Project Update: December 2020

Spring season 2020

Due to Covid-19 we did not manage to follow the original proposal schedule of the project. In line with the effort to be active during the spring lockdown we presented our work on EGS and Rufford project activities as part of the series "Nature and Species Protection" on *Bird Protection and Study Society of Serbia* YouTube channel, titled „*Ground squirrel, ground squirrel, you little rabbit* "[serbian: Tekunice, tekunice ti maleni zecu!] The lecture is available here: https://www.youtube.com/watch?v=83H7lfAEk0A.

After this online communication we made connection with 1) individuals from different local communities that would like to take part in our initiative and 2) the Nature Reserve "Palić-Ludaš" from northern Serbia. This resulted in initiation of joint work on EGS colony repatriation on the border with Hungary. This was one of the direct results from this hour-long talk.

Third activity during this season was round table held in Nature Reserve "Palić-Ludaš", where our representative was dr Dimitrije Radišić and Academia representative prof. dr Duško Ćirović (Figure 1). During this round table Oto Szekeres from "Palić-Ludaš" proposed his plan for relocation of EGS on one locality this public enterprise manages during the last 10 years (Figure 2). The area has recently been evaluated by Institute of Nature Conservation of Vojvodina Province as habitat with good quality for the EGS. After presentation, we visited the site, positioned at the Hungary - Serbia border. More interesting is that this site of 25 ha we visited was restored in 2014 from an arable to open grassland. It is a part of a larger Conservation Program Public Enterprise "Palić-Ludaš" had from 2014 to 2020. In total they restored area of 400 ha in the area of Subotica Sand.

Spring 2020 activities during round table at Palić-Ludaš facilities (left) and site visit (right).

Summer season 2020

During the summer season we had several small and intermittent activities such as field work in Vilovo and Lok – assessing colony size and distribution (as it was proposed, but without any work with the local community), and one (out of two planned) roundtable meeting. During this time, we started filming the video material for the short 10 minutes

documentary. Also, we did some additional field work with Unmanned Aerial Vehicle (UAV) which was supported by the BioSense Institute from University of Novi Sad (Figure 3). Using this new technology in assessing EGS habitat quality is part of the pilot project that come out from our joint wok during the summer. Our field work revealed that the differences in characteristics of EGS occupied and unoccupied areas within grassland habitat are elusive. Thus, there was/ still is an urgent need to assess subtle changes in grassland cover properties within the available habitat at higher spatial and temporal resolutions. Very high-resolution images (VHR) were acquired from unmanned aerial vehicle (UAV) using the hyper-spectral and thermal camera (Figures 3). The use of the first one enabled us to generate first initial results that showed that smaller habitats with higher % contribution of steppe areas and smaller in size support larger and higher density populations. The use of thermal camera opened new direction for the following year research. Namely, there is great potential in using thermal camera to check the population size and density.

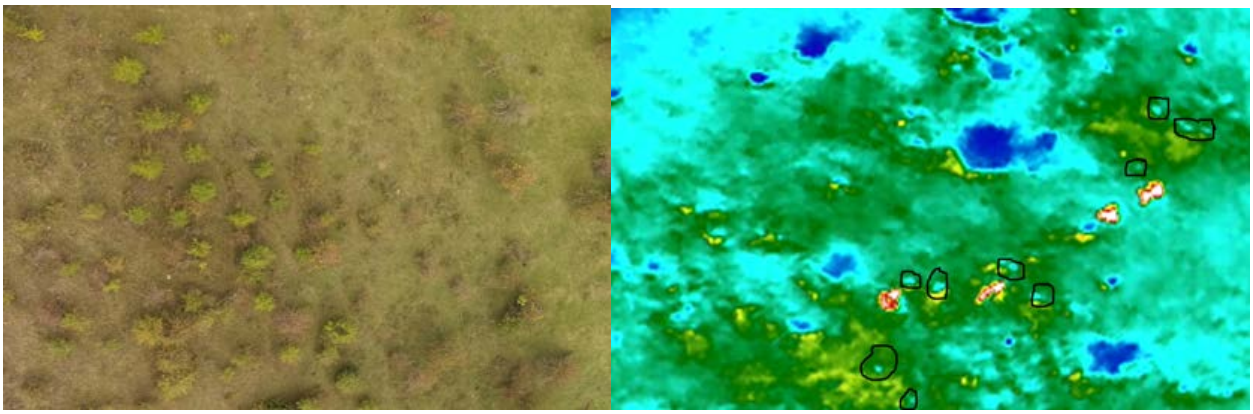


Figure 3 and 4 Images of habitat properties made by use of the UAV: high spatial resolution habitat characteristics (left) and thermal camera habitat signature (right).

In our work with UAV for two habitats we produced orthomosaics (orthoractified image) which were obtained by overlapping photographs with the help of photogrammetric software, and after that a detailed classification of the land cover was performed (Figure 3). In addition we detected with the Flir thermal camera with the Zenmuse XT gimbal on a DJI Inpire1 quadcopter drone differences in the temperature of the burrow within selected habitat. People in the field are marked in red on the thermal image (thermogram), which shows a higher temperature, and burrows within the habitats are marked with cooler tones (blue), which indicate a lower temperature (Figure 4).

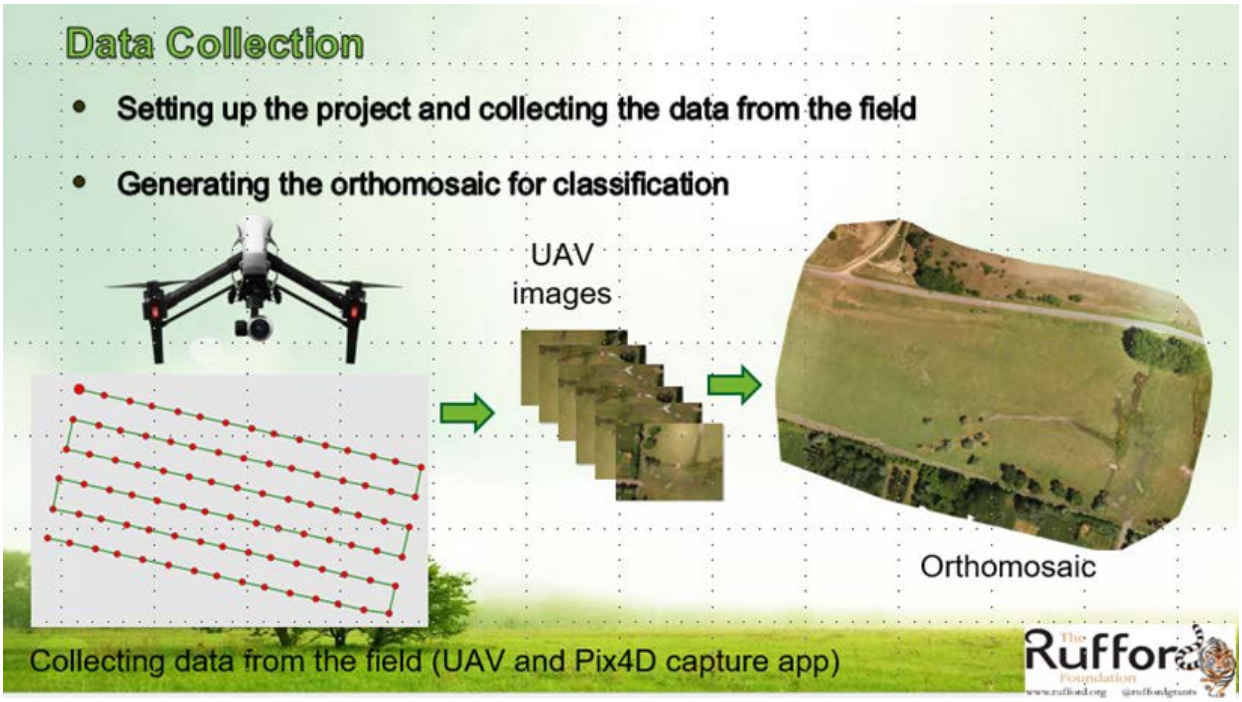
Autumn/winter season 2020

During final quartile of the year, we focused our activities on following: 1) preparing results and presenting abstract and talk for online conference organized by the British Ecological Society – *Festival of Ecology* 2) organizing workshop event to initiate joint activities of Academia, NGO and the Public sector and 3) preparing trailer and later finishing the short documentary.

1) Preparing results for presenting abstract and talk

We processed and stitched over 300 images and generated orthomosaics using Pix4D photogrammetry software. RGB orthomosaics per each site were generated with an average ground sampling distance (GSD) of 3-4cm depending on the slope of the terrain at 100m altitude. A Digital Surface Model is automatically generated by the Pix4D mapper software. Further processing until the final output was done in QGIS software. From the RGB orthomosaic we used red, green, blue and DSM channels. Each of these bands were split and normalized to the value 0-255 and saved to 8bit. After these steps, all four layers were merged into a final 4-band-orthomosaic. The technique we used in our study is the Object Based Image Analysis (OBIA), which uses both spectral and spatial information for classification. This approach involves the categorization of pixels based on their spectral characteristics, shape, texture and spatial relationship with the surrounding pixels. The workflow after data collection and processing outputs can be separated into three main steps: segmentation, classification, and accuracy assessment, which were performed using OrfeoToolbox in QGIS software.

We used the Large-Scale Mean-Shift (LSMS)-segmentation algorithm that has 3 steps: LSMS-segmentation, LSMS-small regions merging, and LSMS-vectorization. LSMS-small regions merging allows for filtering out small segments that are removed and replaced by background labels or merged with a radiometrically closest segment. The final step of this workflow is the vectorization of the segmented image into a vector file with no artifacts, where every polygon represents a unique segment. OTB contains several supervised and unsupervised classification algorithms. In our study we applied and compared three object-based supervised algorithms: Support Vector Machine (SVM), Random Forest (RF) and k-nearest neighbors (k-NN).



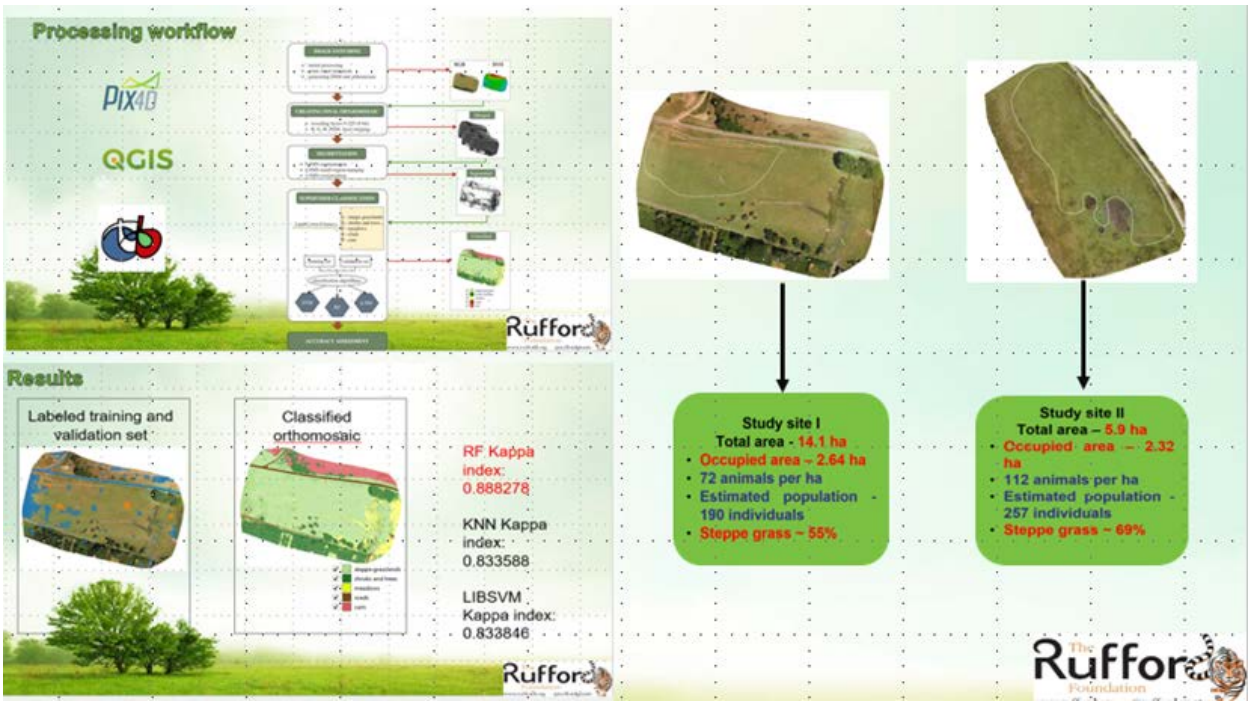


Figure 5 and 6 Workflow and initial results of data collected by using UAV: general overview of data collecting (top) and Processing, classification and first results of high spatial resolution habitat properties data set (bottom).

We selected a certain number of polygons for the training and validation set. We labeled classes from 1 to 5 manually taking care of good distribution and an adequate number of polygons representing each of the classes. Ground truth data was collected at each of the study sites. In total, five classes were annotated manually (steppe grasslands, shrubs and trees, meadows, roads, and cam). After that, we generated results testing three classifiers. This study shows that the RF classifier performs better with respect to the other classifiers. Short presentation of the workflow and initial results presented on *Festival of ecology* are given in Figure 5 and Figure 6.

2) Organizing workshop for Academia, NGO and Public representatives

The workshop was held in Ceremonial Hall of Institute of Nature Conservation of Vojvodina Province (Figure 6). Below is the Agenda and name of the participants of tree sectorial joint workshop. Due to Covid-19 we were limited with number of participants:

Agenda of the Rufford project workshop meeting
European Ground Squirrel Conservation - Habitat Networks for Open Grassland Wildlife in Agricultural Settings

Friday, November 06, 2020 Ceremonial Hall of Institute of Nature Conservation of Vojvodina Province	
10.00	Welcome reception, Building entrance hall
Opening Session	
10.30	**Opening address**

	Tijana Nikolić, Project coordinator *Nikola Stojnić* *Dimitrije Radišić*
11.00	**European ground squirrel conservation - Rufford, the movie** *Oliver Fojkar*
11.15	**Presentation of the EGS Conservation - Habitat networks for open grassland wildlife in agricultural settings** *Tijana Nikolić*
11.45	Coffee break, Building entrance hall
Presentation of the NGO, Public and Academia sectors activities on EGS conservation	
12.00	**Proposal for EGS repatriation at Subotica Sands** *Otto Szekeres, Head Ranger, PE Palić-Ludaš*
12.20	**Ecological network and EGS conservation in Vojvodina Province** *Slobodan Puzović and Jadranka Delić, Assistant Director and Mammologist, PE Institute for Nature Conservation of Vojvodina Province*
12.40	**Overview of Rufford foundation support in Serbia** *Maja Arok*
13.00	**Mapping EGS habitats in south Banat area: status and trends of habitat characteristics and occupancy in 2019** *Nada Ćosić*
13.20	Round table discussion: future EGS conservation actions in Serbia
14.30	Lunch/Cocktail

Participants

1. Tijana Nikolić
Research associate (BioSense Institute, University of Novi Sad)
Academic Society for Nature Conservation

2. Nikola Stojnić
Head of Sector for species protection (Institute for Nature Conservation of Vojvodina Province)

3. Dimitrije Radišić
Assistant professor (Department of biology and ecology, Faculty of Sciences, University of Novi Sad, Bird Protection and Study Society of Serbia)

4. Slobodan Puzović
Assistant director (Sector for nature protection, Institute for Nature Conservation of Vojvodina Province)

5. Oliver Fojkar
PR (Institute for Nature Conservation of Vojvodina Province)
President of Academic Society for Nature Conservation

6. Lada Delić
Head of Mammology team (Institute for Nature Conservation of Vojvodina Province)

7. Duško Ćirović
Associate professor (Faculty of Biology, University of Belgrade)

8. Nada Ćosić
Research associate (The Institute for Biological Research 'Siniša Stanković', University of Belgrade)

9. Maja Arok
Research assistant (Department of biology and ecology, Faculty of Sciences, University of Novi Sad and Academic Society for Nature Conservation)

10. Otto Szekeres
Head Ranger (PE Palić-Ludaš)

After the presentation, the main topics of discussion were i) proposed **relocation instead repatriation** of endangered local populations to Subotica Sands Nature Reserve ii) how to act in case it is necessary to report habitat usurpation or harassment of active colony in the field, iii) translocation strategy:

i. **Relocation strategy/procedure:** According to the suggestion of Institute for Nature Conservation of Vojvodina Province we agreed that further activities would be aimed to relocation of the targeted endangered colony in northern Serbia. Permission will be required to carry out this activity and we have the green light from Institute for Nature Conservation of Vojvodina Province. The proposal is to make a care plan and program, ask for a permit, and buy equipment (Academic Society for Nature Conservation and partly from the University) and to perform the relocation at the end of July and the beginning of August 2021. Representatives of PE Palić-Ludaš already have the equipment (cages, drills for holes, etc.) for the setup of the EGS new / future habitat. The joint care plan and program (working version) should be written by the end of January 2021, and the final version by the end of March 2021. Permission for taking care of the colony with an explanation why the targeted colony from a certain habitat is selected to be relocated to the Subotica Sand should also be submitted in January 2021.

   It was also pointed out that it is not always a good practice to meet individual stakeholder's demand to relocate animals, as is the case with individuals in the habitat of Bikovo Airport (private sport airport) in Bačka region. In cases in which a) the colony interferes with the locals such as this example and b)

stakeholder property is habitat of good quality for the EGS, it is better to jointly manage local population with the stakeholder group. Thus, there is a need to involve them in all our future activities and make joint initiatives in Bačka. Part of the solution for this problem and further communication with stakeholders will be explained in the planned proposal of the care plan and program.

ii. **What to do in case of colony harassment and habitat usurpation**: According to the institute for Nature Conservation of Vojvodina Province, if we spot plowing / usurpation of land or harassment of a colony within e.g., protected property, it is necessary to call the Institute for Nature Conservation of Vojvodina Province, the Sector for the Protection of Species headed by Nikola Stojnić. Many violations are difficult to sanction for various technical reasons. For example, it is said that the so-called "plow trials" or dumps are problems for which it is necessary to catch the perpetrator in action and then prove that he committed a violation, and as such in the current system, unfortunately, cannot be sanctioned.

Figure 7 Workshop for Academia, NGO and Public representatives: opening and trailer presentation (a, b), from plan to action – initiative (c) and final discussion (d).

iii. **How to form new colonies:** For successful action all sectors concluded that in the joint plan and program it is necessary to explain which local populations will be taken care of first. This primarily refers to the joint agreement at this workshop on taking care of individuals from local populations in clover or other endangered localities in the north of Bačka, and to relocate the selected colony inside this very region. We will also contact fellow practitioners from Hungary gathered around the LIFE project *RaptorsPrayLife* who have experience with relocation protocols and the minimal number of individuals to be relocated. Thus far we had the opportunity to jointly work in the field on these activities in Hungary, and thus already have good contact and experience with them. Finally, based on everything mentioned above we have decided which target colony will be relocated, but will have to decide the optimal number of individuals to be relocated, tagged and managed in the first phase starting from the following summer.

3) Preparing the Movie

The material for the movie and interviews from project members were recorded and later prepared by Oliver Fojkar, the president of our NGO organization and Studio – *Prizma Produkcija*. The trailer was presented on 3 sectorial meeting and at the Festival of ecology, BES and the 10 min documentary is finalized and will be used for promotion of EGS protection and our future activities. The trailer can be found here: Trailer The movie can be found here: Movie.