AEGRO Workpackage 10, D10.7: A CyberTracker application to gather data for *in situ* baseline monitoring – User Manual

Introduction

In the previous reporting period it was decided to use CyberTracker for the implementation of field tools operating on mobile data acquisition devices. A pilot application has been developed and first tests have been made in the *Beta* case crop study. A description of the survey tool used is available from http://aegro.bafz.de/uploads/tx_neofileshare/2008-05-27_10-33-31_cybertracker260508.doc.
Five use cases have been identified to generate demographic and genetic baselines for crop wild relatives *in situ*:

1. Define monitoring plots: A plot is geographically localised, described and documented for continued monitoring to control the success of management plans.
2. Count individuals species-wise in plots or transects.
3. Define patches: A patch is an agglomeration of individuals of a certain plant species. It is geographically localised, described and documented for continuing monitoring.
4. Demographic monitoring - census: An occurrence is geographically described within a plot or patch (see previous case cases) and the demographic status (number or percentage of individuals in certain age cohorts) is observed. This can be done on a patch or a plot level
5. Individual monitoring – sampling: An occurrence is geographically described. Individuals are located, geo-referenced and samples are taken from them for (genetic) analysis.

These are illustrated by screenshots from the revised CYBERTRACKER_AEGRO2010.MDB application.

Acquisition of general information:

All use cases have in common a need for general geographic and project information:

A) User and survey identification:

The start screen (Fig.1) requires entering your name and an identifier of the survey you are to perform. Both observer name and survey identifier are required. You cannot proceed without having

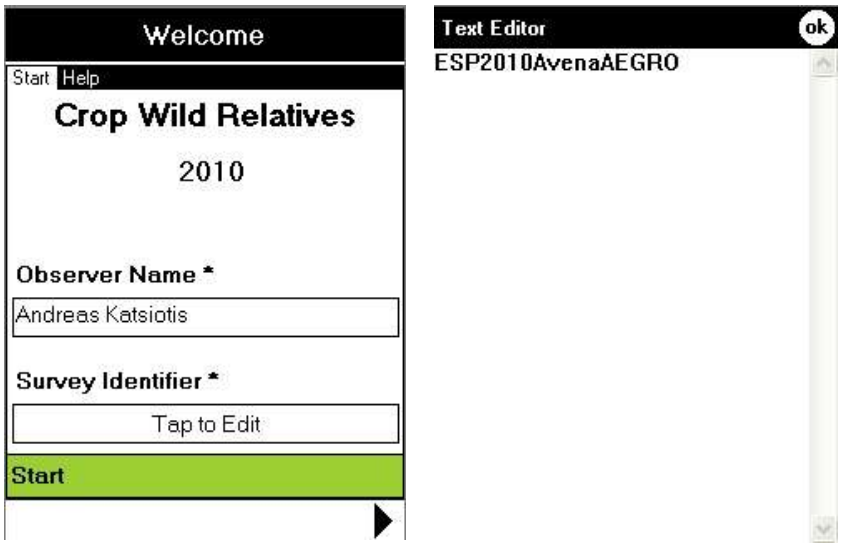
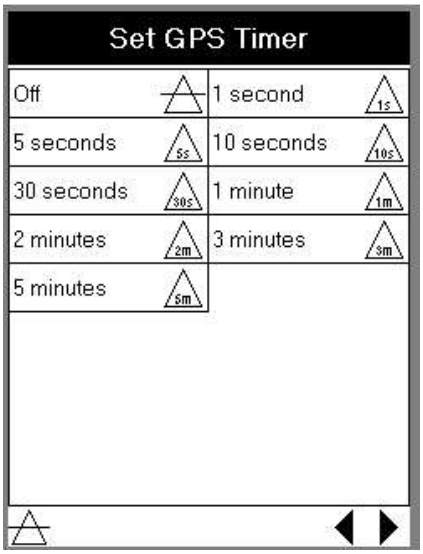


Fig.1a) Enter name and survey identifier

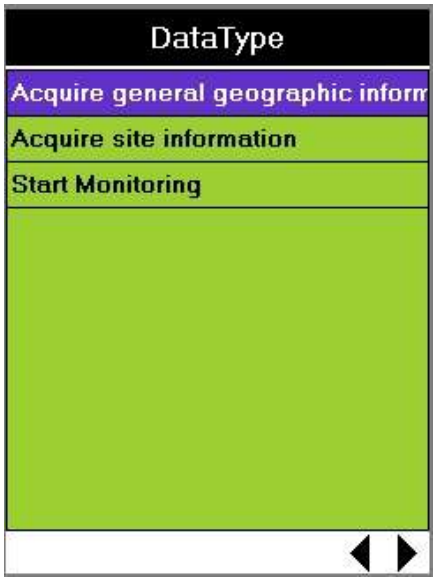
Fig.1b) these are required.



input these data (Fig. 1 b). A survey is a set of observations taken for a certain purpose and as a unit for evaluations and calculations. We recommend a survey identifier containing country - year – target (crop) – project acronym (e.g. "ESP2010AvenaAEGRO") in the indicated sequence to optimize sorting. On tap to a text field a text editor opens. There you enter information and save with ok. With a click to start you get to the GPS timer (Fig.2).

The time choice determines how long the GPS is allowed to search for a signal until a measurement is taken and recorded in the database (Fig. 2). The time between start and end of the GPS measurement is displayed by CyberTracker as 0 ⋯ 100% completed.

Fig. 2. Set GPS Timer



Before starting the monitoring in the survey some general geographic information should be entered. These are the administrative unit (country – state / region– province– district– nearest village or town, the name of the protected area, if you are monitoring in a protected area and some details of the site. On the screen shown in Fig.3 you can choose between these options.
In surveys covering a broad geographic range like the AEGRO crop case studies or other prospective missions visiting various areas and sites, acquisition of this general information needs to be done in the field tool. In case of monitoring by the protected area management only for one area these settings are constant for all surveys and can be recalled with each login of a registered user before uploading survey data.

Fig. 3. Choose which type of data you want to enter

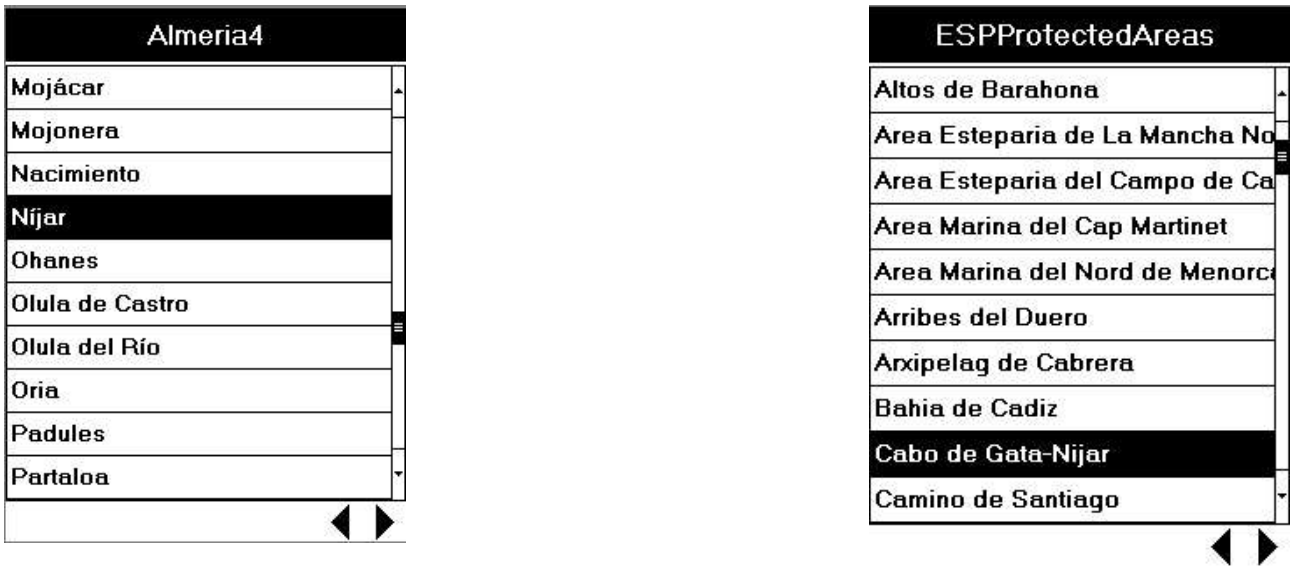
B) Documentation of administrative unit and protected area where the survey is made:

This is necessary to easily identify the political administrative unit and, if applicable, the protected area, which are owning and responsible for the observed occurrences of genetic resources.

The administrative unit, within which the observation will be taken, is selected (Fig. 4) from the hierarchy country − state/region (NUTS1) - province (NUTS2) − district (NUTS3) − location (LAU2). Layers may be skipped in case of small countries or subunits. The application provides for subordination of each name to the correct level.
If observations are taken within a protected area, the protected area is selected from a list or "no protected area" is indicated (Fig.5). Currently the protected area has to be selected from all protected areas per country.

Country Province (NUTS2) District (NUTS3)

Fig. 4) Search administrative units



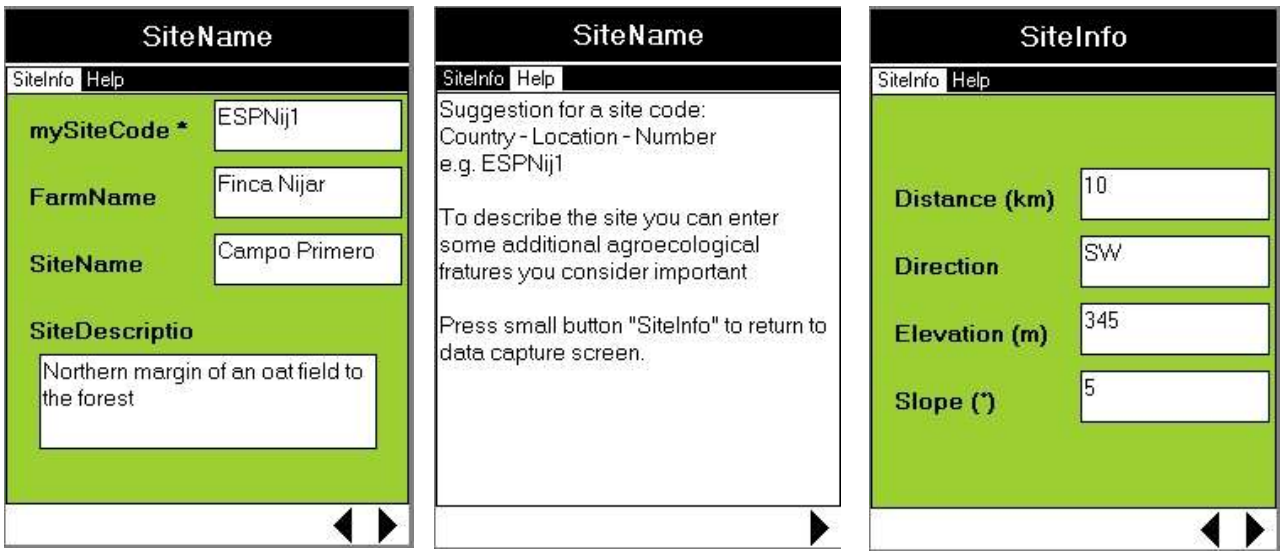
a) Location – next village or town (LAU 2)

b) Protected Area

Fig. 5) Search lowest administrative unit and protected area

C) Documentation of site details:

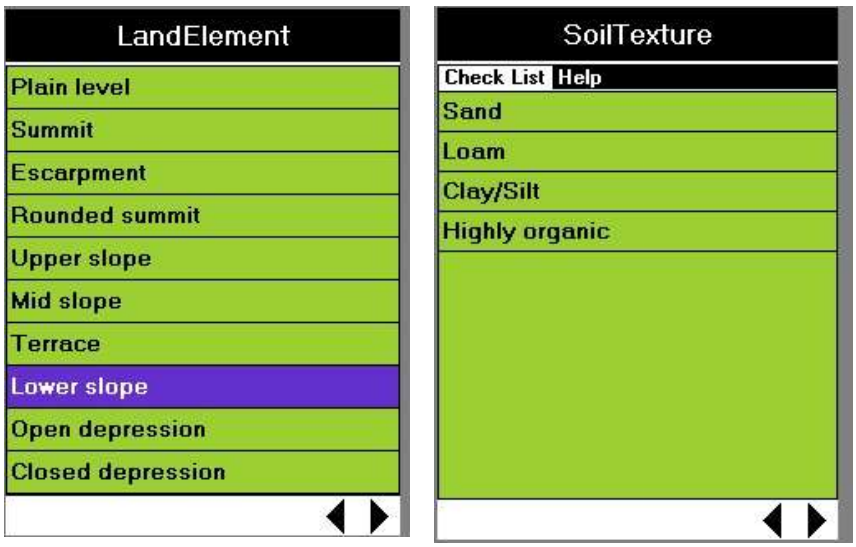
We understand the site as a point where a collection or observation event occurs. Thus it is the lowest level of geographic description. Heterogeneous description formats are found in traditional site (or locality) descriptions, often covering administrative unit and protected area as well. As there is no standardisation of a site identifier foreseen it has to be set by the observer / collector. We recommend a scheme of abbreviated country – Location (nearest town or village – LAU2) - sequential number (e.g. ESPNij1 for a site near the village Nijar in Spain / Andalucia / Almeria – see Fig. 6b). Additionally you should enter the name of the land owning enterprise (farm, forest, research station etc.) and the name of the field or plot, which also in many cases will be available.



a) Names and description b) Help for explanation66 c) Quantitative qualifiers

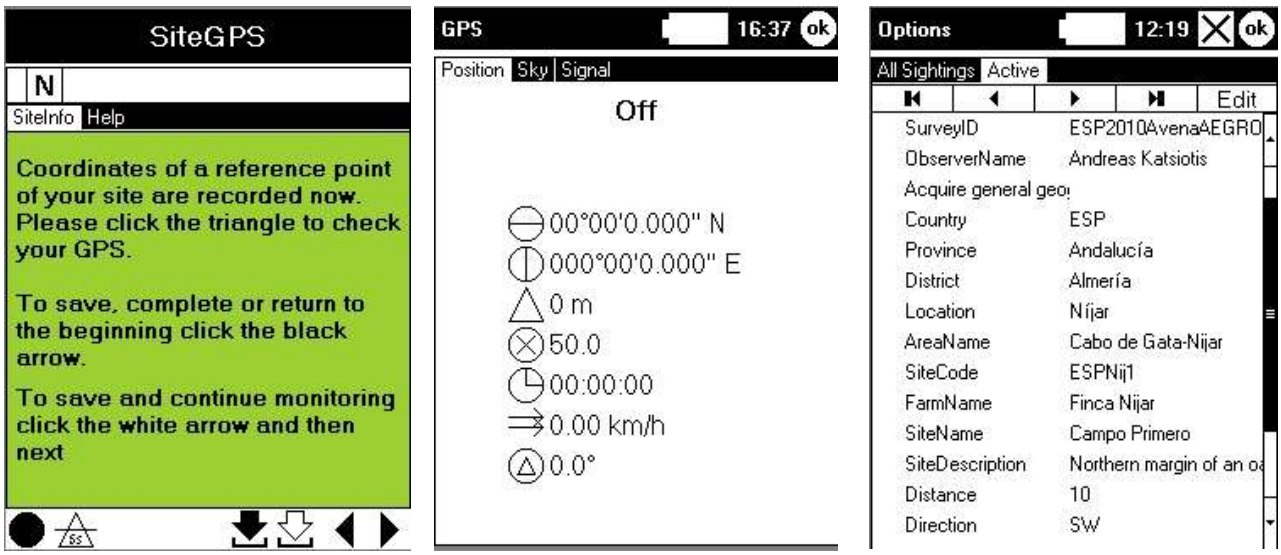
Fig. 6) Enter site information

You can enter additional information you consider important in a description field. Note that information about distance and direction from the next settlement (LAU2) is requested in the next screen (Fig. 6 c) and must not be duplicated in the site description.
Distance means the distance from the next named settlement – village or town (LAU2), which has been selected before (see Fig. 5a). The same applies for the direction. The elevation, measured by an altimeter and the slope of the surface can be entered as well.
Land elements and soil types for a minimal ecological site description can be selected in the next two screens (Fig 7).
This will lead you into a screen for recording the GPS signal (Fig.8)



a) Land elements b) Soil texture

Fig. 7) Ecological relevant landscape and soil features



a) Controls for GPS and save b) Check GPS c) Check inputs

Fig. 8) Record GPS position for a site and save it

You can check your GPS (Fig. 8b) by clicking the triangle. The already entered data (Fig. 8c) you can check by clicking the black circle. A click to the black arrow saves the entered information and leads you back to enter another site (Fig. 6 a). The white arrow saves your information and leaves you at the screen and you can continue with next to choose between three actions at a site or return for a new site or location (Fig. 9):

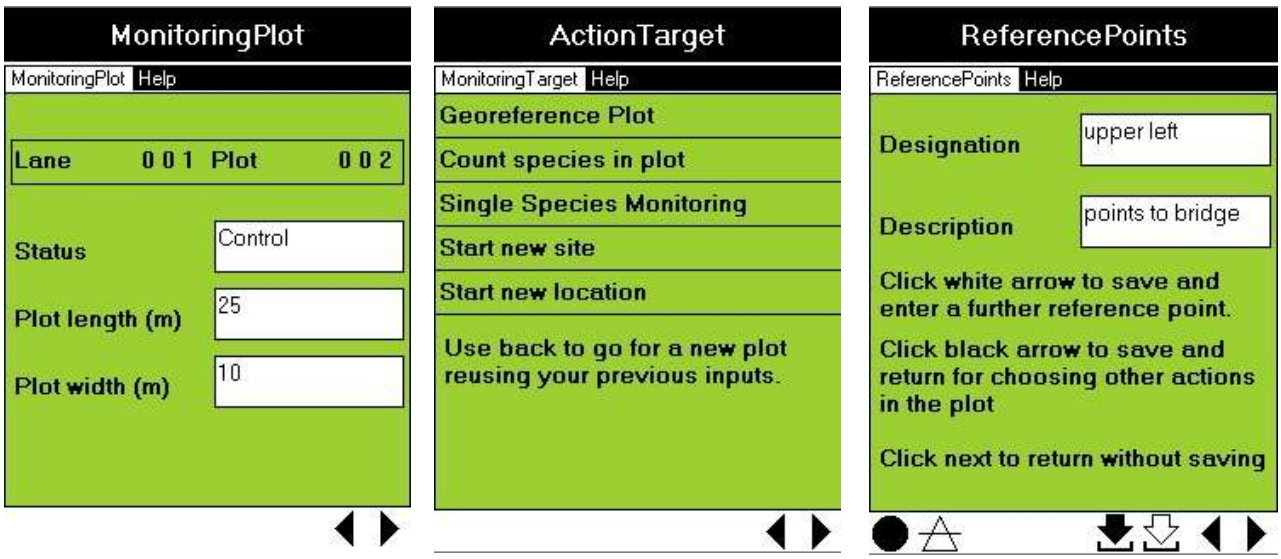
- Define and geo-reference a monitoring plot for repeated observations during a survey (Fig. 10).
- Count species in a transect (Fig.11).
- More detailed monitoring on a single species basis (Fig. 13 b), which are observation of patches, demographic monitoring (census) and individual monitoring and sampling.

Fig. 9) Choice between actions at a site.

Use case 1: Define and geo-reference monitoring plots

A plot is normally identified by its position in an experimental field design matrix (lane, plot). The counters (Fig. 10 a) can be changed by a click. Plot size parameters are documented to facilitate area related quantitative calculations and indicate the status of the plot in the survey (e.g. control, treated etc.). After having input this information you can choose to geo-reference the plot, count the individuals of different species or make more detailed monitoring on a single species basis within the plot (Fig. 10b).

Geo-referencing can be done by geo-referencing one or few fixed reference points - e.g. the four edges of a plot or recording the margins of the plot. A small number of reference points we would prefer in ordinary field experiments with regularly shaped plots. Only the preferred method is currently available for plots (Fig.10 c). Geo-referencing outlines may be necessary for irregularly shaped plots, e.g. due to the agglomeration of plants. These should be better referred to as patches (see below).



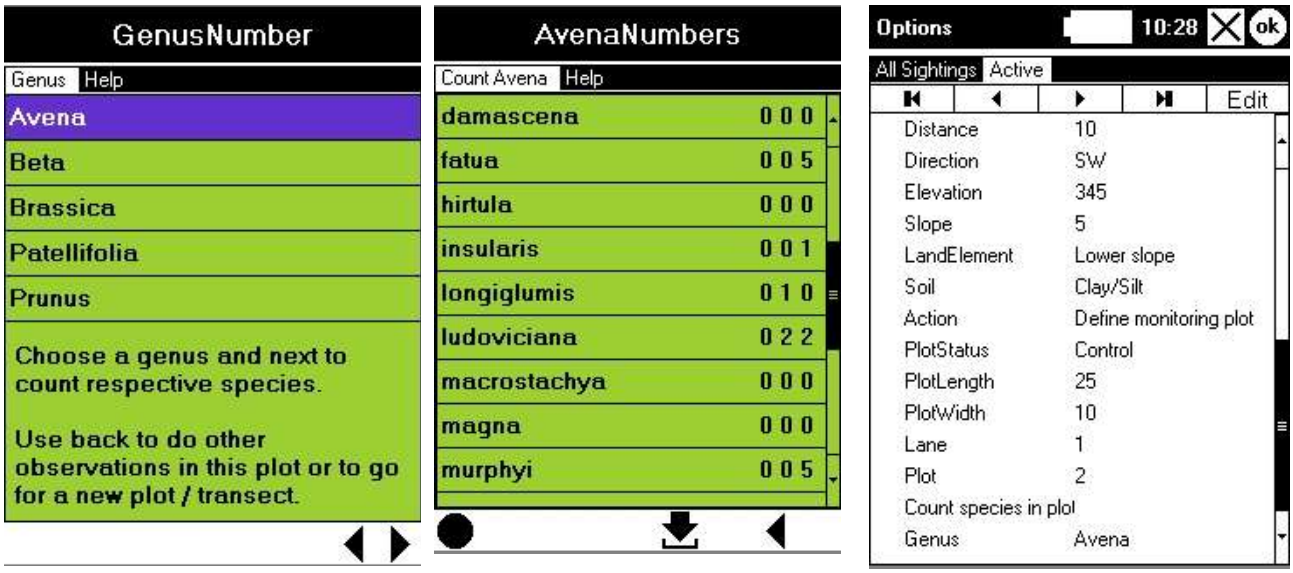
a) Define monitoring plot b) Actions within a plot c) Record reference points

Fig. 10) Define and geo-reference a monitoring plot

You can enter the designation of a reference point (e.g. geometric position in the plot), a description of the point facilitating revisit and record GPS position with the white arrow, which leaves you in this screen for recording a further reference point. With the black arrow you get back for choosing other actions in the plot (Fig. 10 b).You can check your GPS with the triangle and your background data with the circle. Next brings you back without saving a GPS record.

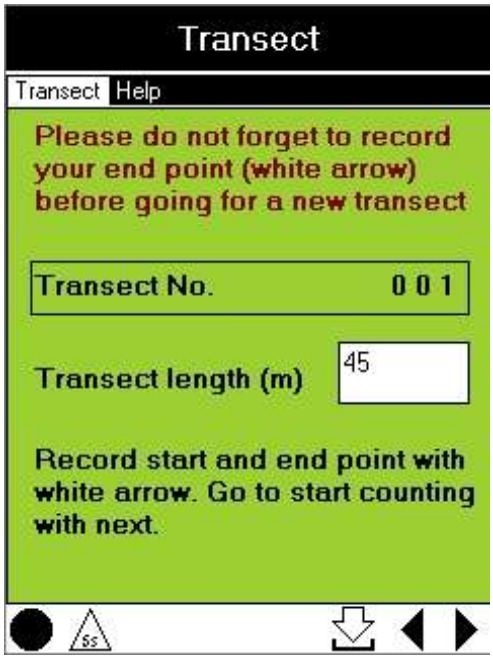
Use case 2: Count individuals species wise in plots or transects

To monitor biodiversity on a taxon level for one or more genera (crop groups) individuals can be counted in plots or transects. Fig.11 shows screens used to count species in a plot. The first screen (Fig.11 a) for choosing the crop group (genus) is opened from the second selection in Fig.10 b. You choose a genus and open a list of species with next.



a) Choose a genus b) Enter counts for the species c) Check background info

Fig. 11) Count species within a monitoring plot



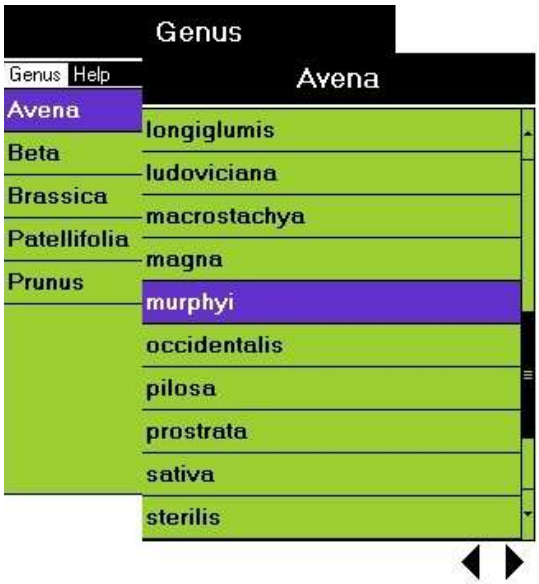
Here you can enter species counts by click to the digits (Fig. 11b). Again you can check all background information you have already collected (Fig.11 c) with the black circle. You can save with the black arrow, which leads you back to the list of genera for choosing another one (Fig.11 a). With back you come from there to the screen for choosing another action (Fig. 10 b). A further back will bring you again to the plot description and you can define another plot reusing your inputs.

An alternative would be to count species along a transect. With the screen shown in Fig.12 you can define a transect (enter identifying number and length) and GPS record start and end points. You record a start point with the white arrow. With next you get to the screens to select a genus and count species (cf. Fig. 11 a, b). After leaving there you use the back button from Fig.11a) to come back to the transect screen. Do not forget to geo-reference the end point with the white arrow before starting a new transect or another action.

Fig. 12) Define and geo-reference a transect.

Use case 3: Describe patches

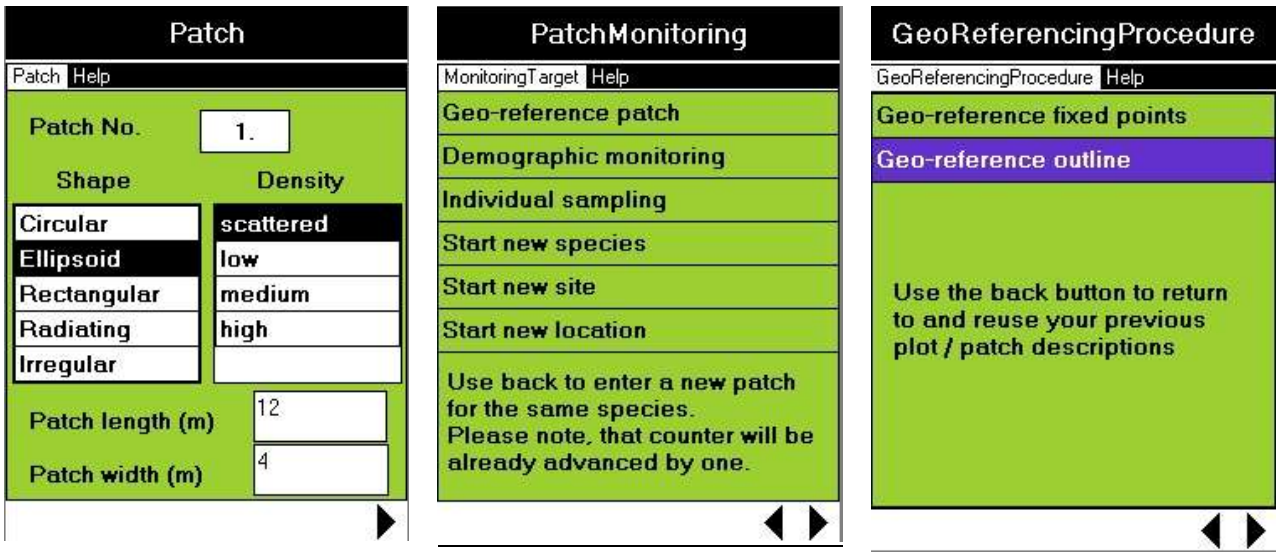
We call a patch an agglomeration of plants of the same species: on revisiting, if a recorded patch area overlaps with a previously recorded one, they are considered the same patch. After fusion one of them is considered successor of both. Like a plot a patch can be described in shape and size and / or geo-referenced. Due to mostly irregular shape the most exact way to geo-reference a patch would be to take coordinates around its entire margins. Patches are documented from single species monitoring (Fig.9), then choosing genus, species (Fig. 13 a) and patch monitoring (Fig.13 b).



a) Choose genus and species

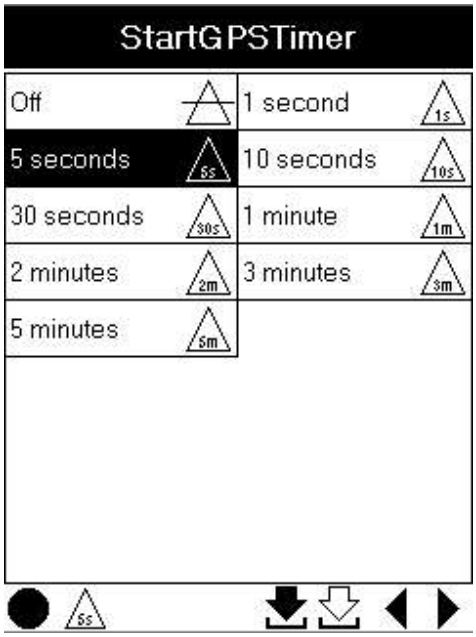
b) Choose patch monitoring

Fig. 13) Start patch monitoring



a) Input patch information b) Actions in patches c) Geo-referencing methods

Fig. 14) Describe patches



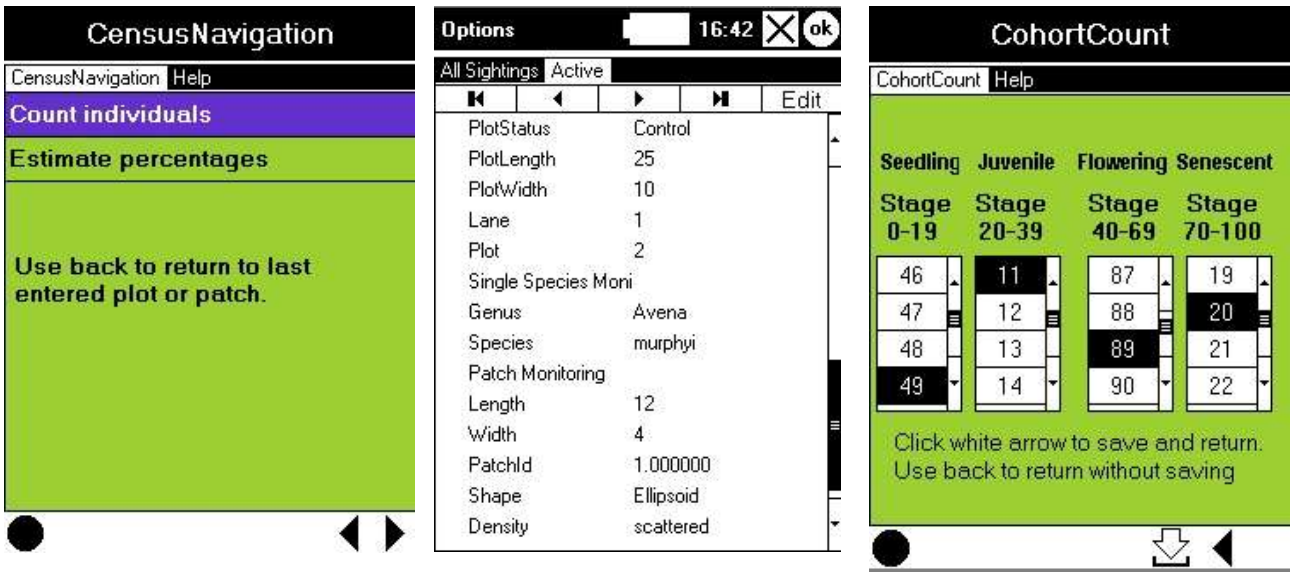
The patch number is an automatic counter, while shape and density have to be selected and size parameters entered. Plants can be scattered or of low density within a patch – in these cases it is questionable to speak of a patch and may be preferable to make individual observations. In case of high density the species completely covers the ground, what would be normally expected for a patch. The length is the longest extension of the patch, the width the shortest (usually orthogonal) one. Next gets you to a screen shown in Fig.14 b, where to choose actions to be done within a patch (geo-referencing, demographic monitoring and individual sampling).

The preferred method to geo-reference irregularly shaped patches will be to geo-reference the whole outline of a patch. Therefore you activate the GPS Timer (Fig.15) with the white arrow. It is stopped with the black arrow. The option geo-reference fixed points is similar to the same procedure for monitoring plots (Fig. 10 c)

Fig. 15) Start timer to record outline of a patch.

Use case 4: Demographic monitoring – census

A demographic census observing the number or percentage of different development stages of plants can be made on a plot or patch basis (even patches may be observed within plots – Fig.16 b). In a plot it starts from single species monitoring and demographic monitoring (cf. Figs. 9 b, 13 b), in a patch from demographic monitoring (Fig. 14 b). The census is based on four cohorts: seedling, juvenile plants (before flowering), flowering plants and senescent plants (after flowering). Absolute numbers of individuals can be counted or percentages estimated. First decide which method (counting or estimation) you want to use (Fig. 16 a).

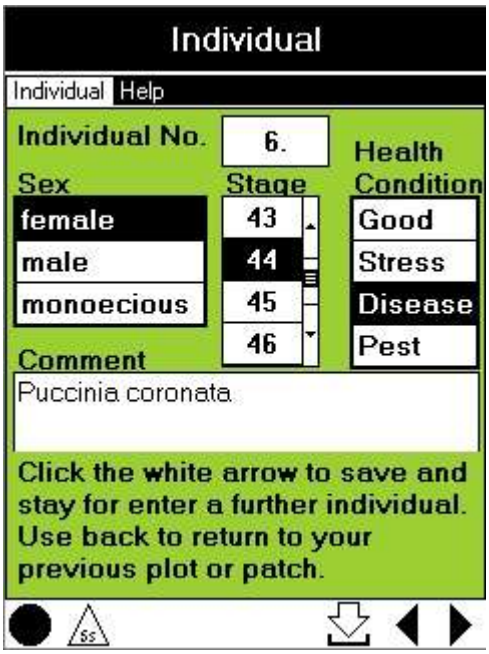


a) Select method b) Check background c) Check background (patch)

Fig. 16) Demographic monitoring

Please assure with the black circle (background data), that a respective plot or patch has been defined or entered and the correct species selected before (Fig. 16 b). Numbers indicating respective counts or percentages can be selected from the radio lists (Fig. 16 c). With the white arrow you save and return to the previous screen (Fig. 16 a). From there you can use the back button to return to the previously entered patch (Fig. 14b) or plot (Fig. 13c), e.g. for additional individual sampling.

Use case 5: Individual monitoring – sampling:



Individuals are identified (individual number), characterised by sex, stage and general condition (e.g. abiotic stress, pests or diseases) and geo-referenced. You can give additional information in the comment field. In case of stresses, pests and diseases it would be useful to refer to the agent. When the save button (white arrow) is pressed then the GPS signal for this particular plant is measured and recorded in the database. The counter for the individual number automatically proceeds to the following one. Information in the radio lists is obligatory. You cannot proceed without having selected one.

Fig. 17) Document and geo-reference individuals.

Summary of the screen flows in flow diagrams

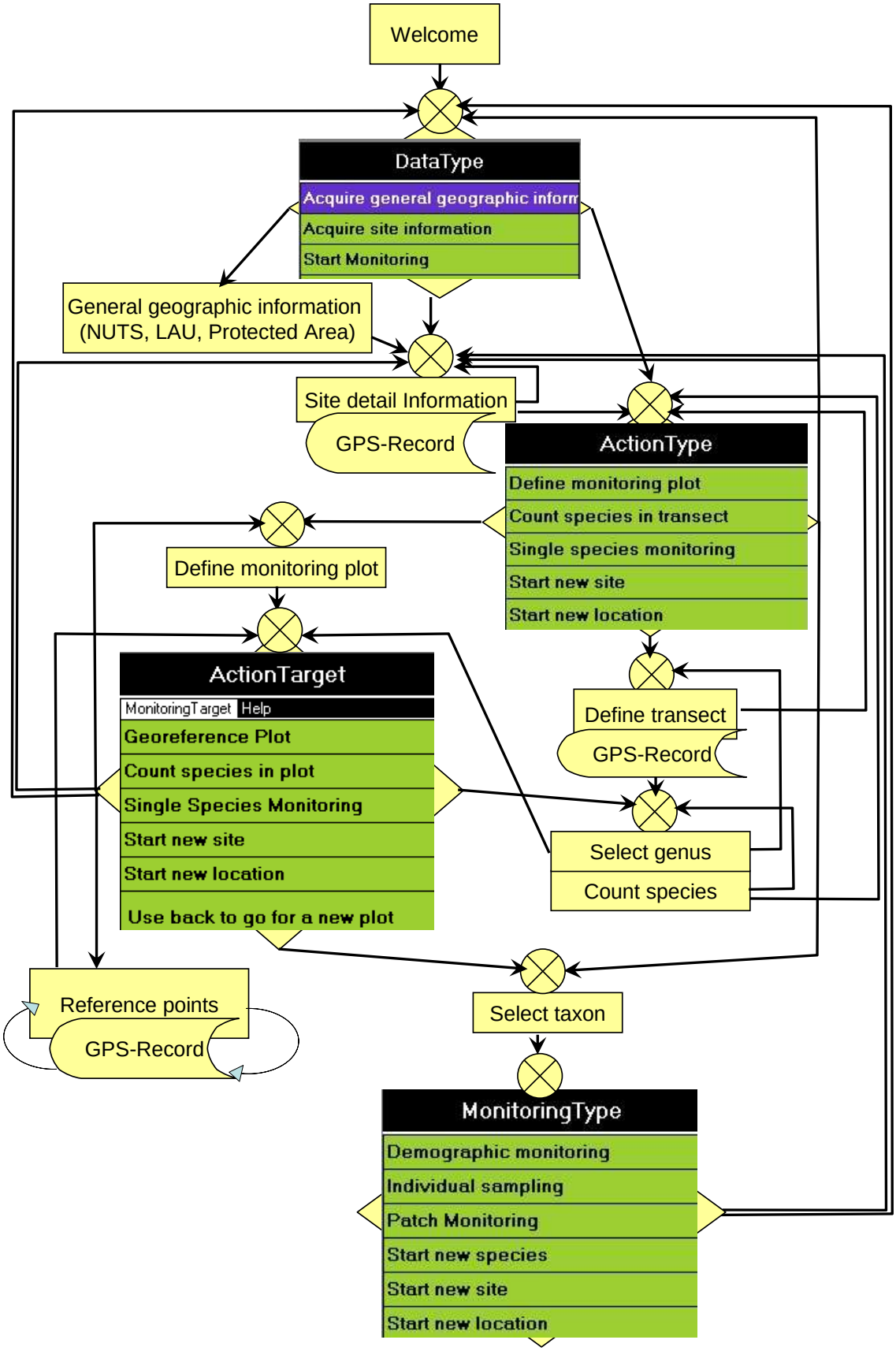


Fig.18 a) Flow diagram of complete application (general information – single species monitoring)

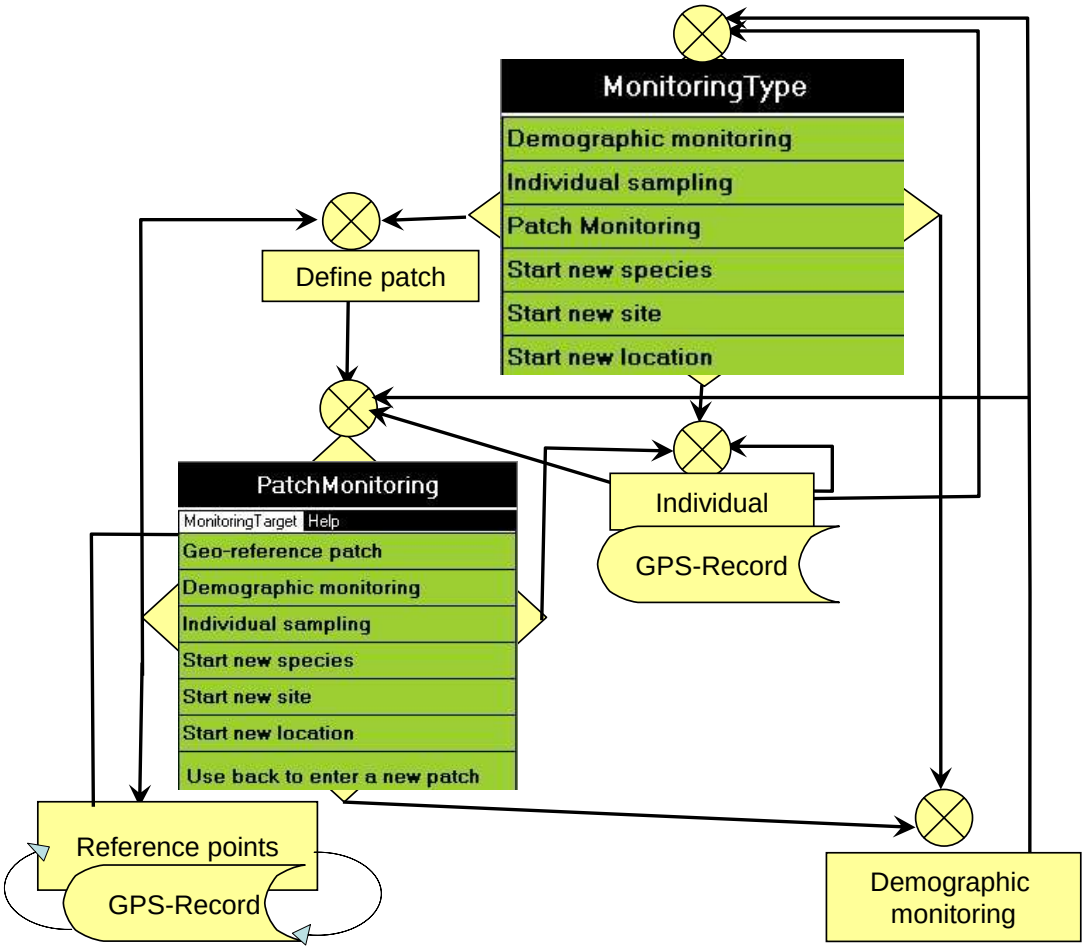


Fig.18 b) Flow diagram of complete application (single species monitoring)

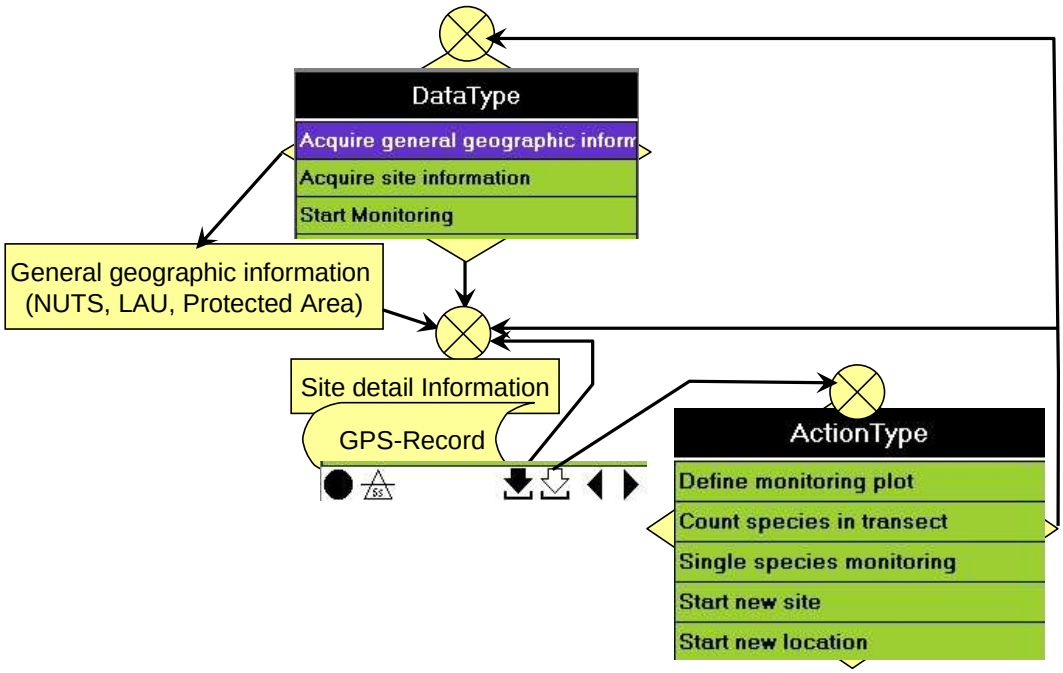


Fig.19)Flow diagram of recording sites and general geographic information

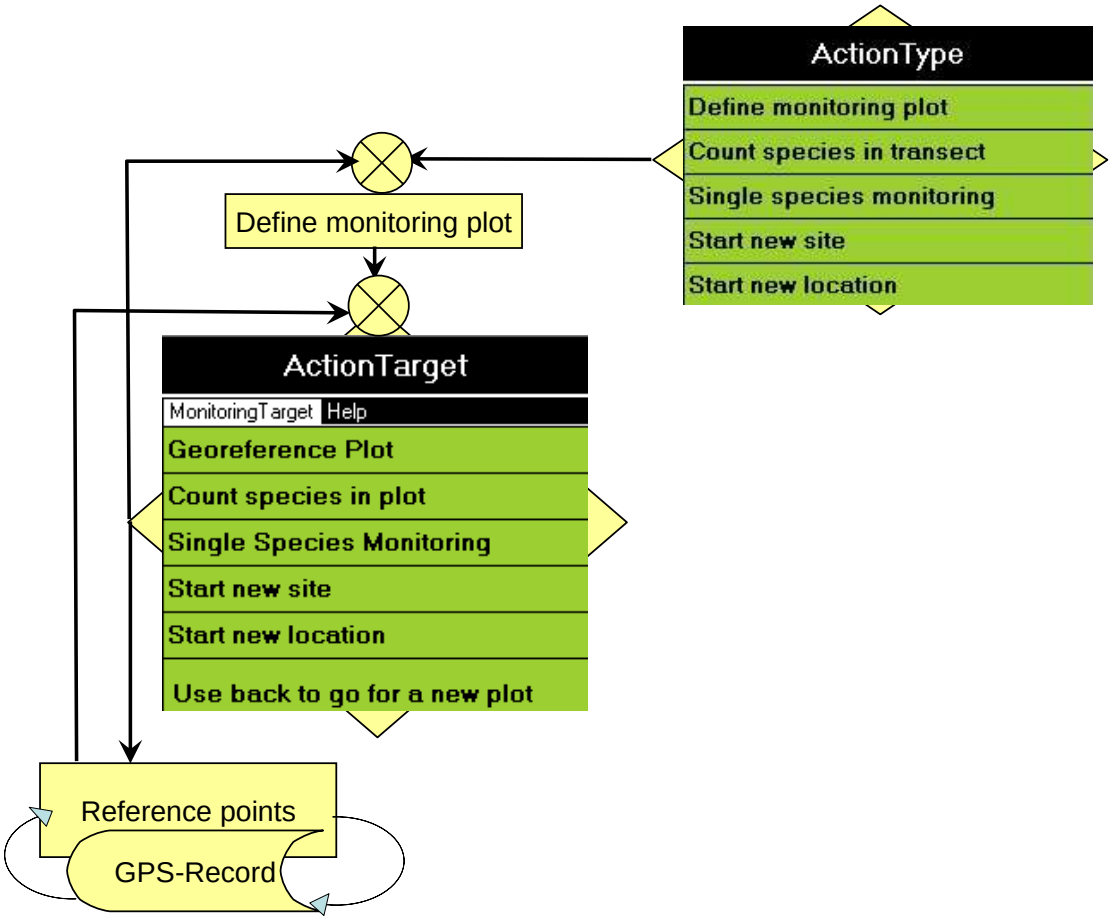


Fig. 20) Flow diagram for the definition monitoring plots

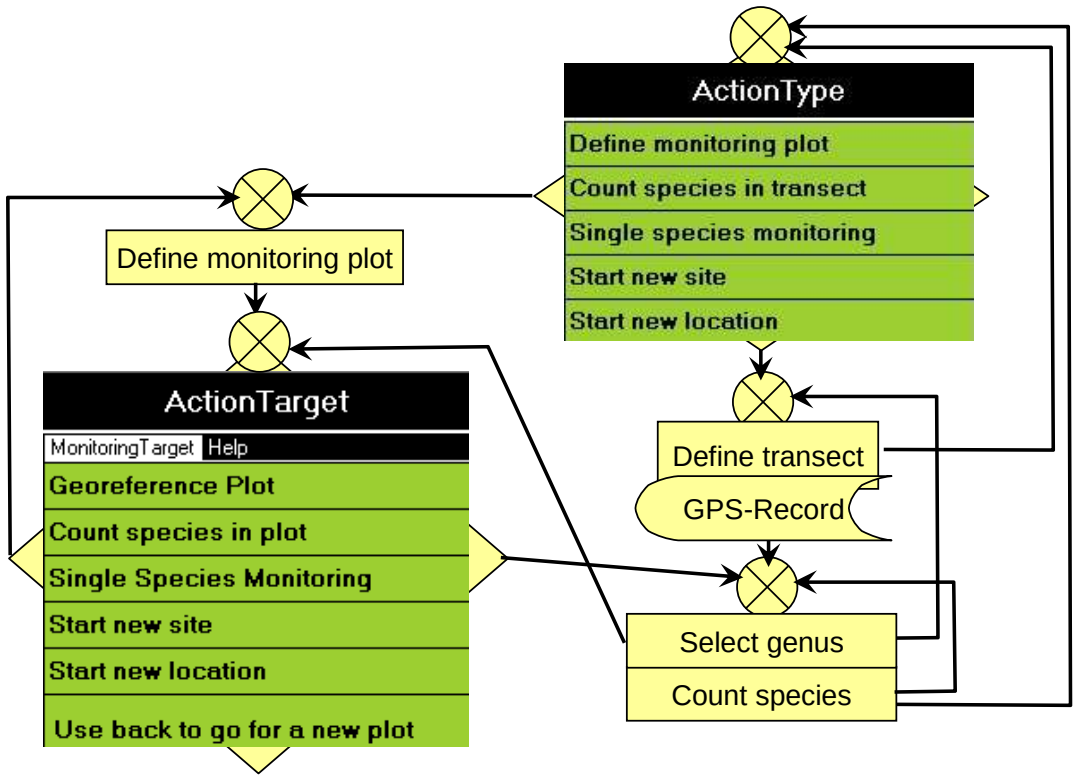


Fig. 21 Flow diagram of counting species occurrences in plots and transects

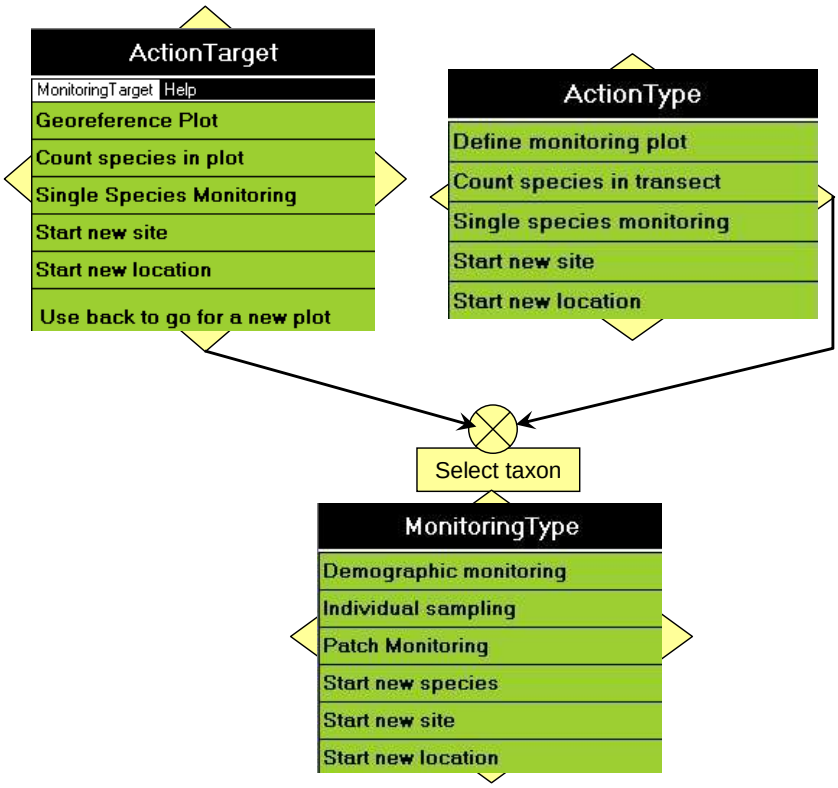


Fig. 22 Flow diagram for preparation of single species monitoring

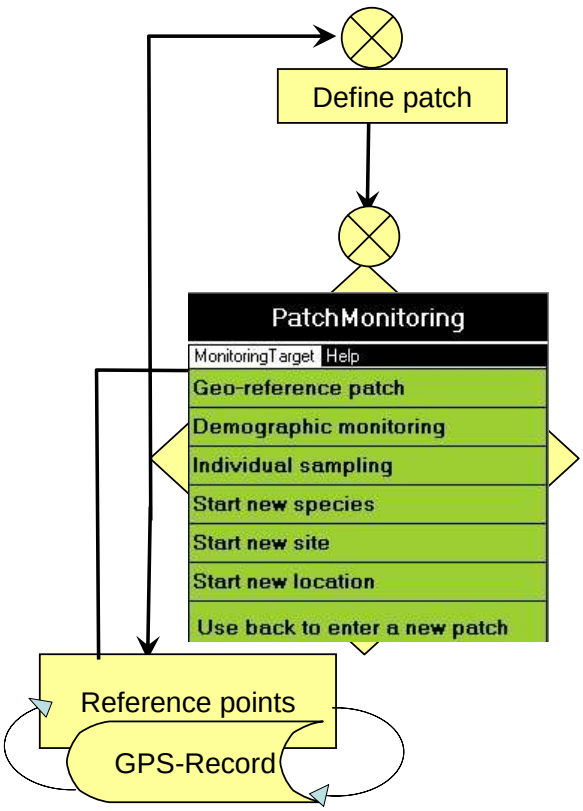


Fig. 23 Flow diagram of patch recording

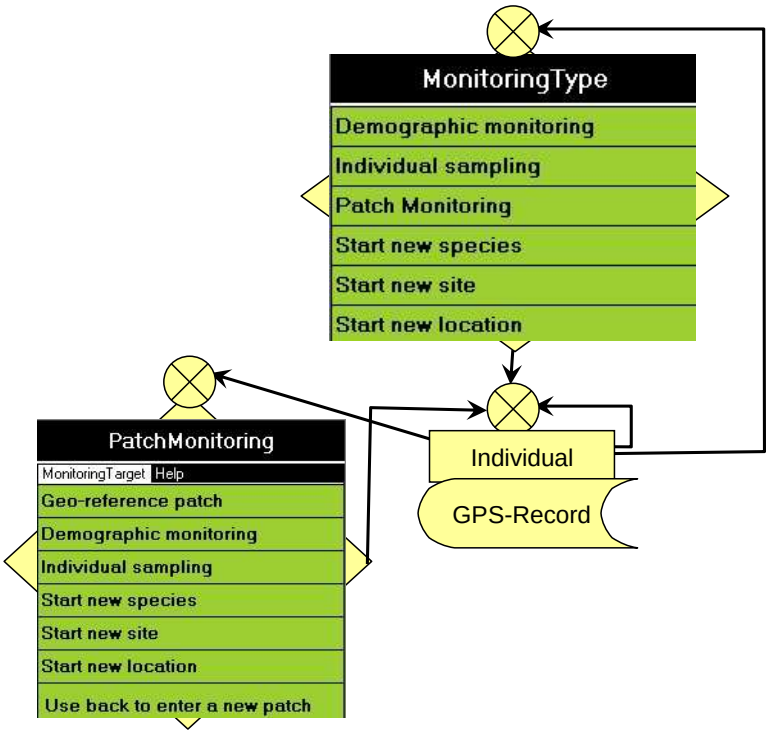


Fig. 24 Flow diagram of individual monitoring

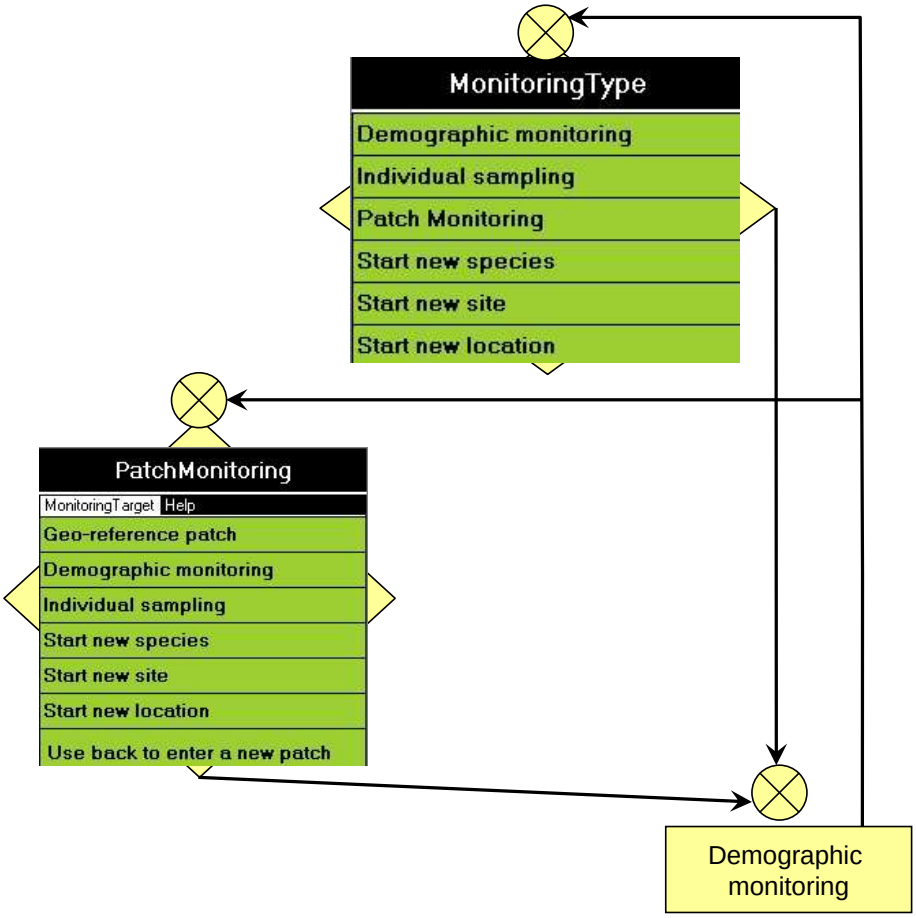


Fig. 25 Flow diagram of demographic monitoring in plots or patches

http://www.steventonconsulting.com/CyberTrackerFAQ.aspx

What are timer tracks?

The timer track feature sets up a timer that takes a GPS reading at fixed intervals. You can customize how long those intervals are from 1 second up. The track system internally has 2 separate modes of operation: short interval and long interval. For short intervals (60 seconds or less), the device is prevented from going to sleep on it's own and the GPS is left permanently connected. For long intervals (more than 60 seconds), the device can be shut down and the alarm system will be used to wake it up, take a reading and shut it down again.

How can I edit my timer tracks?

There is no support in the CyberTracker UI for track editing. However, since the CyberTracker database is a Microsoft Access MDB file, you can open it and modify the "Waypoint2" table directly.

How do I make the screen state persist between sightings, e.g. so a list keeps it's selection?

Several controls allow you to persist their state by using their "Retain state" property. You will need the Studio version to change this property. Click the "Lock" toolbar button in "Sequences" mode, select the control and check that property.

What does the GPS Accuracy number mean?

"Accuracy" is a number that the GPS provides to give some idea of the uncertainty of the reading. This number ranges from 0 to 50 and should typically be multiplied by 10 meters (32 feet) to get an idea of the area you are dealing with. For example, a value of 3.5 means that the GPS knows you are within 35 meters of where it says you are.

How does the Element Formula control work?

The formula property is a regular expression, meaning it can hold expressions like: "1+2". If you set the formula to this, the output will be "3". However, there is also support for more complex expressions:

1. "A+2" (where A is the number value of the Elements in the "Element A" property.
2. "(1 + 2) * 3" works because parentheses are supported
3. "max(1, 2)" produces "2" and "min(1, 2)" produces "1"
4. "abs(-5)" produces 5
5. "Today" works with the "Output as date" property. "Today-1" is yesterday.
6. "date(2007, 5, 20)" produces a date, see (5).
7. "if (1 < 2, 3, 5)" produces "3"
8. "if (1 > 2, 3, 5+1)" produces "6"

You can place the result of the calculation in the "Result element", which will then become part of the sighting data.

If you put the result into a global value using the "Result global value" property, then you can later reuse that value in the formula itself. This provides the ability to do counters. Try this:

On screen 1, drop an "Element Formula" control:
Set the "Formula" property to "Test + 1"
Set the "Result global value" property to "Test"

Now everytime you save and return to this screen, the number will automatically increment.

http://www.cybertracker.org/CyberTracker%20Change%20History.pdf

8. "Retain state" for Element Number List The Element Number List now supports "Retain state" in the same way as Element Lists do.

3. New property: "Retain state" which allows the state of a screen to be retained between sightings
4. New property: "Save result" which allows a screen to be used for navigation only purposes without affecting the data in a sighting.

[CT] http://www.cybertracker.co.za/
http://www.steventonconsulting.com/CyberTracker.aspx