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Preserving the Values of Mediterranean Enclosed Fields with Dry Stone Walls, an Example of Vulnerable Natural and Rural Heritage

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Abstract: In the continental Mediterranean mountains of the Iberian Peninsula is located a landscape characterized by the presence of enclosed land parcels delimited by dry stone walls or vegetation, or by both these elements. This landscape has been included, since 2018, in UNESCO's Representative List of Intangible Cultural Heritage of Humanity under the name of Art of dry stone walling, knowledge and techniques. However, today's territorial dynamics jeopardize the maintenance of this landscape heritage. This work set out to understand their origins, dynamics, and evolution from the 11th century (Middle Ages) to the present using historical documentation from different sources and diachronic cartography from aerial photographs. The fieldwork was designed to identify natural, cultural features and recent dynamics, in particular those related to urbanization changes of the last 70 years. Finally, we delved into the new dynamics of exploitation that were based on extensification and a loss of productive diversity. The results obtained lead us to consider that the loss of this agro-landscape must be prevented, with a reasonable livestock grazing criteria and a rational management of its heritage features. This requires regional, national, and European policies that recognize the enclosed landscape as a heritage ecosystem in which biodiversity and agriculture are closely linked.

Keywords: rural landscape; Spain; Mediterranean hedgerows; biodiversity; agri-environmental schemes; environmental history

Citation: López-Estébanez, N.; Molina-Holgado, P.; Allende Álvarez, F. Preserving the Values of Mediterranean Enclosed Fields with Dry Stone Walls, an Example of Vulnerable Natural and Rural Heritage. *Heritage* **2024**, *7*, 844–872. https://doi.org/10.3390/heritage7020041

Academic Editor: Arlen F. Chase

Received: 15 November 2023
Revised: 30 December 2023
Accepted: 6 February 2024
Published: 10 February 2024

1. Introduction

1.1. Mediterranean Enclosed Fields: A Singular European Landscape

The Mediterranean mountains are home to one of the most endangered silvo-pastoral agrosystems in Europe: enclosed fields. These heritage landscapes are disappearing due to new economic trends, which will have serious consequences in terms the conservation of the associated biodiversity and resources. A territorial vision of landscape heritage in countries with an extended history is necessary to address issues related to sustainability, planning, the conservation of natural resources, and its agrarian functionality [1].

The traditional enclosed landscapes of Mediterranean Europe contain elements that are at serious risk of extinction. Among the most threatened of these landscapes are hay meadows, grazing meadows, and woodland pastures [2]. All these grasslands have been fundamental in rural economies, not least because they have considerable environmental value and they are productive, constituting a basic element of the European agricultural heritage. These areas are normally wooded spaces that have a well-developed herbaceous stratum, and where domestic or wild animal grazing is combined with mowing, fruit harvesting, leaf litter raking, etc. [2,3]. They are common throughout Europe and their management, past and present, provides key insights into the heterogeneity of species and the distribution, density, and size of the trees [4,5]. Silvo-pastoral systems has many

functionalities (cultural, social, economic, food security, and environmental) that are constantly changing, which are a problem for the recognition of their heritage value (despite the appropriate processes of patrimonialization).

The conservation and productivity of silvo-pastoral systems are directly related to the enclosed field landscapes that, sometimes, are listed as high nature value farmlands [6]. Among the value of these landscapes is their contribution to the conservation of biodiversity, to climate regulation, and to run-off control [7–10]. In addition, they have a social function related to local and regional identities, heritage, and tourism [11], which has led these systems to be included in UNESCO's Representative List of Intangible Cultural Heritage of Humanity as the "Art of dry stone walling, knowledge and techniques" (2018, 13.COM) [12].

These landscapes were included in UNESCO's List because they have been "transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, and provides them with a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity. For the purposes of this Convention, consideration will be given solely to such intangible cultural heritage as is compatible with existing international human rights instruments, as well as with the requirements of mutual respect among communities, groups and individuals, and of sustainable development." (Convention for the Safeguarding of the Intangible Cultural Heritage: Article 2) [13]. In this declaration, two criteria were considered: (a) A dry stone building is a living tradition, which has become increasingly well-developed for the sake of the sustainable management of cultural heritage, agricultural land, human dwellings, and their environment; (b) the art of dry stone merges a widespread technique with respect for local conditions and the exclusive use of local building materials. The preservation of Mediterranean enclosed fields is linked to the art and tradition of construction, but these landscapes have a multitude of tangible and intangible attributes that act as vectors of heritage [14]. This landscape is a living and productive agrarian system where traditional and new territorial uses coexist and it has an essential role in the global context of food insecurity and nutritional problems [15].

Moreover, fenced landscapes are a representative element of some of the places recognized by the FAO as Globally Important Agricultural Heritage Systems (GIAHSs), such as Barroso (Portugal, 2018) or Montaña de León (Spain, 2022). Special mention must also be made of the agro-ecological value of these spaces in agrosystems [12,16–18], not least through their contribution to landscape heterogeneity, biotic connectivity, and species richness [19,20].

Within this intangible cultural heritage, there are different landscape expressions, two of which are particularly common: terraced landscapes and enclosed landscapes, both built with dry stone walls. Field enclosures can be defined as private, small- or medium-sized land parcels delimited by dry stone walls, wire fences, hedges, or trees [19,21], and they are established with a variety of goals in mind, geared toward producing food, firewood, fodder trees, grass, etc. [19,22,23]. This is one of the most extensive landscapes in Europe, which not only has value in identifying terrains [19] but that is also a key element in the design of green infrastructures and networks [24]. Field enclosures are the best studied of these two landscapes and they are widely distributed in the Mediterranean area, in countries like Italy [25–27], Cyprus [28,29], Greece [30], Portugal [31], and Spain [32,33]. Two subtypes of these enclosures can be differentiated, the first of which extends over large areas of central and northern Europe and that are associated with an oceanic climate (annual rainfall between 1000 and 2000 mm). This rural landscape is comparable to the *bocage* in France [34], the dry wall landscape in Ireland [35–37], the hedgerows in the English countryside [38], or the *pluzinas* in the Czech Republic [39]. The second is a Mediterranean type that is characterized by the development of intense water stress during the summer and the best examples are located in areas with a higher soil humidity (annual rainfall between 600 and 800 mm). This subtype is found in several countries of the Mediterranean basin, including Croatia, Cyprus, southern France, Greece, Italy, Slovenia, southern Portugal, and Spain,

and aspects of these landscapes have been studied in some depth in Italy [40], Greece [41], Croatia [42–44], Slovenia [45,46], and Portugal [31]. To date, most of the studies carried out in the Spanish Mediterranean area have focused on the northwest [47,48] and northeast areas of the peninsula [49], although some research in the central territories has been carried out from an ecological standpoint [50], or focusing on the historical evolution, natural and cultural features, and their territorial dynamics [16,21,51–56].

1.2. Mediterranean Enclosed Fields in Spain

The genesis of Spanish private enclosures in the Mediterranean mid-mountain landscape is similar to that considered in the south-east of the British Isles [57], where the dominant landscape evolved from old open fields enclosed during the agrarian revolution. Both cases share their roots in the private appropriation of the collective space, with the aim of increasing yields through diversification and defending the farmer against animals [48]. However, the dynamics experienced by these landscapes in the Mediterranean area highlight the significant differences between these landscapes, and those in central and northern Europe [21,52]. Indeed, the latter have been subjected to activities associated with the increased use of agricultural fertilizers [58,59], with functional changes [60,61], and the processes of agrarian intensification [39,61]. By contrast, there has been a dramatic reduction in this type of landscape in southern Europe, which has even disappeared entirely in many places [21,61–63]. The loss of functionality in rural areas and the progressive transformation of territories into urban peripheries are some of the drivers behind the progressive disappearance of these landscapes. However, their strong heritage value is based on the richness of natural and cultural elements or practices, including numerous intangible values and others associated with identity. The combination of all these factors is expressed through a unique and valuable landscape heritage. This heritage needs to be studied in more detail to understand its strengths, reducing the impact of the dynamic changes that affect it [1,60,62,64]. As a natural heritage, the biological diversity of these landscapes is significant [7–10,65,66], and culturally, the enclosed landscape preserves traditional agro-livestock practices that are in symbiosis with the surrounding natural environment. Moreover, the interaction between nature and culture in these areas creates a visual narrative that transcends generations. In any event, they constitute a heritage that must be preserved and revalued [1,22,39,51,60].

There are many agents involved in the construction of this landscape (local, regional, and national administrations, livestock farmers, and businessmen), and there are others who can indirectly influence its maintenance and conservation: tourists, consumers, researchers, and artists. These agents can be articulated in complex networks in which territorial governance plays a leading role [67–69]. The networks have advice from supranational institutions (European Union) on how to use the World Heritage Mark as a tool to improve the economic and social sustainability of rural areas [70]. As an example, five key initiatives can be included: benefits brought to society by cultural heritage in general and agricultural landscapes in particular have to be monetized in order to increase their attractiveness; agricultural landscapes should be defined taking into account the relevance of the primary sector in economic and social terms; scope to encourage the cross-border networking of agricultural landscapes in Europe; a hybrid approach in the conservation and preservation of agricultural landscapes that also considers the development of rural areas should be promoted; and creative ways to actively engage local communities in initiatives with a central role for young people.

In this study, we focus on the Mediterranean mountains of the central Iberian Peninsula, specifically the Sierra de Guadarrama and its southern piedmont. Some of the best examples of enclosed landscape exist there and they are perhaps the most threatened. As a result, the following research questions are raised:

- What are the keys to interpreting this landscape and what elements make up its heritage value (historical evolution, biological diversity, traditional management practices, protection, productivity, population dynamics, or changes in production systems)?

– Is it possible to preserve this heritage?
– What types of strategies are necessary for its conservation?

Accordingly, this aim of this research is:

(1) To understand the historical information related to the evolution and construction of this landscape.
(2) To identify the elements that make up the national and cultural heritage of the Mediterranean enclosed landscape.
(3) To understand the dynamic changes that have taken place in this landscape over the last 70 years.
(4) To understand the current dynamics, resilience, and adaptive capacity of this traditional landscape in a new rural market economy.
(5) To enhance the intrinsic relationship that this landscape maintains between the conservation of agrobiodiversity, agricultural functionality, and territorial sustainability.

2. Study Area and the Historical Construction of the Enclosed Heritage Landscape

2.1. Study Area

The study area extends over 49 municipalities (see Figure 1). It is broadly a Germanic-type topography, with metamorphic material of an intrusive nature arranged in a succession of tectonic steps that descend progressively toward the south until they disappear under the evaporitic sediment of the Tagus basin. It is an area with a continental Mediterranean climate, with verified annual thermo-pluviometric values ranging from 670 mm and 12.5 °C in the basal piedmont areas to 1200 mm and 8.4 °C at the summits [71]. In this sector, the landscape of enclosed fields is associated with well-preserved watercourses, wet valleys, wetland plateau or marsh flatland, granite alveoles, etc., and with a strong identity and natural value. The study carried out aimed to assess how the landscape of enclosed fields has been configured and to establish its historical development to date. In addition, the functionality of the enclosed fields in the Mediterranean area was evaluated, as was the impact that the changes in the traditional management of this agro-landscape may have had. Moreover, an important part of the study area lies within the Sierra de Guadarrama National Park.

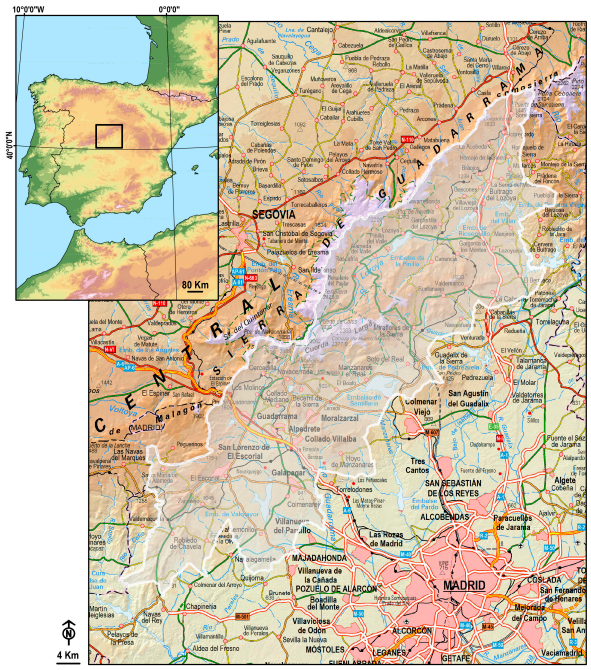

Figure 1. Location map of the study area. Source: Spain MDE from USGS Shuttle Radar Topography, 2004 (**above**). Topographic information from the National Geographic Institute 1:200,000 (**bottom**). Prepared by the authors.

We find a variety of different types of enclosed fields in the area studied based on different parameters (see Figure 2). Focusing on the morphology of the plots, three main types can be distinguished: small and very narrow rectangular plots that originate from the equal division of common land; elliptical plots on granite alveoli; and square plots with no control over access to the property. In addition, three main types of hedges were defined: dry stone walls with no vegetation; walls with dispersed trees, normally pollarded; and walls with trees and dense thickets. Finally, and in a Mediterranean context, a further classification can be used to reflect the soil moisture, again distinguishing three categories: humid, semi-humid, and dry [51,53] (see Figure 2g–i). The combination of each of these parameters provides a rich categorization of the plots that reflects their landscape, productivity, culture, and biology.

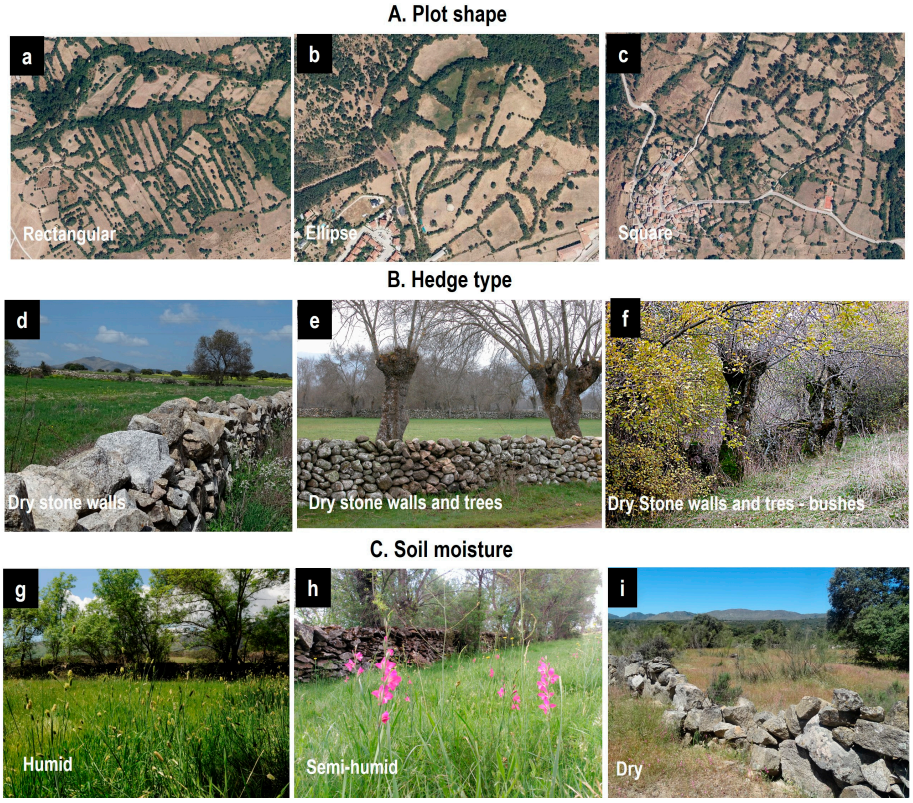

Figure 2. Enclosure types based on the plot shape, hedge type, and soil moisture. Location: (**a**). Alameda del Valle; (**b**). Rascafría; (**c**). Horcajo de la sierra, (**d**). Colmenar Viejo; (**e**). Los molinos; (**f**). Alameda del Valle, (**g**). El Escorial; (**h**). Lozoyuela; and (**i**). Fresnedillas de la Oliva. Source: authors' photographs.

2.2. Enclosed Field Landscape in the Center of the Iberian Peninsula: Evolution and Territorial Configuration of the Rural Heritage from the XI to XXI Centuries

The processes of appropriation, purchase, or delimitation of spaces underlie the genesis of enclosed spaces in the center of the Spanish peninsula between the 11th and 21st centuries. The 11th century marked the middle of the Christian Reconquista of the Muslims and the colonization of the Trasierra (the denomination of the southern slope of the Sierra del Guadarrama), and it also marked the beginning of the construction of enclosed landscapes (see Figure 3). Four major stages were identified here in which similar patterns of evolution were followed regarding the configuration of the enclosed spaces: the 11th century and the first decades of the 13th century, the 13th and 14th centuries, from the late 14th century to the 19th century, and from the 20th century to the present.

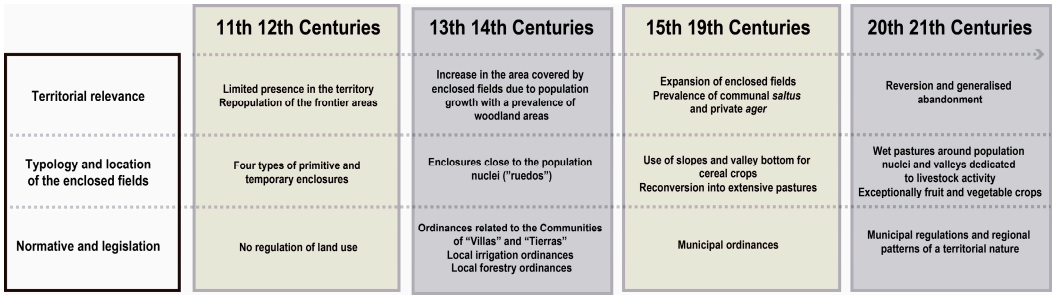

Figure 3. The evolution of enclosed fields in the center of the Iberian Peninsula from the 11th century to the present day. Prepared by the authors.

The establishment of enclosed land parcels took place in the second half of the of the 11th century, although it was not until the 12th century that the division or segregation and the delimitation of land became more generalized on the southern slopes of the Central Spanish Mountain system, as did the regulation of these plots [55,56].

At this time, this was promoted by the king through the granting of privileges ("fueros" in Spanish), municipal charters, and franchises to settlers willing to clear agricultural land [55,56]. Initially, these frontier territories in the Iberian Peninsula's Middle or Central March were sectors well-suited to pastoral activities and they represented areas for the movement of livestock from the Segovian plateau. After this demographic consolidation, these territories were organized into frontier jurisdictions with extensive privileges, essentially the 'Comunidad de Villa' and 'Tierra de Buitrago' in the northeastern sector, 'El Real de Manzanares' in the central area, and the 'Sexmos de Lozoya' and 'Casarrubios' that were dependent on the 'Comunidad de Villa' and 'Tierra de Segovia' in the central and southwestern intramountain basins [48,56,72,73].

The enclosures that originated at this time were very primitive and of a temporary nature, although they soon began to be regulated by ordinances (either local governances or those from the regional Communities of 'Villa' and 'Tierra'). Such regulations involved cataloguing these plots based on their quality, differentiating four distinct types: grasslands for direct livestock feeding, grasslands to generate surplus for the winter season, pastures, and fenced enclosures [73].

The second stage in the evolution of enclosures coincides with the transition into the High Middle Ages (13th–14th centuries). It was a period when the land ownership was consolidated through the use of enclosures, and the configuration of these enclosed land parcels, established in the earlier era, shifted progressively. The advances and the regressions in the configuration of enclosed spaces were associated with demographic fluctuations, which were most intense from the 14th century onward. Many traces of these changes are still relevant to the function of this land and remained evident into the second half of the 20th century.

At the beginning of this period, it was common for the enclosures to be destroyed by the Segovian livestock owners, who were particularly belligerent toward the residents who were under the governance of the Madrid Government [72,73]. On the other hand, the local councils appropriated the most productive woodlands closest to the population centers, enclosing them and regulating their use [45]. The fenced areas, close to the towns, made a dense network of watercourses that were set up to irrigate the meadows, fields for sowing cereal, flax fields, vegetable and fruit crops, or vineyards. In turn, it was in this period that the first regulations governing irrigation systems were laid down. These regulations were essential for the construction of this landscape and now their elements have a great heritage value: irrigation channel ordinances, Braojos (1603); irrigation channel ordinances, Villavieja del Lozoya (1485); etc. [73]. During this period, enclosed fields began to have a significant presence in the landscape.

From the 14th century to the end of the 19th century, a third stage is recognized, in which greater demands were placed on self-sufficiency, resulting in a clear compartmen-

talization and demarcation of fertile spaces that became particularly intense in the sectors closest to the towns. The ordinances in this period included the obligation of landowners to enclose their land to protect them "from sheep, goats, etc. that graze on common and open land" (Ordinances of Villa y Tierra and of Montejo, 1576), or "[...] to delimit the boundaries of the flax fields in this municipality [...] established by the mayors, and those who do not enclose [their plots] within the specified time shall pay [...]" (Ordinances of Braojos, La Serna, and Ventosilla, 1569).

Establishing the King's residence in Madrid in the second half of the 16th century led to an increase in the demand for the produce of the forests and enclosed fields of the nearby towns. Gradually, this agro-landscape became the most intensive productive area, but also the one that incorporated the constructive elements that have survived to the present day (see Figure 4). During this period and until the first decades of the 20th century, an archaic system was maintained that was based on an agro-livestock landscape typical of the Old Regime and deeply rooted in medieval times. The persistence of structures related to land tenure and the local planning ordinances for land use did not favor the intensive establishment of enclosures characteristic of the 18th and 19th centuries and advocated by the English agrarian revolution [57].

Figure 4. Representation of and changes to the enclosed fields of Somosierra and Robregordo in the 18th century (**left**) and how they remained in the 20th century and their current status (**right**). Source: Question 1 of the General Answers to the General Interrogation of the Cadastre of Ensenada, 1751 (National Historical Archive) of the municipality of Somosierra, and orthophotographs from 1956 (United States Air Force) and 2020 (Madrid Region). Prepared by the authors.

The productive system in place maintained a degree of homogeneity until the first quarter of the 20th century. The opening up of the markets, directly associated with improvements to the road systems, facilitated the progressive reconversion of landscapes towards an economy based on livestock production. Changes in the productive system transformed enclosed spaces into pastures or hay meadows; there was an increase in the woody spaces in the most fertile valley floors, and Ramón/breadnut trees and grassland pastures for mowing were favored. The most inaccessible enclosed slopes, which were irrigated and on many occasions were appropriated as common land, were also reoriented as pasture for intensive or rotational livestock grazing. During this stage, the productive terrain was structured into two clearly differentiated cells: a private and agricultural ager (field or plot), close to the towns and settlements, and delimited in some way; or land

assigned a common saltus (not cultivated), sometimes enclosed (Boyal pastures), and primarily focused on livestock and forestry.

Finally, a fourth stage is identified between the 20th century and the present time. It is characterized by a generalized abandonment of agricultural and livestock spaces, which led to the disappearance of many of the boundaries on the slopes. Nevertheless, the shape of these land parcels was preserved in the landscape, maintaining the functionality of the valley bottom enclosures. By contrast, the highest areas where transhumant livestock are herded lost their functionality with the fall of the Mesta (professional association of farmers dedicated to transhumance, of medieval origin) and only the best (enclosed) wetland highlands were functional, being used for the transterminance of bovine livestock. In addition, urban development and modifications to the traditional populated areas took place in these agricultural spaces, which mostly bordered the rural settlements. In the following sections, we evaluate the characteristics of this latter stage.

3. Materials and Methods

Digital, historical, and socioeconomic data were analyzed to reconstruct the boundaries, historical evolution, and dynamics of the privately owned enclosed fields (see Figure 5). All the info was processed using and integrated into the Geographical Information System software (ArcGIS Pro v 3.1.2). It is a method in which the combination of qualitative and quantitative methods is of great interest as well as the comparison between the results of each of them.

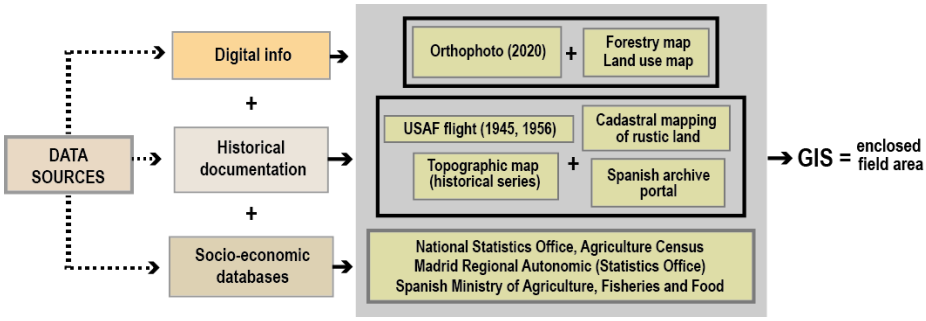

Figure 5. Classification of data sources. Prepared by the authors.

3.1. Historical Sources

In a first phase of the study, the historical documentation was analyzed to reconstruct the temporal evolution of the privately owned enclosed fields, reviewing the data available from different sources (see Table 1): regional and municipal archives, cadastral mapping, and from digital documentation available at the Spanish Archives Portal (PARES). Historical cartographic sources from the Spanish Geographic National Institute (IGN) were also used, paying particular attention to the first editions of the topographic maps on a scale of 1:50,000 and the historical flights of the United States Air Force (USAF: Series A and B).

Table 1. Historical documentation sources.

Source	Scale
Historical flight of the USAF. Series A, 1945 (IGN) [1]	Approx. 1:45,000/0.5 m per pixel
Historical flight of the USAF. Series B, 1956 (IGN) [1]	Approx. 1:45,000/0.5 m per pixel
Cadastral mapping of rustic land [2]	1:5000
First edition of the National Topographic Map [1]	1:50,000
PARES (Spanish archive portal) [3]	Regional/municipal

[1] Spanish Geographic National Institute (accessed on 10 March 2022: http://www.ign.es/csw-inspire/srv/eng/main.home); [2] Spanish Rustic Cadastre (accessed on 10 February 2021: http://ovc.catastro.meh.es/Cartografia/WMS); [3] (accessed on 10 February 2021: https://pares.culturaydeporte.gob.es/inicio.html).

3.2. Cartography Sources and Comparative Cartography

A comparative cartography was carried out in a second phase, in which the evolution of the enclosures was assessed from photographs, comparing images from 1956 (USAF) and 2020 (National Plan for Aerial Orthophotography, PNOA). Two reference categories were identified: urban land and enclosed fields. In addition, complementary info from aerial photographs (1945–1946) in conjunction with the cadastral maps was used (see Table 2).

Table 2. Cartography sources.

Source	Scale
Orthophotography PNOA (2020) [1]	1:5000/0.25 m per pixel
Forestry map of the Madrid Region [2]	Regional/municipal
Land use map of the Madrid Region [3]	1:5000

[1] Spanish Geographic National Institute (accessed on 10 March 2022: http://www.ign.es/csw-inspire/srv/eng/main.home); [2] Department of the Environment, Madrid Regional Autonomy (accessed on 10 February 2021 online: https://idem.madrid.org/); [3] Madrid Regional Autonomy (accessed on 20 June 2021: https://idem.madrid.org/).

All the digital info was implemented into and processed in ArcGIS Pro (see Figure 6). An enclosed land boundary and database were designed in the editor module and included two key fields in numeric format: urban and enclosed land use for 1956 and 2020. Then, the topology was validated and completed with forestry, land use, and cadastral data.

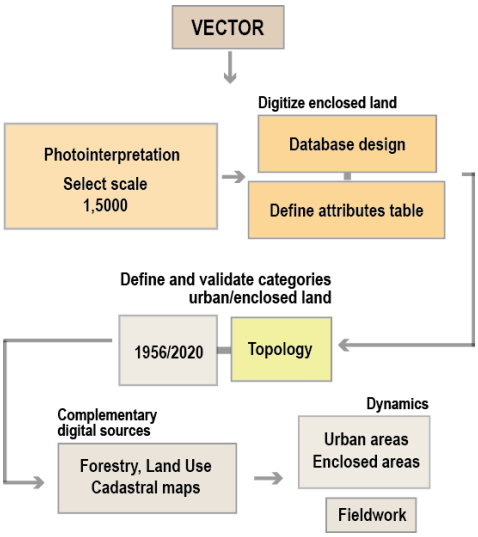

Figure 6. Workflow in ArcGIS Pro v3.1.2. Prepared by the authors.

3.3. Defining Enclosure Field Boundaries

In a third phase, fieldwork was carried out in which specific sample areas were selected that allowed the enclosed land parcels to be located and identified. Enclosed fields were selected by considering the spaces delimited by well-defined boundaries of dry or grouted stone walls, arborescent shrub or tree hedgerows, or simply when trees formed well differentiated areas. These categories also included divisions that, despite not being differentiated as land parcels, had a visible external enclosure. Once the enclosures were defined for the reference years, and the validation and topological correction of the resulting layers was carried out, the area involved (in hectares) was calculated for both dates (see Appendix A).

3.4. Identification of Cultural and Natural Heritage and Socioeconomic Analysis

The elements of the landscapes with cultural value were identified and classified based on fieldwork and previous studies [16,74]. The types of enclosure (dry stone wall, dry stone

wall with arboreal vegetation, and dry stone wall covered by multiple strata of vegetation), the types of access (traditional gates, access through gates made with artificial materials, and modern gates that preserve the traditional forms), and the elements of patrimonial nature and identity in the landscape were analyzed.

To identify the value of the natural patrimony associated with the dry stone walls, transects were drawn up along different axes of the municipalities in order to register the presence of taxa of a woody nature. The differences in the presence of these taxa were established from a territorial point of view: northeastern sector, Somosierra; central sector of the Guadarrama mountains and their foothills; and the southwestern sector of the Guadarrama mountains. This information was complemented with data from our previous studies [16,75].

Once the species were identified, the database was completed with information regarding the specific characteristics that were associated with their biogeographical distribution, for which diverse flora [76–78] and the Anthos Project (accesed on 20 November 2023: http://www.anthos.es/) were used. Each taxa was assigned a value between 1 and 3: 1 = Cosmopolitan; 2 = Central Spain; 3 = rare in the study area. Finally, the type of protection of the species present in the walls was recorded based on the Royal Decree 18/1992, 26th March, in which the Regional Catalogue of threatened species of wild fauna and flora was approved, and the categories of rare species in the Region of Madrid were established: E, Endangered; V, Vulnerable; SI, Special interest. The red list of Spanish vascular flora was also reviewed to attribute a special classification, Critical, as elaborated by the Spanish Ministry for the Environment [79], and this was applied exclusively to the species registered in the walls (*Betula pendula* subsp. *fontqueri* (Rothm.) G. Moreno & Peinado).

Information regarding the cultural value of the natural patrimony associated with the walls was also included. As such, the species traditionally used by the local communities in different applications were identified. The sources used were the Spanish Inventory of Traditional Knowledge relative to Biodiversity (IECTB) [80] and our previous studies [16,53]. Another source of information to estimate the patrimonial value of this landscape was the selection of artwork and of other artistic formats attributed to Spanish Masters that represent this agricultural landscape and/or the elements that contribute to these landscapes.

In addition, a socioeconomic approach was followed based on the information available in different statistics both at the regional and local levels (see Table 3), including agrarian, livestock, rural, and demographic data (Madrid and databases of interest from the National Statistics Offices). Sample areas and socioeconomic variables were used to characterize the dynamics. Also, different local actors were interviewed (non-formal).

Table 3. Socioeconomic databases.

Source	Scale
National Statistics Office, Agriculture Census [1]	Municipal/0.25 m per pixel
Madrid Regional Autonomic (Statistics Office) [2]	Regional/municipal
Spanish Ministry of Agriculture, Fisheries, and Food [3]	National/regional/local

[1] accessed on 10 March 2023: https://www.ine.es/index.htm; [2] accessed on 10 March 2023: http://www.madrid.org/iestadis/; [3] accessed on 10 January 2022: https://www.mapa.gob.es/en/pac/post-2020/default.aspx.

4. Results

4.1. The Types of Enclosed Landscape and the Elements Involved

The main function of enclosed spaces is to protect the most fertile or best located soils for livestock. Considering their type of use and functionality observed in the fieldwork and located from photointerpretation, two types of enclosures can be distinguished: those that delimit Boyal pastures and mountains (not considered in the present study); and those intended to protect crops or grasslands. The productivity of these spaces is conditioned by the availability of water, such that the whole agrosystem is conditioned by access to and the management of water. An approximation to classify the types of enclosures was

previously established by our group through the use of SENTINEL-2 images and based on soil moisture, proposing three sub-types: humid, semi-humid, and dry [21]. In turn, the enclosed space itself presents variations in its internal structure, differentiating two clearly contrasting elements: the boundary elements and their functional coverage; and the productive interior of the enclosure.

The fence/wall is essentially an element that delimits and protects a productive space. Also, the stone walls serve their own purpose in retaining moisture, delaying erosion, augmenting the diversity of flora and fauna, favoring the presence of trees, enhancing the shade, and extending the productive period of the pasture.

An analysis of the state of the walls and gates offers an interesting panorama. In general, the enclosure's walls are undergoing significant degradation due to a lack of upkeep of these structures and preservation of their traditional form (see Figures 2 and 4–6). The farmers and owners opt for the incorporation of wire fencing and the use of other objects (pallets, bed bases, etc.) to repair and maintain the gates, and to stop cattle or other animals from entering these plots. Specifically, an important change in the types of gates and the materials used for them was noted (see Figure 7), since traditionally, they are usually constructed from wood of different species (see Table 4), but they have been transformed by substituting this wood with metallic gates, bed bases, recycled gates, building pallets, or using the doors of farms or at the entrance of farms (see Figure 7). In some cases, new wooden gates produced in a similar manner to the traditional gates have been introduced. These latter types can be most often found in the Lozoya valley, the sector with the greatest influx of tourists of the areas studied, and which is located in the area around the Sierra de Guadarrama National Park (2021: 24,757 visits were registered at the El Paular Visitor center) [81].

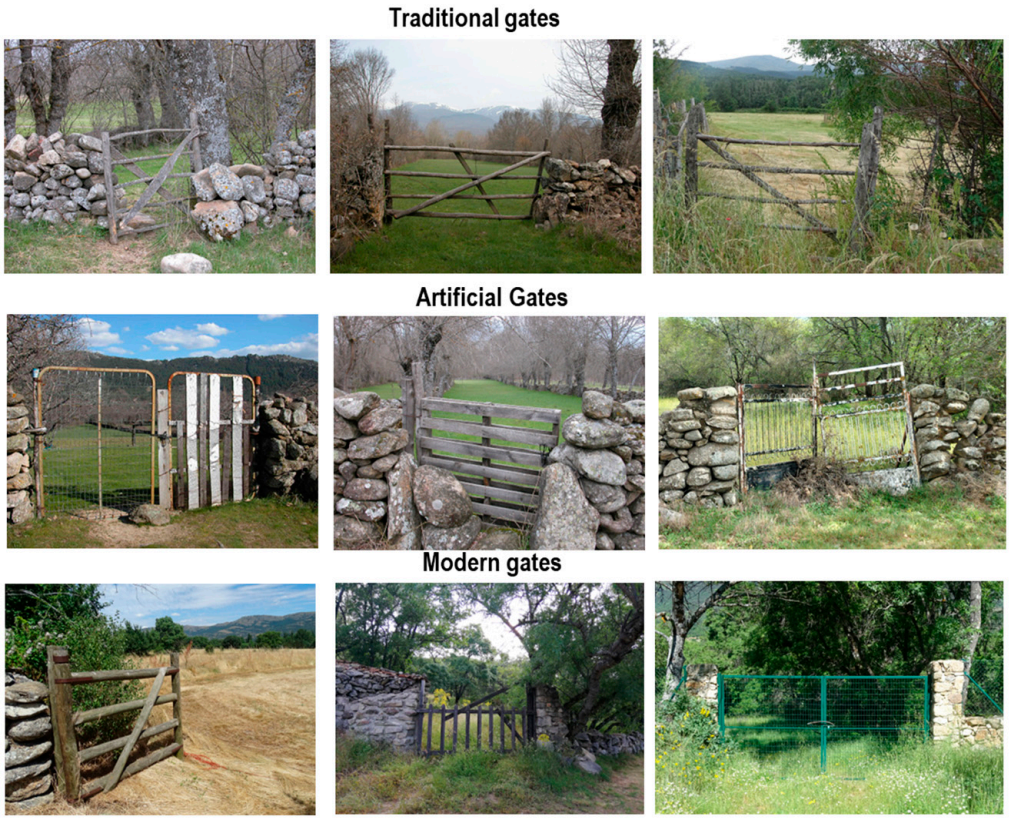

Figure 7. Types of gates. Source: authors' photographs.

Table 4. 1: Northwest sector (Somosierra); 2: Central sector (Eastern Guadarrama); 3: Southwest sector (Western Guadarrama). BS = Biogeographical singularity and area of distribution: 1 = Cosmopolitan; 2 = Central Spain; 3 = Rare in the study area; TP = Type of protection (Decree 18/1992 of 26 March 1992 approving the Regional Catalogue of endangered species of wild fauna and flora and creating the category of singular trees): E, Endangered; V, Vulnerable; SI, Special interest; *, Critical (red list of the Spanish vascular flora).

	1	2	3	BS	TP	Wood	Pollarding	Fodder	Firewood	Food	Charcoal	Tools	Construction	Gates	Hedges
Acer monspessulanum	•	•	•	1			•	•	•		•	•	•		
Alnus glutinosa	•	•	•	1		•		•	•				•		
Betula pendula fontqueri	•			3	SI *	•	•		•			•		•	•
Betula pubescens	•			3	SI	•	•		•			•		•	•
Corylus avellana	•	•		2	SI	•		•	•	•	•	•	•	•	•
Crataegus monogyna	•	•	•	1					•	•		•			•
Daphne gnidium	•	•	•	1								•			
Euonymus europaeus	•	•		3											•
Frangula alnus	•	•		1					•			•	•		•
Fraxinus angustifolia	•	•		1		•	•	•	•		•	•	•	•	•
Ilex aquifolium	•			3	E	•		•	•		•	•	•	•	•
Jasminum fruticans		•	•	2				•							•
Juglans regia	•			2		•				•		•			
Juniperus communis hemisphaerica	•	•		1				•					•		
Juniperus oxycedrus	•	•	•	1				•					•		
Ligustrum vulgare	•			2											•
Lonicera etrusca		•	•	2				•	•						•
Lonicera periclymenum hispanica		•		2				•	•						•
Lonicera xilosteum	•			3				•	•						•
Malus sylvestris	•			1	SI				•	•		•			
Pinus sylvestris	•	•		1		•			•						
Pistacia terebinthus		•	•	2		•		•	•		•	•	•	•	•
Populus alba	•	•	•	2		•		•	•						
Populus tremula	•			3				•					•	•	•
Prunus avium	•	•		3	SI	•				•					
Prunus insititia	•	•	•	3											•
Prunus mahaleb		•		3											•
Prunus padus	•			3	V	•									
Prunus spinosa	•	•	•	1						•					•
Pyrus bourgaeana		•	•	3	E					•					•
Quercus faginea faginea		•		2		•	•	•	•	•	•	•	•	•	•
Quercus petraea	•			3	SI	•	•	•	•	•	•	•	•	•	•
Quercus pyrenaica	•	•		1		•	•	•	•	•	•	•	•	•	•
Quercus rotundifolia		•	•	1		•	•	•	•	•	•	•	•	•	•
Quercus welwitschii		•		2		•	•	•	•	•	•	•	•	•	•
Rhamnus cathartica	•	•	•	2					•						•
Rhamnus lyciodes		•	•	2					•						•
Rosa agrestis		•	•	2				•							•
Rosa canina	•	•	•	1				•							•
Rosa corymbifera	•	•	•	1				•							•
Rosa micrantha	•	•	•	1				•							•
Rosa pouzinii	•	•	•	1				•							•
Rosa villosa	•			3	SI			•							•
Rubus brigantinus		•		3				•		•					•
Rubus caesius	•	•		2				•		•					•
Rubus idaeus	•	•		2				•		•					•
Rubus laincii	•			3				•		•					•

Table 4. *Cont.*

	1	2	3	BS	TP	Wood	Pollarding	Fodder	Firewood	Food	Charcoal	Tools	Construction	Gates	Hedges
Rubus ulmifolius	•	•	•	1				•		•					•
Ruscus aculeatus		•	•	2						•					•
Salix alba		•	•	1				•	•			•	•	•	
Salix atrocinerea	•	•	•	1				•	•			•	•	•	
Salix caprea	•			3				•	•			•	•	•	
Salix salvifolia	•	•	•	1				•	•			•	•	•	
Sambucus ebulus	•	•	•	1					•			•			
Sambucus nigra	•	•	•	3	SI				•			•			
Sorbus aria	•			3	SI	•	•	•	•	•		•	•	•	
Sorbus aucuparia	•	•		2	SI			•	•	•		•	•	•	•
Sorbus domestica		•	•	2	SI			•		•		•	•	•	•
Sorbus latifolia	•	•		2	E	•	•	•	•	•		•	•	•	•
Ulmus minor	•	•	•	1		•		•	•			•	•		
Viburnum lantana	•			3					•			•			
Viburnum opulus	•			3	SI				•						

In tree-lined enclosures, there is the possibility of using pruning to shape "ramón" trees (a type of fodder) when they are green in order to obtain firewood by annual pollarding in the case of *Fraxinus angustifolia* Vahl. The traditional practice of pollarding in other regions of Western Europe has established an association between this activity and enclosed fields. At present, there is a general trend towards an abandonment of pollarding in small land parcels and particularly where there is a poor rate of transmission across generations [61].

The boundaries of humid enclosed fields are generally preserved the best. It is notable that their walls are generally constituted of dry stone, with certain properties, and that they are often associated with a relatively dense hedgerow that is sometimes composed of multiple strata. In these enclosures, we highlight the presence of *Fraxinus angustifolia* and *Quercus pyrenaica* Willd trees, with a wide variety of silvo-structures, such as those of the arborescent and arboreal types, or low-lying shrubs. The semi-humid enclosed fields are less productive than the humid ones mentioned above, yet they normally preserve high-quality stone walls and there is a predominance of a discontinuous shrub stratum, sometimes quite dense, and with the presence of arborescent and isolated arboreal elements. In the case of dry enclosed fields, typical in the middle and upper slopes, the walls are usually made of bare stone and they are commonly less well constructed. Moreover, they are normally not covered by any vegetation or they may have scattered shrubs associated with them.

The analysis of the woody vegetation associated with the stone walls identified 62 common species in this landscape (see Table 4): 46 in the northern and central sector and 29 in southern sector. Among these, the species with a noteworthy biogeographical distribution in the areas studied were: *Betula pendula fontqueri, Betula pubescens, Euonymus europaeus, Ilex aquifolium, Lonicera xilosteum, Populus tremula, Prunus avium, Prunus insititia, Prunus mahaleb, Prunus padus, Pyrus bourgaeana, Quercus petraea, Rosa villosa, Rubus brigantinus, Rubus laincii, Salix caprea, Sambucus nigra, Sorbus aria, Viburnum lantana*, and *Viburnum opulus*. A total of 16 of these 62 species are listed with some type of protection: 3 are Endangered (*Ilex aquifolium, Pyrus bourgaeana*, *and Sorbus latifolia*), 1 is Vulnerable (*Prunus padus*), and 12 are of Special Interest, with *Betula pendula* subsp. *fontqueri* being included in the red list of the Spanish vascular flora ("Critical" status).

This natural patrimony is related to the cultural value attributed to forest species. For centuries, the local communities have taken advantage of this resource, transforming and modifying the silvo-structure and creating a landscape of great interest. Up to 10 uses were

identified in relation to the species found: timber exploitation, pollarding of the trees in the walls and interior of the plots, trees destined for the production of fodder, firewood, fruit collection for alimentation, carbon production, the elaboration of tools and implements, the use of wood in construction, gate building, and the strengthening and raising of hedges (see Table 4). In total, as many as 251 uses have been registered, highlighting the versatility of all the *Quercus* species present in the study area (*Quercus faginea* subsp. *faginea*, *Quercus rotundifolia, Quercus pyrenaica, Quercus rotundifolia*, and *Quercus welwitschii*), as well as that of other species, like *Corylus avellana, Fraxinus angustifolia*, and *Sorbus latifolia*.

Traditionally, the most frequent uses are in hedges (41 species), as fodder (39 species), and for firewood (35 species). An intimate relationship between the natural patrimony of the agricultural landscape studied and the traditional uses of the rural communities was observed [16]. At the present time, there are few preserved uses that are related to this natural patrimony. These have disappeared in the framework of the new consumer economy, generally reflected through the abandonment of wood as a construction material. Of the species that still have a certain functionality, the arboreal contributions of the genus *Quercus* and *Betula* stand out, and to a lesser extent those of the genus *Salix* or of the species *Corylus avellana* or *Fraxinus angustifolia*. The latter is one of the taxa that maintains the greatest functional diversity. The density and thorny nature of the *Rubus* genus explain their presence in the rehabilitation of walls and gates, in many cases substituting stone as a structural element. Species like ash are among the few species that now serve as fodder and, although cattle take advantage of them in the field, it is not specifically pruned with this purpose in mind.

Regarding the interior of the enclosures, trees are common elements and of great interest in terms of the systems' function. There are meadows and grasslands with no trees, but scattered or isolated trees are more common, as are true copses. In many cases, there are meadows in which pure grassland areas alternate with shady areas, and this plant community was adapted to mowing and the gathering together of small livestock to fertilize those shady areas where the grass is better preserved. In drier areas, the tree shade allows for the period of livestock grazing to be extended. However, due to the low livestock density in these areas at present, the functionality of these areas is being lost and they are experiencing a progressive process of lignification, with the vegetation becoming tougher.

Another aspect that adds heritage value to this agro-landscape is its appearance in the pictorial works produced by the great masters of Spanish painting. The appearance of an agrolandscape background in paintings was a common feature during the 17th and 18th centuries. Some examples are the landscapes with hedges and trees in the Guadarrama foothills of "The Boy from Vallecas" (Velázquez, 1635–1645) or "Charles III, in Hunting Dress" (Goya, 1787). In the third example, Jaime Morera places the landscape of the enclosed fields of the Guadarrama foothills as the central element of the "Valley of Chozas, Guadarrama" (1891–1897). Finally, panel 4 shows the artistic proposal of Lucía Loren from her project *El Monte hueco (The hollow woodland)* in 2004, in which the author works on examples of pollarded trees and using natural materials collected in situ (see Figure 8).

Finally, a number of elements with considerable value in terms of identity were defined, of which we highlight the richness of the irrigation infrastructures, still functional in some sectors, and that include the ancestral communal management of water regulation by old ordinances (see Figure 9a). Small constructions for animals may still be preserved in the enclosed plots and they are completely integrated into the lithic landscape. The protection of these features is compromised by the lack of functionality (see Figure 9b), although there are still individuals specialized in the construction and repair of dry stone walls. This activity requires maintaining a good physical shape, time, and experience, and the younger generations do not appear to be interested in this trade (see Figure 9c). The entrance to the fields and the walls that surround the properties contain a number of stone elements that have an important presence and that have an entire range of names in the local knowledge (*hincones*, *bolos*, *mampuestos*, *matacanes*, etc.; see Figure 9d–g).

Figure 8. Four examples of pictorial representations of enclosed field landscapes in the Sierra de Guadarrama and its piedmont: (**a**) "The Boy from Vallecas, Francisco Lezcano" ("El niño de Vallecas, Francisco Lezcano") by Velazquez, 1635–45 (Reproduced with permission from Museo del Prado, Madrid, Spain); (**b**). "Charles III in Hunting Dress" ("Carlos III, Cazador") by Goya, 1787 (Reproduced with permission from Museo del Prado, Madrid, Spain); (**c**). "Valley of Chozas, Guadarrama" ("Valle de Chozas, Guadarrama"), by Jaime Morera, 1891–1897 (Reproduced with permission from Museu d'Art Modern i Contemporani de Lleida, Spain); (**d**). "The hollow woodland" ("El bosque hueco: Puebla de la Sierra"), by Lucia Loren (2004), copyright: Lucía Loren.

Another element of value in terms of identity is the image of the pollarded ash tree, within or on the border of the plot. This is an image that is characteristic of this sector in the center of Spain and such pruning is still carried out today, although it is now performed mechanically (see Figure 9h,i). The persistence of this landscape, and of the agricultural and cattle practices associated with these plots, are testament to the importance of field enclosures, and this is reflected in the work of the sculptor Manuel Revelles (Colmenar Viejo, 2009), who represents the enclosures along with the cattle (see Figure 9j). Likewise, the trails proposed by the local council of Bustarviejo within the so-called "livestock landscape" include the enclosed fields in the "Arroyo de la Valle" valley (see Figure 9k). In conjunction with the above, the intense network of trails that run along the limits of the enclosed fields ("callejos/alleyways") provide access to the landscape and allow for this scenery to be enjoyed (see Figure 9l,m).

Figure 9. Heritage and identity elements linked to the landscape of enclosure fields: (**a**): irrigation channel structure in a wall (Alameda del Valle); (**b**): livestock stable as a part of a wall (Zarzalejo); (**c**): stone pillars ("hincones") at the entrance of an enclosure (Colmenar Viejo); (**d**): small rural road ("callejo") between enclosures (Lozoya; (**e**): natural heritage elements (*Fraxinus angustifolia* pollarding) as a wooded wall (Alameda del Valle); (**f**): granite pillar (Lozoya); (**g**): wall repair work (Gargantilla del Lozoya); (**h**): granite boulders embedded in the wall (Soto del Real); (**i**): separation pillars inside the wall (Soto del Real); (**j**): pruning work on an ash tree (Soto del Real); (**k**): monument to livestock farmers (*El encierro*) (Colmenar Viejo); (**l**): touristic track labeled as livestock landscape (Bustarviejo); (**m**): a general view of the enclosed landscape with dry stone walls and tree hedges (Colmenar Viejo). Source: authors' photographs.

4.2. Changes in and Loss of Cultural and Natural Heritage

The analysis of the documentation and data collected in the fieldwork show that the boundary of the enclosed fields at the foothills of the Sierra de Madrid have undergone multiple changes since the mid-twentieth century, not only in relation to their exploitation, but also those resulting from the emergence of new forms of management that are associated with recent social and territorial situations (see Figure 10 and Appendix A): changes in crop types and cultivation methods, and the simplification of the agricultural space and new population dynamics and shifts in productive systems.

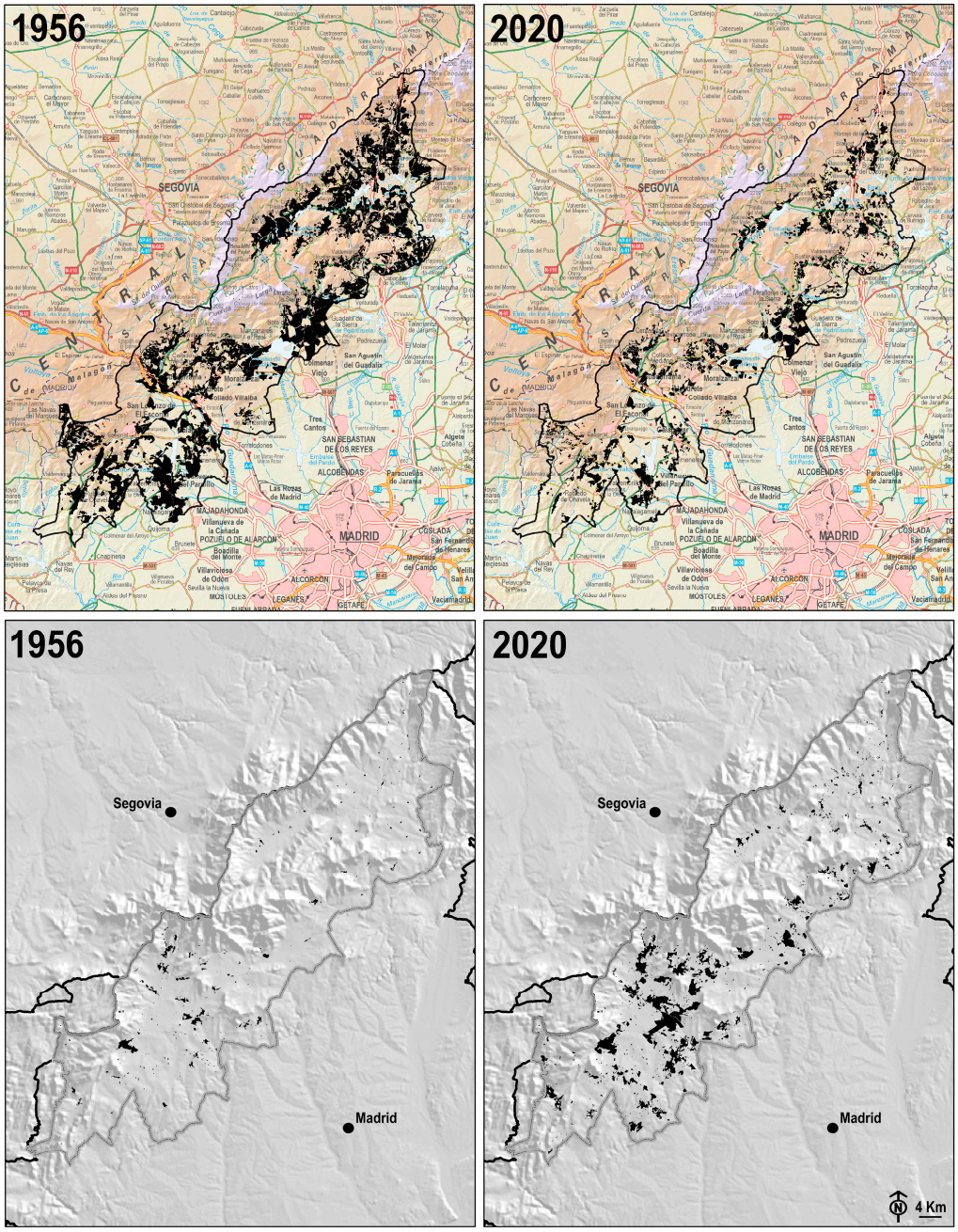

Figure 10. The distribution of enclosed fields (**top**) and urban areas (**bottom**) between 1956 and 2020. Source: topographic (**above**) and digital terrain model (**down**) information from the National Geographic Institute 1:200,000. Prepared by the authors.

Crop types and forms of harvesting have changed on enclosed parcels. Traditionally, these areas were cultivated using short-cycle, low productive, and non-irrigated monoecious cereals. Their productive phenology was relatively brief, involving seeding, which was dependent on each year's weather conditions and that was carried out at the end of autumn, with harvesting carried out at the end of spring. The trampling and natural fertilization of the soil compacts the plant residue following cereal harvesting, and it helps enrich soils that are not deep and that have a low capacity for nutrient retention. These cycles remained functional until they were gradually abandoned in the years after the Civil War (1950s and 1960s).

Biennial rotation was the most productive mixed cropping destined for self-consumption that was carried out on irrigated and fertile meadows. These areas were located around the urban settlements and they were cultivated with flax fields and vegetable/fruit crops. The irrigated space was maintained thanks to a structured network of channels that took advantage of water run-off entering the main streams [80]. Irrigated pastures for mowing were more productive and they were kept closed from March, allowing livestock access for grazing when mowing ended in mid-June. The silage obtained through mowing was a resource of utmost importance to maintain livestock in the winter season. Sometimes, the autumn rains allowed the livestock to graze low-lying, newly emerging grass for a second period [82,83].

In terms of the livestock type and density, major changes have taken place with important consequences for the landscape. Traditionally, there was some heterogeneity in the type of livestock used (cattle, sheep, goats, horses, etc.), with the black coat cattle autochthonous to the center of the Iberian Peninsula being particularly prominent. This range of domestic species is reflected in the Spanish Livestock Rearing Census of 1865, drawn up when traditional livestock farming was based on mixed herds of small livestock together with production and pack animals that helped to fertilize the land [84]. In this period, sheep were the dominant type of livestock in Madrid (65.66%), followed by mules, donkeys, and horses, while cattle only accounted for 5.05% of the total headcount.

The rural exodus from the 1950s provoked intense changes in the traditional productive structures, resulting in a generalized abandonment and a progressive simplification of productive cultivated land. One example is that of cereal crops, which almost completely disappeared from the continental Mediterranean mountains, transforming these territories into grazing pastures. Flax and arable lands suffered the same process, although some functional recovery of enclosed fields has been observed, mainly in terms of the most humid plots or those with a system of irrigation for the cultivation of vegetable/fruit crops. On the other hand, the diversity in the uses of tree coverage and the number of trees that are pollarded has decreased. In the case of ash trees, these are still used as green forage at the end of summer and to obtain firewood from pruning during autumn or winter [16,85]. As in the cases described above, there has been a significant loss of meadows used for mowing.

Exploitation kept the enclosures in a good condition, but this activity has decreased and the enclosures have presently deteriorated due to abandonment or to the use of materials from other environments for items such as bed frames, bathtubs, etc. In addition, the enclosures have undergone other changes related to modifications in their ownership, since the rural exodus has led to a concentration of their ownership to the hands of just a few. All these factors have generated an extensification of the grazing pastures and the opening up of the enclosures into larger grazing areas in which the movement of livestock is easier. Moreover, this loss of land for agricultural and livestock activity has not occurred uniformly, as the most marginal plots, which are drier and more distant, have been abandoned and the little activity that persists has been concentrated in the more humid sectors [21].

Moreover, population dynamics and shifts in productive systems have changed substantially over the last 70 years, which is particularly evident in the simplification of the type of livestock and in the simplification of the meat sector. From the 1960s, the production of non-native breeds became more common (Limousin, Charolais) due to their

more widespread introduction. The figures provided by the latest Agrarian Census available [86] reflect the predominance of cattle (70.7% of the total livestock count) over sheep and goats, the latter presently representing only 18.9% and 7.8% of the total livestock count, respectively. This predominance of bovine livestock presently exceeds 90% of the livestock count in 68.63% of the municipalities, and the presence of autochthonous breeds from other regions is ever more common, such as the red Berrenda cattle. Another important issue to understand how this agro-landscape has changed is related to livestock farms. When analyzing the figures from the last two Agrarian Censuses available [86,87], a decrease in the number of farms (879) can be seen (see Table 5). In addition, the agricultural area utilized has also decreased between these two dates (23,386 ha), and although the total number of bovine livestock units has decreased by 19.1%, there has been a recent increase in that of sheep (14.4%) and goats 2.4%. The analysis of these three indicators for these dates suggests an increase in the prominence of farms with a similar headcount but concentrated in a smaller area.

Table 5. Evolution of livestock units (LSUs) by type of livestock, number of holdings, and agricultural area utilized (AAU) between 1989 and 2020.

	1989 [1]	**1999** [1]	**2009** [1]	**2020** [2]	**2009–2020**
LSU bovine %	79.8	83.5	89.8	70.7	−19.1
LSU sheep %	10.3	7.7	4.5	18.9	+14.4
LSU goats %	14.7	11.8	5.4	7.8	+2.4
Agricultural holdings	10,20	5.061	2.116	1.237	879
AAU (ha)	124.85	111.10	97.92	74.53	−23.38

[1] Madrid Statistics Office. [2] Spanish Statistics Office.

These changes have occurred in conjunction with a shift in the population density, which has increased in 47 of the 49 municipalities analyzed, even though virtually 50% of the municipalities maintain a population density below 50 inhabitants per km^2 [87]. Another indicator of interest is the average age of the population, which increased from 41.2 to 44 years of age between 1998 and 2018, although population aging (people aged 65 years and over) decreased in this period from 1996 (20.17% of the population) to 2018 (19% of the population). Nevertheless, the maximum value of the average age was 45.28 years old in 1996, while it reached 49.92 years old in 2018 (Spanish Statistics Office: see Figure 10). Two categories of municipalities can be considered in the light of these changes in population aging: those in which it reduced (24%) and those where it increased (76%). The most remote municipalities and those furthest from Madrid city center are identified as the most rural, while the rest are located under the area of influence of metropolitan Madrid. The representation of women in these populations decreased from 0.95 to 0.91 between 1996 and 2018, reinforcing this tendency. Most of the municipalities (23 out of 49) that experienced a reduction in population aging were among those located furthest from the city of Madrid [87].

5. Discussion

The results present a landscape with a large number of features that reflect its singular character and identity. Many of these landscapes are undergoing a rapid and unstoppable transformation, tending to disappear due to abandonment and a lack of use. As such, and with some urgency, there is a need to identify and recognize this heritage, as indicated in different guidelines and documents regarding landscapes [1,88,89].

This landscape preserves a natural patrimony that has undoubtable value and that has suffered important modifications in the past 70 years. As they remain visible, the silvo-structures begin to be better defined and especially in terms of the tree cover, such as *Fraxinus* sp. and *Quercus* sp. The decrease in the concentration of cattle, in conjunction with a more limited functionality of the system, has favored the progression of the arborescent scrub species, and in general, thorny scrub, covering a large part of the walls and generating

densely vegetated borders. This dynamic is especially intense in the colder and more humid areas: the northeastern sector, Somosierra, and the central sector, Valle de Lozoya. The increase in the density of the hedges and the tree growth is not the most worrying aspect. The less intense animal exploitation and the abandonment of traditional uses have extended to the interior of the enclosures, leading to a disappearance of the heterogeneous mosaic of uses and favoring homogenization. In turn, this has generated a lignification of the grasslands and, in general, a progressive loss of the cultural landscape [89–91]. One exception, as indicated above, is that of *Fraxinus angustifolia*, which is still maintained, especially in the central and southwestern sectors, due to its complementary exploitation (fodder–firewood) via pollarding. The persistence of this species is based on economic considerations (summer fodder when green) and identity. Along these lines, in recent years, incentives have been introduced to maintain and promote this practice (accesed on 6 September 2022: https://www.elboalo-cerceda-mataelpino.org/2022/10/26/fiesta-del-trasmocho-2022/), in accordance with the experiences in other sectors in the Iberian peninsula [92] and central Europe [93–96].

In addition to the patrimony associated with traditional practices, there is a cultural heritage of undeniable value, which, despite pertaining to the area of study, is not recognized or managed beyond its inclusion in the List of Intangible Cultural Heritage of Humanity, in contrast to other Mediterranean sectors [46]. The proximity of Metropolitan Madrid to the Sierra de Guadarrama has for centuries made this an area of special scientific and artistic interest, contributing to the visibility and notoriety to these landscapes [97–99]. This association between the territory and its artistic value can be intensified and maintained by the tendencies of the artists who bring together artistic and environmental concerns (https://www.elcuboverde.org/, accessed on 10 February 2021). Together, this should be incorporated as an objective to achieve a more active and renewed sensitivity towards this patrimony and these landscapes, stimulating the participation of the society that contributes to this landscape.

From a functional point of view, the rural landscape in Europe, and specifically in Mediterranean territories, suffered the consequences of dynamic abandonment and territorial transformations during the XX century, fundamentally the simplification of a complex and multifunctional landscape towards achieving a much more homogeneous one [2,23,33,38,44,62,100]. However, efforts should be made to ensure that the essential elements responsible for establishing the character of the landscape are maintained, correctly preserved, and interpreted [1]. In this sense, the field enclosures that have been destroyed and that are not maintained are those that require the most urgent attention.

The changes in the traditional management of enclosed fields caused by shifts in social and economic models has led to a widespread homogenization of this productive system. This more limited productive functionality of the landscape has brought about a loss of diversity in the habitats [61]. These phenomena, conditioned by the proximity of Metropolitan Madrid, dominate the southern mountain slopes. In turn, many farmers have abandoned their activities to search for more comfortable jobs in the city or more urban areas. This has enabled the population remaining in these spaces to increase their livestock population and to acquire the land of the migrating population through purchase or lease. In the latter case, it is common to make livestock farming compatible with other activities [38].

Hence, this landscape is decreasing and it is languishing at present, although it can attract tourists at the weekends who are looking to take advantage of these territories, to enjoy the conjunction of the landscape, rural activities, and the conservation of the livestock management. That is, there is presently a demand for a living rural landscape, cared for and maintained, in which enclosed field are the protagonists, for example, in the Lozoya valley at the heart of the Sierra de Guadarrama National Park. However, the temptation of assigning responsibility for the maintenance of this agricultural landscape to the local communities, and more specifically to the livestock farmers who are the authentic creators of these landscapes, must be avoided. It is also interesting to contemplate the

role that these territories should assume, beyond that of a museum-like conservation that could be of interest to the urban population [61]. As such, it makes sense to ensure this landscape remains productive, the true driver of its management, and that by maintaining these activities, the distinguishing features and patrimony are preserved, as well as its environmental value. The proximity to a great metropolis, like Madrid, can be the key to not only fulfil this weekend role, but also to constitute a Territorialized Agroalimentary System, as proposed elsewhere [74]. Of course, all these considerations should be shared by all the territorial actors that make up and contribute to this landscape [68,101].

A necessary political action is critical to the conservation of the enclosed fields and it depends to different extents on a wide variety of entities. The shift towards the sustainable management of these agrarian systems can be provoked by the Common Agricultural Policy (CAP) [102], bestowing these agrosystems an adequate patrimonial, cultural, biological, and productive value. In this sense, enclosed land parcels can benefit from CAP funds for the period of 2023–2027 as part of the catalogue of interventions in Spain's Strategic CAP Plan [102]. The CAP Plan contemplates the maintenance or improvement of habitats and traditional agricultural activities that preserve biodiversity, commitments to agroforestry systems, the promotion and sustainable management of pastures, or investment in the transformation, marketing, and/or development of agri-food products, among others (see Table 6). Specifically, this plan considers the possibility of including them within the eco-regime, "Extensive grazing, mowing and biodiversity in Mediterranean pasture landscapes" (Intervention Code: 1PD31001801V1), in which possible practices to comply with extensive grazing include the establishment of islands of biodiversity and sustainable harvesting.

Table 6. Rural development interventions under Regulation (EU) 2021/2115. Modified from Spain's CAP Strategic Plan (2022).

Code	Intervention in Spain's Cap Strategic Plan for Which Funding Is Provided	Budget (€)
6501.6	Agri-environmental commitments to agricultural land. Maintenance or enhancement of traditional habitats and farming activities that preserve biodiversity	19,164,164.00
6502.2	Commitments to maintain forestry and agroforestry systems	25,050.00
6501.3	Agri-environmental commitment to agricultural land. Commitment to the promotion and sustainable management of pastures	2,615,218.00
6844	Grants for non-productive investments in agricultural holdings linked to climate change mitigation–adaptation; the efficient use of natural resources and biodiversity	4,500,000.00
6842.2	Grants for investments in the processing, marketing, and/or development of agri-food products	73,461,253.84
6881.1	Non-productive forestry investments in afforestation and agroforestry systems	23,412,872.48

On a national scale, the National Plan for Cultural Landscapes [88] offers the opportunity to re-establish the specific goals in the UNESCO declarations regarding these agricultural landscapes. Finally, the local administrations closest to the territories and communities should also develop adequate instruments and policies. For example, the case studied here is situated in the National Park of the Sierra de Guadarrama, and its governance (Uses and Management Master Plan) refers to the specific manner of managing and protecting the enclosures as cultural patrimony [103] (see Table 7), but there is no other regional document that mentions enclosed fields, their maintenance, and the ordinances or strategies regarding their patrimonial situation.

As such, there are intentions and possibilities to maintain these landscapes, although there is no regional or national strategy capable of extending these actions to the entire territory and not only to the most intensely protected spaces. Along these lines, the French initiative of the Pact for Hedges [104], promoted by Agriculture and Food Sovereignty, stands out, which aims to halt the destruction and degradation of hedges and to increase their extension by 50,000 km by 2030.

Table 7. Key articles for the survival and conservation of the enclosed fields. Uses and Management Master Plan of the Sierra de Guadarrama National Park.

Article	Text
Article 19. Criteria for landscape conservation	5. The conservation of traditional dry stone walls will be promoted, as will that of hedges and boundaries, or other traditional elements of the landscape that favor biological diversity and connectivity.
Article 20. Criteria for the conservation of tangible and intangible cultural heritage	2. The management of the national park must take into account the diverse cultural manifestations in this park, such as the elements that explain the symbolic identities pertaining to, and with their roots in, the local population. These explain the emotional attraction and satisfaction of visitors, and they help to establish the intergenerational connection with the lifestyles of our ancestors.
Article 43. Landscape and connectivity protection	7. The elimination of traditional walls and other lineal elements of the landscape (hedges, boundaries, etc.) that favor the maintenance of the biological diversity and connectivity.
Article 61. Livestock developments	8. Stone enclosures will be potentiated and maintained, and will not be substituted by others, with existing small infrastructures or folds being restored or rehabilitated.
Article 77. Cultural heritage conservation sub-program	(a) The elaboration of a catalogue of cultural material and immaterial assets that exist within the park, in collaboration with the relevant administrations, and facilitating citizen participation. (b) Promotion of the susceptible elements in the catalogue to be declared as material of cultural interest. (d) Collaboration with the competent administrations to implement conservation measures in relation to the elements of the catalogue of cultural assets, material and immaterial, in the park.

6. Conclusions

1. In the Mediterranean region, the preservation of enclosed landscapes is under significant threat, such as those from aggressive urbanization projects and the general abandonment of traditional practices. Although changes in their functionality are necessary, it is fundamental to identify those elements that enable them to maintain their essential morphologies.
2. This type of agro-landscape system has generally shown some reluctance to disappear and it has been reinvented by incorporating new functionalities into existing structures, modifying keys aspects that underlie their interpretation despite maintaining their visible imprint on the terrain.
3. Despite the fact that such changes have affected their functioning, land parcels of a medieval origin can be identified that have survived from the end of the 13th century to the present day. These small parcels of land are one of the keys to the survival of this landscape, considered to be areas with a disproportionate environmental importance in relation to their size. These are spaces of special interest since they represent an efficient link between biodiversity and productivity.
4. Long-term management, in which traditional practices and a modern productive system can coexist, is required to ensure the preservation of these land parcels. In addition, this management should be carried out over areas large enough to have consequences at a regional level.
5. The participation of regional and local administrations is essential to protect this heritage and keep it alive, as well as to recognize it as a tourist resource that shows the identity of the territories in which it is developed.
6. It is still necessary to complete the characterization of some of the most unique heritage landscapes of Europe, and progress in these areas of research is critical to fully interpret the current state of these territories and their dynamics.
7. The importance of these spaces as biodiversity banks, as raised by us previously, should be more explicitly recognized in the EU Habitats Directive. Thus, one of the main challenges related to enclosed fields in continental Mediterranean mountain areas is to achieve compatibility between livestock practices and biodiversity conservation. From the perspective of political action, the new CAP is perhaps the best way to preserve the natural and cultural heritage of the most threatened enclosed landscapes in mainland Europe.

8. It is advisable to create knowledge networks linking the communities that live in and build these landscapes in Mediterranean Europe. This can be possible through a recognized figure that includes them in the List of Intangible Cultural Heritage of Humanity "Art of dry stone walling, knowledge and techniques".

A number of questions and issues remain open for future research. Firstly, we need to look more closely at the tangible and intangible values of this agro-landscape and its relationship with biodiversity conservation. Secondly, we must raise the following questions: can local communities, who are the creators of this agro-landscape, continue to maintain it? What is needed to preserve this rural heritage?

Author Contributions: Conceptualization, N.L.-E. and F.A.Á.; methodology, F.A.Á. and N.L.-E.; resources, P.M.-H. and N.L.-E.; writing—original draft preparation, N.L.-E., F.A.Á. and P.M.-H.; writing—review and editing, N.L.-E., F.A.Á. and P.M.-H. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Spanish Ministry of Science and Innovation PID2019-105711RB-C61/AEI/10.13039/501100011033. Project: "Multifunctional and territorialized agri-food systems in Spain. Conceptualization and governance. Case studies were conducted in in Madrid and Castilla-La Mancha (SAMUTER MadClM).

Data Availability Statement: The data are available upon justified request.

Conflicts of Interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Extension of Enclosed Fields in Each Municipality in 1956 and 2020

Municipality	1956 (ha)	% 1956 *	2020 (ha)	% 2020 *	ha Lost 1956–2020
Alameda del Valle	606.8	24.3	204.5	8.2	402.3
Alpedrete	272.2	21.5	89.7	7.1	182.5
Becerril de la Sierra	822.0	27.9	410.7	13.9	411.4
Braojos	764.6	30.7	216.0	8.7	548.6
Buitrago de lozoya	656.6	25.3	254.7	9.8	401.9
Bustarviejo	1417.8	24.9	906.0	15.9	511.8
Canencia de la Sierra	991.2	18.8	502.4	9.5	488.9
Cercedilla	582.6	14.2	321.5	7.9	261.1
Collado Mediano	703.0	31.4	362.5	16.2	340.5
Collado Villalba	579.6	21.9	190.0	7.2	389.6
Colmenarejo	1247.2	39.4	385.9	12.2	861.4
El Berrueco	1558.0	54.7	268.8	9.4	1289.2
El boalo	1524.1	38.5	918.5	23.2	605.6
El Escorial	1671.3	24.3	864.1	12.6	807.2
Fresnedillas	1356.2	48.1	353.2	12.5	1003.0
Galapagar	2041.3	31.5	616.7	9.5	1424.6
Garganta de los Montes	1727.5	42.8	855.9	21.2	871.6
Gargantilla del Lozoya	1671.0	68.9	704.0	29.0	967.0
Gascones	541.5	27.0	237.1	11.8	304.4
Guadarrama	1760.9	30.9	848.3	14.9	912.6
Horcajo de la Sierra	1078.0	50.9	360.9	17.0	717.1
Hoyo de Manzanares	409.6	9.1	149.0	3.3	260.6
La Acebeda	614.7	28.1	79.3	3.6	535.4
La Cabrera	894.3	40.5	292.5	13.2	601.9

Municipality	1956 (ha)	% 1956 *	2020 (ha)	% 2020 *	ha Lost 1956–2020
La Serna del Monte	420.1	76.2	163.4	29.6	256.7
Los molinos	722.8	37.0	495.0	25.3	227.8
Lozoya del Valle	1275.1	22.0	246.1	4.3	1029.1
Lozoya-Navas-Sieteiglesias	2660.5	51.7	1290.4	25.1	1370.1
Madarcos	221.3	25.9	117.3	13.7	104.0
Manzanares el Real	1845.3	14.4	780.7	6.1	1064.6
Miraflores de la Sie.	2367.6	41.9	1532.8	27.1	834.7
Moralzarzal	849.7	19.9	435.9	10.2	413.9
Navacerrada	312.0	11.4	103.2	3.8	208.8
Navalafuente	885.3	72.7	212.6	17.5	672.8
Navarredonda	807.2	29.4	173.0	6.3	634.2
Pinilla del Valle	697.3	38.2	195.2	10.7	502.1
Piñúecar	1111.0	43.0	635.8	24.6	475.2
Puentes viejas	2114.6	36.1	651.3	11.1	1463.4
Rascafria	1548.3	10.3	599.8	4.0	948.5
Robledo de chavela	2201.6	23.7	917.7	9.9	1283.9
Robregordo	282.5	15.4	21.5	1.2	261.0
San Lorenzo Escorial	306.5	5.4	214.7	3.8	91.8
Sta Mª de la Alameda	2398.0	32.2	853.2	11.5	1544.8
Somosierra	296.0	14.5	85.9	4.2	210.1
Soto del Real	2673.9	61.9	1645.5	38.1	1028.4
Valdemanco	549.7	30.9	291.1	16.4	258.7
Valdemorillo	4313.7	46.1	1852.9	19.8	2460.8
Villavieja del Lozoya	780.7	32.6	115.8	4.8	664.9
Zarzalejo	932.7	45.2	602.2	29.2	330.4
Total	58,065.1	1613.8	24,624.9	656.2	33,440.2

* Total surface area of the municipality.

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