



GIS ANALYSIS ON THE HABITAT SELECTION OF JUVENILE IMPERIAL EAGLES

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The Imperial Eagle (*Aquila heliaca*) is an endangered species with solely as much as around 120 pairs remaining in Central Europe, most of them in Hungary. A LIFE Nature project has been set up to identify the most important habitats for the species, i.e. Temporary Settlement Areas and Breeding Areas. In the current study the identification of Temporary Settlement Areas are demonstrated.



Temporary Settlement Areas (TSA)

are those areas where non-breeding individuals (usually juveniles) regularly occur. These are usually prey-rich undisturbed habitats, in the neighborhood of which no breeding pairs can be found. While most conservation programmes focus on Breeding Areas, protection of TSAs are of equal importance, because **50-70 % of juveniles die on these areas before reaching maturity.**

Materials and Methods

Historical and recent data on the distribution of Imperial Eagles have been collected and compiled into a georeferenced database. The geodatabase is built up of several subdatabases, each relating to a record collecting method. For the current study on TSAs, four subdatabases were used, with the following summary statistics:

Subdatabase	Period	No. of individuals	No. of records	Accuracy (km radius)	Coverage
Radio telemetry	2003-2006	12	180	2,5	Monitored area
Satellite telemetry	2003-2006	7	1140	10	Hungary
Recovery	1996-2006	45	45	10	Hungary
Sightings	1996-2006	cca. 400	1042	2,5	Hungary

Common attributes of the four subdatabases that were used in this analysis are:

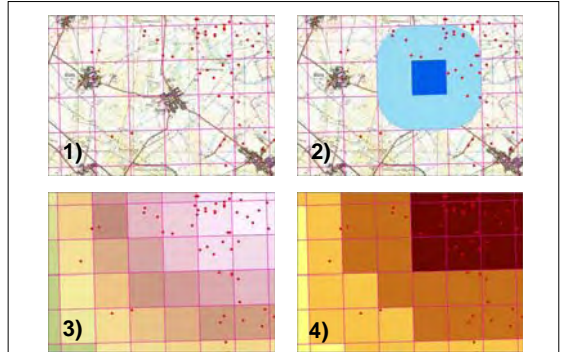
- Date and time of recording
- Coordinates
- Accuracy of coordinates

Each subdatabase has its vices and virtues:

- Radio telemetry records are greatly effort-dependent, therefore carry large observer bias, but provide accurate location data (accuracy within 2,5 km) and individual identification on a moderate sample size.
- Satellite telemetry provides many records, but from only few individuals, therefore the sample cannot be considered completely representative. Moreover, data have high spatial inaccuracy (~10 km in average).
- Recovery data are inaccurate and scarce, but are of great importance, because they indicate where animals were injured or killed.
- Sightings data are effort-dependent, but are accurate and numerous.

A 2,5 km UTM grid was used for the representation of eagle occurrence densities for greater coherence with data from other projects. For each subdatabase, the number of records contained by each UTM cell's buffer of a radius equal to the accuracy of the database (2,5 km for radio telemetry and sighting, 10 km for satellite telemetry and recovery) was calculated. The resulting density values were assigned to the corresponding UTM grid cells. Density values were reclassified to a 4-level scale by expert judgment, in order to allow inter-subdatabase comparison and synthesis of results.

Results of the subdatabases were synthesized in one single map by summing the 4-level UTM cell scores, and subsequently reclassifying the values again to a 4-level scale.

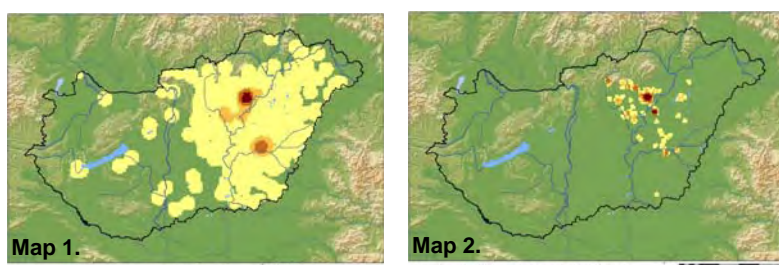


Steps of density value calculation:

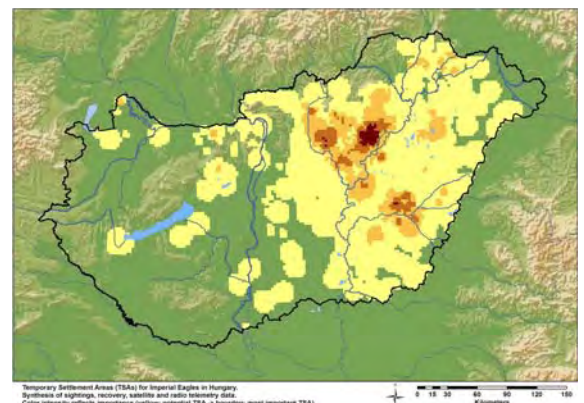
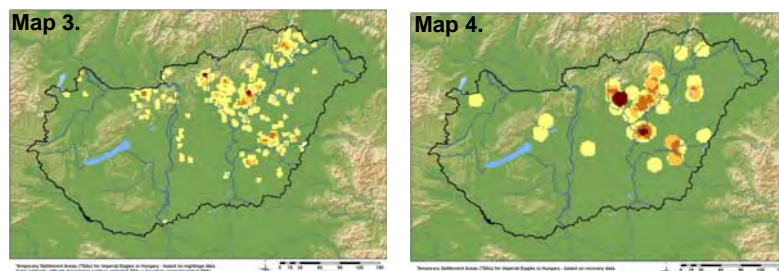
- 1) records from a subdatabase are taken with UTM grid
- 2) an appropriate buffer (2,5 or 10 km, depending on the accuracy of the data) is created for each UTM grid cell,
- 3) record numbers are summed for each buffer and assigned to the corresponding UTM cell, so that each UTM cell has a density value,
- 4) values are reclassified to a 4-class scale, to be comparable between subdatabases.

Utilization of results and future perspectives

Preliminary results of the analyses have been submitted to the companies that manage power lines to insulate the most critical pylons to avoid electrocution, which is the most common cause of mortality of juvenile eagles. Potential areas will be fine tuned with Corine Landcover and the Hungarian Habitat Database (www.novenyzeiterkep.hu/meta/en) for governmental nature conservation to assist the designation of new protected sites.



Importance of areas for Imperial Eagles in Hungary, based on the analysis of satellite telemetry (Map 1.), radio telemetry (Map 2.) sightings (Map 3.) and recovery (Map 4.) records of the Imperial Eagle Database.



Potentially important areas for Imperial Eagles in Hungary, based on the synthesis of analysis results from four subdatabases of the Imperial Eagle Database.

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