



LIFE with VULTURES

ACTION A3. STUDY ON CONTRIBUTION OF GRIFFON VULTURES TO ECOSYSTEM SERVICES IN CYPRUS *Layperson's summary*

*LIFE WITH VULTURES: SAVING GRIFFON VULTURES IN CYPRUS
THROUGH CONCRETE CONSERVATION ACTIONS
(LIFE18 NAT/CY/001018)*

Prepared by: Vulture Conservation Foundation

Authors: Louis Phipps & Ioannis Vogiatzakis

January 2021

Project Partners:



Funded by:



Authors

W. Louis Phipps, Vulture Conservation Foundation

Ioannis N. Vogiatzakis, Open University of Cyprus

Recommended citation

Phipps, W.L. & Vogiatzakis, I.N. 2020. LIFE with Vultures CY - LIFE18 NAT/CY/001018, Action A3: Study on contribution of Griffon Vultures to ecosystem services in Cyprus. Layperson's summary.

About the project

LIFE with Vultures is a targeted conservation project for the protection of the Griffon Vulture in Cyprus. In this four-year endeavour (2019-2023), [BirdLife Cyprus](#), the [Game and Fauna Service](#), [Terra Cypria – The Cyprus Conservation Foundation](#) and the [Vulture Conservation Foundation](#) have joined forces to tackle the main threats facing the Griffon Vulture and prevent Cyprus' most threatened bird of prey from going extinct. The project has a €1,375,861 budget and is co-funded (60%) by the EU's LIFE programme. Find out more at: www.lifewithvultures.eu

Project Partners:



Funded by:



The Cyprus Griffon Vulture population through time.

Griffon Vultures were abundant in the first half of the twentieth century (Iezekiel et al. 2004), with up to 140 individuals observed at a single carcass in the 1950s (Flint and Stewart 1983). In the latter half of the twentieth century, frequent poisoning incidents and decreased food availability (among other factors) caused a rapid and sustained population decline to 14 individuals in 2005 (BirdLife Cyprus 2005), and less than 20 individuals thereafter, apart from a short-lived increase following releases of translocated individuals in recent years. The current population is estimated to be 20 individuals, including three breeding pairs, consisting of individuals from the original Cyprus population and individuals that were translocated from Crete during previous conservation projects.

The LIFE with Vultures Project.

In this four-year endeavour (2019-2023), **BirdLife Cyprus** (coordinating beneficiary), the **Game and Fauna Service**, **Terra Cypria – The Cyprus Conservation Foundation** and the **Vulture Conservation Foundation** have joined forces to tackle the main threats facing the Griffon Vulture and prevent one of Cyprus' most threatened species from going extinct.

The project includes actions against the use of poison baits, actions to reduce collisions with overhead powerlines and actions to increase feeding opportunities for the provision of safe food to the vultures. Through the project, Griffon Vultures will be brought from Spain for release in Cyprus to prevent this vulnerable and isolated population from going extinct, which has been predicted to be likely within 15 years without urgent intervention (Phipps 2020).

Another key aspect of the project is the implementation of a coordinated and targeted awareness-raising campaign, both in local communities related to the Griffon Vulture and island-wide, to spread the message of the importance of the Griffon Vulture and the problems posed by poisoned bait in the countryside.

Project objectives.

The primary objective of the LIFE with Vultures project is to prevent the extinction of the Griffon Vulture in Cyprus followed by improving the conservation status of the population. To achieve this, the project will address critical threats to the species, involving key stakeholders in the process and bolstering the local population to enable its recovery.

Specifically, the project aims to:

Tackle threats:

The project aims to reduce the mortality of Griffon Vultures by addressing key direct threats. Specifically, it aims to reduce the illegal use of poisons as one of the most critical causes of mortality; reduce the mortality risk from collision with overhead electricity wires; and increase availability of safe food sources by increasing (and better managing) the provision of supplementary feeding.

Project Partners:

Funded by:



Reinforce the population:

The project aims to enhance population viability via supplementation (or “reinforcement”) with translocated individuals once the main threats have been addressed. This will be achieved by releasing birds translocated from Spain, following well-established practices for releasing them into the local environment.

Understand and inform:

The project aims to fill knowledge gaps related to the threats facing Griffon Vultures and enhance the national technical and operational capacity of the relevant authorities to effectively protect and manage the Griffon Vulture population in Cyprus.

Raise awareness:

The project aims to improve stakeholders’ awareness about the importance of the species and the need for its conservation, and to establish a national functioning network of actors related to nature conservation.



Figure 1. Griffon Vulture in Cyprus.

Project Partners:



Funded by:



What are ecosystem services and how do birds provide them?

Ecosystem services are defined as the contributions that ecosystems (i.e. living systems) make to human well-being, according to the European Environment Agency's Common International Classification of Ecosystem Services (CICES). Essentially, they directly or indirectly support our survival and quality of life.

There are three main types of ecosystem service according to the CICES framework (Haines-Young and Potschin 2018):

Provisioning services are the products obtained from ecosystems such as food, fresh water, wood, fibre, genetic resources and medicines.

Regulating and maintaining services are defined as the benefits obtained from the regulation and maintenance of ecosystem processes such as climate regulation, natural hazard regulation, water purification and waste management, pollination or pest control.

Cultural services include non-material benefits that people obtain from ecosystems such as spiritual enrichment, intellectual development, recreation and aesthetic values.

The ecosystem services provided by birds arise from their ecosystem functions (Whelan et al. 2015). Their ability to fly makes birds highly mobile and able to respond to changes in the availability of essential resources such as food and habitats. This mobility and their diverse morphology and ecology means that birds live on all continents, foraging in terrestrial, aquatic and aerial environments, and therefore play important roles in maintaining ecosystem function throughout the world. There are 10,500 bird species on earth, consuming a wide variety of food sources that can facilitate pollination, seed dispersal, control of insect pests and removal of carrion through scavenging (Whelan et al. 2015). Birds can even be thought of as “ecosystem engineers” through, for example, their construction of nests which can host other species. Through their roles at different levels of complex food-webs birds therefore provide many important ecosystem functions. When those functions benefit humans, birds provide ecosystem services.

Examples of “direct” or provisioning ecosystem services provided by wild birds include the use of “eider down” for insulation in jackets and sleeping bags; seabird “guano” (excrement) for fertiliser; the legal harvesting of [puffins in Iceland](#), [sooty shearwaters in New Zealand](#) and [waterbirds in Europe](#); or illegal hunting of [passerines in central and southern Europe](#) for human consumption.

In terms of cultural services, humans and birds have a long history of interactions dating back thousands of years, as evidenced by cave paintings and murals created by ancient civilizations. Birds often have symbolic values and important roles in mythology and religion for many different cultures. As a result, many nations and provinces included birds on their flags, ranging from the powerful symbol of eagles clutching swords (e.g. Byzantine Empire) to the resplendent quetzal holding a scroll (Guatemala). Other cultural services provided by birds include the use of raptors for falconry, as well as the keeping of cage birds for personal pleasure or for educational purposes. However, it is widely accepted that the cage bird trade and falconry both [threaten wild bird populations worldwide](#). While bird hunting is primarily a provisioning service it also contributes to cultural services in the form of recreational activities but also maintaining local

Project Partners:



Funded by:

traditions in some communities (Schulp et al. 2014).

One of the most important cultural services provided by birds in modern times comes in the form of recreation and tourism, especially the growing pastime of birdwatching. Birdwatching is an international industry that can be a significant source of income through the publication and sale of bird guidebooks, the employment of local guides, and all of the activities associated with local and global ecotourism. While tourism as a whole continues to increase, particularly in Europe (Weston et al. 2019), the growth of the nature-based tourism sector has been especially fast and widespread, with up to 25% of holidaymakers from some European countries stating that their primary motivation for choosing a holiday destination is to see nature. The income from birdwatching can often exceed other local industries that rely on natural resources. For example, it has been shown that the 14,000 bird-watchers visiting the Białowieża Forest in Poland each year spend 66% more than other visitors, spend longer in the area and generate USD 2.2 million of local income, which is in stark contrast to the loss-making forestry industry (Czeszczewik et al. 2019). The increasing interest in bird-based tourism is also reflected in the growing membership of conservation organizations. For example, BirdLife International is the world's largest nature conservation partnership, with more than 10 million members and supporters globally, comprising 2.72 million members and 7.2 million people who supported BirdLife partners in 2015 without being members. Importantly, the income generated from ecotourism and conservation organization membership can be invested back into conservation actions to maintain ecosystem function and ultimately deliver more ecosystem services for people.

The majority of the ecosystem services provided by birds are in the regulating category, with the most well-known and widely studied being pollination, seed dispersal and plant dispersal, all of which are vital to maintaining ecosystem processes and ultimately promoting biodiversity and benefitting human health. For instance, without these services plant reproduction would be affected, and plant community composition and habitat structure would change, with implications for human land use. One clear example of how birds can provide a regulating service to humans, with associated economic benefits, is derived from their ecological role as consumers of pest species which can damage agricultural crops. In Spain and Israel, the use of artificial nest boxes boosted the population of Barn Owls and Kestrels close to agricultural fields which reduced populations of rodents which would otherwise consume arable crops (Meyrom et al. 2009; Paz Luna et al. 2020). This not only boosted profits through increased yields, but also reduced economic costs and environmental contamination by eliminating the need to use rodenticides. In Cyprus these efforts are being replicated by government departments and BirdLife Cyprus.

It is becoming more widely acknowledged that one of the most critical roles of birds in stabilizing food webs in ecosystems (Buechley and Şekercioğlu 2016), and thus providing important ecosystem services to humans (O'Bryan et al. 2018), is derived from their role as scavengers, and vultures are among the most efficient scavengers of them all.

Project Partners:



Funded by:



How do vultures contribute to ecosystem services, and why do we need them?

Obligate scavengers (i.e. those that survive solely from eating dead animals) such as Griffon Vultures consume large amounts of carrion derived from animal carcasses, maintaining the transfer of energy through food webs and supporting important ecosystem services such as nutrient recycling, removal of soil and water contaminants and regulating the development and spread of diseases and populations of facultative scavengers such as foxes (Buechley and Şekerçioğlu 2016).

Recent studies have shown that vultures provide an efficient, cost-effective and environmentally beneficial carcass disposal service which is positively valued by livestock farmers (García-Alfonso et al. 2019). For example, in Spain it has been demonstrated that exploiting the ability of Griffon Vultures to rapidly consume livestock carcasses would significantly reduce annual greenhouse gas emissions (by 77,344 metric tons of CO₂ eq.) and economic costs (\$50 million in insurance payments) arising from the collection and transport of carcasses to processing plants by vehicles (Morales-Reyes et al. 2015).

As vultures are specialized for rapidly locating and consuming carcasses, they have a competitive advantage over terrestrial species such as foxes. In the absence of vultures it has been shown that populations of feral dogs and other facultative scavengers can increase, potentially increasing the development and transmission of diseases such as rabies (O'Bryan et al. 2019; Ogada et al. 2012a; Ogada et al. 2012b). While vultures are likely to help limit disease transmission at carcasses (Plaza et al. 2020), further work on this topic is required.

Vultures also provide cultural and spiritual services dating back thousands of years, as well as recreational services in the form of ecotourism, particularly for birdwatchers and photographers. For example, it has been estimated that the potential value of viewing Griffon Vultures at a nature reserve in Israel was more than US\$1 million, and that 85% of the visitors went to the park specifically to view vultures (Becker et al. 2005). There are many other examples of the potential value of ecotourism around vulture breeding areas and feeding sites as important sources of local income (e.g. southern Africa; Spain; South America). Therefore, as tourism in Cyprus generates €2.7 billion annually and contributes 15% towards the GDP, the projected increase in the Griffon Vulture population could provide an additional boost to local economies if some of the four million visitors each year can be engaged in vulture watching and photography. However, the Covid-19 pandemic has illustrated the vulnerability of conservation models that rely on ecotourism and this should be considered when planning sustainability and exit strategies (Lindsey et al. 2020).

It is now widely acknowledged that promoting the scavenging services provided by vultures would restore an important ecological function for the mutual benefit of vultures, the wider environment and ultimately provide socio-economic and well-being benefits to people (O'Bryan et al. 2018). The aim of this study is to provide a first assessment of how this applies to the restoration of Griffon Vultures in Cyprus.

Project Partners:



Funded by:



SUMMARY OF STUDY RESULTS

This report presents a short summary of the results of the LIFE with Vultures preparatory action A3: Study on contribution of Griffon Vultures to ecosystem services in Cyprus (Phipps and Vogiatzakis 2020). The study area was delineated on the basis of the core foraging area of the current Griffon Vulture population in Cyprus and individuals released and tracked as part of Project GYPAS, combined with the Natura 2000 sites targeted by this project. The necessary data for the various calculations performed were aggregated from the administrative units within this study area.

We developed a conceptual model using standard guidelines (e.g. [CICES framework](#)) to demonstrate how Griffon Vultures could potentially interact with the environment and human activities in Cyprus and how these interactions would influence ecosystem services, disservices and human health (Figure 3). We employed the CICES framework for ecosystem services assessment using a set of indicators. We collated and evaluated a number of existing datasets for the above ecosystem service indicators. In common with other studies, we employed a set of criteria which combines suitability of an indicator to capture a given service, with data properties (e.g. availability, accessibility, quality) for measuring or estimating the indicator values. Indicators were then assigned to three categories using a "traffic light" system (green, amber, red). Indicators relating to the contribution of Griffon Vultures to regulating services through the consumption of livestock carcasses, as well as contributions to cultural services through tourism, literature and historical features and identity were assigned the highest assessment scores.

To provide a first quantitative estimate of Griffon Vulture contributions to ecosystem services we assessed the availability and consumption of livestock carcasses by Griffon Vultures and the carcass collection costs related to greenhouse gas (GHG) emissions and financial costs. We also provide an estimate on the potential contribution of vulture-based activities to tourism and potential methods of assessing non-material contributions to eco-tourism but also community perception and scientific knowledge.

We estimate that 17,440 dead sheep and goats that do not enter the human food chain are currently collected by vehicle and disposed of by a designated carcass disposal service from the overall foraging range of Griffon Vultures in Cyprus each year. Within the core foraging range this equates to an average of 2425 ± 183 dead sheep per year, providing 95% of the food requirements for the long-term population target of 200 individuals if all carcasses are made available to them. If carcasses were delivered to the nearest vulture feeding site instead of collection and transportation to the carcass processing plant, that would result in a **43-61% reduction in travel distance (to 40,749 km per year) and associated CO₂ emissions (from 11,080-16,508 t CO₂ to 6,361 t CO₂ per year) and transport costs (from €24,844-37,013 to €14,262 per year).**

Project Partners:



Funded by:



STUDY ON CONTRIBUTION OF GRIFFON VULTURES TO ECOSYSTEM SERVICES IN CYPRUS

Griffon Vulture related recreation and tourism could contribute to €648,818 revenue generated each year. Following a community perception survey (601 interviewees) 81% responded that vultures remove dead animals from the environment, 57% that they increase tourism and specifically agrotourism, while 38% believe that they save money for livestock breeders and farmers.

The study presents a first assessment of the role of Griffon Vultures as contributors to ecosystem services in Cyprus. Future efforts should aim to further develop relevant indicators for assessing and monitoring the contribution of Griffon Vultures to ecosystem services as the population increases during and beyond the course of the LIFE with Vultures project, particularly for tangible benefits such as the generation of revenue via vulture-based recreation.



Figure 2. Photo of people watching Griffon Vultures in Cyprus.

Project Partners:



Funded by:



Main beneficiaries + benefits

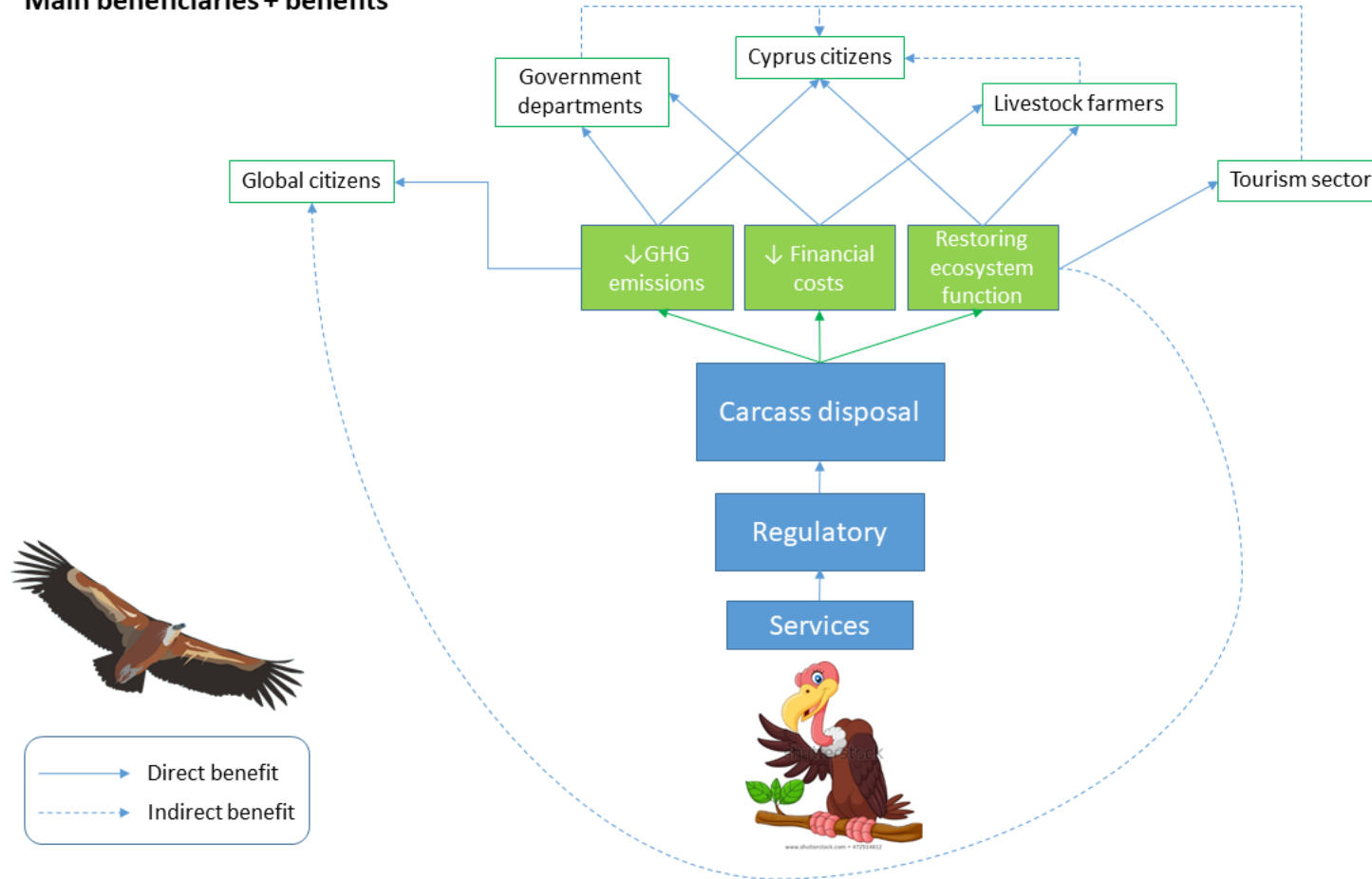


Figure 3. Conceptual diagram of how the role of Griffon Vultures as consumers of carcasses contributes to ecosystem services, showing some of the main benefits and beneficiaries.

Project Partners:



Funded by:



CONCLUSIONS & RECOMMENDATIONS

The results confirmed the role of vultures as contributors to ecosystem services through a selection of potential indicators which can be used for ecosystem service assessment and mapping. **Main ecosystem service contributions are a result of carrion consumption which could potentially reduce carcass collection costs by 43-61% in terms of greenhouse gas emissions and financial expenditure.** In addition, Griffon Vultures offer a range of cultural services identified by this study, including the **potential contribution of vulture-based activities to tourism (potentially generating €648,818 revenue each year)**, education and research as well as local identity and cultural heritage.

Additional potential methods of assessing non-material contributions to eco-tourism were proposed as well as a number of indicators which can be used for a range of other cultural services supported by Griffon Vultures. The literature review which was carried out as part of this study demonstrated that regulatory services can be assessed most readily, followed by cultural services.

Although assessing contributions of vultures to ecosystem services is still a relatively new research area, this first attempt to do so in Cyprus has demonstrated that tested methodologies from elsewhere can be applied and that real or proxy data for most of the proposed indicators are available. Some key messages can be summarized below:

- There is a sufficient representation of indicators for the main ecosystem services relevant to Griffon Vultures in Cyprus;
- Quantitative estimates for some of these indicators can be calculated using existing data and methods;
- The estimation of regulating services is more readily quantifiable compared to cultural services;
- There are tested alternative methodologies which could fill in the gaps for some indicator estimations;
- Ecosystem Service provision level is dependent on the size of the Griffon Vulture population, confirming the importance of conservation and population reinforcement actions;
- Involvement of stakeholder groups may build synergies between knowledge sharing and awareness raising for Griffon Vultures and their contributions to ecosystem services;
- Emphasis should be given to assessing the potential for Griffon Vulture-based recreation, which may provide a source of income to local communities and further incentivize support for Griffon Vulture conservation;
- At the national level the work aligns with the first national assessment of ecosystem services currently under way as part of the [LIFE+ IP Physis project](#).

Project Partners:



Funded by:



REFERENCES

- Becker, N., Inbar, M., Bahat, O., Choresh, Y., Ben-Noon, G., Yaffe, O., 2005. Estimating the economic value of viewing griffon vultures *Gyps fulvus*: a Travel Cost Model Study at Gamla Nature Reserve, Israel. *Oryx* 39, 429-434.
- BirdLife Cyprus, 2005. Annual Bird Report 2005.
- Buechley, E.R., Şekercioğlu, Ç.H., 2016. The avian scavenger crisis: Looming extinctions, trophic cascades, and loss of critical ecosystem functions. *Biological Conservation* 198, 220-228.
- Czeszczewik, D., Ginter, A., Mikusiński, G., Pawłowska, A., Kałuża, H., Smithers, R.J., Walankiewicz, W., 2019. Birdwatching, logging and the local economy in the Białowieża Forest, Poland. *Biodiversity and Conservation* 28, 2967-2975.
- Flint, P., Stewart, P., 1983. The birds of Cyprus. Zoological Museum, UK.
- García-Alfonso, M., Morales-Reyes, Z., Gangoso, L., Bouten, W., Sánchez-Zapata, J.A., Serrano, D., Donazar, J.A., 2019. Probing into farmers' perceptions of a globally endangered ecosystem service provider. *Ambio* 48, 900-912.
- Haines-Young, R., Potschin, M.B., 2018. Common International Classification of Ecosystem Services (CICES) V5.1 and Guidance on the Application of the Revised Structure. Available from www.cices.eu
- Iezekiel, S., Bakaloudis, D., Vlachos, C., 2004. The status and conservation of Griffon Vulture *Gyps fulvus* in Cyprus, In *Raptors Worldwide*. eds R.D. Chancellor, B.-U. Meyburg, pp. 67-74. WWGBP/MME, Budapest, Hungary.
- Lindsey, P., Allan, J., Brehony, P., Dickman, A., Robson, A., Begg, C., Bhammar, H., Blanken, L., Breuer, T., Fitzgerald, K., Flyman, M., Gandiwa, P., Giva, N., Kaelo, D., Nampindo, S., Nyambe, N., Steiner, K., Parker, A., Roe, D., Thomson, P., Trimble, M., Caron, A., Tyrrell, P., 2020. Conserving Africa's wildlife and wildlands through the COVID-19 crisis and beyond. *Nature Ecology & Evolution* 4, 1300-1310.
- Meyrom, K., Motro, Y., Leshem, Y., Aviel, S., Izhaki, I., Argyle, F., Charter, M., 2009. Nest-Box use by the Barn Owl *Tyto alba* in a Biological Pest Control Program in the Beit She'an Valley, Israel. *Ardea* 97, 463-467, 465.
- Morales-Reyes, Z., Perez-Garcia, J.M., Moleon, M., Botella, F., Carrete, M., Lazcano, C., Moreno-Opo, R., Margalida, A., Donazar, J.A., Sanchez-Zapata, J.A., 2015. Supplanting ecosystem services provided by scavengers raises greenhouse gas emissions. *Sci. Rep.* 5.
- O'Bryan, C.J., Holden, M.H., Watson, J.E.M., 2019. The mesoscavenger release hypothesis and implications for ecosystem and human well-being. *Ecology Letters* 22, 1340-1348.

Project Partners:



Funded by:



STUDY ON CONTRIBUTION OF GRIFFON VULTURES TO ECOSYSTEM SERVICES IN CYPRUS

O'Bryan, C.J., Braczkowski, A.R., Beyer, H.L., Carter, N.H., Watson, J.E.M., McDonald-Madden, E., 2018. The contribution of predators and scavengers to human well-being. *Nature Ecology & Evolution* 2, 229-236.

Ogada, D.L., Keesing, F., Virani, M.Z., 2012a. Dropping dead: causes and consequences of vulture population declines worldwide. *Annals of the New York Academy of Sciences* 1249, 57-71.

Ogada, D.L., Torchin, M.E., Kinnaird, M.F., Ezenwa, V.O., 2012b. Effects of Vulture Declines on Facultative Scavengers and Potential Implications for Mammalian Disease Transmission. *Conservation Biology* 26, 453-460.

Paz Luna, A., Bintanel, H., Viñuela, J., Villanúa, D., 2020. Nest-boxes for raptors as a biological control system of vole pests: High local success with moderate negative consequences for non-target species. *Biological Control* 146, 104267.

Phipps, W.L., 2020. LIFE With VulturesCY - LIFE18 NAT/CY/001018, Action A4: Population Viability Analysis of the Cyprus Griffon Vulture population under different management scenarios. Final report. Vulture Conservation Foundation.

Phipps, W.L., Vogiatzakis, I.N., 2020. LIFE With VulturesCY - LIFE18 NAT/CY/001018, Action A3: Study on contribution of Griffon Vultures to ecosystem services in Cyprus. Final report. Vulture Conservation Foundation & Open University of Cyprus.

Plaza, P.I., Blanco, G., Lambertucci, S.A., 2020. Implications of bacterial, viral and mycotic microorganisms in vultures for wildlife conservation, ecosystem services and public health. *Ibis* 162, 1109-1124.

Schulp, C.J.E., Thuiller, W., Verburg, P.H., 2014. Wild food in Europe: A synthesis of knowledge and data of terrestrial wild food as an ecosystem service. *Ecological Economics* 105, 292-305.

Weston, R., Guia, J., Mihalič, T., Prats, L., Blasco, D., Ferrer-Roca, N., Lawler, M., Jarratt, D., 2019. Research for TRAN Committee – European tourism: recent developments and future challenges, European Parliament, Policy Department for Structural and Cohesion Policies, Brussels.

Whelan, C.J., Şekercioglu, Ç.H., Wenny, D.G., 2015. Why birds matter: from economic ornithology to ecosystem services. *Journal of Ornithology* 156, 227-238.

Project Partners:



Funded by:

