

Habitat management for prey recovery

an off-site mitigation tool for wind farms' impacts on top avian predators

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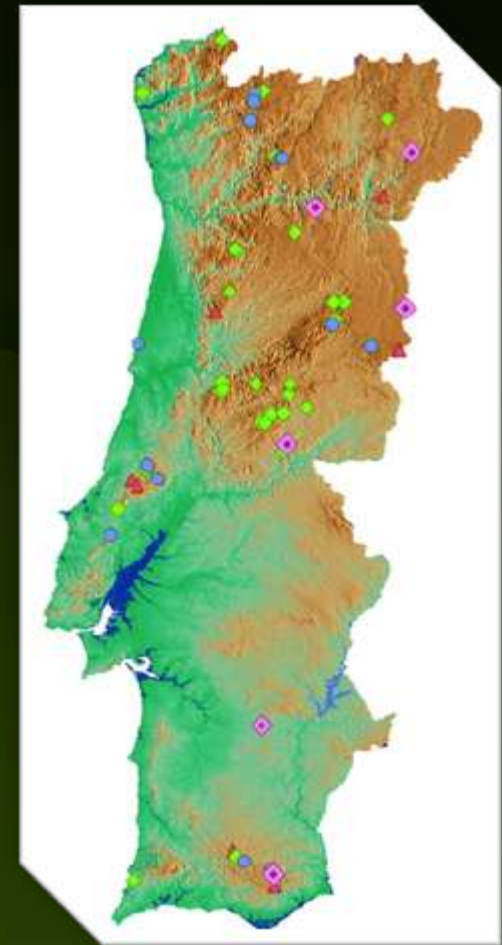
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Who are we?



- Bio3 is a company recognized as a national leader in ecology and biodiversity consultancy, research and information systems.
- We have a multidisciplinary team with 26 highly skilled technicians.
- 6 years: ecological assessment/surveys of more than 320 projects.
- R&D on windfarms & biodiversity since 2005 (fatality estimate & searcher efficiency).
- More than 60 biodiversity studies & surveys in Portuguese windfarms:
 - ▲ Ecological Impact Assessment (EIA)
 - ◆ Biodiversity Surveys
 - EIA & Biodiversity Surveys
 - ◆ Compensation measures



Presentation topics



- Introduction:
 - Impacts of Wind farms and Power lines on raptor community
- Off-site mitigation strategy to minimize and compensate negative impacts on raptors:
 - Increasing prey availability outside the potential impact area
- Case study
 - off-site mitigation strategy to compensate the power line impact on golden eagles
 - Main Conclusions
- Application to wind farm projects

Introduction



PME lider

- Wind Farms (WF) and Power Lines (PL)

Potential negative impacts on avian communities



- Habitat loss
- Barrier effect
- Displacement
- **Collision & mortality**

Raptors are one of the most vulnerable groups

(Wind Farms: e.g. Hunt & Hunt 2006, Lucas, 2008, Garvin *et al.*, 2011; Power Lines: e.g. Rollan et al., 2010)

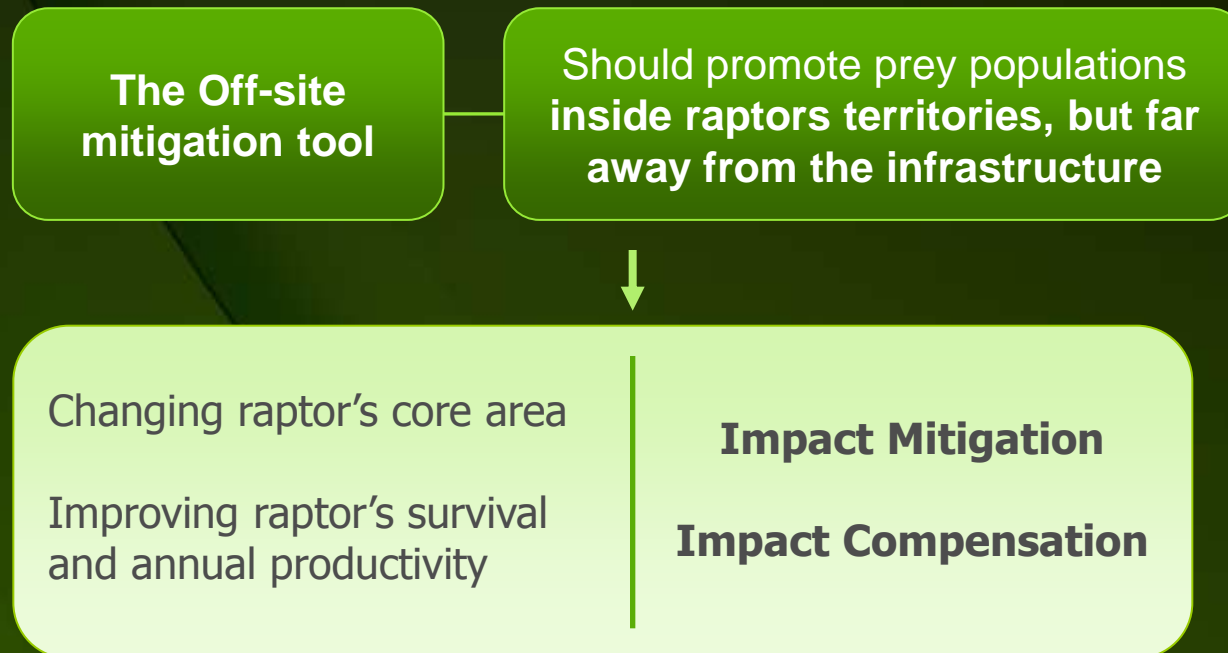
- Hierarchy of approaches to risk minimization (Langston & Pullan 2003):



- **Avoidance**: if possible, have priority
- **Mitigation**: layout readjustment; increasing visibility; temporary shutdown...
- **Compensation**: based on conservation measures, habitat enhancement...

The off-site mitigation tool

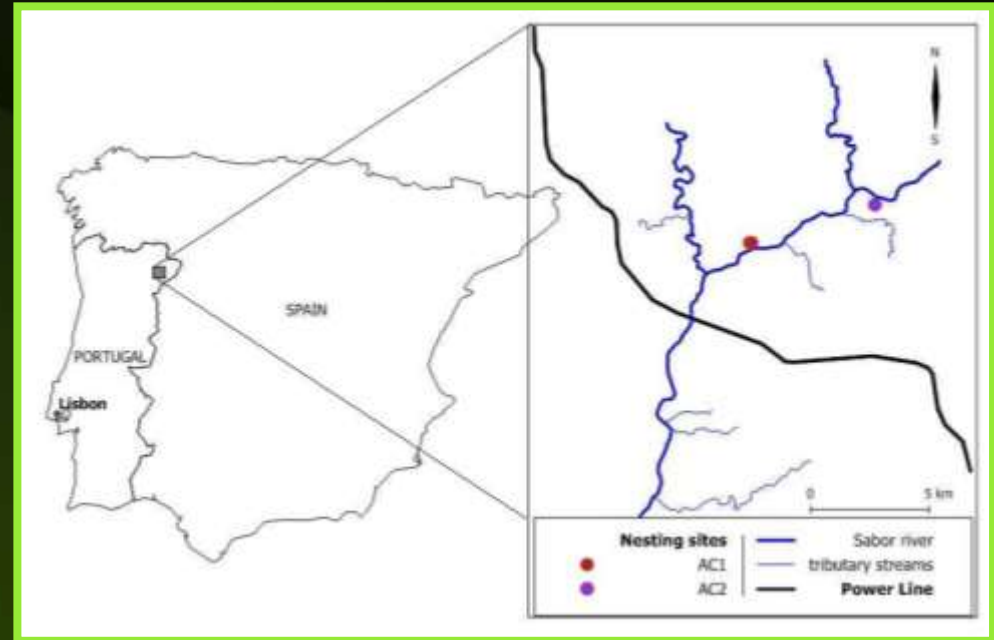
- To plan an off-site mitigation strategy we must understand the ecological requirements of the target populations
 - Birds of Prey are attracted to areas of high prey densities
 - » Sometimes impact risk increases when high number of preys occur in the vicinities of the WF (*e.g.* Hunt & Hunt, 2006)



Case study – an off-site mitigation strategy to compensate the power line impact on golden eagles



- Tested in Northern Portugal (Oct2007-Oct2010);
- To compensate the negative impact of a power line implemented (in Oct2008) in the vicinity of two Golden Eagle's territories
- Both pairs nest on riverside cliffs, in the North area of the PL



The off-site mitigation strategy:

Conservation plan for wild rabbit inside golden eagle's territories and far-off the power line to avoid line crossing and increase eagle's reproduction success

Case study – an off-site mitigation strategy to compensate the power line impact on golden eagles



- To design the off-site mitigations strategy we must know both species:

The considered to be at risk:

The Golden eagle

(*Aquila chrysaetos*)

- **Top Predator**
- **K-strategists**
- **Endangered Species** in Portugal;
- **Conservations problems:** electrocution, collision, direct persecution;
- In Iberia, the decline of wild rabbit, decreased golden eagle's reproduction success.

The "target" species

The European wild rabbit

(*Oryctolagus cuniculos*)

- **"Near Threatened"** in Portugal
- **Key** species in Mediterranean ecosystems (main prey for several endangered predators);
- **Important game species** (high social-economic relevance);
- **Conservations problems:** habitat loss, diseases, strong hunting pressure.

Case study – an off-site mitigation strategy to compensate the power line impact on golden eagles



- Wild rabbit conservation plan was based on habitat management:
 - Improving food availability, shelter & reproduction condition:
 - Small pastures in scrubland areas
 - Supplementary food and water in summer
 - Artificial warrens
- Included Survey Programs:
 - Habitat management;
 - Wild rabbit populations;
 - Golden eagles pairs .
- Participation of hunter community:
 - Collaboration protocols with hunters
 - Awareness-raising workshops:
 - The importance of a sustainable game management
 - The role and importance of top-predators (eagles) on ecosystems

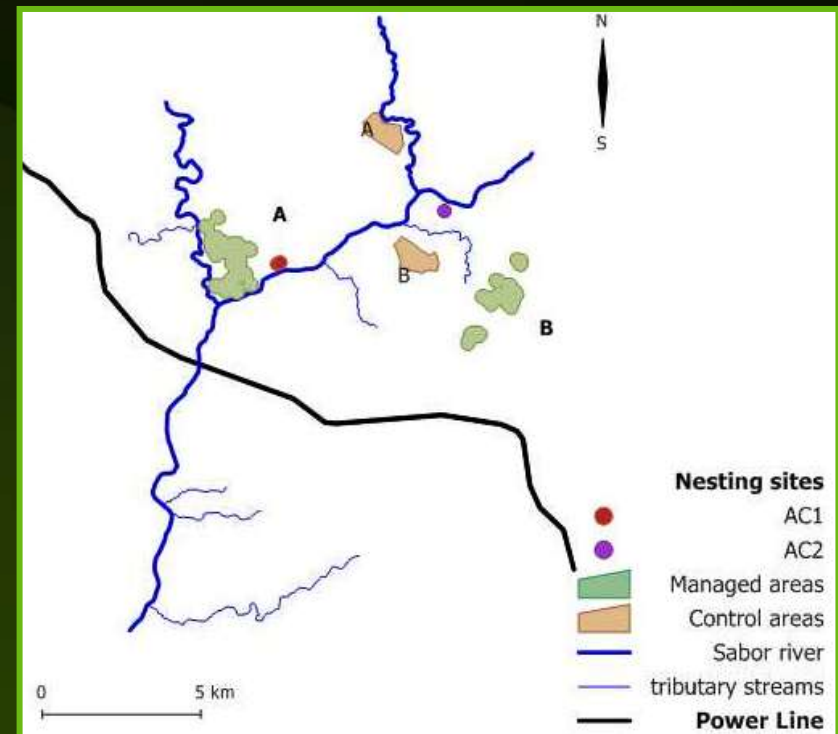


Case study – an off-site mitigation strategy to compensate the power line impact on golden eagles



• Conservation Plan for wild rabbit: implementation and survey

- Implemented in two game reserves;
- Managed areas were dominated by Mediterranean scrublands and presented scarcity of food resources;
- The initial wild rabbit density was low/medium;
- Management actions were visited monthly to evaluate maintenance and assess wild rabbit usage;
- Populations were surveyed by latrines (pellet) counts in line transects in Managed and Control Areas (same game reserve and similar initial conditions);

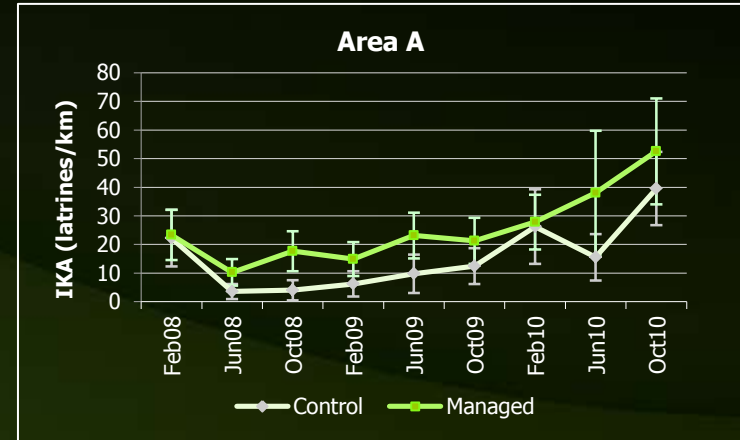


Case study – an off-site mitigation strategy to compensate the power line impact on golden eagles



• Conservation Plan for wild rabbit: main results

- Wild rabbit used 75% of pasturelands and warrens in area "A" and 95% in area "B".
- Rabbit presence & abundance differences were tested between years and areas using a Hurdle Model;
- After habitat management wild rabbit presence & abundance was higher in Managed areas in relation to Control areas ($p < 0.001$);
- Presence & abundance in Managed areas was also significantly higher in the end of the project ($p < 0.001$).



Wild rabbit presented a positive response to habitat management

Case study – an off-site mitigation strategy to compensate the power line impact on golden eagles



- Golden eagles' Survey Program:
 - Field methods:
 - Eagles were surveyed monthly by observation points and eagles movements and behaviour were mapped;
 - Satellite telemetry - we were only able to mark couple AC1 with a PTT (male: Nov08-Feb09; female Nov09-present);
 - Nest survey;
 - Carcass searches.
 - Data analysis:
 - Eagle's observations were quantified in a grid;
 - PTT data: home-range (95% probability kernel) and core areas (50% probability kernel).

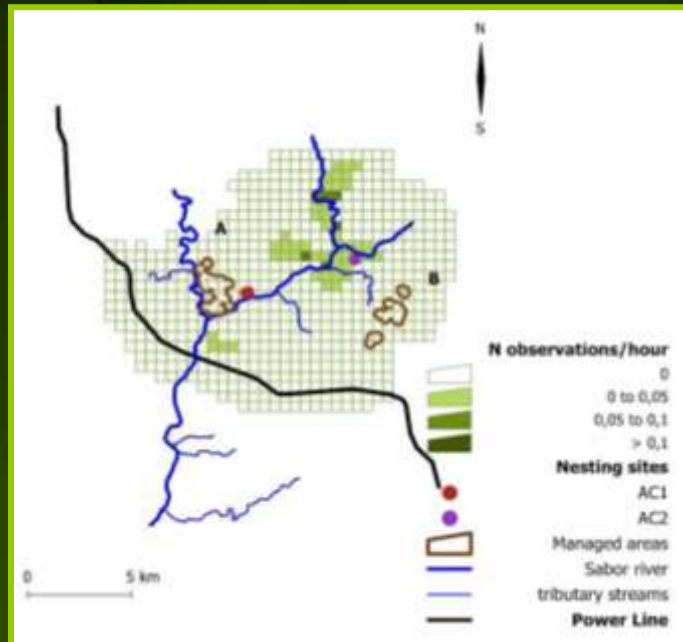


Case study – an off-site mitigation strategy to compensate the power line impact on golden eagles

Quantification of golden eagle's spatial use based on observations:

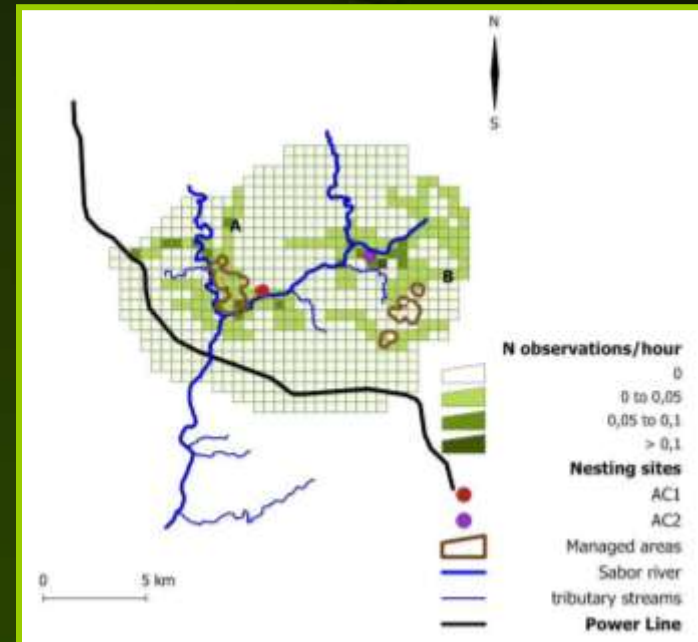
Before power line construction:

- Oct 2007 to Oct 2008;
- Before habitat management effect (slight decrease of wild rabbit populations)



After power line construction:

- Nov 2008 to Dec 2010;
- After habitat management effect (wild rabbit population recovery)



Case study – an off-site mitigation strategy to compensate the power line impact on golden eagles



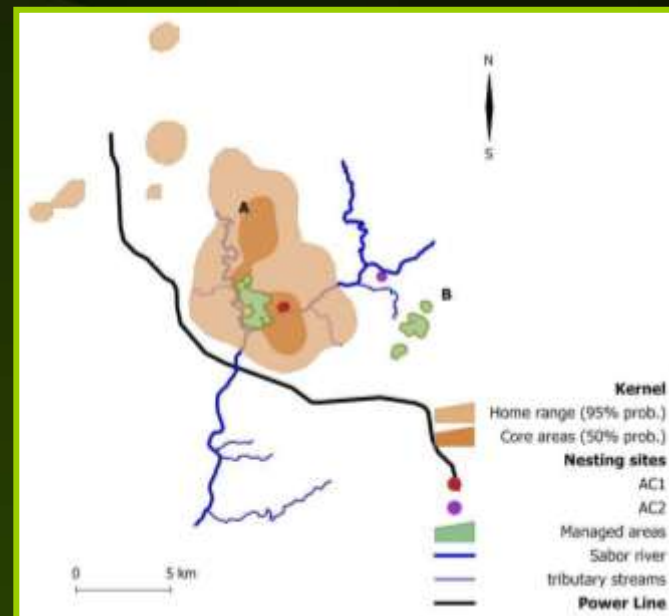
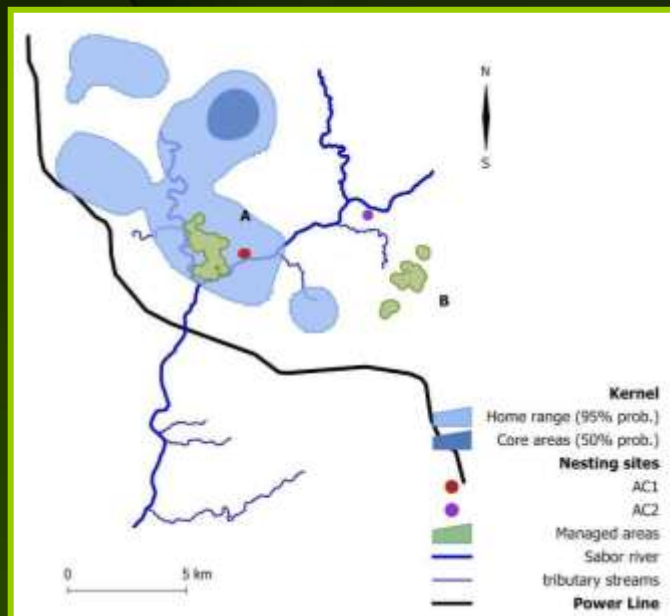
- Home-range (95% probability kernel) and core areas (50% probability kernel)

Male AC1 (Nov 2008 to Feb 2009):

Managed area located inside his home range
(considerable use of MA)

Female AC1 (Nov 2009 to Dec 2010):

managed area located inside her core area
(intensive use of MA)



Low use of the area in the vicinity of the power line

Case study – an off-site mitigation strategy to compensate the power line impact on golden eagles



• Nest Survey results

Nest survey	AC1			AC2		
	2008	2009	2010	2008	2009	2010
Confirmed breeding	Yes	Yes	No	unknown	Yes	Yes
Clutch size	2	2	0	-	2	2
Brood size	2	2	0	-	2	2
Productivity	2	2	0	-	2	2

Both pairs presented high productivity

• Carcass searches

- Collision & mortality impact wasn't found

Case study: main conclusions



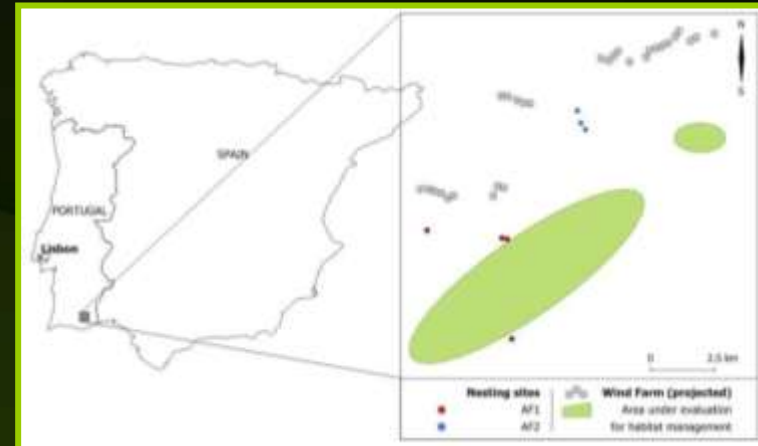
- ***The off-site mitigation goals were achieved!!***
 - ✓ Managed areas were located in golden eagles home range and far-off the power line
 - ✓ Rabbit population presented a positive response to habitat management;
- Both Golden eagles pairs:
 - ✓ use managed areas (AC1 female use intensively managed area A)
 - ✓ presented low use of the area in the vicinity of the power line
 - ✓ Presented high productivity
 - ✓ Presently, hunter community maintain the managed area – long term solutions;
- ***This off-site mitigation tool could be applied to Wind Farms with similar impacts on raptors community***

Application to wind farm projects



- Bio3 is now implementing this off-site mitigation tool for a Wind Farm

- Started in 2011, in south Portugal;
- Compensate a negative impact of WF (29 turbines) that will be implemented near two Bonelli's eagle's (*Aquila fasciata*) breeding territories;
- Same off-site mitigations strategy;
- Presently:
 - Selecting management areas (based on habitat potential and rabbit abundance);
 - Establishing cooperation protocols with the local hunters.





ATKINS



Thank you

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Conference on
**Wind energy and
Wildlife impacts**