



# Water Communities on the Northern Slopes of the Guadarrama Mountain Range

Mar Pinillos Rodríguez and David Martín Carretero

## Abstract

Guadarrama is a mountain range located in between the provinces of Madrid and Segovia. On the northern slopes, the population settled on the foothills, where, in the medieval period, they built *caceras* (ditches/canals) to draw water from the streams and irrigate the surrounding fields. This chapter spans two main issues that have yet to be studied in this area: the communal management of the water and the irrigation systems and the ecosystem services provided by the *caceras* as ecological corridors and biodiversity reserves. The *caceras* act to slow down the water speed of the streams, widening the effect of these waters and creating a microclimate. The flooding of the lands alongside the ditches not only generates meadows and pastures with ash trees, ensuring a great diversity of species (amphibians, orchids, etc.), but also forms natural water deposits and provides water in the dry season. This is supplemented by the waters that issue slowly from natural springs and feed fountains, both for the supply of the local population and for maintaining the ecosystem. This study looks at the way in which this water management system, handed down from generation to generation, constituted a master class of culture, hydrology, agronomy and the environment that has hitherto been undervalued and now verges on near extinction.

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M. Pinillos Rodríguez (✉) · D. Martín Carretero  
Tenada del Monte, Segovia, Spain  
e-mail: [info@tenadadelmonte.es](mailto:info@tenadadelmonte.es)

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## 1 Introduction

The province of Segovia is located in the centre of the Iberian Peninsula, with its southern border formed by the Central System Mountain range, divided into different areas, including the Guadarrama mountain range.

The Guadarrama mountain range acts as a large water reservoir, due to its winter accumulation of snow, which is then gradually filtered through surface aquifers during the thawing period. Mountain rivulets and streams owe their continued water flows to these reservoirs during drought seasons, fed by the natural springs that appear at the surface (Mejías et al. 2015: 180–186). However, these streams run rapidly down through steep, narrow and cold valleys, while the population live on the lower, flatter and sunnier reaches of the mountain range. Therefore, recourse to gravity represented the only means of transporting the water from the source stream along irrigation channels, or *caceras* (Sintes et al. 1994: 22–3).

There are no complete studies explaining the communal usage and management of water in detail (Graña 1992: 79–84). However, these ditches, and their almost millenary remains, constitute signs of our land culture and a tradition of cooperation in favour of the common good. The survival of rural communities provides the key to the origin of these systems, even while they also hold relevance as ecological corridors that generate cultural landscapes and biodiversity (Plaza and Guzmán 2010: 258).

In this research, we have studied an area comprised of seven water systems and communities on the northern slope of the Guadarrama Mountain Range (in Segovia Province). This area is coherent from a geographical, historical and social point of view, and hence the cases are comparable. The analysis has drawn on three core sources of documentation:

- Personal, semi-structured interviews with key witnesses. In total, we interviewed fifty-two people. They were all aged between seventy-five and ninety years old and currently live in twenty-six different villages. These interviews focused on water management, governance, traditional ecological knowledge, land uses and recent changes in practices and the territory.
- A literature review, including primary sources from the historical archives of Segovia Cathedral, and the Provincial and Municipal archives of Segovia, Basardilla, Caballar, Santiuste de Pedraza, Turegano and Torre Val de San Pedro. In addition, we also reviewed the scientific literature related to the historical irrigation system from the agricultural, hydrological, ethnographic, historical and cultural perspectives.
- Finally, we carried out fieldwork to study the systems and their conservation in detail, alongside their usages by the local population and the ecosystem services thereby generated, particularly flora and fauna analysis, to this end, deploying specific biological methodologies for sampling, identifying and documenting the associated biodiversity.

## 2 Communal Management and the *Juntas del Agua*

One of the most interesting aspects of water management is its communal use: the systems and water are shared by different villages and regulated by the *Juntas del Agua*. These are institutions composed of representatives from the participating villages established to manage, organize and guard the waters, and make decisions about water-related topics. These are water courts similar to the famous “Aguas de Valencia” Court, now registered as a UNESCO World Heritage site (Giménez and Palerm 2007: 12–17).

In this research, we approached seven of these *Juntas del Agua*. Six manage water sourced from rivers, with the seventh overseeing a natural spring water source. Some of the old settlements taking part in each system have disappeared over the course of history. They are, however, detailed in the historical sources and the different local by-laws that regulate each *Junta del Agua*. The following list includes all of the historical villages belonging to each *Junta* and the dates of the first preserved by-laws:

- Cacera de Navalcaz (1515, with earlier versions lost), made up of the following villages: Rosales, Aldeanueva, Juarrillos and Gallococeado (Cacera de Navalcaz by-law, 1515).
- Cacera de Cambrones (1401), integrated by Palazuelos, Tabanera, Sonsoto, Trescasas, San Cristóbal, Aragoneses and Ojalvilla (Cacera de Cambrones by-law, 1401).
- Cacera de San Medel (1734, with earlier versions lost), made up of: Torrecaballeros, La Aldehuela, Cabanillas del Monte, Tizneros, Espirido, La Higuera, Brieva, Adrada, Basardilla, Santo Domingo de Pirón, Pajares and Adradilla (Cacera de San Medel, 1734).
- Cacera de Río Viejo (1221–1510), made up of: Sotosalbos, Pelayos, La Cuesta, Berrocal, Carrascal, Aldeasaz, Las Navas, Losana, Tenzuela, Torreiglesias, Collado Hermoso, Robledillo, La Mata, Requijada and Yertega (Cacera de Río Viejo, 1510).
- Cacera de Arroyos Truchas y Pinar (1497), made up of: Torreval de San Pedro, Valle de San Pedro and Chavida (Carpeta de aguas, 1497).
- Cacera de Ceguilla (1551), made up of: Ceguilla, Las Navas and Galíndez (Cacera de Ceguilla by-law, 1551).
- Cacera de Caballar y Turégano (1588), made up of the villages of Caballar and Turégano (Acuerdos, 1588) (Fig. 1).

We agree here with M. Graña and his emphasis on the importance of water in the past historical process of settlement from the Medieval period: “Water was a decisive point in the installation of villages and, therefore, in their organization of the spaces and fields for exploitation. From a strictly physical and geographical point of view, water and its activities could be considered as a basic instrument in



**Fig. 1** From left to right: Caceras of Navalcaz, Cambrones, San Medel, Río Viejo, Arroyos Truchas y Pinar, Ceguilla and Caballar and Turegano. Archive Tenada del Monte

the task of colonizing the rural environment, a task involving all the social elements” (Graña 1992: 84–5).

These ditches may possibly have dated from the eleventh century, when the lands of Segovia were repopulated by King Alfonso VI, following their conquest from the Muslims in 1076 (González Herrero 1974: 367). They might even have pre-existed that date, extending back into the Islamic period of al-Andaluz. Nevertheless, the earliest preserved written document concerning communal riverbed water resource usage dates to 1221. This document refers to an agreement between the Cistercian Santa María de la Sierra monastery, in Collado Hermoso, and several other villages over recourse to the waters of the Viejo River (Acuerdos, 1221).

As stated above, the Juntas de Aguas were organized by means of by-laws, written mainly over the course of the fifteenth and sixteenth centuries (Pinillos and Martín 2005: 27). However, these documents mostly refer to an earlier, ancient and immemorial tradition. Their members generally met at fixed places, normally on rocks or rocky hills located near the boundaries between territories (Pinillos and Martín 2015: 30). These significant meeting places also bestowed the name on the

institutions as ‘junta,’ literally meaning ‘meeting.’ For instance, the Junta of Navalcaz was entitled the Junta de Peñaslenguas, that of the Cambrones River, the Noble Junta de Cabezuelas, while, for the Viejo River, there was the Junta de la Manzaneda. In turn, the Junta of San Medel met beside a hermitage dedicated to La Magdalena, in Ceguilla, on a rock named La Peñuela. Finally, the water community established between Caballar and Turégano used to meet in a place called Peña de la Cruz. However, we have no information about the site where the community of Truchas and Pinar met. Trials related to offences and failure to comply with the by-law took place in these special places, as did the swearing-in of members for the different positions in the Juntas. On one of the rocks, there was once an engraved cross over which oaths were made.

The essential figures in these water management systems are the Juez de Aguas, the Guardas de Aguas and the Voceros. The Juez de Aguas (Water Judge hereafter) constituted the highest authority in the Junta de Aguas. Depending on the respective Junta, this position received different titles. In Navalcaz and Cambrones, the highest authority was the Alcalde de Cartas, in San Medel, this person became the Alcalde de Pastores, Rio Viejo appointed the Fiel del Agua, and the Ceguilla and Arroyos Truchas y Pinar systems had an Alcalde de Aguas as their overseer, while we lack any information for the situations of Caballar and Turégano.

These positions typically rotated from village to village each year, except in the cases of Rio Viejo and the Ceguilla, where the Water Judge always came from Sotosalbos and Galindez, respectively. Each rotation also involved transferring the *Cartas* (“letters”), the documents generated by the Junta de Aguas (by-laws, minutes, lawsuits, etc.), from the outgoing figure of authority to the successor. Throughout centuries, these documents were stored inside of wooden chests or tin cases (as in Navalcaz).

Other figures essential to water management include the Guardas de Aguas (Water Guardians hereafter), called Aguaderos in Cambrones, Navalcaz and Caballar and Turégano; Pastores del Agua in Rio Viejo and San Medel and Guardas de la Cacara in the Arroyos Truchas and Pinar and Ceguilla water systems.

The Water Guardian was charged with caring for the common infrastructures and, correspondingly, not only repairing any existing flaw, but also reporting any failure to comply with the by-laws or water theft. In the Junta established between Turégano and Caballar, the Water Guardian was also in charge of regulating the water that ran back and forth between the two villages.

The Water Guardians in the San Medel system were the people from each village entitled to supervise the ditches on a communal and weekly basis, impose fines and extract water for their villages at the appropriate places and on specific dates. Regarding the Rio Viejo ditch, apart from communal weekly control, members were also placed in the council’s service at any moment during a water shortage. The election of the Water Guardian in each village commonly took place through an auction held during council meetings, with their duration limited to the irrigation period, generally from April until the end of September (*Libro de Vecindad de La Cuesta*).

The Water Guardian profession is as ancient as the Juntas de Agua, and they correspondingly appear in all of the by-laws. Their work, quiet and complicated because of the conflicts generated by communal water usage, required a great deal of discernment, fairness and firmness.

Finally, the Vocero, present in every Junta de Aguas, held responsibility for instructing people to attend meetings or repair the *caceras* (Fig. 2).

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### 3 Communal Maintenance

As with any other infrastructure, *caceras* need annual maintenance and cleaning, as vegetation grows and branches and leaves fall, blocking and/or closing the river channel, and thus hindering normal water flows. “That traditional management not only offers advantages to farmers but also promotes plant diversity and ecosystem services” (Sanchez et al. 2018: 396–402).

Several kinds of labour are required for maintaining the ditches. The first involves cleaning the main ditches, achieved by communal work, with people coming from every village involved in each irrigation system. The second corresponds to cleaning and maintaining the ditch branches that irrigate each village, carried out by labourers from each respective settlement. Finally, there are communal areas, such as pastures, that also need communal maintenance. Communal works are called *hacenderas* and, as a general rule, although there are some exceptions that we specify below, it was mandatory for all village residents to attend these cleaning sessions, with any absence resulting in monetary fines.<sup>1</sup>

We have studied two ditch systems: one that now receives communal management (Cambrones, San Medel, Truchas and Pinar and Caballar) and another that does not currently benefit from this communal maintenance (Ceguilla, Navalcaz and Rio Viejo). During this research, we participated in the Cambrones, San Medel and Truchas and Pinar cleaning days. In the Caballar, Ceguilla, Navalcaz and Rio Viejo ditches, we also carried out personal interviews with community members. Thus, this chapter constitutes a summary of all of the oral information collected and then compared with the historical by-laws.

The communal cleaning of the main ditches took place on the same dates as those established by the ancient by-laws. As detailed below, this correspondingly preserves some extremely interesting traditions. In the Cambrones ditch, the cleaning is carried out on the last Saturday in May. At dawn, as the historical tradition stipulates, the Water Judge and the rest of the Cabezuelas Junta meet in the place known as “La Madre” (The Mother) in order to close the lock-gate that diverts water from the Cambrones river into the ditch. This is the day of the *Cacera Mayor* (the main ditch or the ditch section common to all villages).

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<sup>1</sup>Information collected in interviews with ditch users.



**Fig. 2** Pastores del agua (Water Guardians) in Cacera de San Medel. Archive Tenada del Monte

Each village taking part in the maintenance oversees two *quintos* (sections hereafter), which are the ditch sections whose lengths have been interrelated according to the amount of water or *caces* corresponding to each village. After the water supply is shut off, the riverbeds are cleansed of sediments, leaves, branches and grass, with the Junta members working on short sections of the ditch. They then take a mid-morning break. After taking care of this “institutional section,” the maintenance of each village section that forms part of the Cambrones hydraulic system begins, in the following order: Sonsoto, San Cristobal, Trescasas, Tabanera, Palazuelos and La Lastrilla.

The border between each section is marked and defined by a cross and a half moon, both dug into the ground with mattocks by the neighbours. This tradition suggests that the design and digging of these ditches might trace their origins to the first phase of the repopulation of Segovia around the eleventh century, as these signs seem to depict symbols of the coexistence and collaboration between Christian and Muslim communities.

After the cleaning phase and lunch, a prayer is said over each section. This prayer has survived down into contemporary times through oral tradition. The *peones* (labourers hereafter) kneel down and the oldest person in the group leads the prayer. Once it ends, people continue talking, drinking and playing cards until

the water again flows through the ditch, following the opening of the lock gate. This signals that it is time to return home.<sup>2</sup>

On the following day, the Water Judge, accompanied by the rest of the Cabezuelas Junta, inspects the cleanness of each section and discusses any pending issue. The following week, they celebrate a communal meal dedicated to bonding and replacing the Water Judge (Fig. 3).

*Creazon* day is when the villages of Cacara de San Medel, which, as stated above, is made up of the villages of Torrecaballeros, La Aldehuela, Cabanillas del Monte, Tizneros, Espirido, La Higuera, Brieva, Adrada, Basardilla and Santo Domingo de Pirón, join together to clean their ditch system. This takes place on the Saturday prior to Saint John's Day in June, in accordance with the 1734 by-law regulation. This by-law defines the number of labourers in each place and their respective organization (San Medel by-law, 1734).

Several days before the communal cleaning celebration, the mayor of Torrecaballeros sends a letter to every village notifying them of the day and time to meet. On that day, at 11:30am, the Water Guardian and labourers from each village meet at a place called "Cerca del Romo" or "Las Cruces de la Junta." As soon as they arrive, they carve out the name of their villages, along with a cross, with their mattocks, renewing the previous carvings dug a year earlier. Either the mayor of Torrecaballeros or the person whom he delegates shouts out each village's name. The Water Guardian of the said village replies by indicating the number of labourers that have come with him, a number that the mayor then repeats aloud. After checking the attendance from the different villages, the Lord's Prayer is said, both in memory of the ancestors who founded the *cacera* and for all of the people who have performed this task previously, as a way of starting the *creazón* or *criazón* (the ditch cleaning maintenance).

The mayor divides the labourers into two groups: one group heads upstream from the distribution point, called the *Tercio* ("one third"), with the Santo Domingo labourers, while the second group starts cleaning downstream of the dam, but along the same watercourse. Both groups meet at the Romo watermill. Labourers and Water Guardians gather together there to rest while chatting about the ditch and other everyday details.

After the mid-morning snack, both groups set off to carry out their respective tasks. A person named by the mayor organizes each group, ordering them as what they are to do and then checking on their labours. When both groups finish their tasks, at around 2:30 pm, they eat in the same place where they had their mid-morning snack before playing cards. Later, they recite the Lord's Prayer again, indicating that the moment of farewell until next year has arrived. The following day, they return to the ditch to verify whether the work has been properly done.<sup>3</sup>

<sup>2</sup>Collected during technical visits made on "Cacara Mayor" Day (Ditch cleaning) from 2004 to 2018.

<sup>3</sup>Collected during technical visits made on "Creazón" Day (Ditch cleaning) from 2004 to 2018.





**Fig. 3** Communal cleaning in Cacera de Cambrones on the last Saturday in May. Archive Tenada del Monte

In Cacera de Navalcaz, the communal cleanings no longer take place. According to an agreement signed in 1867 (Bases, 1867), the Segovia council took charge of the safe-keeping, preservation and repair of the ditch system. In this agreement, the parties did not extract the summer surplus in order to allow the water to follow its course and ensure that the Clamores River never ran dry, because it was necessary for the functioning of different industries. Until then, the 1515 by-law, which was diligently followed, had dictated the ways in which each common stretch of the system should be cleaned and who should clean them. Following the agreement, the council of Segovia committed itself to appointing two Water Guardians, one who lived in the city, the other in Valsain, with each walking along the ditch in opposite directions; one would walk from the source to Segovia and the other from Segovia to the source, each whilst checking the ditch's condition. These Water Guardians submitted reports detailing the conditions of the channel flow to the municipal architect and requested either improvements or money for repairs. The last Water Guardian retired in 2005. Nowadays, in order to carry out cleaning or any channel repairs, the respective parties have to reach an agreement with the Junta de Aguas and then send the respective documentation to the Segovia council, which undertakes the work.<sup>4</sup>

<sup>4</sup>Interview with Julian García Tejero, farmer of “quinto del Mercado” (Mercado section—Segovia) (2005).

Another ditch without any current maintenance is the Cacera del Río Viejo. Currently, the cleaning days are only symbolic and only cover some sections belonging to a few villages. The Cacera del Río Viejo was made up of councils from different jurisdictions: the Community of Villa and Land of Pedraza and the City and Land of Segovia. The organizational complexity constitutes one of the distinguishing features of this system, as, apart from the meetings and common cleaning sessions held by both jurisdictions, each also had their own dates for meeting and section-cleaning.

The cleaning of the ditch common to all villages took place on the fourth day of Pentecost at 11 am. Five men from each village held a board meeting by the “El Paredon” fountain in Mata del Fraile (oak tree forest) to “collect” the water and channel it into the ditch in order to first fix it and then clean it (González Herrero 1994: 75).

Concerning the riverbed that forks towards the Land of Pedraza, we know from the different trades sent out by some councils in the 20th century that they met between July and August at the place called “El Molinillo.” Each village was represented by a certain number of people (Oficios de limpieza, 1953).

Regarding the stretch of the Cacera del Río Viejo that runs through the Land of Segovia, here, the organization proved somewhat more complicated, due to the numerous divisions existing among the different villages.

In fact, two different Juntas de Aguas existed: one for the councils of Sotosalbos and Pelayos, a jurisdiction of “the most revered masters Dean and Cabildo of the Cathedral Church of Segovia,” and another for the remaining villages, a jurisdiction of the “most noble and loyal city of Segovia,” which made up the so-called Junta de Aguas del Peral. Brought together, they became the Junta de Aguas del Roble (González Herrero 1974: 401).

By 1508, both parties had reached an agreement to put an end to their mutual disconformities through drafting a by-law that settled the punishments, as well as the water distribution. On the first Saturday in April, a board meeting would take place in Pelayos (in the place called Los Robles) with six Water Judges, twelve Water Lawyers and six Water Guardians in order to clean the *cepos* (the site of water distribution) and *calderas* (a type of pond), as well as clean and inspect the water (González Herrero 1974: 402) (Fig. 4).

Another ditch system that has suffered from neglect of its communal maintenance and cleaning is the Cacera del Río Ceguilla. Three *cuadrillas* (teams hereafter) once cleaned the stretch from the first division to the dam that captures the water. At first, this would take place on the Wednesday of the Holy Spirit Octaves, but, during the twentieth century, it was moved to the last Monday of April.

The Galíndez Water Judge was in charge of submitting requests to the Confederación Hidrográfica del Duero (the river basin authority) and making proclamations announcing the date and time of the ditch cleaning. The day before cleaning, the water was cut off so that, should any trout appear, they might be returned to the river.



**Fig. 4** *Caldera* in the Cacera del río Viejo. Archive Tenada del Monte

Before meeting the other two teams, the Galíndez labourers first cleaned a ditch section in the area called “Calleja Ancha.” After cleaning this, they would head off to meet the rest at the *dientes* (splitting point) of Carrapinar and engage in communal ditch-cleaning.

The groups cleaned by sections. The Water Lawyer, along with his group, accompanied them and provided the labourers with wine and refreshments. After cleaning, the teams joined together to eat in the evening and the Galindez Water Judge would swear an oath in “El Raso.” As in most Juntas de Aguas, the effectiveness of the cleaning efforts was subsequently inspected. Hence, the following week, the Galíndez Water Judge would receive the oaths of the Water Judges from the two other teams (Ceguilla y Las Navas).<sup>5</sup>

Along the Cacera de Truchas y Pinar streams, the stretch that historically corresponded to the council of Santiuste de Pedraza was piped for domestic use many years ago, and thus it today runs along its riverbed only in years of heavy rain. The Arroyo Pinar ditch carried the water for irrigation and supplied the Sorreoyo fountain, which catered to residents in the village of Urbanos.

<sup>5</sup>Interview with Leandro Vicente Arcones (RIP), the last Water Judge of Galindez (2006).

In spring, labourers from La Mata and Chavida would clean the watercourse, meeting in the stream itself. They would then distribute themselves approximately every four steps across its whole width. At the “Fuente Blas,” they stopped to eat before continuing cleaning as far as “Prado Cercón.”<sup>6</sup>

According to the testimonies gathered, they never met their neighbours from the other council of Torre Val de San Pedro, who were the other water beneficiaries. The most historical news concerning when and how the latter cleaned the system comes from a complaint filed by this council in 1899 against a neighbour from Navafria concerning the theft of water from the ditch system (Carpeta de Aguas, 1899). Testimony accounts state that cleaning took place the day after the feast of Saint Peter in June, even though they tried to keep this to a Saturday or Sunday. On cleaning day, neighbours from El Valle and Torre Val worked on their respective ditch sections as far as the distribution point (*dientes*), and from there onwards jointly as far as the dam. Other neighbours went up to the springs to “collect” the water: the Bañaderos and Hiruela fountains on one side and the Sabuca stream on the other, in order to boost the flow of water.

The evening meal was celebrated in the “Pradera de las Vigas.” There, some papers (some kind of regulation) were read out before the members of the Junta de Aguas were proclaimed for the following year.<sup>7</sup>

Nowadays, a council announcement convenes its residents to join the communal works. Attendance is no longer compulsory, but some neighbours normally take part, dividing the cleaning tasks among themselves. The council pays for refreshments and food in compensation for the work done, generally once they have returned to the village.<sup>8</sup>

The water coming from the fountains in Caballar, called Fresnera and Redonda, now serves a smaller area of irrigation. The oldest people in this settlement do not remember the existence of any Junta de Aguas with Turégano, but they do recall the conflicts with the nearby village related to water sharing.

The aforementioned agreements do not provide an exact date for undertaking the cleaning of the fountains, but they do detail the duty of the neighbours from Caballar to clean the fountains at their expense, although residents in Turégano also had to pay an amount of money before the day of San Antonio (June 13th) to defray part of those expenses (Concordias entre Caballar y Turégano).

According to elderly residents in Caballar, the fountains were cleaned on the Sunday before Santiago. The bailiff, on that Sunday morning, made an announcement at mass, at around 1 pm, when the sun was at its highest point, and the neighbours then fetched their mattocks and winnowing rakes and went to each fountain.

<sup>6</sup>Interview with Bonifacio Sanz González, mayor of Santiuste de Pedraza. (2004).

<sup>7</sup>Interview with Lucas Peñas Arahuetes, Alejo Arahuetes Sanz, Crescencio Arahuetes Hernanz and Manuel Orejana Ruiz from Valle de San Pedro (2014).

<sup>8</sup>Collected during the technical visit on Ditch Cleaning Day 2011.

Before arriving at the fountains, they drank wine and sang the *Salve Regina*. Around eight to ten people would climb into the fountain. In the channel, divided into stretches, they would clean up to the *el diente* (splitting point), where they then split up among the different branches.

On that day, the council distributed bread, cheese and wine in compensation for the work done. Currently, the cleaning is performed during the morning of any convenient day.<sup>9</sup>

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## 4 The Distribution of Water and Irrigation

The partition of water among the different villages took place through *dientes* or *cepos*, situated at different points along the ditch. These *dientes* are enormous monolithic stones into which some equidistant slots are cut so that an equal amount of water can run through (Fig. 5).<sup>10</sup>

In the ditches studied, we encountered two different modes of water distribution. Many villages received water permanently, but, in other instances, villages could only access it during certain days as established by the prevailing by-laws.<sup>11</sup> In both cases, turns were established whenever irrigation was needed. The water distribution dates and periods were constituted so as to irrigate all of the lands holding such rights, both communal and private, and their crops.

The organization of irrigation in each council was adapted to the days and hours when the water was available. They had to combine the irrigation of the different communal lands, such as the pastures, with that of the private fields and, afterwards, account for the different existing crops. As a result, different dates were set to irrigate each particular case. This became easier through the establishment of two blocks of irrigation: one included the meadows and pastures, while the other dealt with the flax fields and vegetable gardens (Pinillos and Martín 2015: 86).

The first written reference to fields growing flax (*Linum ussitatissimum*) comes from 1221. Although the quality of the flax harvested in Segovia was routinely deemed the best in Spain into the eighteenth century (Larruga 1791: 53; Gómez de Somorrostro 1820: 178), this crop had disappeared from these fields by the mid-twentieth century. In most villages, it was sown, treated, spun and woven in these ditches, nurturing a culture that still remains in the memories of some inhabitants of the lands where it was formerly cultivated.<sup>12</sup>

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<sup>9</sup>Interview with Marcelo Contreras (RIP) and Inés Tapias from Caballar (2015).

<sup>10</sup>In the Ceguilla ditch, these were originally wooden. Interview with Leandro Vicente Arcones (RIP), the last Water Judge of Galindez (2006).

<sup>11</sup>Agreements between the Turégano and Caballar, the San Medel ditch and the Navalcaz ditch bylaws establish the days and hours corresponding to each village.

<sup>12</sup>Interviews with Rufina Miguel Cantalejo (2006) and Pablo Egido Palacios (2005) (RIP) from Tenzuela, Juan Pinillos and Encarna Martín (2006), José Borreguero and Dolores García (2006) from Berrocal, Eduardo García from Pelayos (2006), and José González (2006) from Basardilla.



**Fig. 5** “Dientes of Cabanillas” in Cacera de San Medel. Archive Tenada del Monte

Everything was interrelated with the amount of water attributed to each neighbour, while the irrigation places and the dates and times of cleaning and water management were all regulated by different by-laws. In some cases, these regulations have been preserved, while in other cases, tradition kept them alive until the mid-20th century, almost unchanged, despite the passage of centuries. Moreover, in some villages, such as La Cuesta, the comparison between oral testimonies and sixteenth century by-laws tells us that practically nothing changed for over four hundred years.

Another important aspect of water management that this research has revealed is the different ways of resolving the amount of water that belonged to each neighbour. We have identified two methods for calculating water rights, one used in Pelayos del Arroyo (Pelayos del Arroyo, 1688) and the other in Sotosalbos (Sotosalbos, 1634), both of which we might refer to as the fiscal method.

The *pecheros* (neighbours who paid taxes) were those who held water rights. With this method, depending on how much they contributed, they received more or less of the water available. Logically, those who paid more (the richer) then gained a larger amount of water. The fiscal measuring unit was the *centena* (“hundred”). Using the total amount that the council had to pay, they took the list of registered *pecheros* and divided them into *centenas* that each neighbour had to pay based on income and property. In other cases, as in the Ceguilla ditch system (Cacera de

Ceguilla, 1588), La Cuesta and their neighbourhoods (La Cuesta, 1628), the right to irrigate was determined by the number of flax *fanegas* (measurement of grain) sown by each neighbour. Some of the by-laws that we consulted specifically forbade outsiders (people not settled there) who had inherited property in the villages from irrigating flax, wheat or meadows.

The first places to be irrigated were the pastures and communal fields. Seasonally, access to these common pasture lands was prohibited (with entrance forbidden) so that they could rest and provide local cattle with food throughout most of the summer. Before access was prohibited, or just afterwards, those residents who took their cows to pasture would perform the communal works on the channel and *regaderas* (secondary ditches) of the pasture. The president or mayor held responsibility for convening the people for such cleaning tasks. A list was drafted with the names of those neighbours who were required to go, with anybody who was absent receiving a fine. Depending on the number of livestock that they owned, individuals had to clean longer or shorter stretches of the ditch.

Generally, the use of pastures was banned from March to May, being some of these days specifically fixed in order to use the whole amount of available water to irrigate this cherished field (La Cuesta 1628; Gómez et al. 2016: 32–47).

Frequently in combination with the irrigation of pastures, other meadows were also irrigated, as well as other fields dedicated to obtaining fodder for subsequent harvest. In such cases, the irrigation allowance was usually extended to as far as the end of June. The animals, during the break period for the pasture, took turns moving between different enclosures owned by neighbours or among communal plots. When the cows went back to the pasturelands, access to the private meadows and enclosures was prohibited, and they were irrigated in turns, depending on the areas owned.

Between the feast days of Saint John and Saint Peter (depending on the village), irrigating the meadows and enclosures was halted in favour of beginning to irrigate the flax fields and orchards with the water supplied to coincide with the commencement of the rotational turns for irrigation. This turn system responded to the need for a fair distribution of the water, so that everybody might be able to irrigate according to their own particular needs.

For better control over these irrigation turns, there was an “irrigation book” (*libro de riego*), which has since disappeared from many of these villages. We have found only two, in La Salceda and Caballar. However, from these, we did obtain information on the interesting composition of this type of document. When the irrigation season started, the neighbourhood mayor called a meeting to establish the turns. The irrigation times and the rules that were to be followed were assigned to each flax field. The book regulated the order of irrigation, the name of the estate, the owner and the time (Libro de riegos de La Salceda, 1848; Libro de riegos de Caballar) (Fig. 6).

Before irrigating, it was compulsory for flax field owners to have their stretch of ditch cleaned. Generally, they started irrigating the most distant part, doing it *a manta* (traditional flood irrigation), furrow by furrow, one at a time. Water entered

Tercer Legión		Cuarta Legión	
+ Antonio García	6 m	+ Francisco García	6 m
+ Pedro García	6 m	+ Domingo García	4 m
+ Pedro García	5 m	+ Antonio García	2 m
+ Juan García	3 m	+ Manuel García	4 m
+ Antonio García	4 m	+ Victoria García	1 m
+ Ángel García	2	+ Ángel García	6
+ Ángel García	3	+ Matías García	4 m
+ Ángel García	2	+ José García	3
+ Ángel García	2	+ Juan García	6 m
+ Ángel García	3	+ Antonio García	1
+ Ángel García	3		
+ Ángel García	2 m		
Tercer Legión 38 J m		Cuarta Legión 39 J m	
+ Juan García	11	+ Antonio García	7
+ Juan García	3	+ Manuel García	7
+ Matías García	7	+ Juan García	3 m
+ Juan García	2 m	+ Manuel García	3
+ Juan García	2 m	+ Ángel García	2
+ Juan García	2 m	+ Antonio García	3
+ Juan García	2 m	+ Ángel García	4 m
+ Juan García	2 m	+ Juan García	3
+ Juan García	1 m		

Fig. 6 Irrigation book found in La Salceda. Archive Tenada del Monte

the field through a gate opened into the ditch called a *boquerón* (literally “bib mouth”). When finishing, the *boquerón* was closed before the next one was opened, passing *la vez* (“the turn”). For everybody’s sake, the guideline was that there could be no excess of water if it meant that others would lack the means for irrigation. In Caballar, they always started watering those orchards that were furthest from the fountain before moving on to irrigating the orchards and meadows.<sup>13</sup>

## 5 The Ditches: A Source of Biodiversity

The ditches represent one key part of a humanized system required for the survival of the population that benefitted from the resulting irrigation and production. They simultaneously enabled the existence of species and ecosystems in places where they would otherwise not have been able to exist. Hence, they have long since served as what contemporary environmentalists now refer to as ecological corridors (Castillo 2014: 301–320). They still retain this function, even while their neglect is causing a progressive loss in their ecological utility.

<sup>13</sup>Interview with Marcelo Contreras (RIP) and Inés Tapias from Caballar (2015).



The ditch system provides humidity and freshness for whichever environment it runs through. On many occasions, ditches are flanked by prickly, almost impassable bushes, where different species mingle to form a passageway through which the ditch runs. These species are usually wild roses (*Rosa sp.*), blackberries (*Rubus sp.*), blackthorns (*Prunus spinosa*) and hawthorns (*Crataegus monogyna*). Among them, some species of willow (*Salix sp.*), privet (*Ligustrum vulgare*), elderberry (*Sambucus nigra*) and spindle tree (*Euonymus europaeus*) (Albacete et al. 2015: 396) can also be found.

In spring, all of these species blossom into life, with their flowers attracting a large number of insects, which, in turn, provide nourishment for the many birds whose nests are hidden away in the tangle of branches and thorns. By autumn, these thickets begin fruiting, constituting a food source that aids in the survival of animals that either do not migrate or that hibernate through winter. They hold an enormous protective value, as many species use them as shelters or places to sleep. They also hold great importance for the arboreal vegetation, as the thorn barrier protects the young trees from the grazing of cattle and wild herbivores and enables the growth of young trees (Pinillos and Martín 2015: 150).

Longstanding historical landscapes featuring meadows surrounded by dry stone walls and communal pastures still remain preserved in the last surviving stretches of ditches in the vicinity of some villages. In the communal pasture lands, we can find randomly scattered centenarian specimens of ashes (*Fraxinus angustifolia*) with their tops cut off (Albacete et al. 2015: 397–8). This was a traditional method of pruning to trigger the widening of the trunk and the formation of gaps that shelter a great variety of fauna, including owls (*Tyto alba*), tawny owls (*Otus scops*), little owls (*Athene noctua*), different species of bat, genets (*Genetta genetta*) and dormice (*Eliomys quercinus*), which find an almost ideal breeding environment there. The ashes contribute to the subsoil's water retention capacity while refreshing the ground with their shade. Hence, they make a major contribution towards these excellent quality pasture lands of such great economic value (Fig. 7).

The oldest ashes also sustain nests for storks (*Ciconia ciconia*), a species that finds plentiful food sources in these pasture lands. Storks may frequently be observed "grazing" there, looking for worms, insects, small mice and amphibians.

The enclosed fields, which are usually left fallow in the spring in order to irrigate them and subsequently harvest the grass for fodder, are not only a very important habitat, but are also part of our cultural and landscape heritage. Many of these enclosed fields are surrounded by beautiful, extremely old ashes and Pyrenean cork oaks (*Quercus pyrenaica*). They are also surrounded by prickly borders populated by the aforementioned species, with their fruits providing an abundant food source for the birds that winter in these meadows (Pinillos and Martín 2015: 158). Orchids bloom in spring in most of the ditch-irrigated meadows, with their diversity in the Guadarrama Mountain Range, with around 25 to 30 species present, being much higher than is generally perceived by the public.

The most common species in the hill meadows are several examples of the *Orchis* genus, such as *O.morio* and *O.mascula*. Another species of this genus that is easily encountered in some meadows is the *Orchis coriophora*. We might also find



**Fig. 7** Centenarian specimens of ash in Carrascal de La Cuesta. Archive Tenada del Monte

a unique orchid in terms of its appearance: *Serapias lingua* (Martínez-Sagarra et al. 2013: 49–56).

These enclosures are also usually much more productive than the open fields, as the stone walls provide a barrier against cold and hot weather, therefore easing the variations in temperature (De Andrés et al. 2003: 28–34). When we add to this the irrigation and the fertilizing effect of cattle during the periods that they spend in the enclosures, we have an explanation for this high productivity. Many birds also contribute to the fertilization process, as they distribute the cow droppings while looking for insects in the excrement.

Traditional flood irrigation has been found to increase the diversity of both plants and insects (Müller 2017). These fertile features are present in the orchards of Caballar (an endangered cultural landscape), where many fruit trees line their boundaries and interior areas, such as mazzard cherry trees (*Prunus cerasus*), pear trees (*Pyrus communis*), apple trees (*Malus domestica*), plum trees (*Prunus domestica*) and amazing specimens of walnut tree (*Juglans regia*) (Blanco 1998: 91, 131, 135).

Another environmentally important ecosystem generated by human activities deriving from the ditch systems are the temporary wetlands, with the pools used to soak flax and the large puddles made while washing the wool providing the finest

examples, although we might also add the fountains, natural springs and watering holes (Albacete et al. 2015: 394–5).

These temporary ecosystems are capable of hosting a greater amount of biodiversity than the permanent wetlands, as they preserve vegetal and animal communities adapted to the disappearance of water throughout several months of the year. They are simultaneously the place where most Amphibia, currently the most threatened animal group, reproduce. They also serve a purpose for other wild fauna species, both in regard to feeding and to quenching their thirst.

Restoring the ditches also means preserving and helping to recover the populations of Spanish ribbed newts (*Pleurodeles waltl*), mottled newts (*Triturus marmoratus*), tree frogs (*Hyla molleri*), spur toads (*Pelobates cultripes*), running toads (*Epidalea calamita*), common frogs (*Pelophylax perezi*), common toads (*Bufo spinosus*) and common obstetrician toads (*Alytes obstetricans*) (Martín Carretero 2010).

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## 6 Conclusions

Quite simply, these ditch systems made life possible, as they generated a habitable area for the populations in these mountain foothills over one thousand years ago. Throughout the 1960s, these villages experienced depopulation, and these efficient and complex networks of ditches began to suffer from progressive abandonment due to a lack of generational renewal in the agricultural and livestock sectors. In spite of this, and in addition to all of the bureaucratic difficulties encountered by the Confederación Hidrográfica del Duero, some of these complex and singular governance systems formed by the Juntas de Aguas have survived down to our days (Cambrones, San Medel, Truchas and Pinar, Caballar and Navalcaz).

In terms of those that have already fallen into disrepair (Río Viejo, Ceguilla and Navalcaz), it would be neither difficult nor expensive to restore them, as they have only been abandoned for a short number of years and their ditches are still in relatively good condition.

Furthermore, there is an emerging pro-active social movement in the villages that backs the recovery of all of the ditch systems and their associated ecosystems. Additionally, the founding of the National and Natural Parks of the Guadarrama Mountain Range and the corresponding commitment to the conservation and recovery of the ditches represent grounds for optimism.

Ditches, far from wasting water, create a microclimate, delay hydrography and spread the effects of rivers, both by maintaining the same population of fauna and flora and by transforming the places through which they run into outstanding and flourishing gardens. Swamped soils generate meadows and pasture lands with ash trees and a great diversity of species. They simultaneously also form natural water deposits and guarantee that, during the dry season, the water that emerges slowly from natural springs and fountains remains sufficient both to meet needs of the local population and to maintain the surrounding ecosystem. Nowadays, our meadows,

enclosures, fields of ashes and ponds suffer from the silence of the dry and forgotten ditches, and thus from the consequent loss of their biodiversity. These ditches form part of undervalued socio-ecosystems that we should learn from, not only for all of their social and cultural value, but also for the agronomic, hydrological and environmental value that they generate.

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