

# Justification of Minimum Conservation Targets ( $T_s$ )

## 1. Definition of the Constraint

To prevent the optimization model from prioritizing purely economic efficiency (thereby excluding costly species) or saturating "cheap" species, a Species Equity Constraint (Minimum Conservation Target) has been implemented.

This constraint compels the algorithm to guarantee a minimum viable area ( $T_s$ ) for each species before optimizing the remaining budget. The values for  $T_s$  have been determined based on spatial ecology (*Home Range*) and population viability principles.

Species	Target ( $T_s$ )
<i>Martes martes</i>	40 km <sup>2</sup>
<i>Atelerix algirus</i>	20 km <sup>2</sup>
<i>Elyomis quercinus</i>	20 km <sup>2</sup>
<i>Oryctolagus cuniculus</i>	20 km <sup>2</sup>

## 2. Specific Justification by Species

### 2.1. *Martes martes*

The *Martes martes* acts as an umbrella species due to its demanding spatial requirements.

**Biological Evidence:** Specific telemetry studies conducted in Menorca [1] reveal marked spatial sexual dimorphism. While females occupy reduced areas (~0.5 km<sup>2</sup>), males patrol extensive territories ranging between **5.0 and 9.0 km<sup>2</sup>** (500-900 ha).

**Modeling Decision:** A higher target of **40 km<sup>2</sup>** is established. This surface area is necessary to support a viable social structure composed of several dominant male territories overlapping with multiple females.

### 2.2. *Atelerix algirus*

**Biological Evidence:** This species exhibits significant variation in space use [2]. Females maintain stable territories (0.04 - 0.3 km<sup>2</sup>), but males display high mobility, with ranging areas that can reach up to **1.0 km<sup>2</sup>** (100 ha) in search of resources.

**Modeling Decision:** A baseline target of **20 km<sup>2</sup>** is set. This threshold does not seek the absolute minimum but guarantees sufficient connectivity and space for male movements, ensuring the reproductive viability of a mixed population.

### 2.3. *Eliomys quercinus*

**Biological Evidence:** This species maintains comparatively small territories, typically ranging between **0.03 and 0.075 km<sup>2</sup>** (3.3 - 7.5 ha) [3].

**Modeling Decision:** A target of **20 km<sup>2</sup>** is more than sufficient to sustain a demographically robust population. Theoretically, this area could harbor between **250 and 600 territorial individuals**, far exceeding the minimum threshold to prevent genetic drift.

### 2.4. *Oryctolagus cuniculus*

This species presents a particular challenge: high biological density but extremely high economic cost in the model.

**Biological Evidence:** It is a social species organized in *warrens*. According to the IUCN Action Plan [4], under favorable conditions, they defend very small territories, often less than **0.01 km<sup>2</sup>** (1 hectare).

**Modeling Decision:** Despite its low spatial requirements, the high average adaptation cost tends to exclude the rabbit from the optimal solution. The **20 km<sup>2</sup>** target is established as a **safety measure**: it forces the model to acquire sufficient habitat to theoretically support a metapopulation of 2,000 social groups, ensuring resilience against diseases and preventing local extinction based purely on financial criteria.

## 3. References

1. Clevenger, A. P. (1993). "Pine marten (*Martes martes* L.) home ranges and activity patterns on the island of Minorca, Spain". *Zeitschrift für Säugetierkunde*, 58, 137-143.
2. García, F., et al. (2015). "Algerian hedgehog (*Atelerix algirus* Lereboullet, 1842) habitat selection at the northern limit of its range". *ResearchGate Publications*.
3. Bertolino, S., Cordero, N., & Currado, I. (2003). "Home ranges and habitat use of the garden dormouse (*Eliomys quercinus*) in a mountain habitat". *Acta Zoologica Academiae Scientiarum Hungaricae*, 49(Suppl 1), 11-18.
4. Gibb, J. A. (1990). "The European Rabbit". In: *Rabbits, Hares and Pikas: Status Survey and Conservation Action Plan* (pp. 116-120). IUCN.