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LIFE CAÑADAS

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Autor/es: Francisco Martín Azcárate, Violeta Hevia Martín, Paula Solascasas, Cristina Mata, Juan E. Malo Arrázola, Laura dos Santos Pinto Vázquez.

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Contenido

Summary

This deliverable is part of the public awareness and dissemination of results, it contains a compilation of the communications made in congresses and seminars by the Autonomous University team presenting the LIFE CAÑADAS project. During the year 2023 the project has been presented in a total of 4 congresses and 2 scientific publications.

Introducción

Este entregable forma parte de la acción dedicada a la diseminación de las acciones y resultados, consiste en la recopilación de las comunicaciones realizadas en congresos y seminarios por parte del equipo de la Universidad Autónoma presentando el proyecto LIFE CAÑADAS. Durante el año 2023 el proyecto se ha presentado en un total de 4 congresos y 2 publicaciones científicas.

1. The 3rd Global Soil Biodiversity conference

University College Dublin, Ireland
13th – 15th March 2023

Assessing Soil Conservation of the Madrid Drove Roads Network, within the Life CAÑADAS Project.

Poster presentation (Fig. 1).

Authors: Paula Solascasas, Violeta Hevia, Raúl Ochoa-Hueso, Francisco M. Azcárate.

Introduction: Grassland soils are important habitats for the conservation of soil biodiversity, especially in agricultural landscapes. They are also important reservoirs for carbon sequestration and climate change mitigation. In the Iberian Peninsula, extensive grazing contributes to the conservation of semi-natural grasslands. Drove roads (DRs) are the traditional livestock routes used for for seasonal movements by transhumant herds, in search of the most productive pastures. The progressive decline of transhumance has led to the degradation of this natural ecological corridors, specially in the Community of Madrid where they occupy up to 1.63% of the regional territory (Figure 1a). Objective: to evaluate how soil quality is affected by the different conservation states of DRs within the Madrid network and the ecological implications at the landscape scale. Hypothesis: (a) plots affected by erosion will have the most degraded soils and will differ the most from the reference state, and (b) overgrown abandoned locations will also differ from reference plots, but not as clearly as the eroded ones.

THE 3RD GLOBAL SOIL BIODIVERSITY CONFERENCE
13-15 MARCH 2023, DUBLIN, IRELAND

Assessing Soil Conservation of the Madrid Drove Roads Network, within the Life CAÑADAS Project.

Paula Solascasas[1,2,4], Violeta Hevia[2,4], Raúl Ochoa-Hueso[3], Francisco M. Azcárate[1,4]

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Introduction

Grassland soils are important habitats for the conservation of soil biodiversity, especially in agricultural landscapes[1]. They are also important reservoirs for carbon sequestration and climate change mitigation[2]. In the Iberian Peninsula, **extensive grazing** contributes to the conservation of semi-natural grasslands. **Drove roads (DRs)** are the traditional livestock routes used for for seasonal movements by **transhumant** herds, in search of the most productive pastures[3]. The progressive decline of transhumance has led to the **degradation** of this natural ecological corridors[4], specially in the Community of Madrid where they occupy up to 1.63% of the regional territory (*Figure 1a*).

Objective: to evaluate how **soil quality** is affected by the different conservation states of DRs within the Madrid network and the ecological implications at the landscape scale.

Hypothesis: (a) plots affected by **erosion** will have the most degraded soils and will differ the most from the reference state, and (b) **overgrown abandoned** locations will also differ from reference plots, but not as clearly as the eroded ones.

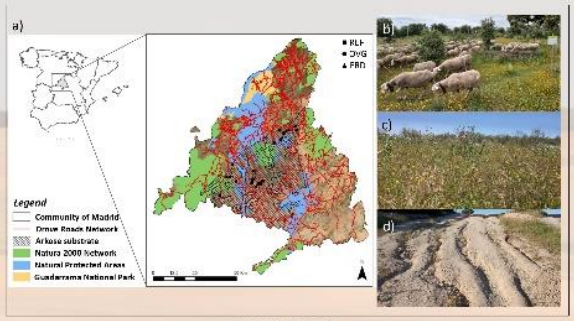


Figure 1. Study area

Materials and Methods

- We established 3 DRs conservation categories: (i) reference, (ii) abandoned overgrown and (iii) eroded (*Figure 1b, 1c, 1d*).
- We selected 30 sampling sites within the Madrid network, 10 of each status, and in each location, we delimited one plot of 10x15 m.
- In July 2020, we collected topsoil samples and determined: soil fertility variables (% C, N, P, K, pH, EC), litter decomposition[5] (*k*, *S*) and enzyme activities[6] (AS, AG, BG, CB, LAP, NAG, PHOS, XYL).

Results

According to GLMs, soil organic carbon (% C), total N, total P, available K and litter decomposition rate were significantly lower (p-value < 0.05) in eroded DRs, while overgrown abandoned DRs did not differ from reference plots (*Figure 2*).

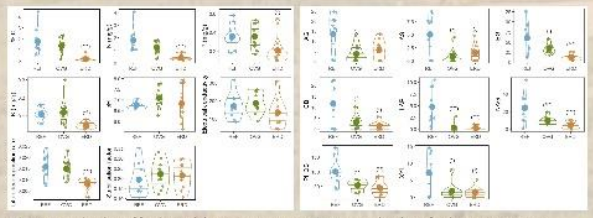


Figure 2. Violin plots of fertility and decomposition rate. *Figure 3. Violin plots of soil enzyme activities.*

Most of the enzymatic activities determined showed significant differences between reference drove roads and the degrade states (p-value < 0.05), with lower activity both in overgrown and eroded plots. Only α-glucosidase (AG) did not differ between plot types (*Figure 3*).

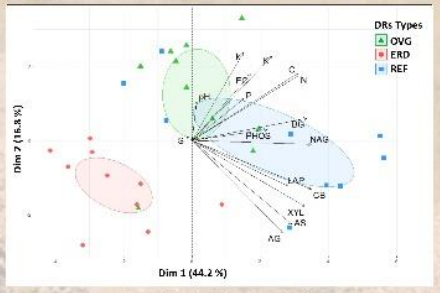


Figure 4. Principal Components Analysis

The graphical representation of the samples showed a clear separation of clusters related to conservation state. Reference plots were the most scattered, whereas eroded plots were highly grouped and separated from the other types (*Figure 4*).

Discussion

- Both the excessive accumulation of biomass due to the cessation of grazing and the loss of vegetation cover through erosion lead to a similar **loss of soil multifunctionality** within the Madrid drove roads network. The degradation of these soils entails the **loss of several ecosystem services**.

- Considering the vast surface covered by this unique network (~1% of the national territory) and the way it connects several mountain systems with lowlands[7], its conservation can have ecological implications at the landscape and regional scale.
- The presence of drove roads act as **ecological corridors** and diversity reservoirs that, when preserved, can increase grassland habitat availability within intensified and homogeneous landscapes, besides having a key role in long-distance seed dispersal[8].

References

[1] Menta, C., Leoni, A., Gardi, C., & Delle Cortili, F. (2011). Are grasslands important habitats for soil microarthropod conservation? *Biodiversity and Conservation*, *20*(5), 1077–1087.
[2] Chang, Q., Wang, L., Ding, S., Xie, T., Li, Z., Song, X., Zhao, X., Wang, D., & Pan, D. (2018). Grazer effects on soil carbon storage vary by herbivore assemblage in a semi-arid grassland. *Journal of Applied Ecology*, *55*(5), 2517–2526.
[3] Ruiz, M., & Ruiz, I. P. (1986). Ecological history of transhumance in Spain. *Biological Conservation*, *37*(1), 73–86.
[4] Oteros Rozas, E., González, J. A., Martín López, B., López, C. A., & Montes, C. (2011). Ecosystem services and social-ecological resilience in transhumance cultural landscapes: Learning from the past, looking for future. In H. Pleininger & C. Bieling (eds.), *Resilience and the Cultural Landscape: Understanding and Managing Change in Human-Shaped Environments* (pp. 185–194). Cambridge University Press.
[5] Keuskamp, J. A., Dingemans, B. J., Lehtinen, T., Sarneel, J. M., & Hefting, M. M. (2013). Tea Bag Index: A novel approach to collect uniform decomposition data across ecosystems. *Methods in Ecology and Evolution*, *4*(11), 1070–1075.
[6] Bell, C. W., Fricks, B. E., Rocca, J. D., Steinweg, J. M., McMahon, S. K., & Wallenstein, M. D. (2013). High-throughput fluorometric measurement of potential soil extracellular enzyme activities. *Journal of Visualized Experiments: JoVE*, *81*, 1–16.
[7] Bunce, R. G. H., Arenastel, I. D., Schmitz, M. F., & Pineda, F. D. (2006). A review of the role of Drove Roads (Cañadas) as ecological corridors. *Alterra-Report*, *1428*. Wageningen, The Netherlands, 2006.
[8] Manzano, P., & Malo, J. E. (2006). Extreme long-distance seed dispersal via sheep. *Frontiers in Ecology and the Environment*, *4*(5), 244–248.

Fig. 1. Poster presented at the conference.

2. XVI Congreso Nacional de la AEET. La ecología en una biosfera humanizada.

Almería, Spain
16th – 20th October 2023

Diagnosis of the ecological condition of the transhumance drove roads in the Autonomous Community of Madrid (central Spain).

Presentation and oral comunication of a Poster (Fig. 2) at the scientific session SG.05. "Landscape ecology and land use changes."

Authors: Francisco M. Azcárate, Violeta Hevia

Introduction: Drove roads are landscape corridors traditionally used for livestock movement in many regions of the world, including Spain, where they cover about 0.8% of the land. They have ecological importance due to their role in connectivity, seed dispersal, soil preservation, habitat and biodiversity conservation, and the provision of ecosystem services. Drove roads are experiencing deterioration due to the abandonment of extensive grazing and transhumance. Objectives We aim to characterize the conservation status and main predictors of deterioration of the drove roads in the Community of Madrid, a region in Spain with a high presence of these corridors.

Diagnosis of the ecological condition of the transhumance drove roads in the Autonomous Community of Madrid (central Spain).

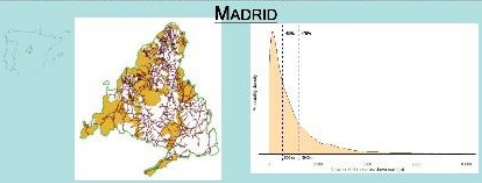
Francisco M. Azcárate[1,3], Violeta Hevia[2,3]

[1] Terrestrial Ecology Group, Department of Ecology, Universidad Autónoma de Madrid, Spain; [2]Social-ecological Systems Laboratory, Department of Ecology, Universidad Autónoma de Madrid, Spain; [3]Centro de Investigación en Biodiversidad y Cambio Global (CIBC-UAM), Universidad Autónoma de Madrid, Spain.

WELL PRESERVED DROVE ROADS ARE EXCELLENT ECOLOGICAL CORRIDORS IN MEDITERRANEAN LANDSCAPES

- Drove roads are landscape corridors traditionally used for livestock movement in many regions of the world, including Spain, where they cover about 0.8% of the land.
- They have ecological importance due to their role in connectivity, seed dispersal, soil preservation, habitat and biodiversity conservation, and the provision of many others ecosystem services.
- Drove roads are experiencing deterioration due to the abandonment of extensive grazing and transhumance practices.

THE DROVE ROAD NETWORK OF THE AUTONOMOUS COMMUNITY OF MADRID

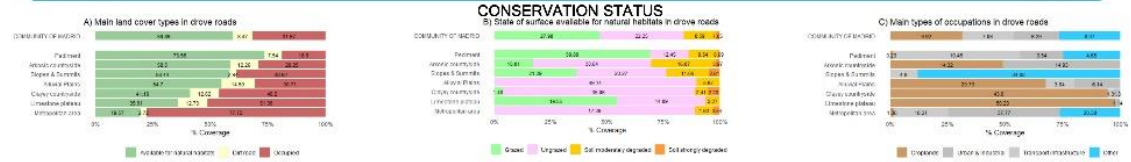


The Community of Madrid has a particularly dense and extensive network (4168 kilometers and 13,093 hectares), occupying up to 1.63% of the regional territory, the highest value for the Spanish autonomous communities as a whole. 50% of the Madrid territory is below 699 m distance from a drove road, and 75% within 1545 m (fig. on the right). In Madrid, as well as in other regions, the drove roads show great potential for connecting natural Natura 2000 sites (fig. on the left).

OUR DATA

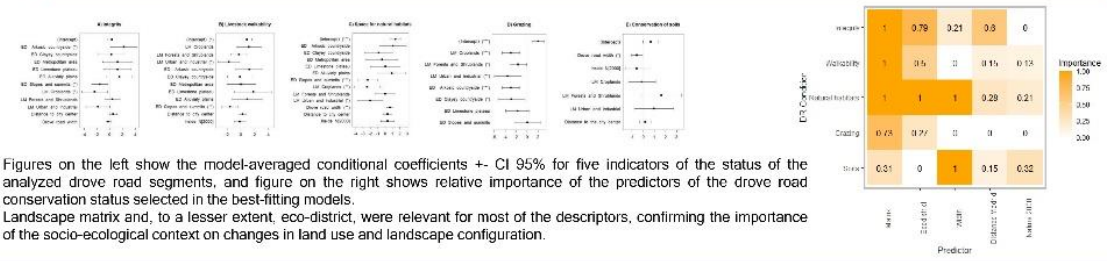
We used a sample of 160 segments of 200 m-long drove roads, distributed using a grid of 10 km x 10 km cell size (map on the left) to ensure adequate geographical representation. The segments and their environment contexts were characterized combining photo-interpretation, geographic analysis using QGIS 3.20, and field work. We used a high number of predictor variables, including the eco-district to which the livestock route segment belonged (map on the right: Purple: Slopes and summits; Green: Pediment; Yellow: Arkosic countryside; Brown: Clayey countryside; Pale brown: Limestone plateau; Blue: Alluvial plains; Grey: Metropolitan area).

MADRID DROVE ROAD NETWORK EXHIBITS HIGH LEVELS OF OCCUPANCY AND A NOTICEABLE DETERIORATION IN ITS CONSERVATION STATUS



Figures show an estimation of land cover inside the drove roads of the Community of Madrid and for each of the seven eco-districts. Approximately one third of the surface area is used for other purposes, many of which are difficult to reverse, such as transport infrastructure, urban-industrial uses. Crops occupy almost 10% of the surface area, although in this case reversibility is more feasible. Another concerning aspect is the proliferation of dirt roads of excessive width, which results in further loss of semi-natural space in already narrow corridors. Of the space available for natural habitats (59.9% of the network), slightly less than half is grazed, which is driving a clear decline in the presence in DRs of species-rich annual grasslands, highly dependent on grazing. Near 10% of the available habitat area has erosion problems, often due to misuse for recreational activities (cycling, motorcycling) and the circulation of vehicles off the main dirt road.

LANDSCAPE MATRIX IS THE MOST PREDICTIVE FACTOR FOR DROVE ROAD CONDITION



Figures on the left show the model-averaged conditional coefficients +- CI 95% for five indicators of the status of the analyzed drove road segments, and figure on the right shows relative importance of the predictors of the drove road conservation status selected in the best-fitting models.
Landscape matrix and, to a lesser extent, eco-district, were relevant for most of the descriptors, confirming the importance of the socio-ecological context on changes in land use and landscape configuration.

TOWARDS THE IMPLEMENTATION OF A RECOVERY PLAN FOR THE NETWORK FOCUSED ON ECOLOGICAL RESTORATION

A recovery plan for Madrid drove roads should prioritize environmental benefits, especially in simplified landscapes where these roads play a crucial role in habitat connectivity and biodiversity. Preservation of these routes is vital, especially in agricultural and forested areas, while urban or industrial areas pose greater challenges for restoration. The **reintroduction of livestock grazing is proposed as a key restoration tool** due to its historical relevance and positive ecological impacts. However, connectivity issues must be addressed, identifying critical sections hindering livestock movement. Additionally, declining livestock practices require alternative strategies and collaborations with local stakeholders to revive traditional management and support drove road restoration.

This work is part of the LIFE CAÑADAS project (LIFE 18 NAT/ES/000930), funded by the Life Program of the European Union.

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Fig. 2: Poster presented at the conference.

3. Jornadas del Centro de Investigacion en Biodiversidad y Cambio Global (CIBC)

Universidad Autónoma de Madrid, España
26 – 30 Octubre 2023

Cómo ubicar medidas de restauración que favorezcan la conectividad ecológica de *Psammodromus algirus* en tramos de vías pecuarias de la Comunidad de Madrid.

Presentación de un Póster (Fig. 3).

Autores: Juan Molina, Cristina Mata, Violeta Hevia, Francisco M. Azcárate, Juan E. Malo

Introducción: El mantenimiento de la conectividad ecológica de las especies es una pieza clave para frenar la actual crisis de pérdida de biodiversidad, contrarrestando así los efectos adversos de la fragmentación de hábitats y facilitando la adaptación de las especies a los cambios en sus áreas de distribución causados por el cambio climático u otros factores inductores de cambio.

Cómo ubicar medidas de restauración que favorezcan la conectividad ecológica de *Psammodromus algirus* en tramos de vías pecuarias de la Comunidad de Madrid

Juan Molina, Cristina Mata, Violeta Hevia, Francisco M. Azcárate, Juan E. Malo
Departamento de Ecología-CIBC-UAM

INTRODUCCIÓN Y OBJETIVO

El mantenimiento de la conectividad ecológica de las especies es una pieza clave para frenar la actual crisis de pérdida de biodiversidad, contrarrestando así los efectos adversos de la fragmentación de hábitats y facilitando la adaptación de las especies a los cambios en sus áreas de distribución causados por el cambio climático u otros factores inductores de cambio.

OBJETIVO: realizar una propuesta metodológica que ayude a identificar tramos en vías pecuarias en los que realizar medidas de restauración para favorecer la conectividad de una especie modelo, la lagartija colilarga (*Psammodromus algirus)*

MATERIAL Y MÉTODOS

En 25 tramos de vías pecuarias de la C. Madrid en el marco del proyecto LIFE CAÑADAS se han instalado muros de piedra seca (Figura 1) para proveer de hábitat y refugio a diferentes especies, entre ellas los reptiles.

Seguimiento de éxito de la medida mediante transectos de observación de reptiles:
Periodo: 2021-2023.
2 campañas anuales (primavera y otoño).

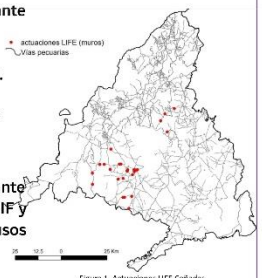

Figura 1. Actuaciones LIFE Cañadas

En paralelo, para la especie modelo se han seguido los siguientes pasos :

1. Construcción de un **modelo de idoneidad de habitat** (Figura 2) mediante MaxEnt con datos de presencia de GBIF y variables ambientales (topográficas, usos del suelo, hidrográficas y de clima).
2. Definición de **áreas fuente** para la especie (parches óptimos: 75% probabilidad de presencia) y de **superficie de resistencia** al movimiento.
3. Cálculo de corredores ecológicos (menor coste de movimiento) mediante LinkageMapper.
4. Solapamiento de red de vías pecuarias y corredores para identificar tramos prioritarios a restaurar

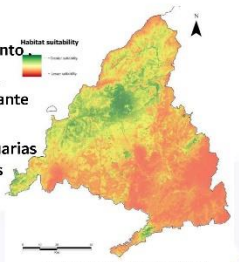

Figura 2. Modelo de idoneidad de hábitat para *Psammodromus algirus*

RESULTADOS

De los 25 tramos de estudio, el 52% de ellos se sitúan en área de potencial corredor para la especie (Figura 3).

Los resultados del seguimiento no muestran diferencias significativas (Chi^2= 0,43; p>0,05) en cuanto a presencias de lagartija colilarga entre tramos ubicados o no en corredores ecológicos para la especie.

- En los 13 tramos ubicados en corredor se han obtenido un total de 19 registros de la especie
- En los otros 12 : 8 registros.

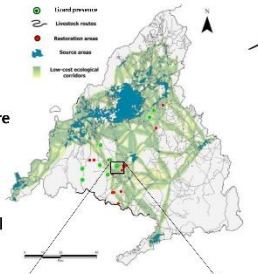

Figura 3. Mapa de corredores de menor coste de desplazamiento para *Psammodromus algirus*

Cabe esperar que la medida vaya siendo más efectiva con el paso del tiempo y probablemente, esta tendencia sea más clara y la efectividad sea mayor en aquellos tramos ubicados en corredores.

CONCLUSIONES

A pesar de los sesgos metodológicos derivados del origen de los datos (GBIF) y de la restricción a áreas políticamente delimitadas (CAM), la metodología propuesta puede ser una herramienta promisoria para orientar la selección de lugares de intervención en tramos de vías pecuarias y contribuir a reforzar su rol de infraestructura verde.

La medida de restauración utilizada se muestra muy exitosa para estos reptiles. Los resultados muestran una colonización progresiva de los muros experimentales

BIBLIOGRAFÍA

de Oliveira-Junior, N. D., Heringer, G., Bueno, M. L., Pontara, V., & Meira-Neto, J. A. A. (2020). Prioritizing landscape connectivity of a tropical forest biodiversity hotspot in global change scenario. Forest *Ecology and Management* **472**, 118247.

Phillips, S.J. , Robert P. Anderson, Robert E. Schapire. 2006. Maximum entropy modeling of species geographic distributions. *Ecological Modelling* **190**, 231-259.

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Comunidad de Madrid

Jornadas Científicas
Centro de Investigación en Biodiversidad y Cambio Global
Financiación:

Fig. 3: Póster presentado.

4. XVII Congresso Internacional de Mirmecologia

Instituto Politécnico de Beja, Portugal
26 – 30 Junio 2023

Grassland strip width of drove roads determines ant biodiversity in agrarian landscapes in central Spain.

Oral presentation.

Autores: Rocío R. Daza, Francisco M. Azcárate, Violeta Hevia.

Introduction: On-going intensification and fragmentation of European agricultural landscapes is leading to an accelerated loss of biodiversity and its associated ecological roles. Drove roads are the traditional corridors used by herders for seasonal movements of livestock between grazing grounds (transhumance). Well-preserved and delimited drove roads play an essential ecological role in the Mediterranean region acting as reservoirs of local biodiversity. This function is closely linked to the availability of the strip of grassland habitat, whose width is being threatened by recent land-use changes (i.e., abandonment of transhumance, soil erosion and invasion by neighboring land uses). The aim of this study was to evaluate the effect of grassland strip width and adjacent landscape configuration on the role of drove roads as reservoir of ant diversity within intensive agricultural landscapes in central Spain. We used pitfall traps to sample ants assemblages in 20 sections of drove roads that represented a gradient in grassland strip width. Ant assemblages were described by their taxonomic (species richness, species composition and nestedness pattern) and functional diversity (FD). Our results showed that grassland strip width, and not the configuration of the adjacent matrix, determined the role of drove roads as reservoirs of taxonomic and functional diversity of ant. Thus, narrower drove roads harbored lower species richness and had ant assemblages composed by a subset of the species found in the wider, species-rich drove roads. Functional Richness (FRic) was also higher on wider drove roads, suggesting an enhanced functional diversity due to increased availability of natural habitat. Our study draw attention to the role of drove roads as ecologically unique systems and highlights the need to preserve their natural width, particularly within intensive agrarian landscapes.

Fig. 4: Cover of the oral presentation.

5. Publicaciones científicas

Landscape correlates of sand racer species (Lacertidae; Psammodromus) segregation in their contact area along the Conquense Drove Road (Cuenca, Iberian Peninsula)

Scientific journal: Basic and Applied Herpetology

Authors: Juan E. Malo, Antonio Martín-Higuera, Cristina Mata, Francisco M. Azcárate

Sumary: The Edwards's sand racer (Psammodromus edwarsianus) was recognised as distinct from the Spanish sand racer (P. hispanicus) a decade ago, but both their distributions and interspecific range limits are poorly defined. Results of sampling both species along 70km of the Conquense Drove Road (Central Spain) indicate a clear North/South segregation, with P. edwarsianus inhabiting the area North of Las Pedroñeras and P. hispanicus the South. The segregation corresponds with lithological and vegetation differences, hard calcareous substrates in the North and softer sandy sedimentary material in the South. The latter is associated with more intensive agricultural land-use in contrast to the persistence of copses and scrub on the calcareous terrain. The results provide new data on the regional distribution of both species. They also highlight the potential value of this species-pair as a model for study of interactions and habitat segregation in lacertids.

Diagnosis of the ecological condition of the drove road network in the Autonomous Community of Madrid (central Spain)

Scientific journal: Landsc Ecol

Authors: Francisco M. Azcárate, Violeta Hevia

Abstract: *Context:* Drove roads are landscape corridors traditionally used for livestock movement in many regions of the world, including Spain, where they cover about 0.8% of the land. They have ecological importance due to their role in connectivity, seed dispersal, soil preservation, habitat and biodiversity conservation, and the provision of ecosystem services. Drove roads are experiencing deterioration due to the abandonment of extensive grazing and transhumance. Objectives We aim to characterize the conservation status and main predictors of deterioration of the drove roads in the Community of Madrid, a region in Spain with a high presence of these corridors.

Methods: We considered all the network of the region, with the main analyses based on a sample of 160 segments of 200 m-long, which were evaluated using GIS and fieldwork.

Results Nearly one third of the network surface is occupied by crops, communication infrastructure, and urban or industrial surfaces. Natural habitats make up 60% of the network and are afected by soil degradation and grazing abandonment. Landscape matrix was the main predictor of drove road status, with urban and cropland matrices leading to a reduction in spatial integrity and availability for natural habitats. Grazing was most preserved in grassland matrices. Eco-district, drove road width, and distance to city center also had infuence on conservation status.

Conclusions Despite their concerning state, the network is restorable in many areas of the region. Restoration should focus on intensifed and simplifed landscapes, where the network plays a more decisive role, and should consider the reintroduction of livestock.