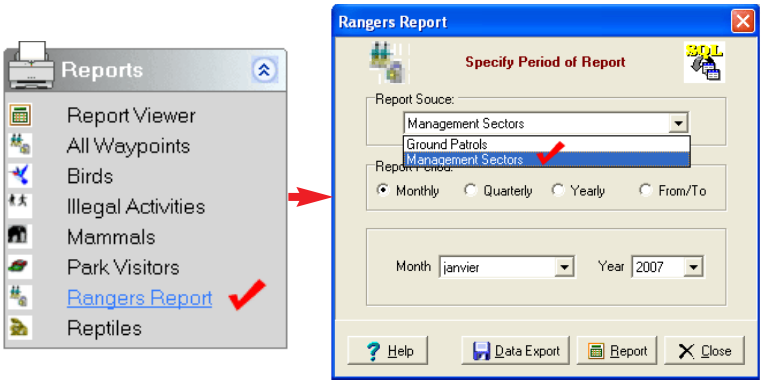
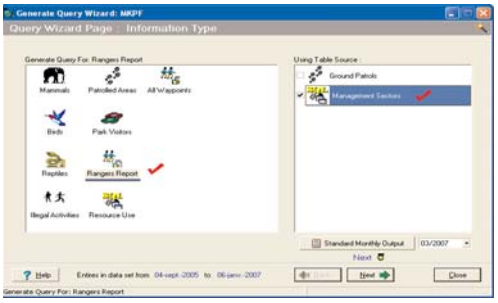


Figure 3: Query Wizard



It should be noted there are several ways to select a date in MIST, we can use the date the patrol started or finished, or the date at which a waypoint was taken. In this case the procedure uses the date the patrol started as a reference, i.e. if a patrol starts on the 29th of January and finishes on the 2nd of February, that patrol will then be counted amongst January patrols. The same query with a date based on waypoints would allocate that patrol both to January and February, hence counting it twice.

Figure 4: An example of a rangers' report

Figure 5: an example of a report summary created with Microsoft Excel. Here the management sectors are displayed in columns

NB Patrol id		Station name		
Family name	First name	Trapeang Chhouk	Trapeang Thmier	Total
Cham	Nin		3	3
Chey	Thou	4		4
Chreuk	Chan		2	2
Keo	Sukhoma		2	2
Man	Ream		6	6
Neang	Kimhung		6	6
Net	Sorn		4	4
Pin	Anen		2	2
Sive	Meng		3	3
Tat	Mla	5		5
Thorn	Buntha		1	1
Yim	Priya	3		3
Total		12	29	41

Figure 6: another example of a report summary created with Microsoft Excel. Here the management sectors are displayed in rows.

Station name	Family name	First name	NB Patrol id
Trapeang Chhouk			12
	Chey	Thou	4
	Tat	Mla	5
	Yim	Priya	3
Trapeang Thmier			29
	Cham	Nin	3
	Chreuk	Chan	2
	Keo	Sukhoma	2
	Man	Ream	6
	Neang	Kimhung	6
	Net	Sorn	4
	Pin	Anen	2
	Sive	Meng	3
	Thorn	Buntha	1
Total			41

6 Data Analysis Report

- Built a new query & associated report for ranger stations
- Train Data Project Assistants in the use of MIST new options: GIS Analysis, Trend Chart & query per management sector
- Create a report template using Microsoft Word
- Set a link between MIST & Microsoft Access

6.a. Data Analysis

MIST can provide regular updates on what is happening in the PA with the production of distribution maps and the calculation of distance-related indices (see Schmitt, 2001 and Schmitt & Sallee, 2002). Indices provide a measure of relative density and can be used in comparisons for monitoring, both over time and between management sectors. Those maps and indices can be produced both for species and human activity records.

MIST also allows us to calculate the distance covered by each patrol and maps patrol coverage. These can be used as indicators of patrol efficiency and interpreted as survey effort.
You should pay attention to two important points when using MIST indices:

- Firstly, ensure that the raw data are of good quality. As we saw in section three, a patrol distance calculated using a bad set of data would obviously provide wrong results. Indices calculated from those patrols would therefore also be incorrect.
- Secondly, relate those indices to the patrol effort. In order to compare indices over time, the patrol effort within each management sector should be constant. In order to com pare those indices between manage ment sectors, the survey effort should be identical in each.

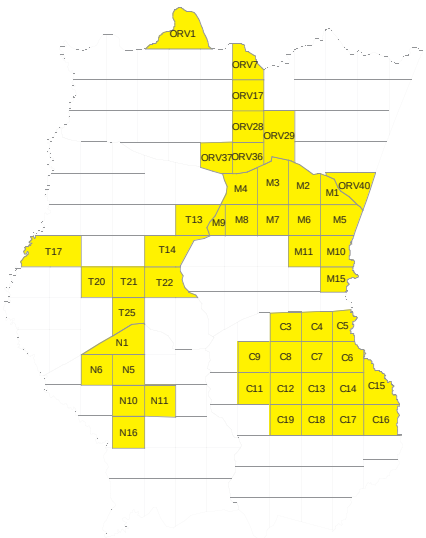
When comparing indices be aware that those figures can be influenced by the habitat and the amount of species recorded might vary according to the probability of the rangers to detect a species or the sign of its presence.

New additions were made to the old version of MIST with both the release of a new version of the software and some alteration to the database:

- **GIS Analysis**

This tool can be used to overlay different sets of data. For example, MIST can highlight all patrol blocks including one or more record of a specific species such as tiger. In the same way we can highlight all ranger blocks, including at least one waypoint recorded during the period of time queried (see example on map 2).

Map 2: Example of map showing the blocks patrolled (in yellow) during a given month.



The GIS Analysis also allows us to calculate densities or percent occurrence per management sector or ranger block. However, a quick test of that function revealed possible errors. This tool should, therefore, be tested more before being used.

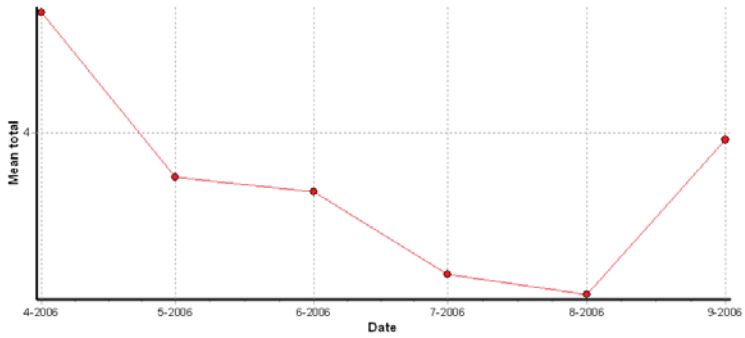
- **Trend Chart**

This tool allows us to show the temporal change in the total number of observations seen within a time period. For example, we could look at the number of banteng sightings recorded per month. An average of records per patrol and per month can also be displayed. An example is presented below on Graph 1.

- **Ranger Station**

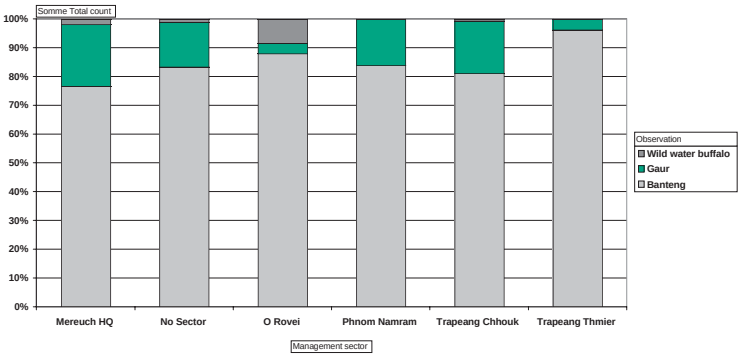
As indicated in section five it is now possible to allocate a ranger station to each ground patrol. This allows us to calculate statistics per ranger station and ensure that all stations are appropriately active. A report was created to include this parameter, as figure 4 shows.

Graph 1: Example of graphic showing trends for a specific species. Here we can see the mean banteng footprints recorded per patrol from April to September 2006.



The technical advisor requested to be able to calculate comparative ratio of wild cattle. This can easily be achieve using, again, Microsoft Excel Pivot Tables. First, using MIST Query Wizard create a report showing only the records of wild cattle for the requested period. Save the report produced by MIST and open it with Microsoft Excel. Select the chart option of the Pivot Tables wizard (see example on graph 2).

Graph 2: Comparison of the number of wild cattle footprint recorded during year 2006 per management sector



6.b. Reporting

SWAP technical advisor stated that the reports and particularly the maps were not always very easy to read. It is true that a map can easily appear to be crowded if too much information is displayed. Below are a few comments and recommendations, which will, hopefully, help improve the look of the maps:

- Both MPF and PPWS original data bases included detailed river and road datasets. At the scale of the entire PA datasets showing only the main rivers and roads should be enough.
  The consultant provided MPF with such datasets but did not have time to create one for PPWS. It would be good if the GIS Manager could provide PPWS assistants with a dataset of similar level of detail.
- Do not put too much infor mation on the map; for example records for all key species can be displayed on a map summarising data for a month, but can look too crowded on a six-month map. In the later case, key species from the same family could be grouped. For example a map could be created to show records of big cats, another one would display wild cattle records.
- Use the same set of symbols and colours each month.
- Ensure that maps are large enough in your document.

Using inputs from the team, the consultant designed a report template using Microsoft Windows and trained the data entry officer to produce maps, graphs and tables required in that report. Training was provided to both assistants on the new features listed above. As indicated some options, such as densities, calculated by the GIS analysis tool still have to be tested thoroughly. The idea was to produce a single monthly report, easy to read, and compiling only the key information needed by the PA Managers and Technical Advisers. The report should provide information as indicated in box 2.

Box 2: Information to be included in MIST monthly reports

RANGER ACTIVITY

- √ A table summarising the main infor mation about the rangers' patrol such as number of patrols and distance patrolled;
- √ a table showing the number of patrols each individual ranger participated in and summarised per ranger station (see figure 5 & 6);
- √ a map showing all waypoints recorded. Alternatively a map showing all patrol routes;
- √ a map highlighting the patrol blocks surveyed during the month (see map 2).

MAMMALS, BIRDS AND REPTILES

- √ A map showing the location of key species records;
- √ a table showing the number of records per management sector;
- √ graphics showing the number of key species records made per month (alternatively an average of key species records made per patrol and per month) over the last six months (see graph 1).

HUMAN ACTIVITIES

- √ A table showing the number of records per management sector;
- √ a table showing the type of activities recorded together with their associated remarks;
- √ a map showing the location of human activity records.

6.c. Link to Microsoft Access

The team also requested being able to import MIST tables into Microsoft Access. This could allow user who are not familiar with MIST, to query the database without having to rely on the assistant. The consultant installed Firebird ODBC driver v1.2 both on Huy Keavuth and Att Sreynak's computers. Then the consultant imported the MIST tables which store data related to ground patrols using the live link option. When using that option, any changes or additions made to the database using MIST can automatically be seen in Microsoft Access, i.e. the user does not need to re-import the tables. It should be noted that the database can only be opened using one software at a time. The tables were imported as read only and should not be updated using Microsoft Access.

The assistants were given an overview of Microsoft Access and shown how MIST tables could be imported and linked together within Access. The consultant supplied the team with a list of tables related to ground patrols and a diagram showing how those link (see appendix 4).
The consultant was asked to create some report templates using Microsoft Access to answer the team's specific questions. However as shown during the length of my contract, it is possible to add new report templates to MIST directly and without using Access. Limiting the number of software to be used for data analysis is obviously less confusing for the staff and the consultant therefore favoured this option.

Recommendations

Classified by category:

Training:

- Update MIST user guides to integrate the changes made to the new version of MIST.
- The rangers of PPWS require further training and need to understand the importance of data collection guidelines.
- The assistant would benefit from training on Microsoft Access & Excel. Understanding of basic computer language could also be an advantage.

Data Quality:

- The MPF assistant should check if any observation remarks could be entered in the database for records going from September 2005 to March 2006.
- If the rangers sometimes use a vehicle to carry out patrols, test how often they should take a waypoint for MIST to be able to calculat an accurate patrol distance.
- Implement MIST monthly schedule and the use of reporting forms.
- Keep track of the name of rangers who participate in patrols with problem data.
- Encourage the rangers to police themselves.

Database maintenance

- The Data Project Assistants should consult the management team before updating MIST look- up tables.
- Back-up the database after each update and save a copy in, at least, two different locations. For example one copy on the hard drive of your computer and one on the server.
- Create a spatial dataset for PPWS showing only the main rivers and roads.

Reporting

- Keep the maps simple and always use the same symbogy.
- Use the Microsoft Word template for monthly reports.
- Organise a monthly meeting after the report has been passed through the team members and discuss the information provided. Appendix 8 provides an example of integration of the information produced by MIST in the PA management cycle. This report was created by the BPAMP Project.
- Provide regular feedback to the rangers. For example, maps and reports could be displayed in the rangers offices. The consultant believes that rangers motivation can be increased if they can see the results of their work.

Other

- A quick check of the GIS Analysis tool that allows us to cal culate densities or percent occurrence seems not to be working properly. This option should be further tested.

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Appendix 1: Values stored in look-up tables of the first database created for MPF

OBSERVATION GROUP	OBSERVATION	OBSERVATION TYPE
Birds	Abbott's Babbler	Call
		Nest
		Photo
		Poached
		Sighting
		Egg
	Alexandrine Parakeet	Same as Abbott's Babbler
	Black Kite	Same as Abbott's Babbler
	Black-naped Oriole	Same as Abbott's Babbler - egg
	Black-necked Stork	Same as Abbott's Babbler
	Crested Serpent Eagle	Same as Abbott's Babbler
	Darter	Same as Abbott's Babbler
	Eagle	Same as Abbott's Babbler
	Eangle	Same as Abbott's Babbler
	Germain's Peacock Pheasant	Same as Abbott's Babbler
	Giant Ibis	Same as Abbott's Babbler
	Great Hornbill	Same as Abbott's Babbler
	Great Slaty Woodpecker	Same as Abbott's Babbler
	Greater Adjutant	Same as Abbott's Babbler
	Green Peafowl	Same as Abbott's Babbler
	Grey-headed Fish Eagle	Same as Abbott's Babbler
	Kite	Same as Abbott's Babbler
	Lesser Adjutant	Same as Abbott's Babbler
	Lesser Fish Eagle	Same as Abbott's Babbler
	Oriental Pied Hornbill	Same as Abbott's Babbler
	Owl	Same as Abbott's Babbler
	Red Junglefowl	Same as Abbott's Babbler
	Red Kite	Same as Abbott's Babbler
	Red-headed Vulture	Same as Abbott's Babbler
	Sarus Crane	Same as Abbott's Babbler
	Slender-billed Vulture	Same as Abbott's Babbler
	Spot-bellied Eagle Owl	Same as Abbott's Babbler
	White-rumped Vulture	Same as Abbott's Babbler
	White-shouldered Ibis	Same as Abbott's Babbler
	White-winged Duck	Same as Abbott's Babbler
	Woolly-necked Stork	Same as Abbott's Babbler
	[Spotted Bush Warbler]	Same as Abbott's Babbler
Features	Bridge	Car
		Foot trail
		Motorbike
		Occupied
		Old, abandoned
		Ox-Cart
		Position
		Recently abandoned
		Unknown
	Camp	Bamboo
		DDF
		EF
		MDF
		Old, abandoned
		Position
		Recently abandoned
		SEF
		Spring
		Unknown
		Village
		Waterhole
	Road	Same as Bridge
	Saltlick	Same as Bridge
	Seasonal Village	Same as Bridge
	Trail	Same as Bridge
	Trapeang	Same as Bridge
	Village	Same as Bridge - Recently abandoned

OBSERVATION GROUP	OBSERVATION	OBSERVATION TYPE
Human Activities	Direct Evidence	Cleared
		Clearing
		Collecting NTFP
		Destroying house
		Fire
		Fishing
		Hunting banteng
		Hunting Civet
		Hunting D-Langur
		Hunting Eld's Deer
		Hunting Elephant
		Hunting Fishing Cat
		Hunting Gaur
		Hunting Hog Deer
		Hunting LTM
		Hunting leopard
		Hunting Otter
		Hunting PTM
		Hunting Red-Muntjac
		Hunting S-Langur
		Hunting STM
		Hunting Sun Bear
		Hunting Tiger
		Hunting WWB
		Hunting Wild Pig
		Logging Luxery Wood
		Other/Unknown
		Planted
	Sign	Same as Direct Evidence +
		Hunting
		Logging
		NTFP
Mammals	Asian Elephant	Call
		Carcass
		Dead - cause Unknown
		Dead-Carnivor eating
		Dig
		Dropping
		Footprint
		Natural Death
		Nest
		Photo
		Poached
		Scratch
		Sighting
		Trail
	Asiatic Brush-tailed Porcupine	Same as Elephant
	Asiatic Jackal	Same as Elephant
	Banteng	Same as Elephant
	Bat spp.	Same as Elephant
	Canid spp.	Same as Elephant
	Cattle spp.	Same as Elephant
	Civet spp.	Same as Elephant - Trail
	Clouded Leopard	Same as Elephant
	Dhole	Same as Elephant
	Douc Langur	Same as Elephant - Nest
	East Asian Porcupine	Same as Elephant - Sighting
	Elds Deer	Same as Elephant
	Fishing Cat	Same as Elephant + Dung & Track
	Flying Squirrel spp.	Same as Elephant
	Gaur	Same as Elephant
	Irrawaddy Dolphin	Same as Elephant + Dung & Track
	Large-toothed Ferret Badger	Same as Elephant + Dung & Track
	Leopard	Same as Elephant
	Long-tailed Macaque	Same as Elephant

OBSERVATION GROUP	OBSERVATION	OBSERVATION TYPE
Mammals	Otter spp.	Same as Elephant - Scratch
	Pig-tailed Macaque	Same as Elephant - Carnivor eating
	Pileated Gibbon	Same as Elephant
	Porcupine spp.	Same as Elephant
	Red Muntjac	Same as Elephant
	Sambar	Same as Elephant
	Siamese Crocodile	Same as Elephant + Dung & Track
	Silvered Langur	Same as Elephant
	Slow Loris	Same as Elephant
	Small Asian Mongoose	Same as Elephant
	Small Carnivore/Small/Med Cat	Same as Elephant
	Southern Serow	Same as Elephant + Dung & Track
	Stump-tailed macaque	Same as Elephant
	Sun Bear	Same as Elephant
	Sunda Pangolin	Same as Elephant
	Tiger	Same as Elephant
	Wild Pig	Same as Elephant
	Wild Water Buffalo	Same as Elephant
	Yellow-cheeked Crested Gibbon	Same as Elephant
Position	Position	End
		Position
		Start
Reptiles	Bengal Monitor	Dead-Cause Unknown
		Nest
		Photo
		Poached
		Sighting
	Snake spp.	Same as Bengal Monitor
	Turtle spp.	Same as Bengal Monitor
	Water Dragon	Same as Bengal Monitor
	Water Monitor	Same as Bengal Monitor

Appendix 2: Values stored in look-up tables of the second database created for MPF

OBSERVATION GROUP	OBSERVATION	OBSERVATION TYPE
Birds	Bengal Florican	Call
		Footprint
		Nest
		Photo
		Poached
		Sighting
		Egg
	Black-headed Ibis	Same Bengal Florican - egg
	Black-necked Stork	Same Bengal Florican
	Chinese francolin	Same Bengal Florican - footprint
	Collared Seops Owl	Same Bengal Florican
	Common Tern	Same Bengal Florican
	Cotton Pygmy-goose	Same Bengal Florican
	Crested Serpent Eagle	Same Bengal Florican
	Darter	Same Bengal Florican
	Germain's Peacock Pheasant	Same Bengal Florican
	Giant Ibis	Same Bengal Florican
	Great Hornbill	Same Bengal Florican
	Great Slaty Woodpecker	Same Bengal Florican
	Greater Adjutant	Same Bengal Florican
	Green Peafowl	Same Bengal Florican
	Koel	Same Bengal Florican
	Lesser Adjutant	Same Bengal Florican
	Lesser Fish Eagle	Same Bengal Florican - footprint
	Lesser Whistling-duck	Same Bengal Florican
	Little grebe	Same Bengal Florican
	Oriental Pied Hornbill	Same Bengal Florican
	Owl	Same Bengal Florican - footprint
	Red Junglefowl	Same Bengal Florican
	Red-headed Vulture	Same Bengal Florican
	Sarus Crane	Same Bengal Florican
	Siamese Fireback	Same Bengal Florican
	Slender-billed Vulture	Same Bengal Florican
	Sparrowhawk	Same Bengal Florican
	Spot-billed Pelican	Same Bengal Florican
	White-rumped Vulture	Same Bengal Florican - call
	White-shouldered Ibis	Same Bengal Florican
	White-winged Duck	Same Bengal Florican
	Woolly-necked Stork	Same Bengal Florican
	Wreathed hornbill	Same Bengal Florican
Features	Bridge	Car
		Foot trail
		Motorbike
		Occupied
		Old, abandoned
		Ox-Cart
		Position
		Recently abandoned
		Unknown
	Camp	Car
		DDF
		EF
		Foot trail
		HBF
		LBF
		Motorbike
		Occupied
		Old, abandoned
		Ox-Cart
		Pool
		Position
		Recently abandoned

OBSERVATION GROUP	OBSERVATION	OBSERVATION TYPE
Features	Camp	SEF
		Saltlick
		Spring
		Stream
		Trapeang
		Unknown
		Village
	Road	Car
		Foot trail
		Motorbike
		Ox-Cart
	Saltlick	Car
		Foot trail
		Motorbike
		Occupied
		Old, abandoned
		Ox-Cart
		Position
		Recently abandoned
		Unknown
	Seasonal Village	Same as Saltlick
	Trapeang	Same as Saltlick - Ox-cart
	Village	Same as Saltlick
Human Activities	Direct Evidence	Fishing
		Hunting
		Logging
		NTFP
		Other/Unknown
	Land	Cleared
		Clearing
		Planted
	Sign	Fishing
		Hunting
		Logging
		NTFP
Mammals	Asian Elephant	Call
		Carcass
		Dead - cause unknown
		Dead-Carnivor eating
		Dig
		Dropping
		Dung
		Feeding Sign
		Fighting Sign
		Footprint
		Natural death
		Photo
		Poached
		Scratch
		Scratching
		Sighting
		Sleeping Sign
		Trail
	Asian Golden Cat	Same as Elephant - Dung
	Asiatic Black Bear	Same as Elephant
	Asiatic Brush-tailed Porcupine	Same as Elephant
	Asiatic Jackal	Same as Elephant
	Banteng	Same as Elephant
	Berdmor's Suirrel	Same as Elephant + Nest
	Canid spp.	Same as Elephant - Feeding, Fighting & Sleeping
	Cattle spp.	Dropping
		Dung
		Footprint
		Sighting

OBSERVATION GROUP	OBSERVATION	OBSERVATION TYPE
Mammals	Civet spp.	Same as Elephant + Nest - Scratching
	Clouded Leopard	Same as Elephant
	Dhole	Same as Elephant
	Douc Langur	Same as Elephant
	Eld's Deer	Same as Elephant
	Fishing Cat	Same as Elephant
	Flying Squirrel spp.	Same as Elephant - Footprint
	Gaur	Same as Elephant
	House rat	Same as Elephant + Nest
	House shrew	Same as Elephant + Nest - Trail
	Jungel cat	Same as Elephant + Nest
	Large bandicoot rat	Same as Elephant + Nest
	Leopard	Same as Elephant
	Leopard cat	Same as Elephant - Carcass
	Long-tailed Macaque	Same as Elephant - Feeding & Fighting
	Marbled Cat	Same as Elephant - Fighting, Scratch & Scratching
	Northern treeshrew	Same as Elephant + Nest - Feeding, Fighting & Scratching
	Otter spp.	Same as Elephant - Feeding & Fighting
	Pig-tailed Macaque	Same as Elephant - Feeding & Fighting
	Pileated Gibbon	Same as Elephant - Feeding, Fighting & Sleeping
	Porcupine spp.	Same as Elephant - Feeding & Fighting
	Red Muntjac	Same as Elephant
	Sambar	Same as Elephant - Feeding, Fighting, Scratching & Sleeping
	Siamese hare	Same as Elephant - Feeding, Fighting & Scratching
	Silvered Langur	Same as Elephant - Feeding, Fighting, Scratching & Sleeping
	Small Asian Mongoose	Same as Elephant - Feeding, Fighting, Scratching & Sleeping
	Small Carnivore/Small/Med Cat	Same as Elephant - Feeding, Fighting, Scratching & Sleeping
	Spinner Dolphin	Same as Elephant + Nest
	Squirrel	Same as Elephant + Nest - Feeding, Fighting, Scratching & Sleeping
	Stump-tailed macaque	Same as Elephant - Feeding, Fighting, Scratching & Sleeping
	Sun Bear	Same as Elephant - Feeding, Fighting, Scratching & Sleeping
	Sunda Pangolin	Same as Elephant - Feeding, Fighting, Scratching & Sleeping
	Tiger	Same as Elephant - Feeding, Fighting, Scratching & Sleeping
	Wild Pig	Same as Elephant + Nest - Feeding, Fighting, Scratching & Sleeping
	Wild water buffalo	Same as Elephant - Feeding, Fighting, Scratching & Sleeping
Position	Position	End
		Position
		Start
Reptiles	Bengal Monitor	Dead-Cause unknow
		Nest
		Photo
		Poached
		Sighting
	Crocodile	Same as Bengal monitor
	Siamese Crocodile	Same as Bengal monitor
	Snake spp.	Sighting
	Turtle spp.	Nest
		Sighting
	Water Dragon	Same as Bengal monitor
	Water Monitor	Same as Bengal monitor - Photo

Appendix 3: Available remarks in the second database created for MPF

	Fishing				Hunting				
	Direct		Sign		Direct		Sign		
Weapons/gears	**Confiscated**	**Seen**	**Confiscated**	**Seen**	**Confiscated**	**Seen**	**Confiscated**	**Seen**	**Destroyed**
transportation	■	■	■			■			
- oxcart	■					■			
- bicycle	■	■				■			
- motorbike	■		■			■			
- car			■			■			
CKC					■				
ckc	■	■			■	■	■	■	
home-made gun	■	■			■	■		■	
ak	■	■			■	■	■	■	
shotgun	■	■			■	■	■	■	
M16							■		
electric machine	■	■	■	■					
battery	■	■	■	■					
bent	■	■	■	■					
poison	■	■	■	■					
electric rod	■	■	■	■					
fishing net		■							
Fishing net		■							
do		■	■	■	■	■	■	■	■
boat			■	■					
traditional			■	■					
big trap					■	■	■	■	■
crossbow					■	■	■	■	
big snare					■	■	■	■	■
sou					■	■	■	■	■
small trap					■	■	■	■	■
knife					■	■	■	■	
small snare					■	■	■	■	■
Gun Shot Heard							■	■	■
People	**Confronted**	**Seen**			**Confronted**	**Seen**			
Other	■	■			■	■			
Local People	■	■			■	■			
Police Border	■	■			■	■			
Military Police	■	■			■	■			
Military	■	■			■	■			
Action Taken	■				■				
- issued full contract	■				■				
- issued short contract	■				■				
- educated them	■								
- sent to the court	■								
Recorded information									
By intelligence	■	■			■	■			
By chance	■	■			■	■			
Animals					**Confiscated**	**Seen**			
dead					■	■			
- Lesser Mousedeer					■	■			
- Slow Loris					■	■			
- Red Muntjac					■	■			
- Porcupine spp.					■	■			
- Wild Pig					■	■			
- Long-tailed Macaque					■	■			
- Turtle spp.					■				
- Bengal Monitor					■				
alive					■	■			
- Long-tailed Macaque					■	■			
- Sarus Crane					■	■			
- Red Muntjac					■				
- Sunda Pagolin						■			
- Slow Loris						■			
- Water Monitor						■			
- Wooly-necked Stork						■			
parts					■				
- skin					■				
+ Python spp.					■				
- stomach					■				
- bones					■				
- meat (kg)					■				
- horns						■			
- gall bladder						■			

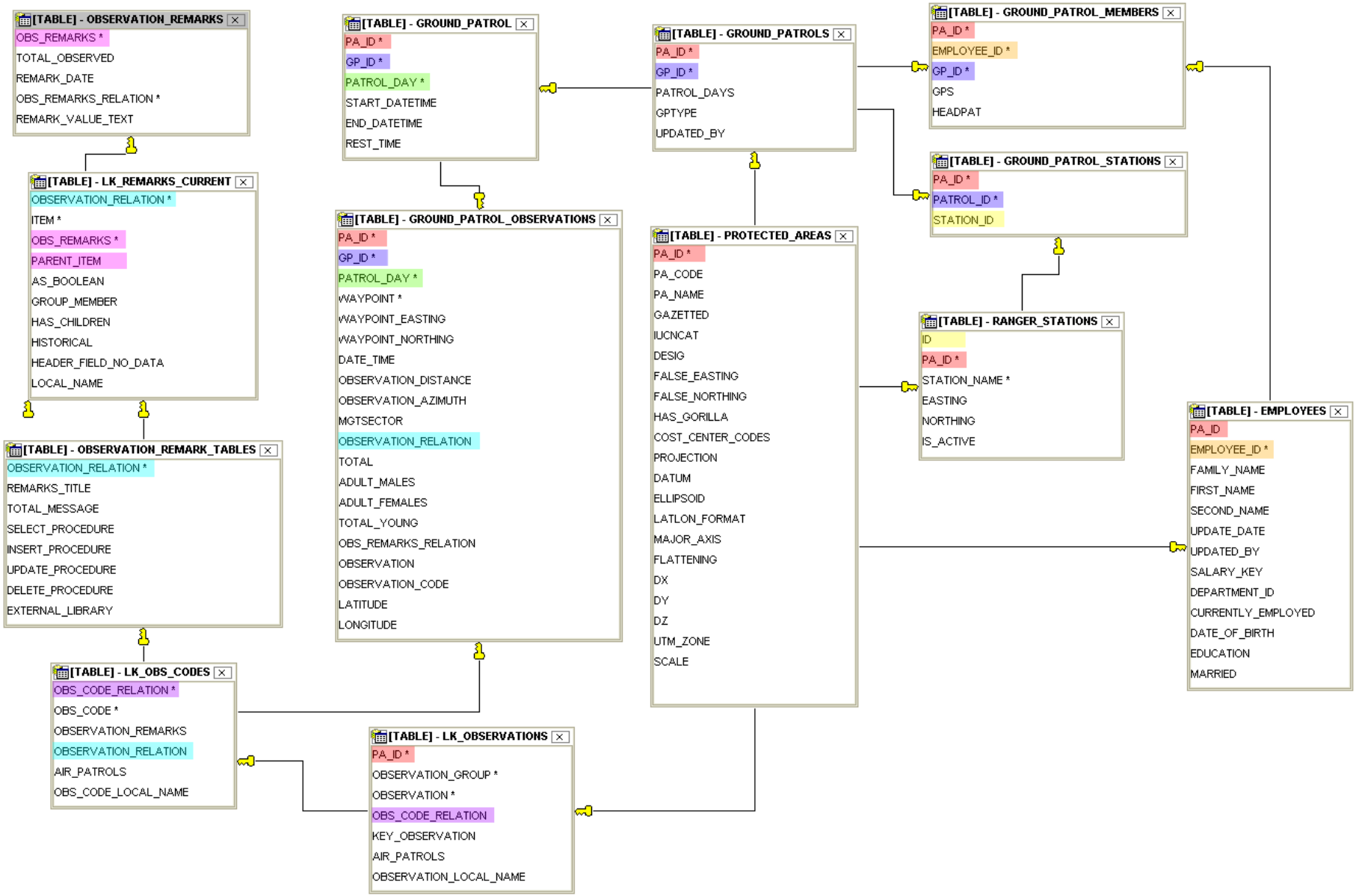
	Logging			
	Direct		Sign	
Gear	**Confiscated**	**Seen**	**Confiscated**	**Seen**
boat engine				
other illegal				
axe				
chainsaw				
handsaw				
Knife				
Ko Yun				
People	**Confronted**	**Seen**		
Other				
Local People				
Police Border				
Military Police				
Military				
Action Taken				
- issued full contract				
- issued short contract				
- educated them				
- sent to the court				
Recorded Information				
By intelligence				
By chance				
Wood	**Confiscated**	**Seen**	**Confiscated**	**Seen**
Doug Cheam				
- number of trees				
- number of pieces				
- number of logs				
- m3				
Thnung				
- number of trees				
- number of pieces				
- number of logs				
- m3				
Kra Kah				
- number of trees				
- number of pieces				
- number of logs				
- m3				
Kro Nhoung				
- number of trees				
- number of pieces				
- number of logs				
- m3				
Koki				
- number of trees				
- number of pieces				
- number of logs				
- m3				
Choeu teal toeuk				
- number of trees				
- number of pieces				
- number of logs				
- m3				
Popel				
- number of pieces				
- number of logs				
- number of trees				
- m3				
Neang noun				
- number of trees				
- number of pieces				
- number of logs				
- m3				
Beng				
- number of trees				
- number of pieces				
- number of logs				
- m3				
Other				
- number of trees				
- number of logs				
- number of pieces				

	NTFP			
	Direct		Sign	
Weapons/gears	**Confiscated**	**Seen**	**Confiscated**	**Seen**
transportation				
- car				
- oxcart				
- motorbike				
axe				
chainsaw				
handsaw				
Knife				
Weapons/gears confiscated				
People	**Confronted**	**Seen**		
Other				
Local People				
Police Border				
Military Police				
Military				
Action Taken				
- issued full contract				
- issued short contract				
- educated them				
- sent to the court				
Recorded Information				
By intelligence				
By chance				
Species	**Confiscated**	**Seen**	**Confiscated**	**Seen**
malva tree				
honey				
samraong fruit				
rattan				
liquid resin				
orchids				
medical plant				
bamboo				
wild fruit/veg/mushroom				
dry resin				
charcoal				
fruit tree				
Scrap metal				
Other				

	Other/unknown
	Direct
Transportation	
- car	
- ox-cart	
- motorbike	
- elephant	
- bicycle	
People seen	
Other	
Local People	
Police Border	
Military Police	
Military	

	Land					
	Clearing		Cleared		Planted	
Weapons/gears	**Confiscated**	**Seen**	**Confiscated**	**Seen**	**Confiscated**	**Seen**
transportation						
- bycicle						
- oxcart						
- car						
- motorbike						
axe						
chainsaw						
handsaw						
Knife						
People	**Confronted**	**Seen**	**Confronted**	**Seen**	**Confronted**	**Seen**
Other						
Local People						
Police Border						
Military Police						
Military						
Action Taken						
- issued full contract						
- issued short contract						
- educated them						
- sent to the court						
Recorded Information						
By intelligence						
By chance						
Size (ha)						
Crop						**Seen**
cashew						
rubber						
rice						
corn						

Appendix 4: MIST tables related to ground patrols



Appendix 5: Description of MIST tables related to ground patrols

GROUND_PATROLS: GIVES INFORMATION ABOUT EACH PATROL

GROUND_PATROLS	
PA_ID	Protected Area id, e.g. PPWS
GP_ID	Ground Patrol id (number)
PATROL_DAYS	Number of days
GPTYPE	Mean of transport (Foot, Bike, …)
UPDATED_BY	Refers to person who logging

GROUND_PATROL: GIVES INFORMATION ABOUT EACH PATROL DAY

GROUND_PATROL	
PA_ID	Protected Area id, e.g. PPWS
GP_ID	Ground Patrol id (number)
PATROL_DAY	Patrol day number
START_DATETIME	Date and time when Patrol day start
END_DATETIME	Date and time when Patrol day end
REST_TIME	Rest time during the patrol day

GROUND_PATROL_STATION: LINKS PATROLS AND STATIONS

GROUND_PATROL_STATION	
PA_ID	Protected Area id, e.g. PPWS
PATROL_ID	Ground Patrol id (number), same as GP_ID
STATION_ID	Station id (number)

RANGER_STATIONS: GIVES INFORMATION ABOUT THE RANGER STATI

RANGER_STATIONS	
ID	Station id (number)
PA_ID	Protected Area id, e.g. PPWS
STATION_NAME	Station name
EASTING	Coordinate
NORTHING	Coordinate
IS_ACTIVE	Is the station active (yes/no)

GROUND_PATROL_MEMBERS: ASSIGNS RANGERS TO EACH PATROL

GROUND_PATROL_MEMBERS	
PA_ID	Protected Area id, e.g. PPWS
EMPLOYEE_ID	Employee id (number)
GP_ID	Ground Patrol id (number)
GPS	Did this employee use a GPS during this patrol? (Yes/No)
HEADPAT	Was this employee the patrol leader for this patrol? (Yes/No)

EMPLOYEES: INFORMATION ABOUT EMPLOYEES

EMPLOYEES	
PA_ID	Protected Area id, e.g. PPWS
EMPLOYEE_ID	Employee id (number)
FAMILY_NAME	Family name
FIRST_NAME	First name
SECOND_NAME	Second name

GROUND_PATROL_OBSERVATIONS: INFORMATION RELATED TO RECORDS

GROUND_PATROL_OBSERVATIONS	
PA_ID	Protected Area id, e.g. PPWS
GP_ID	Ground Patrol id (number)
PATROL_DAY	Patrol day number
WAYPOINT	Waypoint number
WAYPOINT_EASTING	UTM X
WAYPOINT_NORTHING	UTM Y
DATE_TIME	Date and time the record was made
MGTSECTOR	Management sector (given by MIST)
OBSERVATION_RELATION	MIST create a number for each combination observation- observation type. Works like an id.
TOTAL	Total observations made for this record
OBS_REMARKS_RELATION	Link to OBSERVATION_REMARKS table (number)
OBSERVATION	Observation
OBSERVATION_CODE	Type of Observation
LATITUDE	Latitude (decimal degree)
LONGITUDE	Longitude (decimal degree)

OBSERVATION_REMARKS: INFORMATION ABOUT REMARKS ENTERED IN MIST, LINKED TO GROUND PATROL_OBSERVATIONS

OBSERVATION_REMARKS	
OBS_REMARKS	Remark id (number)
TOTAL_OBSERVED	Total items observed
REMARK_DATE	Date of Remark
OBS_REMARKS_RELATION	Link to GROUND_PATROL_OBSERVATIONS table (number)
REMARK_VALUE_TEXT	

LK_REMARKS_CURRENT: Remark options and how they relate to each other.

LK_REMARKS_CURRENT	
OBSERVATION_RELATION	Link to GROUND_PATROL_OBSERVATIONS table (number)
ITEM	Name of item
OBS_REMARKS	Remark id (number)
PARENT_ITEM	Link to field OBS_REMARKS when hierarchy in Remarks
AS_BOOLEAN	Remarks displayed as tick box (yes/no)
GROUP_MEMBER	Remark is part of a group (yes/no)
HAS_CHILDREN	Refer to remarks hierarchy (yes/no); e.g. Wood Seen > Species > Quantity
HISTORICAL	Existing data saved, not seen (yes/no)
HEADER_FIELD_NO_DATA	Displayed as remark header, no data entry possible (yes/no)
LOCAL_NAME	Local name

Appendix 6: Form A - Data entry issues for investigation

Protected Area:		**Date:**	

Patrol ID	**Day**	**Wpt**	**Description of issue**	**Resolved**

Instructions:

Record any waypoints that you cannot enter correctly into MIST in the form above. Refer these waypoints to the management team. When the problem has been resolved tick the column "Resolved"

Appendix 7: Form B - Problem Reporting Report

Protected Area: **Date:**

Problems in the field with GPS receivers

Problems with data collection (getting data sheets on time)

Problems using MIST

Recommendations

Appendix 8: MIST Management Action Report

Prepared by _____
Date: _____
Covering the period:_____

Introduction

The purpose of this document is to link the information outputs of the MIST Protected Area Management Information System with well-justified specific management actions.
This report covers recent information provided by the MIST system at Virachey National Park and provides an organized accounting of all management decisions that have been based on these and other information.

Key Resource/Illegal Activity Management information

Significant biodiversity element occurrences

The following table lists all occurrences of high-priority biodiversity elements. A full table of all wildlife occurrence observations for the month can be found in Appendix 1. These data inform our long-term understanding of biodiversity distribution and status and can indicate important trends. However, These data should always be evaluated in the context of a longer term understanding of distribution and status including seasonal and other temporal fluctuations and other factors.
Impacts on natural resources/biodiversity

No.	Biodiversity or other valued feature	Method of detection	UTME	UTMN	Other Notes
1	Banteng herd in sector 5	Direct observation	667903	1564783	• Comment

The following table lists the most significant human impacts that have occurred during the report period. A full table of all impacts recorded during the reporting period is in Appendix 2.

Discussion of Key Threats

No.	Impact Type	Specific Impact	UTME	UTMN	Other Notes
1	Clearing	Burning			• Comment

Based on all available data, list any situations (that have not been previously identified) where impacts identified above (or those identified by longer term trends) may be having or could have an effect on high-priority biodiversity or other valued features. The list should be prioritized in terms of the conservation significance of the feature and the severity or scope of any associated threat(s).
It is OK to speculate on the possible long term effects of threats or perceived patterns of threat as long as speculations are qualified.

Management Actions or Policy Changes

In this section, the list of threats constructed above is translated into management actions and/or policy changes. The list should be limited to actions that are not expressly described in either the protected area management plan or the annual operations plan.
All existing, new, or finishing actions or policy changes are listed. This information is presented in a list format so that this part of the report can be posted and/or distributed conveniently as a stand alone policy document.
New actions should only be undertaken if there is convincing evidence that a change in standard operating procedures or policies may result in better protection of priority biodiversity elements or other features of value.

The rationale and justification should explain how or why the management action or policy change is likely to result in better protection for one or more values of priority biodiversity elements or other features of value that will be affected should be specifically identified here.
The period of the action should be stated whenever possible or indicated as a permanent policy change. The overall success of the action should be explicitly evaluated at the end of the specified period. At this time, the manager may decide to end the policy or extend the period of the action.
Various management decisions are likely to impact local communities and other stakeholders. These impacts should be discussed in sufficient detail to avoid unexpected outcomes.

1. **<u>Action or Policy Change</u>** (Example: Patrol teams 1 and 3 will spend approximately 3 days of their monthly patrol period talking with village heads and other representa - tives on the southern border of man agement sector 3 about controlling burning of agricultural fields.)
   Status: (Continuing, New, or Finis hing) N
   Rationale and justification: (Example:In 2004, fires in this area caused long-term damage to the dry dipterocarp forests in the southern part of this sector. As the source of the fires was in most cases a direct result of uncontrolled burning of agricultural fields in the area, educa-ion of local residents could substan tially contribute to a reduction in the number and extent of fires inside the PA.)
   Period: (Example: February and March 2005)
   Potential impacts on local residents and other stakeholders: (Example: As this is a non-confrontational educational effort, no negative impacts on local communities are expected. However, the reduction in patrol

days within the park will reduce the overall patrol distance for these patrol teams.)

2. **Action or Policy Change**
   Status (Continuing, New, or Finishing):
   Rationale and justification:
   Period:
   Potential impacts on local residents and other stakeholders:

3. **Action or Policy Change**
   Status (Continuing, New, or Finishing):
   Rationale and justification:
   Period:
   Potential impacts on local residents and other stakeholders:

etc.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by:

- conserving the world's biological diversity
- ensuring that the use of renewable natural resources is sustainable
- promoting the reduction of pollution and wasteful consumption

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