GRAZING CAPACITY STUDY

OF AKROTIRI MARSH

JANUARY 2024

CONTENTS

1. INTRODUCTION – BACKGROUND INFORMATION

This report is prepared within the context of the Darwin Plus Project: **DPLUS141: Habitat Restoration & Wise Use for Akrotiri & Cape Pyla**. This 3-year Project, which is funded by Darwin Plus UK, aims to restore important wildlife habitats within the Cyprus Sovereign Base Areas, focusing on Akrotiri wetlands and native scrub on Cape Pyla (Dhekelia), to promote wise use of the area whilst developing eco-tourism opportunities to support the local economy. The project's partners are BirdLife Cyprus (leading role), Terra Cypria, the Cyprus Sovereign Base Areas Administration - Environment Department (SBAA ED) and the Royal Society for the Protection of Birds (RSPB).

Akrotiri Marsh is the only remaining lowland wet grassland in Cyprus, covering an area of ~150 hectares. It is part of the Akrotiri wetland complex, the largest natural wetland complex of the island. It is situated on the Akrotiri Peninsula, the southernmost tip of Cyprus, which is also the southernmost point of Europe. The site is on state land within Cyprus Sovereign Base Area (British Overseas Territory). The wetland is protected under: Ramsar Convention, Important Bird & Biodiversity Area (IBA), Special Protection Area (SPA) for birds & a Special Area of Conservation (SAC) for habitats and species (according to the mirror legislation in the Cyprus Sovereign Base Areas). It is an important breeding site for birds, resting and wintering site for migratory birds and also important for its flora, hosting rare and threatened plant species. The local villagers historically have grazing rights and rights to exploit natural marsh resources, such as plants for basketry.

In the last few decades, changes in nearby land uses resulted in changes in the hydrological regime of the site. Additionally, on-site grazing had been in decline and in combination with hydrological changes, led to the rapid over-expansion of reeds, resulting in biodiversity degradation on site. From 2015 to 2017, the Darwin Plus project "Akrotiri Marsh Restoration: a flagship wetland in the Cyprus SBAs" took place in order to enhance the biodiversity richness of the wetland, by restoring Akrotiri marsh to a mosaic of habitats, similar to the state it was in some decades ago. To maximize cattle grazing effectiveness, the Darwin Plus project (2015-2017) funded locals to purchase cattle and built cattle sheds with feeding and water stations. The site was fenced to allow free-range grazing and control visitor access to reduce disturbance. Additionally, through mechanical reed cutting and creation of pools (during 2015-2017), suitable habitat was created for key bird species, such as Ferruginous Duck. At the same time, key drainage channels were restored and water level control structures were installed to facilitate managed drainage of the site.

The support for conservation grazing resulted in an **increase in the number of native Cyprus cattle grazing on site**, as follows: **2015: 28 cattle**, **2017: 87 cattle** and **2023: 167 cattle**. A total area of 38 000 m^2 of reed was cleared due to a combination of reed cutting and cattle grazing, resulting in an **increase in grazing area from 13 ha at the start of the Darwin Plus project (2015) to 18 ha at the end of the project (2017)**. The following years, the **grazing area further increased to 29 ha (2023)** due to cattle grazing clearing the dense reeds, creating open spaces and promoting habitat diversity (pl. refer to photos 1-1 to 1-4). The **number of wader species using the site has increased noticeably**, including an increase in Spur-winged Lapwings, a key local species.

Photo 1.1: Satellite picture of Akrotiri Marsh on 09/2016

Photo 1.2: Satellite picture of Akrotiri Marsh on 11/2017

Photo 1.3: Satellite picture of Akrotiri Marsh on 18/2019

Photo 1.4: Satellite picture of Akrotiri Marsh on 06/2022

The objective of this report is to update the "Akrotiri Marsh Grazing Capacity Study" (John Badley, 2016), which was elaborated in the frame of Darwin Plus project "Akrotiri Marsh Restoration: a flagship wetland in the Cyprus SBAs'" (2015-2017), based solely on a) updated data on vegetation cover in the Marsh and b) numbers of cattle. The aim is to establish a suitable livestock grazing regimen at Akrotiri Marsh in order to enhance the conditions for the primary target species found in the wet grassland habitat, specifically the breeding black-winged stilt and spur-winged lapwing. To enhance the conditions for these breeding waders, but also biodiversity in the Marsh, it is necessary to have a balanced coverage of reed and grassland area. Livestock grazing plays a crucial role in the conversion of reed to wet grassland and the sustainable management of the Marsh.

Based on the Akrotiri Marsh Grazing Capacity Study (John Badley, 2016):

- The **appropriate grazing density for Akrotiri Marsh** was set up within the range of **1.0-1.75 LSU/ha.**
- The **aspirational target** for **wet grassland habitat** was set up within the range of **50 – 60 ha** (of the total area of 118 ha of the Akrotiri Marsh), retaining **15 ha of saltmarsh and 43-53 ha of reedbed**.

The grazing density at that time (March 2017) was 49.05 LSU in 17.5ha or 2.80 LSU/ha.

Since the goal for Akrotiri Marsh still is 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 was considered desirable for the **first years to have a livestock grazing density in the range 1.75-3.00 LSU/ha** (as was calculated over the 17.5 ha of then existing grassland).

The grazing pressure needs 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.

Based on the above, the grazing levels were reviewed and grazing density recalculated to consider changes in a) grazed area/wet grassland and b) numbers of cattle.

2. UPDATED VEGETATION MAPPING IN AKROTIRI MARSH

Mapping of the different vegetation types was done in order to estimate and update their cover within the Akrotiri marsh and their suitability as a food source for the different livestock.

The mapping of the vegetation types was a step-wise process, as follows:

- Delineation of the different vegetation types using satellite images (google earth), drone photos which were taken for the purpose of this mapping during February and June 2023 and geotagged photos taken while on-site visits.
- A ground-truthing procedure followed with extensive field visits, at which the boundaries and/or the vegetation types were updated where deemed necessary.

Image 2.1: Vegetation cover of Akrotiri Marsh in 2023 as depicted through drone mapping

The different vegetation types and their cover in 2023 are presented in Table 2.1 and Figure 2.1. It must be noted that Akrotiri Marsh is a seasonal, as well as a quite fast evolving ecosystem, thus the vegetation cover has some changes over the course of the year.

Table 2.1: Different vegetation types in Akrotiri Marsh and their cover in 2023

Vegetation types	Description	Hectares (2023)
Reeds	*Phragmites australis* dense reedbeds	70,92
Grassland	Annual and perennial Mediterranean tall humid grasslands	29,31
Halophilous Scrubs	*Salicornia fruticosa scrubs*	16,93
Lake	Flooded area, inaccessible to cattle for most of the year	0,24
Thistles	Thistle fields, mostly *Centaurea calcitrapa* and some *Rubus sanctus*	0,72
Shrubland	Thickets of *Tamarix sp.*	0,17
TOTAL		**118,29**

Image 2.2: Akrotiri Marsh through drone pictures in 2023

As already mentioned, based on the Akrotiri Marsh Grazing Capacity Study (John Badley, 2016), the aspirational target for wet grassland habitat was set up within the range of 50 - 60 ha, retaining 15 ha of saltmarsh and 43-53 ha of reedbed, of the total area of 118 ha of the Akrotiri Marsh.

Table 2.2 presents the vegetation types and cover in 2017 and 2023, in relation with the aspirational target. Based on that, we see that the overall goal for Akrotiri Marsh is still to reduce the area of reed and to increase the area of grassland.

Table 2.2: Vegetation types and cover in 2017 and 2023, in relation with the aspirational target

Vegetation types	Hectares (2017)	Hectares (2023)	Aspirational Target - Hectares
Reeds	85,5	70,9	43-53
Grassland	17,5	29,3	50-60
Halophilous Scrubs	15	16,9	15
Lake	N/A	0,2	N/A
Thistles	N/A	0,7	N/A
Shrubland	N/A	0,2	N/A
TOTAL	**118**	**118,3**	

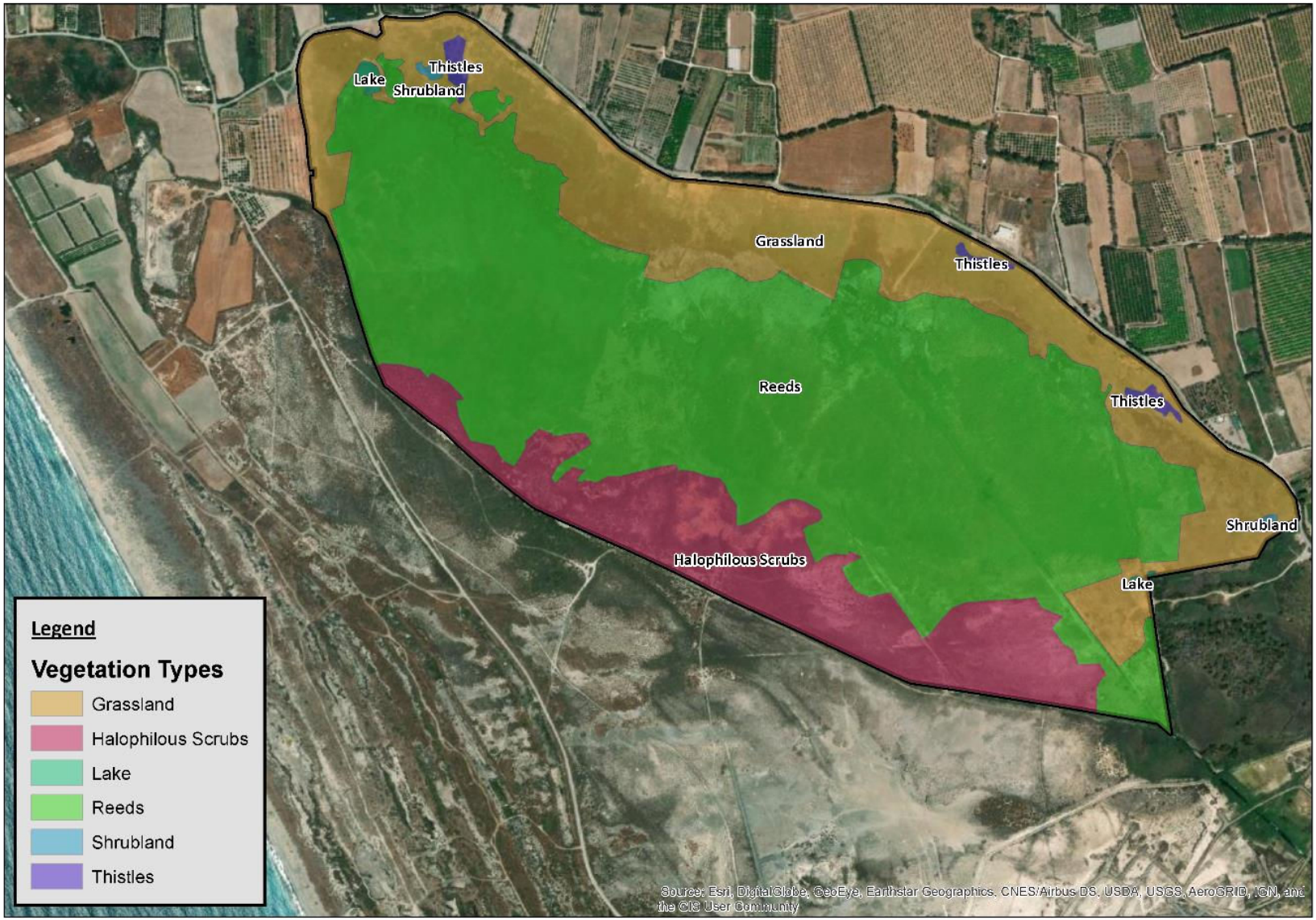

Figure 2.1: Different vegetation types and their cover in Akrotiri Marsh in 2023 (*Satellite basemap: Maxar 01/06/2022*)

3. CURRENT NUMBER OF ANIMALS IN AKROTIRI MARSH

Image 3.1: Cyprus local cattle breed & donkeys at Akrotiri Marsh

Based on data from the Veterinary Services, Table 3.1 presents the number of animals in Akrotiri Marsh per type/age for 2023.

Additionally, their respective 'Livestock unit coefficients' are presented according to the Eurostat Livestock Unit (LSU) calculations. As it was applied in the grazing study for Akrotiri Marsh by Badley (2016), the Eurostat LSU values were lowered for all age classes by 0.2 LSU, since the traditional Cypriot local cattle breed is noticeably smaller than UK cattle (upon which the criteria are based) and smaller animals require less food (grass).

Table 3.1: Number of animals in Akrotiri Marsh per type/age for 2023 and their respective LSU values

Animal Type	LSU (reduced by 0,2 LSU*)	Number of animals	Total LSU (LSU x No of animals)
Bull	0,8	20	16
Cow 2+ years old	0,6	98	58,8
Cow 1-2 years old	0,5	21	10,5
Calf ≤1 year old	0,2	28	5,6
Horse/ donkey 2+ years old	0,7	17**	11,9
TOTAL		**167 *****	**102,8**

* *according to the recommendation of John Badley, 2016*
** *approximation based on field counts*
*** *cattle numbers only*

4. UPDATED GRAZING CAPACITY IN AKROTIRI MARSH

Based on the a) updated data on vegetation cover in the Marsh and b) numbers of cattle and horse/ donkeys the current grazing density -**December 2023**- is:

102.8 LSU in 29.3ha or 3.51 LSU/ha

The grazing density in the Marsh at March 2017 (John Badley, 2016) was:

49.05 LSU in 17.5ha or 2.80 LSU/ha

The current grazing density **3,51 LSU/ha** is higher than the objectives set for short-term and long-term grazing density i.e. **first years 1.75-3.00 LSU/ha** and **longer term to 1.0-1.75 LSU/ha**.

However, and according to the vegetation cover targets set for the Akrotiri Marsh on 2016, the aspirational target for wet grassland habitat of 50 – 60 ha, retaining 15 ha of saltmarsh and 43-53 ha of reedbed, are still not reached – current wet grassland is 29,3 ha and reedbed is 70,6 ha (see also tables 2.2 and 4.1).

This is due to a combination of factors, mainly non-adaptive and managed grazing and existence of areas that are not reachable by cattle (too much water or dense reeds), resulting in areas that are over-grazed and areas that need more grazing.

Since the goal for Akrotiri Marsh still remains to reduce the area of reed and increase the area of grassland, it is proposed that the number of animals at the marsh are retained in these numbers for short/ medium-term timeframe and through managed grazing to reach towards the aspirational target for wet grassland/reedbed and then re-evaluate.

Table 4.1: Grazing Density and grassland cover in Akrotiri Marsh in 2017 and 2023 and aspirational targets

Year	Total LSU in the Marsh	Wet grassland cover (ha)	LSU/ Ha
2017	49	17,5	2,8
2023	102,8	29,3	3,5
Aspirational Target (short/medium term)		50-60	1.75-3.00
Aspirational Target (long-term)			1.0-1.75

5. FUTURE RECOMMENDATIONS

The update of the grazing capacity of Akrotiri Marsh, that was presented in this report, was based solely on a) updated data on vegetation cover in the Marsh and b) numbers of cattle/ other animals.

In a comprehensive grazing study, apart from the vegetation cover and numbers of cattle/ other animals in the Marsh, an analysis of various other factors is needed in order to ensure sustainable grazing practices that balance ecological health and social parameters of grazing.

By addressing these components, the grazing capacity study will provide a holistic understanding of the Akrotiri Marsh ecosystem and inform sustainable grazing management strategies. The following components need to be included and considered synergistically:

1. Site Description

- Location and Size: Detailed mapping of the marsh's geographical location, area, and boundaries.
- Climate and Weather Patterns: Analysis of seasonal weather patterns, rainfall, temperature, and humidity.
- Soil Types and Quality: Soil sampling and analysis to determine nutrients, texture, pH, and drainage characteristics.

2. Vegetation Analysis

- Flora Inventory: Comprehensive list of plant species, their distribution, and abundance.
- Forage Quality and Quantity: Assessment of the nutritional value and biomass of the available forage.
- Seasonal Growth Patterns: Understanding of plant growth cycles and peak biomass production periods.
- Invasive Species: Identification and impact assessment of invasive plant species on grazing capacity.

3. Wildlife and Biodiversity

- Fauna Inventory: Identification of key wildlife species (e.g. birds, insects).
- Conservation Status: Assessment of protected or endangered species and their habitat requirements (nesting, feeding, etc.).

4. Hydrology

- Water Sources: Mapping and analysis of water inputs in the marsh system, including rainfall, groundwater.
- Water Quality: Testing for water quality parameters such as pH, salinity, nutrients and contaminants.
- Flooding and Drainage Patterns: Understanding of natural flooding regimes and drainage patterns.

5. Current Grazing Practices

- Grazing History: Historical data on grazing practices and stocking rates.
- Current Grazing Patterns: Current livestock numbers, types, and grazing areas.

- Grazing Management Practices: Existing land management strategies including fencing (incl. evaluation on fenceless grazing systems), rotational grazing, and supplementary feeding.

6. Carrying Capacity Calculation

- Forage Production Estimates: Quantitative measurement of forage production per unit area.
- Animal Forage Requirements: Determination of the daily forage intake requirements of different livestock species.
- Stocking Rate: Calculation of the optimal stocking rate to prevent overgrazing and land degradation.

7. Ecological Impact Assessment

- Habitat Health: Monitoring indicators of habitat health such as soil erosion, vegetation cover, and biodiversity.
- Ecosystem Services: Evaluation of ecosystem services provided by the marsh, such as carbon sequestration, water purification, and biodiversity support.

8. Socio-Economic Factors

- Grazing Economics: Analysis of the economic viability of grazing, including costs, revenues, and market conditions.
- Community Involvement: Engagement with local communities and stakeholders to understand their needs and incorporate their knowledge and practices.

9. Management Recommendations

- Grazing Management Plan: Development of a sustainable grazing management plan with recommendations for animal numbers, grazing rotation, and monitoring.
- Restoration/ Protection of Species and Habitats Strategies: Recommendations for habitat restoration and species protection/ conservation.
- Monitoring and Evaluation: Establishment of a long-term monitoring and evaluation framework to track the effectiveness of management practices and adapt as necessary.

10. Regulatory and Policy Framework

- Legal and Policy Analysis: Review of relevant regulations and policies affecting grazing and land use in the marsh.
- Compliance Recommendations: Guidance on how to comply with legal requirements and leverage policy support for sustainable grazing practices.

Since the end of 2023, the Akrotiri Marsh Management Committee was set up and is coordinated by the Environment Department of the Cyprus Sovereign Base Areas Administration (SBAA ED), where all key stakeholders are included and the aim is to co-decide on the management aspects of the Marsh. The Committee had its 1st meeting on October 2023 and since then various meetings and efforts are made towards this direction. The Akrotiri Marsh Management Committee needs to start addressing the various issues related to the grazing in the Marsh – as they are also proposed in the above paragraphs- in order to achieve a sustainable balance between ecological health of the marsh (primary objective due to its protection status) and social parameters of grazing.

Monitoring is a crucial aspect in this process that is partially already taking place in the area by various organisations/ scientists (i.e. water levels/ qualitative parameters, number of animals, numbers/ extents of plant species/ birds' monitoring, etc). Monitoring also needs to be supplemented by various other parameters that are important in providing a more holistic view of the system, as described above. Finally, monitoring results need to be included and assessed by a centralised monitoring database/ system in order to evaluate and adjust management practices.