NYUNGWE NATIONAL PARK

RANGER-BASED MONITORING, AND MANAGEMENT INFORMATION SYSTEM AND TECHNOLOGY

Training Manual for Rwanda Development Board Staff

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RDB RWANDA DEVELOPMENT BOARD

WILDLIFE CONSERVATION SOCIETY

Approval Page

The Rwanda Development Board has approved the content and the use of this training manual for RDB staff in Nyungwe National Park

On behalf of the **Rwanda Development Board**

_____
Mrs. Rica Rwigamba
Head, Tourism & Conservation

Date: _____

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Acronyms

GIS: Geographical Information System

GPS: Geographic Positioning System

MIST: Management Information System and Technology

NNP : Nyungwe National Park

ORTPN: Office Rwandais du Tourisme et des Parcs Nationaux

RBM: Ranger-Based Monitoring

RDB: Rwanda Development Board

UPS: Universal Polar Stereographic

USAID: United States Agency for International Development

UTM: Universal Transverse Mercator

WCS: Wildlife Conservation Society

Table of contents

INTRODUCTION

Threats to biodiversity in Nyungwe National Park are the results of human activities driven by dependency on park resources by communities surrounding the park. The impact of human induced threats to Nyungwe National Park resources can take the form of a decrease of park resources, local disappearance of species, habitat loss and damage to plant species. In Nyungwe, poaching has led to the local extinction of large animals such as the African Buffalo (*Synceruscaffer*) and African Elephant (*Loxodontaafricana*) and has significantly reduced the population of duiker species and has also had a negative impact on carnivores. Pressure is placed on the park through a variety of illegal activities including the collection of honey, cutting trees for firewood, cutting bamboo for poles and other uses. Some examples of the negative impact of human activities are well known, for example bushfires have posed a substantial threat to Nyungwe's biodiversity in last 15 years, destroying large areas of the park with long lasting consequences.

The Rwanda Development Board (RDB) has been monitoring key animal species and threats to the biodiversity of Nyungwe National Park (NNP) since 2003. Prior to this time, the former *Office Rwandais du Tourism et des Parcs Nationaux* (ORTPN) carried out anti-poaching patrols in only some areas of Nyungwe. In 2003, ORTPN started Ranger-Based Monitoring (RBM) to monitor the status and trends of illegal activities and key animal species in Nyungwe National Park.

RBM is a threat based monitoring system focusing mainly on incidents of illegal activities, and it was designed in such a way that data are collected on a routine basis by park rangers on patrol. Rangers collect a range of information on illegal activities/human signs and key animal species. Geographical information is also collected at each observation to facilitate the estimation of patrol effort (distance walked) and to illustrate the spatial distribution of illegal activities and key animal species in the park. Ranger gathered information is fed into the Management Information System (MIST) database and is used to assess trends in encounter rates of illegal activities per unit effort (kilometer patrolled or patrol day).

Ranger-based monitoring data are used to better understand illegal activities in terms of abundance, trend and changes overtime and help park managers to take decisions on how they can improve park surveillance and look for ways of gaining improved community support for the park's management. The RBM program is considered the foundation of monitoring illegal activities within the park in order to build a strong bottom-up approach whereby park rangers and wardens develop improved capacity for the adaptive management of the park.

Who is this training manual developed for?

This training manual describes in detail the methods of RBM data collection and MIST database management. It is written as a reference guide for senior park managers, Zone Heads as well as managers in the department of research and monitoring as a guide for carrying out ranger training on RBM data collection by ranger-trained trainers.

Why Ranger training is important

Since the primary mandate of park rangers is park protection, the sustainability of Ranger-based monitoring relies on a strong training component and support from park management authorities. In order to build sustainability in terms of the use of RBM, the capacity of rangers and park wardens must be improved and this manual is aimed at assisting with this process.

Other requirements for effective monitoring of law enforcement effort include the provision of equipment such as GPS units, maps and compasses.

This training manual provides step–by-step guidance on how to organize and carry out RBM data collection and data management to produce basic reports for park managers at park level. Two major components are presented in this training manual. The first component describes the techniques of RBM data collection and equipment used to collect RBM data. The second component describes the step-by-step management of RBM data including Management Information System and Technology (MIST GIS). In MIST GIS, we present a step-by-step review of data entry, data analysis, producing reports from MIST, and MIST database management. This training manual supplements the RBM protocol that was previously developed and is being applied.

PART 1. RANGER-BASED MONITORING DATA COLLECTION

Why use rangers to collect data?

- Rangers are out on patrol every day in Rwanda's National Parks. While on patrol they make observations that often remain unrecorded unless there is a standardized process of capturing and communicating this;
- Rangers also patrol most of the protected area during the course of a month/season and as a result information is collected from a wide area;
- Protected area managers rarely have the chance to visit all of the area they manage and so this information is potentially very useful for their management needs if it can be documented and processed effectively;
- Limited additional equipment/resources are required for ranger data collection;
- The training organized and carried out by park staff themselves will reduce dependence on external resources and build the overall sustainability of the monitoring;
- This kind of monitoring is essential to ensure that rangers contribute towards the adaptive management of the protected area.

If park managers need to monitor the success of conservation they need to monitor any changes in animal population and extent of threats to park resources (hopefully increases in animal densities and decreases in threats to park resources including biodiversity).

What does RBM record?

Why do you carry out patrols? What do you look for?

- In areas such as Nyungwe National Park where poaching, tree/bamboo cutting, mining, encroachment for agriculture, etc. threaten wildlife and their habitat, park managers need to follow the status, changes/trends or extent of illegal activities on vegetation or animal populations;

- Not only does information help a manager determine appropriate plans of action for managing the resources within the protected area, but when used effectively, information can also bring more support to the protected area in the form of increased tourism, scientific research, staffing and funding;
- Managers at all levels require up-to-date and timely information to enable them to make informed decisions for action planning;
- Rangers and park managers need information for implementation, monitoring and evaluation of the activities for which they are responsible;
- Only data which can be processed into information which is relevant and useful for managers are collected, stored and analyzed.

Examples of what information RBM can provide:

- Status and trends of threats to biodiversity across the park,
- Status and trend of key animal species in the park,
- Timely up-to-date information on the status of the park

Processing of your data

What can we learn from RBM data?

Examples

- Where you went (patrol coverage): this helps with patrol planning;
- Spatial distribution of illegal activities and changes over time;
- Status of key animal species is in Nyungwe National Park (trends in abundance and distribution of key animal species over time).

Principles of RBM data collection

Given the fact that RBM data are opportunistically collected by rangers (collection is not systematic), for it to be utilized in monitoring the following criteria must be met:

- Data collection must follow the RBM principles;
- Data collection in distinct strata/management sectors must be consistent from month to month;
- The number of kilometres patrolled per month must be high; and

- The bias in spatial distribution of patrol coverage must be low, i.e. patrols must be more or less evenly distributed.

Key principles of RBM data collection:
- ✓ **Regular recording of waypoints (accuracy of patrol effort)**
- ✓ **Use of standardized terminology/nomenclature**
- ✓ **Consistent deployment of patrols in distinct strata/area**

Standardization

Standardization means that data is always collected in the same way. Remember that nine or more teams are collecting the same data from 9 or more ranger posts

Why is standardization important?

Standardization is crucial if your data is intended to have long-term value: many years later, other researchers/managers can continue to analyze the data. In addition, it means that the data you collect will be directly comparable with data collected in another time or place (by you or another team). This could allow us, for example to detect trends in human activities or presence of key species over time or to compare different areas of Nyungwe National Park, or compare Nyungwe with another site using RBM.

Step-by-step to carry out RBM data collection in the field

Filling the patrol data sheet

Before the start of a patrol

- Take enough patrol data sheets for the day (take twice the number of planned patrol days if you plan overnight patrols); make sure the data collection data sheet has complete information (an example of data sheet is given in appendix 2);
- Keep patrol data sheets, maps and instruction documents in a waterproof bag and leave filled datasheets at the post or at the camp to keep them safe from rain;
- Always carry spare pens, pencils and GPS batteries when on patrol;

- Ensure that the GPS unit is correctly setup and that the previous months' GPS coordinates (waypoints) have been saved to a computer and have then been deleted from the GPS. Any change in the setup of GPS units must come from the Research & Monitoring Warden (avoid any unnecessary playing with GPS settings). For detailed information on GPS set up, GPS coordinates, and making GPS waypoints (position), see GPS utilization section (p. 13).

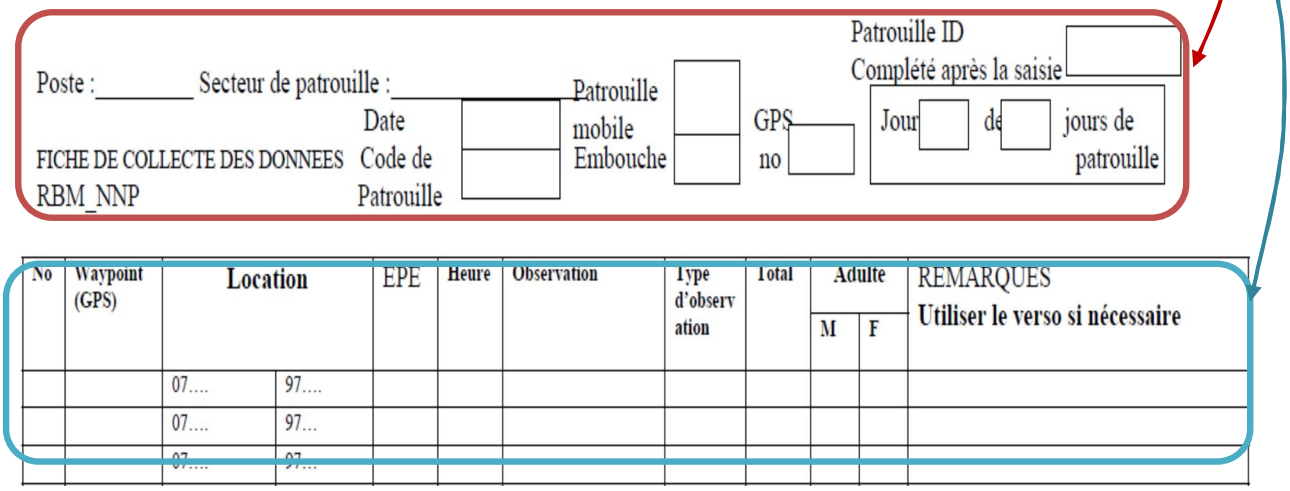
Before you start each patrol or each day of a multi-day patrol

- A new patrol data sheet must be used for each day of patrol. Never use one data sheet for more than one patrol day;
- More than one data sheet can be used in one day: in this case, you should indicate the page number in the order they were used (i.e. 1 of 2 if you used 2 pages, and 1 of n if you used n pages);
- Before the start of each day's patrol, fill in the patrol data sheet header information correctly. The header information comprises the sector of patrol, date, type of data being collected, name of person with GPS, the name of recorder, and names of patrol members.

Recording of observations (patrol data sheet entries)

The datasheet as designed can be divided into 2 parts:

- The first part will give information about the patrol
- The second part will give information about the record



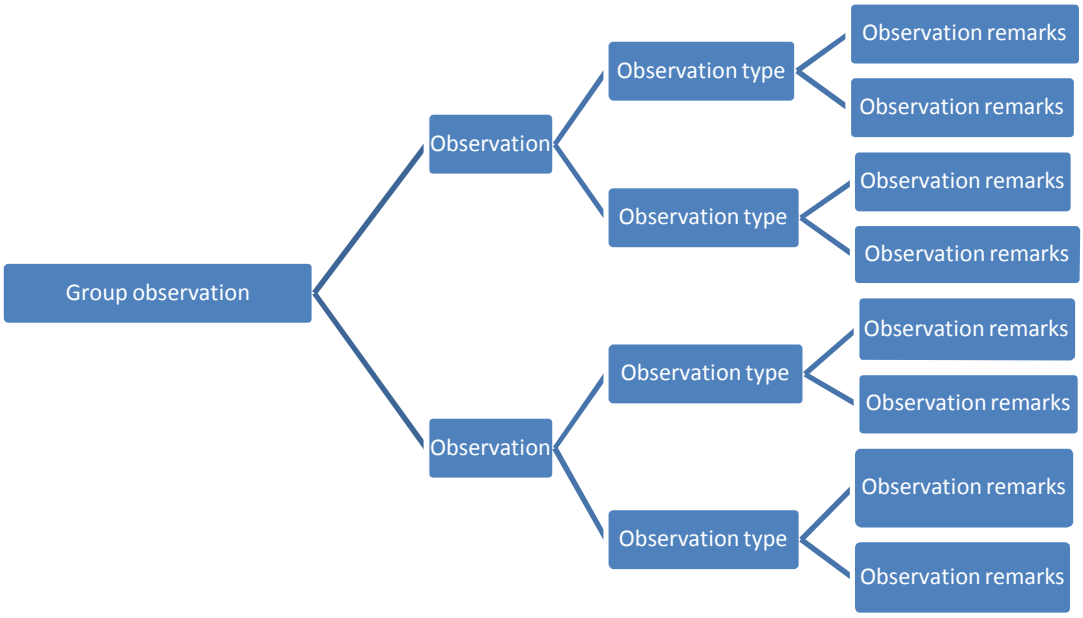
Each observation (= row) gets its own number starting from 1; every day. If several observations are made from one point (e.g. snare and Colobus), each gets its own run number on the datasheet and GPS waypoint. NB. A waypoint has to be recorded for each observation (row)!

At the start of the patrol, the GPS location/waypoint is written down on the datasheet and saved into the GPS. The number of the waypoint is written down and the time noted and recorded on the data sheet, it is saved in the same way on the GPS (**DON'T CHANGE THE NAME OF THE WAYPOINT IN THE GPS**). Time can be obtained from the GPS and will be more accurate than a watch. These data are all saved when the waypoint is saved and will be downloaded automatically to the computer when the patrol team submits the GPS for downloading by the Zone Coordinator or Research and Monitoring Warden.

Note: The start or end of a patrol is not that GPS location of the ranger post or base camp when you are based, but that GPS location of your start or end of the actual patrol. In some cases, you may travel one, two or three kilometers from your base camp before you start or end your patrol.

Observations, Observation codes and Observation remarks

In Management Information System and Technology (MIST), the observations are organized following a certain hierarchy, which can be illustrated using the following flow-chart:



With reference to above diagram, rangers will record from the field data at 3 levels: observation, observation type and observation remarks (for more details, see the appendix 1). Observations

include signs of illegal activities such as poaching, tree cutting, mining sign, and key animal species sighted such as colobus monkey, chimpanzee. Observation type describes the status of illegal activities such active, recent or old, and the way animal species was observed (direct or indirect observation. Observation remarks provides more information on illegal activity observed (e.g a ranger has seen a group of colobus; he records colobus for observation, seen (direct observation) for observation type, and estimated number of individual for observation remarks). Observation remarks are not always required- they describe and provide more information on specific observations (the list of observation, observation type and observation remarks is given in appendix 1 p. 46).

Four observation groups include:

- Illegal activities
- Poaching
- Mammals, and
- Birds

For each animal sighting and or illegal activity/human sign, observers should note on datasheet:

- Time;
- Location - a map coordinate or GPS position reading;
- Species and or illegal activity/human sign;
- When possible, the number of individual animals in a group(record number of adult males, adult females, sub-adults / juveniles and infants if possible);
- Record "1" for any sign of illegal activities, and record a description in the remarks on the back of the datasheet;
- Together in the team, estimated the size of the affected area (this is applicable for fire, Marijuana crop, and encroachment for agriculture);
- For the Colobus monkey, you will record "1" as group and the estimated number of individual in a group is recorded in observation remarks box;
- If nothing is sighted within 30 minutes of a previous recording on the data sheet a waypoint is taken to help record where the patrol has passed and the waypoint details recorded on the data sheet as described above. This is very important because it is used to calculate the distance the patrol has walked and this is used to calculate the encounter rates of observations as well as the patrol effort.

Use of maps, compasses and GPS

For people working in the tropical rain forest, where visibility is restricted and large landmarks, such as mountain ridges are often obscured, the use of GPS and map navigation are important skills. If you do lose your way, a compass and ideally a map and good working knowledge of the area (such as knowing that an access road running east-west) is normally enough to prevent you getting lost. You simply have to follow a compass bearing towards that access road. In a more serious situation, you can also transmit your GPS position by radio to others and a search party could be mobilized.

In the context of RBM data collection, the GPS plays an extremely important role in collecting information that enables to accurately measure effort (distance walked) when on patrol, and mapping where illegal activities and animal were sighted. The use of a compass and topographic map are basic and essential tools for navigation.

What is a compass?

A compass is an instrument used to indicate direction. It is made of a magnetized needle that floats freely (often in a liquid). The needle always points North and is surrounded by a moveable dial on which the four "points of a compass" are written (North, South, East and West). The dial is further divided into 360 equal sized parts, called degrees, the standard unit measure for directions and angles. To navigate from one place to another using compass and map, follow the following steps:

1. Adjust compass for map declination. Disregard the magnetic needle
2. Place the compass on the map, where one edge of the base plate touches both the start point and destination point (Figure 1). The direction of travel arrow needs to point towards the direction of destination
3. Turn the compass housing so that the orienting arrow points to true north, parallel to map edge and longitude lines
4. Read bearing at the index line. This is the direction in degrees of the magnetic bearing.

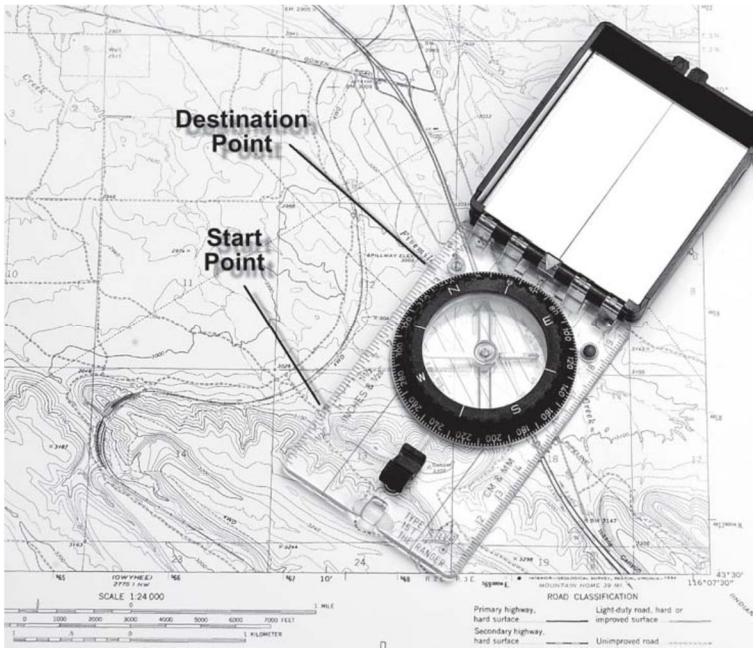


Figure 1. Navigation in the field using Compass and topographic map

Note: The GPSMap Garmin 60 series are also equipped with an electronic compass that is easy to use. Rangers can therefore use maps and a GPS for navigation if they do not have a compass.

What is a map?

A map is a representation of a landscape. It uses symbols to represent the features found on the ground. Many types of specialized maps exist focusing on different features (e.g. marine, road, geological, tourist), but, for general use, topographic maps give the most information. A single characteristic which distinguishes topographic maps from other kinds of maps is the fact that they show the topography or the shape of the ground such as roads, rivers, lakes, etc.

Maps are important tools for any land manager or field researcher. They provide a means of representing spatial information in an accurate and compact way. Maps provide spatial information that cannot be conveyed in writing. Maps provide a simple, efficient way of recording and presenting spatial information collected in the field. Maps allow someone to locate features in a new area. An accurate map enables someone to walk into an area where he or she hasn't been before and find a feature drawn on the map. When carefully interpreted, a map can allow someone to estimate how long it will take to get to a particular spot, and what the best route for walking

there might be. Hence, you can use maps to navigate to and from areas of interest which cannot be accessed by road.

Maps can indicate which parts of a proposed study area are inaccessible, due to the presence of large rivers, wide swamps or high mountains, or which areas are far from roads or trails. Good maps also provide information on general habitat types or physical features which may influence your patrol (for example steep slopes prone to frequent disturbance from landslides and are difficult to walk, etc.).

Orienting the map to true north is key to navigating successfully. Orienting a map also gives you a general idea of your own location on the map.

Elements of a topographic map

Title: Indicates to the reader the name of the area that the map is showing

Scale: It is the relationship between the real distance and that which represents it on the map. The scale can be numerically or graphically presented. Numerical presentation for example, a scale of 1:100000 means that 1 cm on the map corresponds to 100000 cm (or 1 km) on real ground. In some maps, graphic scale is used to measure distances on the map itself. Place a piece of paper along the edge of the scale and mark on the paper each kilometre line (or other distance) with a pencil. Then move the marked paper to the area of the map you wish to measure.

Symbol: Symbols are used to present features on the map. Both man-made and natural features can be defined using symbols. For example, villages, roads, streams, mountain tops and waterfalls can each have their own symbol. Different features can be defined using different colours, or widths of lines, or different pictures, such as a tree for a forest. Any symbol used in the map should be defined in the map's legend. Major symbols include point, line and polygon (Figure 2).

Legend: A legend is a box located near the edge of a map that has examples of each symbol, together with an explanation of what that symbol means. Sometimes a group of maps will have only one common legend, but these maps should always be found together. In short, the legend is the list and the significance of the symbols used to represent the objects being reproduced on the map (Figure 2).

Orientation: Shows north on the map. The north is mostly placed on top.

Contours: The third dimension and altitude are indicated to us by contours. These are continuous line which shows the relief of the terrain.

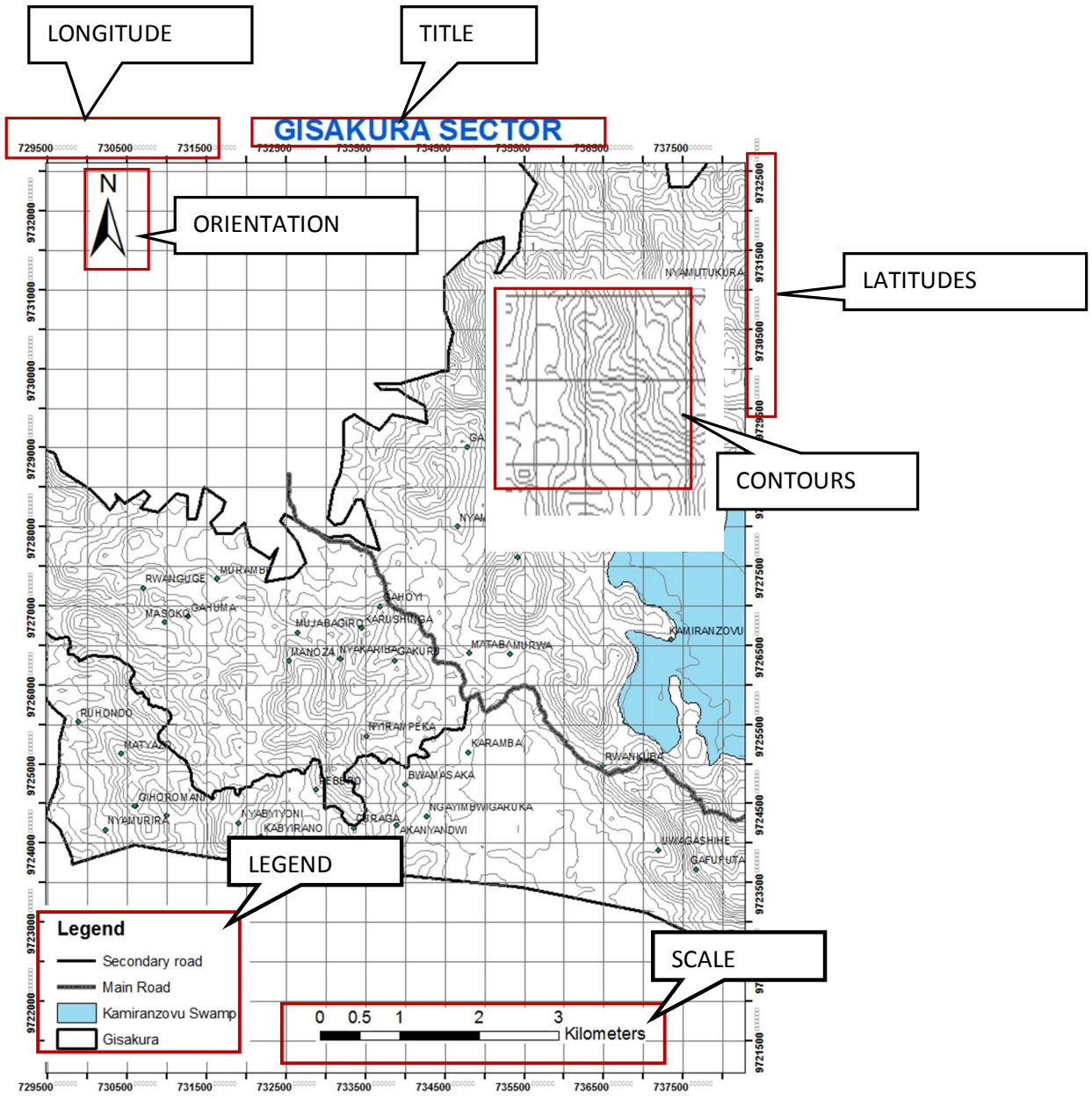


Figure 2. Major elements of Topographic map

GPS utilization

The Global Positioning System (GPS) is a satellite-based navigation that sends and receives satellite reception signals. The global positioning system consists of a network of 24 orbiting satellites, eleven thousand nautical kilometers above the earth. The satellites are constantly moving, making two complete orbits around the Earth each day. The GPS receives radio signals from these satellites and uses the signals to calculate its position on the earth surface by triangulation of the signals. The two commonly used coordinate systems for identifying locations on the earth are latitude/longitude (lat/long) and the UTM (Universal Transverse Mercator) or map grid system.

GPS coordinates

Most modern maps are marked with two types of coordinates: geographic coordinates measured in degrees, minutes and seconds; and UTM (Universal Transverse Mercator) coordinates measured in meters.

Geographic coordinates (latitude and longitude) are designed to locate positions on the spherical planet (Figure 3).

The UTM system of coordinates measures distance in meters and adjusts for the changes inherent in the geographic system. The UTM is a metric system and measurements are made in metres eastwards and northwards from a point to the west of each UTM zone.

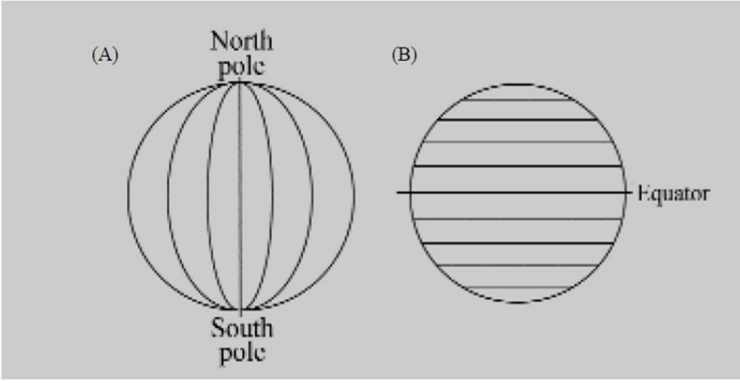


Figure 3. Longitude (A) and Latitude (B), geographical position is composed by latitude and longitude (lat, long)

Factors that affect GPS accuracy

There are two factors that can affect GPS accuracy (estimated position error). The first factor affecting GPS accuracy is satellite geometry. In simple terms, satellite geometry refers to where the satellites are located relative to each other (from the perspective of the GPS receiver). If a GPS

receiver is locked onto four satellites and all four of these satellites are in the sky to the north and west of the receiver, satellite geometry is rather poor because all the distance measurements are from the same general direction. This means triangulation is poor and the common area where these distance measurements intersect is fairly large. If the same four satellites are spread out in all directions, the position accuracy improves significantly.

Satellite geometry becomes an issue when using a GPS receiver near tall buildings or in valleys in mountainous terrain or under tree canopy because these objects can block the signal from the GPS receiver antenna. This can be the case in Nyungwe (due to the dense canopy of trees and hilly topography), especially for some old series of Garmin GPS unity such Garmin III, Garmin GPS 12 XL, Garmin GPS 60. On the other end, the current series of Garmin GPS units such as Garmin GPS etrex, Garmin GPSmap 62CSx, and Garmin GPSmap 62s are resistant to above obstacles.

A second source of error is multipath. Multipath is the result of a signal being reflected off an object. With GPS, multipath occurs when the signal bounces off a building, a tree or terrain before reaching the GPS receiver's antenna. The signal takes longer to reach the receiver than if it had travelled a direct path. This added time makes the GPS receiver take it that the satellite is farther away than it really is.

How a GPS determines position

To determine position the GPS receiver compares the time a signal was transmitted by a satellite with the time it was received by the GPS receiver. The time difference tells the GPS receiver how far away that particular satellite is. If distance measurements are added from a few more satellites, position triangulation can be done. With a minimum of three, the GPS receiver can determine a latitude/longitude or Easting/Northing position (2D position fix). With four or more satellites, it can determine a 3D position which includes latitude, longitude, and altitude. For this reason the GPS needs to receive a signal continuously from the satellite for about 30 seconds before it accepts the signal – this occurs when the GPS signal turns from a white bar to a dark bar on the satellite acquisition screen of the GPS.

Note: If you are recording time using GPS, make sure you have four or more satellites that determine your position (3D position).

GPS satellite pages

- The satellite page displays information about the satellite signals the GPS is receiving;
- The satellites appear on the page where they would appear in the sky if you looked straight up;
- The strength of each satellite appears on the graph at the bottom of the page;
- An outlined bar (unshaded) means that GPS is trying to acquire a signal;
- A shaded bar means that the GPS has already acquired a signal;
- When the GPS has at least 3 satellites (shaded bars) signals, your position in coordinates appears at the top of the page;

Note that information at the top of the page "2D" or "3D" shows dimension which GPS is ready to provide:

- "2D" means that GPS is ready to provide only 2 Dimensions (Latitude, longitude), in this situation, don't record altitude and time if it is required.
- "3D means that GPS is ready to provide 3 dimensions (Latitude, Longitude, time and altitude). In most cases, "3D" is shown when you have at least four satellites (shaded bars) signals.

GPS Setup

- Most of set up of GPS is done from "The Main menu page". Main menu page displays at least 12 icons but the most settings are in "Setup" icon from which you customize your GPS to your personal preference. **Note** that once you set your GPS unit, it will remain with specified set up until you change it. Rangers should avoid unnecessarily set up and GPS manipulation

Customize your GPS

GPS Garmin is commonly used in Nyungwe since RBM started and it is assumed to be used for next years. Thus, these GPS settings and customization remains applicable for GPS Garmin.

- On the "Main Menu" page, highlight "Setup" menu and press "ENTER"
- On the "Setup menu" two major setup menu (System and Units) are very useful for your GPS settings.

System Setup

The system setup page allows you to select from four modes of GPS operation, enable/disable WAAS, choose display text language, etc.

To change a system setup feature:

From the Setup Menu, highlight "System" and press ENTER. Use the ROCKER and ENTER keys to select the feature and setup options:

- GPS = Normal
- WAAS = Enabled
- Battery type = Alkaline
- Text Language = English or Français
- External power lost = Turn off

Position Format

Your current location can be viewed on the GPS unit in the form of position coordinates. The most common coordinate system is latitude and longitude (easy for the most projection systems). In Nyungwe, we use the UTM/UPS (Universal Transverse Mercator/Universal Polar Stereographic) system. UTM/UPS coordinates are easy-to-use metric grids and easy for navigation and distance estimation on the map.

Setup GPS Units (Metric or Imperial?)

Use setup page to setup units:

1. From the Setup page, highlight "Units and press ENTER.
2. Use the ROCKER keys to highlight the various units field and select the desired units from the list displayed

- ✓ Map datum: Select WGS 84
- ✓ Distance/speed: Select Metric
- ✓ Elevation: Select Metric

Creating Position

To mark a waypoint at your current location/position:

1. Press the MARK key from any page to show the mark Waypoint Page;
2. To save the waypoint, highlight “OK” and press ENTER. If you do not want to save the waypoint, press the “QUIT” button to exit;
3. You can also change the name of waypoint (but don’t change the name of waypoint for any observation);
4. To change the name of waypoint, use ROCKER key to highlight the “Name” to display keypad. Use the ROCKER and ENTER keys to select a name for the waypoint.

PART 2. MANAGEMENT INFORMATION SYSTEM AND TECHNOLOGY (MIST GIS)

Part one provided step by step for RBM data collection and is targeted at all rangers, head of zones, monitoring agent and research and monitoring warden. Part 2 provides step by step of RBM data entry in MIST GIS. This information is compiled by head of zones, monitoring agent and research, and monitoring warden whose responsibilities are RBM data entry, analysis and reports production from MIST GIS. It describes the step-by-step data entry process, from entering data into the MIST database, editing a map project, producing report, data sharing for further analysis, and finally database management.

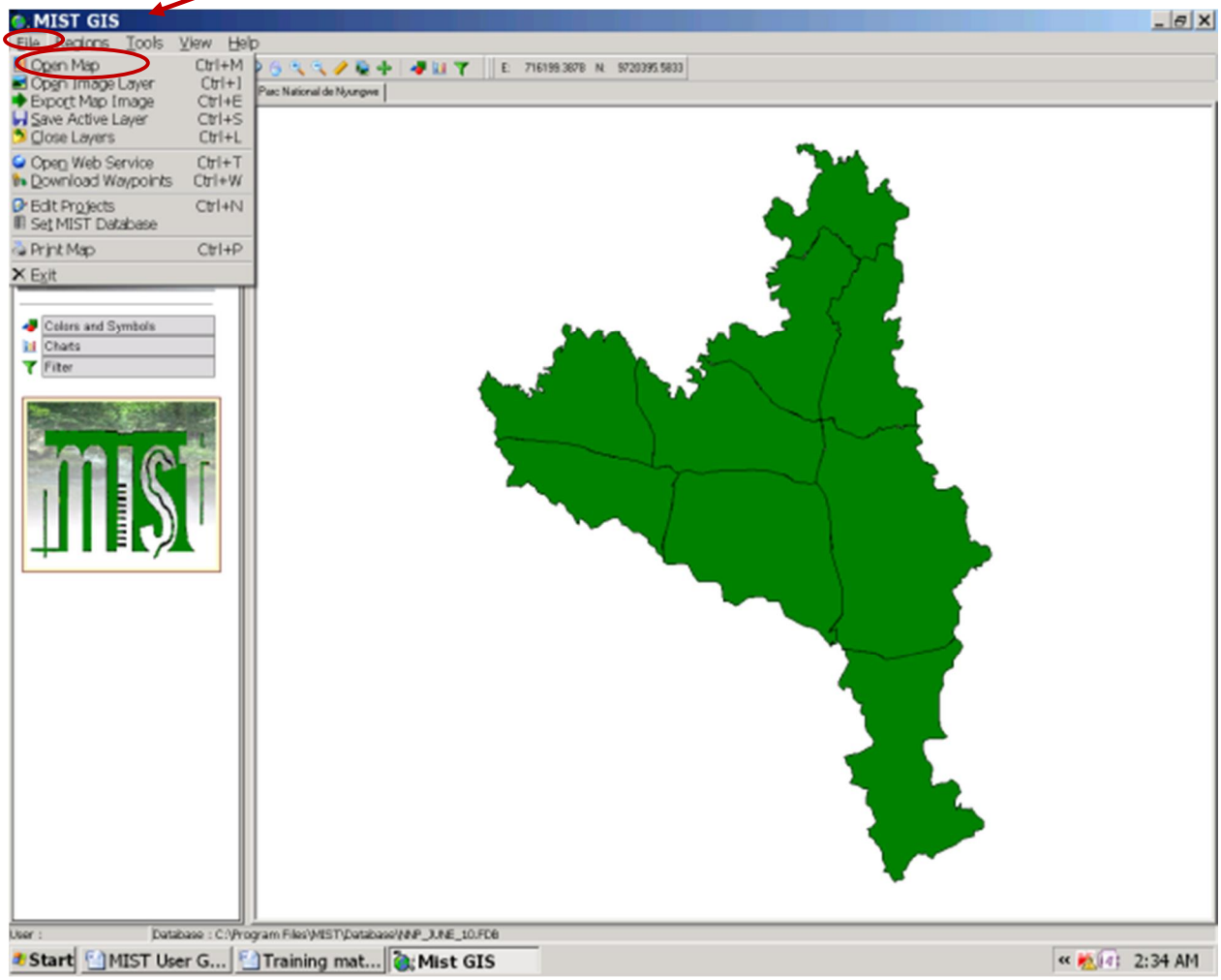
DATA ENTRY FROM DATA SHEET TO MIST GIS

Starting MIST-GIS

1. Double click on the MIST icon on the desktop 

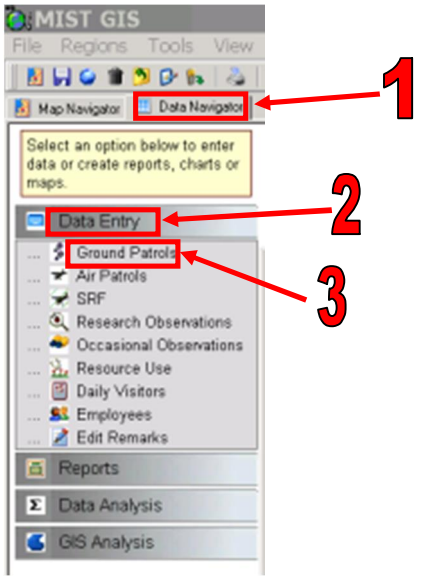
2. Enter the user name and password. Username:**sysdba** Password:**masterkey**

3. After entering username and password click **ok** to open, the image below displays. If the Nyungwe Map doesn't display, go to **file- open map-**then look at **the place** where you stored your Nyungwe shape file to open it. You can also use "Edits Projects" under file to display maps.



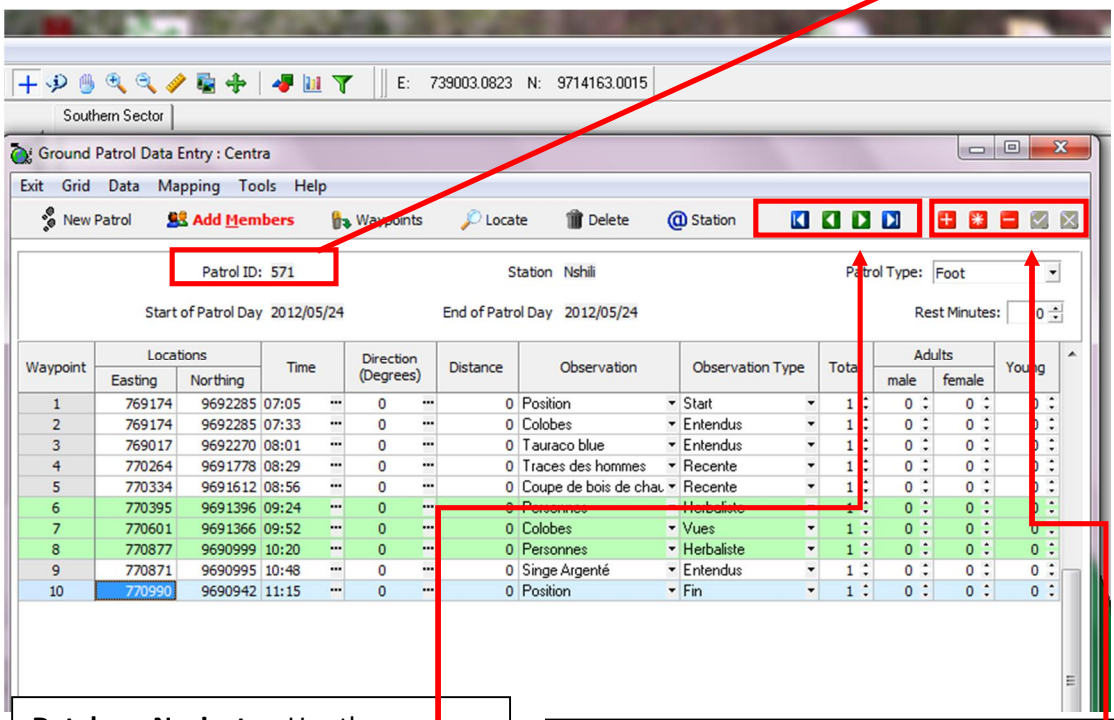
Viewing Ground Patrols

To open the ground patrol which will help you to open the window for data entry follow these different steps from 1 to 3

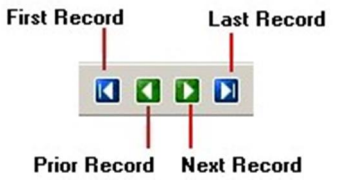


1. Click on **Data Navigator** tab
2. Click on **Data entry title** and then
3. Click **Ground Patrol**

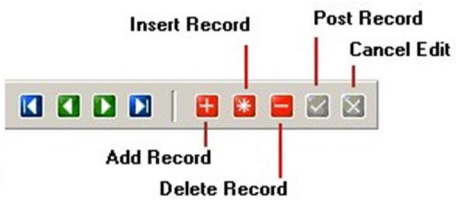
A MIST datasheet data entry window opens. The figure below shows **Patrol ID 571**



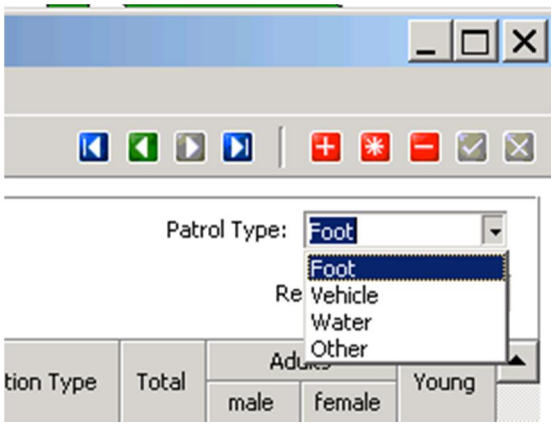
Database Navigator: Use these buttons to see other patrols.



These buttons of Database Navigator control the editing and updating of changes to the database records.

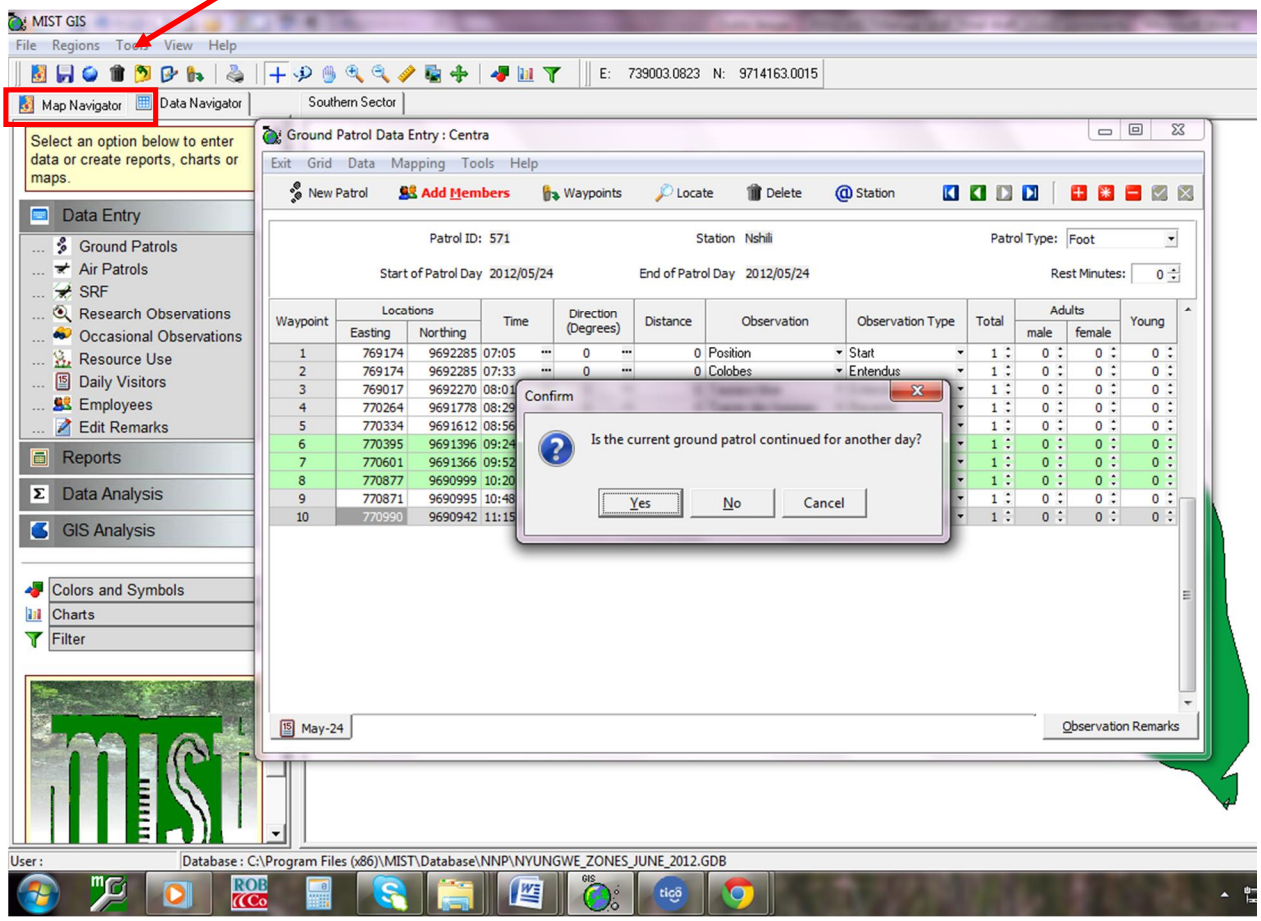


Select the appropriate **patrol type** from the drop down list; for Nyungwe we only use **Foot** patrol type.



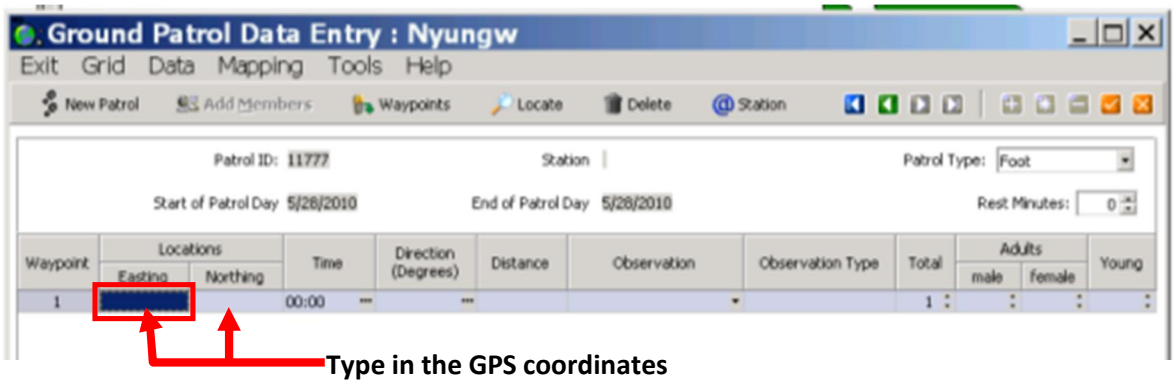
Recording a new patrol day

From the ground patrol tab, Click on **New patrol**, The question "is the current ground patrol continued for another day?" appear. By clicking "**Yes** "it means that the patrol you are going to enter was recorded to a next day (date) following the previous patrol. When clicking "No" you will be asked to choose another date, then proceed with data entry.



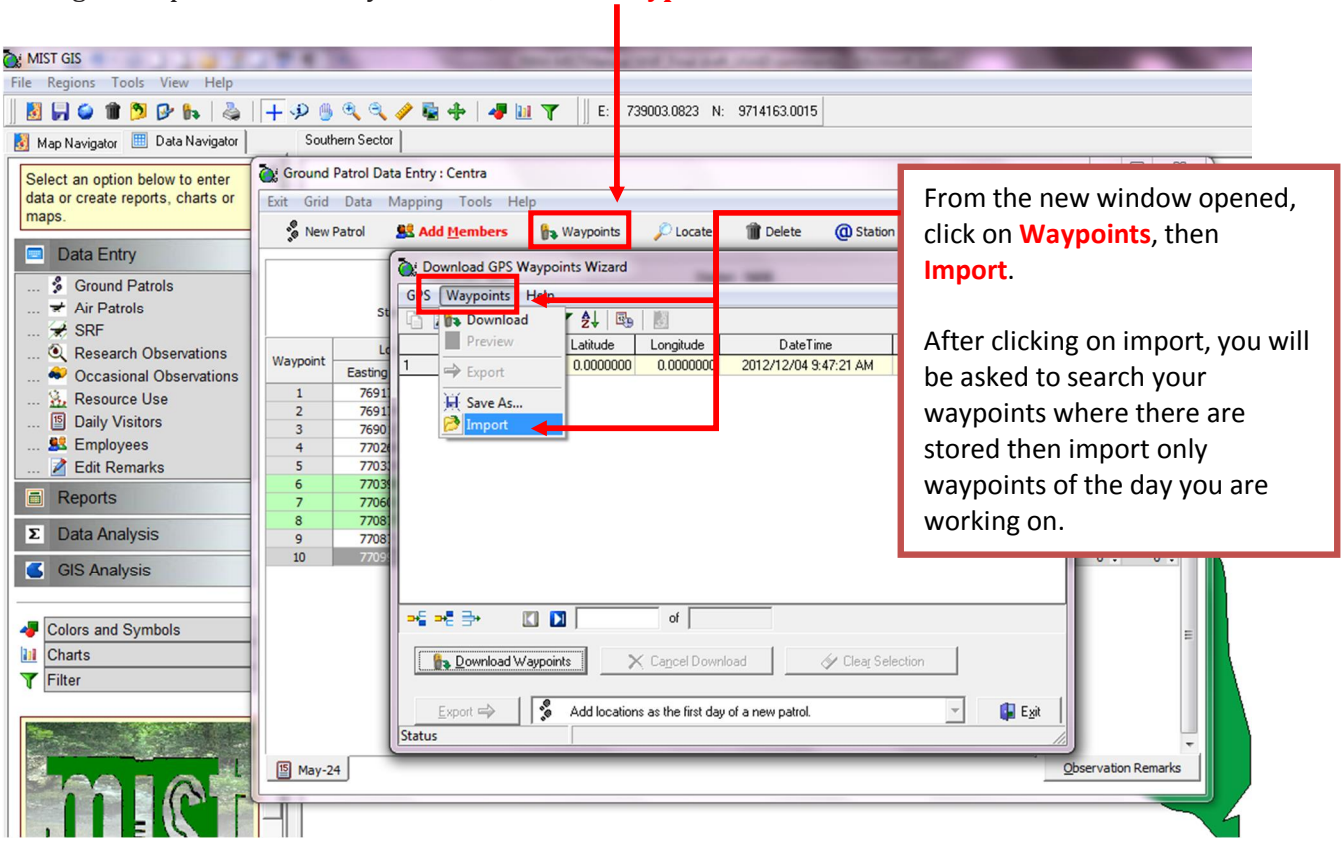
Entering Patrol Observations

When data were not downloaded directly from the GPS, you will need to retype geographic coordinates in Easting and Northing tabs. Blue color indicates the active window. You can use Tab button on your keyboard to go to the next window.

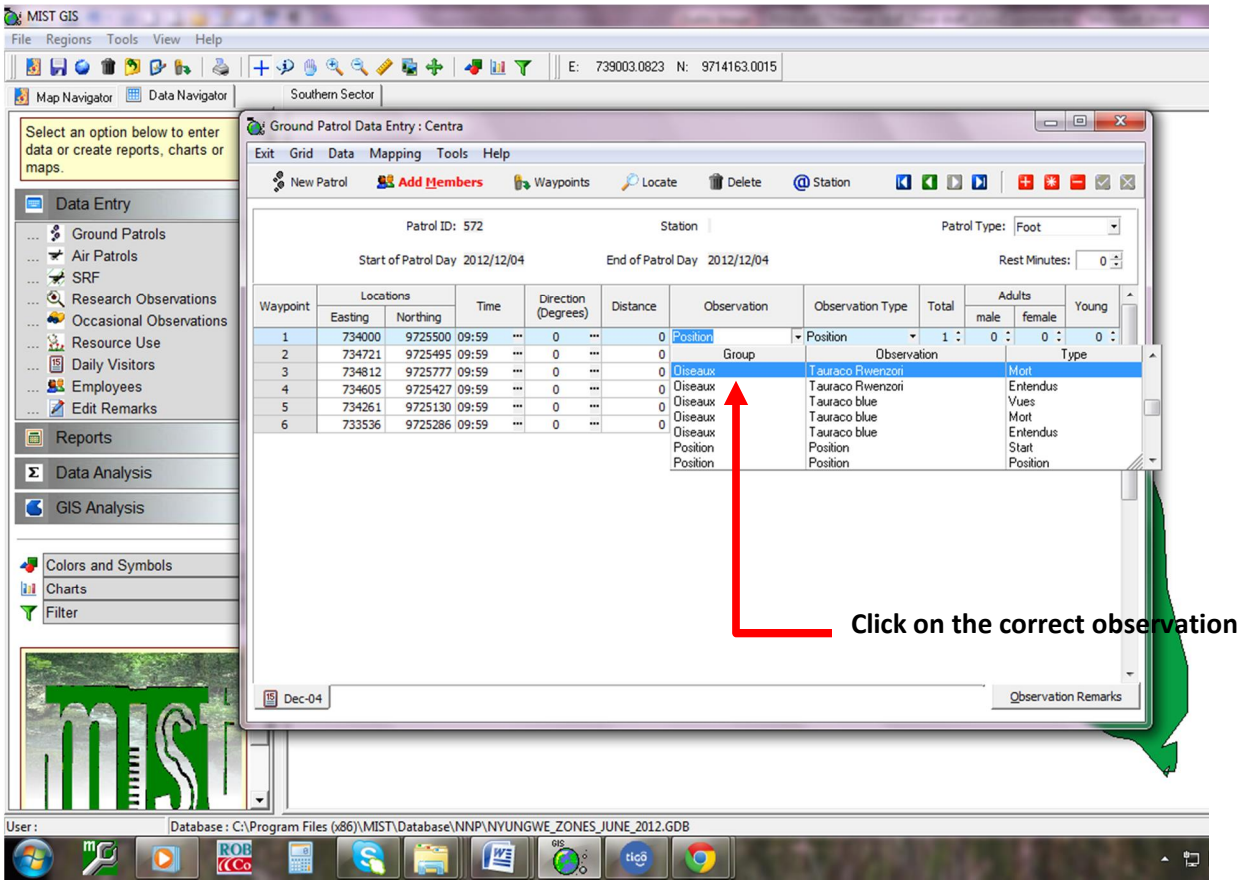


When geographic coordinates have been downloaded from the GPS, you will need to upload coordinates from where they have been saved then enter only observation for each patrol day.

From the ground patrol data entry window, click on **Waypoints**



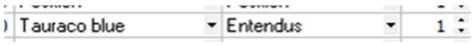
After getting geographic coordinates, use the drop-down menus: click on ▼ to select observation and Select the correct observation from the list



Entering Observation Remarks

If a waypoint (or line) turns to **red** you can enter some **remarks** for the type of observation recorded

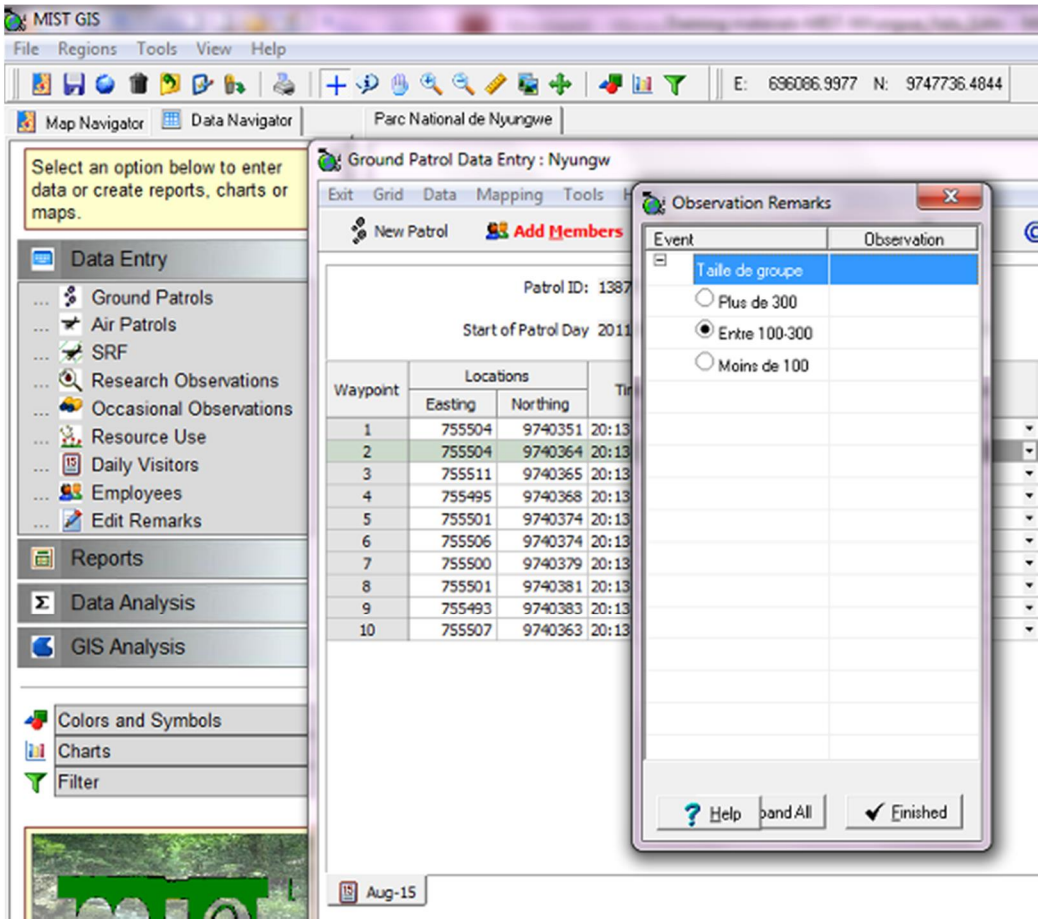
Remarks available



No remark available

1. Click on **Observation Remarks** at the right bottom of the datasheet 

2. Click on ⊞ to expand the list of remark for the respective group



Enter numbers or use the check boxes □

When you are done, click on Finished: 

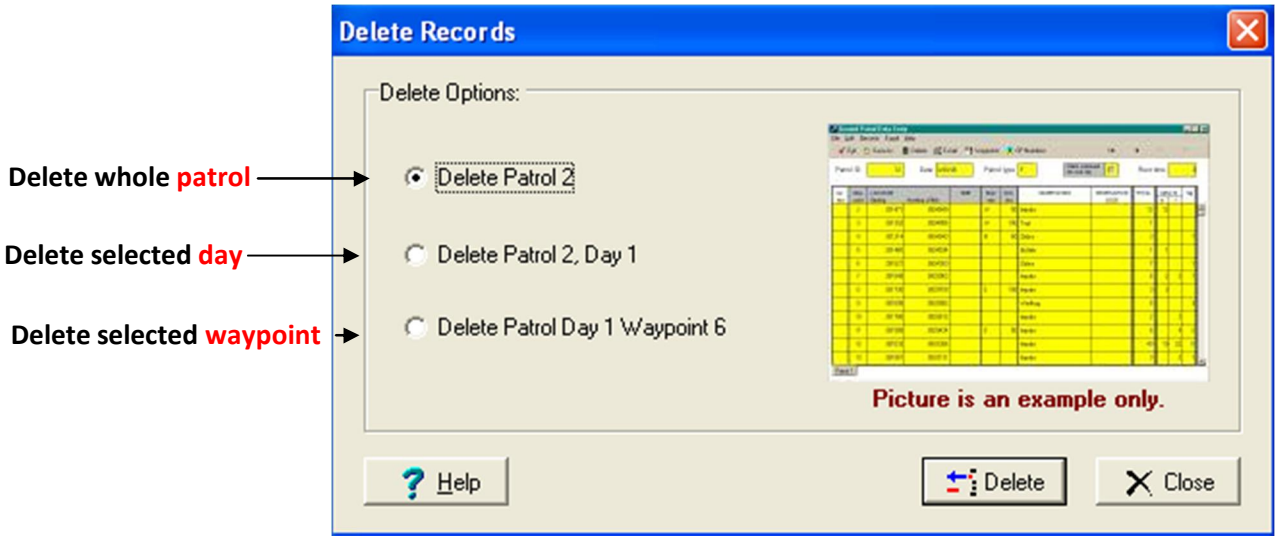
The waypoint turns to green:

Remarks completed

Deleting a Waypoint or a Patrol

1. In the datasheet window click on **Delete**: 

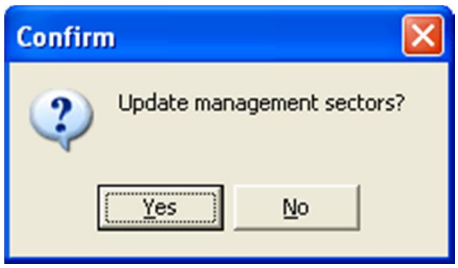
2. Choose what you want to delete **– but be careful you don't delete a whole patrol by mistake!!**



1. Click **Delete**: 

Updating Management Sectors

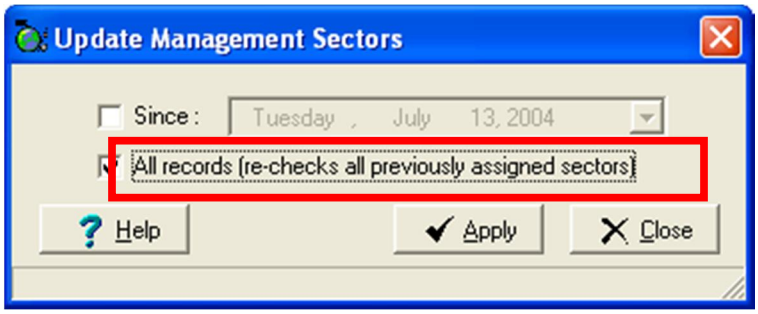
If you have added a new patrol, or made changes to an existing patrol, when you close the Ground Patrol Data Entry window MIST will ask you: **Update management sectors?**



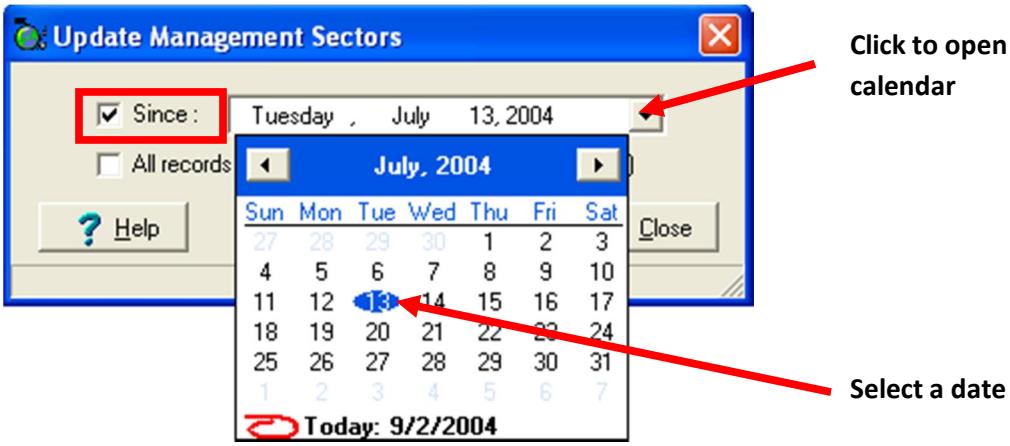
1. Click **Yes**

2. Select if you want to update **all records** or only those entered **after a specific date**.

- To update **all records (**this will take long depending on how many records you have in all database**)**:



- To update **since a specific date**:

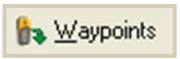


3. Click **Apply**: 

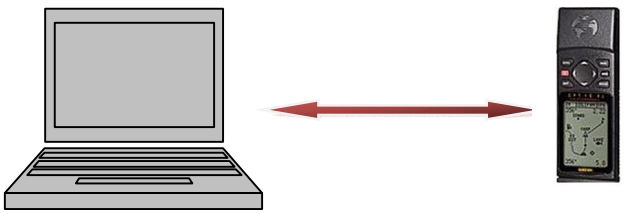
4. Click **OK**

5. Click **Close**: 

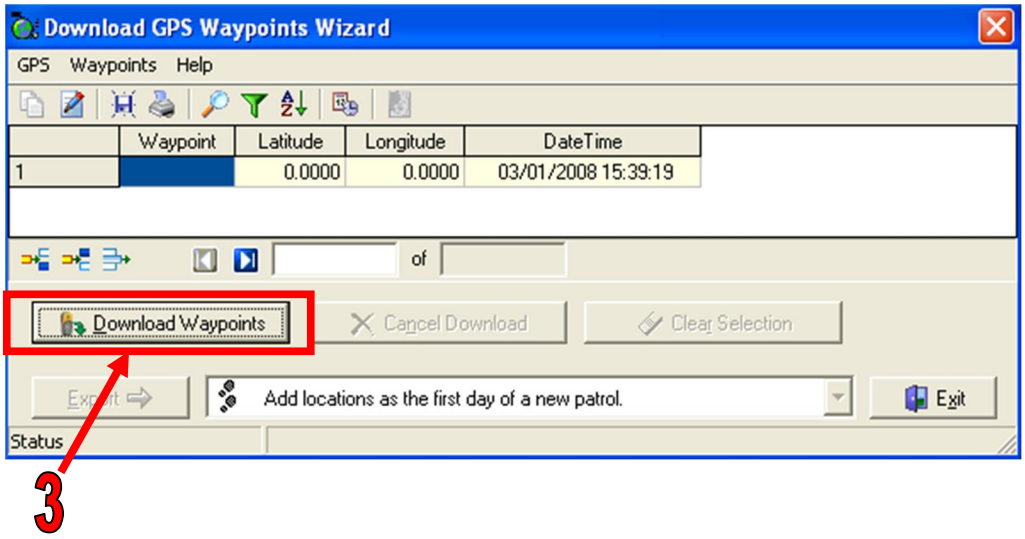
Downloading Waypoints from a GPS Receiver (Desk top)

1. In the **Ground Patrol** window click on **Waypoints** toolbar button: 

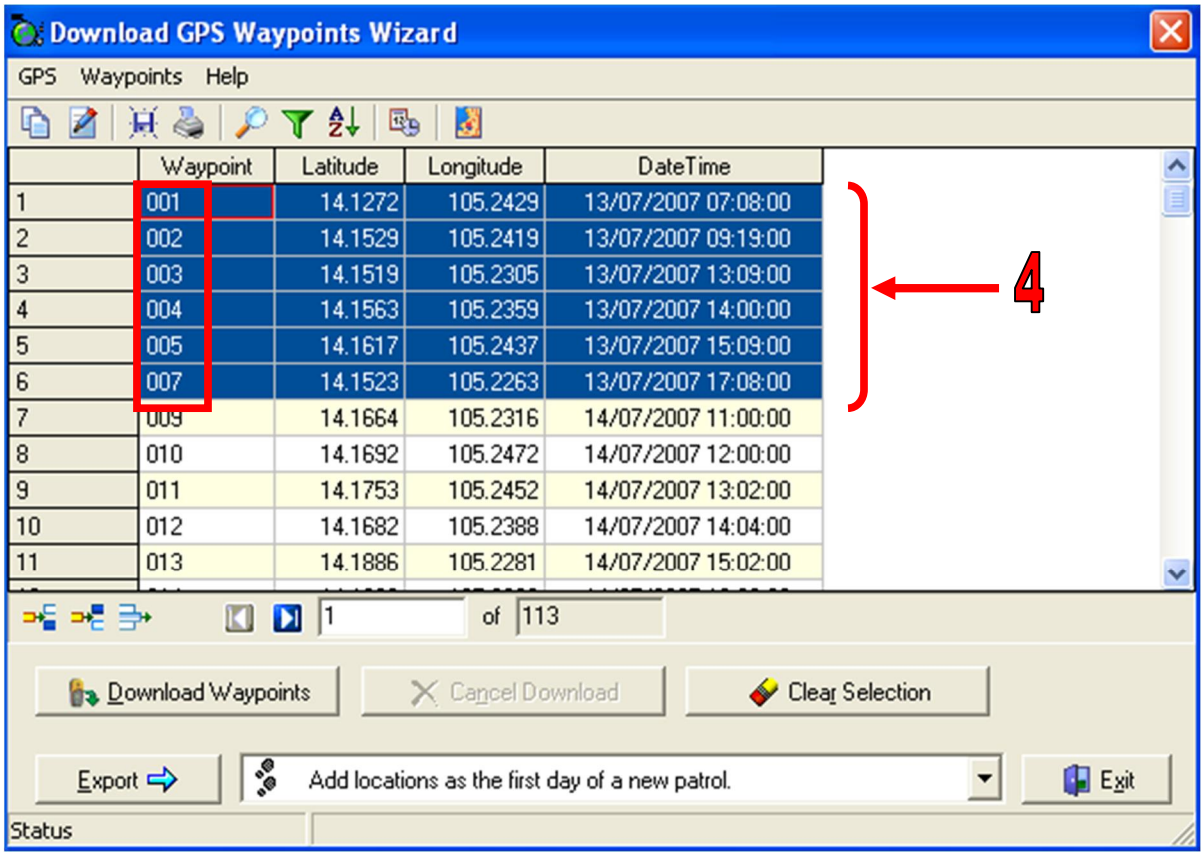
2. Connect the **GPS** receiver to the computer (Desktop or laptop with Serial port)



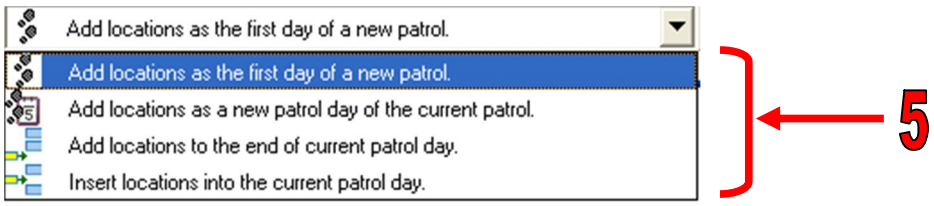
3. In the **Download GPS Waypoints Wizard** click **Download Waypoints** button:



4.When you are downloading waypoints at the same time as you are entering data observations, Select the waypoints for **one patrol day**

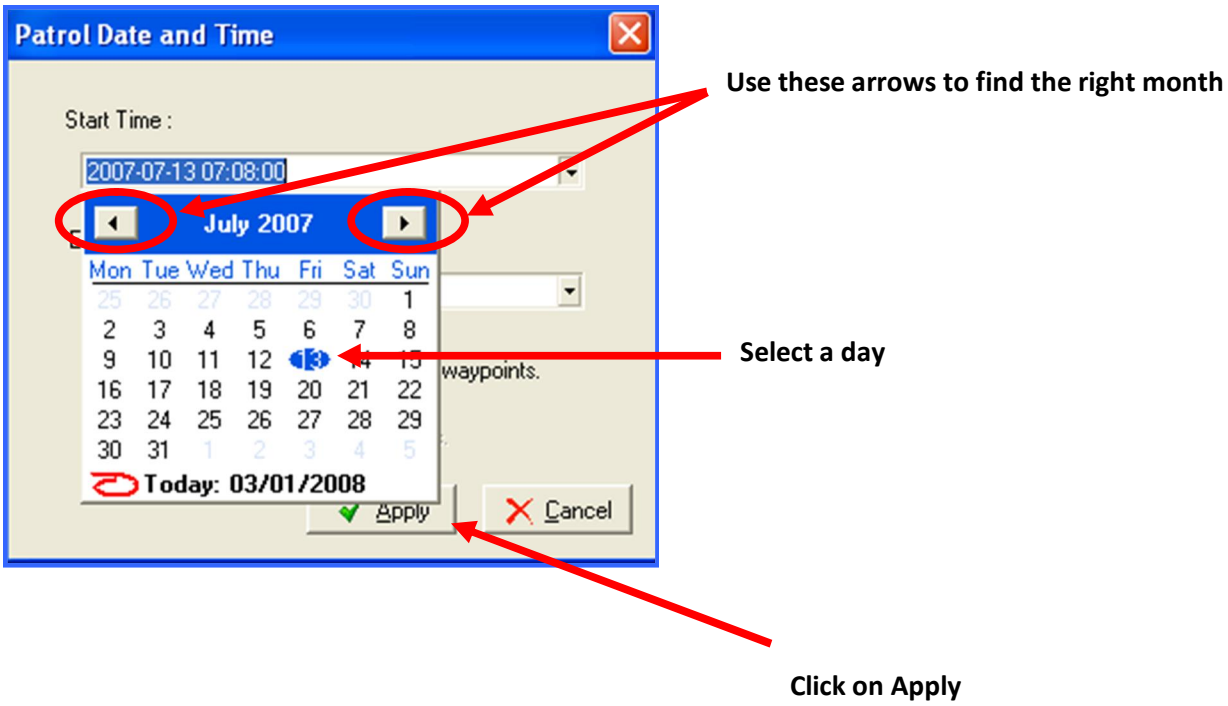


5. Select the how you want to export the data from the drop down list box. The options allow you to enter new patrols, new patrol day or to modify the records of the currently selected patrol.

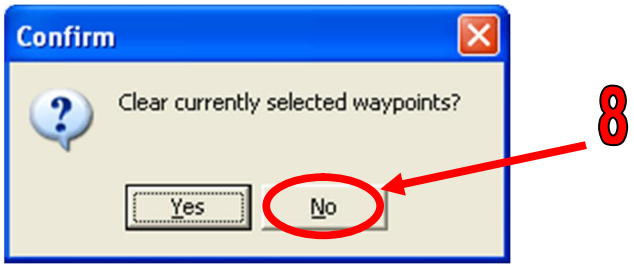


6.When you have highlighted the rows you wish, click on the **Export** button: 

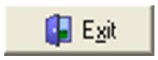
7. Check the **date**; if wrong, select the correct one (on datasheet). Then click **OK**



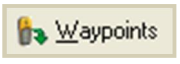
8. Click **No** to **leave** the selected waypoints from the **Download GPS waypoints wizard**.



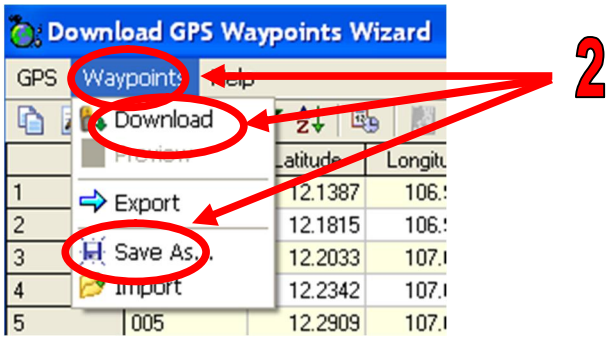
9. Repeat steps **4-8** for each day of the patrol and each patrol. When finished click on **Exit**:



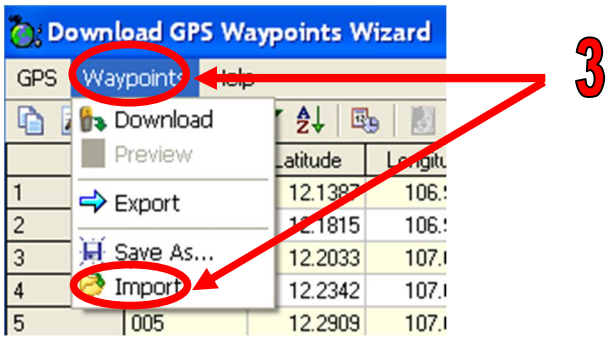
You can also download waypoints, save them and then import them again into MIST-GIS at a later date. This is useful for example if you need to download waypoints from multiple GPS units quickly, before the patrol teams return to the field.

1. In the **Ground Patrol Data Entry window** click on **Waypoints** toolbar button: 

2. In the **Download GPS Waypoints Wizard** click **Waypoints** menu then select **Save As** to save as ***.wpf**.



3. In the **Download GPS Waypoints Wizard** click **Waypoints** menu then select **Import** to retrieve the *.wpf file that we saved.

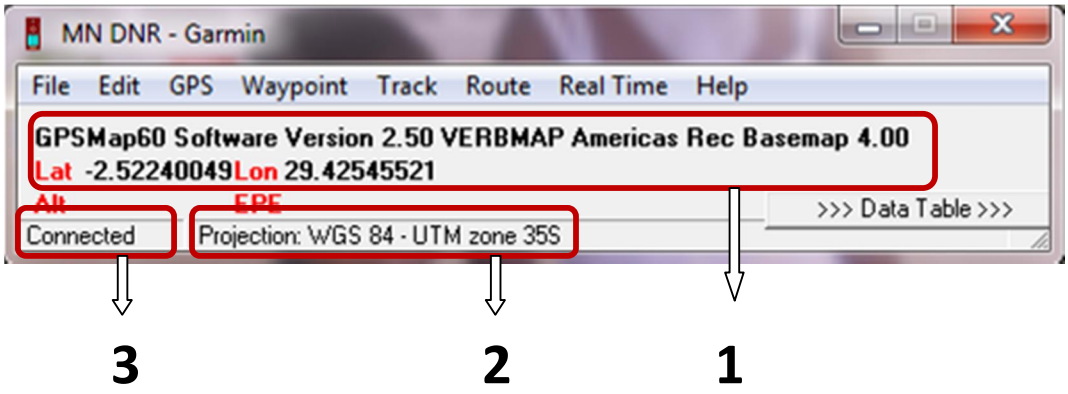


Downloading data from GPS receiver to the computer (Laptop) with USB port

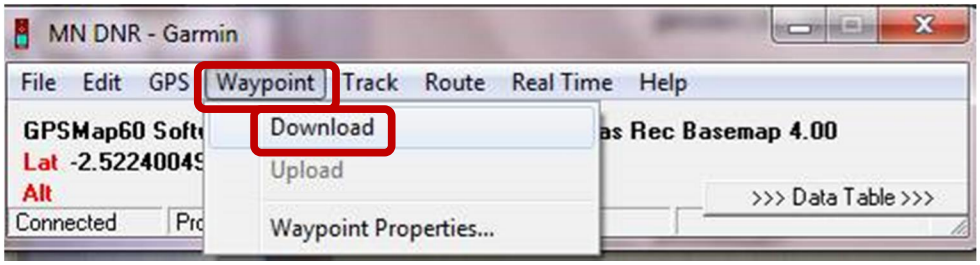
Contrary to the computer with Serial port, you will first need DNR Garmin software to download "waypoints" from GPS receiver to computer with "USB port". DNR Garmin is free download from the internet.

http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html

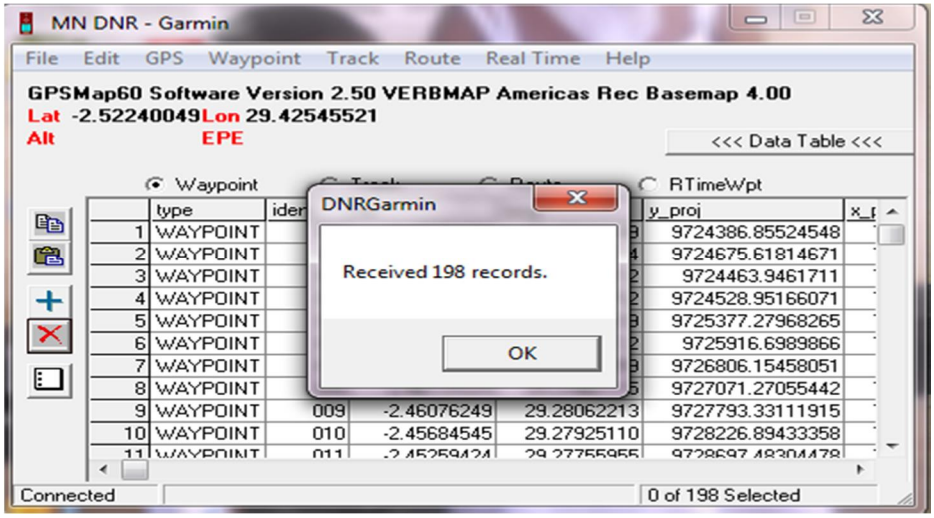
1. Connect GPS receiver to your computer/laptop with USB cable (use USB) port on your GPS.
2. Once GPS is connected to the computer, open DNR Garmin software. Once DNR Garmin is open, the window will appear showing GPS information (**1**), Waypoint projection (**2**) and status of connection (**3**). Make sure projection is WGS 84 – UTM zone 35S



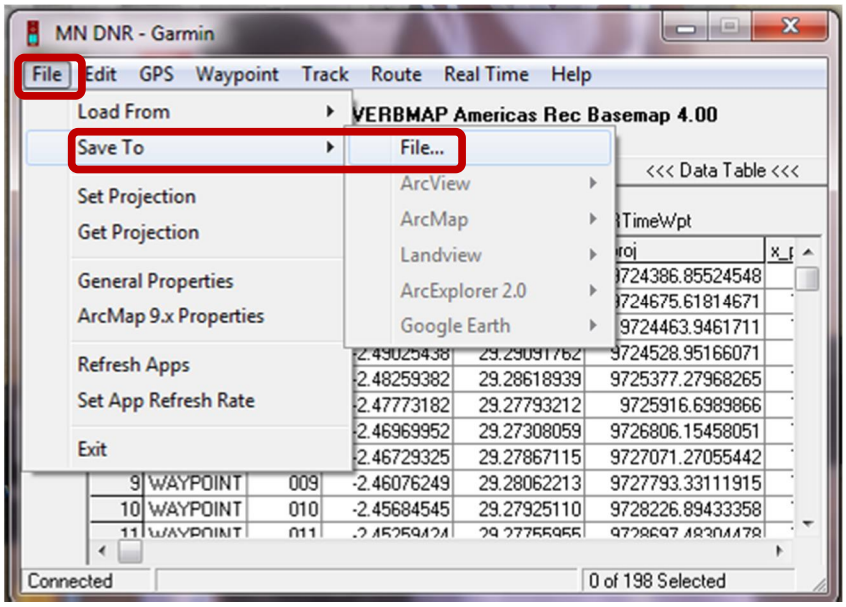
3. In the **DNR Garmin window,** click **Waypoints** menu then "Download"



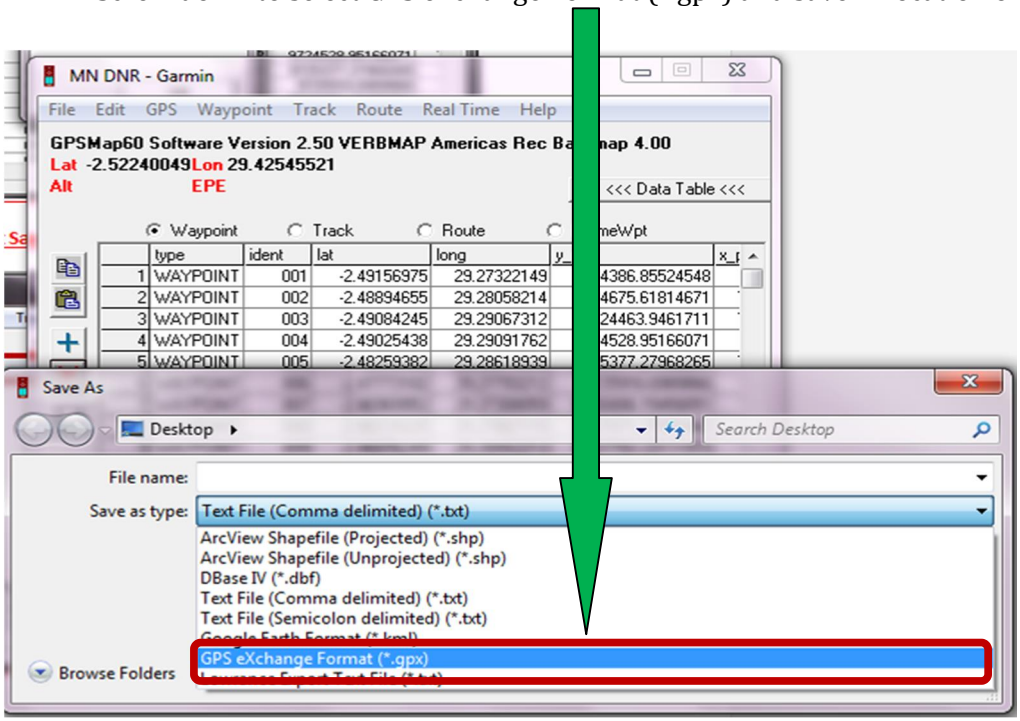
4. When you click "Download" the following window will appear, click "OK" if download is completed



5. From "File menu" select **Save to file and** save as GPS eXchange Format (***.GPX)**.

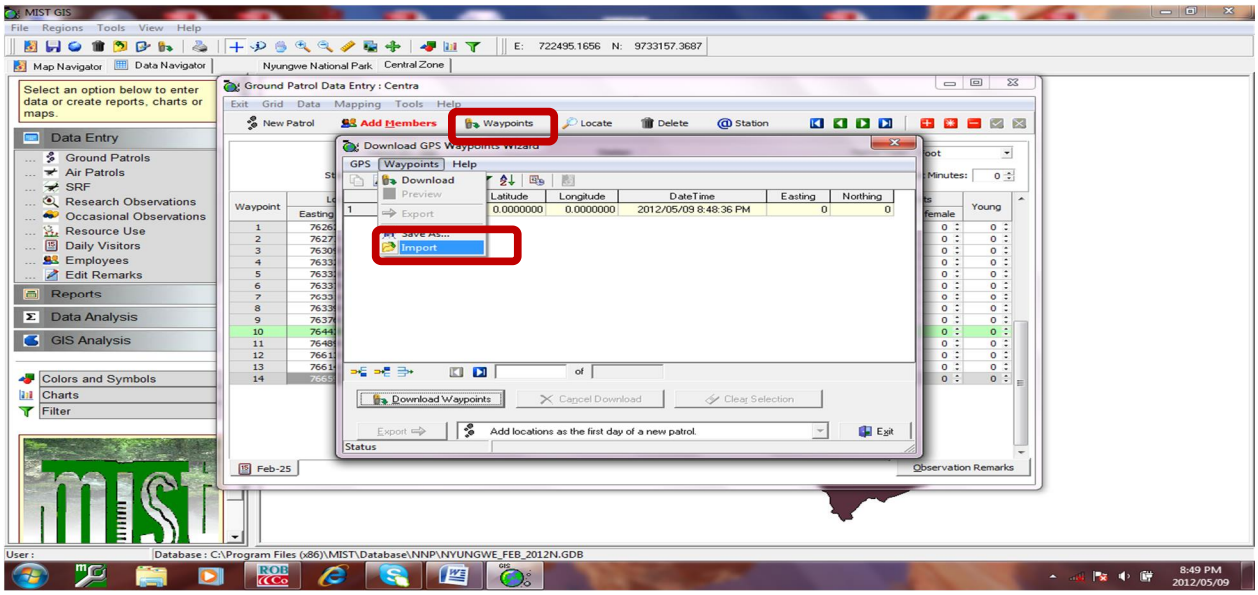


1. Screw down to select GPS eXchange Format (*.gpx) and save in location of your choice



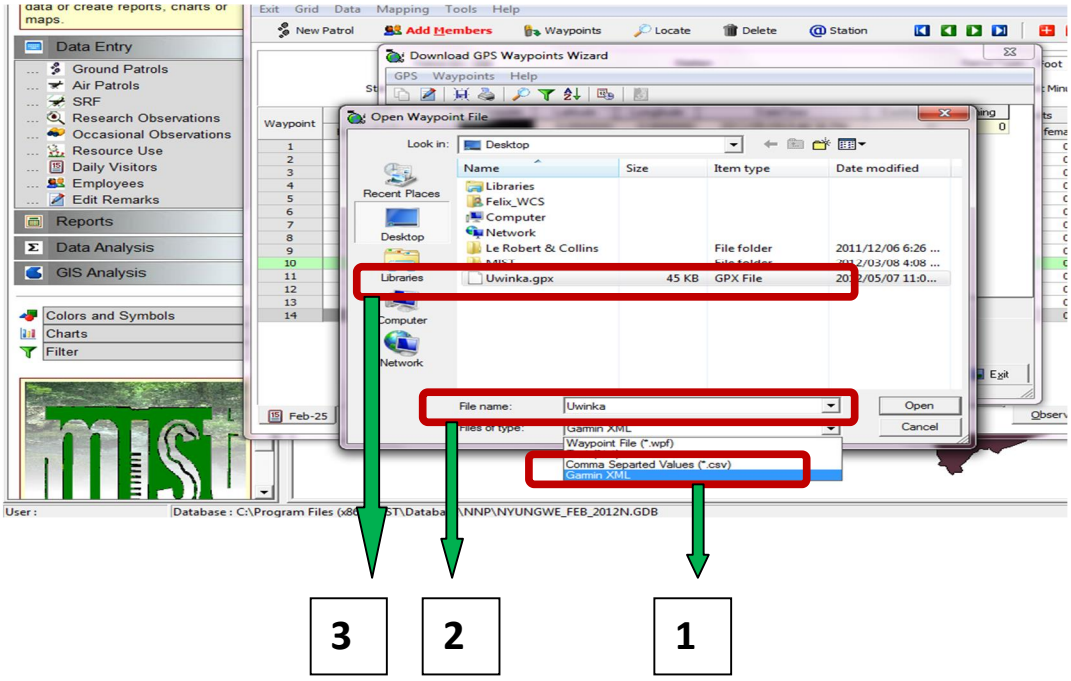
Importing GPS data into MIST GIS

You have saved downloaded data in GPS eXchange Format (*.gpx) and you need to import saved data into MIST GIS and record observation. The procedure is the same as you do with "Download GPS Waypoints Wizard". Only the difference is the file format you import. This time you import GPS eXchange Format file (as you saved it) but GPS eXchange Format (*.gpx) will not show up into MIST data entry/import window.



Instead, import the saved file in "GARMIN XML" format.

1. If the file which you saved does not show upin "import window", you will need first to screw down "Files of Types" to select "GARMIN XML" **(1)**, then the file will show up.
2. Select the name of the file (*.gpx) **(2)** and make sure it shows up in "File name" **(3)**

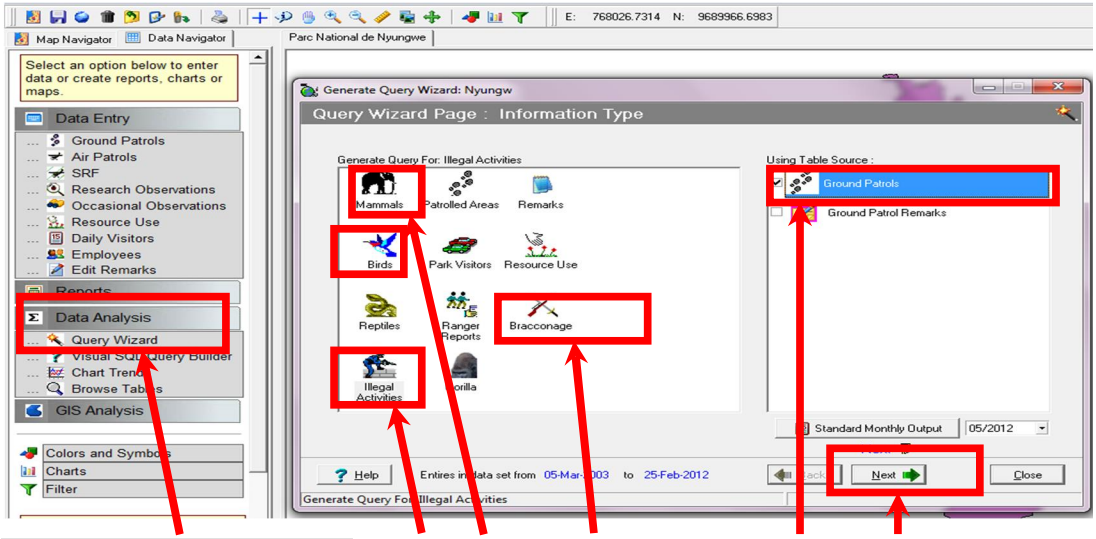


3. Click “Open” to show up data in a table

Data analysis and reporting in MISTGIS

Query Wizard

Click on **Data Analysis**, select one of observation groups, then check **Ground Patrol** and click on **Next**



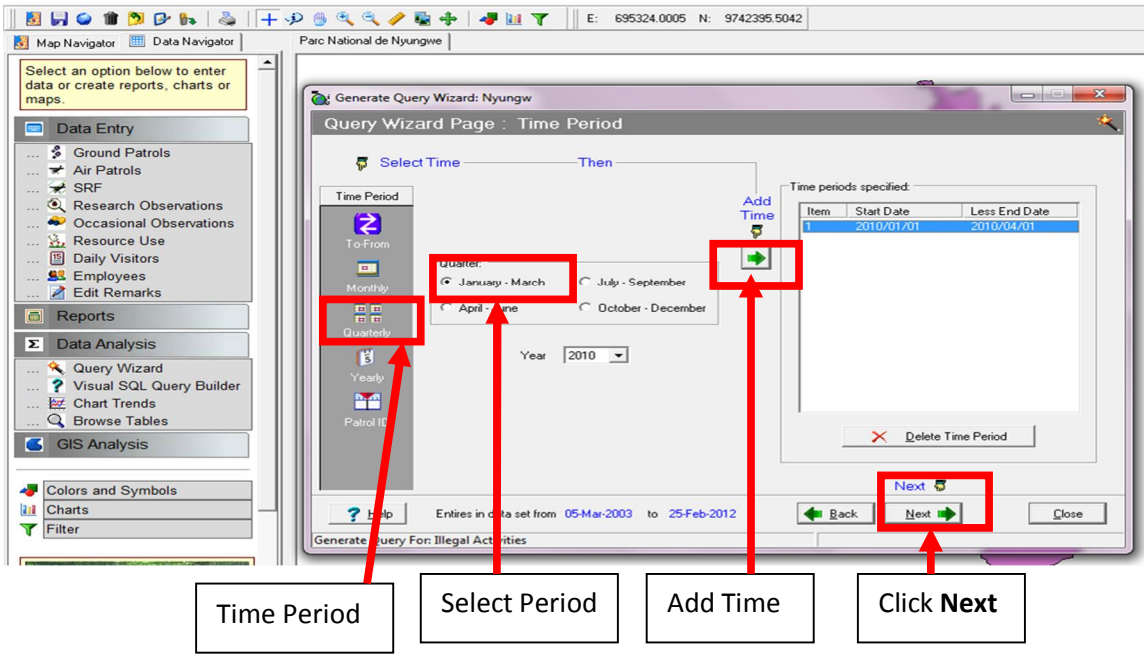
Click on Data analysis then « **Query Wizard"**

Click on one of **Observation groups**

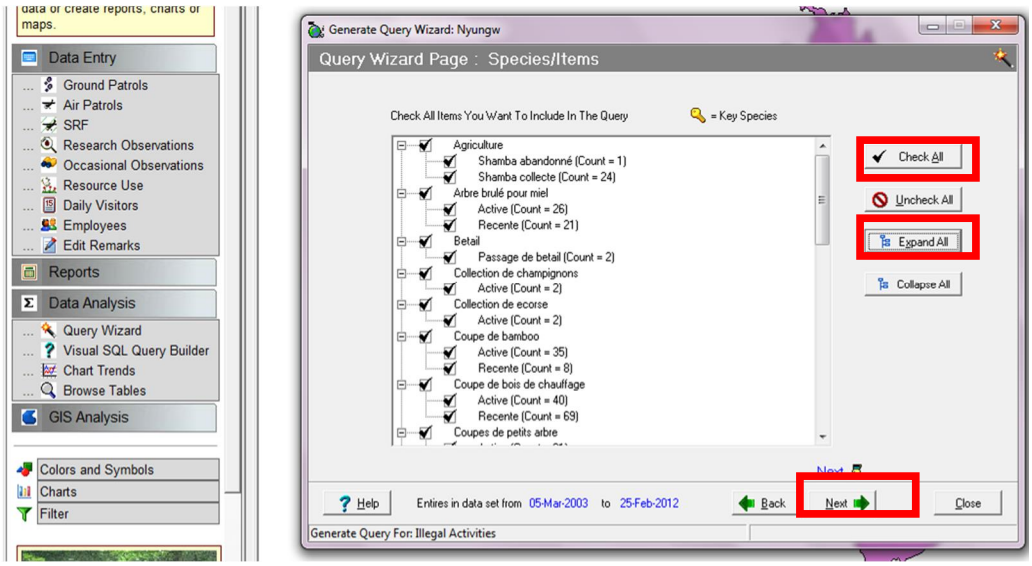
Select "**Ground Patrol**" then click on "**Next**"

Click on **Apply Query to Entire Protected Area** or click on the patrol zone or patrol post you want to select for this query (the query will then be only applied on these patrol zones or patrol posts), then on Next

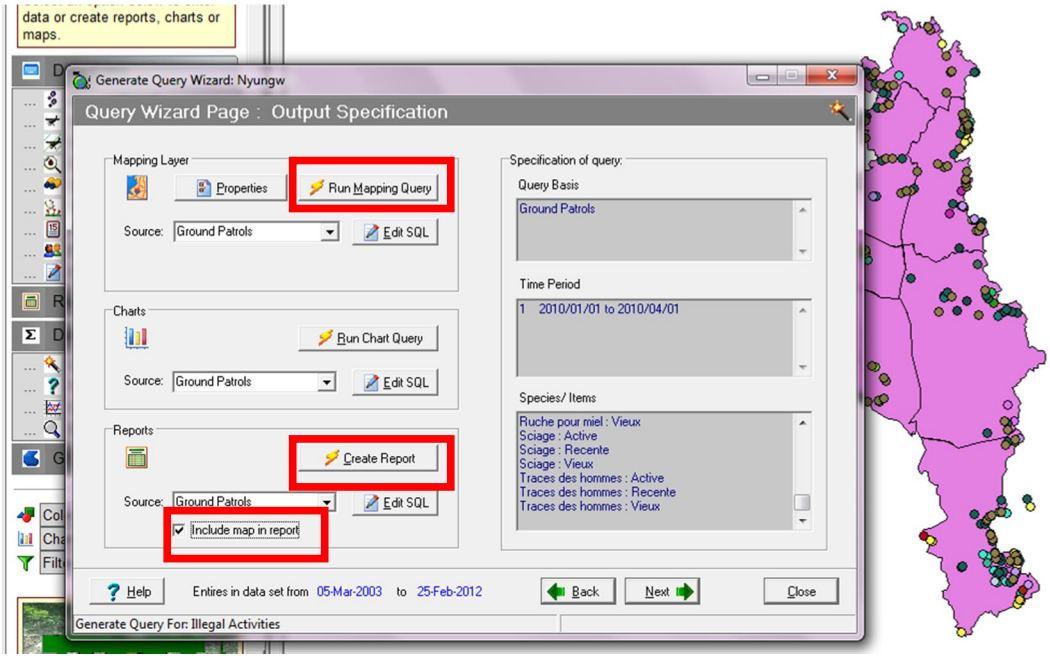
Under Query Wizard Page "Time Period", click on of time periods you want to analyze, select appropriate period, add time then click on Next



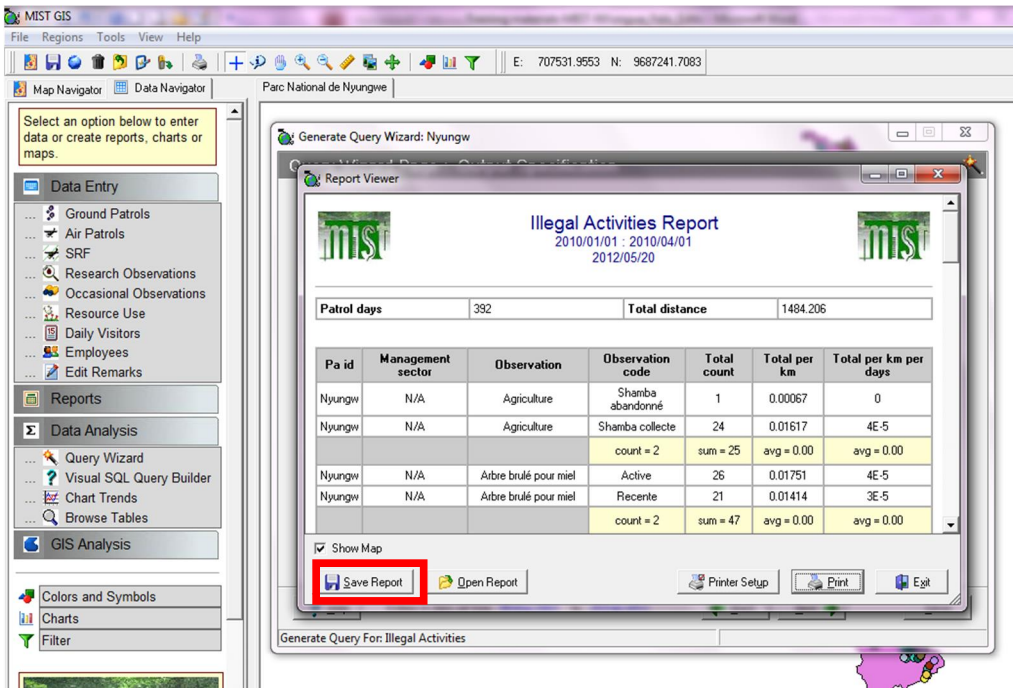
Under Query Wizard Page "Species/Item", click on check all, expend all, then click on Next. You can check or uncheck some item on your choice. You may wish to uncheck "Old observations" so that they are not included in the report.



Under Query Wizard Page "**Output Specification**", click on "Run Mapping Query" if you want to display observation items, click on "**Create a Report**". You can wish to add a map on your report by checking "**Include Map in report**" box.

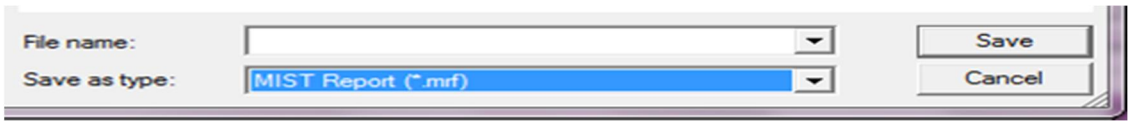


Under Report Reviewer Window, you are able to view each observation, observation code, total count and encounter rates (total/km). You will see total number of kilometer walked and total number of days. Click on "Save" to save your report.



There are various report formats in which you can save your report: HTML (*.htm), Text (*.txt), and MIST Report (*.mrf). If you intend to edit the saved report in Excel sheet, then you will need to save

in **MIST Report (*.mrf)** format. Type the name of the report and save it in appropriate folder/location.



To edit saved MIST Report, open it in Excel sheet then edit it on your choice.

MIST database management

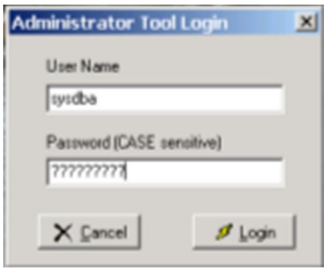
BACKUP AND RESTOREMIST GIS backup and restore is very important in such way your database is secured when you computer is damaged or lost. Head of zone, and research and monitoring warden must make sure that database is backed up every month after data entry. Database restore is only done when necessary (if your original database was damaged or lost.

Backup

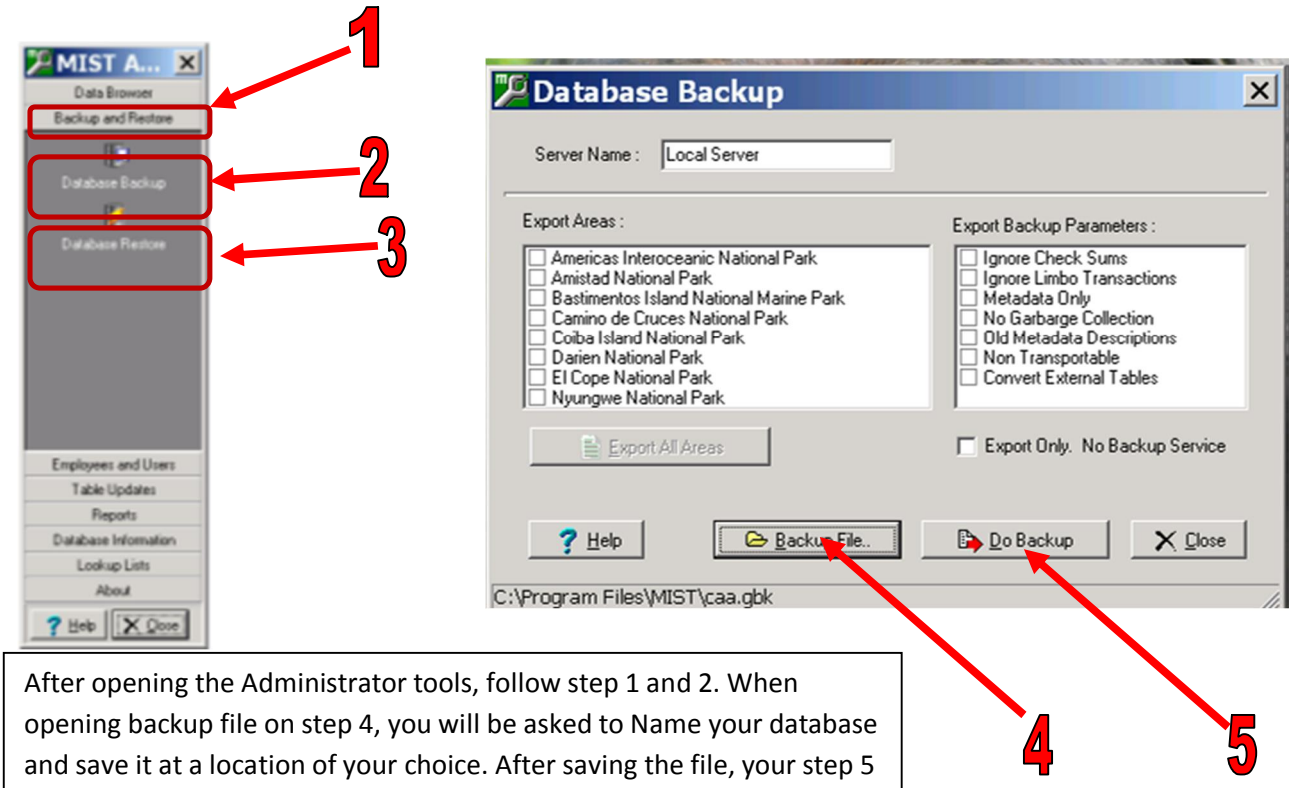
When data have been entered in MIST database, it will be necessary always to proceed with a backup in order to create a local copy of the MIST database that only contain relevant data for Nyungwe in our case.

a) Click on the Administrator Tools icon on your desktop 

b) Enter the appropriate username **(sysdba)** and password **(masterkey)**



c)



After opening the Administrator tools, follow step 1 and 2. When opening backup file on step 4, you will be asked to Name your database and save it at a location of your choice. After saving the file, your step 5 will be activated and click on it to start the backup.

Note: the name must include database, month and year corresponding to data entered

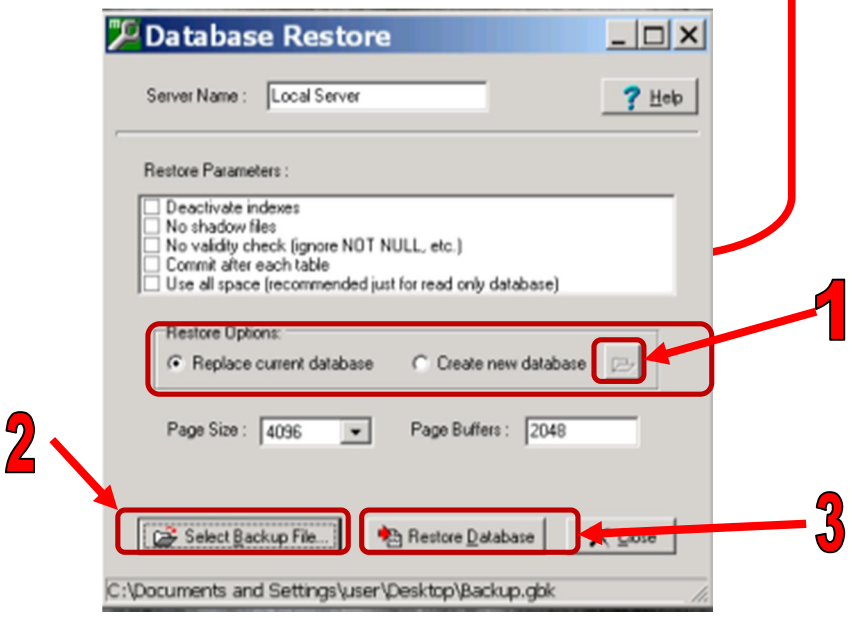
The step number **5** shows information being backed up. After the backup finished click **OK** to the window saying **Backup complete**

Restore

Database Restore is used to restore a previously created **backup** to be used as a database.

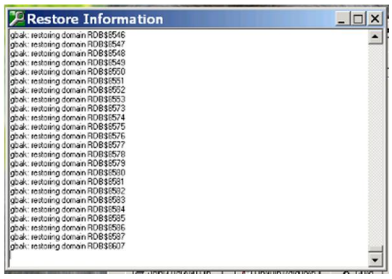
a. Click on **step 3** above to start restoring your database.

b. Choose option to create database(**creating new database or replacing existing database**). When you choose to replace the current data base, you will loose the previous database which will be replaced by the one you restore. When choosing to create a new database you will keep a copy of the previous database and create a new for your restore.



It is advised to create **new database** when doing restore

1. Choose **create new database,** open the window **1**to allow you to save your new database
2. Click on **select backup file** (2) then select the backup file you created and saved when doing backup
3. After selecting the backup file, the window showing Restore database will be activated to allow you to start restoring your database. Click on **Restore Database (3)**

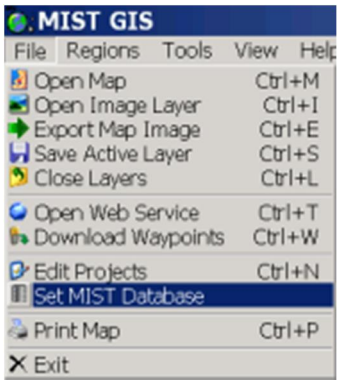


❖ Set MIST database

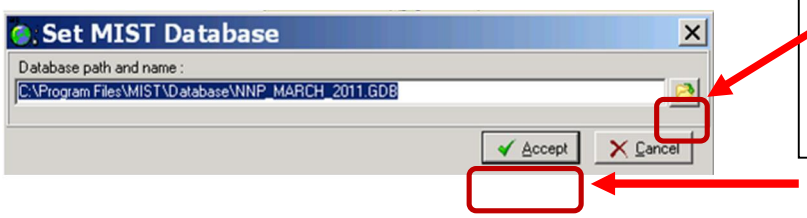
Set the MIST database allow you to activate the database that has been restored from a backup file so that you can work on it.

1. Open MIST navigator by clicking the icon 

then enter username and password

2. 

Click on **Open file** and then click on **Set Mist Database**

3. 

Click on this window to search and open the database restored

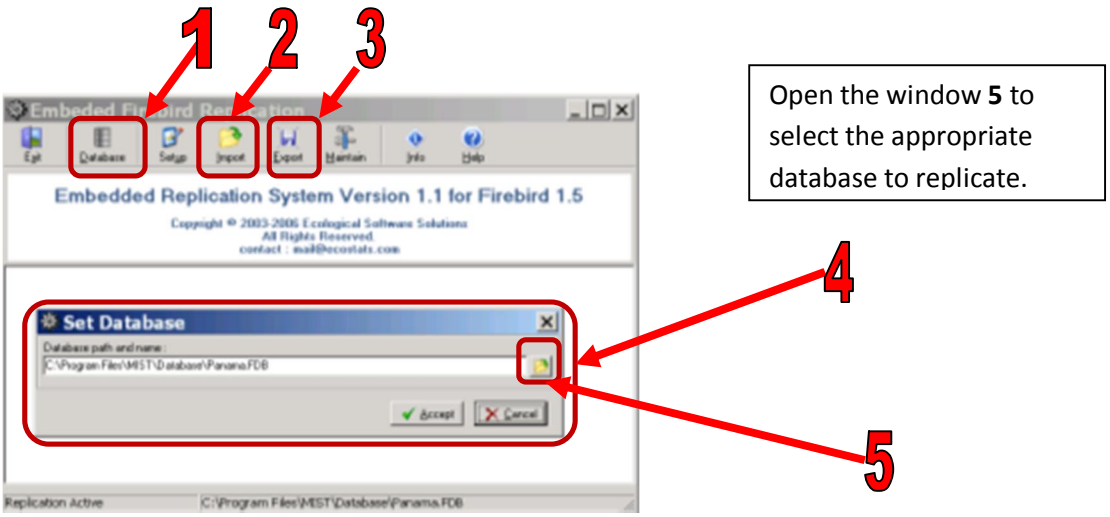
Then accept to confirm the database

Replication

Replication helps to update any modification done to the database without changing the database or doing backup/restore.

1. Click on Mist replication icon on your desktop 

,enter the username **(sysdba)** and password **(masterkey)** to open the replication. You should first activate database that you need to replicate: click on **Database (1)** to open the window **(4)**



2. To save you replication file click on Export (**3**), rename your replication file then save.
3. After saving your replication file, click on **export replication data** and wait until the replication finish.
4. To import the replication file that has been replicate to allow the update of the database, click on **import**

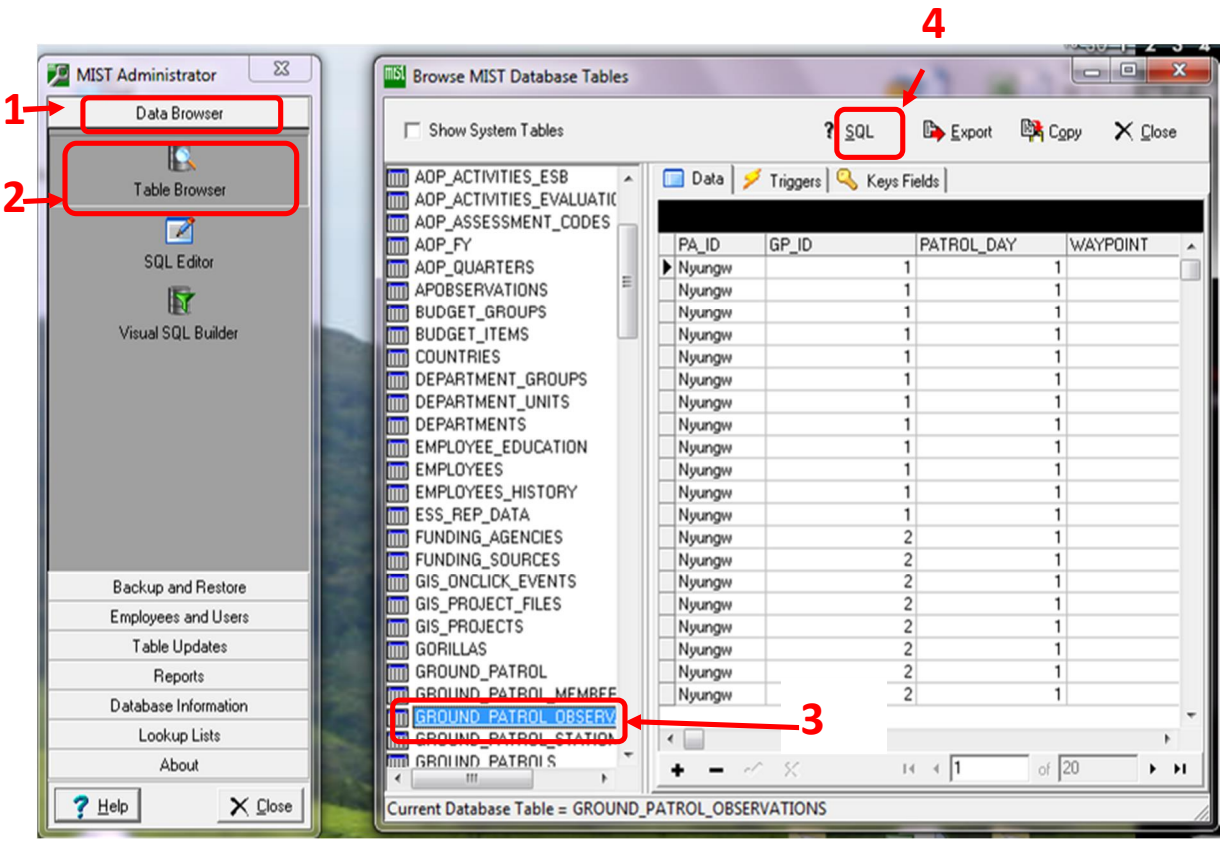
Note: Generally, MIST database replication takes 1 to 2 minutes, but sometimes it takes longer up to 1 hour or more, in this case, you need to follow the steps provided in appendix 3(page 51) to correct this error.

Table Browser

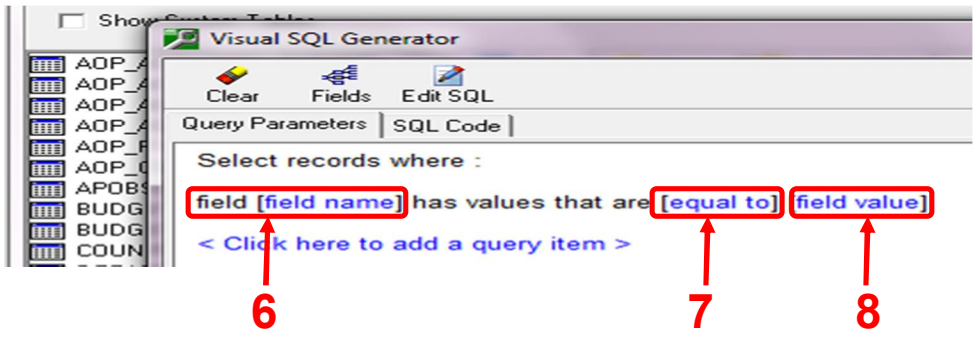
The Table Browser is for viewing and querying of single table data. The Table Browser is a two pane window with the MIST tables on the left and the database table and its data displayed on the right. The table browser allows querying your data according to your need. You may need to query specific time interval or specify observation using Structured Query Language (SQL). The table browser also allows you to export data from MIST GIS to other file format (text) for other uses such GIS or Excel tables.

Steps for table browser

1. Open MIST administrator window
2. Click on Data browser icon (1)
3. Then click Table browser (2)
4. In Browse MIST Database Tables (right), select and click "GROUND PATROL OBSERVATIONS" from a list of tables (3)



5. Click on "**SQL**" (4)to show up Visual "SQL" Generator
6. In the Visual SQL Generator window, add query item by clicking on "click here to add query item" (5)
7. Select SQL item from the list from the field name (6), select value (7) then select field value (8). For the specific period, you will select "DATE_TIME" for field name, choose "Between" for Value, and the starting and ending time for "Field value"



8. Export data from MIST (browse table)

Once you have specified your SQL (step 7), you can export table and save it in text file format. The exported table can be used for many applications (GIS, Excel)

LITERATURE CITED

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APPENDICES

Appendix 1

Observations and Observation types in RBM program in Nyungwe National Park

Group Observation	Observation	Observation type	Observation remarks
Illegal activities	Agriculture	Shamba abandone	Yes
		Shamba collect	
		Shamba marijuana	
	Arbre brule pour miel	Active, Recente, Vieux	
	Betail	Package de betail	
		Passage de betail	
	Collection de champignon	Active, Recente, Vieux	
	Collection ecorce	Active, Recente, Vieux	
	Coupe de bamboo	Active, Recente, Vieux	
	Coupe de bois de chauffe	Active, Recente, Vieux	
	Coupe de petit bois	Active, Recente, Vieux	
	Exploitation minerais	Active, Recente, Vieux	
	Feu de brousse moins 1 ha	Active, Recente, Vieux	Yes
	Feu de brousse plus 1 ha	Active, Recente, Vieux	Yes
	Four a charbon	Active, Recente, Vieux	
	Hutte	Active, Recente, Vieux	
	Personne	Collecteur du bois	Yes
		Cultivateur	
		Harbaliste	
		Passage de pieton	
		Minier	
	Place de feu	Active, Recente, Vieux	
	Plante medicinale	Active, Recente, Vieux	
	Ruche pour miel	Active, Recente, Vieux	
	Sciage	Active, Recente, Vieux	
	Trace des hommes	Active, Recente, Vieux	
Poaching/ Braconnage	Camp de braconnier	Active, Recente, Vieux	Yes
	Personne	Braconnier avec piège	Yes
		chasseur	
	Piège trous	Active, Recente, Vieux	
	Piège métalliques	Dans l'arbre	
	Piège corde	Large	
		Petit	
Mammifères	Babouin	Vue, Entendu, Mort	
	Céphalophe a dos jaune	Vue, Entendu, Mort	

	Céphalophe a front moire	Vue, Entendu, Mort	
	Chien errant	Vue, Entendu, Mort	
	Chimpanzés	Vue, Entendu, Mort	
	Colobes	Vue, Entendu, Mort	
	Ecureuil	Vue, Mort	
	Genette	Vue, Entendu, Mort	
	Mangabe	Vue, Entendu, Mort	
	Potamochère	Vue, Entendu, Mort, Crotte, Trace	
	Rat de Gambie	Vue, Mort	
	Serval	Vue, Entendu, Mort	
	Singe argente	Vue, Entendu, Mort	
	Singe Hamlyni	Vue, Entendu, Mort	
	Singe L'Hoest	Vue, Entendu, Mort	
	Singe Mona	Vue, Entendu, Mort	
Oiseaux	Calao	Vue, Entendu, Mort	
	Tauraco Ruwenzori	Vue, Entendu, Mort	
	Tauraco Bleu	Vue, Entendu, Mort	
Position	Position	Start	
		Position	
		End	

Appendix 2 RBM data collection datasheet

FICHE DES DONNEES RBM - NYUNGWE		
Poste _____Zone patrouille _____ Dates : _____ Patrouille guidées per MIST ? Oui ☐ No ☐	Patrouille Mobile ☐ Patrouille Camping ☐ Patrouille mixte ☐ Patrouille coordonnée ☐ Patrouille embouche ☐	GPS No ☐ Patrouille ID (A compléter après la saisie) Jour ☐ de ☐ Jour de patrouilles Lieu de Camping :_____ Coordonnées GPS : 07……., 97…….

No	Waypoint dans GPS	Location			Heure	Observation	Type d'observation	Total	Adultes		Remarques (utiliser le verso si nécessaire)
		07…..	97……..	EPE					M	F	

Nombre de patrouille :_____(a) Nom de celui qui utilise le GPS : _____ (b) Nom de celui qui remplie la fiche des données: _____(c) Nom des autres membres de patrouille : _____

Temps de repos (min) : _____ Données saisies par : _____ Date : _____ Page : _____

Appendix 3

Note of correction of Replication errors

Directive to resolve replication bugs

1. Open MIST Administrator

2. Make sure your MIST Administrator is set to the same database as your replication program.

3. Select the "Browse Tables" option

4. Go to the table ESS_REP_DATA

5. Make sure you are at the first record (see attached screen shot), and note the REP_CODE number.

6. Scroll down in the table for "about" 5,000 to 10,000 records and find a record that shows a date change (see attached screen shot). Note this
REP_CODE number at the date changes so you capture all the replications for that day.

7. Open the MIST Administrator tool "SQL Editor"

Paste this in and run it (click on the lighting bolt):

```
updateess_rep_data set exported='Y';
```

You can only run one command at a time, so replace the above command if it ran successfully with the following (replace "230465" with your REP_CODE number from step 5 and "231985" with your REP_CODE number from step 6):

```
updateess_rep_data set exported='N' where rep_index>=230465 and rep_index<=231985;
```

This will mean only the replications between these values will be placed into the replication output file.

8. If you are using MIST with a LOCAL embedded database driver, you will have to close the MIST Administrator and open the Replication Program.
Replicate your data. The total about (but not exactly) 5,000 or 10,000(which ever you picked in step 6).

9. Import this replication output file into your second database. If you still get memory error, close the Replication program and go back to step 1 and select a smaller interval between records when you get to step 6.

10. Once a replication file imports without errors, go back an repeat from step 1, except select as your starting point the REP_CODE number 1 more than your last number (i.e. my last number in this example was 231985, so I would start with 231986 and include 5,000 to 10,000 records from there as the "next" set of data to replicate).

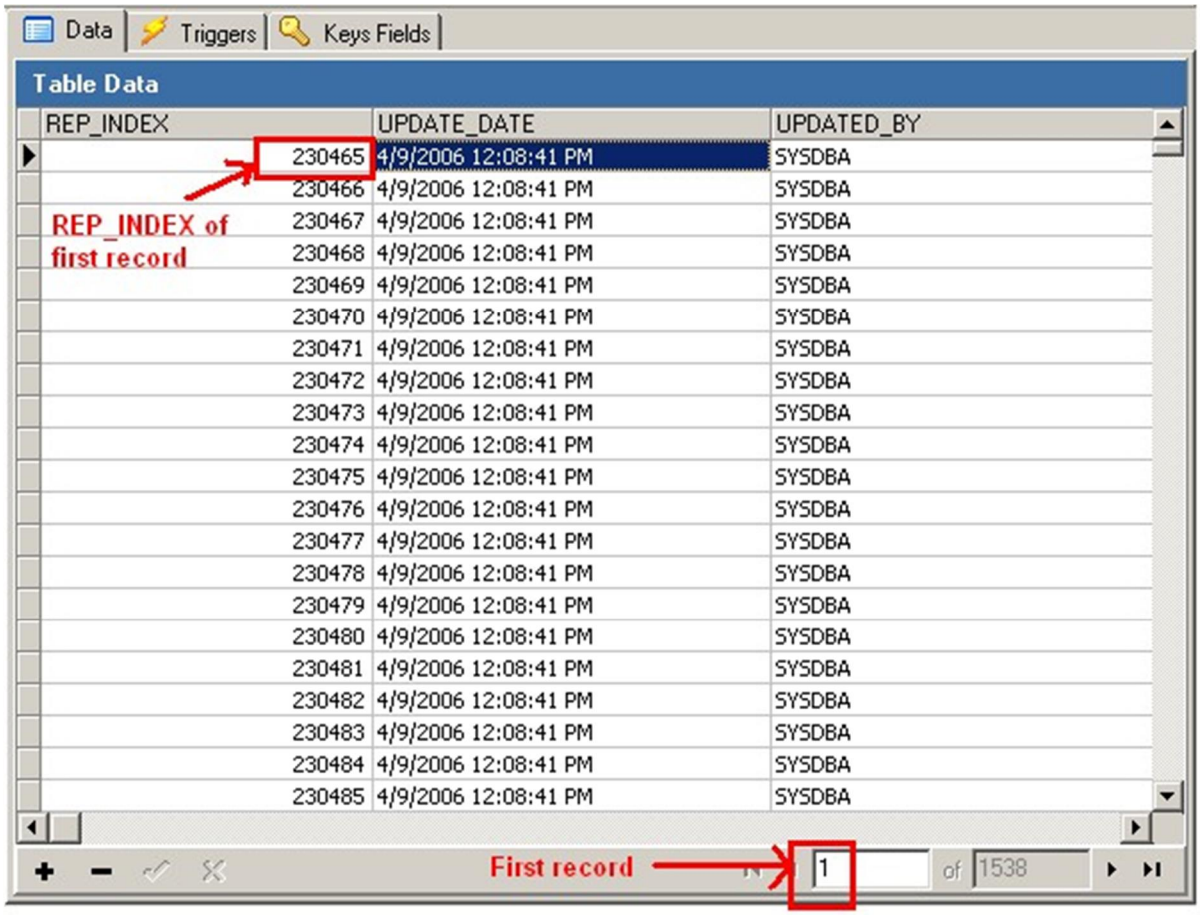
11. Repeat both SQL statements, but remember to adjust the second one with your next set of REP_CODE values.

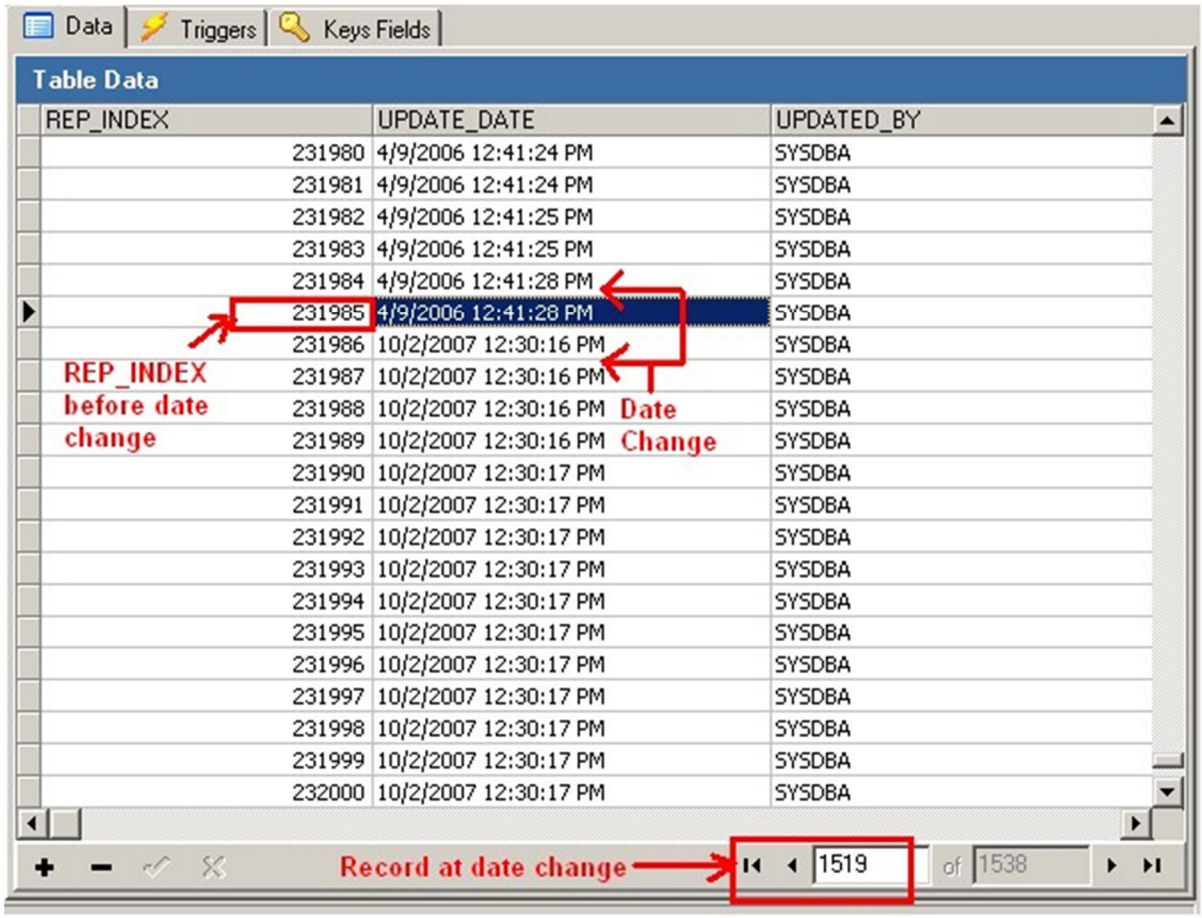
Update ess_rep_data set exported='Y';

Then run (where 231986 is my new start REP_CODE and 236981 is my new end REP_CODE):

updateess_rep_data
set exported='N'
whererep_index>=231986 and rep_index<=236981;

12. Repeat 1to 11 until you have replicated all your data.


Data
Triggers
Keys Fields
Table Data
REP_INDEX
UPDATE_DATE
UPDATED_BY
230465 4/9/2006 12:08:41 PM SYSDBA
230466 4/9/2006 12:08:41 PM SYSDBA
230467 4/9/2006 12:08:41 PM SYSDBA
230468 4/9/2006 12:08:41 PM SYSDBA
230469 4/9/2006 12:08:41 PM SYSDBA
230470 4/9/2006 12:08:41 PM SYSDBA
230471 4/9/2006 12:08:41 PM SYSDBA
230472 4/9/2006 12:08:41 PM SYSDBA
230473 4/9/2006 12:08:41 PM SYSDBA
230474 4/9/2006 12:08:41 PM SYSDBA
230475 4/9/2006 12:08:41 PM SYSDBA
230476 4/9/2006 12:08:41 PM SYSDBA
230477 4/9/2006 12:08:41 PM SYSDBA
230478 4/9/2006 12:08:41 PM SYSDBA
230479 4/9/2006 12:08:41 PM SYSDBA
230480 4/9/2006 12:08:41 PM SYSDBA
230481 4/9/2006 12:08:41 PM SYSDBA
230482 4/9/2006 12:08:41 PM SYSDBA
230483 4/9/2006 12:08:41 PM SYSDBA
230484 4/9/2006 12:08:41 PM SYSDBA
230485 4/9/2006 12:08:41 PM SYSDBA
REP_INDEX of first record
First record
1
of 1538


Data
Triggers
Keys Fields
Table Data
REP_INDEX
UPDATE_DATE
UPDATED_BY
231980 4/9/2006 12:41:24 PM SYSDBA
231981 4/9/2006 12:41:24 PM SYSDBA
231982 4/9/2006 12:41:25 PM SYSDBA
231983 4/9/2006 12:41:25 PM SYSDBA
231984 4/9/2006 12:41:28 PM SYSDBA
231985 4/9/2006 12:41:28 PM SYSDBA
231986 10/2/2007 12:30:16 PM SYSDBA
231987 10/2/2007 12:30:16 PM SYSDBA
231988 10/2/2007 12:30:16 PM SYSDBA
231989 10/2/2007 12:30:16 PM SYSDBA
231990 10/2/2007 12:30:17 PM SYSDBA
231991 10/2/2007 12:30:17 PM SYSDBA
231992 10/2/2007 12:30:17 PM SYSDBA
231993 10/2/2007 12:30:17 PM SYSDBA
231994 10/2/2007 12:30:17 PM SYSDBA
231995 10/2/2007 12:30:17 PM SYSDBA
231996 10/2/2007 12:30:17 PM SYSDBA
231997 10/2/2007 12:30:17 PM SYSDBA
231998 10/2/2007 12:30:17 PM SYSDBA
231999 10/2/2007 12:30:17 PM SYSDBA
232000 10/2/2007 12:30:17 PM SYSDBA
REP_INDEX before date change
Date Change
Record at date change
1519
of 1538