

INFLUENCE OF ROAD NOISE DISTURBANCES ON BLACK VULTURE NESTING AREA:

CASE OF 'CABEZA DE HIERRO' STATE IN SPANISH MEDITERRANEAN CENTRAL MOUNTAIN



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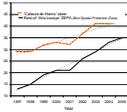


The private state 'Cabeza de Hierro' (Rascafría, Madrid, Spain) is a singular and interesting example of the state of art for Spanish forest management. The forest covers about 1900 ha at the Spanish Central Range, with Scots pine as main species, though mixed with Pyrenean oak on lower elevations. The private ownership has been harvesting pine timber since acquisition in 1840, combining harvest with the processing on its own sawmill. Since the first management plan in 1957, mean annual timber harvest has been about 3 m³.ha⁻¹.yr⁻¹. Beside direct productions like timber, fuel wood, big game, pasture or mushrooms, the high socio-economic importance of the forest is based on more services and externalities like recreational use, biodiversity and conservation, landscape scenery or as CO₂ sink. The forest also fulfils some scientific and educational functions with several on-going research projects on natural regeneration, stand structure, wildlife habitat, forest inventory methodologies, externalities valuation, etc. The pending inclusion of this state in the future Guadarrama National Park creates uncertainties that might question the sustainability of the present equilibrium state in the medium and long run.

Aegypius monachus
A. San Miguel, 2010.



BIODIVERSITY, WILDLIFE CONSERVATION
Beside the rich catalogue of vegetation and wildlife species present at the state, it is remarkable the presence of one of the main colonies of Central Spain of the endangered black vulture. A research project has been developed to determine guidelines to improve vulture's habitat as well as for studying its preferences of tree selection for nesting.



Road Ecology is an emerging science which arises from the field of **Landscape and Ecosystem Ecology**. Originally focused on the adverse impact of roads on nature, the current studies and experiences offer an interesting background on analyzing **road traffic disturbances effects on wildlife**. On the other hand, **traffic movements** are nowadays **linked to the forest services enjoyment**: visitors from the close city of Madrid, with more than 5 millions of people, frequently come to the area for recreational use. Recent environmental impact statements on transport infrastructure projects have established threshold levels of 50 dB(A) in **nightly period (Lni)** and 60 dB(A) in **24 hours period (Lden)** when roads are crossing natural reserves.

METHODOLOGY

Study of 12.6 km of M-604 road in Madrid Province (two lane mountain road).
Traffic volume and vehicle types are considered constant. Variation in noise immission levels at different surroundings points are attributed to changes in topography, different vehicles speed and local road features. Temporal variation is related to the day/night traffic cycle.
Noise modelling of the road surroundings: Predictor Type 7810 programme, Version 5.0 (French method XPS 31-133, recommended at EU level and by Spanish Law)
Model applied to different circular buffers (25, 100 and 200 m) around each nest
Noise immission levels were calculated on a square grid of receptors for each area
Info about 145 black vulture nests was recorded by SEO Birdlife for Madrid Regional Gov.
Traffic data by *Dirección General de Carreteras* (Madrid Regional Government)
Annual average daily traffic of M-604 road: 853 vehicles (5% of heavy vehicles).

STRETCH	LENGTH (km)	ALTITUDE (m)	SLOPE (%)	LIGHT V. SPEED	HEAVY V. SPEED
#1	8.4	1.150 - 1.400	3	80 km/h	70 km/h
#2	4.2	1.400 - 1.650	6	60 km/h**	50 km/h**

Characteristics of the M-604 road. * straight tracks ** curves

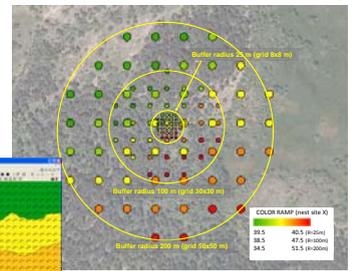


OBJECTIVE

Is there a relationship between road noise disturbances and black vulture nests location?



Receiver points distribution in 25, 100 and 200 meters radius buffers (DISPLACED NEST LOCATION FOR SECURITY REASONS).

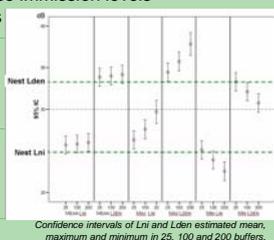


RESULTS

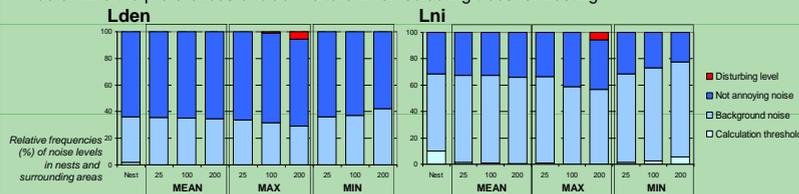
- ✓ M-604 is a road with low AADT (<1000 vehicles) with low noise immission levels
- ✓ Quantification of road noise at black vulture nests and buffers
- ✓ Low levels of noise in buffers, with **minimums at nests**
- ✓ Strong reduction of noise from road (source) to nests buffers

	Lni			Lden		
	Source (Road)	Nest (4m)	Nest (18 m)	Source (Road)	Nest (4m)	Nest (18m)
Mean	87.3 ± 2.4	24.7 ± 9.7	25.4 ± 9.3	75.0 ± 2.4	53.0 ± 9.6	33.8 ± 9.2
Maximum	70.3	42.5	43.2	78.8	50.7	51.8
Minimum	64.3	2.2	4.3	72.7	10.0	12.5

Noise levels for Lni and Lden in source (road) and nests (standard height in road ecology -4m- and mean height of black vulture nests -18m-)



Apart from noise disturbances (road or other sources), there are many other factors that would determine the preferences of black vulture when selecting trees for nesting



CONCLUSIONS

- ✓ Low level of noise disturbances in the proximity of nests
- ✓ Location of black vulture nests in the lowest noise level of surrounding areas
- ✓ Interest of the adaptation of road ecology techniques to analyze noise disturbances (road or other sources) effects on wildlife
- ✓ Future research lines: identification of critical periods, grid height adaptation to fauna requirements, etc.

This work was developed in the project RTA2009-00110 (INIA-Spain). (<http://sites.google.com/site/dehesasytalaresdeencia>)
Black vulture nests information for scientific purposes was provided by Peñalara Natural Park managers (Madrid, Spain).



Biodiversity of Mediterranean Forest Ecosystems: changing the paradigm of conservation.
Understanding community dynamics, fostering evolutionary processes, promoting values

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