SITE MANAGEMENT PLAN FOR AKROTIRI MARSH, CYPRUS SBAs

BirdLife Cyprus

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Project partners:

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www.akrotirimarsh.org

List of abbreviations

FRVs: Favourable Reference Values

IBA: Important Bird Area

RSPB: Royal Society for the Protection of Birds (BirdLife United Kingdom)

SAC: Special Area of Conservation

SCI: Site of Community Importance

SPA: Special Protection Area

SPEC: Species of European Conservation Concern

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1. INTRODUCTION

Importance of Akrotiri Marsh

Akrotiri Marsh is part of the Akrotiri wetland complex, the largest natural wetland system of the island. The Akrotiri wetlands make a significant contribution to the maintenance of biodiversity in the eastern Mediterranean biogeographic region. The wetlands are of international importance in containing good quality examples of inland saline and freshwater wetland habitats, a combination that is unique within the biogeographic region of the eastern Mediterranean (Jonathan Cox Associates Ltd, 2009) and are also a Ramsar site under the Ramsar Convention.

Akrotiri Peninsula is a recognised Important Bird Area (IBA) and is designated as a Special Protection Area (SPA) and a Special Area of Conservation (SAC) equivalent to the EU designation, according to the Cyprus Sovereign Base Area (SBA) mirror laws: Game and Wild Birds Ordinance (21/2008) and Protection and Management of Nature and Wildlife Ordinance, (26/2007). The SAC, SPA and Ramsar maps can be found in Appendix 5.

The Akrotiri Marsh site itself covers an area of around 150 hectares supporting significant numbers of rare, vulnerable and endangered plant species included in the Red Data Book of the Flora of Cyprus. The Red Book plants recorded at Akrotiri Marsh are *Baldelia ranunculoides*, *Cynanchum acutum*, *Euphorbia hirsute*, *Ipomoea sagittata*, *Juncus maritimus*, *Mentha aquatic*, *Orchis palustris*, *Phyla nodiflora*, *Scirpus lacustris subsp*. t*abernaemontani*. 76 bird Species of European Conservation Concern (SPECs) and 64 bird species (/subspecies) listed in Annex I of the EU Birds Directive, (34 species are both SPEC and Annex I species) have been recorded at the site.

For some plants such as *Ipomoea sagittata*, *Mentha aquatica*, *Euphorbia pubescens*, *Orchis palustris* and *Baldelia ranunculoides*, Akrotiri Marsh is their only known site in Cyprus. Akrotiri Peninsula is also one of the botanical hotspots in Cyprus, hosting more than 800 estimated indigenous plant taxa.

The whole of Akrotiri Marsh is Crown Forest land, which is subject to Akrotiri villagers' grazing rights and rights to exploit natural resources such as plants for basketry and water.

The Annex I species Black-winged Stilt (*Himantopus himantopus*), Spur-winged Lapwing (*Vanellus spinosus*), Ferruginous Duck (*Aythya nyroca*) have breeding records at Akrotiri Marsh. For the Ferruginous duck, a species of global conservation concern that is a very rare breeding bird in Cyprus, Akrotiri Marsh is amongst the best breeding sites in Cyprus. Other important breeding birds are Black Francolin (*Francolinus francolinus*) and probable Little Bittern (*Ixobrychus minutus*). Also of note are the Reed warbler (*Acrocephalus scirpaceus*) and the Black-headed Yellow Wagtail (*Motacilla flava feldegg*) which breed only at a few sites in Cyprus. In addition, a further 60 Annex I species and 68 SPEC species visit during migration in spring, autumn or winter (overlap is 34), and there are a further 87 non-Annex I species that visit in spring autumn or winter and 76 non-SPECs (of which 23 are on Annex I, so 53 non-SPEC non-Annex I). In total, about 200 species have been recorded at the site. Ferruginous Duck *Aythya nyroca* nested successfully at the Marsh in 2005, 2006, 2007, 2009, 2010, 2011, 2012 & 2015. The full list of bird species recorded at Akrotiri Marsh up to the end of 2016 is given in Appendix 1.

West of the site (marked with no 1 on Figure 2), outside the boundaries of designation there is a scrape that seasonally holds water, especially during winter and in early breeding season. This additional wetland area is of significance to the designated wetland as they could be important for some of the species discussed here (particularly Spur-winged lapwing, *Vanellus spinosus*) and potentially for others, especially if management is complementary to that outlined below.

Figure 1: The Akrotiri Marsh area (outlined in black). Also shown here is a seasonally flooded area on farmland close to the western edge of the marsh (marked with no1)

2. THE DARWIN FUNDED PROJECT "AKROTIRI MARSH RESTORATION: A FLAGSHIP WETLAND IN THE CYPRUS SBAS"

2.1 State of Akrotiri Marsh at the start of the project

The extensive reed bed (*Phragmites australis*) of the Marsh is a relatively new feature that has taken over the majority of the Marsh's area only during recent decades. The northern part of the Marsh features a grazing area which was traditionally (and still is) grazed mainly with Cyprus breed cattle. Due to grazing, this area (around 12.5 ha at the start of the project) has been maintained reed-free and covered by wet meadow vegetation.

Figure 3: A sequence of satelite photos (Google Earth) in recent years, 2003 (top), 2004 (middle) and 2013 (bottom), showing the expansion of reeds within the Marsh.

However, in recent decades, the number of cattle on site had decreased, allowing reeds to expand both in the flooded areas and the drier ones. In addition to the decreased grazing intensity, other factors that contributed to the expansion of the reed bed were the hydrological changes brought by the construction of Kouris dam in 1988 (reduced water input into the system) and the lack of habitat management. The open water areas were significantly reduced (see Figure 4), although there is no record of by how much, and, with the encroachement of reeds, the habitat diversity was also reduced. As with many other sites in Cyprus, there was also the issue of disturbance affecting the breeding success of birds. Disturbance was mainly caused by people who accessed the site throughout the year, in an uncontrolled manner. The disturbance was generated by both walking and driving through the site (in the more open, grazed area). A lack of public awareness about the importance of the site and its protection status also led to the site being neglected rather than been seen as a special area worthy of protective/conservation management.

The Red Book plant species which have not been found in the last few years are *Baldelia ranunculoides*, *Cynanchum acutum*, *Orchis palustris*. *Baldelia ranunculoides* was last recorded on site in 2000 due to changes in hydrological conditions and/or prolonged fires. The subpopulation of *Cynanchum acutum* was probably vanished possibly due to continuous flooding. *Orchis palustris* was last recorded at Akrotiri Marsh in 2002 and the last subpopulation was probably destroyed by the permanent flooding of its habitat due to blockage of the drainage ditches.[1]

The expansion of reeds into open water areas slowly turned the Marsh into a simplified, reed dominated system which led to a reduction of biodiversity.

Figure 4: Aerial photo of the northwest area of Akrotiri Marsh taken in 2006 (P. Charilaou) and aerial photo of Akrotiri Marsh taken in 2015 as part of the project. Red dot shows the approximate same point on the Akrotiri Marsh road.

[1] T. Tsintides, C.S. Christodoulou, P. Delipetrou, K. Georghiou (2007). The Red Data Book of the Flora of Cyprus.

Habitat and Hydrology – baseline situation at project start

The 150ha of the Akrotiri Marsh is largely flat and low-lying, characterised by low permeability soils with high residual salt concentrations, brackish groundwater, and a highly seasonal rainfall input followed by a prolonged summer drought season, in most years. In addition to rainfall inputs there are surface water and spring inputs from the catchment to the north of the marsh.

The topography of the site and the presence of salt residues indicates a history of sea water inputs, suggesting that the lower parts of the site could, in historical times, have been connected to the sea. Groundwater levels on the site are 2m or more above current sea level and show some pressure, a clear indication that there is currently no marine influence.

The combination of a low-lying, impermeable land and brackish groundwater in a Mediterranean climate tends to generate a seasonal drawdown type system with fluctuating salinity (from largely fresh in winter to hypersaline or dry in late summer), surrounded by brackish tolerant communities of *Phragmites australis* and salt meadows. This is largely the case at Akrotiri, but the higher ground levels and significant surface and groundwater inputs on the northern edge of the site have resulted in a more characteristically freshwater habitat in that area.

The site has been modified at various times, notably by a series of surface drains to gravity drain the wet areas, including stop-log type sluices to retain water when needed. These have fallen into disrepair in recent years, which has reduced the overall drainage effect and any control, resulting in the spread of reed into more open seasonal drawdown grassland. These dynamic wet margins are some of the most valuable habitats on the site, but are reliant on access for cutting and grazing, taking advantage of seasonal water drawdown. The result of the reed spread has been smaller and more fragmented wet meadows, and an abrupt reed edge. Akrotiri Marsh is connected to Akrotiri Salt Lake via a narrow vegetated channel, with the Marsh sitting slightly higher.

The reed bed itself has also been left largely unmanaged partly due to access difficulties, resulting in very dense and tall reed with an abundance of litter accumulation. It is also possible that the reed bed itself may have become lower during periods of more intensive drainage which may have resulted in less effective gravity outflows - peat often decays under such conditions (drainage) in such environments.

2.2 Site Management Plan

The Darwin project (DPLUS034) was implemented (April 2015 – May 2017) to restore the biodiversity value of the marsh through a combination of research, direct conservation work and public awareness initiatives. The significant changes on the site, summarised in the 'Management actions as part of the Darwin project' section below, have led to more effective control of site conditions (habitat creation, water levels, access control and vegetation management with grazing), better enabling effective management of the site for key breeding species, migratory and wintering birds as well as Red Book plants.

This Site Management Plan is therefore written as part of the Darwin project to complement the existing Management Plan (which focuses on the entire Akrotiri Peninsula) and provide current management guidance incorporating recommendations from reports completed through the Darwin project, which weren't available when the Management Plan was written. This is a 5-year Management Plan which is recommended to be reviewed in 5 years time.

This Site Management Plan will highlight threats which may potentially have an impact on the key breeding bird species and will provide clear, concise, practical management objectives and actions, which can be carried out to enable the maintenance and continued improvement of the site's conservation status. As an objective of the Darwin project, the production of this Site Management Plan has been agreed by the project partners (BirdLife Cyprus, the Akrotiri Environmental Education Centre and the RSPB) and the Project Steering Committee (Game and Fauna Service, Department of Forests, Water Development Department, Department of Fisheries and Marine Research, Akrotiri Community Council and MERRAS Committee). Information has been taken mainly from the Grazing Capacity Study (given in Appendix 2) and the Water Management Regime Report (given in Appendix 3) compiled through the Darwin project and key management recommendations have been incorporated into the management objectives laid out in this plan.

2.3 Management actions implemented as part of the Darwin project DPLUS034

The Darwin project (2015-17) enabled significant restoration and management work to be completed within the Akrotiri Marsh.

Following the boundaries of the State Forest land, **a fence was built** to meet two different objectives. First, to control access within the site in order to minimise disturbance and, second, to allow cattle to graze within the fenced area without being tethered. The fence restricts public access to the site, an action considered to be vital to reduce disturbance to breeding bird species. Spur-winged lapwing and Black-winged Stilt are known to be particularly vulnerable to disturbance during breeding season. The fence also serves as a means to clearly delineate the wetland habitats from the neighbouring habitats (road, farmland etc.).

The fence includes four double gates (3.60m wide to allow vehicle access) to allow access to authorised people and main users of the Marsh, i.e. graziers (stock breeders) and basketry weavers. The fence also includes smaller gates and pedestrian openings to allow controlled access to the site for graziers, birdwatchers and other users/visitors.

Livestock grazing is a key management tool for the conversion of reed to wet grassland and the sustainable management of the Marsh. Cattle limit reeds by grazing and can damage the reed's rhizome by trampling. Livestock fencing allows free-ranging cattle to make use of the edge of the reed bed, opening the vegetation structure and creating a poached, invertebrate rich margin. Before the project start, the existing cattle were tethered and therefore had no free access to the edge of the reed bed, but were instead relocated by the graziers depending upon where there was food availability within the grassland. As the cattle numbers were not sufficient to control

and manage the reeds, **the project implemented actions that would result in the increase of grazing cattle**. To enable this, the project built **four cattle sheds**. This action enabled graziers from Akrotiri Community to apply to the Veterinary Services for a permit[2] to maintain cattle at Akrotiri Marsh. The project also **funded the purchase of cattle** to encourage existing graziers to buy more cattle as well as to encourage other locals to become involved in this farming activity. To provide more support to graziers, the project organised **training by visiting experts from Greece**, which covered both cattle management and managing grazing in pastures.

As a result of the above actions, cattle numbers increased from 28 in May 2015 to 87 in March 2017 (numbers include bulls, all females and calves). In parallel, **graziers increased in numbers from three at the start to nine by the end of the project**.

The project implemented **engineering works to provide suitable habitat for birds and other wildlife**. The project created open water areas of variable depths to attract breeding Ferruginous Ducks, Black-winged Stilts and Spur-winged Lapwings, all species listed in Annex I of the Birds Directive that have breeding records at Akrotiri Marsh. In total, **the project created seven deep pools and one shallow scrape**. The pools were created at the core of the Marsh and towards the southwest side. The restored scrape is located at the north side of the Marsh (Figure 5). The scrape includes islets to provide raised nesting areas and damp feeding areas particularly for Spur-winged Lapwing and Black-winged Stilt, but will also benefit other waders and waterbirds in general.

Water management works such as ditch dredging and installation of water control structures enabled site managers to have enhanced control of water levels, allowing them to keep water on site during the crucial breeding period.

This project has focused on reinstating the water management system of the marsh by **restoring key drainage channels and installing new water level control structures** (three in total). This has been done alongside work to connect these new ditches to the seven new pools within the reed bed, and a restored 'scrape' on the northern edge to reinstate a significant area of dynamic marginal wetland edge habitat. These new structures and features will allow water to be retained to target (optimum) levels in winter and spring, then allow effective and controlled drawdown to facilitate cutting and grazing along the reed bed edges in late summer and autumn.

These changes will provide optimal habitat for key target species on site. Ferruginous ducks will benefit from open pools with reliable, relatively deep, water levels, diverse marginal and aquatic vegetation and an abundance of aquatic invertebrates. Black-winged Stilts and Spur-winged Lapwings will make use of open area shallow flooding with retreating damp edges and light grazing. A wide diversity of other reed bed and wetland edge species will also benefit from this management regime.

[2] According to the legal provisions concerning animal welfare (Cyrus law 82/2002 and Directive 98/58/EC concerning the protection of animals kept for farming purposes) cattle at Akrotiri Marsh need to have sheds to protect them from poor weather conditions, and other factors that might pose a risk to the animals' health.

The project also **cleared a total area of 38 000 m^2 of reeds** in different locations within the Marsh, and graziers collaborated with project partners to put their cattle into these cleared areas after cutting. In other areas, control of reeds was achieved through grazing alone. **Figure 6 shows the retreat of reeds within a period of 3 months (August 2016 – October 2016) thanks to a combination of cutting and cattle grazing.** It is estimated that the grazing area increased from 12.5 ha at the start of the project to 17.5 ha at the end of the project.

Moreover, the project focused its efforts in **promoting the site** to the wider public and enhancing visitor's experience on site. With **two new birdwatching hides** (one ground hide and one tower-hide), **parking bays and information signs** with site maps, visitors can enjoy the site's wildlife and learn about its importance without causing disturbance. The strategic placement of **road signs directing people to Akrotiri Marsh** was also a key action that helps visitors find their way to the site.

To enable and guide much of the above work, a **topography survey** was carried out to provide important information on ground levels at Akrotiri Marsh. This enabled the design of the engineering works and the location and level-setting for the birdwatching hides. Other studies that gathered important information about the site were the Bird Productivity Studies, the study on the Mediterranean Killifish and the Grazing Capacity Study. These studies also formed the basis for this Site Management Plan. A full list of the studies produced as part of the project is given in Appendix 4.

The project management actions can be summarised as:

1. Fencing of the site to allow free-range grazing
2. Encouragement and support for grazing, leading to a significant increase in the zsize of the herd of native Cyprus cattle grazing on site
3. Engineering works to create deep pools and a shallow scrape
4. Water management works, including restoring key drainage channels and installing new water level control structures
5. Reed control
6. Site promotion, including birdwatching hides, information signs and road signs
7. Topography survey

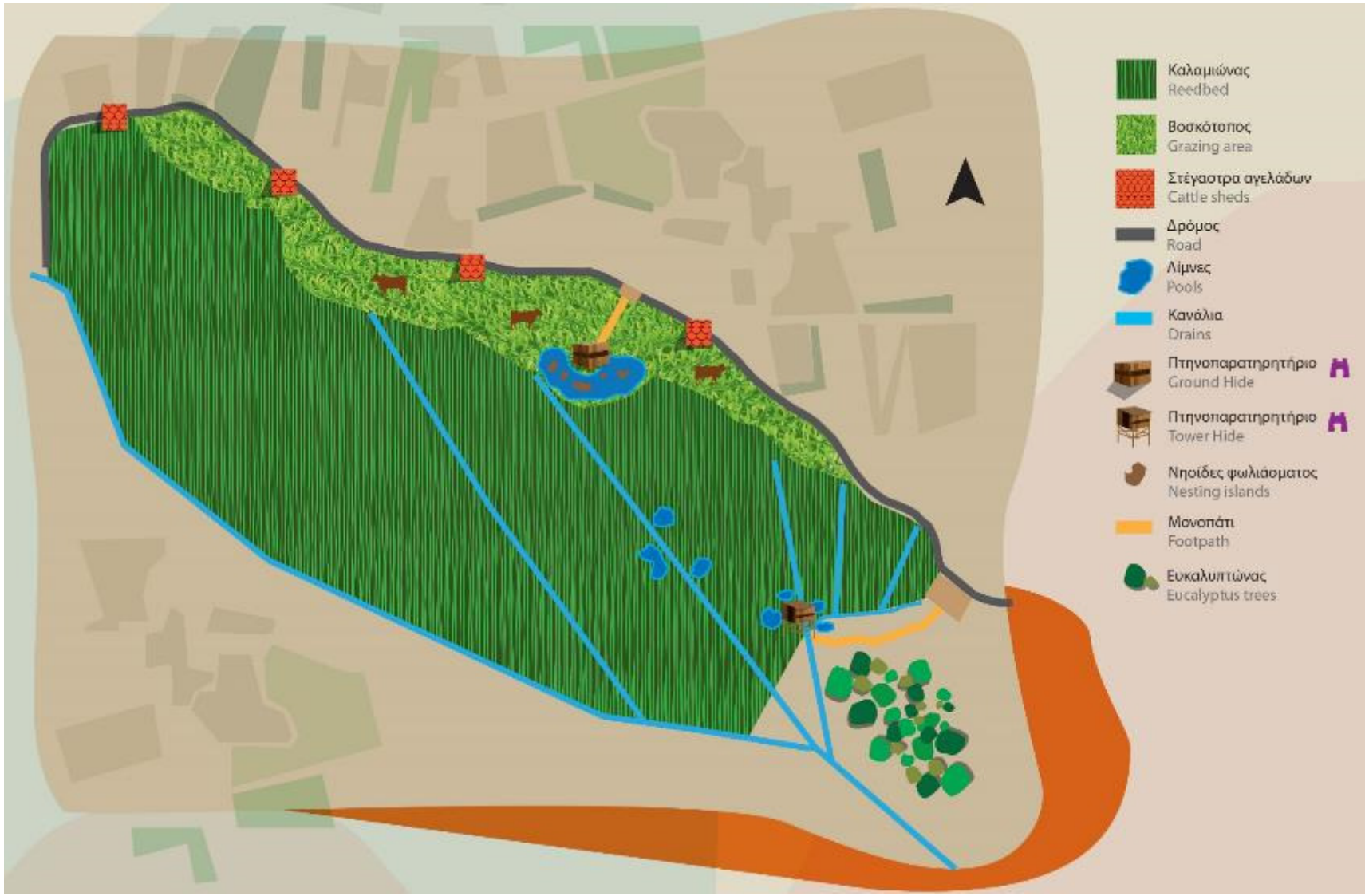

Figure 5: Pictorial summary of management works and visitor facilities implemented as part of the Darwin (DPLUS034) project.

Figure 6: Satellite photos of Akrotiri Marsh in August 2016 (top) and in October 2016 (bottom). Bottom photo: circled areas from left to right: area that was mechanically cleared and then grazed, area where grazing animals had access to the reed bed edge, restored scrape, area that grazing animals had access to the reed bed edge.

3. IMPORTANT BIRD SPECIES

3.1 Breeding Annex I species

Three Annex I species have been recorded breeding regularly at Akrotiri Marsh and are the breeding species for which the marsh was designated as the equivalent of a Special Protection Area (SPA). These are the Black-winged Stilt *Himantopus himantopus*, Spur-winged Lapwing *Vanellus spinosus* and Ferruginous Duck *Aythya nyroca*.

Spur-winged Lapwing *Vanellus spinosus*

For the new millenium, breeding records of this species from Akrotiri Marsh exist only for 2012.

The Spur-winged Lapwing is a migratory species that breeds in Cyprus and is also a passage migrant through the island. There has been an increasing trend for over-wintering also in recent years, and the species is now considered resident in Cyprus, with additional numbers seen on passage in both seasons (mid-March to mid-May and late July to October). This wader is found in, around or near wetlands and other water bodies (including artificial sites), feeding mostly on bare or sparsely vegetated open ground. It mainly feeds on adult and larval insects as well as spiders, centipedes, millipedes and occasionally crustaceans, molluscs, small lizards, tadpoles, adult frogs, fish and seeds. The species chooses bare ground to build its nest. This species has a mainly African distribution; it is a scarce breeder is Southeast Europe and vagrant to West Europe. It breeds only in Greece and Cyprus from the countries of the EU. The species has probably bred in Cyprus since 1990, but first confirmed records were in 1998. In Cyprus it has a central, south-eastern and eastern distribution.

The Spur-winged Lapwing is a species on Annex I of the Birds Directive (2009/147/EU). It is classified as rare at European level according to IUCN (World Conservation Union) criteria and as a species of conservation concern (SPEC 3) by BirdLife International. The Cyprus population is slightly bigger than the Greek one, at around 40-60 breeding pairs and with an increasing trend. Important areas in Cyprus where this species nests are Oroklini Lake, Paralimni Lake, Achna Dam, Famagusta wetlands, Aradippou area, Larnaca salt lakes and Mia Milia.

The recent island wide census (2007-2009) showed a population over 200 (at 10 wetlands during autumn migration) while around 50 birds wintered in Cyprus. The breeding population was estimated around 59-65 pairs (in 15 areas).[3]

Enhancing and maintaining the breeding population of Cyprus, through site management directly helps to enhance and help conserve more than 50% of the EU population of this wader.

[3] Charalambidou, I., Kassinis, N., Gűcel, S. & Fuller, W. (2012) The Status and Breeding Population of the Spur-winged Lapwing *Vanellus spinosus* in Cyprus. PODOCES Vol. 7, No. ½.

The Spur-winged Lapwing is not known to have bred over most of the Akrotiri wetlands (only at Akrotiri Marsh), despite the presence of extensive areas of apparently suitable habitat. This may be the result of high levels of disturbance across the main lake and flats (Tye A. *et al*. (2014), Setting Favourable Reference Values for Annex I bird species at Oroklini marsh, as part of the LIFE project: "Restoration and Management of Oroklini Lake SPA in Larnaca, Cyprus").

Black-winged Stilt *Himantopus himantopus*

For the new millenium, breeding records of this species from Akrotiri Marsh exist for 2003, 2004, 2005, 2006 and 2008, which was the year with the last recent record.

The Black-winged Stilt is a migratory species that breeds in Cyprus and also occurs a passage migrant during spring (and rarely in autumn also). Some birds have been recorded wintering in Cyprus in recent years (for example in 2010 and 2011 at Oroklini Lake). This wader is found in wetlands of shallow fresh, brackish or salt water. Its characteristic long legs allow this bird to feed on insects and other invertebrates in deeper water than used by other waders. The Black-winged Stilt nests on vegetated islets or near water and occasionally on a raised mound of vegetation in shallow water. The species breeds solitarily or in loose colonies of 2-50 pairs (occasionally more) showing a preference for open areas close to foraging sites with good all-round (360 degree) visibility. It is quite noisy during the breeding season and it chases potential predators that approach the colony while calling loudly.

The Black-winged Stilt is a species listed in Annex I of the Birds Directive (2009/147/EU) which is considered secure at European level. The species nests in large numbers in Spain and Turkey but otherwise breeding populations in other countries are relatively small. The breeding population in Cyprus is estimated between 80-140 pairs annually depending on water levels, but the species is very sensitive to drought and changes in water levels and site conditions at wetlands.

The large populations in Western Europe mean that the western European population is quite secure, however in Eastern Europe the large Turkish population declined between 1990 and 2000. That means that the regional populations in Eastern Europe, such as that of Cyprus, become more important, especially at EU level. Important sites for the Black-winged Stilt in Cyprus are Oroklini Lake, Larnaca Salt Lake, Akrotiri wetlands, Mia Milia, Famagusta wetlands and also Paralimni Lake, Achna Dam, and Aradippou area.

Ferruginous Duck *Aythya nyroca*

The first confirmed breeding record for Cyprus of this Globally Near Threatened duck was in 2005 at Akrotiri Marsh. Breading records for Akrotiri Marsh exist for 2006, 2007, 2009, 2010, 2011, 2012 & 2015. The Ferruginous Duck is also an Annex I protected species under EU law. The first breeding record beyond the Akrotiri Peninsula for the species was from Athalassa damin 2012, but Akrotiri remains the stronghold for the duck in recent history.

Ferruginous ducks are regular if rather scarce winter and passage migrant visitors to Cyprus.

For the Ferruginous duck, Akrotiri Marsh is amongst the best breeding sites in Cyprus.

The species forms monogamous pair bonds of seasonal duration. The nest is usually located on the ground close to water, or above water or on floating rafts of dense reeds and other aquatic vegetation. A single clutch is laid containing 7-10 eggs. Incubation begins from late May to late June in southern Europe, and up to a month later further north. Eggs hatch after 25-28 days. Only one brood is reared per year. Brood size varies from 3-12 ducklings. Fledging takes 55-60 days.

The species is omnivorous, but plant material predominates in analyses of stomach contents. Areas of shallow water close to dense ground vegetation are favoured feeding areas.

Habitat degradation and the loss of wetland habitat from human developments are probably the two most significant factors in the decline of the Ferruginous Duck. For example, 60% of wetlands in Greece and over 90% in Bulgaria have been drained since 1900, most of which would have been prime habitat for the species[4].

Many wetlands important for the Ferruginous Duck have been degraded and as the species is highly dependent on highly structured wetlands with rich macrophyte and emergent plant growth, it is particularly sensitive to habitat alterations. The most important negative alterations include degradation of emergent vegetation, disruption of water regimes (when this causes a reversion to a less structured wetland or succession to scrub), siltation, and increased turbidity (causing loss of macrophytes).

Another factor that affects the species productivity is human disturbance. For example, in Bulgaria, the species has become extinct in recent years with the only change apparent being more intensive use of sites by anglers and water-sports enthusiasts. At Lake Constance, in Germany, a moulting group of about 20 birds has developed since reductions in disturbance during the post-breeding period (together with increasing numbers of other species).

[4] Robinson A. J. & Hughes B. (2006), International Single Species Action Plan for the Conservation of the Ferruginous Duck Aythya nyroca.

3.1 Current breeding activity

During the 2015 and 2016 breeding seasons, the project undertook a bird monitoring and productivity study. The data from this monitoring is included in Table 1 below giving an indication of the breeding activity for 2015 and 2016 at Akrotiri Marsh.

Table 1: Breeding birds at Akrotiri Marsh species for Akrotiri Marsh SPA for 2015&2016

Species	Estimated Population Size (2015)	Status	Comments
Breeding birds			
Ferruginous Duck (*Aythya nyroca*)	4-5 pairs	SPA qualifying species. Annex I	Numbers peaked with 9 Ferruginous ducks (individuals) in 2015 survey and with 7 birds in 2016 survey. There are confirmed records of breeding activity on site between 2005 - 2007
Black-winged Stilt (*Himantopus himantopus)*	No pairs	SPA qualifying species. Annex I	No breeding activity in 2015 or 2016.
Spur-winged Lapwing (*Vanellus spinosus*)	No pairs	SPA qualifying species. Annex I	No breeding activity in 2015 or 2016
Little Bittern (*Ixobrychus minutus*)		Annex I	Probable breeder Numbers peaked with 6 Little Bittern in 2015 survey
Black Francolin (*Francolinus francolinus*)	3-4 pairs	IBA qualifying species	
Yellow Wagtail (*Motacilla flava feldegg*)	unknown		One of the best sites in Cyprus
Eurasian Reed Warbler *(Acrocephalus scirpaceus)*	unknown		One of the best sites in Cyprus

4. OBJECTIVES FOR AKROTIRI MARSH

4.1 Defining Favourable Conservation Status and setting Favourable Reference Values (FRVs)

Favourable Conservation Status (FCS) of the Akrotiri Marsh site is predominantly dependent on the status of the breeding populations of the three key nesting species of the site, namely Ferruginous duck *Aythia nyroca*, Black-winged stilt *Himantopus himantopus* and Spur-winged lapwing *Vanellus spinosus*. One further Birds Directive (2009/147/EC) Annex I species thought to be breeding at the Marsh, Little Bittern *Ixobrichus minutus*, is added to the list, in particular because the species has only been recorded breeding at 3 other sites in all Cyprus. Furthermore, migrant visitors should also form part of the FCS definition, where they occur at the marsh in numbers of regional (European) or global importance.

We also stress, however, the importance of maintaining the status of other Annex I bird species, plus some non-Annex I but regionally important species, while of key importance are also the plant community for which the marsh was designated as the equivalent of a Special Area of Conservation (SAC), plant species of the Cyprus Red Data book and rare insects and important animals on site, such as the Tree frog *Hyla savignyii*.

The concept of Favourable Reference Values (FRVs) has been developed to facilitate the assessment of Favourable Conservation Status (FCS). Favourable Conservation Status is defined in the EU Habitats Directive (92/43/EEC) as when a habitat can be considered stable or increasing, is functioning as it should and will do so for the foreseeable future and, the species that are intrinsic to the habitat are also considered at favourable status. FRVs permit both the quantification of conservation objectives and the measurement of progress towards them. FRVs can generally be defined as the population size or breeding density that a species must be at in order to be considered not at risk of extinction and should also be high enough to allow a species to fulfil its ecological functions and to allow for resilience to climate change. The FRV for a species should be a population size at which the risk of extinction is acceptably low, the species is biologically functional within the ecosystem and there is no contraction of range or decrease in population size (beyond the bounds of the 'normal' year-on-year fluctuations in population size that would be expected for a given species).

For birds, FRVs for key breeding species in Cyprus were recently determined under a project funded by the Interior Ministry (Game & Fauna Service) to draw up management plans for all Special protection Areas (SPAs – Natura 2000 sites for birds) in the Republic[5]. The project, completed in 2016, involved determining FRVs at all-Cyprus level and at site level for qualifying species for Special Protection Areas (SPAs). It also involved the determination of approximate 'target values' for key passage and wintering species at SPAs, corresponding to the numbers of these species that should be regularly recorded at SPAs to allow favourable status to be

[5] Ετοιμασία Στόχων Διατήρησης & Διαχειριστικών Σχεδίων για τις Ζώνες Ειδικής Προστασίας (ΖΕΠ) που έχουν καθοριστεί στην Κύπρο σύμφωνα με την Οδηγία για τα Άγρια Πτηνά (2009/147/ΕΚ) Αρ. Συμβ. 13.25.006.02.02 -3η Ενδιάμεση Έκθεση Προόδου. Υπηρεσία Θήρας και Πανίδας, Υπουργείο Εσωτερικών. Ετοιμάστηκε από: I.A.CO Environmental and Water Consultants και Πτηνολογικό Σύνδεσμο Κύπρου. Λευκωσία 2016.

maintained. The relevant report should be referred to for details of how FRVs and target values were set for Cyprus.

The project funded by the Interior Ministry did not cover the British Sovereign Base Areas (SBAs) and therefore no site-level FRVs (or target values) were set for the Akrotiri wetlands. However, the island-wide FRVs (and target values) set under the above project were used here to set relevant values for Akrotiri Marsh, based on comparison with similar wetlands in other parts of Cyprus (for which FRVs were already set) and also on expert assessment. Use was also made of three other very relevant studies: the 2014 study defining FRVs for breeding birds at Oroklini marsh[6] (including both Black-winged stilt and Spur-winged lapwing); the 2012 study on the Black-winged stilt at the Akrotiri wetlands[7]; the 2014 inventory of Important Bird Areas (IBAs) in Cyprus [8].

The full list of bird species relevant for defining FCS at the Akrotiri Marsh is shown in the table that follows. The catalogue below is based on the qualifying species for the 'Akrotiri Wetlands' SPA as designated under the Protection and Management of Game and Wild Birds Ordinance 2004, and also on the 2014 IBA inventory, published by BirdLife Cyprus.

Qualifying bird species for Akrotiri Marsh		
Scientific name	**English name**	**Status at Akrotiri Marsh**
Aythia nyroca	Ferruginous duck	Breeding
Himantopus himantopus	Black-winged stilt	Breeding, Passage Migrant
Vanellus spinosus	Spur-winged lapwing	Breeding
Ixobrichus minutus	Little Bittern	Breeding
Falco eleonorae	Eleonora's falcon	Breeding – feeding area only
Ardeola ralloides	Squacco Heron	Passage Migrant
Ardea purpurea	Purple Heron	Passage Migrant
Plegadis falcinellus	Glossy Ibis	Passage Migrant

[6] Tye, A., Christodoulou–Davies, C., Papazoglou, C. & Apostolidou, M. (2014) Setting Favourable Reference Values for Annex I bird species at Oroklini marsh, as part of the LIFE project: "Restoration and Management of Oroklini Lake SPA in Larnaca, Cyprus". BirdLife Cyprus, Nicosia.

[7] Tye, A., Stylianou, J., Anastasi, V. & Papazoglou, C. (2012) A survey of the distribution, habitat use, populations and breeding of the Kentish Plover *Charadrius alexandrinus* and Black-winged Stilt *Himantopus himantopus* at the Akrotiri Wetlands, September 2011 to August 2012. BirdLife Cyprus, Nicosia, Cyprus.

[8] I*mportant Bird Areas of Cyprus* (2014) by Hellicar, M.A., Anastasi, V., Beton, D. & Snape, R. BirdLife Cyprus, Nicosia, Cyprus.

Circus aeruginosus	Western Marsh Harrier	Passage Migrant, Winter Visitor
Falco vespertinus	Red-footed Falcon	Passage Migrant
Grus grus	Crane	Passage Migrant, Winter Visitor
Calidris minuta	Little Stint	Passage Migrant
Philomachus pugnax	Ruff	Passage Migrant
Chlidonias leucopterus	White-winged Tern	Passage Migrant
Merops apiaster	European Bee-eater	Passage Migrant

Setting FRVS for key breeding bird species at Akrotiri Marsh

Ferruginous Duck: The 2016 FRV study funded the Interior Ministry did not include this species, as it is not a qualifying species for SPAs in the Republic of Cyprus (RoC) areas. Given the potential for managing the Akrotiri Marsh for the benefit of this duck species of global conservation concern, principally through creation of pools and avoidance of disturbance, it is considered that a relatively ambitious target can be set for the species, that of 10 breeding pairs. Recent data suggest that up to 5 pairs have bred at the site, but this can be expected to increase following the creation of seven deep pools with the needs of this species in mind. The 10 breeding pairs target is a long-term one and should be reviewed in the light of information provided by monitoring. The short-term (5-year) target for the species should be 5 breeding pairs.

Black-winged Stilt: the all-Cyprus FRV for the species was set at 300 pairs in 2016, even though the estimated breeding population for all Cyprus in 2015 was much lower than this, at 50-200 pairs. The ambitious target for Cyprus was based on the assumption of affective protection at key wetlands for the stilt, coupled with relevant management action to increase breeding numbers. Site-level FRVs were set at 60, 10, 60 and 50 pairs respectively for Larnaca Salt Lake, Akhna Dam, Oroklini Lake and Paralimni Lake. Tye *et al* (2014) note that there is considerable potential foraging and nesting habitat for the Black-winged stilt at the Akrotiri wetlands as a whole. The Akrotiri wetlands are assessed by Tye *et al* to offer a similar habitat extent to the Larnaca salt lakes, which had a site-level FRV target set at 60 pairs for the stilt, as stated above. This suggests a similar FRV could be set for the Akrotiri wetlands as a whole (around 60 pairs). In years with suitable water levels, the Akrotiri salt lake (margins) provide good foraging and nesting habitat for the Black-winged stilt-however, the site suffers from disturbance, but the Akrotiri Marsh, given suitable management (scrape creation and management, water level management and disturbance control) could support 10 pairs of Black-winged stilt. Again, and as in the case of the Ferruginous Duck, this is a long-term target that is management-dependent and should be reviewed in the light of information provided by monitoring.

Spur-winged Lapwing: This is a species with an increasing breeding population in Cyprus, so an all-island FRV of 200 pairs was set in 2016, though the 2015 population estimate was a relatively

modest 50-70 pairs. Again, as for the stilt above, the ambitious target for Cyprus was based on the assumption of affective protection at key wetlands for the lapwing, coupled with relevant management action to increase breeding numbers. Site-level FRVs were set at 50, 5, 15 and 30 pairs respectively for Larnaca Salt Lake, Akhna Dam, Oroklini Lake and Paralimni Lake. Tye *et al* (2014) note for this wader also, that there is considerable potential foraging and nesting habitat for the Spur-winged Lapwing at the Akrotiri wetlands, in fact almost twice as much as the assessment of suitable habitat extent for any other wetland. But the fact that the Spur-winged Lapwing has a predominantly easterly distribution in Cyprus, and the absence of breeding records for this wader from the Akrotiri wetlands, with the exception of Akrotiri Marsh, leads us to set a more modest target of 5 pairs for the marsh, to be reviewed upwards once the lapwing re-established itself at the site (no breeding records in 2015 or 2016).

Little Bittern: A species not assessed under the 2016 FRV study and only confirmed as a breeding in Cyprus since 2004, and then only sporadically. Bred at Akrotiri Marsh in 2005 and 2007, and considered a 'probable breeder' during the 2015 and 2016 productivity studies. The target for the species is for it to become a regular breeder at the Marsh, but more information is needed about this species as a breeder in Cyprus before a numerical target can be set for an FRV.

The table below summarises the FRV targets for breeding birds at the Akrotiri marsh:

FRVs for breeding birds at Akrotiri Marsh		
Species	Status at Akrotiri Marsh	**FRV target**
Aythia nyroca	Breeding	10p (5p as short-term target, for 1st five years)
Himantopus himantopus	Breeding, Passage Migrant	10p (5p as short-term target, for 1st five years)
Vanellus spinosus	Breeding	Over 5p (5p as short-term target, for 1st five years)
Ixobrichus minutus	Breeding	regular breeding presence

Target values for wintering and passage species at Akrotiri Marsh are set in an indicative manner here. For almost all of the relevant species, no target values were set under the 2016 all-Cyprus report.

The indicative conservation target for passage and wintering species should be for these species to continue to be recorded at Akrotiri Marsh in *at least* the numbers they have occurred in over the last few years (expressed as a range) based on records from systematic monitoring by the Game & Fauna Service and BirdLife Cyprus, who carry out monthly counts at the site. Additionally, birdwatching records from the Marsh can also be utilised towards this end. Target values set in this way would thus correspond to the numbers of these species regularly recorded at the sites

in recent years. These target values need to be assessed against data from continued monitoring on-site.

Indicative 'target values' for key passage/wintering species for Akrotiri Marsh are as in the table that follows, based on monthly counts over the period 2006-2016.

Species	**Target numbers (range)** **(individuals)**	**Season/period**
Himantopus himantopus	2-15	Spring passage (non-breeding)
Ardeola ralloides	5-10	Spring
	0-1	Autumn
Ardea purpurea	5-70	Spring
	0-1	Autumn
Plegadis falcinellus	10-60	Spring
	1-10	Autumn
Circus aeruginosus	2-8	Winter
	1-2	Spring
	3-20	Autumn
Grus grus	1-80	October-March
Calidris minuta	10-20	Spring
Philomachus pugnax	5-100	Spring
Chlidonias leucopterus	2-5	Spring
Merops apiaster	10-50	Spring
	50-350	Autumn
Falco eleonorae	1-10	May-October
Falco vespertinus	1-10	Spring
	10-150	Autumn

As an indication of maintenance of Favourable Conservation Status (FCS) for these visitor species, numbers within the ranges stated above should be recorded during monthly counts in the relevant months. If recorded numbers for one or more passage/wintering species fail to lie within the range of the target values listed above for more than one year within any 5-year period, then this should 'trigger' an assessment of what factors on site may be proving unsuitable for the species and appropriate corrective management action should be taken where feasible.

In the longer-term, continuing monitoring of these passage/wintering species should aim to allow an estimation of the actual numbers of these key species occurring, in total, during the seasons in question. This will allow more definite 'target values' to be set for these visitor species and a more reliable assessment of FCS.

Even though proposed management actions are not targeted at these passage/wintering species *per se*, the habitat requirements of these visitor species do need to be borne in mind when planning and carrying out management actions. Given that most of the passage/migrant species are waders or herons, it seems reasonably safe to assume the management already carried out and proposed for the site will benefit these passage and wintering species as well as the targeted breeding waders and duck species. Furthermore, the increased habitat diversity promoted through the site management undertaken under this project and proposed for continuation under this site management plan, will be of benefit for the key passage and wintering species, including the falcons and Bee-eaters using the site.

4.2 Management objectives and targets

Management objective 1:

To manage Akrotiri Marsh to achieve a balance between open water, reedbed and grassland for the benefit of key associated species, notably breeding Ferruginous Duck and waders (Spur-winged Lapwing and Black-winged Stilt), and a diversity of migrant birds.

Species targets

- 5-year mean of 5 pairs of Ferruginous Duck for first 5 years, 10 pairs thereafter
- 5-year mean of 5 pairs Spur-winged Lapwing for first 5 years, to be revised upwards thereafter
- 5-year mean of 5 pairs Black-winged Stilt for first 5 years, 10 pairs thereafter
- Regular breeding presence of Little Bittern
- Presence of passage migrant/wintering qualifying species in numbers lying within 'target value' ranges for each species

Habitat conditions

- Water levels reaching 12.0m in late winter/early spring, dropping to 11.4m by summer, according to the main water level gauge board.
- Wader scrape and islands to have vegetation cover less than 20% during the breeding season.
- Maintain reed-fringed 7 open pools, with a diversity of emergent aquatic vegetation.
- Water levels in spring to create diverse wet/muddy conditions on the reed/grass margin.
- Grassland area to increase from 17.5 ha, ideally to 55 ha, retaining 15ha of saltmarsh and 43-53ha of reed bed.
- Maintain a structurally diverse grassland, with an average sward height of <10cm over 30% and >20cm over 30% of the area during spring.
- The 'scrape' and wet grassland margin needs to be shallow (typically 20-40cm depth) flooded at the beginning of the breeding season in March, keeping islands free of water. The scrape bed level is at 11.5m, and islands are at 12.1-12.2. Target water level for this time of year is 12.0m.

Summary management

- Grazing density: For the first five years to have a livestock grazing density in the range 1.75-3.00 LSU/ha (as calculated over the 17.5ha existing grassland) to achieve 50-60ha (of the total ca. 118ha Akrotiri Marsh total area), retaining 15ha of saltmarsh and 43-53ha of reed bed. Once the desired habitat areas have been achieved based on 60ha grassland the number of animals required would equate to 100-175 cows aged 2 years or older (using the grazing density range 1.0-1.75 LSU/ha).

- Graze scrapes with livestock outside of the breeding season (March-May) at a density of 0.9 LSU/ha. If necessary mechanically remove reed encroachment of scrape area/islands by removing mechanically between x and y to ensure an area of at least 1ha remains available for breeding wader. If reeds establish they need to be cut manually in autumn/early winter, otherwise grazing should start in late February
- Graze grassland area to achieve a diverse sward with an average height in April of no more that 5-10 cm with an average of 1.75 – 3.0 LSU/ha for the first five years.
- Re-excavate/clear vegetation from the Ferruginous Duck pools and primary channels when vegetation cover exceeds 70% to ensure they are suitable for nesting
- Control water levels by ensuring sluice(s) A, B and C are set to maximum level (12.0) between November and March, (desirable water levels will be achieved due to evaporation).
- Electric fence around the wader scrape between early March and late June to keep grazing animals out of that area to avoid nest trampling nests
- During August-October annually cut Up to 5ha of mature reed along the reed/grass margin to extend the area for livestock grazing and facilitate conversion from reed to wet grassland.
- Restrict access for visitors on foot or vehicle to scrape between February and July.
- Install water level gauges

Summary monitoring

- Breeding bird surveys for Ferruginous Duck, Spur-winged Lapwing, Black-winged Stilt and Little Bittern, with a focus on estimating actuall productivity for these key species
- Monthly counts for all birds at site, with focus on qualifying passage/wintering species.
- Water levels
- Vegetation in scrapes and Ferruginous Duck pools
- Key plant species
- Encourage visiting birdwatchers and naturalists to submit records
- Monitor cattle numbers and area of grassland. It is considered desirable for the first five years to have a livestock grazing density in the range 1.75-3.00 LSU/ha (as calculated over the 17.5ha existing grassland)
- Monitor water levels in scrape and open sluices early when there are late spring rains to avoid flooding at this time of year.
- Gauge boards should be read at least at the times that the pipes are checked and/or set, and preferably every month
- Record Salinity and water levels. Salinity should be recorded in the pools and, when water is present, in the wader scrape. Salinity should be recorded at the same times as the gauge boards are read, and also ideally every month, using a high range conductivity meter. A refractometer will be more appropriate if conductivities rise above 20m^{S}.

Management objective 2:

To facilitate and encourage community usage and enjoyment of Akrotiri Marsh without detriment to the conservation status of the site

Summary management

- Facilitate viewing and enjoyment of the site, notably though a bird hide overlooking the wader scrape and a tower hide overlooking the ferruginous duck pools by maintaining visitor infrastructure
- Facilitate viewing and enjoyment by managing vegetation to maintain key sightlines from viewpoints
- Cut reed around the tower hide and between the hide and pools to ensure there is a good view of the pools and reduce the risk of damage to the hide in case of a fire
- Maintain fencing
- Facilitate community usage of the site through mutually beneficial vegetation harvesting and grazing
- Promote education visits
- Promote the site for bird watchers and naturalists
- Maintain interpretative signs informing visitors of the access policy
- Maintain footpaths leading to the birdwatching hides
- Maintain screening along the track to the groundhide to minimise disturbance to birds
- Plant appropriate plants long the existing screening to ensure screening of walkway in the future
- Maintain controlled access to areas hosting basketry plants.
- Monitor the abundance of basketry plants with a view to take measures to maintain their availability.

Management objective 3:

To manage Akrotiri Marsh in order to establish the presence of *Aphanius fasciatus* on site*

Species target

- Establish presence of a viable population of killifish at Akrotiri Marsh

Overview of management actions

- Re-introduce *Aphanius* at pool refugium at Akrotiri Marsh in conjunction with *Gambusia* extermination and anti-stocking information campaigns
- Develop Annual Action plan and personnel training for specific actions
- Provide hydrological connections among Episkopi Bay Wetland-Akrotiri Marsh-Salt Lake lagoonal basin.
- Combat *Gambusia holbrooki* stocking/dispersal and survival (especially in freshwater parts of the system (Akrotiri Marsh, Zakaki, North shore of Salt Lake).

- Explore food web implications of increasing *Aphanius* populations. i.e. Set up natural experiments/adaptive management frameworks etc.

Overview of monitoring actions

- Monitor the ichthyofauna of newly dug canals and "ponds" within Akrotiri Marsh.

**Although the study on* Aphanius fasciatus *was conducted as part of the DPLUS034 project confirmed that the species was absent from Akrotiri Marsh we incorporate here recommended management and monitoring actions for the species. Akrotiri Marsh is an important as natural refugia for the species during times of drought.*

Management objective 4:

To manage Akrotiri Marsh to achieve a balance between grazing with habitat targets in mind and plants included in the Red Data Book of Cyprus.

Species target

- Expand and diversify the area covered by *Scirpus lacustris subsp. tabernaemontani, Euphorbia hirsute, Ipomoea sagittata and Mentha aquatica.*

Overview of management actions

- Fence off areas of grey club-rush from March to August to ensure they aren't overgrazed by cattle or cut around patch to reduce competition, then allow to spread.
- Control reed and bramble growth and expansion within the enclosure with mechanical ways, i.e. strimming and/or grazing (enclosure has a gate to allow grazing access).
- Plant *Ephorbia hirsute*, and *Mentha aquatica* in suitable new areas outside the enclosure and monitor the impact of grazing on them.
- Collect seeds of *Euphorbia hirsute* and *Ipomoea sagittata,* in order to conserve in seed banks and plant in botanic gardens.

Overview of monitoring actions

- Monitor regularly the populations of all Red Book Plants on the marsh with special attention to the plants within the enclosure.
- Monitor impact of grazing on vegetation. Consider a rotational regime of grazing or use temporary electric fencing around important populations.
- Continue searching for the plants which are thought to have locally become extinct, namely *Baldelia ranunculoides*, *Cynanchum acutum*, *Orchis palustris.*

5. FIVE YEAR WORK PROGRAMME

Priority: 1 – Essential actions, 2 - Important actions, 3 – Desirable actions.

Action	2017	2018	2019	2020	2021
Graze scrapes with livestock outside of the breeding season (March-May) at a density of x LSU/ha. If necessary mechanically remove reed encroachment of scrape area/islands by removing mechanically between x and y to ensure an area of at least xha remains available for breeding wader. If reeds establish they need to be cut manually in autumn/early winter, otherwise grazing should start in late February	1	1	1	1	1
Graze grassland area to achieve a diverse sward with an average height in April of no more that 5-10 cm with an average of 1.75 – 3.0 LSU/ha for the first five years , dropping to 1.00 – 1.75 LSU/ha once a larger area of grassland habitat had been created at the expense of reeds	1	1	1	1	1
Re-excavate/clear vegetation from the Ferruginous Duck pools and primary channels when vegetation cover exceeds 70% to ensure they are suitable for nesting	3	2	1	3	2
Control water levels by ensuring sluice(s) A, B and C are set to maximum level (12.0) between November and March.	1	1	1	1	1
Electric fence off the wader scrape between March and May so livestock do not trample nests	1	1	1	1	1
During August-October annually cut/burn? Up to 5ha of mature reed along the reed/grass margin to extend the area for livestock grazing and facilitate conversion from reed to wet grassland.	2	1	3	2	2
Fence of areas of grey club-rush from March to August to ensure they aren't overgrazed by cattle	2	2	2	2	2
Restrict access for visitors on foot or vehicle to scrape between February and July.	1	1	1	1	1
Install water level gauges	1	3	3	3	3
Re-introduce *Aphanius* at a pool refugium at Akrotiri Marsh in conjunction with *Gambusia* extermination and anti-stocking information campaigns	2	1	2	3	3
Develop Annual Action plan and personnel training for specific actions	2	2	2	2	2
Provide hydrological connections among Episkopi Bay Wetland-Akrotiri Marsh-Salt Lake lagoonal basin.	3	3	3	3	3

Combat *Gambusia holbrooki* stocking/dispersal and survival (especially in freshwater parts of the system (Akrotiri Marsh, Zakaki, North shore of Salt Lake).	1	1	2	2	2
Fence off areas of grey club-rush from March to August to ensure they aren't overgrazed by cattle or cut around patch to reduce competition, then allow to spread.	2	2	2	2	2
Control reed and bramble growth and expansion within the enclosure with mechanical ways, i.e. strimming and/or grazing (enclosure has a gate to allow grazing access).	1	1	1	1	1
Plant *Ephorbia hirsute*, and *Mentha aquatica* in suitable new areas outside the enclosure and monitor the impact of grazing on them.	2	2	2	2	2
Collect seeds of *Euphorbia hirsute* and *Ipomoea sagittata,* in order to conserve in seed banks and plant in botanic gardens.	2	2	2	2	2
Monitoring					
Breeding bird surveys for Ferruginous Duck Spur-winged Lapwing, Black-winged Stilt and Little Bittern, with a focus on estimating actuall productivity for these key species	1	1	1	1	1
Monthly counts for all birds at site, with focus on qualifying passage/wintering species.					
Water levels	1	1	1	1	1
Vegetation in scrapes and Ferruginous Duck pools	1	1	1	1	1
Key plant species	1	1	1	1	1
Encourage visiting birdwatchers and naturalists to submit records	3	3	3	3	3
Monitor cattle numbers and area of grassland. It is considered desirable for the first five years to have a livestock grazing density in the range 1.75-3.00 LSU/ha (as calculated over the 17.5ha existing grassland)	1	1	1	1	1
Monitor water levels in scrape and open sluices early when there are late spring rains to avoid flooding at this time of year.	1	1	1	1	1
Gauge boards should be read at least at the times that the pipes are checked and/or set, and preferably every month	1	1	1	1	1
Record Salinity and water levels. Salinity should be recorded in the pools and, when water is present, in the wader scrape. Salinity should be recorded at the same times as the gauge boards are read, and also ideally every month, using a high range conductivity meter. A refractometer will be more appropriate if conductivities rise above 20mS.	2	2	2	2	2

Monitor the ichthyfauna of newly dug canals and "ponds" within Akrotiri Marsh.	2	2	2	2	2
Monitor impact of grazing on vegetation. Consider a rotational regime of grazing or use temporary electric fencing around important populations.	1	1	1	1	1
Monitor regularly the populations of all Red Book Plants on the marsh with special attention to the plants within the enclosure.	1	1	1	1	1
Continue searching for the plants which are thought to have locally become extinct, namely *Baldelia ranunculoides*, *Cynanchum acutum*, *Orchis palustris.*	1	1	1	1	1
Community					
Facilitate viewing and enjoyment of the site, notably though a bird hide overlooking the wader scrape and a tower hide overlooking the ferruginous duck pools by maintaining visitor infrastructure	2	1	2	1	2
Facilitate viewing and enjoyment by managing vegetation to maintain key sightlines from viewpoints	1	1	1	1	1
Cut reed around the tower hide and between the hide and pools to ensure there is a good view of the pools and reduce the risk of damage to the hide in case of a fire	1	1	1	1	1
Maintain fencing	3	2	1	3	2
Facilitate community usage of the site through mutually beneficial vegetation harvesting and **grazing**	1	1	1	1	1
Promote education visits	3	3	3	3	3
Promote the site for bird watchers and naturalists	3	3	3	3	3
Maintain interpretative signs informing visitors of the access policy	3	2	1	3	2
Maintain footpaths leading to the birdwatching hides	3	2	1	3	3
Maintain screening along the track to the groundhide to minimise disturbance to birds	2	1	2	2	2
Plant appropriate plants long the existing screening to ensure screening of walkway in the future	3	1	3	3	3
Research					
Study nest predation / bird breeding success	2	2	2	2	2
Explore food web implications of increasing *Aphanius* populations. i.e. Set up natural experiments/adaptive management frameworks etc.	2	2	2	2	2
Study on grassland productivity (*see note below)	2	1	3	3	3
Add something about studying the response of the wetland to enrichment of aquifer from treated water	3	1	3	3	3

**Note: Study on grassland productivity (simple experimentation to assess the seasonal grazing capacity of the fenced site)*

The vegetation of the site is clearly composed of three zones: (a) the upper dry grassland that hosts various species of grazing tolerant grasses, legumes and forbs, as well as some thistles on over-grazed patches, located on soils which are never flooded; (b) a wet grassland with typical wet meadow plant species able to grow on soils that are partly flooded for some months, located between the dry grassland and the reedbed; (c) the reedbed itself, that covers low-laying soils. Fenced plots (2X2m each) to exclude grazing could be established within each of the three zones with at least three replicates, i.e. a minimum of six plots to measure vegetation productivity at the end of each season. In practice, the vegetation is cut within each plot in 1-3 quadrats of 0,5X0,5m; then samples (without unpalatable species) are dried and weighed to calculate productivity of each vegetation zone in Kgr/ha. To calculate grazing capacity, 50% of the productivity is theoretically left to grazers and the remaining 50% is left on site to maintain vegetation in a good status. The overall grazing capacity is calculated by taking into account the full area that is or can be grazed by cattle and based on the fact that each animal needs to consume vegetation quantities equal to 3% of its live weight daily (vegetation in dry weight). After each seasonal sampling, the fenced plots should be translocated to a nearby location in the same vegetation zone; for details see Kazoglou *et al*. (2006). [9]

[9] Kazoglou Y. E., F. Mesléard and V. P. Papanastasis. 2004. Water buffalo (Bubalus bubalis) grazing and summer cutting as methods of restoring wet meadows at Lake Mikri Prespa, Greece. Grassland Science in Europe, Vol. 9: 225-227.

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6. REGULATIONS AND GUIDELINES

6.1 Sectoral Guidelines

Recommended farming practices in accordance with the code of good agricultural practice

6.2 Regulation of Uses

No hunting at any time.
No deliberate release of non-native species on the SPA/SAC.
No access to restricted areas at any time except by authorised personnel. Members of the public are encouraged to park at the designated parking areas.
No dumping (deliberate or accidental) of waste (industrial or residential) on SPA/SAC.
No use of pesticides (including killing mosquitoes) or artificial fertilisers within the SPA/SAC.
No surveys unless with a protected species licence under the Game and Wild Birds Ordinance or the Protection and Management of Nature and Wildlife Ordinance.

Annual maintenance of road should be undertaken under the supervision of the competent authority.

6.3 Appropriate Assessment

Any project, activity or development that may have an impact on the SPA/SAC, must undergo an Appropriate Assessment. Projects, activities or developments likely to impact include, but not restricted to, building development, business development, road improvements, changes to current uses.

All management actions related to the conservation of the site should be monitored for conservation effectiveness and impact.

6.4 Contractual Agreements

Essential obligations to be captured in Ministerial Decree

6.5 Review period

This plan should be revised after five (5) years taking into account progress against targets set out in the conservation objectives above. To aid this process a report should be prepared annually summarising all habitat management work carried out including maps of areas where work has been completed, summary of all monitoring including highlighting whether or not conservation objectives have been achieved, and a summary of all events / walks / education activities on the site.

6.6 Competent authority

Primarily the SBAs. Responsibility for implementation, reporting and review lies with these authorities.

It is strongly recommended that, also the Department of Forests, BirdLife Cyprus, the Game and Fauna Service, the Water Development Department, the Department of Fisheries and Marine Research are fully involved. Additionally, the Akrotiri Community Council and MERRAS Committee are important stakeholders for the management of this site.

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APPENDIX 1: List of bird species recorded at Akrotiri Marsh

Resident birds	*Anas platyrhynchos* Mallard *Tachybaptus ruficollis* Little Grebe *Falco tinnunculus* Common Kestrel *Francolinus francolinus* Black Francolin *Fulica atra* Common Coot *Gallinula chloropus* Common Moorhen *Columba palumbus* Common Wood Pigeon *Streptopelia decaocto* Collared Dove *Tyto alba* Barn Owl *Galerida cristata* Crested Lark *Cettia cetti* Cetti's Warbler *Sylvia conspicilata* Spectacled Warbler *Carduelis carduelis* European Goldfinch *Carduelis chloris* European Greenfinch *Passer domesticus* House Sparrow *Passer hispaniolensis* Spanish Sparrow *Parus major* Great Tit *Corvus cornix* Hooded Crow *Corvus monedula* Eurasian Jackdaw *Pica pica* Eurasian Magpie
Spring visitors	*Anas querquedula* Garganey *Anas platyrhynchos* Mallard *Anas crecca* Common Teal *Anas clypeata* Northern Shoveler *Anas acuta* Northern Pintail *Coturnix coturnix* Common Quail *Ardea cinerea* Grey Heron *Ardea purpurea* Purple Heron *Ardeola ralloides* Squacco Heron *Bubulcus ibis* Cattle Egret *Egretta alba* Great Egret *Egretta garzetta* Little Egret *Ixobrychus minutus* Little Bittern *Nycticorax nycticorax* Black-Crowned Night Heron *Platalea leucorodia* Eurasian Spoonbill *Plegadis falcinellus* Glossy Ibis *Grus grus* Common Crane *Porzana parva* Little Crake *Porzana porzana* Spotted Crake *Accipiter nisus* Eurasian Sparrowhawk *Circus aeruginosus* Western Marsh Harrier *Circus macrourus* Pallid Harrier *Circus pygargus* Montagu's Harrier *Pandion haliaetus* Osprey *Falco naumanni* Lesser Kestrel *Falco subbuteo* Eurasian Hobby *Falco vespertinus* Red-Footed Falcon *Actitis hypoleucos* Common Sandpiper *Gallinago gallinago* Common Snipe

	Clamator glandarius Great Spotted Cuckoo *Charadrius dubius* Little Ringed Plover *Charadrius hiaticula* Common Ringed Plover *Calidris alpine* Dunlin *Calidris ferruginea* Curlew Sandpiper *Calidris minuta* Little Stint *Calidris temminckii* Temminck's Stint *Glareola pratincola* Collared Pratincole *Himantopus himantopus* Black-Winged Stilt *Recurvirostra avosetta* Pied Avocet *Vanellus spinosus* Spur-Winged Lapwing *Numenius arquata* Eurasian Curlew *Philomachus pugnax* Ruff *Tringa erythropus* Spotted Redshank *Tringa glareola* Wood Sandpiper *Tringa nebularia* Common Greenshank *Tringa ochropus* Green Sandpiper *Tringa stagnatilis* Marsh Sandpiper *Tringa totanus* Common Redshank *Chlidonias hybrid* Whiskered Tern *Chlidonias leucopterus* White-Winged Tern *Sterna albifrons* Little Tern *Sterna nilotica* Gull-Billed Tern *Alcedo atthis* Common Kingfisher *Merops apiaster* European Bee-Eater *Upopa epops* Eurasian Hoopoe *Coracias garrulus* European Roller *Delichon urbica* Northern House Martin *Hirundo daurica* Red-Rumped Swallow *Hirundo rustica* Barn Swallow *Riparia riparia* Sand Martin *Cuculus canorus* Common Cuckoo *Streptopelia turtur* European Turtle Dove *Oriolus oriolus* Eurasian Golden Oriole *Jynx torquilla* Eurasian Wryneck *Anthus campestris* Tawny Pipit *Anthus cervinus* Red-throated Pipit *Anthus pratensis* Meadow Pipit *Anthus spinoletta* Water Pipit *Anthus trivialis* Tree Pipit *Motacilla alba* White Wagtail *Motacilla flava* Yellow Wagtail *Motacilla flava feldegg* Black-headed Wagtail *Motacilla flava flava* Blue-headed Wagtail *Motacilla flava thunbergi* Grey-headed Wagtail *Phoenicurus phoenicurus* Common Redstart *Oenanthe hispanica* Black-eared Wheatear *Oenanthe isabellina* Isabelline Wheatear *Oenanthe oenanthe* Northern Wheatear *Saxicola rubetra* Whinchat *Acrocephalus schoenobaenus* Sedge Warbler *Sylvia atricapilla* Blackcap

	Sylvia cantillans Subalpine Warbler *Sylvia communis* Common Whitethroat *Sylvia curruca* Lesser Whitethroat *Sylvia melanocephala* Sardinian Warbler *Sylvia rueppelli* Rüppell's Warbler *Hippolais pallida* Eastern Olivaceous Warbler *Phylloscopus sibilatrix* Wood Warbler *Phylloscopus trochilus* Willow Warbler *Ficedula albicollis* Collared Flycatcher *Ficedula hypoleuca* Pied Flycatcher *Muscicapa striata* Spotted Flycatcher *Lanius collurio* Red-backed Shrike *Lanius nubicus* Masked Shrike *Lanius senator* Woodchat Shrike *Emberiza caesia* Cretzschmar's Bunting *Emberiza hortulana* Ortolan Bunting *Emberiza melanocephala* Black-Headed Bunting *Miliaria calandra* Corn Bunting ***Rare Spring visitors:*** *Anser anser* Greylag Goose *Anas strepera* Gadwall *Aythya nyroca* Ferruginous Duck *Netta rufina* Red-Crested Pochard *Crex crex* Corncrake *Botaurus stellaris* Great Bittern *Ciconia ciconia* White Stork *Ciconia nigra* Black Stork *Porzana pusilla* Baillon's Crake *Grus virgo* Demoiselle Crane *Aquila fasciata* Bonelli's Eagle *Aquila pennatus* Booted Eagle *Buteo buteo* Common Buzzard *Buteo rufinus* Long-legged Buzzard *Buteo buteo vulpinus* 'Steppe' Buzzard *Milvus migrans* Black Kite *Pernis apivorus* European Honey Buzzard *Gallinago media* Great Snipe *Limosa limosa* Black-Tailed Godwit *Chlidonias niger* Black Tern *Sterna hirundo* Common Tern *Asio flammeus* Short-eared Owl *Ceryle rudis* Pied Kingfisher *Merops persicus* Blue-cheeked bee-eater *Motacilla citreola* Citrine Wagtail *Luscinia luscinia* Thrush Nightingale *Sylvia borin* Garden Warbler *Acrocephalus arundinaceus* Great Reed Warbler *Phylloscopus collybita* Common Chiffchaff *Phylloscopus bonelli* Bonelli's Warbler *Locustella luscinioides* Savi's Warbler *Hippolais icterina* Icterine Warbler

	Ficedula semitorquata Semi-collared Flycatcher *Lanius minor* Lesser Grey Shrike ***[Halcyon smyrnensis* White-throated Kingfisher]** ***[Saxicola maurus* Siberian Stonechat]**
Summer visitors (breeding)	*Aythya nyroca* Ferruginous Duck *Coturnix coturnix* Common Quail *Vanellus spinosus* Spur-Winged Lapwing *Motacilla flava feldegg* Black-headed Wagtail *Himantopus himantopus* Black-Winged Stilt *Apus apus* Common Swift [feeding area] *Delichon urbica* Northern House Martin [feeding area] *Hirundo daurica* Red-Rumped Swallow [feeding area] *Hirundo rustica* Barn Swallow [feeding area] *Clamator glandarius* Great Spotted Cuckoo *Streptopelia turtur* European Turtle Dove *Oenanthe cypriaca* Cyprus Wheatear *Acrocephalus scirpaceus* Eurasian Reed Warbler *Cisticola juncidis* Fan-Tailed Warbler *Hippolais pallida* Eastern Olivaceous Warbler
Autumn visitors	*Anas querquedula* Garganey *Anas platyrhynchos* Mallard *Anas crecca* Common Teal *Anas acuta* Northern Pintail *Ardea cinerea* Grey Heron *Ardea purpurea* Purple Heron *Bubulcus ibis* Cattle Egret *Egretta alba* Great Egret *Egretta garzetta* Little Egret *Nycticorax nycticorax* Black-Crowned Night Heron *Plegadis falcinellus* Glossy Ibis *Platalea leucorodia* Eurasian Spoonbill *Vanellus spinosus* Spur-Winged Lapwing *Ciconia ciconia* White Stork *Grus grus* Common Crane *Grus virgo* Demoiselle Crane *Porzana parva* Little Crake *Porzana porzana* Spotted Crake *Accipiter nisus* Eurasian Sparrowhawk *Aquila fasciata* Bonelli's Eagle *Aquila pennatus* Booted Eagle *Aquila pomarina* Lesser Spotted Eagle *Buteo buteo* Common Buzzard *Buteo buteo vulpinus* 'Steppe' Buzzard *Buteo rufinus* Long-legged Buzzard *Milvus migrans* Black Kite *Circus aeruginosus* Western Marsh Harrier *Circus macrourus* Pallid Harrier *Circus pygargus* Montagu's Harrier

	Pandion haliaetus Osprey *Pernis apivorus* European Honey Buzzard *Falco naumanni* Lesser Kestrel *Falco peregrinus* Peregrine Falcon *Falco subbuteo* Eurasian Hobby *Falco tinnunculus* Common Kestrel *Falco vespertinus* Red-Footed Falcon *Actitis hypoleucos* Common Sandpiper *Charadrius dubius* Little Ringed Plover *Charadrius hiaticula* Common Ringed Plover *Charadrius leschenaultii* Greater Sand Plover *Calidris alpina* Dunlin *Calidris ferruginea* Curlew Sandpiper *Calidris minuta* Little Stint *Calidris temminckii* Temminck's Stint *Philomachus pugnax* Ruff *Tringa glareola* Wood Sandpiper *Tringa nebularia* Common Greenshank *Tringa ochropus* Green Sandpiper *Tringa stagnatilis* Marsh Sandpiper *Tringa totanus* Common Redshank *Gallinago gallinago* Common Snipe *Glareola pratincola* Collared Pratincole *Larus ridibundus* Black-Headed Gull *Chlidonias hybrida* Whiskered Tern *Chlidonias leucopterus* White-Winged Tern *Sterna nilotica* Gull-Billed Tern *Alcedo atthis* Common Kingfisher *Upopa epops* Eurasian Hoopoe *Coracias garrulus* European Roller *Merops apiaster* European Bee-Eater *Delichon urbica* Northern House Martin *Hirundo daurica* Red-Rumped Swallow *Hirundo rustica* Barn Swallow *Riparia riparia* Sand Martin *Streptopelia turtur* European Turtle Dove *Cuculus canorus* Common Cuckoo *Oriolus oriolus* Eurasian Golden Oriole *Anthus cervinus* Red-throated Pipit *Anthus campestris* Tawny Pipit *Anthus pratensis* Meadow Pipit *Anthus trivialis* Tree Pipit *Motacilla flava* Yellow Wagtail *Motacilla flava feldegg* Black-headed Wagtail *Motacilla flava flava* Blue-headed Wagtail *Motacilla flava thunbergi* Grey-headed Wagtail *Oenanthe isabellina* Isabelline Wheatear *Oenanthe oenanthe* Northern Wheatear *Saxicola rubetra* Whinchat *Acrocephalus schoenobaenus* Sedge Warbler *Sylvia atricapilla* Blackcap *Sylvia curruca* Lesser Whitethroat

	*Sylvia hortensis*Orphean Warbler *Sylvia melanocephala* Sardinian Warbler *Phylloscopus trochilus* Willow Warbler *Muscicapa striata* Spotted Flycatcher *Lanius collurio* Red-backed Shrike *Lanius minor* Lesser Grey Shrike *Lanius nubicus* Masked Shrike *Emberiza caesia* Cretzschmar's Bunting ***<u>Rare autumn visitors:</u>*** *Anser anser* Greylag Goose *Aythya nyroca* Ferruginous Duck *Coturnix coturnix* Common Quail *Crex crex* Corncrake *Porzana pusilla* Baillon's Crake *Ardeola ralloides* Squacco Heron *Ixobrychus minutus* Little Bittern *Recurvirostra avosetta* Pied Avocet *Ciconia nigra* Black Stork *Falco columbarius* Merlin *Circaetus gallicus* Short-toed Snake Eagle *Limosa limosa* Black-Tailed Godwit *Numenius arquata* Eurasian Curlew *Tringa erythropus* Spotted Redshank *Chlidonias niger* Black Tern *Sterna hirundo* Common Tern *Jynx torquilla* Eurasian Wryneck *Apus pallidus* Pallid Swift *Halcyon smyrnensis* White-throated Kingfisher *Motacilla alba* White Wagtail *Luscinia luscinia* Thrush Nightingale *Locustella luscinioides* Savi's Warbler *Sylvia borin* Garden Warbler *Sylvia communis* Common Whitethroat *Sylvia rueppelli* Rüppell's Warbler *Phylloscopus sibilatrix* Wood Warbler *Emberiza hortulana* Ortolan Bunting
Winter visitors	*Anas platyrhynchos* Mallard *Anas penelope* Eurasian Wigeon *Anas crecca* Common Teal *Anas clypeata* Northern Shoveler *Anas acuta* Northern Pintail *Aythya farina* Common Pochard *Aythya nyroca* Ferruginous Duck *Tadorna tadorna* Common Shelduck *Tachybaptus ruficollis* Little Grebe *Fulica atra* Common Coot *Rallus aquaticus* Water Rail *Phalacrocorax carbo* Great Cormorant *Ardea cinerea* Grey Heron

	Bubulcus ibis Cattle Egret *Buteo buteo* Common Buzzard *Egretta alba* Great Egret *Vanellus vanellus* Northern Lapwing *Phoenicopterus roseus* Greater Flamingo *Buteo rufinus* Long-legged Buzzard *Circus aeruginosus* Western Marsh Harrier *Alcedo atthis* Common Kingfisher *Charadrius leschenaultii* Greater Sand Plover *Calidris alpina* Dunlin *Calidris minuta* Little Stint *Tringa totanus* Common Redshank *Gallinago gallinago* Common Snipe *Numenius arquata* Eurasian Curlew *Larus ridibundus* Black-Headed Gull *Anthus pratensis* Meadow Pipit *Anthus spinoletta* Water Pipit *Alauda arvensis* Eurasian Skylark *Lullula arborea* Wood Lark *Motacilla alba* White Wagtail *Motacilla cinerea* Grey Wagtail *Erithacus rubecula* European Robin *Phoenicurus ochruros* Black Redstart *Turdus merula* Blackbird *Turdus philomelos* Song Thrush *Luscinia svecica* Bluethroat *Saxicola torquata* Common Stonechat *Acrocephalus melanopogon* Moustached Warbler *Sylvia atricapilla* Blackcap *Sylvia melanocephala* Sardinian Warbler *Phylloscopus collybita* Common Chiffchaff *Remiz pendulinus* Penduline Tit *Carduelis cannabina* Eurasian Linnet *Carduelis carduelis* European Goldfinch *Sturnus vulgaris* Common Starling *Fringilla coelebs* Eurasian Chaffinch *Emberiza schoeniclus* Reed Bunting *Miliaria calandra* Corn Bunting ***<u>Rare winter visitors:</u>*** *Cygnus olor* Mute Swan *Anser anser* Greylag Goose *Anas strepera* Gadwall *Aythya fuligula* Tufted Duck *Tadorna ferruginea* Ruddy Shelduck *Marmaronetta angustirostris* Marbled Teal *Botaurus stellaris* Great Bittern *Egretta garzetta* Little Egret *Pelecanus onocrotalus* Great White Pelican *Platalea leucorodia* Eurasian Spoonbill *Grus grus* Common Crane *Falco columbarius* Merlin

	Glareola nordmanni Black-winged Pratincole *Calidris temminckii* Temminck's Stint *Lymnocryptes minimus* Jack Snipe *Philomachus pugnax* Ruff *Tringa glareola* Wood Sandpiper *Tringa nebularia* Common Greenshank *Tringa ochropus* Green Sandpiper *Recurvirostra avosetta* Pied Avocet *Ceryle rudis* Pied Kingfisher *Turdus viscivorus* Mistle Thrush *Parus ater cypriotes* Cyprus Coal Tit

APPENDIX 2: Akrotiri Marsh Grazing Capacity Study

Akrotiri Marsh Grazing Capacity Study

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RSPB Frampton Marsh & Freiston Shore

Akrotiri Marsh Grazing Capacity Study

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www.akrotirimarsh.org

Akrotiri Marsh Grazing Capacity Study

The aim of this document is to establish an appropriate livestock grazing regime at Akrotiri Marsh to help improve conditions for the key target species associated with the wet grassland habitat, specifically breeding black-winged stilt and spur-winged lapwing.

In order to improve conditions for breeding waders the area of reed needs to be reduced and the area of grassland increased, in particular a much larger area of wet or partially flooded grassland needs to be created to provide feeding and nesting opportunities for these species. The grassland sward should be generally short (no more than 5-10cm average height during April), but with a diverse range of plants including the rarer species such as grey club-rush *Scirpus tabernaemontani.*

Livestock grazing is a key management tool in the conversion of reed to wet grassland and the sustainable management of the Marsh. In order to calculate an appropriate livestock grazing density (number of grazing animals) a number of factors need to be examined. These are outlined below and taken into consideration for the recommended grazing densities under the final section 'Recommendations'.

Vegetation type

Very little information is available on the species of grass present at Akrotiri Marsh. It is assumed they will be similar to species or in characteristics to those found elsewhere in wet grassland habitats, both tolerating and benefitting from a wet soil conditions and periodic inundation.

Rare plants

Some nationally rare plants occur at Akrotiri Marsh. Each has its own specific habitat preferences and all are likely to benefit from at least some extensive grazing. However, an area containing sensitive species has been excluded from the grazed area. Here habitat management with periodic manual cutting using brushcutters will help keep conditions favourable and stop them being out competed by reed growth. These plants may also be affected by bramble encroachment. This could in part be due to lower than normal water levels during the past two years (2015 and 2016) to facilitate the engineering works. The bramble may need to be removed manually (or perhaps by grazing with goats) but as wet conditions have been reinstated bramble encroachment may be limited in future.

Grey club-rush *Scirpus tabernaemontani which is an unusual plant in Cyprus grows in the wet zone areas between the reed and wet grassland. This may be affected by heavy grazing and is also a plant which is popular with basket weavers. Although the extensive grazing and pushing back of the reed edge should create more favourable conditions for this species in the longer term these plants will need to be monitored to ensure they do not adversely suffer due to the higher/extensive grazing pressure. If this is considered to be the case then they could be fenced off with electric fencing for part or all of the season. Consideration could also be given to translocating the seeds from the Scirpus to other suitable areas on the Marsh as they become available to reduce the potential for disturbance to nesting waders (currently a key location for the plant is adjacent to the wader scrape) by basked weaver and to ensure a more viable population.*

Insect communities

These will be associated with the diversity of habitat conditions and plant species on site. As with plant diversity a very heavily grazed sward could lead to a reduction in insect diversity, however, without reasonably high grazing pressure it will be difficult to expand the area of grassland. Excluding livestock form certain areas or rotational grazing may alleviate potential impacts.

Soils

The soils at Akrotiri Marsh are generally peaty in the north and central areas and sandy towards the west and south. Peaty soils are better for wetland sward grass growth due to retaining moisture and having more organic matter. The soils in the areas of existing grassland are suitable for the wetland grass sward and the soils in the central areas, currently dominated by reeds would be suitable to convert to a grassland sward. It will be less likely a suitable grass sward could be achieved in the west and south of the site due to the presence of sandy soils which will dry out and not retain sufficient water for the sward to establish.

Water levels

Water level management is important to ensure optimal habitat conditions for both ecological targets and grazing. The higher winter levels should be retained into spring to benefit breeding ferruginous ducks and provide suitable areas for breeding and passage waterbirds including black-winged stilts and spur-winged lapwings. At present there is little suitable habitat for breeding waders (other than the wader scrape, which due to the provision of islands surrounded by sufficiently deep open water should be suitable) but as the reedbed is pushed back over time larger seasonally flooded areas of grassland would be expected. This area of habitat recreation is a key objective of the project. Water levels can be allowed to gradually and naturally drop in spring and through the summer before being recharged again in winter. Good water level management is important for grazing livestock because if the levels are too high it could restrict grazing availability and access for livestock to graze the lower areas of marsh. The lower areas of marsh are where we want to encourage livestock to graze to facilitate the transition from reedbed to wet grassland. Water level management is covered in more detail in the Water Level Management Plan.

Salinity

Salinity will significantly affect the growth and composition of grasses as many species are not particularly salt tolerant, with high salinity levels radically altering the vegetation community. Salt tolerant plants are generally palatable to livestock and a saline dominated plant community could be suitable for many passage and breeding waterbird species (eg as is present at Oroklini Marsh) but this is not a habitat type we would prefer at Akrotiri Marsh given the history of the site, the rare species of plants, amphibians and invertebrates that are not salt tolerant and the scarcity of freshwater wetlands in Cyprus. Although there is quite a strong saline influence at the southern end of Aktrotiri Marsh the northern part of the site, which is regularly spring fed and where this work is focussed, does not have a significant saline influence, therefore we do not consider this to be a factor we need to take into account.

Weather (rainfall, temperature and sunshine) and water availability

Climatic conditions at Akrotiri are typified by high temperatures, high levels of sunshine and generally low rainfall. The summer is particularly hot with temperatures frequently reaching 40^0 Celsius.

Grass will grow when the temperature is consistently above 6^0C. In Cyprus we consider this would be from late-February to early December. Therefore the grazing season is extended compared with more northerly European latitudes.

However, the very warm or hot weather conditions associated with a general lack of rainfall might normally be considered detrimental to grass growth, potentially severely so (eg. 'drought conditions'). These conditions might be expected to more than offset the potentially beneficial conditions outlined in the paragraph above and this is the case in much of Cyprus where grass growth is severely restricted. But because Akrotiri Marsh sits in a natural topographical basin and benefits from a regular spring-fed water supply these barriers to grass growth are not significant and this creates ideal conditions for wetland plants.

We have seen how reeds grow extremely vigorously and tall, to 8m plus in some areas at Akrotiri Marsh. Grass has a similar growing cycle to reed and although not as significant, grass growth is also vigorous leading to Akrotiri Marsh developing a lush grass sward where it has not been out competed by reeds.

Pollutants

We have assumed there are no significant pollutants to take account of in this study.

Non-livestock grazing pressure

Unlike many wetland sites the grazing pressure from other animals (eg wildfowl) is negligible. There are very few ducks or geese using Akrotiri Marsh (which can be significant grazers of wet grasslands). Even assuming numbers will increase due to the habitat works it is unlikely given the peak counts in the recent Cyprus bird reports reviewed (2013 & 2014) that geese or ducks will be present in sufficient numbers to be considered in the grazing assessment.

Type of livestock

In order to calculate recommended grazing densities on wetland sites 'Livestock unit coefficients' are often used. These vary depending on the source, but for the purposes of this study we use the Eurostat Livestock Unit (LSU) calculations. Animals of relevance to Akrotiri Marsh include; bull 1.0 LSU, cow over 2 years old 0.8 LSU. Calves 1-2 years old 0.7 LSU and if under 1 year old 0.4 LSU. Horses and donkeys are similarly categorised. However, because the traditional Akrotiri cattle breed is noticeably smaller than UK cattle (upon which the criteria are based) and since smaller animals will require less food (grass) it is suggested lowering the LSU cattle values for all age classes by 0.2 LSU. Therefore the livestock at Akrotiri will be treated as follows;

- Bull 0.7 LSU
- Cow 2+ years old 0.6 LSU
- Cow 1-2 years old 0.5 LSU
- Calf <1 year old 0.2 LSU
- Horse/donkey 2+ years old 0.8 LSU
- Horse/donkey 1-2 years old 0.7 LSU
- Horse/donkey <1 year old 0.4 LSU

Normally cattle are preferred for grazing wet grassland habitats. The current composition of livestock favours cattle. At Akrotiri Marsh having a variety of livestock could be advantageous because horses may be good at eating reed and donkeys are also known for eating tough vegetation in comparison to cattle, so having some horses and donkeys might aid the conversion of reed to

grassland habitat. Sheep are not recommended because they tend to create a rather uniform short sward that does not create diverse habitat conditions for wildlife (the perimeter fencing is also not suitable for sheep).

Supplementary feeding

With an expected lack of growth during mid-December to late-February at Akrotiri Marsh it will be necessary for graziers to either remove their livestock to find alternative grazing or to provide supplementary feeding on site for the animals. The availability of reed will not offset the lack of grass during the winter because the reeds will become woody and unpalatable during winter.

Reed clearance/cutting

From early August until late February (i.e. not during the bird breeding season) some mechanical cutting or other removal of reeds in certain areas would be highly desirable to help facilitate the conversion of reed to wet grassland habitat as mechanical cutting will be more effective and will deliver a quicker transition than grazing alone. It is important for these areas to be grazed as soon as the reed starts to regrow to prevent it quickly reverting to a reedbed and aid the transition to a grassland. Water level control will also be important as if the reeds are removed and the area is flooded it may not prevent livestock from accessing these areas. This should be considered as a management tool to create more wet grassland habitat.

Nest trampling

There is a risk of livestock trampling ground nesting bird nests. In some habitats and for some species this can be a problem (eg saltmarsh nesting redshanks and colonial island nesting species such as gulls, terns and avocets). To reduce this risk livestock should be prevented from accessing the wader scrape during late February to June through the use of an electric fence. After this date the fence should be removed to encourage cattle to graze the scrape, including the islands to manage vegetation growth. For any birds nesting away from the grazing exclosure around the wader scrape including black-winged stilts and spur-winged lapwing plus other species (wagtails etc) there is a greater risk of nest trampling. This can only be reduced by further electric fencing, tethering cattle or reduced grazing densities. Since extensive cattle grazing is important to ensure good quality wet grassland habitat condition and a conversion of reed to wet grassland only further electric fencing and stocking densities measures are considered appropriate. In the short-term it is unlikely there will be many ground nesting birds at Akrotiri Marsh outside of the wader scrape due to the extent and quality of habitat. According to Google Earth around 17.5ha of grazing land is available (date unknown) and as of March 2017 there were a total of 99 animals. This is an overall grazing density of 5.7 Livestock per hectare.

The Wet Grassland Guide includes a calculator for nest trampling rates by grazing livestock on wet grassland habitat. The most closely related species assessed in the guide; black-tailed godwit and northern lapwing would theoretically experience nest trampling rates of around 83% and 62% respectively at current (March 2017) grazing density. At Akrotiri Marsh it might be expected spur-winged lapwing could be similar to northern lapwing and black-winged stilt more similar to black-tailed godwit. Irrespective of the species, these trampling rates would be unsustainably high. However, we are currently in a situation where we need to increase the area of non-reed habitat

and with no breeding waders at present the risks of trampling are somewhat academic. Waders are less likely to attempt to nest in areas with very high cattle grazing density. Once a larger area of suitable habitat for ground nesting waders has been created decisions will have to be made for livestock management during subsequent breeding bird seasons (late February to June) to ensure suitable conditions are created. Management options include lowering overall grazing densities, lowering densities in some areas (i.e. rotational grazing) or excluding livestock from some areas (possibly through the use of seasonal electric fencing).

Livestock management

As there are a number of graziers and some at least will want to keep their livestock separated, but with the community wishing not to have internal permanent fencing the use of temporary electric fencing needs to be considered. It is up to the graziers to negotiate their own grazing parcels, but close liaison with the graziers will be necessary to ensure conservation objectives are being achieved. The wader scrape will need to be fenced off during late February to June to prevent accidental trampling of nests (the cattle are likely to walk out onto the islands). Due to budget constraints a complete perimeter fence could not be installed as part of the DLUS034 project therefore graziers will have to be aware that livestock may be able to escape Akrotiri Marsh if they get through or around the reedbed. This can be addressed with electric fencing provision. In the longer term consideration should be given to complete the perimeter fencing to ensure extensive grazing with livestock can be effectively delivered.

Extra water from dam

Fresh water availability is crucial for the success of Akrotiri Marsh. In certain conditions such as drought or if the spring water flows are insufficient to maintain desired water levels it may be necessary to increase the flow of fresh water into Akrotiri Marsh by supplemental water from the dam. See Water Level Management Plan.

Recommendations

Typical grazing densities for lowland wet grasslands in the UK are in the range of a maximum 0.5 – 0.9 LSU/ha. Given the factors outlined under ‘Soils’, ‘Salinity’ and ‘Weather...’ we consider this should be higher at Akrotiri Marsh, where a range of 1.0-1.75 LSU/ha might be appropriate. The current grazing density (March 2017) at is 49.05 LSU in 17.5ha or 2.80 LSU/ha. However, as suggested under ‘Nest Trampling’ additional grazing is available in the form of reeds adjacent to the 17.5ha wet grassland habitat which contribute to a lower effective pressure on the grassland habitat. As the Akrotiri Marsh Project seeks to reduce the area of reed and increase the area of grassland higher livestock densities are required to encourage the animals to ingress into the reedbed and transition the reed habitat into grassland habitat. Therefore it is considered desirable for the first five years to have a livestock grazing density in the range 1.75-3.00 LSU/ha (as calculated over the 17.5ha existing grassland). Grazing levels should be reviewed annually and recalculated to take into account any increase in the 17.5ha grazed area/wet grassland. The grazing pressure will need to be brought back in the longer term to 1.0-1.75 LSU/ha when the wet grassland area has been increased to the desired area to bring the grazing back into equilibrium so the reedbed area does not continue to be reduced . **An aspirational target for wet grassland habitat could be 50-60ha (of the total ca. 118ha Akrotiri Marsh total area – as measured on Google Maps between the road,**

southern perimeter ditch, eucalyptus wood to the east and farmland to the west), retaining 15ha of saltmarsh and 43-53ha of reedbed. To illustrate the number of animals required once the desired habitat areas have been achieved based on 60ha grassland this would equate to 100-175 cows aged 2 years or older (using the grazing density range 1.0-1.75 LSU/ha).

At these short and longer-term target grazing density levels nest trampling remains a significant issue and so efforts will need to be made to provide areas of suitable habitat where densities are lowered to a maximum of 0.9 LSU/ha. This could be achieved over the whole site if some animals are removed during the nesting season (late February to June) or if this is not possible then the most likely areas for breeding waders (the wetter areas) should be temporarily fenced off from livestock. The wader scrape which has been created specifically for breeding waders should also be ungrazed between late February and June.

The introduction of extensive grazing, leading to a more diverse, less reed dominated habitat will provide enhanced opportunities for plants and invertebrates in the longer term, but in the short-term rare plant and insect species will also need to be monitored (for at least five years) to ensure the communities and rarer species are not adversely affected by the higher levels of grazing required break up and transition reed into other habitats. Short-term mitigation to alleviate potential problems could include the provision of temporary electric fencing around important populations and rotational grazing.

As outlined earlier monitoring will be crucial to inform the grazing densities and to ensure the breeding waders, rare plants and insects benefit from the changed grazing regime. A management plan is also in preparation for the site. This should include monitoring and an annual review comparing grazing levels, key breeding bird numbers, rare plant and invertebrate data to inform management.

Appendix 3: Water Management Plan

Darwin Plus:
Overseas Territories Environment and Climate Fund

Akrotiri Marsh Restoration: a flagship wetland in the Cyprus SBAs:

Water Management Plan

Project Ref Number DPLUS034

BirdLife Cyprus

Royal Society for the Protection of Birds (RSPB)

Akrotiri Environmental Education Centre

Start/End dates of Project 1st April 2015 – 31st March 2017

www.akrotirimarsh.org

Project Overview

This project aims to restore Akrotiri Marsh to a mosaic of habitats. This will lead to restoration of species diversity at the site, and will provide increased socio-economic opportunities for local villagers. The project will provide water management and management of vegetation (mainly reeds) in order to restore biodiversity on site. A number of new surveys and monitoring programmes will be carried out and a management plan developed. The project will contribute to the long-term objective of good management and will also increase resilience of the Akrotiri Ramsar site at a time of increasing drought and increased effects from climate change in Cyprus. It will also contribute to the Akrotiri Management Plan developed by the SBAA and towards the aim of the Environment Service of the SBAs. Akrotiri Marsh belongs to the Akrotiri wetland complex which is a recognised Important Bird Area; a Ramsar site; a Special Protection Area; and a Special Area of Conservation.

The Important Bird Area (IBA) which includes the Akrotiri marsh, Akrotiri Peninsula and the Episkopi Cliffs is among the most outstanding IBAs of Cyprus. This extensive site is a congregation site for waterbirds in winter and spring, including globally important numbers of Flamingos, and a raptor bottleneck site in autumn, with globally important congregations of four birds of prey including the Red-footed Falcon. Other notable migrants occurring in numbers of regional importance include Little Egret, Glossy Ibis, Crane, Demoiselle Crane and Collared Practincole.

Important breeding birds at Akrotiri marsh are Ferruginous Duck, Spur-Winged Lapwing, Black-Winged Stilt, Black Francolin and probable Little Bittern. Also of note are the Reed Warbler and Black-headed Yellow Wagtail which breed only at a few sites in Cyprus. The site is amongst the best breeding sites in Cyprus for the Ferruginous Duck.

Besides its importance for birds, Akrotiri marsh is also important for its flora as the site hosts some rare and threatened species that are included in the The Red Data Book of the Flora of Cyprus. For some plants such as *Ipomoea sagittata*, *Mentha aquatica*, *Euphorbia pubescens*, *Orchis palustris* and *Baldelia ranunculoides*, the Akrotiri marsh is the only known site in Cyprus where these plants exist. The Akrotiri peninsula is also one of the botanical hotspots in Cyprus as it has been estimated that more than 800 indigenous plant taxa occur here. The marsh, which covers an area of around 150 hectares, has been unmanaged for the last 20 years resulting in the overexpansion of reeds and the consequent loss of bird and plant diversity. A Darwin Plus project started in April 2015 in order to restore the biodiversity at Akrotiri marsh through the implementation of on-site conservation actions as well as awareness raising actions and creation of visitor facilities.

The two-year project is funded by the Darwin Initiative through UK Government funding (Darwin Plus, the Overseas Territories Environment and Climate Fund) and is implemented with BirdLife Cyprus as a lead partner and in collaboration with the Akrotiri Environmental Education Centre and the RSPB (BirdLife partner in the UK).

Ferruginous ducks

Spur-winged lapwing

Black-winged stilt

Overview of the site

The 150ha of the Akrotiri Marsh is largely flat and low-lying, characterised by low permeability soils with high residual salt concentrations, brackish groundwater, and a highly seasonal rainfall input. In addition to rainfall inputs there are surface water and spring inputs from the catchment to the north.

The topography of the site and the presence of salt indicates a history of sea water inputs, suggesting that the lower parts of the site could have been connected to the sea in historical times. Groundwater levels on the site are 2m or more above current sea level and show some pressure, so there will be no marine influence now. This is highly significant to the development of hydrological objectives for the site.

The combination of a low-lying, impermeable land and brackish groundwater in a Mediterranean climate tends towards a seasonal drawdown type system with fluctuating salinity (from largely fresh in winter to hypersaline or dry in late summer), surrounded by brackish tolerant communities of *Phragmites* and salt meadows. This is largely the case at Akrotiri, but the higher ground levels and significant surface and groundwater inputs on the northern edge have resulted in a more characteristically freshwater habitat in that area.

The site has been modified at various times, notably by a series of surface drains to gravity drain the wet areas, including stop-log type sluices to retain water when needed. These have fallen into disrepair in recent years which has reduced the overall drainage effect and any

control, resulting in spread of reed into more open seasonal drawdown grassland. These dynamic wet margins are some of the most valuable habitats on the site, but are reliant on access for cutting and grazing, taking advantage of seasonal water drawdown. The result has been smaller and more fragmented wet meadows, and an abrupt reed edge.

The reedbed itself has also been left largely unmanaged partly due to access difficulties, resulting in very dense tall reed with an abundance of litter accumulation. It is also possible that the reedbed itself may have become lower during periods of more intensive drainage which may have resulted in less effective gravity outflows - peat often decays in these environments.

Key changes undertaken by the project

This project has focused on reinstating the water management system of the marsh by restoring key drainage channels and installing new water level control structures. This has been alongside work to connect these new ditches to seven new pools within the reedbed, and a restored 'scrape' on the northern edge to reinstate a significant area of dynamic marginal wetland edge habitat. These new structures and features will allow water to be retained to target in winter and spring, then allow effective and controlled drawdown to facilitate cutting and grazing along the edges. Livestock fencing allows free-ranging cattle to make use of the edge of the reedbed, opening structure and creating a poached, invertebrate rich margin.

These changes will provide optimal habitat for key target species on site. Ferruginous ducks will benefit from open pools with reliable water levels, diverse marginal and aquatic vegetation and an abundance of aquatic invertebrates. Black-winged stilts and spur-winged lapwings will make use of open shallow flooding with retreating damp edges and light grazing. A wide diversity of other reedbed and wetland edge species will also benefit from this management regime.

Target water level management regime

The aim of water level management is to provide suitable water levels during the year to balance the needs of key breeding birds and other wildlife, and management requirements, notably reed cutting and grazing.

The 'scrape' and wet grassland margin needs to be shallow (typically 20-40cm depth) flooded at the beginning of the breeding season in March, keeping islands free of water. The scrape bed level is at 11.5m, and islands are at 12.1-12.2. Target water level for this time of year is **12.0m.**

The pools are excavated to a bed depth of 10.3-10.5m. A 12.0m water level will provide 1.5m of mean water depth.

To achieve these target levels it will usually be necessary to make use of the short duration and intensive rain that is most likely to occur in winter. Winter water levels can be at the spring maximum of 12.0m, or even exceed this.

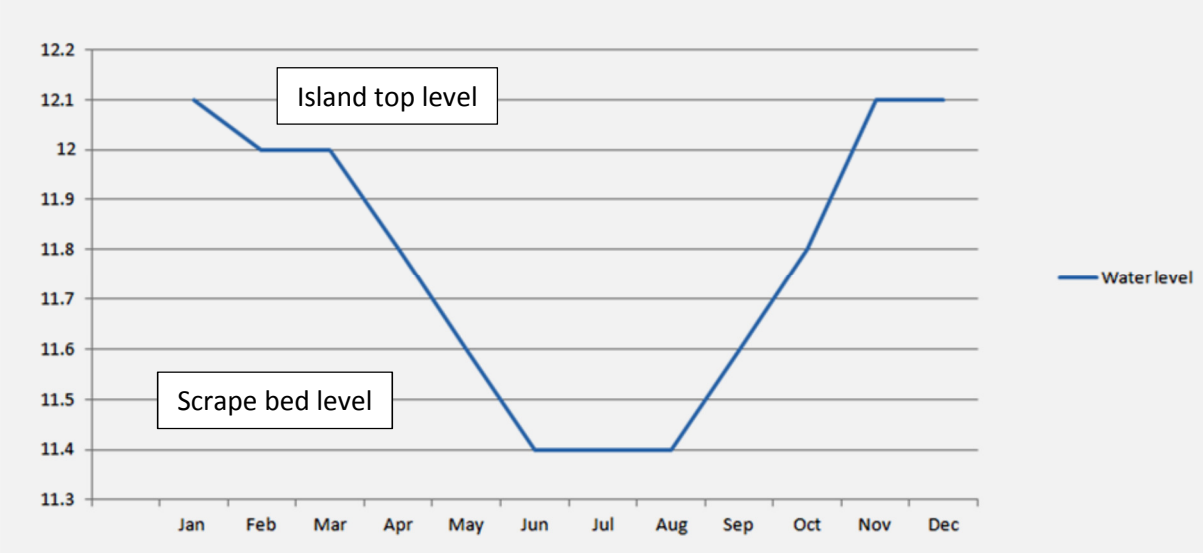
The earth dams are at 12.2m, a level that mustn't be exceeded to avoid erosion risk. The pipe uprights can be set at 12.1m in November and retained at this level until Febraury. Uprights need to be lowered to 12.0m in early March. This allows for the actual levels to rise slightly above this in high flow situations without flooding the islands in the scrape.

Water levels should begin to recede during March and April even if the pipe uprights set at 12.0m. Target level would be a steady recession of levels through the breeding season, not falling below 11.6m until June.

In some wet springs the level may not fall enough to expose muddy feeding edge, and in these years the pipe uprights need to be lowered to 11.8m in early April, and 11.6m in early May. However, some degree of water level fluctuation in April and May can help to retain wet edge, as long as it doesn't risk nest locations (which should be above 12.0m as this was the water level at the time of egg-laying). There is a higher risk if a wet April follows a dry winter - if water levels fail to reach 12.0 at the beginning of March, the pipe uprights should be lowered to match the water level at that time.

Light grazing can be introduced once all wader chicks are mobile, making use of the newly exposed damp grassland and making inroads into reed edge.

Summary of target water level regime



It is likely that water levels will not follow these levels exactly, which is not a problem and can be beneficial by providing some additional dynamic edge. The key benefit of the project has been to provide a large capacity outflow system with fine control to retain levels while coping with unexpected rainstorms. In the breeding season, sudden rises in water levels could lead to nest losses.

Water levels will fluctuate more than this line suggests, but remain within the overall design brief.

In unusually dry conditions the stored winter water should ensure good conditions right through the breeding season.

Summary of key points in water management calendar:
November: Raise uprights to 12.1m
February: Check uprights and lower to 12.0m
Early March: Check uprights at 12.0m. If water level lower than 12.0, lower uprights to 11.8m.
Early April: Check uprights - in very wet spring, lower to 11.8m (if not done previously)
Early May: Check uprights - in very wet spring, lower to 11.6m
Early June: Lower uprights to 11.4.

Sluice pipe inverts are set at between 10.95-11.05m, so even if uprights are removed altogether it is not possible to entirely draw down ditches and pools upstream. The scrape would dry out though, and it is likely that other features would also dry through evaporation.

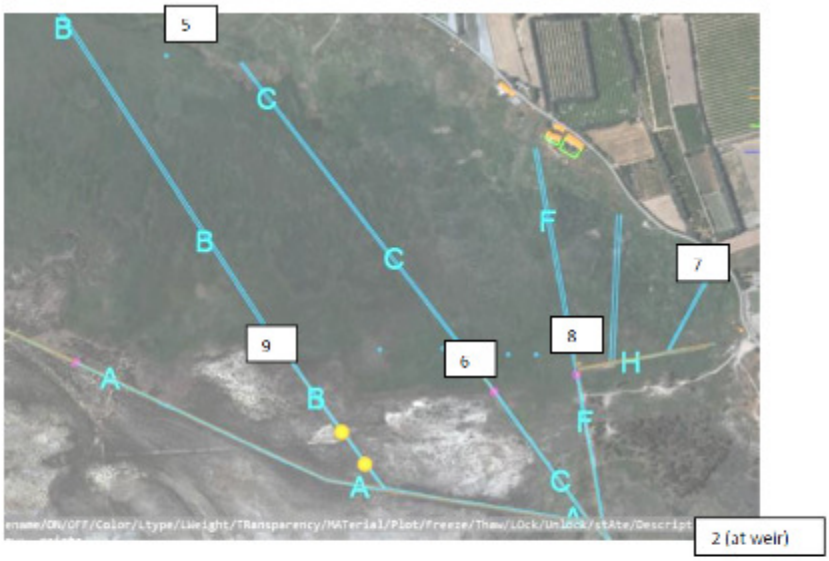
Additional guidance

Monitoring

Water levels.

There are six water level gauge boards on site. These provide vital information on the hydrological function of the wetland. This is especially so in the first years of operation when variations in water level can be identified quickly and their reasons understood and corrected.

Locations of gauge boards:



	Gauge 2	Gauge 5	Gauge 6	Gauge 7	Gauge 8	Gauge 9
Zero on gauge board(m)	10.37	11.44	11.19	11.80	11.44	11.40

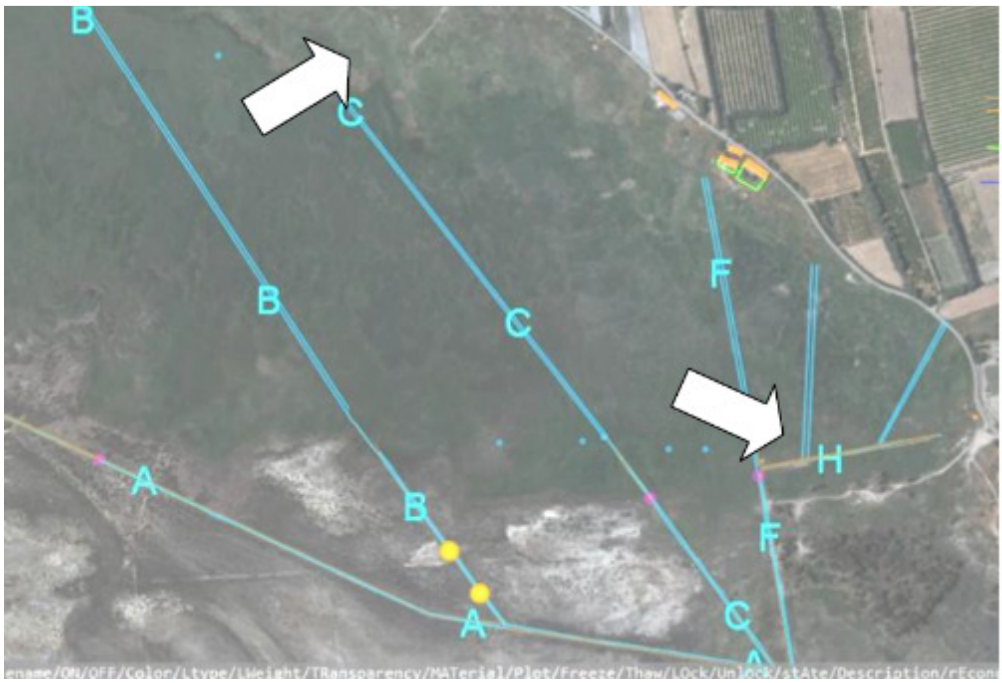
For reference, the outlet weir crest (out to SE of site, near main road) is at 10.96m

Gauge boards should be read at least at the times that the pipes are checked and/or set, and preferably every month.

Salinity

Salinity should be recorded at the same times as the gauge boards are read, and also ideally every month, using a high range conductivity meter. A refractometer will be more appropriate if conductivities rise above 20mS.

Salinity should be recorded in the pools and, when water is present, in the wader scrape:

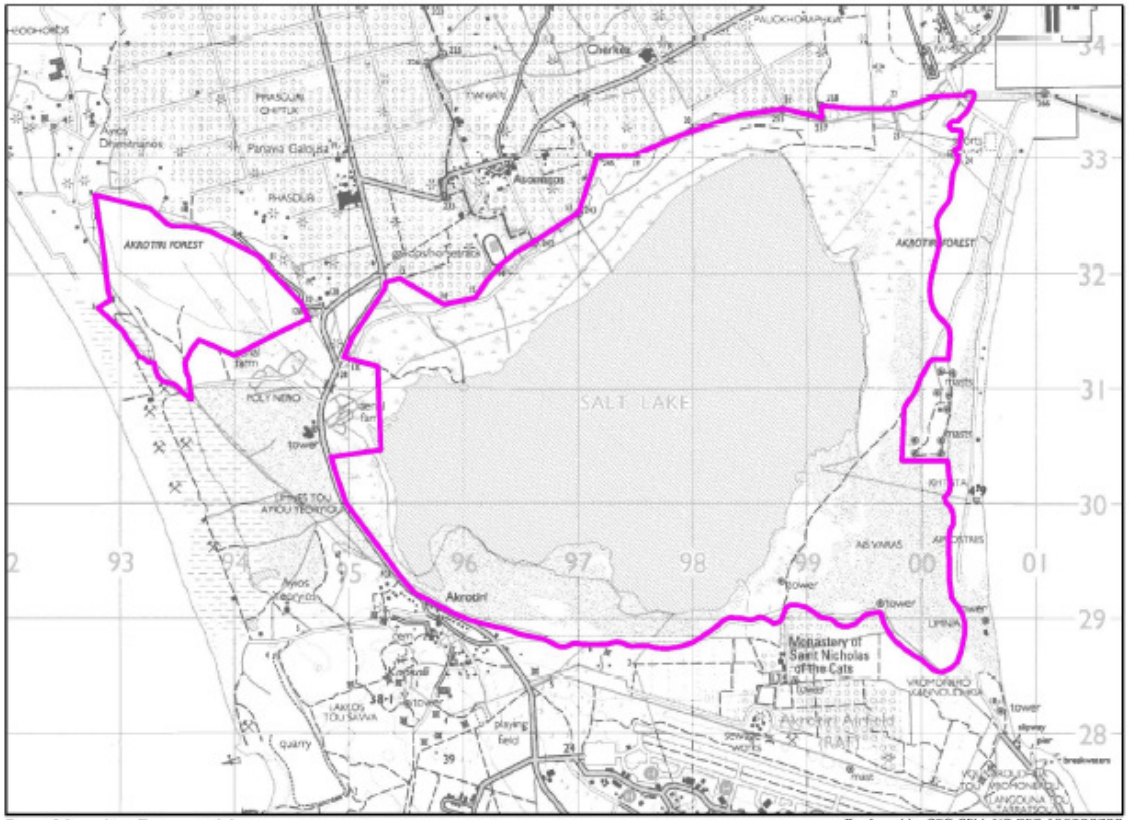


APPENDIX 4: List of studies/reports conducted through the Darwin project (DPLUS034)

Study/report	Language	Partner	Year
Akrotiri Marsh breeding bird study: April-July 2015	English	BirdLife Cyprus Study conducted by Peter Beckenham	2015
Akrotiri Marsh Restoration Project Bird Report 2016	English	BirdLife Cyprus Report by Nathan Wilkie & Ellie Ellwood	2016
Conservation study of the Mediterranean Killifish *Aphanius fasciatus* in Akrotiri Marsh (Akrotiri SBA, Cyprus)	English	BirdLife Cyprus Study conducted by Dr Stamatis Zogaris	2017
Water Management Plan	English	RSPB	2017
Akrotiri Marsh Grazing Capacity Study	English	RSPB	2017
All reports are available from BirdLife Cyprus upon request			

Appendix 5: Maps of conservation status for Akrotiri Marsh

Ramsar Designation



Base Mapping Extracted from:
Series K717
Sheet 23
Edition 6 GSGS

LEGEND

AKROTIRI

SOVEREIGN BASE AREAS, CYPRUS

RAMSAR SITE CODE :

Wetland of International Importance, Ramsar Convention boundary shown thus

Longitude: 32° 58' 00"

Latitude: 34° 37' 00"

Area of Ramsar site: 2171 ha

SCALE 1:50,000 Kms

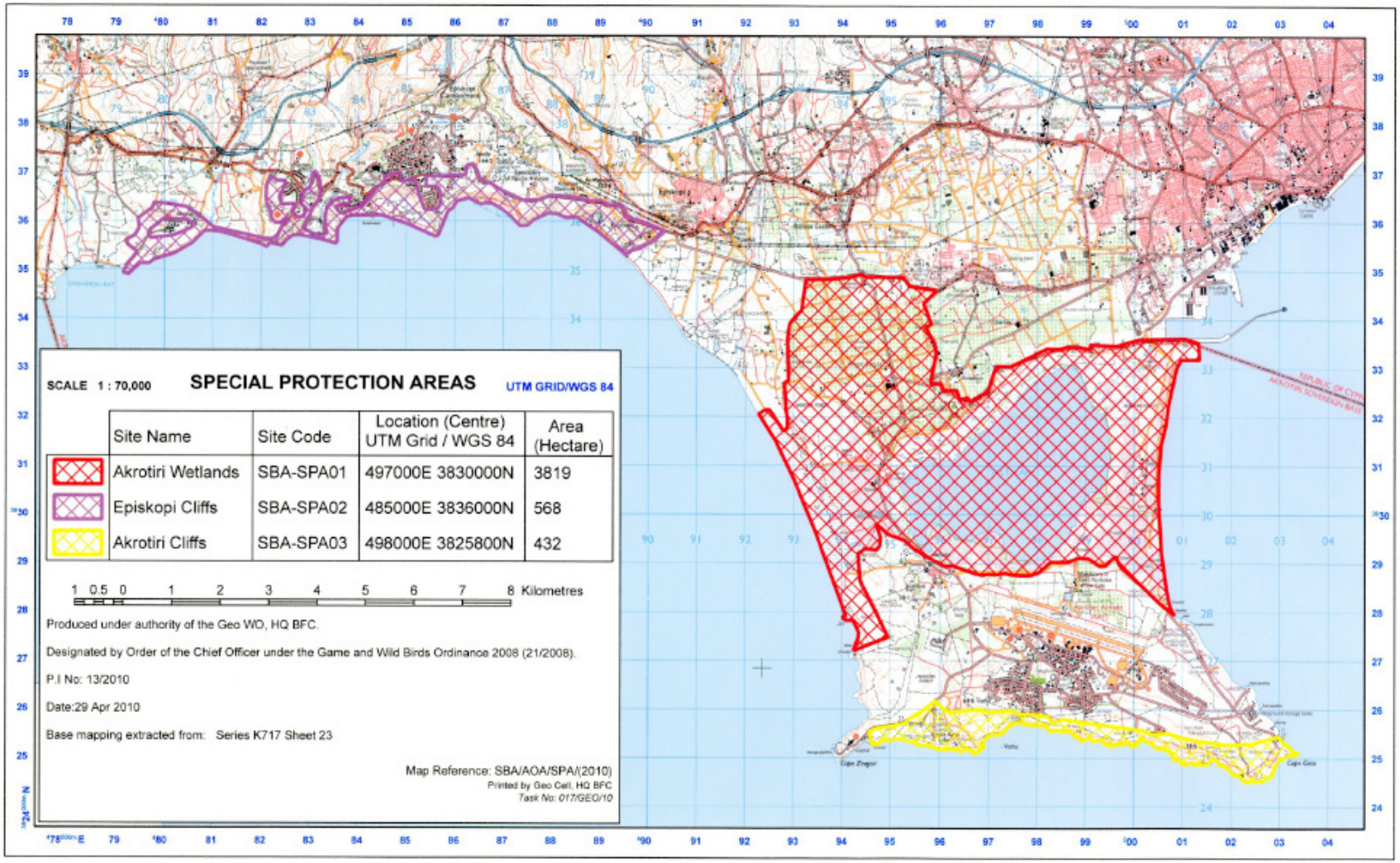
Map 1 of 1

Version number: 1.0/19 December 2002

SCALE 1:50,000

1 0 1 2 3 Kilometres

Special Protection Area (SPA) designation



UTM GRID/WGS 84

SOVEREIGN BASE AREAS ADMINISTRATION (SBAA)
AKROTIRI SPECIAL AREA OF CONSERVATION - SBA/SAC/01/(2015)

SCALE 1:20,000

0 0.5 1 2 3 4 Kilometres

Produced under authority of the Geo Sgt, HQ BFC

Users noting errors or omissions on this product are requested to mark them hereon and forward directly to the Geo. Sgt. J3 HQ British Forces Cyprus

Data obtained from the SBAA Environment Department.

The Protection and Management of Nature and Wildlife Ordinance (26/2007).

Printed by Geo Cell, HQ BFC

Task No: 2015-Geo-001_AKI_v3

Legend

1110	2250 *	6220*+3170*	9540	Degraded Phrygana
1120*	2260	6220*+5420	9540+5212	Development Zoned Land
1150 *	3140	6420	9540+5212+Acacia	Disturbed Ground
1170	3170*	8210	9540+5330	Eucalyptus Plantation
1210	5212	8210+3170*	9540+5420	Exotic Plantation
1210a	5212+3170*	8330	9540+6220*	Installations
1240	5212+5420	9290+5212	9540+9290	Monument
1240 + Taraxacum Aphrogenes	5212+5420+Acacia	92C0	Acacia	Planted Pine
1310	5212+6220*	92D0	Acacia+Eucalyptus	Playing Field
1410	5212+Acacia	9320	Acacia+Pinus+Eucalyptus	Playing Field - Exotic Plantation
1420	5330	9320+5212	Agricultural Cultivation	Quarry
1430	5330+5420	9320+5330	Built-Up Area	Sea
1430 + Acacia	5330+6220*	9320+5420	CY02	Unvegetated Beach
2110	5330+Acacia	9320+6220*	CY05	Unvegetated Cliff
2190	5420	9320+Acacia	CY05+1210	Waste Tip
2230	5420+Acacia	9320+BoSea	CY05+1210a	Wet Sand
2240	6220*	9320+Eucalyptus	Dam	Special Area of Conservation