

LIFE SAFE-CROSSING

ACTION A5. DESCRIPTION OF TARGET ROAD SEGMENTS, IDENTIFICATION OF CROSSING POINTS USED BY ANIMALS AND ANALYSIS OF TRAFFIC VOLUME AN SPEED

ACTION REPORT/2020- ANDALUCÍA

AUTHORS: Fco. Javier Salcedo Ortíz, Matias de Las Heras Carmona, Marcos López Parra



INDEX

1. INTRODUCTION	3
2. PROJECT AREA	3
3. METHODS	5
4. RESULTS	6
5. FINAL CONSIDERATIONS	17

1. INTRODUCTION

The main goal of the action was to identify the sites for the installation of the prevention devices foreseen in Action C1.

In order to reach this goal the following activities were carried out:

- Characterization of the selected road segments;
- Monitoring the road wildlife mortality;
- Identification of the crossing points used by animals;
- Monitoring the traffic volume.

Inside the project area the selection of the road segments to be monitored was based on the already available data on iberian lynx road mortality, and in relation to the analysis carried out in Action A3 (identification of AVC clusters).

The action started in March 2019 and lasted until September 2020.

2. PROJECT AREA

In the project area 7 road segments were selected to be monitored in the frame of Action A5. Of these 7 road segments 5 were located in Sierra Morena and 2 in Donana-Aljarafe.

In Donana-Aljarafe the 2 selected road segments have a total length of 21,4 Km, (14,1 Km A-481, and 7,3 SE-MA-01, Figure 1), while in Sierra Morena the 5 road segments have a total length of 71 Km (25 Km A 421, 20 Km A-3001, 10Km CO-3001, 11 Km CO-3102; 11 Km CO3103; 5 Km CO-3105, Figure 2).

Respect to what was foreseen in the project proposal we decided to extend the monitoring program. In the proposal we foresaw to monitor 13 Km of roads (4 Km on A-481; 10 Km on A-3001 and 2 Km on A-421), therefore the actual monitoring program is more than 4 times bigger than the original one. This increase allowed to have a more precise and accurate estimate of the impact of vehicular traffic on iberian lynx conservation and to monitor the most critical roads in relation to the recolonization of the species in Sierra Morena.

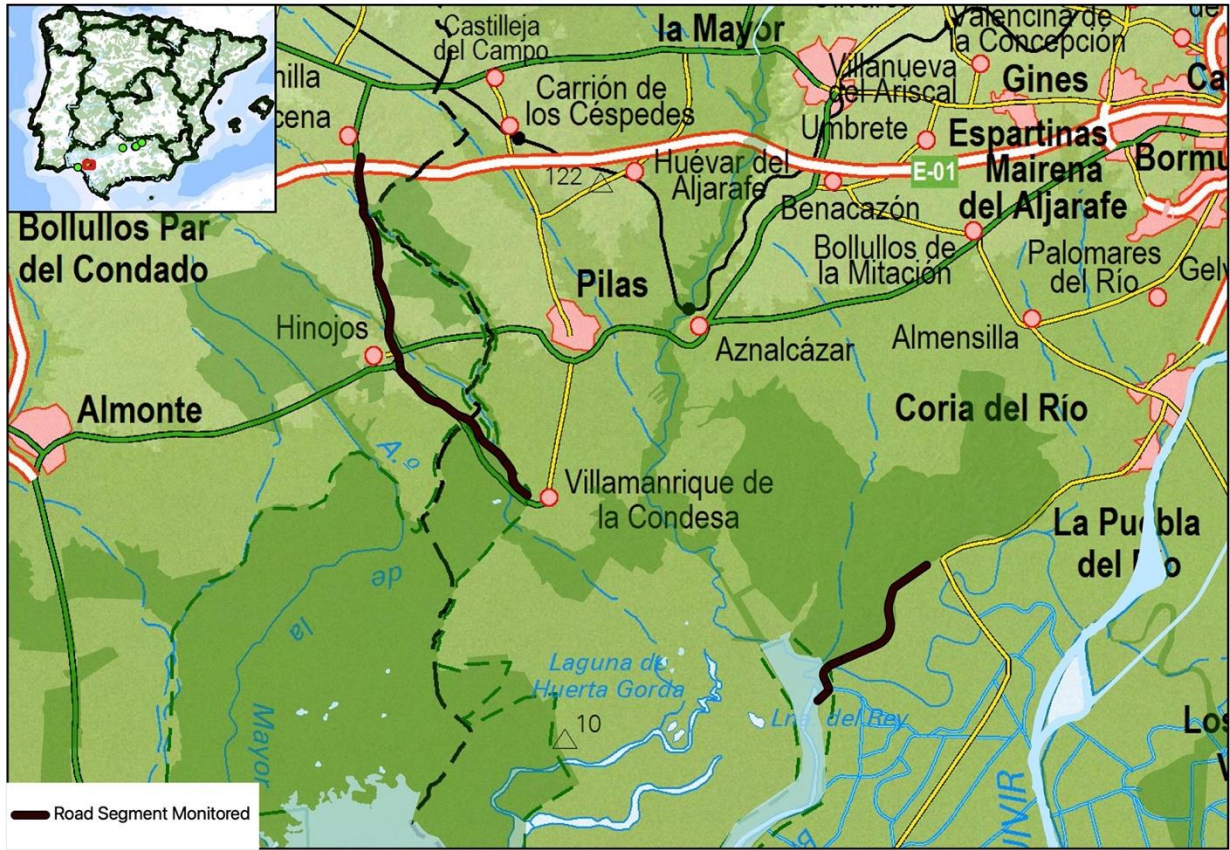


Figure 1: Doñana road segment monitored on A5 action.

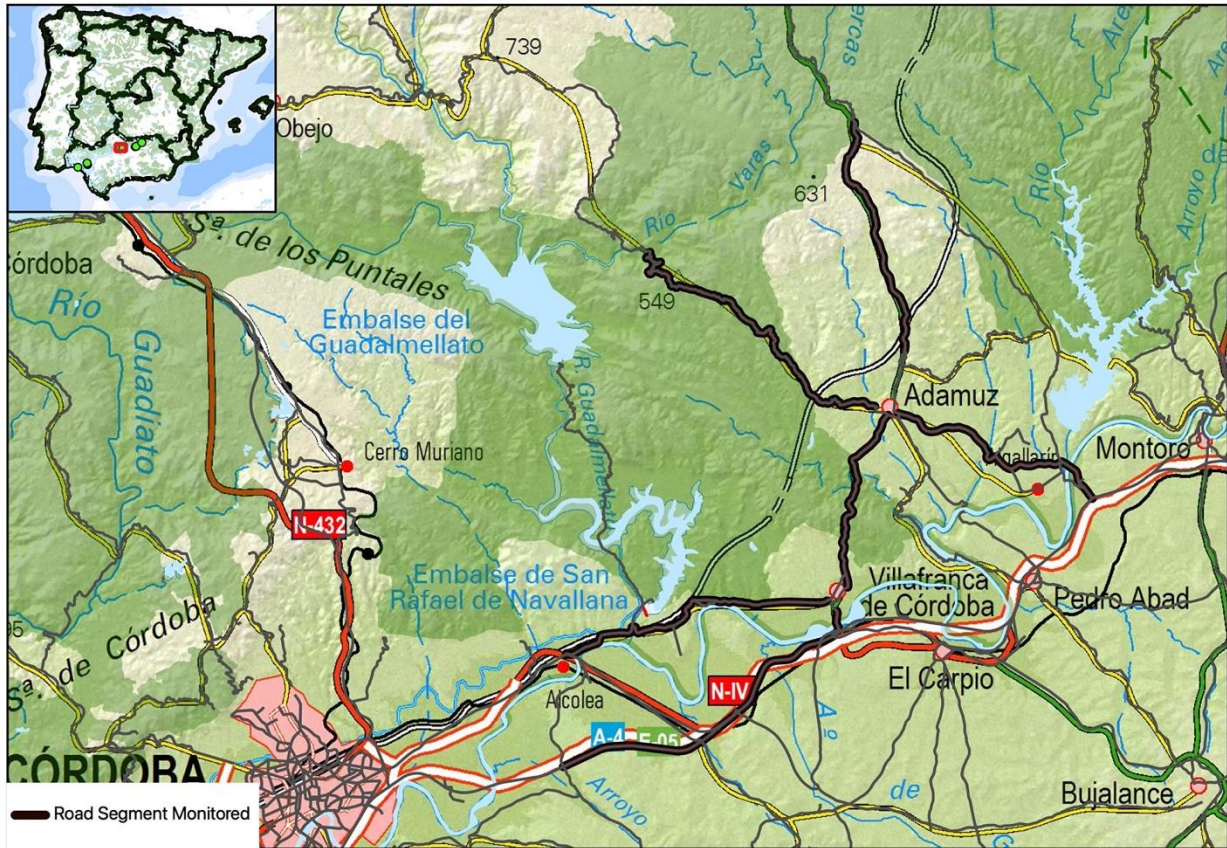


Figure 2: Sierra Morena road segment monitored on A5 action.

3. METHODS

Characterization of the crossing structures

The characterization of the selected road segments was carried out in order to define the main variables of the road to be monitored (number of lanes, speed limit) and the presence of barriers to the movement of the target species.

Monitoring the road wildlife mortality

The selected road segments were travelled on a monthly basis in order to register the animal found dead. We followed the common protocol developed in the frame of the project and all the data were stored in a specific database. To this systematic sampling we added an opportunistic one, this means that we collected the data also outside the planned monitoring sessions, mainly the ones iberian lynx.

Identification of the crossing points used by animals

In order to identify the crossing points used by animals in the selected road segments it was foreseen to install camera traps to detect the frequency of animal passages. Due to some administrative problems the camera traps were purchased only in August 2020, therefore in the previous months we recorded the paths used by the iberian lynx on the basis of tracks detection.

Monitoring the traffic volume

Traffic volume data was foreseen to be collected through the installation of a specific device to measure. Unfortunately we were able to purchase the device in the summer 2020, therefore we made only 1 monitoring session in September 2020.

4. RESULTS

Characterization of the selected road segments

The seven road segments have been characterized through specific field surveys and GIS analysis from April to May 2019. In table 1 we summarized the main characteristics of the monitored road segments. All the road segments have two lanes while the speed limit is between 60-80 Km/h except in SE-MA-01 where is 50 Km/h.

The selected road segments are under the responsibility of the Provinces while for the A-481 the management authority is the Government of the Junta de Andalucía.

Road code	Long. (Km)	Project area	Road type	Nº lanes	Speed limit
A-481	14,1	Doñana-Aljarafe	Autonómica	2	60/80
SE-MA-01	7,3	Doñana-Aljarafe	Provincial	2	50
A-421	25	Sierra Morena	Autonómica	2	60/80
A-3001	20	Sierra Morena	Autonómica	2	60/80
CO-3102	10	Sierra Morena	Provincial	2	60/80
CO-3103	11	Sierra Morena	Provincial	2	60/80
CO-3105	5	Sierra Morena	Provincial	2	60/80

Table 1. Road segments monitored in the area of Donana- Aljarafe, and in the area of Sierra Morena.

A detailed description of the selected road segments, specifically the presence of barriers to animal movements, has been limited to the hotspots resulted from the analysis carried out in Action A3.

In the frame of A3 action 120 lynx road-kills registered between 2008-2018 in Donana-Aljarafe and Sierra Morena have been analyzed in order to identify hotspots of animal-vehicle collisions. (AVC clusters).

The analysis showed the existence of 8 clusters. 3 AVC clusters are included in the seven monitored road segments: 2 in A-481 (Donana-Aljarafe), and 1 in A-421 (Sierra Morena). Two of these three AVC clusters (one in A-481, and one in A-421) are high sureness significance clusters. The rest of the AVC clusters identified are located: 1 in Doñana-Aljarafe along the N-442, and 4 in Sierra Morena (3 on the A4 motorway and 1 on the A-301).

From December 2019 to February 2020 we made specific field surveys to evaluate the presence of barriers to animal movement and habitat types along the AVC clusters identified.

The result of these specific field surveys was summarized in table 2.

Road	Road	Length (m)	N.lanes	Speed	Barriers (Right)	Barriers (Left)	Habitat	Habitat Left
------	------	------------	---------	-------	------------------	-----------------	---------	--------------

code	Type			Limit (Km/h)			Right	
A-421	Autonomica	143	2	60	Slope/Fence	Slope	Olive-Trees	Olive-Trees
A-4 Tramo 1	Highway	137	4	120	Fence	Fence	Scrubland & Olive-Trees	Scrubland & Olive-Trees
A-4 Tramo 2	Highway	223	4	120	Fence	Fence	Olive trees	Tejido urbano
A-4 Tramo 3	Highway	164	4	120	Fence	Fence	Olive trees	Olive trees
A-301	Provincial	127	2	60	Slope/Fence	Fence	Dehesa	Dehesa
A-481 Tramo 3	Autonomica	173	2	60	Fence	Nothing	Company in Biomasa	Pines
A-481 Tramo 4	Autonomica	215	2	60	Fence/Guard-rail	Fence/Rail-Guard	Fruit trees/Olive trees	Pines
N-442	Provincial	206	2	80	Guard-Rail	Guard-Rail	Pines	Pines

Table 2. Characteristics of the AVC clusters identified in the frame of Action A3.

Monitoring wildlife mortality

Starting from May 2019 until September 2020 we made a total 55 monitoring sessions, with a maximum of 14 sessions for the A-481 and a minimum of 5 sessions for the A-3001. The monitoring activity was interrupted during the months of March, April and May 2020 due to confinement caused by Covid 19. Overall we travelled 739.4 Km

In table 3 the total sampling effort realized is summarized.

Road code	Length(Km)	N, monitoring sessions	Km travelled
A-481	14,1	14	219,9
SE-MA-01	7,3	8	58,3
A-421	25	8	200
A-3001	20	5	100
CO-3102	10	8	80
CO-3103	11	6	66
CO-3105	5	6	30

Table 3. Number of wildlife mortality monitoring sessions between May 2019 and September 2020

A total of 32 dead animals were found dead belonging from 10 different species, 28,1% of the animals were domestic ones while the 71,9 % were wild animals.

Road code	Species	Nº of individuals	Project area
CO-3102	Canis familiaris	2	Sierra Morena
A-421	Canis familiaris	1	Sierra Morena
A-481	Canis familiaris	1	Doñana-Aljarafe
CO-3102	Felis silvestris catus	1	Sierra Morena
A-421	Felis silvestris catus	1	Sierra Morena
A-481	Felis silvestris catus	2	Doñana-Aljarafe
A-481	Galerida cristata	1	Doñana-Aljarafe
SE-MA-01	Gallus gallus	1	Doñana-Aljarafe
A-481	Herpetes ichneumon	1	Doñana-Aljarafe
A-481	Lynx pardinus*	1	Doñana-Aljarafe
CO-3103	Lynx pardinus*	1	Sierra Morena
SE-MA-01	Lynx pardinus*	1	Doñana-Aljarafe
A-421	Oryctolagus cuniculus	1	Sierra Morena
A-481	Oryctolagus cuniculus	6	Doñana-Aljarafe
A-481	Passeriformes sp.	4	Doñana-Aljarafe
A-481	Rattus rattus	1	Doñana-Aljarafe
A-481	Strix aluco	6	Doñana-Aljarafe

Table 4. Number and species of animals found dead during monitoring sessions .

* The 3 Iberian lynxes represented in table 4 were not detected during the monitoring sessions, but as they are specimens of the target species in Andalusia, it was considered relevant to include data on lynxes run over on the monitored roads within the time frame of the LIFE SAFE CROSSING project

The monthly distribution of the animals found dead showed that the majority of carcasses was found in July 2020 (8 carcasses on road A-481, most of them was wild rabbits (table 5)

Road code	Month/Year	Nº of carcasses
A-481	05/2019	2
A-421	06/2019	1
A-481	07/2019	3
CO-3102	07/2019	1
A-481	08/2019	3
CO-3103	08/2019	1

SE-MA-01	09/2019	1
A-481	09/2019	3
A-421	09/2019	2
SE-MA-01	12/2019	1
CO-3102	02/2020	1
A-481	06/2020	1
A-481	07/2020	8
CO-3102	07/2020	1
A-481	09/2020	1
A-481	10/2020	2

Table 5. Monthly distribution of the carcasses found during monitoring sessions and the 3 Iberian lynx detected out of monitoring sessions.

The 68,7% of animals were found on the A-481, 9,4% on the A-421, 9,4% on the CO-3102, 6,2% on the SE-MA-01 and the remaining 3,1% on the CO-3103 (fig. 3, and fig.4).

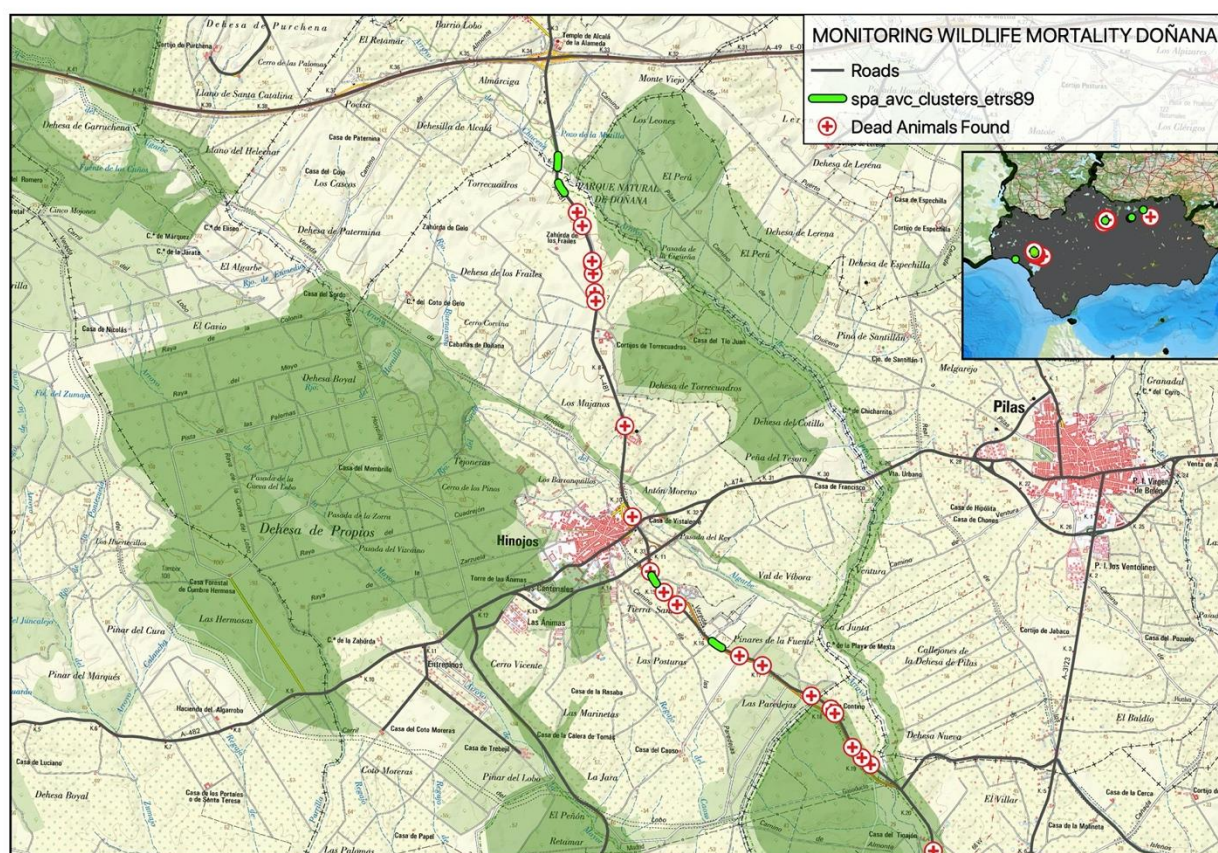


Figure 3. Distribution of the carcasses (n = 22) found in the A-481 during the monitoring sessions

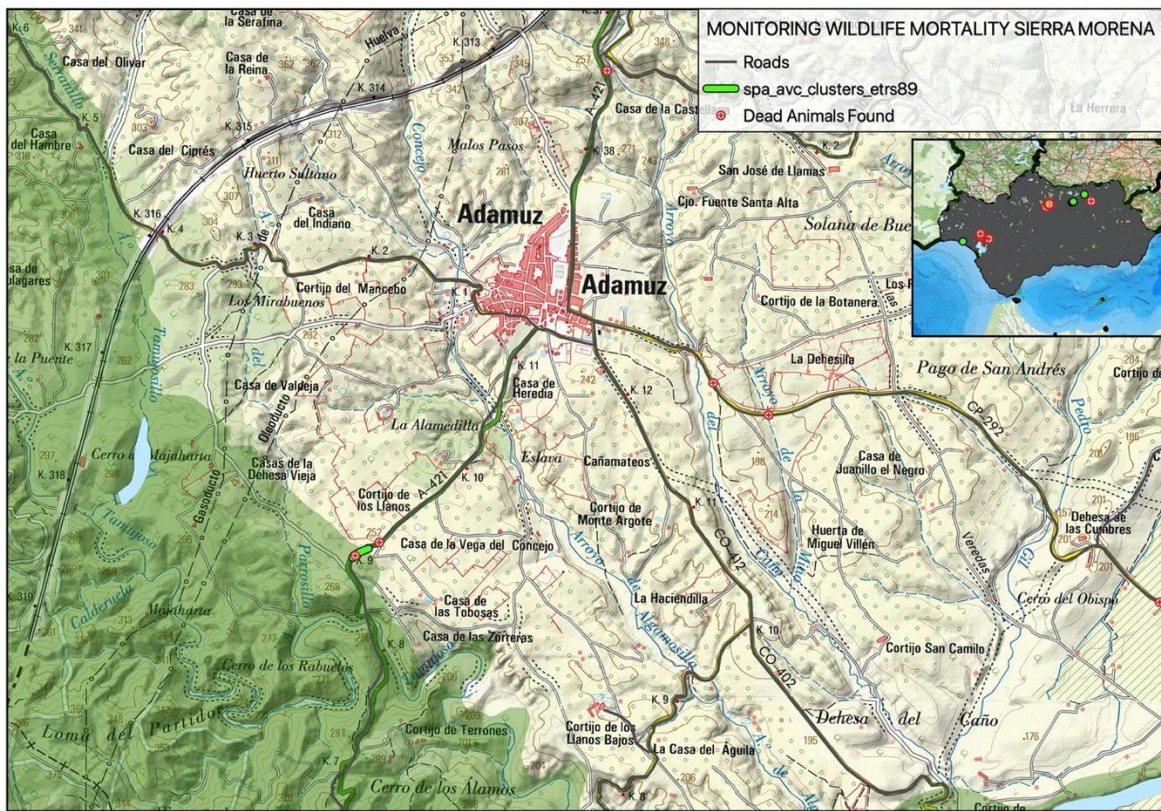


Figure 4. Distribution of the carcasses (n = 3) found in A-421, (n=3) found in CO-3102, (n=1) found in CO-3103.

Along the A-481 the distribution of carcasses, even if widespread in the 14.1 Km monitored showed some concentration around 1 of the resulted clusters. It's obvious that we couldn't expect a complete overlap because the data analyzed in Action A3 were only related to lynx road-kills while the data gathered in A5 are related to different wildlife species, but it's important to underline how the same paths to cross the road can be used by different animals. As we can see later all these data helped us to select the potential site where to install the AVC PS. The same can be seen on the A-421, where 66% of the bodies detected were in one of the clusters resulting from the analysis carried out in action A3.

Lynx road-kills

In Andalusia a total of 67 lynx were found dead on the road since the start of LIFE SAFE CROSSING project, from 21 November 2018 to 14 September 2020 (Figures 5, 6, 7 and 8). Only 3 of the 67 road-kills detected, have occurred inside the 7 monitored road segments. These segments have been selected because on these roads various defragmentation and adaptation of wildlife passages have already been carried out in previous projects. Despite these interventions, several lynx road kills still occurred in these road segments. In addition, the selected areas have a key importance for the lynx conservation, because they host the breeding grounds of the species, and therefore the loss of these reproductive specimens can mean not only the loss of these individuals, but also the loss of the litter of that year and future years, therefore the selected areas are of primary importance for the recolonization of the rest of the country.

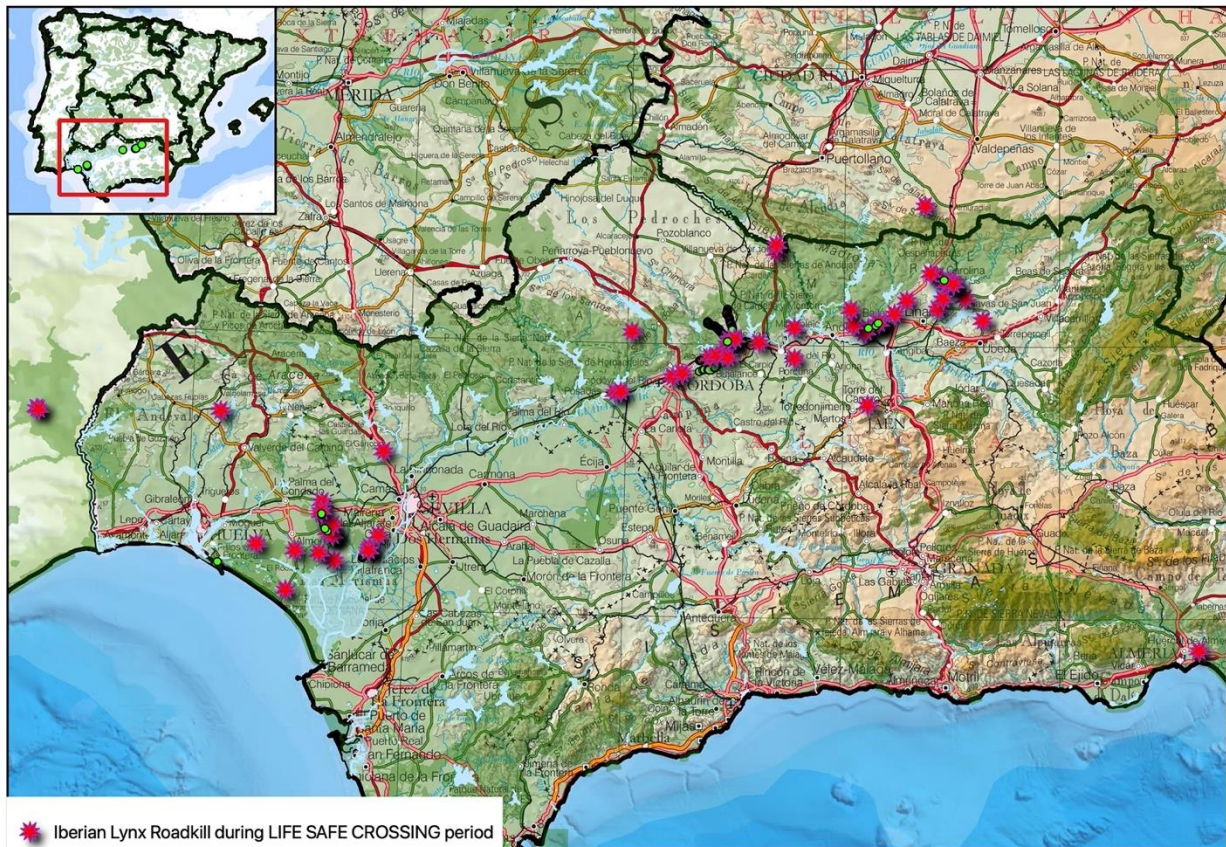


Figure 5. Lynx road-kills (n = 67) between September 2018 and September 2020

Only two roadkills took place in one of the AVC clusters identified in Action A3. The first took place in December 2018 in segment A4_T3, and the other took place in February 2020 in segment A-481_T1, between the municipalities of Chucena and Hinojos. In addition, two other lynx road-kills took place within 100 metres of the segment boundaries proposed by the results of the A3 action analysis, one in February 2019 in segment A4_T1 and the other in March 2020 in segment A-481_T4.

The observed widespread distribution of lynx road kills can be related to different factors. First of all the population is expanding therefore there are dispersing individuals throughout the Region of Andalusia, and lynx road-kills can happen along different and new roads. Moreover the analysis of the AVC clusters was based on data collected in the last 10 years, and during these years some interventions were carried out in order to mitigate the risk of collision. Another important factor is that the main prey of the Iberian lynx is the wild rabbit

It is very common for the wild rabbit to build its burrows in the ditches of some roads, and it is relatively common for some lynx to use these sections of roads as hunting grounds. This behaviour leads to an important increase in the probability for the lynx to be killed along the road, making it extremely complex to define the most dangerous roads, because there are strong fluctuations in the rabbit population. Taking this factor into account, the technical staff of the CAGPyDS and AMAYa partners decided to estimate the abundance of the wild rabbit along the A-481, one of the roads with the highest number of dead lynxes. To find out the density of rabbits present in the road environment, which is considered to be a possible attraction for lynxes to the road, with the risk that this entails, samples have been taken to find out the kilometric index of rabbit abundance. A segment of 5.8 to 6.1 km of the A-481 road was sampled. This

segment is included within the 14.1 km of the A-481 which has been monitored as part of the LIFE SAFE CROSSING. These surveys have been made by vehicle, starting between 20 and 30 minutes before sunrise (the time of greatest activity for the rabbits). This journey was made a total of 11 times between May 2019 and September 2020, with a total effort of 67 km, of which 305 were recorded. The highest value observed was 12.59 rabbits/kilometre (73 rabbits seen in 5.8 km). The highest values observed correspond to the months of July 2019 and July 2020.

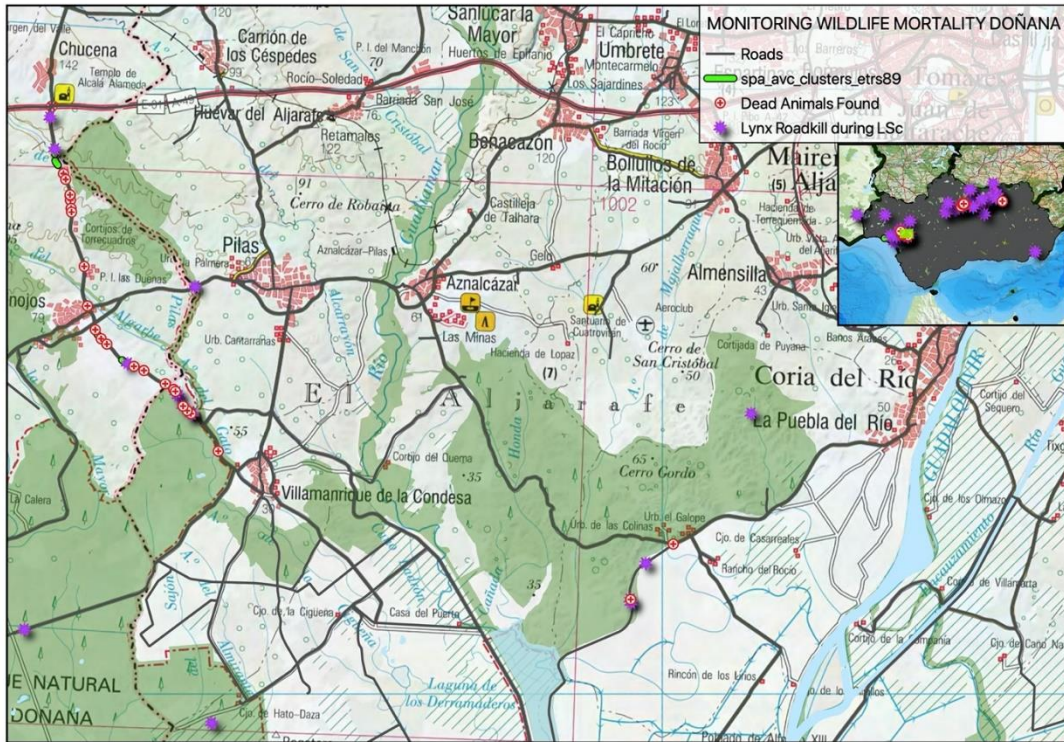


Figure 6. Distribution of lynx roadkills in Doñana area since the beginning of the LIFE SAFE CROSSING project. The carcasses of other species found during the monitoring sessions on the A-481 and SE-MA-01 roads are also represented.

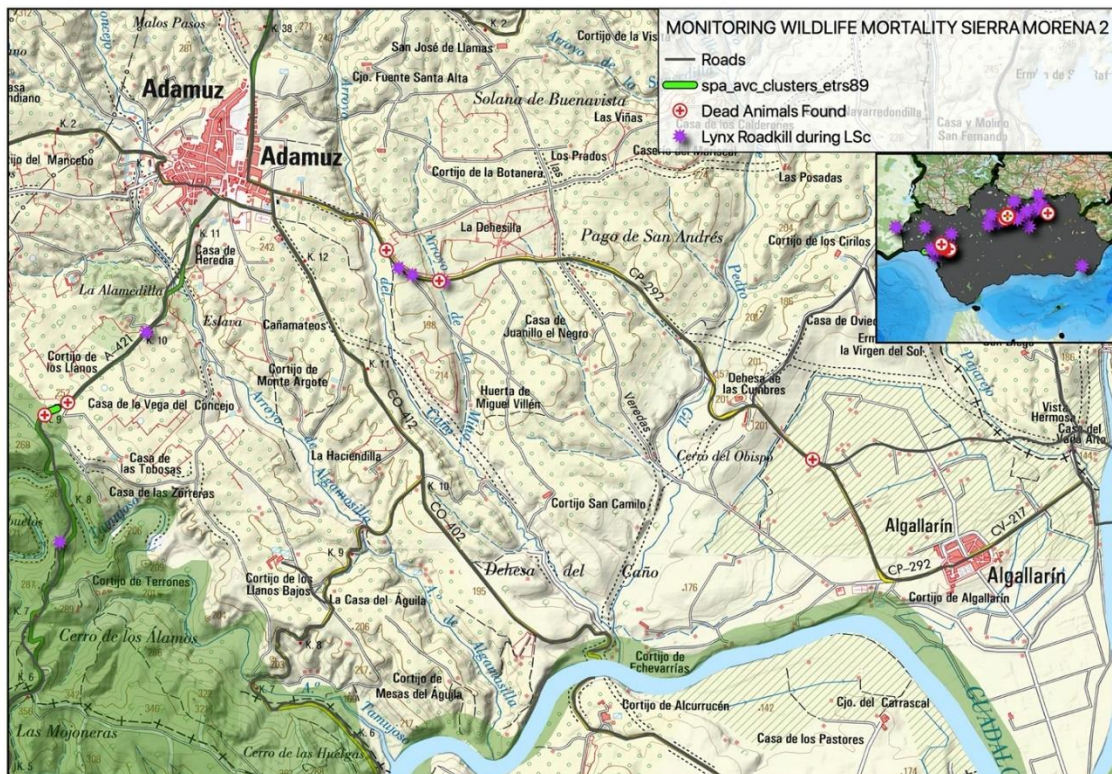


Figure 7. Distribution of lynx roadkills in Sierra Morena since the beginning of the LIFE SAFE CROSSING project. The carcasses of other species found during the monitoring sessions on the A-421 and CO-3102 roads are also represented.

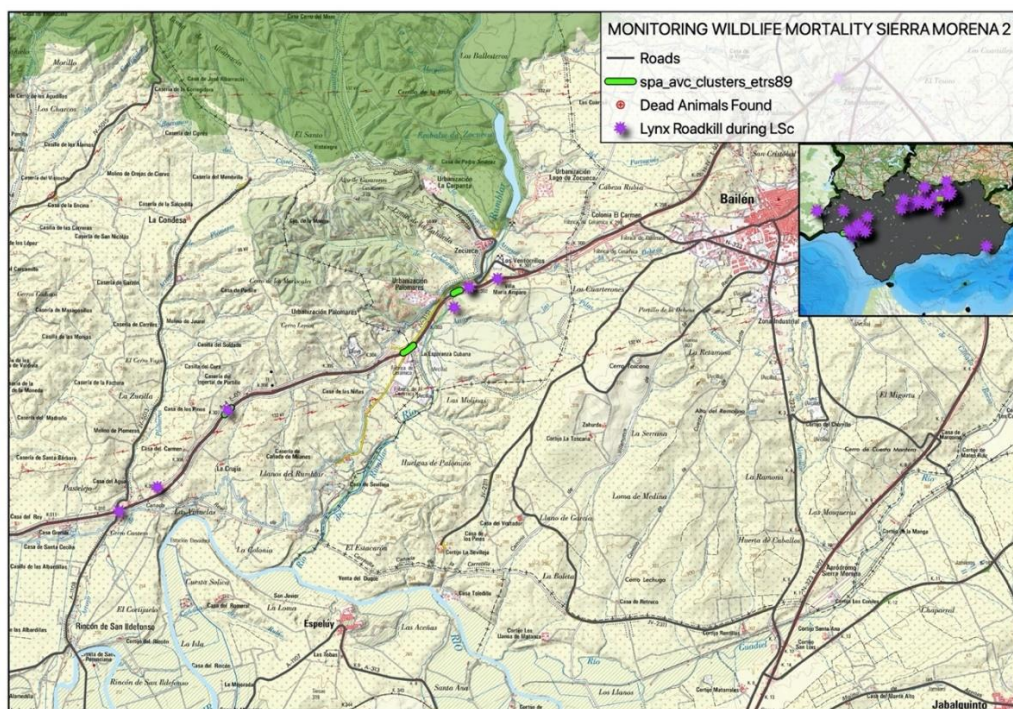


Figure 8. Distribution of lynx roadkills on highway A-4 in Sierra Morena since the beginning of the LIFE SAFE CROSSING project.

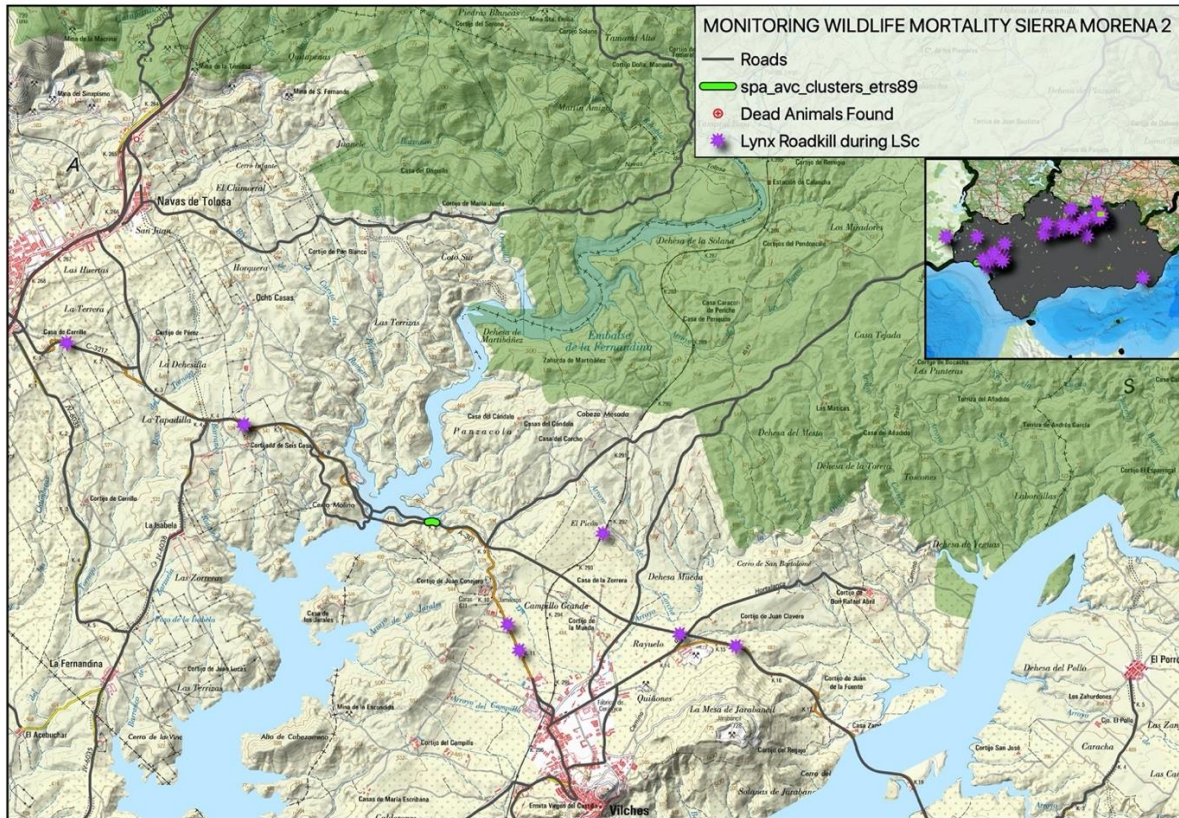


Figure 9. Distribution of lynx roadkills on A-301 road in Sierra Morena since the beginning of the LIFE SAFE CROSSING project.

Monitoring of wildlife crossings.

As we said before a series of changes in the Andalusian public administration (change of government) and some changes in the people responsible for the Iberian Lynx region, have led to a series of delays in the acquisition of the project materials needed to carry out the monitoring activities. For these reasons camera traps could not be acquired until September 2020. In order to overcome this problem, the identification of road crossing points used by animals was carried out recording the tracks on the ground. On the 16th September 2020 the first photo-trapping session on the road A-481 (Doñana) began (fig. 10). In this first session, 4 cameras have been installed and during 7 days a total of 15 crossing events have been registered, among them an Iberian lynx passage was detected on the 19th of September 2020. In addition to the lynx, photos were taken of dogs, badgers, rabbits, mongoose and wild boars. In the next months camera traps will be installed in the other selected road segments.

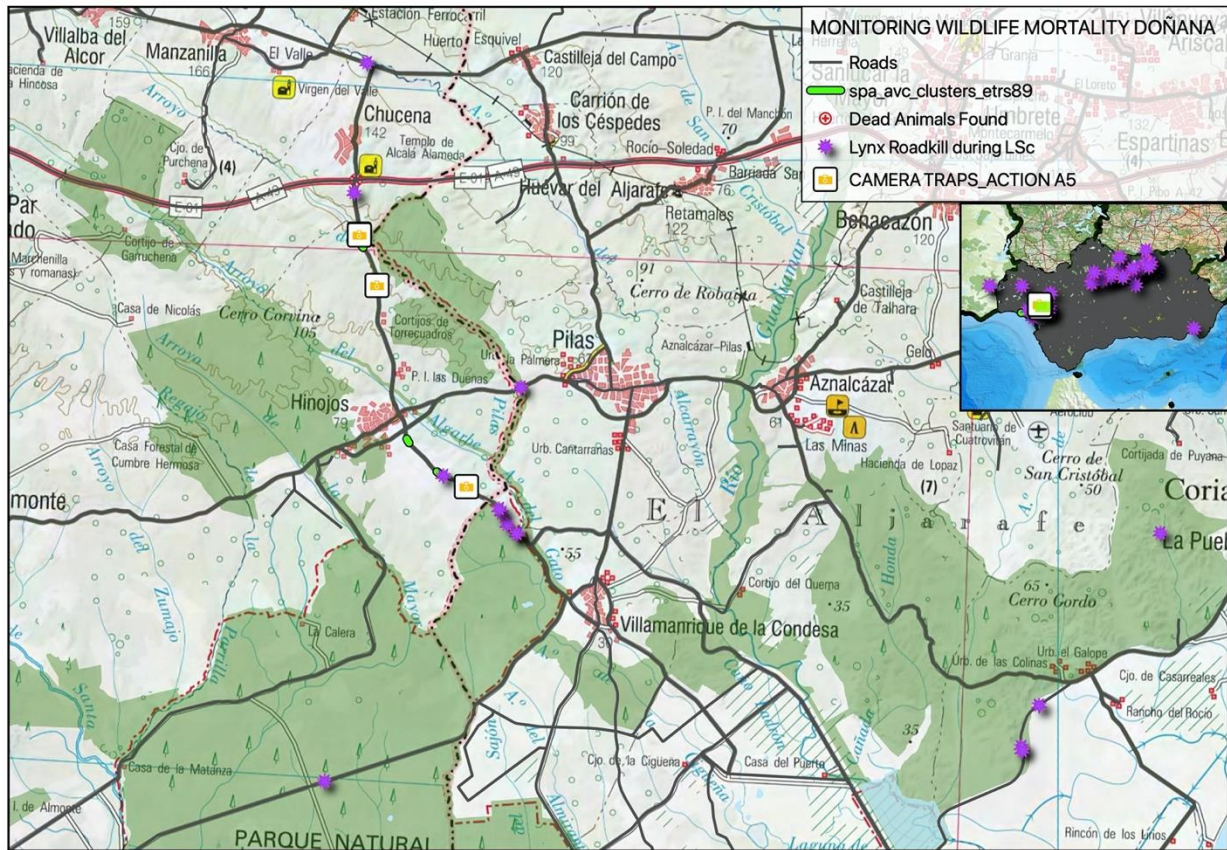


Figure 10. Sites of installations of 4 camera traps in A-481 road in Doñana.

Monitoring of traffic volume in the area.

The device needed to monitor traffic volume, due to the already mentioned problems was installed only in September 2020. The first monitoring session was carried out in the A-481 road segment (fig. 11). The session started on 16th September 2020 and lasted until 23th September 2020. The mean number vehicles/day was 1137 the maximum speed detected was 174 km/h, while the maximum allowed on that stretch is 60 km/h, and 85% of the vehicles exceeded the speed limit allowed.

The sessions to monitor traffic volume will continue in the next months in the other road segments. In any case the available data indicated that all the road segments has a mean number of vehicles per day below the threshold of 5000 vehicles per day..

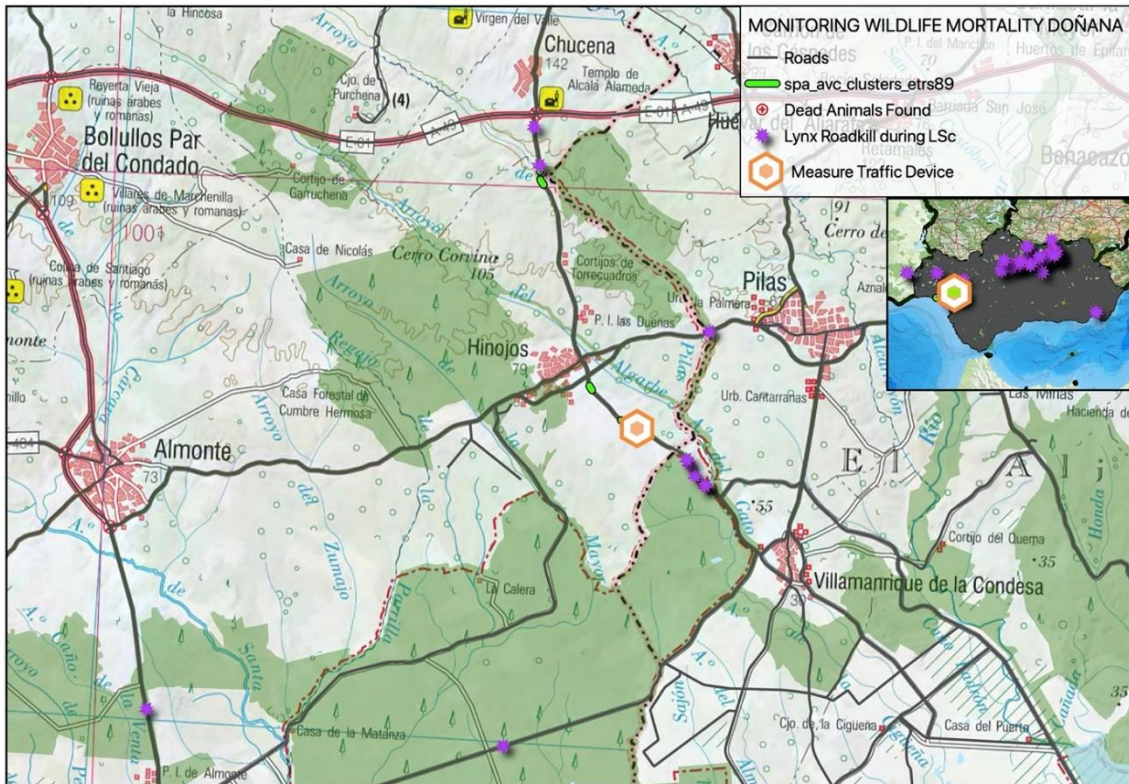


Figure 11. Site of installation of the device to measure traffic volume in A-481.

5. FINAL CONSIDERATIONS

On the basis of the data collected we finally selected 6 potential sites for the installation of the 5 AVC PS foreseen in Action C1 (fig. 12).

The selection has been made considering the wildlife mortality monitoring sessions, the AVC clusters came out from Action A3, as well as the experience of the technical staff. Last but not least we also evaluated the landscape features in relation to the functioning of this new prevention devices.

3 sites were selected in Donana in the A-481 (2 of them inside the AVC Clusters) the other 3 in Sierra Morena: 1 in A-421 (inside the AVC cluster) 1 in A-301, and 1 in A-3000.

The points proposed on the A-301 and A-3000 roads are located on road sections that have not been monitored in Action A5. The reason to include these points is related to the recorded distribution of lynx roadkills in the last year, despite the different mitigation measures applied in previous projects. For this reason it could be very important to install the innovative AVC PS, foreseen in the present project to try to reduce iberian lynx road mortality on these road sections where other types of measures have failed to reach this objective.

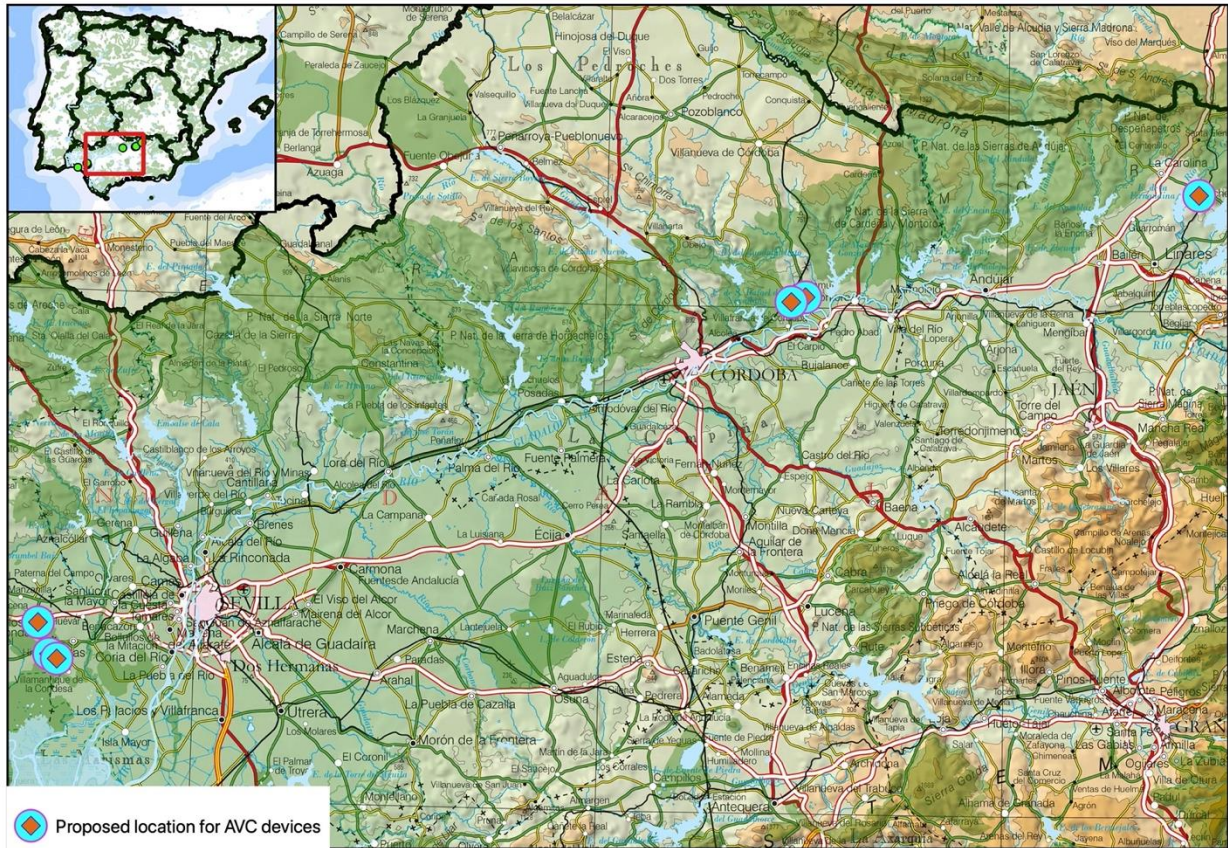


Figure 12. Potential sites selected for the installation of the 5 AVC PS in the project area.

The major problem encountered in the action implementation was related to the delay in the purchase of the camera traps, and the device to monitor traffic volume, but, as was explained in the report, this delay didn't affect in a significant way the monitoring activities, because we found alternative solutions, and we will be able to complete data acquisition in the following months of the project.