Aammiq Wetland
Ecological Monitoring Manual

by

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A ROCHA

Together, caring for God's creation

Introduction

This manual is intended to be an easy-to-refer to guide for anyone taking part in the ecological monitoring of the Aammiq Wetland. The 13 activities described were devised and tested in 2004-6 by staff and volunteers of A Rocha Lebanon, an environmental N.G.O. based in the Bekaa Valley, Lebanon. They are intended to be carried on in the long-term as a good, sustainable way of monitoring the habitats and ecosystems of the wetland. If the methodologies described are adhered to, and not changed from year to year, it will be possible to detect changes in the distribution and abundance of habitats, specific rare plants, birds and mammals within the marsh, and to relate these changes to factors such as grazing-level, burning, the extent of winter flooding, and hunting. The results of the monitoring can be used to help in the process of fine-tuning the management practices at the marsh, or to confirm that certain practices are being successful in meeting their aims.

However, for a full appreciation of the reasoning behind the methodologies employed, it is important to read the document entitled *Pilot Study for the Ecological Monitoring of the Aammiq Wetland – Final Report, January 2006*, by the same author. Copies are held by A Rocha Lebanon and the Ministry of the Environment, of the Government of Lebanon.

The data generated from the monitoring activities at the Aammiq Marsh are currently stored on computers in the A Rocha Lebanon office in Aana, West Bekaa, Lebanon. It is important that the inputting and management of the data carries on in tandem with the actual data gathering. Data is only of any use if it is in a form which can be easily accessed and manipulated.

Finally, most of the activities described require a considerable level of expertise in such fields as botany, bird identification and the use of GIS (Geographical Information Systems) software and other computer systems, and this should influence the choice of personnel for the carrying out and overall management of the Aammiq Monitoring Programme. In particular, it is essential that Activity 10, (Constant Effort Bird Ringing), only be carried out if suitably qualified and experienced practitioners are available to supervise it. In the absence of such people, the risk of harm to birds, people and equipment is very high and it is preferable that ringing be abandoned altogether, until such a time as suitable staff can be found to carry it out.

5 year ecological monitoring calendar

	Year 1 2006	Year 2 2007	Year 3 2008	Year 4 2009	Year 5 2010
All Year	• Map burned areas after fires • Map scarcer special plant spp. (TL, SR, HR & EH) whenever found • B&MT weekly • FPC weekly • CES ringing weekly (c. May onwards, until end Nov.) • RHC weekly • SC weekly	• Map burned areas after fires • Map scarcer special plant spp. (TL, SR, HR & EH) whenever found • B&MT weekly • FPC weekly • CES ringing weekly (Feb-Nov) • RHC weekly • SC weekly	• Map burned areas after fires • Map scarcer special plant spp. (TL, SR, HR & EH) whenever found • B&MT weekly • FPC weekly • CES ringing weekly (Feb-Nov) • RHC weekly • SC weekly	• Map burned areas after fires • Map scarcer special plant spp. (TL, SR, HR & EH) whenever found • B&MT weekly • FPC weekly • CES ringing weekly (Feb-Nov) • RHC weekly • SC weekly	• Map burned areas after fires • Map scarcer special plant spp. (TL, SR, HR & EH) whenever found • B&MT weekly • FPC weekly • CES ringing weekly (Feb-Nov) • RHC weekly • SC weekly
Winter	• Map flooding • Map *M. sobolifera*	• Map flooding • Map *M. sobolifera*	• Map flooding • Map *M. sobolifera*	• Map flooding • Map *M. sobolifera*	• Map flooding • Map *M. sobolifera*
Spring	• Vegetation Transects & Exclosures • CCGS Survey	• Vegetation Transects & Exclosures • CCGS Survey	• Vegetation Transects & Exclosures • CCGS Survey	• Vegetation Transects & Exclosures • CCGS Survey	• Vegetation Transects & Exclosures • CCGS Survey • Finish Habitat Mapping & Tree Count by now.
Summer	• Map *A.. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*	• Map *A.. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*	• Map *A.. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*	• Map *A.. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*	• Map *A.. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*
Autumn	• VTs & Exc-losures	• VTs & Exc-losures • Earliest time for Habitat Mapping & Tree Count	• VTs & Exc-losures	• VTs & Exc-losures • Latest time for starting Habitat Mapping & Tree Count	• VTs & Exc-losures

KEY – TL, SR, HR & EH = *Typha laxmannii, Sideritis remota, Hydrocotyle ranunculoides & Exoacantha heterophylla*
B&MT = Bird and Mammal Transect, FPC = Fixed Point Count, CES ringing = Constant Effort Bird-ringing, RHC= Roosting Harrier Count, SC = Shot Count, CCGS = Corncrake & Great Snipe Survey
VT = Vegetation Transects
M. sobolifera, A.. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale= Merendera sobolifera, Alisma plantago-aquatica, Mentha pulegium, Scirpus tuberosus & Nasturtium officinale

YEAR 1-2006
ECOLOGICAL MONITORING CALENDAR

Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Weekly-B&MT, FPC, SC 3-times - RHC,	**Weekly-** B&MT, FPC, SC **3-times** - RHC, **Once** – Map *M. sobolifera* Map flood	**Weekly-** B&MT, FPC, SC **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CCGS (from week with 1st April) **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CCGS (8 in total) **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once –** Map *A. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,

YEAR 2-2007
ECOLOGICAL MONITORING CALENDAR

Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Weekly- B&MT, FPC, SC 3-times - RHC,	**Weekly-** B&MT, FPC, SC **3-times** - RHC, **Once** – Map *M. sobolifera* Map flood	**Weekly-** B&MT, FPC, SC **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CCGS (from week with 1st April) **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CCGS (8 in total) **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once –** Map *A. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure **NB** Earliest point to start Habitat Mapping and Tree Count	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,

YEAR 3-2008
ECOLOGICAL MONITORING CALENDAR

Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Weekly-B&MT, FPC, SC 3-times - RHC,	**Weekly-** B&MT, FPC, SC **3-times** - RHC, **Once** – Map *M. sobolifera* Map flood	**Weekly-** B&MT, FPC, SC **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CCGS (from week with 1st April) **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CCGS (8 in total) **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once –** Map *A. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,

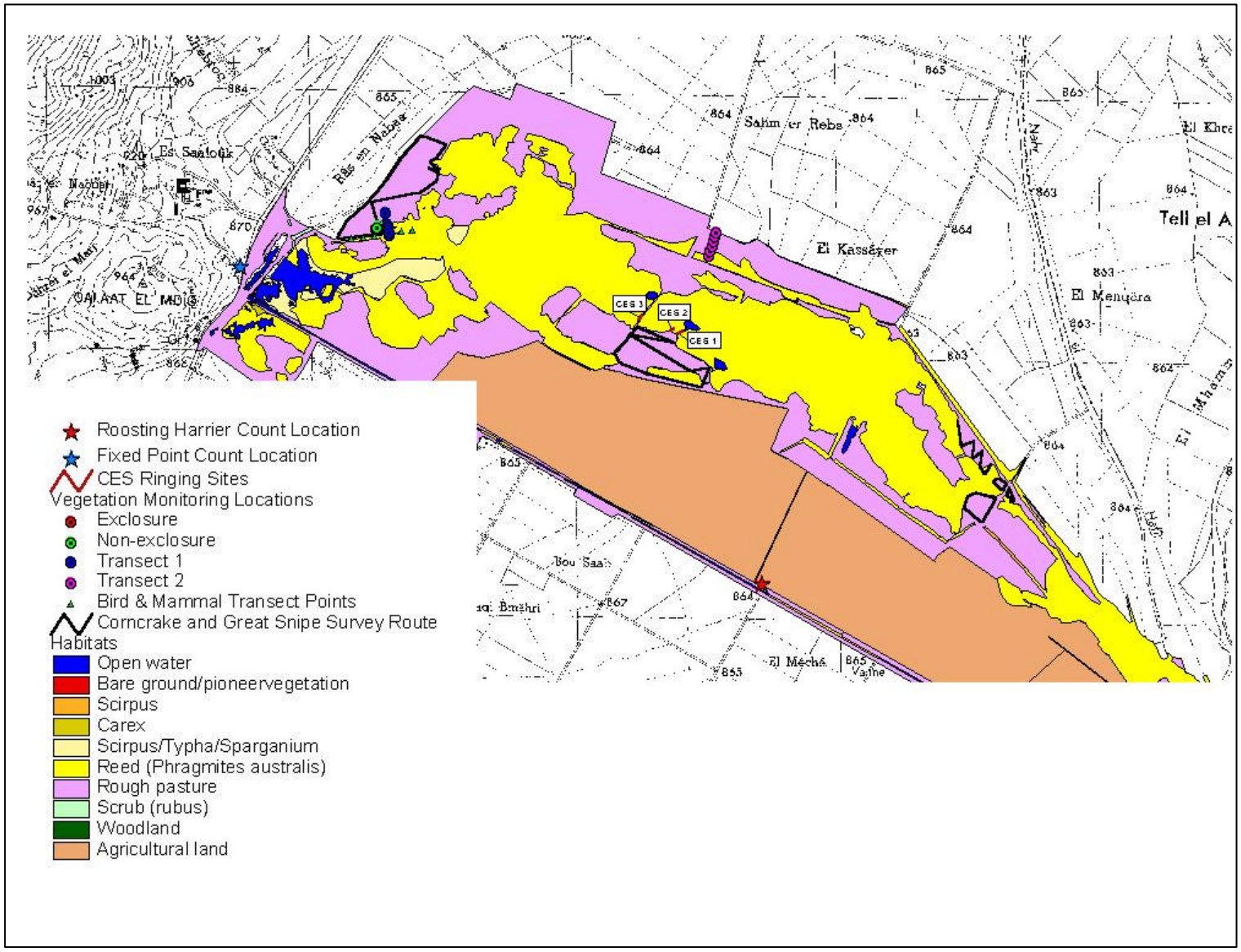
YEAR 4-2009
ECOLOGICAL MONITORING CALENDAR

Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Weekly-B&MT, FPC, SC 3-times - RHC,	**Weekly-** B&MT, FPC, SC **3-times** - RHC, **Once** – Map *M. sobolifera* Map flood	**Weekly-** B&MT, FPC, SC **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CCGS (from week with 1st April) **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CCGS (8 in total) **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once –** Map *A. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure **NB** Latest point to start Habitat Mapping and Tree Count	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,

YEAR 5-2010
ECOLOGICAL MONITORING CALENDAR

Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Weekly-B&MT, FPC, SC 3-times - RHC,	**Weekly-** B&MT, FPC, SC **3-times** - RHC, **Once** – Map *M. sobolifera* Map flood	**Weekly-** B&MT, FPC, SC **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CCGS (from week with 1st April) **3-times** - RHC, **NB** Latest point to finish Habitat Mapping and Tree Count	**Weekly-** B&MT, FPC, SC CCGS (8 in total) **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once –** Map *A. plantago-aquatica, M. pulegium, S. tuberosus & N. officinale*	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC, **Once** – Vegetation transects & grazing exclosure	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,	**Weekly-** B&MT, FPC, SC CES **3-times** - RHC,

Large Map Showing all monitoring points/locations



Detailed Monitoring Plan for Every Monitoring Activity

Activity 1: Vegetation Transects

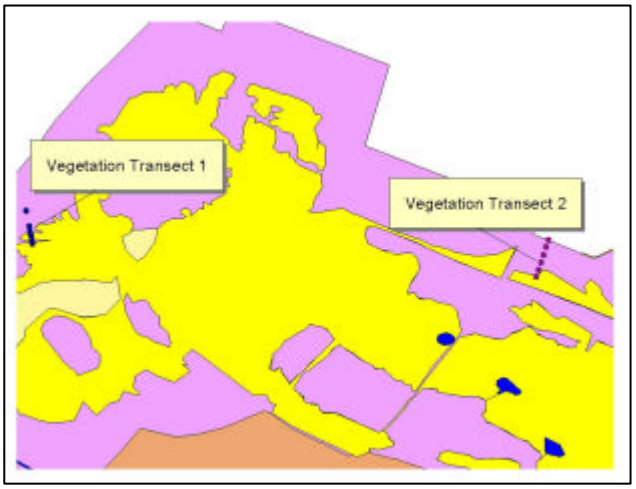
A. Why:

To monitor the ongoing condition of grassland and reed-bed habitats within the marsh and to assess the effectiveness of management

B. When:

June and September (October is permissible if unavoidable)

C. Where:



D. How:

- For each transect, record all the plant species found along a 2-metre wide corridor between each pole and the next one.
- Within a $1m^2$ quadrat at each pole along the transects record all plant species being given a score on the Domin Scale (see sample recording sheet below).
- Measure and record the average and maximum heights of vegetation in the quadrats, and the vegetation height at 2-m intervals along the transects.
- Within the quadrats, collect and count all droppings of domestic grazing animals and record the numbers, distinguishing between buffalo droppings and sheep/goat droppings.

E. Materials/equipment needed

1m X 1m wire quadrat square
1m ruler
Botanical field-guides
Plastic bags for taking samples for identification later
Notebook, paper & pen
Clip-board and recording sheets

F. Field form

See sample recording form below

Record Sheet Vegetation Monitoring Aammiq Marsh

Domin scale:

Cover: Scale:

Cover 75-100%	8
Cover 50-75%	7
Cover 25-50%	6
Cover 12,5-25%	5
Cover 5-12,5%	4

Site: Date:
Quadrat number: Size (m2): Observer(s):

Grazing: none/light/moderate/heavy *(circle your choice)*
Number of droppings of goat: sheep: buffalo:

Average height of vegetation (cm): Max. height of vegetation(cm):
Total cover of vegetation (%):

Species	Cover (Domin)	Species	Cover (Domin)

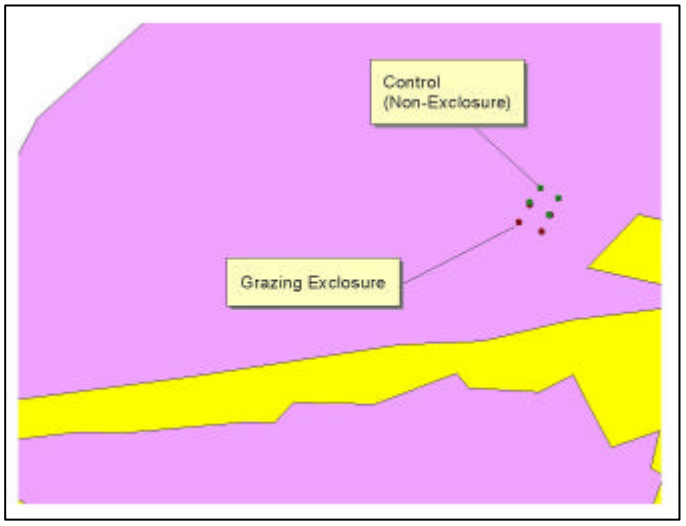
Comments:

Activity 2: Grazing Exclosure Experiment

A. Why:
To assess the affect of grazing on the species composition and vegetation structure in the rough grassland habitat at Aammiq Wetland.

B. When:
June and September (October is permissible if unavoidable)

C. Where:



D. How:
- For both the fenced-off exclosure and the open control areas, record all the plant species found along a 2-metre wide corridor between each pole and the next one.
- Within a $1m^2$ quadrat at the same relative positions in the exclosure and the control record all plant species being given a score on the Domin Scale The locations of the quadrats should be the same from year to year – starting at a point on the north-eastern side of each area, 2.24m south-east of the northern corner. One side of the quadrat should run along the edge of the area.
- Measure and record the average and maximum heights of vegetation in the quadrats, and in the whole exclosure and control.
- Within the quadrats, collect and count all droppings of domestic grazing animals and record the numbers, distinguishing between buffalo droppings and sheep/goat droppings.

E. Materials/equipment needed
1m X 1m wire quadrat square
1m ruler
Botanical field-guides
Plastic bags for taking samples for identification later
Notebook, paper & pen
Clip-board and recording sheets
Ladder to facilitate access to the exclosure

F. Field form
The same form is used for this activity as for the Vegetation Transects

Activity 3: Habitat Mapping

A. Why:
To quantify the change in reed bed area
To quantify the occurrence of reed bed and other habitats (temporary and permanent open water, unimproved pasture, open wood) and to record any changes in their distributions over time.

B. When:
To be repeated every 3-5 years. This exercise was last carried out in Autumn/Winter 2004-5 and so is next due to be repeated some time between Autumn 2007 and Spring 2010.

C. Where:
Whole Aammiq Wetland area – all habitats should be visited

D. How:
All areas of the wetland should be visited and the boundaries of all the different habitats present (using the same habitat types as the Aammiq Habitat Map, produced in 2005) should be mapped using GPS (Global Positioning Satellite) technology, and the data imported into the A Rocha Lebanon GIS (Geographical Information System), in ArcView 3.1
It is important, when marking waypoints using the GPS, to note down, in a notebook, the numbers of the waypoints and what they refer to – e.g "Waypoints 116-132, boundary of patch of Reed (Phragmites), surrounded by Rough Pasture.

E. Materials/equipment needed
Garmin GPS handset (or other suitable GPS technology)
Garmin GPS extension for transferring data onto the computer
Notebook and pen/pencil
Waders
Canoe

F. Field form
Not applicable, as all data is recorded in the GPS and the surveyor's note-book.

Activity 4: Counting of Trees within the Aammiq Wetland Area

A. Why:
Cutting and burning of trees has been identified as a problem in the wetland, leading to reduction in the number of trees

B. When:
To be repeated every 3-5 years. This exercise was last carried out in Autumn/Winter 2004-5 and so is next due to be repeated some time between Autumn 2007 and Spring 2010.

C. Where:
Whole Aammiq Wetland area – all areas where trees were mapped in 2004-5 should be visited, along with the location of any young trees which have appeared since the last count was carried out

D. How:
All trees in the Wetland (including the long Avenue of Trees, should be counted, identified and plotted using GPS (Global Positioning Satellite) technology, and the data imported into the A Rocha Lebanon GIS (Geographical Information System), in ArcView 3.1 Data about each tree (waypoint number, species) should be recorded in a notebook.

E. Materials/equipment needed

Garmin GPS handset (or other suitable GPS technology)
Garmin GPS extension for transferring data onto the computer
Notebook and pen/ pencil

F. Field form
Not applicable, as all data is recorded in the GPS and the surveyor's note-book.

Activity 5: Mapping Maximum Flooded Area

A. Why:

All of the ecosystems within the marsh are affected, directly or indirectly, by the water-levels at different times of year. Any significant change in the water levels may have wide-reaching effects on the flora and fauna of the Aammiq Wetland. Water levels may be influenced by natural processes, such as the amount of snow which has fallen on the adjacent mountains during the previous winter, or by human factors, such as the level of water abstraction for the irrigation of crops. Although the exact hydrological processes involved with supplying the marsh with water are still being assessed, it is evident that rainfall and snow-melt, during the winter and early spring are, by far, the main sources of water and a simple way of assessing this for any given year is to map the maximum extent of the flooded area around the marsh each year.

B. When:

Late February – early March. The exact date at which flooding is at its maximum will vary from year to year.

C. Where:

Entire marsh. In years of high rainfall and snowfall, the flooded area may extend to far beyond the immediate area of the wetland, and this should be mapped too (so long as the flooding is continuous with that at Aammiq).

D. How:

First, on a clear day, observations should be made, and photographs taken, from a point on the hillside above the marsh (the Druze shrine at Sitt Shaweni is a suitable point) to get an overall idea of the extent of flooding.

Next, wherever possible, the edges of the flooded area should be visited and waypoints logged using GPS technology. As with activities 3 & 4 above, it is important to note down the waypoint numbers in a notebook.

The data should then be imported into the A Rocha Lebanon GIS and a new theme and shapefile created with a suitable name. In areas where access was difficult, due to land ownership issues or poor condition of tracks, it will be necessary to estimate the location of the edge of the flooded area, and to add these points by hand to the GIS theme. In any case, once the flooded area has been plotted on the map, the accuracy of it should be verified by referring to the photographs, and any necessary adjustments made.

E. Materials/equipment needed

Garmin GPS handset (or other suitable GPS technology)
Garmin GPS extension for transferring data onto the computer
Digital camera and necessary software
Notebook and pen/pencil
Waders or other suitable footwear

F. Field form

Not applicable, as all data is recorded in the GPS and the surveyor's note-book.

Activity 6: Mapping Burned Area

A. Answer why:

Burning is potentially a useful management tools for the reedbeds and grasslands of the wetland, but without extremely careful planning and supervision it may instead have a negative impact on the ecosystems of the marsh. At present there is no regime of controlled burning in place at Aammiq Wetland, and every effort is made to prevent fires in the marsh. However, occasional fires do happen, due to accident or vandalism, and it is important to monitor the extent of burned areas each year. Comparison with previous years' burnings and reference to the results from the other monitoring activities can be used to inform management.

B. When:

Within 2 weeks of any fires.

C. Where:

Entire marsh.

D. How:

As with Activity 5 above, a combination of photography (e.g. from Sitt Shaweni) and field verification by GPS should be used to map the extent of the burned areas, and the findings imported into the ArcView GIS software.

E. Materials/equipment needed

Garmin GPS handset (or other suitable GPS technology)
Garmin GPS extension for transferring data onto the computer
Digital camera and necessary software
Notebook and pen/pencil
Waders or other suitable footwear

F. Field form

Not applicable, as all data is recorded in the GPS and the surveyor's note-book.

Activity 7: Monitoring Specific Important Plant Species

A. Why:

In the document "Biodiversity assessment and monitoring in the protected areas/Lebanon LEB/95/G31", 9 species of flowering plants were identified as important species which are, or have been, found in the Aammiq Wetland area. Some of these are quite widespread regionally but are scarcer in Lebanon and have been chosen because they are characteristic of the type of wetland habitat found at Aammiq. Others have been chosen because they are rare, threatened or endemic to the region. One species, Water Pennywort (*Hydrocotyle ranunculoides*) has been recorded at Aammiq in the past (pre-1966) but is actually a North American plant which is a troublesome invasive species in many parts of the world, and so it has been included so that if it ever reappears at Aammiq it can be quickly identified and efforts made to stop it becoming established.

B. When:

All year, with particular emphasis on February (for *Merendera sobolifera*) and August (for *Alisma plantago-aquatica, Mentha pulegium, Scirpus tuberosus & Nasturtium officinale*).

C. Where:

Entire marsh including rough grazing areas, flooded ditches and dry rocky areas around the Springs

D. How:

The observer should be familiar with, and able to identify, all of the 9 species. Four of the species, *Typha laxmannii, Sideritis remota, Hydrocotyle ranunculoides & Exoacantha heterophylla,*have not been recorded in the area since the 1960's and any records of these species, at any time of year, should be noted, and the locations marked on the GIS map of the marsh. Of the remaining five species, one, *Merendera sobolifera*, flowers in January and February and should be mapped (using GPS and GIS as for Activities 3-6, above) in February by an observer visiting all the grassland areas of the marsh. The other four species should be mapped in late summer but, particularly for *Scirpus tuberosus*, any records made at other times of year should be noted and the map adjusted accordingly

E. Materials/equipment needed

Garmin GPS handset (or other suitable GPS technology)
Garmin GPS extension for transferring data onto the computer
Notebook and pen/pencil

F. Field form

Not applicable, as all data is recorded in the GPS and the surveyor's note-book.

Activity 8: Bird and Mammal Transect

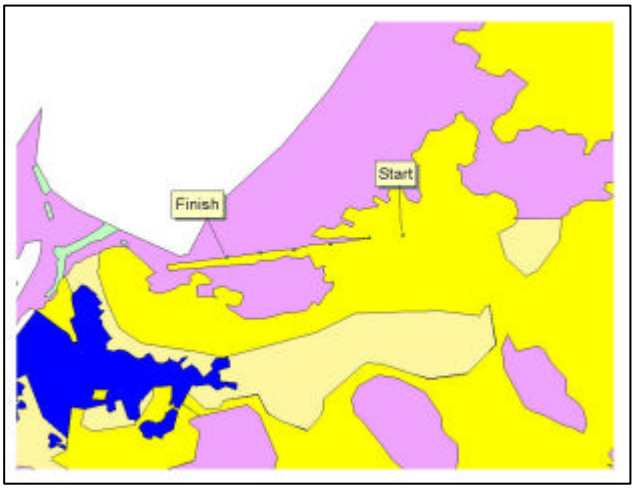
A. Why:

- To monitor, in a long-term, sustainable way, the population levels of wintering, breeding and passage birds using the marsh and also of the large mammals using the marsh.
- To detect, as early as possible, any significant changes in the numbers of individuals and species using the marsh
- To relate these changes to management practices and also to the results from the vegetation/ habitat monitoring programme, and to alter the management appropriately if necessary.

B. When:

Once per week throughout the year, in the early morning, starting from the moment when the sun rises over the Anti-Lebanon range.

C. Where:



D. How:

The transect is divided into 5 sections, each of about 50m in length. Each section should take about 7 minutes to walk, including 1minute spent at the start and five minutes near the mid-point of the section. All birds and mammals seen or heard within 50 metres on either side of the transect should be noted on the recording form (below).

E. Materials/equipment needed

Binoculars
Suitable footwear (Wellingtons/ waders essential during the winter & spring months)
Notebook and pen/pencil

F. Field form

See sample recording form below

Aammiq Marsh New Bird Transect
Recording Form

Date (dd/mm/yyyy) :

Start time:

Finish time:

Observer(s):

Weather (Wind speed, cloud cover, precipitation):

Species	Section 1	Section 2	Section 3	Section 4	Section 5

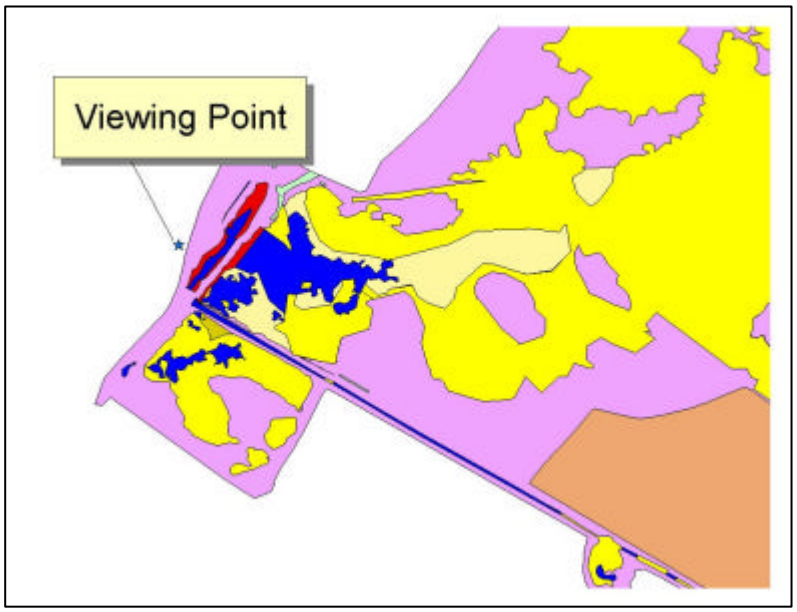
Notes (e.g. unusual circumstances, large movements of birds over head, flocks of sheep etc.)

Activity 9: Fixed-point Bird and Mammal Count

A. Why:
See Activity 8: Bird & Mammal Transect, above

B. When:
Once per week throughout the year, for 1 hour in late afternoon, starting just before dusk.

C. Where:



D. How:
All wild birds and mammals seen in the marsh, the surrounding fields and the avenues of trees are recorded. For each bird or mammal seen, it should be assigned to either the "Inner Area" or the "Outer Area", depending on where it was seen. The inner area takes precedence over the outer area so that if a bird is seen first in one of the fields to the north of the marsh (outer area) but later moves to the main pool in front of the watch-point, it is counted on the inner area's list.

E. Materials/equipment needed
Binoculars
Telescope

F. Field form
See sample recording form below

Aammiq Marsh Single Point Count
Recording Form

Date (dd/mm/yyyy) :

Start time:
Finish time:

Observer(s):

Weather (Wind speed, cloud cover, precipitation):

Degree of Disturbance (e.g. high, medium, low, none)(describe in Notes box below if necessary:

Hunting (shots counted in 1 hr period) Inner area: Outer area:

Birds:

Species	in	out	Species	in	out	Species	in	out
Little Grebe			Montagu's Harrier			Barn Swallow		
Little Egret			Long-legged Buzzard			House Martin		
Grey Heron			Steppe Buzzard			White Wagtail		
Purple Heron			Black Kite			Hooded Crow		
Great White Egret			Common Kestrel			Extra species		
Cattle Egret			Water Rail					
Squacco Heron			Little Crake					
Night Heron			Spotted Crake					
Little Bittern			Moorhen					
Black Stork			Coot					
White Stork			Lapwing					
Gadwall			Common Snipe					
Teal			Green Sandpiper					
Mallard			Wood Sandpiper					
Pintail			Ruff					
Garganey			Turtle Dove					
Shoveler			Alpine Swift					
Lesser Spotted Eagle			Common Swift					
Short-toed Eagle			Common Kingfisher					
Marsh Harrier			White-breasted Kingfisher					
Hen Harrier			Bee-eater					
Pallid Harrier			Sand Martin					

Mammals

Species	in	out
Wild Boar		
Jackal		
Otter		

Notes (e.g. unusual circumstances, large movements of birds over head etc.,)

Activity 10: Constant Effort Bird-ringing

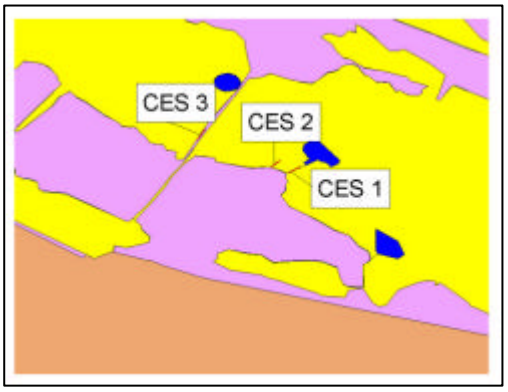
A. Why:

See Activity 8: Bird & Mammal Transect, above.
In addition, bird-ringing can provide useful information about the longevity, breeding cycle, moult strategies and migration routes of the birds that visit the marsh

B. When:

One morning per week throughout the year except for the months of December and January, starting at first light and carrying on for up to five hours (this will vary depending on weather conditions). The nets should be put up the evening before, so they can be opened as soon as it is light.

C. Where:



D. How:

NOTE: This activity MUST only be carried out under the supervision of at least one experienced ringer, who is either a qualified ringer in another country, or who has been assessed as having reached a sufficient level of competence, by a qualified ringer in the A Rocha team.
Three 18m mist-nets are erected at the positions shown on the map above. All birds caught during the prescribed period are identified to species, ringed (unless they already have a ring), aged, sexed (if possible), weighed and the wing-length measured. The EURING age codes are used. Other measurements such as fat and muscle score, moult scores, and bill length, may also be recorded. If a bird already has a ring on its leg (a retrap/control), provided it has not already been caught that day, the ring number and details (such as the address of the ringing scheme for foreign recoveries) are double-checked and written down. All birds should be released as soon as possible after ringing and every effort made to avoid undue stress to the bird. This may include curtailing ringing activities early in very hot, cold, windy or wet weather.
All data is recorded on the sheets shown below, and is later input to the IPMR programme on the computer.

E. Materials/equipment needed

3 x 18m, four-panel mist-nets
6 x mist-net poles (metal or bamboo)
Strings to secure poles in place
Bird-bags
Lebanese bird-rings of all available sizes
Large & small ringing pliers
Circlip pliers for rig removal
Large & small metal wing-rule
Large & small spring-balances or electronic scales, & plastic cone or nylon ‘sock’
Callipers for bill/ tarsus measurements etc.

Straw or other tube for inspecting fat & muscle
Copies of- *Ringers' Manual*, and the latest editions of Svensonn's (passerine) and Baker's (non-passerine) identification guides or their equivalent (NOTE- standard field-guides are NOT sufficient)
Quick-unpick (aka Stitch-ripper)
Copies of recording sheet
Digital camera for photographing rarities

F. Field form

See sample recording form, below.

A Rocha Lebanon – Ringing Data Sheet

Comments:

Date: | Nets open: | Site: | Ringers present:

Last round: | Nets used (e.g. 3x 40ft, 1x 60ft) | Weather:

Cap	Ring No.	Species	Ag	m/f	cp/ bp	Time	Net	Wing (mm)	Wt (g)	F	M	Init	Comments

Cap	Ring No.	Species	Ag	m/f	cp/ bp	Time	Net	Wing (mm)	Wt (g)	F	M	Init	Comments

Activity 11: Roosting Harrier Count

A. Why:

See Activity 8: Bird & Mammal Transect, above.
Also

- detect any changes, positive or negative in the numbers of nationally or internationally scarce or threatened species using the marsh.

The Aammiq Marsh is an important roosting site for four species of Harrier (*Circus*) on migration and in winter, including the Pallid Harrier (*C. marourus*) which is classified as Near Threatened by Birdlife International

B. When:

One evening per week throughout year, starting when the sun disappears behind the Jebel Barouk, and carrying on until it is nearly dark.

C. Where:

See Large Map showing all monitoring points and locations, above
NOTE: the count may be done from the point shown on this map OR from the same point as Activity 9: Fixed Point Bird and Mammal Count. Whichever point is chosen, note MUST be made of it.

D. How:

Count all the individuals of the four species of Harrier which go to roost in the reedbed or the fields and pastures around it, during the count period.

E. Materials/equipment needed

Binoculars
Telescope
Notebook and Pen/pencil

F. Field form

Not applicable, as all data is recorded in the surveyor's note-book.

Activity 12: Corncrake & Great Snipe Survey

A. Why:

See Activity 8: Bird & Mammal Transect, above.
Also

- detect any changes, positive or negative in the numbers of nationally or internationally scarce or threatened species using the marsh.

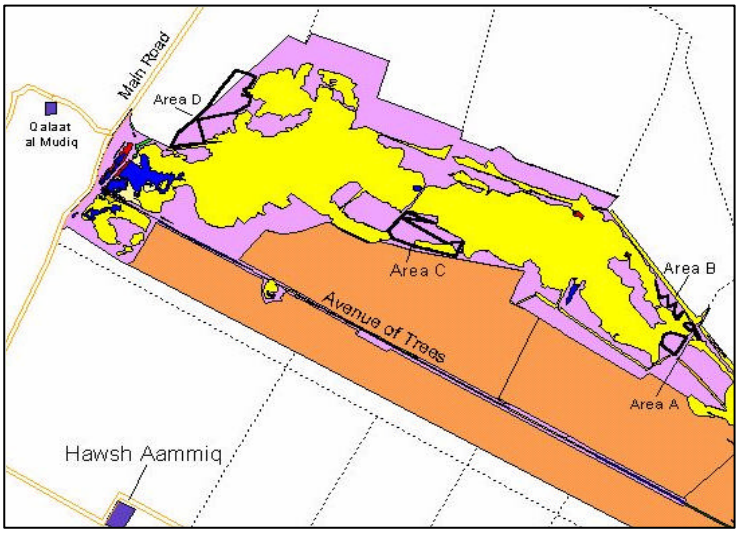
Corncrake (*Crex crex*) and Great Snipe (*Gallinago media*) are two migratory bird species with an unfavourable conservation status which use the Aammiq Marsh as a stop-over site on their migrations.

B. When:

Once a week for 8 weeks in the Spring, starting in the week containing the 1st of April. The survey should be carried out in daylight hours, and while the precise time of the visit is not important, the earlier in the day they are done, the lower the likelihood that birds will have been flushed already by hunters or flocks of grazing animals. It is therefore suggested that, where possible, the survey should be carried out immediately after the weekly Bird and Mammal Transect by the same observer. This is not essential however, and may be varied.

C. Where:

See also maps on recording form, below and Large Map Showing all monitoring points/locations



D. How:

Each of the four areas should be walked, slowly, along the approximate path shown (see the maps on the recording sheet). All birds seen or flushed, in the survey areas, while walking the routes, should be recorded on the sheet. This does not include birds flying over, birds flying out of the middle of the adjacent reedbeds, or distant birds, although these should be recorded in the observer's notebook and input on the general database in the usual way.

E. Materials/equipment needed

Binoculars
Suitable footwear (Wellingtons are usually sufficient)

F. Field form

See below

Recording Sheet

Corncrake & Great Snipe Survey -Recording Form

Date (dd/mm/yyyy) :

Start time:

Finish time:

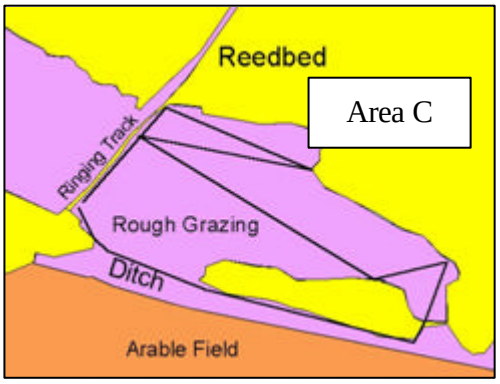
Observer(s):

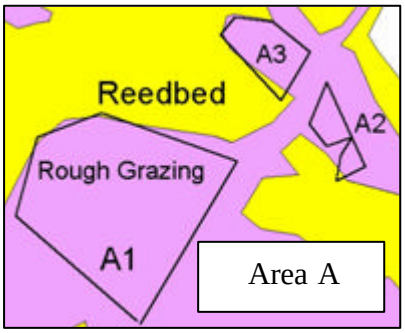
Weather (Wind speed, cloud cover, precipitation):

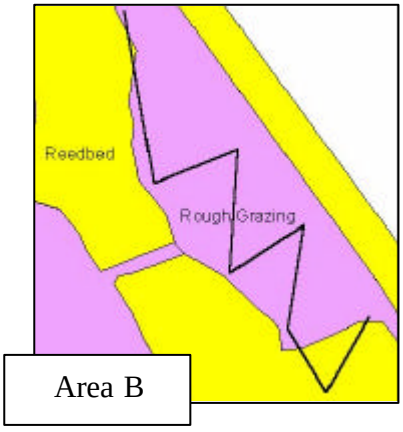
Species					
Great Snipe (**GS**)					
Common Snipe (**CS**)					
Corncrake (**CC**)					
Little Crake (**LC**)					
Spotted Crake (**SC**)					
Baillon's Crake (**BC**)					
Small Crake sp (*Porzana sp*) (**Psp**)					
Quail (**Q**)					

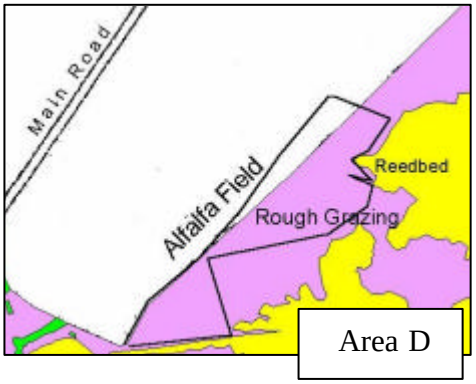
Codes:
Species: See box to left
Habitats:
RG – Rough grazing
Alf – Alfalfa
RB – Reedbed
Di – Ditch
Po – Pool
BG – Bare Ground
Wetness:
W – Wet
Da – Damp
Dr - Dry

Notes (e.g. unusual circumstances, large movements of birds over head, flocks of sheep etc.)









Activity 13: Shot-count

A. Why:
Hunting is one of the major problems at Aammiq Marsh, affecting bird populations. This simple technique allows a measure to be made of the level of hunting throughout the year.

B. When:
Once per week at the same time as the Fixed Point Bird & Mammal Count (Activity 9 above)

C. Where:
See Activity 9 above

D. How:
For one hour, during the Fixed Point Bird & Mammal Count, a count should be kept of the number of shots heard in the marsh and its immediate vicinity. This should be recorded on the same form as that activity and subsequently entered on the Wildlife Recorder database (or its successor).

E. Materials/equipment needed
Notebook & pen/ oencil

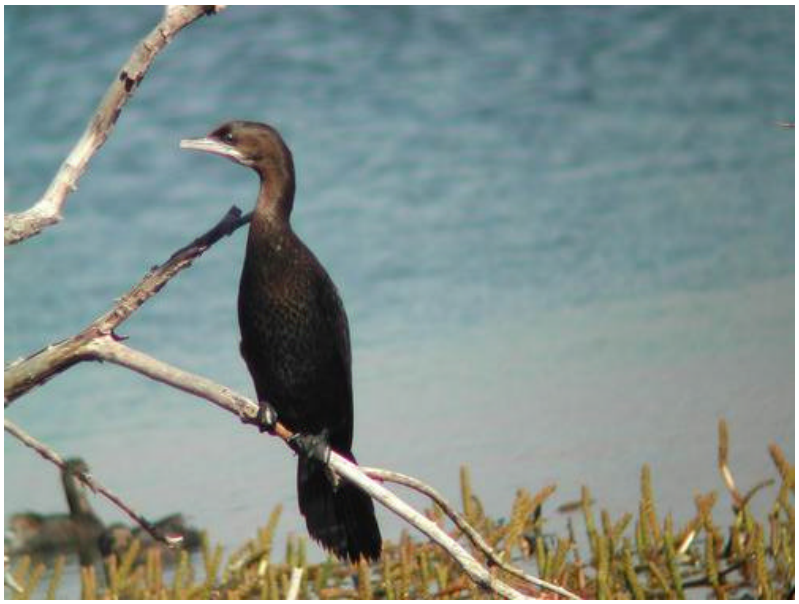
F. Field form
See Activity 9 above.

Pilot Study for the Ecological Monitoring of Aammiq Wetland

Final Report – January 2006

by

Colin Conroy MSc
Scientific Director
A Rocha Lebanon



A ROCHA

Together, caring for God's creation

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1 Introduction

A Rocha Lebanon was contracted by MedWetCoast Lebanon to carry out a pilot study for the long-term ecological monitoring of the Aammiq Wetland site, in the Bekaa Valley, Lebanon.
The pilot study had two main aims. These were:

i) to produce the first full year of data gathering for long-term monitoring of habitats, grazing, rare plant species, birds, mammals and hunting pressure in the Aammiq Marsh,
ii) to test the practicalities of the proposed monitoring activities, leading if necessary to the changing and refining the methodologies to be used in the long-term ecological monitoring of the wetland after February 2006

A third aim of the study was that during the course of the year training in the techniques used would be provided to at least two Lebanese nationals, so that eventually the long-term monitoring of the marsh ecosystems can be carried out entirely by Lebanese people. As well as making the monitoring more sustainable, by eliminating the need for people to come from outside the country, this process will also lead to capacity building for Lebanon as a whole.

2 Methodologies Used

The monitoring methodologies that were piloted this year can be divided into four main groups, although there is some overlap between the groups (for example the counting of shots during the fixed-point bird count). These are:

1) Monitoring of the habitats
2) Monitoring specific important plant species
3) Monitoring of birds and mammals
4) Monitoring of hunting activity within the Aammiq Marsh

These were detailed in the original proposal for the pilot study and the descriptions of the methodologies and their aims, given here, is taken from that document. More detail about the practicalities of the various techniques proposed, and any variations from the proposed methodologies, which were necessary during the pilot study, will be given in section 3 **Implementation of the methodologies**.

2.1 Monitoring of the habitats

The following table summarises the key points of monitoring the habitats present within the Aammiq Wetland.

General problem/issue **Specific problem/issue**	- Decrease of the quantity and quality of habitats. - Decrease of the number of trees in the marsh area. - Inadequate management of the water levels, burning reeds and a high grazing pressure have been identified as the main factors contributing to reductions in reed bed area and loss of quality. - Vegetation succession will lead to less reed bed area and open water in the marsh. - Cutting and burning trees has been identified as the main factors contributing to the loss of trees.
Objective	- To quantify the change in reed bed area - To quantify the occurrence of reed bed and other habitats (temporary and permanent open water, unimproved pasture, open wood). - To assess the general reed bed condition and its evolution over time. - To monitor the grazing pressure. - To monitor the maximum flooded area. - To monitor the burned area. - To monitor the number of trees.
Hypothesis	- The reed bed area will not decrease from the current area in 2004. - The structure of the reed bed will not change (height, density) - The species composition of the reed bed will not change. - The number of trees will not decrease from the number counted in 2004. - The grazing pressure will not lead to damage to valuable vegetation

	- The maximum flooded area will not decrease.
Methods & variables	1. Field verification of habitats by using GPS. 2. Field verification of burned reed and maximum flooded area by using GPS. 3. A series of 1x1 m. quadrats along 150 m. transects. 4. An exclosure (25x25 m.) will be built to protect vegetation from grazing; one-metre quadrats will be selected randomly within the exclosure and outside to assess the impact of grazing on vegetation. 5. List of flora, abundance classes for the plant species found in the quadrats 6. Description of the reed bed: counts of stem density and height of the five tallest stems within 1x1 m. quadrats. (optional) 7. Record the dropping density of grazing animals in the areas of quadrats and transects. 8. Count the number of trees.
Feasibility/cost effectiveness	*Transects*: 3 days a year. *Mapping burned area:* 1 day a year *Mapping maximum flooded area:* 1 day a year *Recording droppings*: 1 day a year. *Mapping habitats:* 5 days for fieldwork. *Counting trees:* one day. Three weeks for analysing and producing maps Two weeks for writing final report. See time-table under this table.
Sampling	*Transects*: 1-2 times a year: May and September *Mapping habitats and counting trees*: every 3-5 years. Best period: September and October. *Mapping burned area*: once a year: November (before 1st rains). *Mapping maximum flooded area:* once a year: January. *Recording of droppings*: 1-2 times a year: May and September
Sample analysis	*Transects*: Statistical analysis of transect data: mean, variance (on EXCEL); comparison of transects to establish seasonal and annual variations; graphic representation. *Habitat mapping:* Producing a map that shows the difference between the current habitats and those of the latest mapping. Producing a cross table which shows the change in habitats between the different years in hectares. *Mapping burned area and flooded area:* Producing a map that shows the flooded and burned area. *Trees*: Producing a map that shows the difference between the number of trees and those of the count in 2004.
Reporting	Annual (for habitat mapping/ tree counting every 3-5 years)

	reporting, including conclusions and recommendations for management action and further monitoring.

Figs. 2.1-2.4 Some common plants of the Aammiq Wetland

Fig 2.1*Phragmites australis and Lythrum salicaria*

Fig 2.2 *Blackstonia perfoliata*

Fig 2.3 *Centaurium pulchellum*

Fig 2.4 *Trifolium pilulare*

2.2 Monitoring specific important plant species

In response to document "Biodiversity assessment and monitoring in the protected areas/Lebanon LEB/95/G31" the following additional botanical values of the wetland have been identified and will be monitored as described:

2.2.1 Problem/question

Decreasing quality of the marsh habitat

2.2.2 Purpose

- To verify if hydrological management leads to an increase in important wetland plant species
- To verify if grazing in the marsh positively affects important wetland plant species.
- To verify if vegetation succession leads to loss of important wetland plant species

2.2.3 Method

The following plant species should be mapped by using a GPS in the field. This is according to the report 'Biodiversity assessment and monitoring in the protected areas/Lebanon LEB/95/G31.

Under abundance:
- 5 : indicate that more than 3/4 of the habitat is covered by the species.
- 4 : indicate that between ½ and ¾ of the habitat is covered by the species.
- 3 : indicate that between ½ and ¼ of the habitat is covered by the species.
- 2 : indicate that 1/20 of the habitat is covered by the species.
- 1 : weak cover.
- + : very weak cover.
- 0 : selected from literature according to the selection criteria but not found during the field surveys.

Rare

Species	English Name	Local Name	Localization		Abundance
			Habitat	GPS	
Typha laxmannii	**Laxmann's reed-mace**	??d?????	water		0
Sideritis remota	**Scattered ironwort**	????**P** ? ???	Rocky soil		0
**Hydrocotyle ranunculoides*	**Water pennywort**	?????µ ? ????????	water		0

Endemic

Species	English Name	Local Name	Endemism	Localization		Abundance
				Habitat	GPS	
Sideritis remota	**Scattered ironwort**	??? ????I?	To East Mediterranean Restricted to Aammiq	Rocky soil		0
**Hydrocotyle ranunculoides*	**Water pennywort**	?µ ? ??? ????????	To East Mediterranean	Water		0
Merendera sobolifera	**Bulbous merendera**	????? ??µ ?	To East Mediterranean	Salt humid ground	N33º43'982'' E35º47'094''	+
Exoacantha heterophylla	**Various-leaved exoacantha**	?????d? ????T ?????	To East Mediterranean Restricted to Aammiq	Localized in dry places		0

Noteworthy

Species	English Name	Local Name	Value	Localization		Abundance
				Habitat	GPS	
Merendera sobolifera	**Bulbous merendera**	????? ??µ ?	Wetlands Bioindicator	Salt humid ground	N33º43'982'' E35º47'094''	+
Exoacantha heterophylla	**Various-leaved exoacantha**	?????d? ????T ?????	Wetlands Bioindicator	Localized in dry places		0
Mentha pulegium	**Penny-royal**	? ?O???	Medicinal Wetlands Bioindicator	Humid ground	N33º43'982'' E35º47'094''	1.3
Nasturtium officinale	**Common water-cress**	?? ??????	Economic/ Edible/ Medicinal	Water and humid ground	N33º43'982'' E35º47'094''	+
Scirpus tuberosus	**Tuberous club-rush**	?O ? ???d?	Economic/ Palatable	Water and humid soil		0

Threatened

Species	English Name	Local Name	Level of threat	Localization		Abundance
				Habitat	GPS	
Alisma plantago-aquatica	**Great water plantain**	? ?????	National	Water	N33º43'982'' E35º47'094''	+
Typha laxmannii	**Laxmann's reed-mace**	??d??	National	Water		0
Sideritis remota	**Scattered ironwort**	????I?? ???	Regional	Rocky soil		0
**Hydrocotyle*	**Water**	?????µ ?	National	Water		0

ranunculoides	**pennywort**	????????				

Specific distribution: spatial (zonation/ location) and temporal (seasonal/ activity) of selected species

R = rare; S = scarce; U = uncommon or localized; C = common; Fl = flowering period (3-5 = March-May); A = annual; V = Perennial (vivace); T = tree or sub-tree; H = herb.

Species	R	S	U	C	Fl	A	V	T	H
Alisma plantago-aquatica			+		4-11		+		+
Typha laxmannii	+				4-9		+		+
Sideritis remota	+				Summer	+			+
**Hydrocotyle ranunculoides*	+				4-7		+		+
Merendera sobolifera			+		1-2		+		+
Exoacantha heterophylla			+		4-7	+			+
Mentha pulegium			+		6-9		+		+
Nasturtium officinale			+		2-7		+		+
Scirpus tuberosus				+	3-12		+		+

*** *Hydrocotyle ranunculoides* –** this species was erroneously described in the document "Biodiversity assessment and monitoring in the protected areas/Lebanon LEB/95/G31" as being endemic to the Eastern Mediterranean, and a rare and noteworthy plant in Lebanon. This mistake was duplicated in the original proposal for this pilot study and in the interim report which was submitted in October 2005. This species is in fact native to North America and is an invasive pest species in European and Asian wetlands. It is reported in Mouterde (1966) from Aammiq and several sites in Syria.

2.2.4 Frequency

Yearly count of the plants = 2days.

2.2.5 Analysis

The results will be published as a map, with different points indicating the occurrence of the different species.

2.2.6 Reporting

Once a year.

2.3 Monitoring of birds, mammals and hunting activity at the Aammiq Marsh

These two groups of methodologies were dealt with in one table in the original proposal and that table is included here.

General problem/ issue	• Potential of decrease in quantity and quality of reedbed, rough grazing and open water ecosystems in the marsh • Potential of decrease in diversity and abundance of birds, mammals and invertebrates using the marsh
Specific problem/issue	• Inadequate management of the water levels, burning of reeds and high grazing pressure have been identified as the main factors contributing to reductions in reed-

	bed area and loss of quality • Too little grazing and lack of reed control are also likely to lead to a decrease in the quantity and quality of rough grazing and open water habitats and in the quality of reedbeds • Many bird species rely on the presence of a mosaic of habitats, including all three mentioned above to successfully breed and during migration and wintering periods • Several bird species which are of national or international conservation importance regularly use the marsh but depend on the presence of specific habitats • Hunting and disturbance directly affect the quality of the marsh as a habitat for birds
Objective	• To monitor, in a long-term, sustainable way, the population levels of wintering, breeding and passage birds using the marsh and also of the large mammals using the marsh. • To detect, as early as possible, any significant changes in the numbers of individuals and species using the marsh • To detect any changes, positive or negative in the numbers of nationally or internationally scarce or threatened species using the marsh – specifically, all four Harrier species, as well as Corncrake and Great Snipe will be monitored. • To relate these changes to management practices and also to the results from the vegetation/ habitat monitoring programme, and to alter the management appropriately if necessary. • To monitor the levels of hunting going on in the different parts of the marsh (i.e. Skaff-owned marsh, Hajj-Chahine land, agricultural fields, and from road.)
Hypothesis	• That the numbers of breeding, wintering and passage birds using the marsh will not decrease • That the diversity and abundance of birds, mammals and other animals will stabilise at the optimum level for a marsh of this size and at this latitude. • That the number of hunters using the marsh and surrounding areas will continue to reduce, eventually to zero
Methods & variables	1. Weekly early-morning transect walk along a straight route at the northern edge of the marsh, recording all birds and large wild mammals seen, with mammal signs, such as tracks and droppings being photographed. 2. Weekly point-count of birds and large wild mammals from the Springs area

	3. "Constant Effort" ringing in the Central Reed area for 37 weeks per year 4. Thrice-monthly count of four Harrier species coming to roost in the marsh 5. Weekly surveys for Corncrake and Great Snipe for eight weeks in Spring. 6. Hunting survey – Shot counts and twice yearly cartridge collection.
Feasibility/cost effectiveness	*Transects*:1 person; c104 hrs /year = 13 days/ year *Fixed point count*: 1 person; c104 hrs /year =13 days per year *Ringing*: 2 persons; c37 days/ year = 74 days per year *Harrier count*: 1 person; c72 hrs/yr (may decrease in future yrs) = 9 days per year *Corncrake/ Great Snipe survey*: 1 person; c16 hrs/yr (spring only) = 2 days per year *Hunting survey*: **Shot count** – no extra cost as included in point and harrier counts. **Cartridge collection –** max 2 days/yr 3 wks/year for analysing data and writing reports = 15 days per year
Sampling **Sample analysis**	*Transects*: weekly, year round, early morning. 1 person *Fixed-point count*: weekly year round, 1hr in late afternoon. 1 person *Ringing*: 1 morning weekly, plus c1hr the evening before to set up nets. Mid-Jan to end May *and* mid-Aug to mid-Dec. *Harrier count*: weekly, year round at first. Evenings from the time when the valley floor is in shadow to dark. It may be decided in future years to suspend the count between the end of May and mid-August. *Corncrake/ Great Snipe count*: weekly for 8 weeks/yr starting in the week containing 1st April *Hunting survey*: a)Counting shots heard within the marsh during point count and for 1 hr during harrier count b)Twice yearly collection and counting of cartridges from 3 10x10m square quadrats – 1 in avenue of trees, 1 near Irrigation Pool, and 1 at eastern end in Hajj Chahine land *All surveys*: Statistical analysis of survey data: mean variance (on Excel); between year comparisons of transect data to detect trends; graphical representation.
Reporting	Annual reporting for all surveys, including comparisons with previous years' data; attempts to relate changes to vegetation surveys and management practices; recommendations for management. These should all be amalgamated into one report, with sections for each survey, and conclusions drawing the results of all the surveys together.

3 Implementation of the methodologies

In this section the actual activities carried out during the year of the pilot study are described and the reasons for any variation from the original proposed methodologies are given. Where appropriate (i.e. the amount of data is small) the results of the various surveys are given in this section. Where large amounts of data have been generated, or need to be shown in map form, the results are given in the Appendices. The locations of the various transects, exclosures and sampling points are shown in Appendix 9, Figure A9.2

3.1Monitoring of the habitats

3.1.1 Vegetation Transects

- 2 vegetation transects set up in different parts of the marsh, each situated so as to cover a variety of habitats
- Transect T1 is situated at the western end of the marsh on the northern side, and is approximately 80m in length
- Transect T2 is situated near the centre of the northern side of the marsh, and is approximately 95m in length.
- Each transect is made up of a line of 6 metal poles, dividing it into 5 sections
- All the plant species found along a 2-metre wide corridor between each pole and the next one, were recorded.
- $1m^2$ quadrats were recorded at each pole along the transects, with all plant species within the quadrat being given a score on the Domin Scale, to give an indication of how abundant it was
- The average and maximum heights of vegetation in the quadrats, and the vegetation height at 2-m intervals along the transects was recorded
- Levels of grazing within the quadrats was estimated and droppings of domestic grazing animals were counted and removed from the quadrats
- The bulk of the fieldwork was carried out in June 2005, with an additional visit in October 2005 to allow late flowering species to be recorded. During the October fieldwork sessions only species which had not been recorded in a particular section or quadrat at the earlier visit, were recorded for that section or quadrat**.**
- All data is shown in Appendix 1

Problems encountered and variation from proposed methodology

- Original proposal stated that transects would be 150m long. At the sites chosen such long transects were not necessary to cover the complete gradient of habitats present and so shorter transects were set up.
- Original proposal stated that fieldwork would be carried out in May and September. Actual fieldwork was done in June and October. This should not greatly affect the species recorded, or the quality of the data. However, to ensure comparability of the data from this year with that of future years, data collection from now on should be carried out, where possible, to within 1-2 weeks of this year's dates
- One of the poles from transect T2 was stolen between the June and October visits. The exact location of the stolen pole, and therefore of the corresponding quadrat, is now unable to be pin-pointed and so, even if the pole is replaced in approximately the same location, this year's data cannot be compared with that of future years. There will be a similar

problem with the species list data from the two sections on either side of the stolen pole, although, as the sampling area is much bigger, and percentage cover is not being estimated, it is less important in this case to find the exact location of the pole before it was stolen

- A large fire at the Aammiq Marsh, on the 11th Dec affected one of the transects, with all of the reeds along the transect being burned and much of the grassland being either burned or lightly scorched. The transect poles were undamaged so the fire will not affect future data-collection along the transect.

3.1.2 Grazing exclosure experiment

- A 4m x 6m ($24m^2$) area was selected, near to vegetation transect T1, on the north side of the marsh at the western end and a strong, buffalo-proof fence was erected around it
- A "control" area of the same size was marked out immediately adjacent to this exclosure, but with no fence, so that grazing animals would be able to access it.
- The intention is that data from the two areas can be compared to assess the effect of grazing on species composition and vegetation structure over time
- The area selected is one which is used for grazing by domestic sheep, goats and water buffalos
- A $1m^2$ quadrat was located at the same relative position in the exclosure and the control and quadrat data recorded in the same way as for the vegetation transects (see 3.1.1 above)
- Species lists for the whole of the two areas were compiled, as in the transects
- Average and maximum vegetation heights were recorded in the quadrats and in the whole areas of the exclosure and the control.
- Droppings of grazing animals were counted and removed from the quadrats
- Fieldwork was carried out at the same times as for the transects
- All data is shown in Appendix 1

Problems encountered and variation from proposed methodology

- As in the transects the timing of the fieldwork was different from that proposed. The comments made in reference to timing of future fieldwork in the transects also apply here.
- Original proposal stated that the exclosure would be 25m x 25m. Fencing off such a large area, in such a way as to prevent access by buffalos, or removal of the poles or wire mesh by members of the public proved to be impractical, and so a smaller area was selected.

Fig 3.1 The Grazing Exclosure and Control Area

3.1.3 Mapping habitats within the Aammiq Marsh area

- This was carried out in 2004-5 and used as the basis for a GIS habitat map of Aammiq. It will be repeated after 3-5 years. The map created in 2004-5 is shown in Appendix 9, Figure A9.1.

3.1.4 Counting and mapping of trees within the Aammiq Marsh area

- This was carried out in 2004-5 and the data mapped using ArcView 3.1 GIS software. It will be repeated after 3-5 years. During the 2004/5 survey a total of 1219 trees of 8 species. These are listed in Table 3.1 with the numbers of trees of each species

Species	Number
Fraxinus ornus	1071
Salix alba	90
Ulmus minor	30
Populus alba	18
Platanus (hybrida)	6
Salix sp.	2
Ficus carica	1
Robinia pseudoacacia	1

Table 3.1 Tree species and the numbers of individuals found in the Aammiq Marsh area

3.1.5 Mapping maximum flooded area

- The maximum flooded area up to the end of January 2006 is shown on the map in Fig A9.3, in Appendix 9. However, at the time of writing, heavy rains continue and the water level in the marsh is still rising and so the map will be updated when the water has reached its maximum height.

3.1.6 Mapping burned area

- A fire on the 11th of December 2005 burned approximately 40.8% (50.97Ha) of the reedbeds and 9.2% (10.53Ha) of the rough grazing areas. This was mapped using a combination of the Garmin GPS and photographs taken from a point on the hillside above the marsh. The photographs are shown below and the map in Appendix 9, Figure A9.4

Figs 3.2 & 3.3 Views of the Aammiq Marsh, shortly after the fire in December 2005, taken from the hillside to the west of the marsh

3.2 Monitoring specific important plant species

Nine plant species were selected for specific monitoring, based on the recommendations made in the document "Biodiversity assessment and monitoring in the protected areas/Lebanon LEB/95/G31". The original proposal for the Pilot Study states that all plants will be counted and mapped. However, the abundance of 5 of the 9 species is too great for this to be practical, while the other 4 have not been recorded at all within the Aammiq Marsh area since the start of the Pilot Study. Instead, the main areas of the marsh where these 5 species occur are represented in map form in Appendix 9 (Figures A9.5 – A9.9) of this document. In addition a verbal description of the distribution and abundance of all 9 species is given below.

3.2.1 *Alisma plantago-aquatica* – Greater Water-plantain

In 2005 this species was fairly common at Aammiq in permanently wet or seasonally flooded habitats around the whole marsh, including the main pools at the western end of the marsh, the network of ditches, rough grazing areas and along seasonally flooded footpaths. (see map in Appendix 9)

3.2.2 *Typha laxmannii* – Laxmann's Reedmace

Not recorded at Aammiq in 2005.It is currently unclear whether or not it has been seen here since 1936, when, according to Mouterde (1966) it was seen next to 'canals' within the marsh.

3.2.3 *Sideritis remota* – Scattered Ironwort

Not recorded at Aammiq in 2005. According to Mouterde (1966) this is the only location within Lebanon where it occurs. However, there have been no recent records from this area and given that it is a plant of dry, rocky, scrub habitats it would seem unlikely that it will be found at Aammiq Wetland, although it may be found on the hillsides above the marsh.

3.2.4 *Hydrocotyle ranunculoides* – Water Pennywort

Not recorded at Aammiq in 2005. Mouterde (1966) gives Aammiq as the only location within Lebanon where the species occurs, but there have been no recent records. This is an invasive species from North America which is a very serious ecological threat in some parts of Europe and Asia. It is therefore not desirable at Aammiq and in the event that it is rediscovered here, should be prevented from becoming established. For this reason we recommend that it remain on the list of species being specifically monitored, although the reasons for this have changed. Actions to be taken if it is rediscovered will depend of the location and abundance of records, and so it is not necessary to devise a strategy in advance.

3.2.5 *Merendera sobolifera* – Bulbous Merendera

This species flowers in the first two months of the year and so the distribution shown in the map in Appendix 9 may be incomplete, as in some parts of the marsh, it may not have commenced flowering by the time that survey work was carried out in early January 2006. However, in 2005 it was abundant in several areas of rough grazing land around the marsh. It is known to be a salt-tolerant species and so it has been suggested that its presence at Aammiq is related to increased soil salinity, possibly as a result of over-extraction of water.

3.2.6 *Exoacantha heterophylla* – Various-leaved Exoacantha

Not recorded at Aammiq in 2005. This species is an arable weed found on heavy soils, and so is unlikely to be found in any of the habitats within the marsh itself, although it may be found in the surrounding agricultural land.

3.2.7 *Mentha pulegium* – Pennyroyal

At Aammiq this species is found mostly in moderately to heavily grazed grassland habitats but also occasionally on the sides of dried out ditches. In 2005 it was seen in widely scattered locations around the marsh but was nowhere very common, and was absent from large areas of apparently suitable habitat (see Map in Appendix 9).

3.2.8 *Nasturtium officinale* – Watercress

Watercress is common in shallow still, or slowly moving water at Aammiq and is often gathered by local people for food. The main location for this species is in the pools around the Aammiq Springs at the west end of the marsh, but it is also found in the Riachi River and in some of the ditches which connect to the Riachi (see map in Appendix 9).

3.2.9 *Scirpus tuberosus* – Tuberous Club-rush

This species is apparently not very common at Aammiq and was recorded no more than 4-5 times during 2005, with all records being from the north-west part of the marsh. One reason for the scarcity of records is that it is an inconspicuous plant which is easily overlooked among much taller reed-like plants. Surveying the ditch and pond edges, from a boat in November 2005 yielded no records in addition to those that were mentioned in the Interim Report for this study.

Fig 3.4 Pennyroyal (*Mentha pulegium*) – one of the plant species being monitored at Aammiq Marsh

3.3 Monitoring of birds and mammals

The five main activities for the long-term monitoring of birds and mammals at Aammiq Marsh are described below. In addition, there have been many informal visits to the marsh, carried out by A Rocha staff and volunteers, and these are mentioned in section 4.

3.3.1 Bird and mammal transect

- A 250m long, straight route was selected along the northern edge of the marsh, towards the western end
- The route was divided into 5 sections, each of approximately 50m
- The start and finish points of the transect, along with the points dividing the five sections were marked by tying markers to the vegetation, by noting down prominent land-marks, and by taking GPS readings of the points, mapped using Arcview Version 3.1 GIS software.
- The transect is walked once a week, throughout the year, starting as close as possible to the point at which the sun rises over the Anti-Lebanon Mountains. In exceptional conditions, such as when there is heavy fog at dawn, the start point may be delayed
- The transect is walked starting at the eastern end, so that the sun is always at the back of the observer
- In each section, 1 minute is spent at the start point, standing still, listening and watching for birds. The observer then walks slowly and steadily to a point approximately halfway along the section, where about 5 minutes is spent watching and listening, before walking slowly and steadily to the start of the next section
- All birds seen or heard, within about 25m on either side of the transect line, during the c7 minutes spent in each section, are noted down on the recording sheet for that section
- Every effort is made to ensure that each bird is only recorded once, so that if a bird is seen in one section and then flies into another section, it is only noted down in the first section.
- Birds flying over high are not recorded as occurring on the transect, although they should be noted in the comments box and added to the database for all Aammiq bird records
- Large wild mammals seen or heard during the survey are also recorded. Large here is defined as being anything bigger than a Stone Marten (*Martes foina*). Tracks or signs should also be noted, and where possible, photographed, particularly where there is any doubt as to the identity of the animal that made them
- The results from the 48 weeks from February 22nd 2005 to 16 January 2006 are listed in Appendix 2. Graph 6.21, in section 6 below, shows how the numbers of 5 of the commonest species of passerine birds at the Aammiq Wetland, vary over the course of a year. The dates referred to by the 'week numbers' in the graph can be found by referring to Table A2.1

Problems encountered and variation from proposed methodology

- Although not explicitly stated in the original proposal, it was initially intended that the direction walked would be alternated from week to week. However, it quickly became apparent that starting from the western end of the transect was impractical, as the sun in the observer's eyes made it very hard to see the birds. One disadvantage of starting at the eastern end is that the number of mammal records made on the transect is likely to be reduced as most of these species are more sensitive to disturbance than most of the birds species present, and so are likely to be frightened away by the observer walking past them on the way to the start point

- The variability of water levels in the marsh, throughout the year placed a severe limitation on the choice of the area for the transect. It would have been preferable to have a route which went right into the heart of the reedbed, but such a route would be under 1-2 metres of water in the late winter and spring, making walking the transect impossible
- The fire which took place in December 2005, while not directly affecting the transect, came up to within less than 1 metre of one end of the transect and so this might have an effect on the numbers of birds seen on the transect until the habitat recovers.

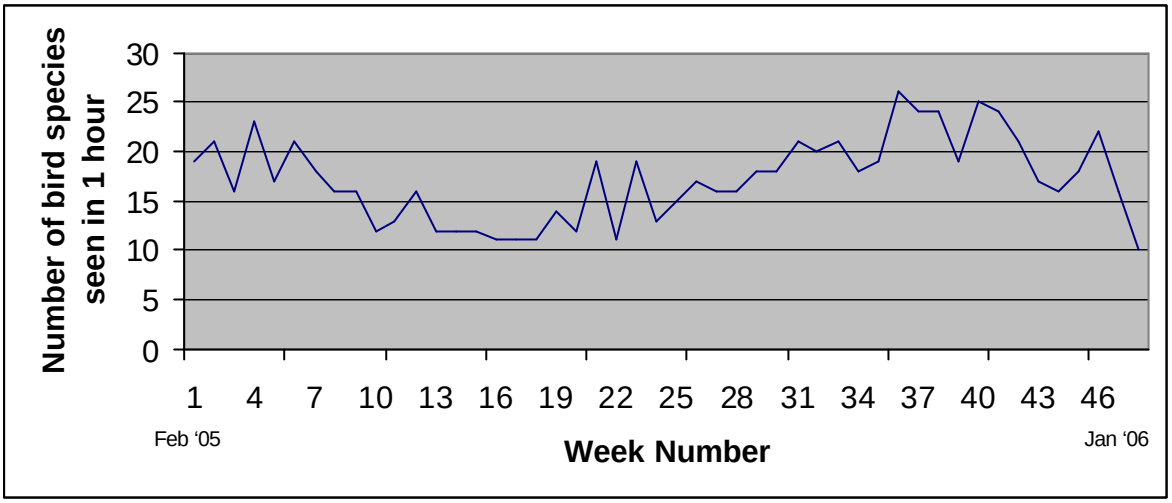
In some cases, the markers indicating the beginning and end of the sections were removed, while in others the plants they were tied to were knocked down or eaten by grazing animals. At present the points are adequately marked and can easily be seen by the person walking the transect. However, in the long-term it will probably be better to mark the points with poles, as in the vegetation transects.

3.3.2 Fixed-point bird and mammal count

- A small area was selected on the hillside overlooking the Aammiq Springs, at the west end of the marsh
- 1 hour is spent in this area each week counting all the birds seen east of the main road. The first 10 minutes of the hour are spent at a point at the south-eastern corner of the area, where the southern part of the springs can be seen better. The last 50 minutes are spent sitting on a rock near the northern edge of the area where a better view of the rest of the marsh can be seen
- The count is timed so that it finishes shortly before it becomes too dark to see clearly
- The area viewed is divided into two sections, known as the "inner area" and the "outer area". The inner area includes most of the visible open water and the trees in the "Springs" area. The outer area is the rest of the visible area east of the road, including the agricultural fields and the "Long Avenue of Trees"
- Any birds which are seen first in the outer area but which then fly into the inner area, are noted down for the inner area and deleted from the outer area. The same is not done in reverse
- All wild mammals seen are recorded in the appropriate place on the recording sheet, with note being made of how many of each species were seen in the inner area and how many in the outer area
- Notes are also made on the recording sheet of the weather, the degree of disturbance by people or domestic animals, and the number of shots heard (see below)

Problems encountered and variation from proposed methodology

- The fixed-point count has proved to be a very useful tool for monitoring at the marsh and one which was very easy to set up. There have been no variations from the methodology as laid out in the original proposal. The complete dataset from the 48 weeks of fixed point monitoring up to 20th January 2006 can be found in Appendix 3. Graph 3.2, below shows the numbers of bird species recorded during the count each week.
- Although numbers of mammals recorded during this survey, have been relatively low, it is still a useful monitoring technique for this group, so long as the methodology remains unchanged, as the data produced will be comparable from year to year.



Graph 3.1 Numbers of bird species seen during the weekly 1hr Fixed Point Count, over a 48-week period in 2005-6

Fig 3.5 Aammiq Marsh viewed from the Fixed-point Count Site

3.3.3 Constant Effort (CES) Bird-ringing

- Three 18 metre mist-net rides were cleared in the reeds on the north side of the marsh. These were called CES1, CES2 & CES3, CES being an abbreviation for Constant Effort Site.
- One morning per week, 48 weeks of the year, for 4-5 hours mist nets are opened in these rides
- All birds caught are extracted by suitably trained practitioners
- Any bird which does not already have a ring on one leg is identified and given a small aluminium ring marked with the word "LIBAN" and a unique combination of letters and numbers. The ring is fixed round one of the bird's legs, using a special pair of pliers, in such a way that it will not hurt the bird or restrict its movement in any way
- Different sized rings are used for different species of birds
- If any bird which already has a ring, the ring number is noted down, and the species identified. If it is a ring from any country other than Lebanon, the details of the ringing scheme, as written on the ring, are also noted down. In all cases, great care is taken to avoid mistakes in transcribing the ring number
- Once the bird has been identified and ringed, or the ring details written down, it is weighed and the wing-length measured. Where possible the age and sex of the bird are determined. Other measurements such as fat and muscle score, moult scores, and bill length, may also be recorded
- The nets are opened just before first-light (necessitating that they are erected and then furled, the night before) and closed between 4 and 5 hours later. The exact time that the nets are closed will be determined by the factors such as the weather and the number of birds being caught
- In exceptional circumstances, such as strong winds, or extremes of heat or cold, ringing activities may be curtailed or abandoned altogether
- The net which each bird was caught in is recorded on the data sheet with all the other details
- All data is later entered into a special database, developed for the purpose by the British Trust for Ornithology
- On occasion extra nets may be erected. In these cases the data for birds caught in CES nets will be kept separate
- During CES ringing at Aammiq in 2005, a total of 1104 birds of 24 species were caught. Of these, 870 were unringed when they were caught. All the results from CES-ringing in 2005 (up to 1st December) are shown in the tables in Appendix 4, and are summarised in Tables 3.2, 3.3 & 3.4, below.

Fig 3.6 Reed Warbler (*Acrocephalus scirpaceus*) being ringed

New	CES1	CES2	CES3	All Nets
No. of Species	17	15	18	24
No. of Birds	307	315	248	870

Table 3.2 Summary of New (unringed) birds caught during CES ringing at Aammiq Wetland

Retraps/ Controls	CES1	CES2	CES3	All Nets
No. of Species	7	4	7	10
No. of Birds	105	54	275	234

Table 3.3 Summary of birds retrapped or controlled (foreign-ringed birds) during CES ringing at Aammiq Wetland

All Birds	CES1	CES2	CES3	All Nets
No. of Species	18	15	18	24
No. of Birds	412	369	323	1104

Table 3.4 Summary of all birds caught during CES ringing at Aammiq Wetland

Problems encountered and variation from proposed methodology

- At the start of the pilot study it was decided that CES ringing would always be for 5 hours, whenever possible. However, it became apparent that in the summer months this would not always be in the interests of the birds, as it often starts to get very hot quite early in the day, and birds hanging in mist nets start to suffer in the heat. On days when the catch is relatively low, or there are enough ringers present to ensure that the nets are cleared sufficiently often, this may not be a problem. On other days it may be necessary to close the nets early. The rule is always that the welfare of the birds comes first.
- The original proposal stated that ringing would only be carried out in 37 weeks of the year (from mid-January to the end of May and from mid-August to the mid-December. In May 2005, as detailed in the Interim Report, it was decided to continue ringing throughout the summer, so that ringing would take place in 48 weeks of the year, and the only break in ringing activities would be for 4 weeks in the middle of winter. In early December 2005, a further modification was made to the timing of the ringing visits. Very cold early morning weather conditions in the Bekaa in winter led to very low catches, as well as an increased risk of injury and death for the birds, and so it was decided that CES ringing activities would be curtailed at the end of November and resumed in February.
- Shortly after the above decision had been taken, and ringing abandoned for the time being, a large fire destroyed 40% of the reedbed at Aammiq (see Section 3.1.6 above, and Fig A9.3 in Appendix 9). This included the reeds surrounding two of the CES ringing rides and those along one side of the remaining ride. Because of this, until the reeds grow up again,

ringing in these sites is unlikely to result in many birds being caught and so the resumption of CES- ringing will be postponed until then.

- Because of concern about the spread of the H5N1 strain of avian influenza in nearby countries additional precautions were adopted in late autumn 2005. These included using a plastic straw to blow the breast feathers up, when examining a bird for fat and muscle scores, more diligent use of an alcohol-based hand rub during ringing, and more frequent washing of bird bags (each bag only used for one bird before being washed). In addition, used bags were carried in a plastic sack, tied at the mouth, to prevent dust from flying around. Also, plans to expand the ringing activities at Aammiq to include the special targeting of water-birds were shelved for the time being.

Fig 3.7 Long-eared Owl (*Asio otus*) caught during CES ringing at Aammiq

Fig 3.8 Male Red-backed Shrike (*Lanius collurio*) caught during CES ringing at Aammiq

3.3.4 Roosting Harrier Count

- Roughly once in every 10-day period throughout the year a count was made of Harriers (birds of prey in the genus *Circus*) going to roost in the evening in the Aammiq Marsh
- The count was actually started in the autumn of 2004 and was initially planned to end in mid-June. However, the decision was made to extend the counting period to cover the whole year, although numbers throughout the summer were very low
- The precise methodology used, and a discussion of the results can be found in the report, entitled *Roosting Harriers in the Aammiq Wetland* by Marius Teeuw, a visiting Dutch scientist, which is included in Appendix 5.

3.3.5 Corncrake and Great Snipe Survey

- The Corncrake (*Crex crex*) and the Great Snipe (*Gallinago media*) are two bird species with unfavourable conservation status globally, which use the habitats at Aammiq Marsh during their migrations
- 4 areas of the rough grassland at Aammiq Marsh were chosen as being suitable for long-term monitoring of these two species on their northward migration in spring
- The survey is carried out once a week for eight weeks in the spring each year, starting in the week which contains the 1st of April
- The precise methodology, a copy of the recording sheet and the raw data from 2005 are shown in Appendix 6

Problems encountered and variation from proposed methodology

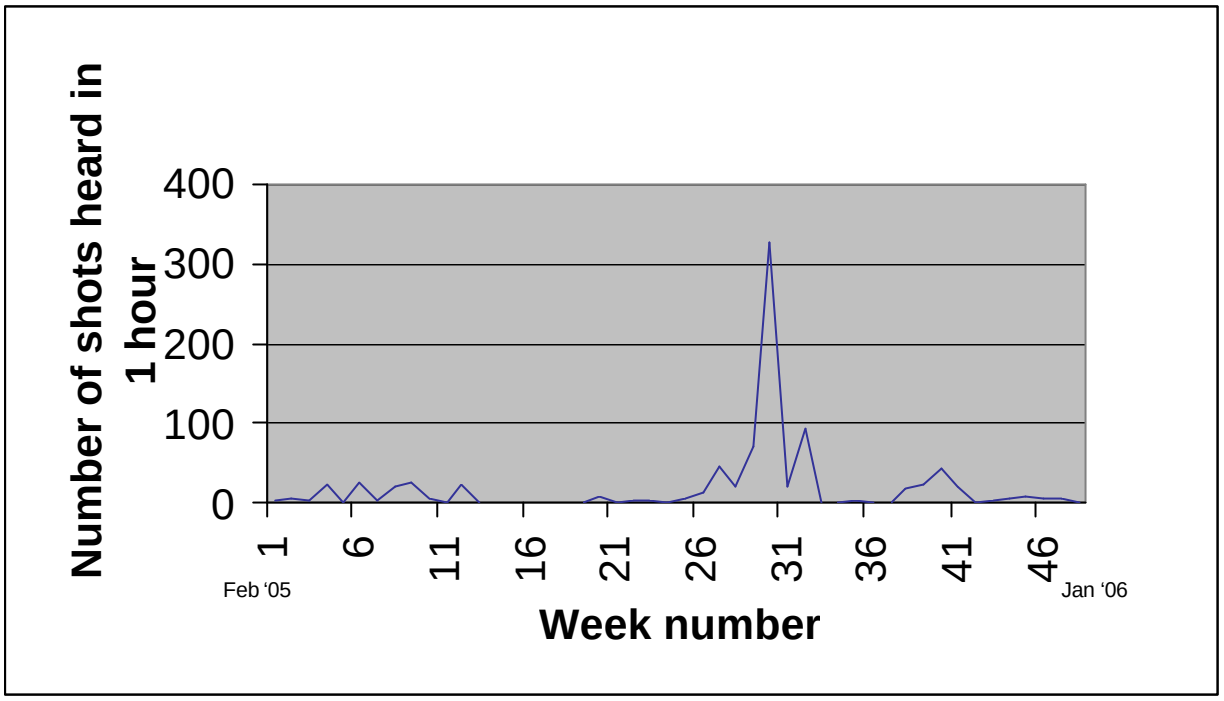
- There was some experimentation at the start of the survey period as to what time of day was best to do the survey. No set time was stipulated but it was found that early-mid morning was best
- The distances between the counting areas meant that there was the potential of a bias being introduced if the same areas were always counted first or last. To minimize any bias, as much as possible the start point was rotated between the four areas

3.3.6 Monitoring of hunting activity within the Aammiq Marsh

Two different techniques for monitoring the levels of hunting in the wetland throughout the year were tested during this Pilot Study. These were shot counting and cartridge collection. Shot counting proved to be a useful survey technique, but the cartridge collection was found to be unworkable and was discontinued. However, shot counting alone gives a good measure of the level of hunting in the marsh and should be continued.

3.4.1 Shot counting

- For 1 hour per week, during the fixed point count, all shots heard from within the vicinity of the marsh are counted
- As with the birds and mammals, shots heard from within the "inner area" are recorded separately from those heard in the "outer area"
- These are recorded on the Fixed Point Count recording sheet
- The data can be found in Table A3.1 in Appendix 3, and is summarised in Graph 3.2 below.



Graph 3.4 Numbers of shots heard during the weekly 1hr Fixed Point Count, over a 48-week period in 2005-6

Problems encountered and variation from proposed methodology

- The original proposal stated that shots would be counted for 2 hours per week – 1 hour during the fixed-point count, and 1 hour during the roosting harrier count. After some experimentation it was decided to abandon the shot count during the roosting harrier count
- Some shots may be missed during the fixed-point count if they are very distant and the observer is concentrating on counting large numbers of waterbirds. It is, of course, impossible to know how big a problem this is, but it is not thought to be significant

3.4.2 Cartridge collection

- In the original proposal, it was proposed that, in addition to the counting of shots, described in section 3.4.1 above, there would be a twice-yearly collection of spent shotgun cartridges from set areas within the marsh. However, after setting up the areas (as described in the Interim Report) several problems were encountered and it was decided to abandon the Cartridge collection methodology. The reasons for this are given below.

Problems encountered and reasons for abandoning proposed methodology

- The original proposal stated that the three areas would each be 10m x 10m. The size of the areas was increased to 15m x 15m when it was realised that shooting along the avenue of trees is more spread out than in the other areas and a 10m x 10m square may not accumulate enough cartridges during a 6 month period to show any significant decrease over time

- The original proposal stated that one of the areas would be adjacent to the irrigation pool. This was changed when it was realised that there was a large shepherds' camp at the proposed site for several months of the year.
- After the submission of the interim report, a collection was carried out in early November 2005, the intention being that the numbers would be added to those from the full count in January 2006. However, on visiting the area at the eastern end of the marsh (Area A2 of the Corncrake and Great Snipe Survey) it became obvious that a large number of cartridges had been collected from other places and deposited in the area. In this one area alone 260 cartridges were found, but most of them were in a single large pile, rather than being scattered over the area as would have been the case if they had just been left where they fell. The reasons for this are unknown but this alone would make the data unreliable. In addition, one of the other areas, a 15m x 15m square of weedy ground and rough grassland on the south side of the marsh, near to the reeds was ploughed in early December 2005 and so became unsuitable for inclusion in the study. This left only one area, a 10m x 22.5m strip along the long avenue of trees, roughly level with the middle of the marsh, where the level of hunting was thought to be much lower than in other parts of the wetland. Consequently, this survey technique was no longer likely to yield valuable results and so the methodology was abandoned.

Fig 3.9 A hunter at the Aammiq Wetland

4 Additional activities/studies outside the monitoring programme

In 2005, observation visits were made to Aammiq Marsh and its immediate surrounds on at least 270 separate days up to the end of September; the number of actual visits (c.400) exceeds the number of days as frequently two or more person visits have taken place on the same day. A list of all birds observed by A Rocha workers up to the end of 2005 (196 species) can be found in Appendix 7.

Further additional activities which have contributed data in terms of bird and mammal observations include ringing activity other than the Constant Effort Site monitoring, for example for one week in mid-September ringing took place daily in the marsh and the hillside overlooking Aammiq. During this time 313 birds were caught and ringed, of 30 different species. New knowledge about the birds using the marsh and its environs was gained from this activity, e.g., the presence of Long-eared Owl in the area (only one previous record from Aammiq). Educational visits by school and University groups also allowed more data to be gathered.

Fig 4.1 Long-legged Buzzard (*Buteo rufinus*)at Aammiq Marsh

Fig 4.2 Night Heron (*Nycticorax nycticorax*) – one of 215 seen at Aammiq Marsh in 2005 – this bird is a juvenile

5 Training of Lebanese Nationals in Ecological Techniques

5.1 Soumar Dakdouk

Miss Dakdouk has attended 6 bird-ringing sessions with A Rocha Lebanon staff so far during 2005. These sessions were at Aammiq Marsh and at Ain el Lejje, a site on the nearby Jebel Barouk. During all these sessions she received training in bird-ringing techniques in two different habitats, and is making good progress. She has also taken part in informal bird-watching activities with A Rocha Lebanon staff on several occasions and possesses a good level of proficiency in bird identification, but is eager to improve her skills yet further.

Total hours training received during the period of the Pilot Study - 45hrs

5.2 Faisal Halabi

Mr Halabi is employed as one of the guards on the Skaff estate, which includes most of the Aammiq Marsh. His work brings him into contact with wildlife on a daily basis and. He works closely with A Rocha Lebanon staff and for several years has been learning from them particularly about birds, of which he already has a good knowledge but is keen to learn more. This relationship has been formalized this year and he has taken part in bird-watching, and bird-ringing activities. It is his, and our, intention that he become even more closely involved with the ongoing bird monitoring at Aammiq during the remainder of the Pilot Study, and in particular the Fixed Point Count and the Roosting Harrier Count

Total hours training received during the period of the Pilot Study - 50hrs

Fig 5.1 Visiting bird-ringers helping with training of A Rocha Lebanon Staff and Volunteers, Sept 2005

6 Discussion of results of surveys in 2005-6

6.1 Monitoring of the habitats

6.1.1 Vegetation transects

A total of 64 species of flowering plant were recorded on the vegetation transects in 2005. Transect 1 had 52 species while Transect 2 had 43 species. The data from the transects are given in full in Appendix 1 and summarised in Table A1.3, also in Appendix 1. No conclusions can be drawn from these data yet.

6.1.2 Grazing exclosure experiment

36 plant species were recorded in the exclosure and non-exclosure areas together (28 in the exclosure and 32 in the non-exclosure.) It is too early to expect to see any statistically significant difference between the two areas, and the greater number of species in the non-exclosure can probably be attributed to chance.

6.1.3 Mapping habitats within the Aammiq Marsh area

This exercise will be repeated 3-5 years after the creation of the existing Aammiq Habitat Map (see Fig A9.1 in Appendix 9), which was during the winter of 2004-5. This will therefore take place some time between the end of 2007 and early 2010, at which point the two maps will be compared to look for any large-scale changes in the distributions and abundance of the different habitat types.

6.1.4 Counting and mapping of trees within the Aammiq Marsh area

1219 mature trees of 8 different species were counted in the Aammiq Wetland area in 2004-5. This will be repeated at the same time as the habitat mapping (see section 6.1.3, above) and the figures from the two counts compared. This comparison can then be used to inform future decision about the management of the wooded habitats in the wetland.

6.1.5 Mapping maximum flooded area

By the end of January 2006, the flooded area at the Aammiq Wetland covered approximately 141 hectares. The situation will be reassessed later in the season and if necessary the figure updated. Subsequently, the flooding will be mapped annually and the area calculated, and any changes relative to previous years can be detected.

6.1.6 Mapping burned area

In December 2005 a single fire burned approximately 40% of the reedbeds in the wetland and approximately 9% of the rough grazing areas. Any effects, positive or negative, of this on the ecosystems at Aammiq are likely to be seen in the long term rather than the short term. Consequently, this fire, and any future ones, must be borne in mind when trying to interpret the data from habitat, vegetation and zoological surveys in the future.

6.2 Monitoring specific important plant species

Of the 9 species being monitored under this heading only five have been seen at Aammiq in recent years and the approximate distributions of these can be seen on the maps in Appendix 9. This data forms a baseline with which the data from future years can be compared and any trends detected. Of the 4 species which weren't recorded in 2005, only one, Laxmann's Reedmace (*Typha laxmannii*) is a plant of wetlands which is native to the region, while of the remaining 3 species, 2

are non-wetland plants, while the third, Water Pennywort (*Hydrocotyle ranunculoides*) is native to North America.

6.3 Monitoring of birds and mammals

6.3.1 Bird and mammal transect

Over the course of the Pilot Study period, 55 species of bird and 1 mammal species were recorded on 48 transect visits. Many of the bird species were only recorded on a few occasions and only 10 were seen/ heard on 15 or more dates. These are:

Water Rail (*Rallus aquaticus*)	19 occasions
Bluethroat (*Luscinia svecica*)	15 occasions
Cetti's Warbler (*Cettia cetti*)	40 occasions
Zitting Cisticola (*Cisticola juncidis*)	29 occasions
Graceful Prinia (*Prinia gracilis*)	21 occasions
Moustached Warbler (*Acrocephalus melanopogon*)	31 occasions
Reed Warbler (*Acrocephalus scirpaceus*)	31 occasions
Great Reed Warbler (*Acrocephalus arundinaceus*)	21 occasions
Penduline Tit (*Remiz pendulinus*)	24 occasions
Corn Bunting (*Miliaria calandra*)	17 occasions

From this it would appear that the main value of this survey technique is for passerine birds, as all except Water Rail fit into this category. As with the other survey methods piloted this year, the 2005-6 dataset constitutes a baseline with which the results from future years can be compared.
The results from this survey are discussed in greater depth in section 7.2 ("Occurrence of reedbed passerines throughout the year") below.

6.3.2 Fixed-point bird and mammal count

In the period covered by this report 48 counts were carried out using the methodology described in section 3.3.2. During these surveys, a total of 78 bird and 2 mammal species were seen. Of the 21 bird species that were recorded on 15 or more visits, 15 were non-passerines which are strongly associated with water. The greatest value of this survey technique is for monitoring breeding, wintering and passage populations of herons, ducks, Little Grebe (*Tachybaptus ruficollis*), Coot (*Fulica atra*) and Common Moorhen (*Gallinula chloropus*). These species, and other large waterbirds, are good indicators of the health of the wetland environment, and so the fixed-point count methodology is a simple way of measuring this.
Of the mammals recorded on the Fixed-point count, the most interesting is the single record of an Otter (*Lutra lutra*). This species, which is extremely rare in Lebanon, is a very shy, mostly nocturnal creature, which is rarely sighted even in areas where it is known to be common, and so this single sighting, during daylight, is unusual.
The results of this survey are further discussed in section 7.3 ("Occurrence of waterbirds throughout the year"), below.

6.3.3 Constant effort bird-ringing

During 2005, 870 birds of 24 different species were ringed during the CES (Constant Effort Site) programme at Aammiq. The total number of birds caught was 1104, but this includes some individual birds which were caught several times and so the figure for new-ringed birds gives a more accurate picture. Of the 870 new-ringed birds, more than half (481) were of the same species, Reed Warbler (*Acrocephalus scirpaceus*).
Although there has been disruption to the CES-ringing programme because of the fire in December 2005, which will prevent ringing taking place during the spring migration and the early part of the

breeding season in 2006, once ringing recommences it will be possible to compare the data from individual weeks and months with the same week/ month in 2005.

6.3.4 Roosting harrier count

Of the four species of harrier (*Circus*) which were targetted by this survey, Marsh Harrier (*C aeruginosus*) (max. 38 birds) and Hen Harrier (*C. cyaneus*) (maximum 25 birds) were both the most abundant and present for the longest period. Hen Harrier is principally a winter visitor, although some of the records from September-October and March-April may be of birds passing through on their way to and from wintering grounds further south. Although the same can be said of Marsh Harrier, during 2005 between 1 and 3 birds were present throughout the summer. These were thought to be all juveniles and no evidence was seen to suggest that they successfully bred.

The other two species, Montagu'sHarrier (*C. pygargus*) (max. 10 birds) and Pallid Harrier (*C. macrouros*) (max. 4 birds), are both mainly passage migrants, with Pallid also being present in very low numbers in the winter. This dataset clearly shows, even in the absence of other years' data to compare with, that Aammiq is a very important site for harriers.

The results of this survey are discussed in greater detail in the report which makes up Appendix 5.

6.3.5 Corncrake and Great Snipe survey

In Spring 2005, 10 Great Snipe (*Gallinago media*) (max. 5 birds), and no Corncrake (*Crex crex*)were recorded during this survey, although Corncrakes were seen on several occasions during other surveys and casual visits to the marsh. The reasons for this difference between the two species are unclear but it may be that this survey technique is valuable for recording Great Snipe numbers and less so for Corncrake. However, the data from future years may indicate otherwise.

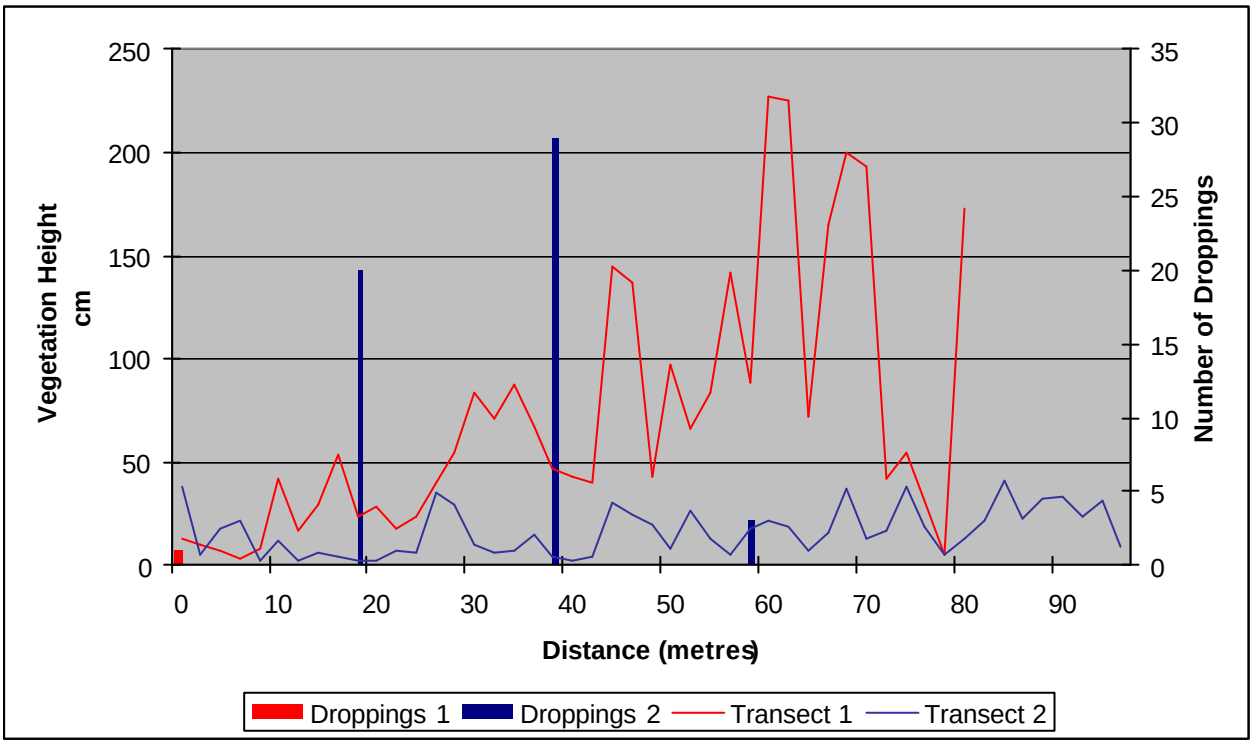
6.4 Monitoring of hunting activity within the Aammiq Marsh

Hunting is still clearly an on-going problem in the Aammiq area (see graph 3.4 above) although most of the shots heard during the fixed-point count come from the far eastern end of the marsh, where hunters know they can carry on their activities unchallenged. Future years' data will show whether or not there is a connection between the level of hunting (as measured by a single hour's shot-count per week) and bird populations at different times of the year. The twice-yearly count of spent cartridges proved to be unworkable and was discontinued.

7 Additional Discussion of Results

7.1 The effect of grazing pressure on vegetation height

Graph 6.1 shows that in Transect 2, the vegetation is low along the length of the transect (nowhere more than 50cm), whereas in Transect 1, it gradually increases to a maximum height of 227cm, and for more than half of the transect it is greater than 100cm. The numbers of sheep/goat droppings found, however, are very low in Transect 1 (only 1 dropping from six $1m^2$ quadrats) and much higher in the other transect (52 droppings found in the six quadrats). Assuming that the greater number of droppings found indicates a higher level of grazing in Transect 2 (and not just that it is easier to find droppings in short grass), then there would seem to be good circumstantial evidence pointing to a correlation between grazing pressure and vegetation structure. However, with only 1 year's data, and only two transects, other causes cannot be ruled out. It would also be unsafe to try to draw any conclusions about other effects of grazing such as effects on species composition, dominance, etc. at this juncture.



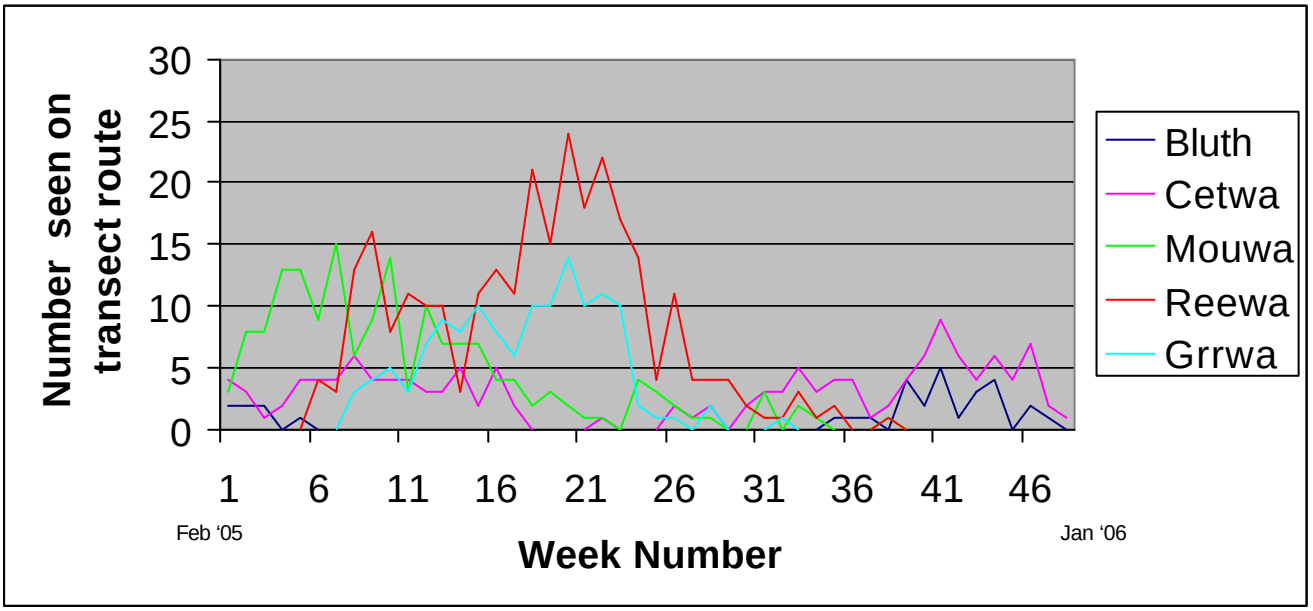
Graph 6.1 Comparison of vegetation heights along the two transects, with the numbers of sheep or goat droppings found at selected points along the transects ["Droppings *n*" = droppings found on Transect *n*]

7.2 Occurrence of reedbed passerines throughout the year

The data gathered from the Bird & Mammal Transect during the Pilot Study back up existing schools of thought about the migratory patterns of three passerine birds at Aammiq. The first two of these are Reed Warbler and Great Reed Warbler, which arrive in the early spring, from their winter quarters, in Africa, and leave in late summer and autumn, after breeding. This is shown in Graph 6.2. The third species, Bluethroat, however, is a winter visitor, which was last seen on the transect in week number 7 (i.e. 5th April 2005 (see Table A2.1 in Appendix 2)) and didn't arrive back until week 35 (19th October 2005).

The figures for Moustached Warbler also appear agree with previously published accounts. It is described in *The Birds of the Aammiq Area* (A Rocha, 2002) as "a common migrant breeder from March to June, with peak numbers in April" but "found sporadically throughout the rest of the year". However, the CES Bird-ringing programme tells a slightly different story (See Table A4.2-A4.4 in Appendix 4). The numbers of new birds caught (Table A4.2) show numbers climbing steadily during April and May, with high numbers in both June and July. Numbers after July are lower but still show a steady stream of unringed birds until November. These later birds are probably migrants from populations further north, passing through on their way to wintering grounds in the south. However, in the absence of recoveries/ controls from countries to the north, we cannot say this for certain.

The 5th species illustrated in the graph is Cetti's Warbler. The graph appears to show that it mostly leaves the area from June to September, whereas the ringing data shows that it is present in greater numbers in July and August than at other times of the year. However, after mid-summer the birds do not generally call as much and are concentrating on raising young. Consequently, these inconspicuous birds are not recorded as much, at these times of year, by non-invasive techniques, although the numbers are actually swelled by newly fledged birds.



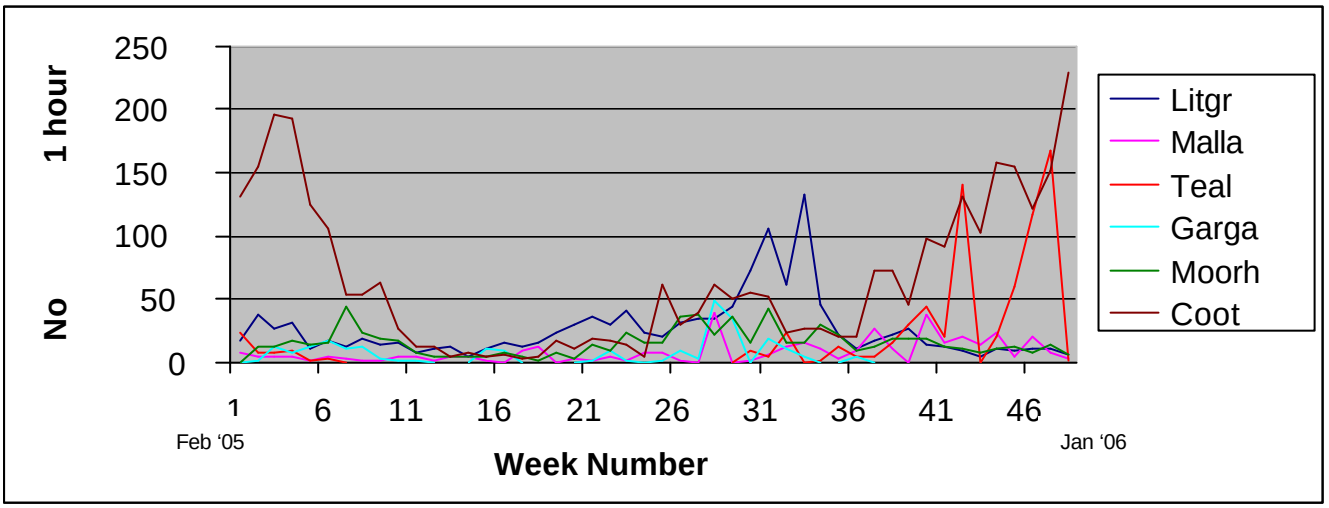
Graph 6.2 The occurrence of five species of reed-bed birds at Aammiq Wetland, over a 48-week period in 2005-6.
[Bluth=Bluethroat, Cetwa=Cetti's Warbler, Mouwa=Moustached Warbler, Reewa=Reed Warbler, Grrwa=Great Reed Warbler]

7.3 Occurrence of waterbirds throughout the year

Graph 6.3 shows how numbers of 6 species of water-bird vary throughout the year. Although this largely agrees with previous knowledge about these species, there are a few exceptions.

Firstly, the numbers of wintering Coot at Aammiq appear to have risen markedly in recent years. Prior to the winter of 2004/5, the highest count of Coot ever made at the wetland was 68, in February 2003. However since then there have been 24 higher counts, including 19 of 100 or more, and 3 counts of over 200 birds (although not all of these were made during the Fixed-point count). The reasons for this are unclear but may be connected to increased water levels throughout the year, prevention of burning of the reeds in the area around the Springs, and reduction in disturbance. Also, Coots, along with Moorhen and Mallard, are now present throughout the year, as the marsh no longer dries out completely in the summer.

Garganey also displays a slightly different pattern of occurrence, now that there is water present throughout the summer. Previously it was scarce in the Autumn passage period, presumably because there was no water for it to land on. In 2005, however, the highest count of the year was made at the end of August, when 48 Garganey were seen during the Fixed-point Count, with 35 being seen the week after.



Graph 6.3 The occurrence of six species of water-birds at Aammiq Wetland, over a 48-week period in 2005-6.
[Litgr=Little Grebe, Malla=Mallard, Teal=Eurasian Teal, Garga=Garganey, Moorh=Moorhen, & Coot=Eurasian Coot

8 Conclusions

The Aammiq Wetland Ecological Monitoring Pilot Study ran for one year from February 2005 to January 2006. The work was carried out by staff and volunteers of A Rocha Lebanon under the supervision of the Scientific Director, Mr Colin Conroy MSc. and the Director Mr Christopher Naylor MA.
The two main aims of the study were that it would be used to test the practicalities of various proposed techniques for the long-term ecological monitoring of the Aammiq Wetland, and that the data generated would constitute the first full year of data for this long-term monitoring. It was therefore also the intention that, at the end of the study, the methodologies would be finalised for use in the long term.
The monitoring techniques piloted were divided into four categories:
Monitoring of the habitats
Monitoring of specific important plant species
Monitoring of birds and mammals
Monitoring of hunting activity within the Aammiq Marsh

The details of the precise techniques used and the changes made to them are given in Section 3 of this report, along with some of the results, while the rest of the data gathered is shown in the appendices. For most of the methodologies, only minor changes were made to those proposed in the original project proposal. However, one of the two surveys piloted for the hunting activity category, had to be abandoned altogether. This was the twice-yearly count of shot-gun cartridges, which proved to be impractical for several different reasons.

The remaining survey techniques, in their modified forms, have yielded valuable data for this, the first year of long-term monitoring at the Aammiq Wetland and it is recommended that they be continued for the foreseeable future as a way of assessing the on-going overall health of the habitats.

The study had a third aim, which was that during the course of the year at least two Lebanese nationals would be trained in the monitoring techniques used, the idea being that eventually the long-term monitoring of the marsh ecosystems can be carried out entirely by Lebanese people. This aim was met with training being given in bird-ringing and bird identification to Mr Faisal Halabi and Miss Soumar Dakdouk.

Although this data constitutes a 'base-line' for the current state of the ecosystems of Aammiq, and therefore no patterns or trends can yet be looked for, the results from the bird surveys in particular do show that the marsh and its immediate vicinity is very important for many species, both as a stop-over site for tired migrants and as a habitat for breeding and wintering birds. This is undoubtedly connected to the balance of different wetland habitats present.

APPENDIX 9 – Maps

Fig A9.1 Map showing distribution of habitats at the Aammiq Wetland, based on fieldwork done in Autumn 2004

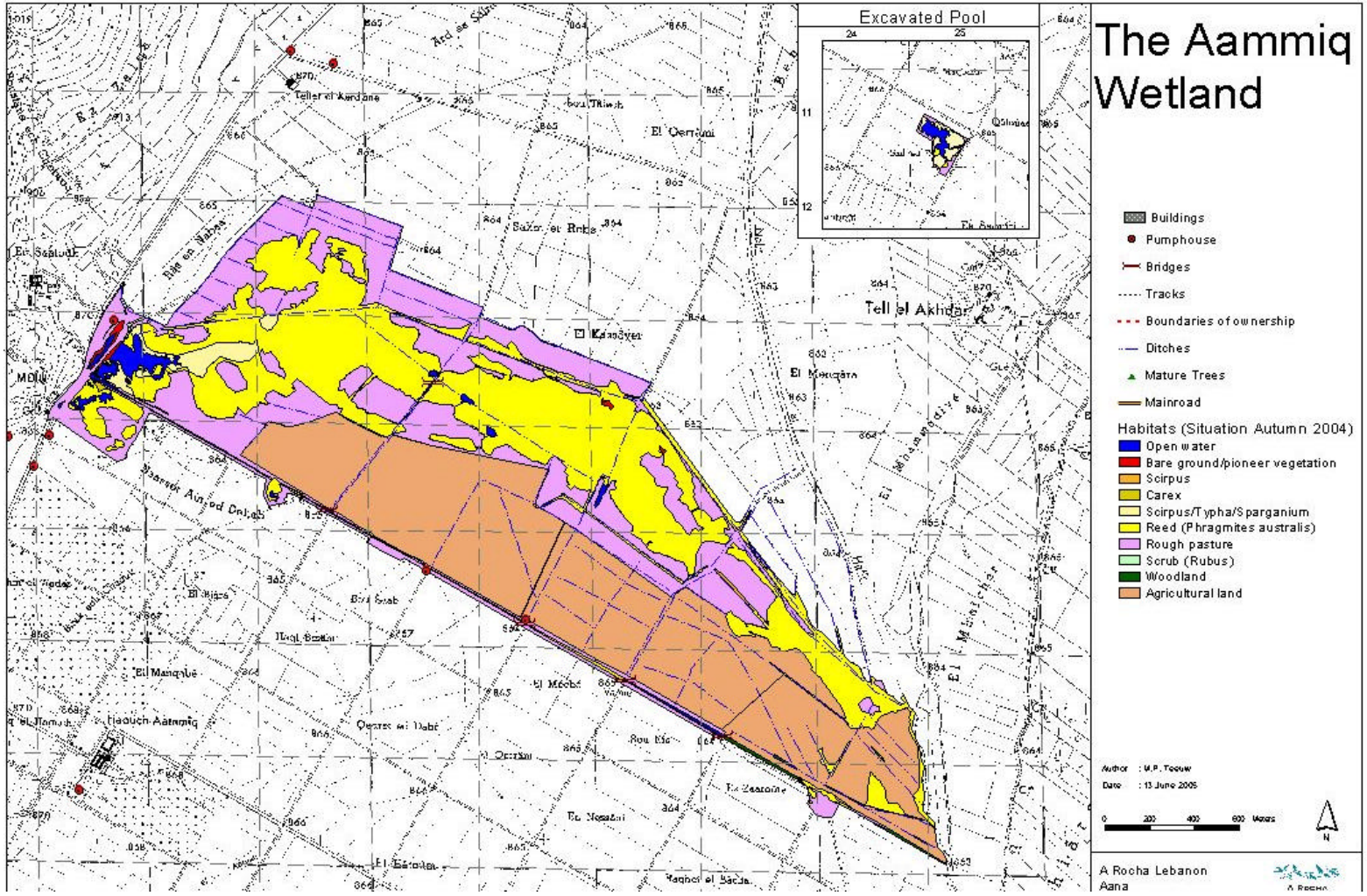


Fig A9.2 A section of the Aammiq Habitat Map showing the locations of the sampling sites, transects etc. established in 2005 as part of the Monitoring Pilot Study. The cartridge collection points are not shown as this methodology had to be abandoned.

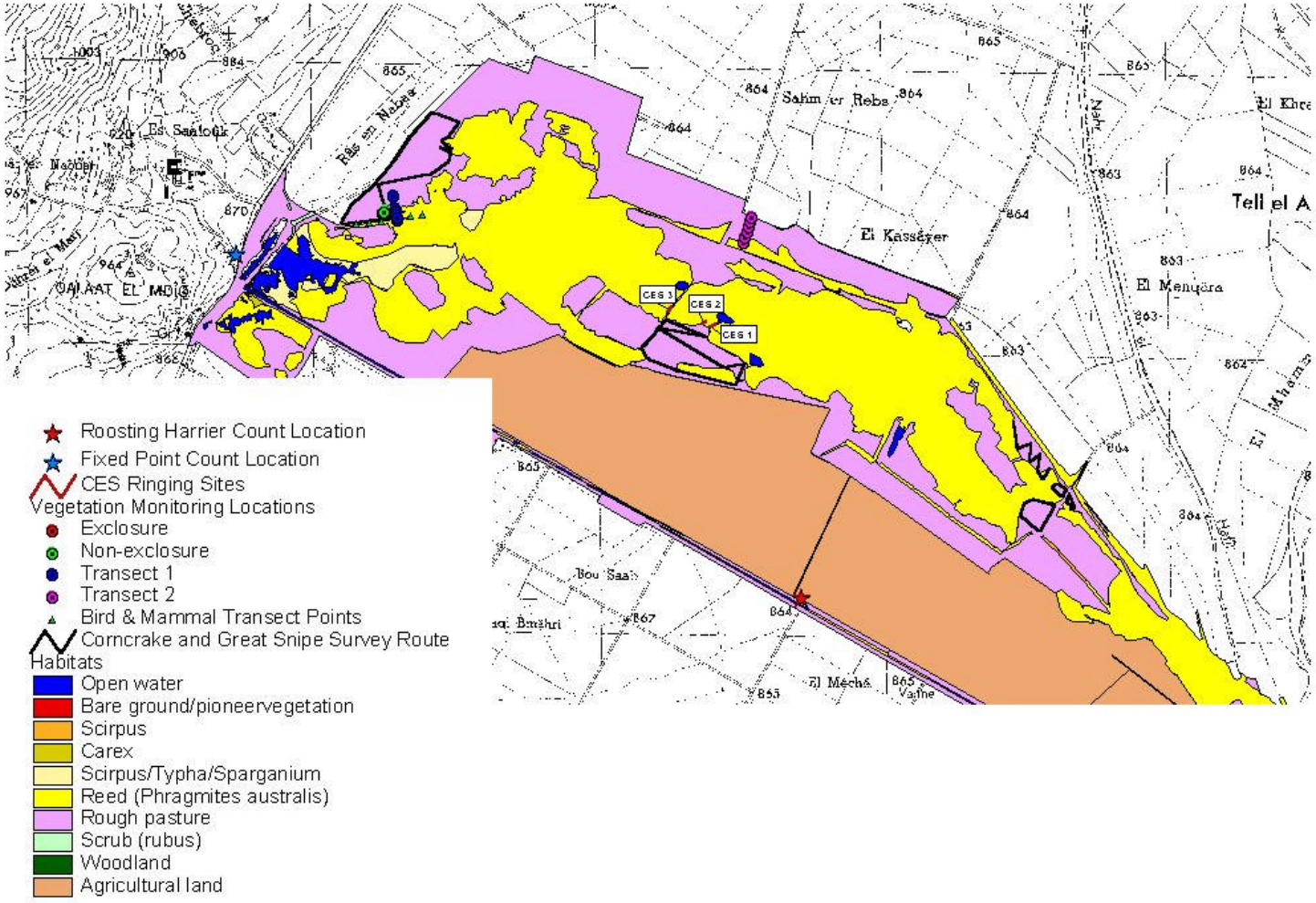


Fig A9.3 Approximate extent of flooded area – end of January 2006

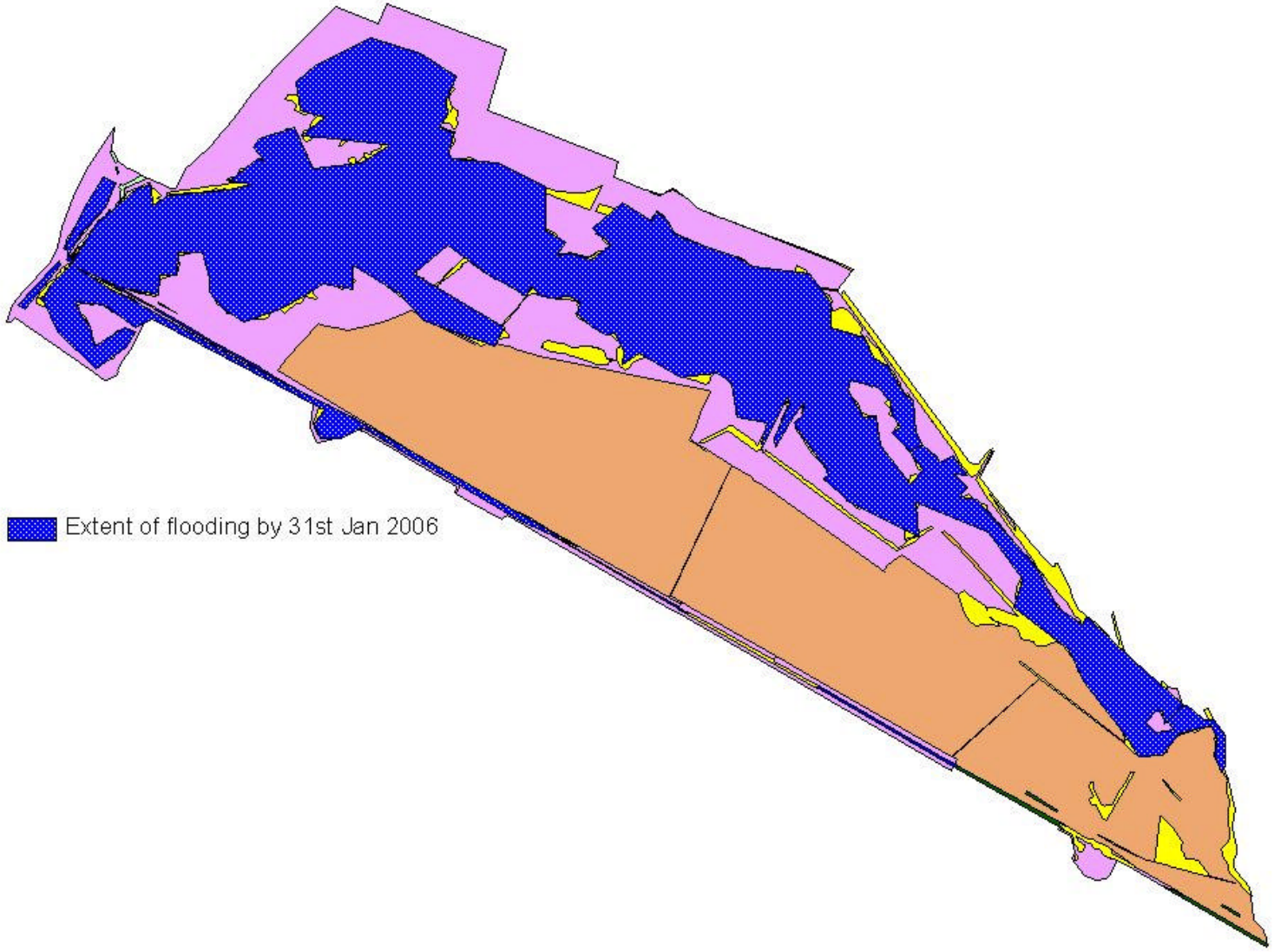
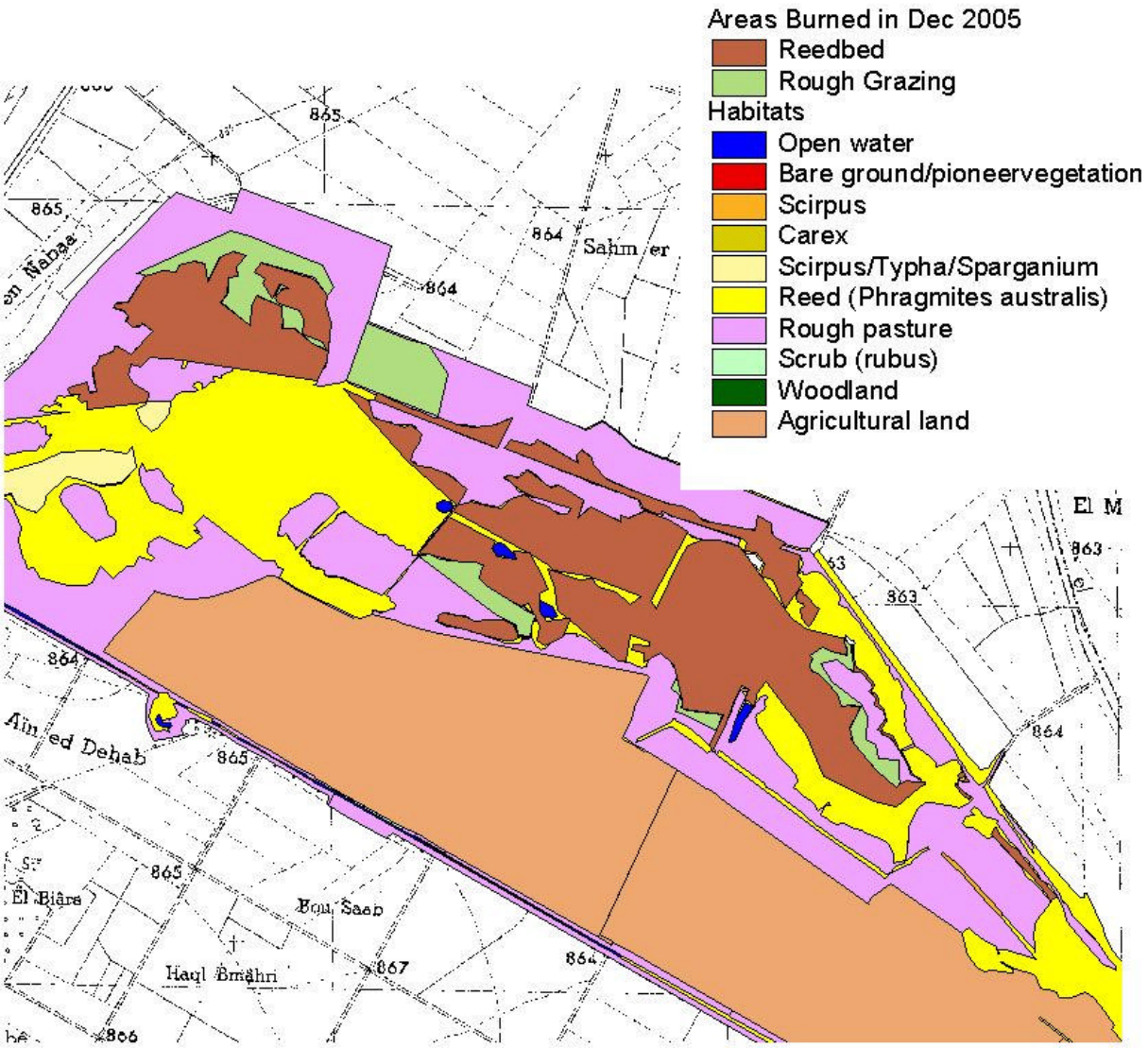


Fig A9.4 A section of the Aammiq Habitat Map showing the areas of Reedbed and Rough Grazing habitats which were burned during the fire on 11th Dec 2005



Figs A9.5-A9.8 Are fragments of a simplified habitat map of Aammiq Wetland, showing the approximate distributions in 2005/6 of the Important Plant Species at Aammiq. **Fig A9.8** is a summary map of Aammiq Wetland showing the approximate locations of the areas depicted in Figs A9.4- A9.7.

Fig A9.5 *Nasturtium officinale* (Watercress)

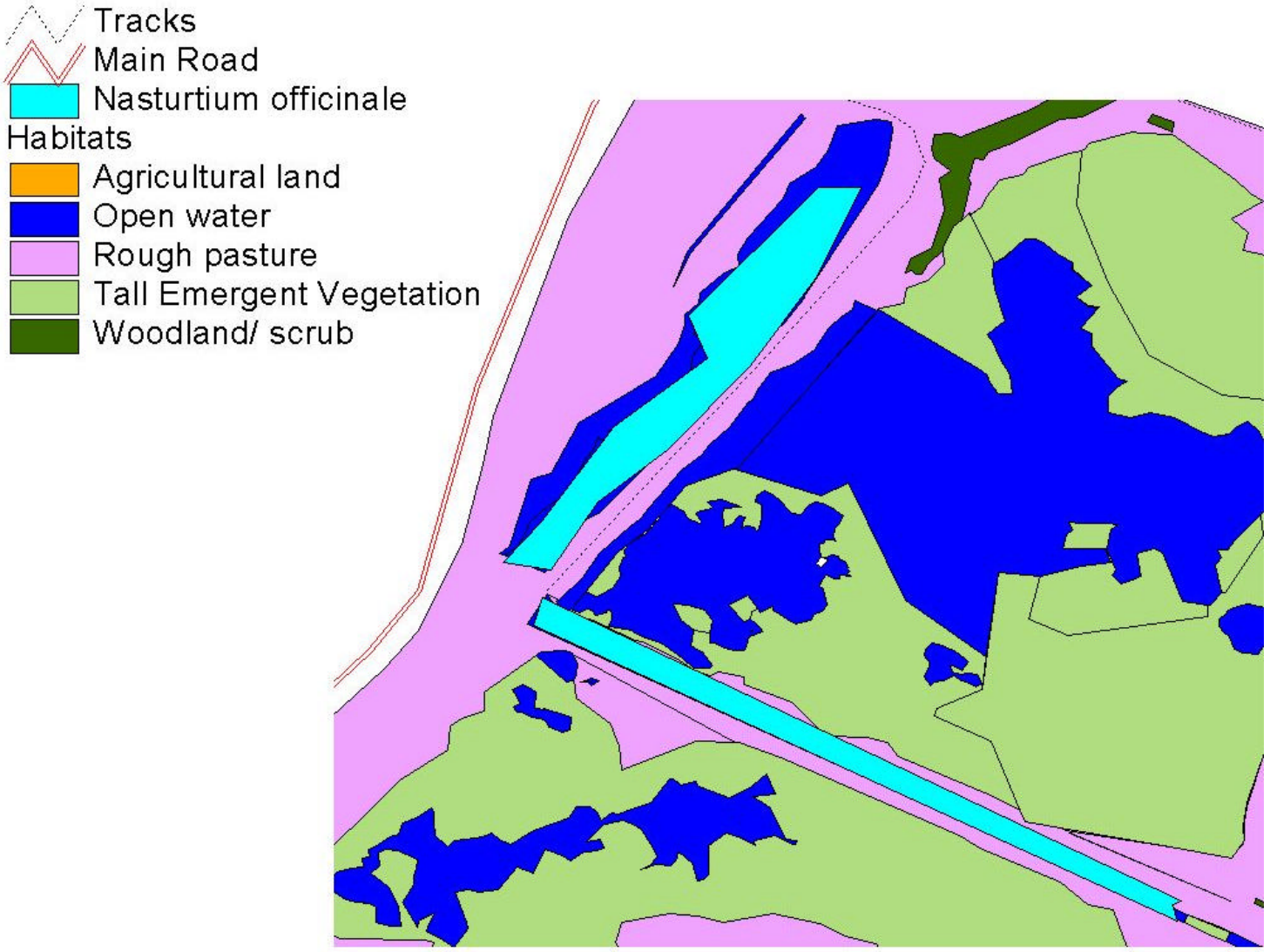


Fig A9.6 *Mentha pulegium* (Pennyroyal)

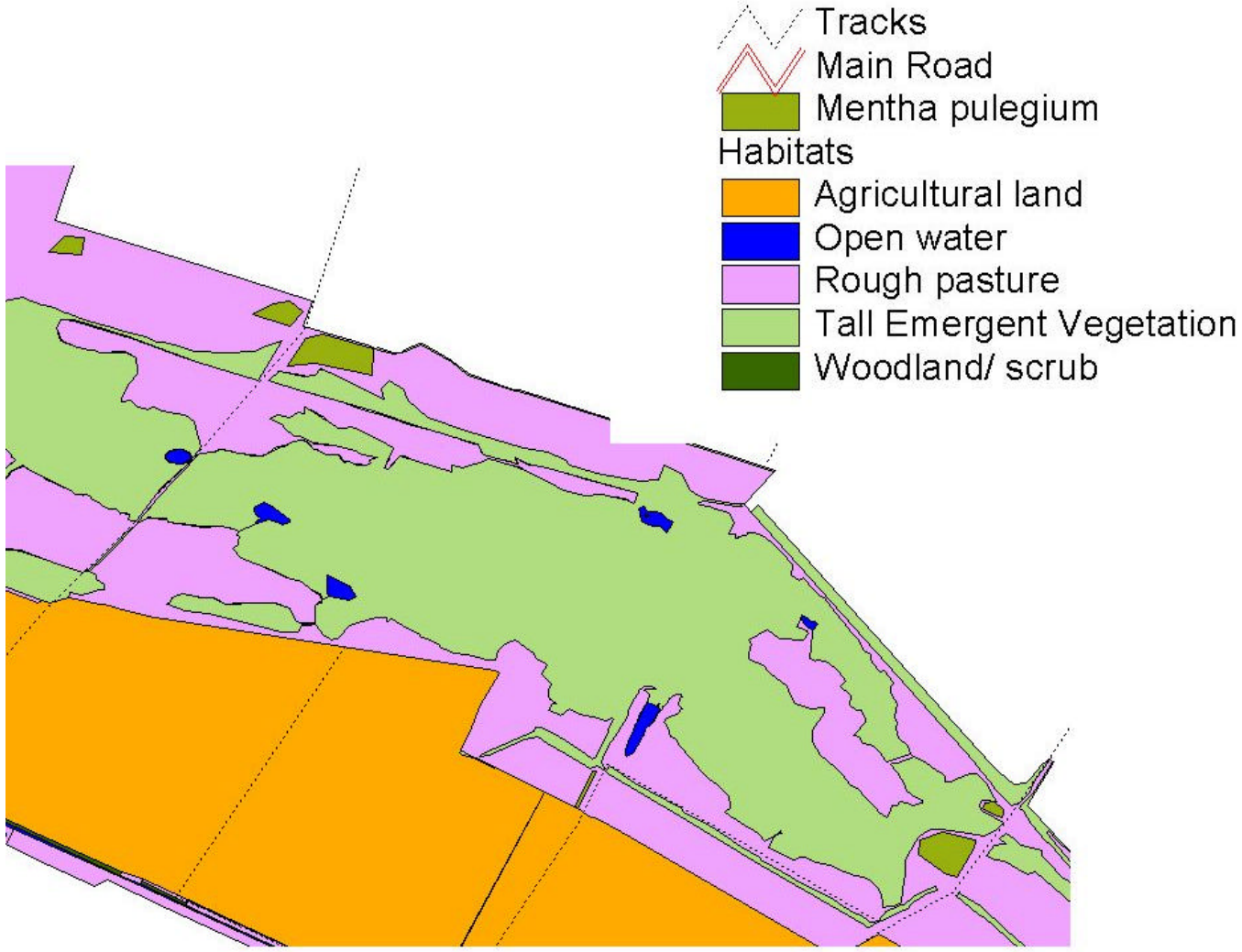


Fig A9.7 *Merendera sobolifera* (Bulbous Merendera), *Scirpus tuberosus* (Tuberous Club-rush) & *Alisma plantago-aquatica* (Greater Water-plantain) – Western area

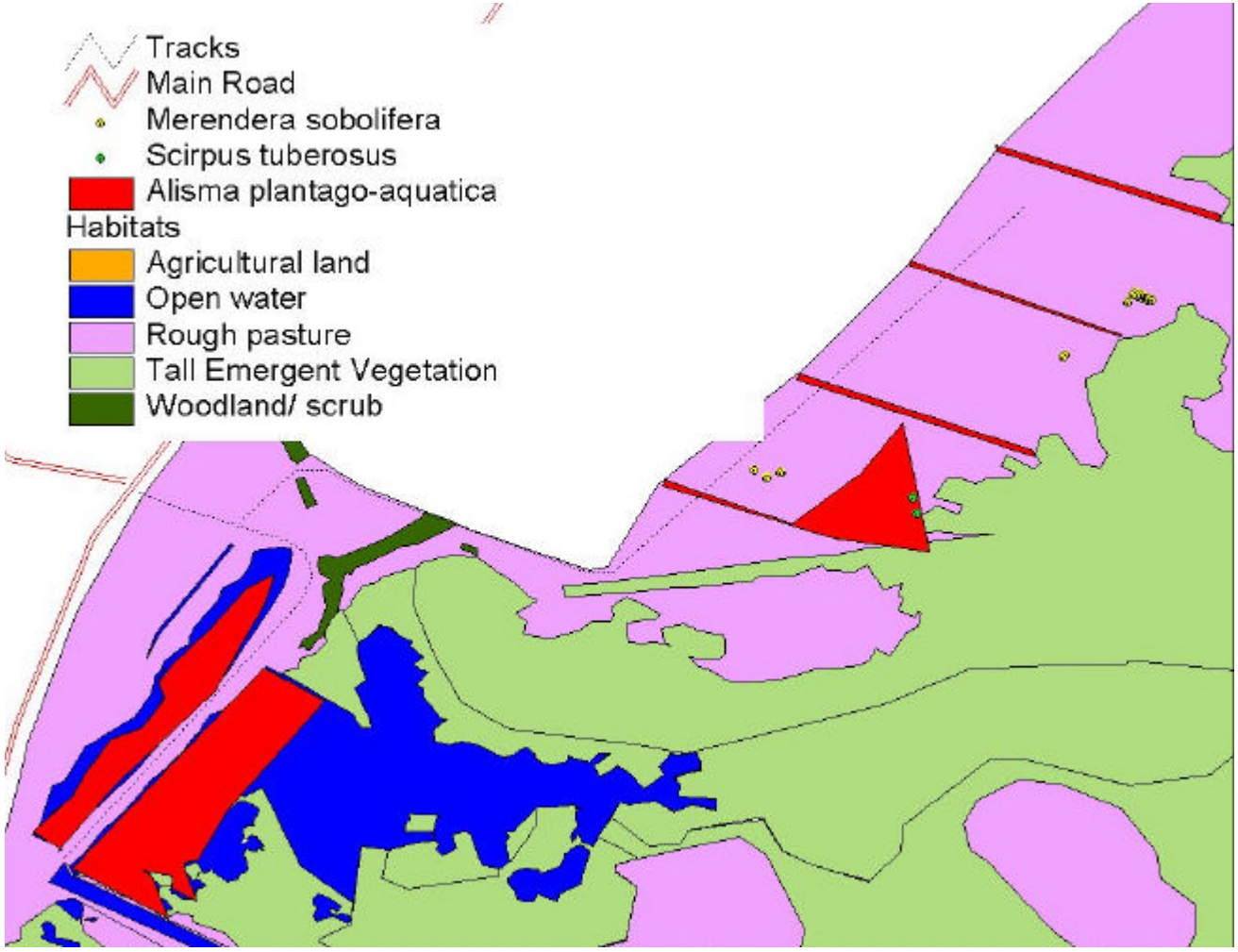


Fig A9.8 *Merendera sobolifera* (Bulbous Merendera), *Scirpus tuberosus* (Tuberous Club-rush) & *Alisma plantago-aquatica* (Greater Water-plantain) – Eastern area

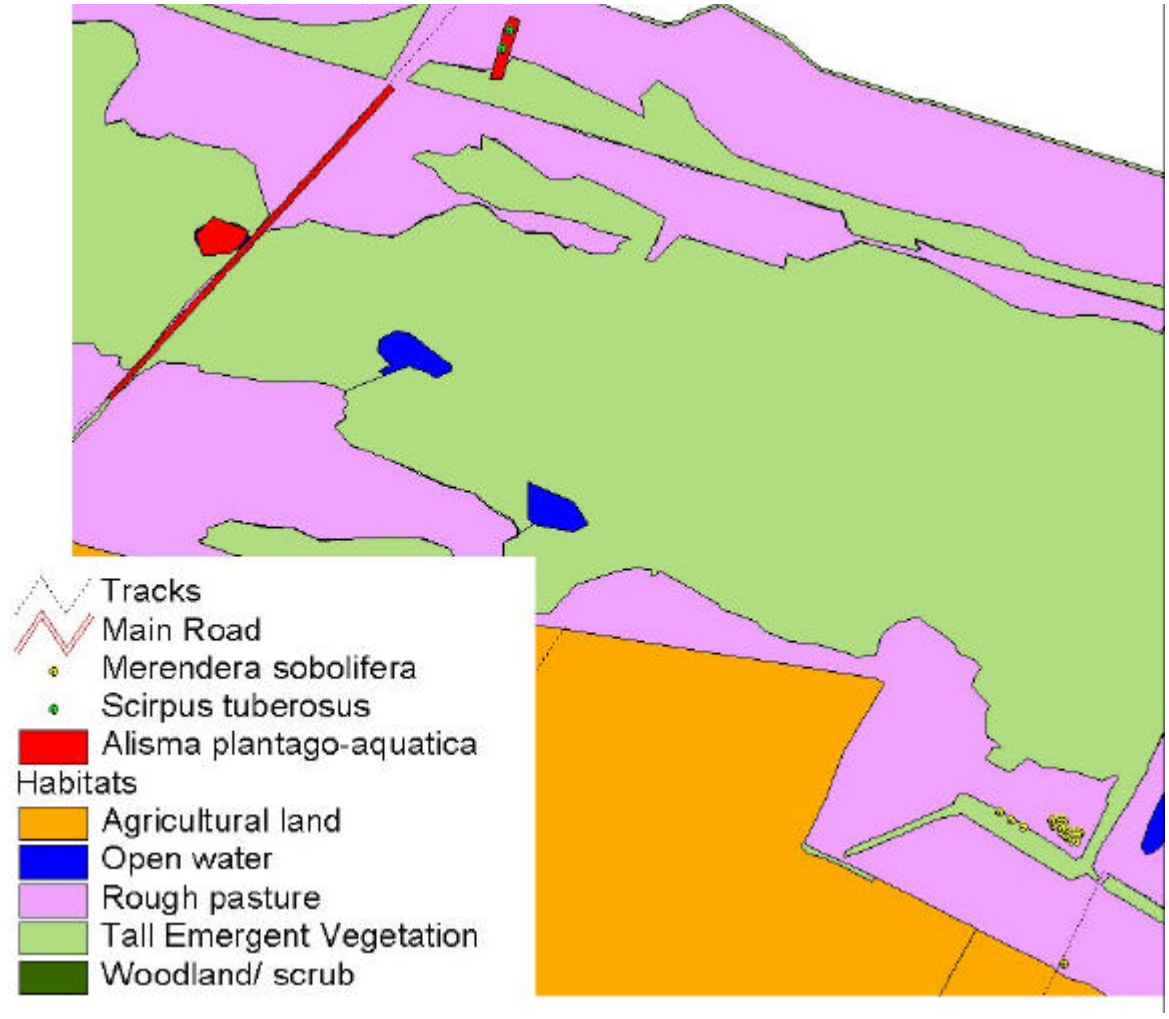


Fig A9.9 Summary Map