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FROM PRACTICE

Enabling conditions for the implementation and conservation outcomes of a private nature reserve

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Abstract

1. Expanding conservation efforts to private land is paramount to halt biodiversity loss and achieve global conservation targets. Individual landowners can play disproportionately important roles by establishing private parks and managing them with biodiversity-focused objectives. However, several constraints hinder the expansion of such initiatives, and little is known about their extent, characteristics and keys for success.
2. Here, we provide insights on the conditions that favoured the establishment and conservation outcomes of a private reserve in central Spain whose management has been fully conservation-oriented for the past two decades. We report on the actions implemented to accomplish four key targets that aimed at protecting and enhancing wildlife populations, and on the landholder's motivations to devote his personal resources to pursue this goal.
3. After acquiring the land, the landowner has made efforts to restore native wildlife populations after decades of poaching and intensive cattle raising. Key actions included re-establishing degraded vegetation and fostering keystone rabbit populations to sustain carnivore populations. Water bodies are maintained to provide drinking points and foster aquatic animal populations; nest boxes target birds and bats. Many actions resulted from advice from multiple stakeholders, including public administration officers, academics, local residents and NGOs. The estate's formal conservation status has made it a partner in major conservation projects, including repeated releases of captive bred Iberian lynx. The landowner's determination for long-term conservation was formalised through a legal protected-area status.
4. The condition that drove the creation of the reserve was the landowner's intrinsic motivation, which resulted from conservation ethic, personal identity and the desire to share and educate about the multiple values of nature. Additionally,

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several external conditions, such as accessibility and appropriate reserve size (biophysical conditions), the lack of need for economic activities (economic), a positive and pro-active relationship with multiple stakeholders (social-cultural), the protected-area status and the capacity to make decisions independently (governance-related), have helped sustain the project.

5. The landholder suggests that public policy should reduce the bureaucratic burden to intrinsically motivated landowners and provide them technical advice, trust and financial incentives to expand conservation on private land.

KEYWORDS

Conservation actions, ecological restoration, land management, landholder motivation, landowner, private park, protected area

1 | INTRODUCTION

Humanity must take firm steps to avoid catastrophic biodiversity loss (IPBES, 2019). With this intention, the Convention on Biological Diversity has established global conservation targets such as Aichi goal 11 of effectively protecting 17% of terrestrial ecosystems by 2020, which stood at 15% in January 2020 (<https://www.protectedplanet.net/target-11-dashboard>, accessed 8/01/2020). However, some argue that protecting one-half of the Earth is necessary to safeguard biodiversity (Watson & Venter, 2017), and ensuring the quality of protection and its representativeness across ecoregions is equally important (Dudley, 2008).

Whereas public nature reserves are the cornerstone of nature conservation, several shortcomings limit their potential to meet these challenges alone (Langholz & Lassoie, 2001). Public reserves are limited in extent, and their expansion is often restricted by private ownership of surrounding land and increasing public opposition (Lindenmayer, Thorn, & Noss, 2018). The quality of public protection is also not always sufficient (Jones et al., 2018). Many species and habitats of conservation concern are only located on private land (Knight, 1999), and this is likely to become more so under shifting climatic conditions (Alagador, Cerdeira, & Araújo, 2014). Conservation on private land may thus be fundamental to meet global conservation targets and minimise the current extinction crisis (Selinske, Coetzee, Purnell, & Knight, 2015), besides providing opportunities for education and other social values. In recognition of all this, some public programmes provide easements and other incentives for conservation on private land (Drescher & Brenner, 2018). Several initiatives also provide inspirational examples of the role that individuals can play to protect biodiversity without an initial impulse from public incentives (Butler, 2010).

As of January 2020, 4.4% of the world's terrestrial protected areas were privately owned and governed, or 0.5% in terms of surface (Figure 1; UNEP-WCMC and IUCN 2020). However, these global figures are likely to be underestimates, given the large variety of forms of protection, the underreporting of private reserves in inventories

of natural protected areas, and the many informal ways of protection (Dudley, 2008; Shanee, Shanee, & Horwich, 2015; Stolton, Redford, & Dudley, 2014). A particular challenge is to identify the motivations and satisfactions that engage landowners – and that keep them engaged – in conservation on their land (Clements & Cumming, 2017; Selinske et al., 2015; Yasué & Kirkpatrick, 2018), and the conditions that enable the success in the implementation and conservation outcomes of private reserves. Case studies are a useful way to address this gap (Drescher & Brenner, 2018).

Here, we report on a case study in central Spain where an individual has managed a piece of land for nature restoration and conservation since its acquisition two decades ago. We report on the targets pursued to achieve the goal of wildlife conservation and the actions to accomplish these targets. We further outline the key conditions that enabled the implementation and conservation outcomes of this private reserve and the motivations of the landholder to invest his personal resources in nature conservation. Finally, we provide some suggestions for landowners interested in conservation, the public administration and researchers, to help establish and maintain successful private parks in the future.

2 | A SPANISH CASE STUDY

2.1 | Private land protection in Spain

Spain is the country with the second highest biodiversity in Europe. As of December 2018, 1,664 protected areas covered 13% of its terrestrial surface (EUROPARC-España, 2019). The Spanish autonomous regions have the capacity to declare protected areas and to define the categories of protection. Whereas most of the protected terrestrial surface country-wide is owned by private landowners, nearly all of it is under public governance and no specific categories exist for protected areas under private governance except in the regions of Extremadura and Galicia (EUROPARC-España, 2019). As a result, the declaration of privately protected areas in Spain would generally need to fall within

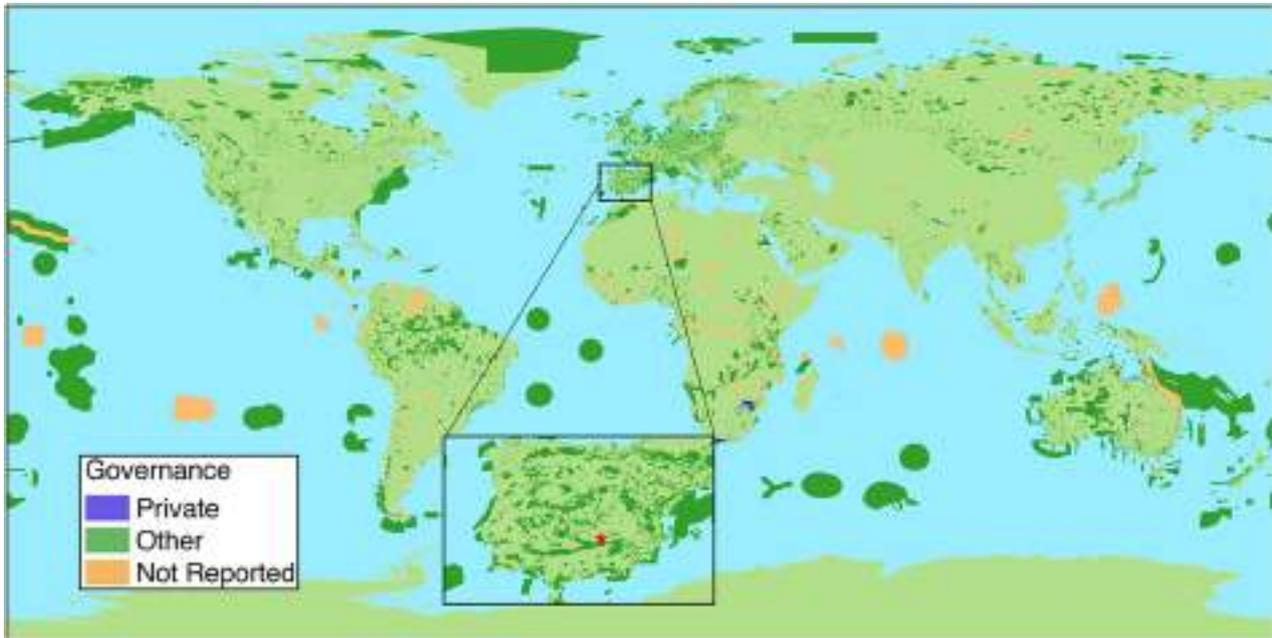


FIGURE 1 Protected areas of the world classified by governance type. Private governance includes individual landowners and for-profit and non-profit organizations. “Other” includes governance by federal, sub-national and government-delegated management, indigenous people, local communities, collaborative and joint governance, and others. The inset shows the Iberian Peninsula, where no private governance is shown (likely due to reporting deficiencies). The red star indicates the approximate position of the Los Barranquillos Wildlife Refuge – the case studied in detail here. Source: UNEP-WCMC and IUCN (2020)

one of the categories established by the regional administration for publicly protected areas.

Several conservation efforts in Spain have appeared through private initiatives. Notoriously, one of the first actions of WWF – and among the reasons for its creation – was the acquisition of ca. 6,000 ha to create the Doñana protected area in 1963 (Duque, 1977). As in Doñana, private land conservation in Spain mostly results from organization-level actions and is generally in the hands of NGOs and foundations (Stolton et al., 2014). Further, much of the voluntary private land protection falls within land stewardship schemes (EUROPARC-España, 2019) – voluntary agreements between landholders and organisations (e.g. SEO-Birdlife) to implement conservation actions. There are likely also several individually owned properties managed for conservation across the country that provide local benefits for nature. However, such initiatives are mostly off the radar due to the lack of reporting and without official declaration due to associated self-imposed bureaucracy and land-use limitations. As a consequence, such cases mostly go unnoticed, and their potential to produce transferrable knowledge is lost. Leveraging the experience obtained from such initiatives and exposing the drivers of their success may contribute to the planning, implementation, evaluation and accountability of other privately protected areas (Rissman, Owley, L’Roe, Morris, & Wardropper, 2017), help meet national policies to diversify the governance of protected areas (EUROPARC-España, 2019), and contribute to international conservation targets. Further, understanding the motivations, wishes and fears of landowners who voluntarily engage in conservation may help establish proper regulatory frameworks that enhance conservation outcomes.

2.2 | Los Barranquillos Wildlife Refuge: Establishment and early objectives

Los Barranquillos Wildlife Refuge is a 454 ha private estate located in central Spain (autonomous region of Castilla-La Mancha; 38°29’21”N, 3°16’24”W) that was purchased by the current owner (PS) in 1999 (Figure 2). Climate in the region is continental Mediterranean with cold winters and hot, dry summers; mean annual temperature and precipitation are 13.5°C and 366 mm, respectively. Elevation ranges between 700 and 937 m a.s.l. Soils are poor, derived from siliceous metamorphic rocks. The previous land uses of this estate were free-range cattle raising and game hunting. Grazing and a low primary productivity due to climatic and soil constraints kept woody and herbaceous vegetation cover low and soil erosion high. Over-hunting diminished the populations of game and predators that were also often killed directly.

Since its acquisition in 1999, the estate has been fully dedicated to the goal of wildlife conservation. The immediate targets to accomplish this were to: (1) change land management profoundly and (2) obtain the legal status of natural protected area from the regional administration.

Land management (target 1) intended to enhance Mediterranean wildlife habitat (Appendix 1: Table S1; Figure 3). Actions were selected according to their known effectiveness, their expected cost/outcome ratio and the synergies created with conservation programmes (see target 3, below). The first action was removing the cattle to promote the mechanisms that would lead to natural regeneration (e.g. Leverkus & Castro, 2017). Thinning of dense maquis aimed to reduce

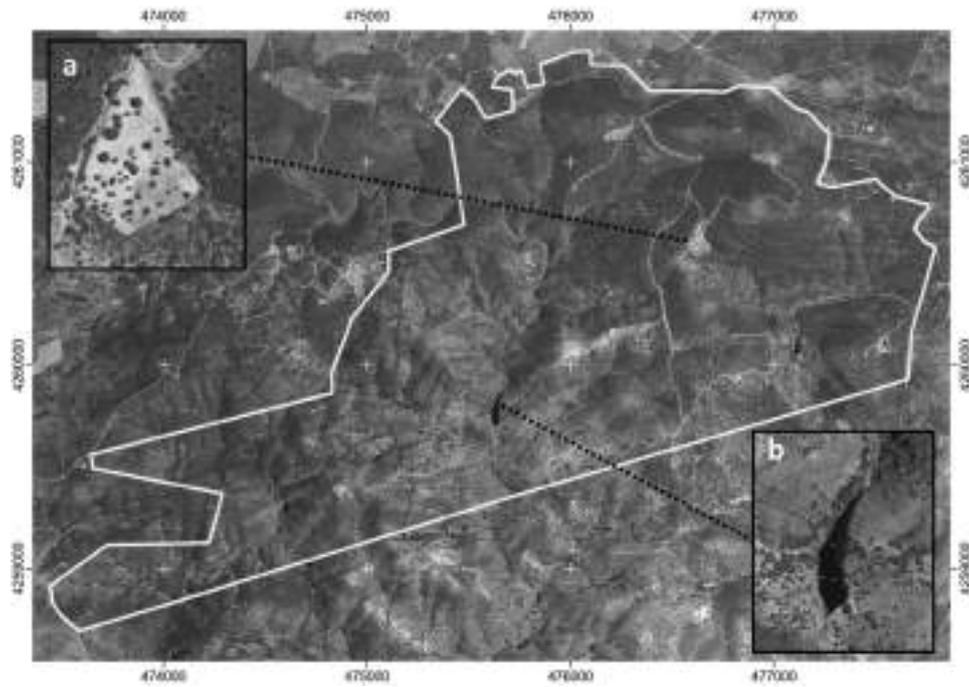


FIGURE 2 Aerial photo of the Los Barranquillos Wildlife Refuge taken in 2016. The insets expand two of the largest elements that are actively maintained for conservation: (a) cereal field to provide open habitat and food for rabbits (which are themselves an essential food source for many carnivores), and (b) small dam as a permanent drinking point and habitat for aquatic species

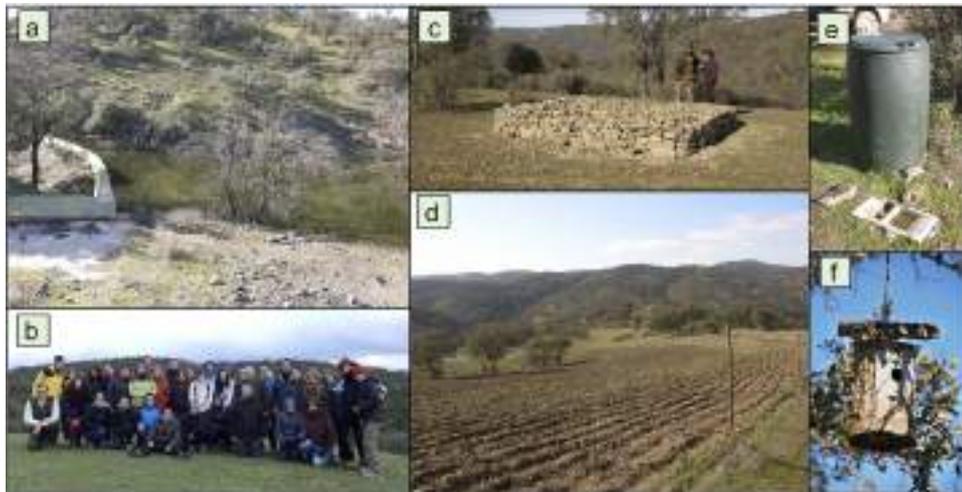


FIGURE 3 Photos of the Los Barranquillos Wildlife Refuge illustrating some conservation actions: (a) small dam, (b) Master's students of ecosystem restoration, (c) refuges for rabbits, (d) small crops, (e) drinking points, (f) nest boxes

competition between overstory trees, stimulate understory vegetation, prevent wildfire, increase structural complexity and improve habitat for several vertebrates (De la Montaña, Rey-Benayas, & Carrascal, 2006). Nest boxes were introduced to enhance the pest-regulation service provided by insectivorous birds (Figure 3; Rey Benayas, Meltzer, De las Heras-Bravo, & Cayuela, 2017), and small water bodies were created or restored to conserve freshwater flora and fauna, particularly amphibians (Figure 3; Shoo et al., 2011). Nine of the 19 conservation

actions listed in Table S1 are directly or indirectly related to fostering the rabbit population – a red-listed species (Villafuerte & Delibes-Mateos, 2019) that is, however, keystone in Mediterranean ecosystems, as it constitutes the major component of the diet of various highly threatened predator species (Delibes-Mateos, Redpath, Angulo, Ferreras, & Villafuerte, 2007). Importantly, management in the Refuge is also tackling emerging environmental issues (Drescher & Brenner, 2018) such as climate change (e.g. by maintaining water bodies for

aquatic wildlife; Shoo et al., 2011). The conservation actions (Table S1) have followed a variety of approaches foreseeing that some would fail – such as re-introduced crayfish being consumed by recolonising otters – and conducted adaptively to learn from failures – such as early refuges for rabbits also being accessible to mustelids and foxes; later models were designed to prevent the entrance of predators.

The second target was achieved on 3 August 2001. After a 2-year period of bureaucratic work, Los Barranquillos received the legal status of Wildlife Refuge (IUCN Category IV: Habitat/Species Management Area, aimed to “maintain, conserve and restore species and habitats”; Dudley, 2008). The declaration was officially published in the regional bulletin D.O.C.M #87, 3/10/2001, p. 9300. A Wildlife Refuge is a category of protection of the autonomous region of Castilla-La Mancha usually dedicated to protection under public governance, and it was chosen due to the lack of specific categories for privately owned and governed protected areas. The major impediment to obtain legal protection was that the officers from the regional environmental administration did not understand the owner’s motivation for it, as it meant self-restricted land-use and management. The owner’s persistence allowed the acquisition of this legal status. Besides, the site is within the Sierra Morena Special Protection Area for Birds and thus has belonged to the Natura 2000 network since 2004.

2.3 | Subsequent objectives and biodiversity status

In a second step, the reserve followed two additional targets: (3) proactive participation in relevant conservation programmes and (4) fostering education, training and dissemination activities.

Los Barranquillos Wildlife Refuge contributes to regional conservation strategies (Target 3; Dudley, 2008), including the conservation programmes of the highly threatened Iberian lynx *Lynx pardinus* and the Spanish imperial eagle *Aquila adalberti*, two Iberian endemics. The Refuge is located in a so-called ‘area of special interest’ for the conservation of these species (Decrees 200/2001 and 275/2003 of the Regional Government of Castilla-La Mancha) and contributes to a spatial network of sites dedicated to conservation (Child, Peel, Smit, & Sutherland, 2013). The imperial eagle has not yet nested within the Refuge, probably due to the absence of large trees, but five pairs breed within a 10-km radius and they often use the Refuge as a hunting ground. Further, the Refuge participates in the conservation of this species through a land stewardship programme with SEO-BirdLife, and in another one with WWF-Spain for the conservation of the lynx. Twelve Iberian lynxes have been released in the Refuge since 2014 as part of a reintroduction programme (<http://www.iberlynce.eu/index.php/eng/>). One female lynx established her territory partially inside the Refuge and four others in its surroundings. Finally, the estate holds one of the few permanent water points available for fire-fighting in the surroundings, thereby also contributing to fire-risk reduction (Syphard et al., 2016). For this, a reservoir was built on a high-elevation point of the reserve for easy access for helicopters and it is included in water-point maps made for this purpose.

Los Barranquillos Wildlife Refuge also contributes to education, training and dissemination (target 4). It receives yearly visits from a Masters’ Programme on Ecosystem Restoration (Rey Benayas et al., 2010). It is also visited by the students of local schools and a plethora of technicians and practitioners from conservation NGOs and the public administration. It recently produced an open, itinerant exhibition – authored by the four co-authors of this study and Verónica Cruz-Alonso – to communicate the conservation values of the Mediterranean biome and, particularly, the biodiversity and associated functions in the Wildlife Refuge. It is an established area for annual bird surveys and ringing under SEO-BirdLife protocols (www.sea.org/2012/02/06/programas-de-anillamiento). It is also a testing point of Virtual Biodiversity, a citizen science network that inventories and monitors biodiversity based on picture hunting (www.biodiversidadvirtual.org). Two other ongoing biodiversity monitoring programmes target: (a) carnivore populations, based upon 12 installed camera traps functioning since 2011; and (b) nesting birds in ca. 1,600 installed nest boxes (Table S1; Figure 3), monitored four to five times per year since 2014. Additionally, the estate has a weather station that registers daily precipitation and temperature since 2009.

Los Barranquillos Wildlife Refuge hosts a rich diversity of habitats and species, and much of it has likely appeared after (or at least benefited from) the conservation actions undertaken. The results of a flora and fauna survey, published in a hardcover catalogue (Gosalvez & Solís, 2009), show that five habitat types of conservation interest exist in the Refuge (3,170 Mediterranean temporal water bodies, 8,220 Siliceous rocky slopes with casmophytic vegetation, 8,230 Rocky slopes with casmophytic vegetation, 92A0 Riparian forests dominated by *Salix alba* and *Populus alba*, and 9,340 *Quercus rotundifolia* forests; European Directive 92/43/CEE Annex I). The Refuge also hosts 42 tree and shrub species, including three protected by regional law (*Acer monspessulanus*, *Pyrus bourgeana*, and *Phyllirea latifolia*), and two others of high conservation value (*Arbutus unedo* and *Viburnum tinus*). The herbaceous communities include 40 families, 128 genera and 164 species (90 annuals and 74 perennials). Twenty species of amphibians and reptiles have been found, three of which are vulnerable (*Salamandra salamandra*, *Emys orbicularis* and *Mauremys leprosa*). Avian biodiversity is remarkably high, with at least 109 species present. Twenty out of the 48 mammal species found in the region (Palomo & Gisbert, 2002) have been detected on the estate.

The abundance of three herbivore populations, namely rabbit, partridge and red deer, has been systematically monitored since 2006 to assess conservation success (Figure 4). Importantly, rabbit abundance increased after management change, although with strong fluctuations due to climatic conditions and the prevalence of diseases such as myxomatosis and viral haemorrhage. Despite a peak in rabbit abundance in 2011–2012 and a subsequent population decline, it remains higher than when monitoring started and the land was acquired (JMS, pers. obs.). A positive trend is also noticeable for partridges, whereas the abundance of red deer seems relatively stable (Figure 4). Additionally, the biodiversity monitoring programmes outlined above endorse the success of the conservation actions.

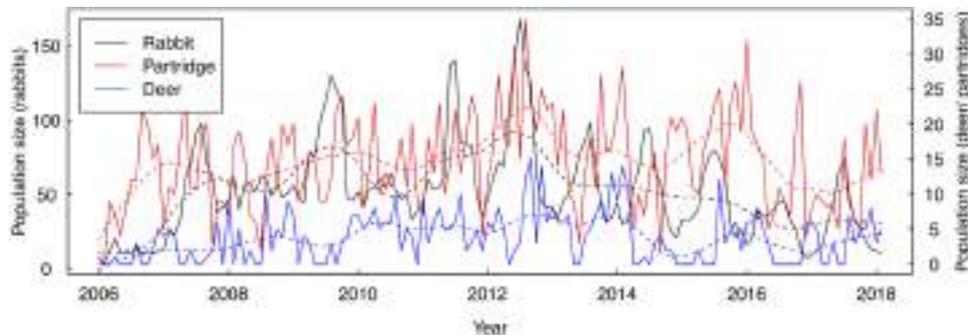


FIGURE 4 Monitoring of rabbit, partridge, and red deer populations in the Los Barranquillos Wildlife Refuge since 2006. Population sizes (kilometric abundance index) were estimated monthly as the number of observed individuals along fixed, 20-m width transects adding up to 10.2-km length and distributed throughout the estate. Solid lines join observed monthly abundances, whereas dashed lines represent trends without seasonal changes

3 | ENABLING CONDITIONS

We here outline the key factors that enabled both the creation and the functioning of this reserve. For this, we use the framework proposed in a recent review, which categorized the enabling conditions of conservation programmes into biophysical, economic, governance and social-cultural (Huber-Stearns et al., 2017). Additionally, we address the landowner's motivations as a fifth category.

3.1 | Biophysical

Certain features related to the location, ecological condition and size of an area can help protect its natural values (Huber-Stearns et al., 2017). In Los Barranquillos, the access road is only a short drive away from the landowner's and the guard's hometown, which eases the intensive care and monitoring of the estate. Additionally, its location far from major cities and the need for a 4WD vehicle likely reduce the impact of occasional walkers-by – although isolation also has its toll, as poaching is frequent in the area. The stewardship of the estate is favoured by its size being in accordance with the resources available for management (Pasquini, Fitzsimons, Cowell, Brandon, & Wescott, 2011), as one guard is able to watch over it. Additionally, the location of the estate's house (behind the photographer in Figure 3b) allows a broad view of the reserve, which facilitates broad monitoring. Finally, the high resilience of vegetation, coupled with the surrounding semi-natural setting, enhanced ecological recovery after intensive past land use. In contrast to what is generally described (Huber-Stearns et al., 2017), the reserve lacked baseline ecological data, and limited ecological monitoring began only after its implementation.

3.2 | Economic

In Los Barranquillos, the maintenance of conservation actions is expensive and only about 10% of running costs are covered by public subsidies (landowner's pers. obs.). The key expenses incurred by the

landowner so far have been: (a) land acquisition; (b) construction of a warehouse to store materials; (c) maintenance of a previously existing house to host groups of students, researchers and other stakeholders; (d) construction and maintenance of two small dams (Table S1) and the helicopter water point; (e) maintenance of dirt roads; (f) acquisition of three vehicles; (g) fuel and maintenance for the vehicles; (h) salary of two full-time employees; and (i) taxes. Several conservation actions – such as constructing platforms for imperial eagle nests – are funded by conservation land stewardship programmes, some – such as thinning vegetation – are covered by limited subsidies (which virtually disappeared during the 2008–15 recession), whereas others – such as the nest boxes, built with by-products from the wine industry – are implemented by using available materials at no cost. Eco-tourism is a frequent source of income for private reserves (Drescher & Brenner, 2018), but it is not currently under consideration to avoid potential conflicts of interest with conservation goals (Clements & Cumming, 2017). In contrast to many conservation programs (Huber-Stearns et al., 2017), external economic input – even through ecosystem services – has played a very minor role to implement and manage the reserve (on the contrary: the land was taken out of production to restore and protect it).

3.3 | Governance

Among the key governance conditions identified by Huber-Stearns et al. (2017), our case matches the 'influential champion' – i.e. one person whose personal drive leads to conservation success. Biodiversity protection on private land often results from top-down models, i.e. official programmes such as conservation easements, regulatory mitigation, contract payments and property-tax incentives (Drescher & Brenner, 2018; Rissman et al., 2007). In Los Barranquillos, not only did the authorities not initiate conservation, but they initially hindered the obtention of the protected-area status. As indicated before, the protected-area condition had to be adapted from public protection categories, including much unnecessary bureaucracy. But the acquisition of the legal status has enhanced the credibility of the conservation

goals of the estate; for instance, it allowed participation in the programmes to reintroduce the lynx and the imperial eagle. Finally, the capacity for rapid decision-making, without the need for long-lasting bureaucratic procedures, has allowed rapid management responses to changing ecological conditions such as drought or increases in wild boar populations. This coincides with some case studies that have benefitted from a lack of intermediaries (Huber-Stearns et al., 2017) and with the notion that autonomy is highly valued by owners of private reserves (Gooden & Grenyer, 2018).

3.4 | Social-cultural

The Los Barranquillos Wildlife Refuge has benefitted greatly from interaction with a well-established and altruistic network of collaborators, including scientists, naturalists, NGOs, teachers and – at later stages – public administration officers. Such links are known to facilitate conservation in private reserves (Gooden & Grenyer, 2018), for instance by helping reduce the lag in the transition from knowledge to management (Cadotte, Barlow, Nuñez, Pettorelli, & Stephens, 2017). In Los Barranquillos, several naturalists collaborated to produce the hard-back biodiversity inventory of the estate (Gosálvez & Solís, 2009) and provided advice on appropriate conservation actions and fauna censuses (Figure 4). A collaborative and respectful relationship is pursued with local inhabitants and other stakeholders, including other landowners, workers, hunters and rural police (for instance, suspected cases of poaching are dealt with through direct, positive communication rather than attempts of law enforcement). The major guard is well trained to watch, monitor and implement actions, and able to communicate with the network of collaborators, and has remained the same since the acquisition of the estate.

3.5 | Motivational

Los Barranquillos does not follow economic objectives (other than the obvious need for its own maintenance). The motivation of the landholder to create and maintain the reserve is of an intrinsic nature, which is further supported by the lack of external regulations or incentives to create the reserve in the first place (Gooden & Grenyer, 2018). The key value obtained by the landowner falls in the realm of relational values – i.e. those derived from the relationship with, and responsibility for, nature (Chan et al., 2016). His motivations coincide with those of other landowners who spare land for its intangible natural values, for their own joy, and as a legacy for their heirs (Langholz, Lassoie, Lee, & Chapman, 2000; Yasué & Kirkpatrick, 2018). Following Welsh, Webb, and Langen (2018), three major themes motivate many landholders for private land conservation: past experience (not in this case, as the landowner's expertise lies in other fields), conservation ethic (the feeling that it is the right thing to do, which does occur in this case) and showcasing (the motivation to show and educate about nature, which also occurs in this case as highlighted by the reserve's target 4, above).

Further, psychological analysis of landholders who have engaged in private conservation initiatives across the world (Gooden, 2019) suggests that such initiatives reinforce landholder identity through three elements. The first is related to the place, through processes such as attachment, temporal continuity of the image of oneself, enhancement of self-esteem and the feeling of having the capacity to do things in a known environment. Second, possession (especially the act of creating something) contributes to a feeling of ownership and self-extension. And third, a project contributes to well-being if it is functioning, felt as one's own, and visible and supported by the social setting (Gooden, 2019).

4 | WAYS FORWARD AND THE LANDOWNER'S PERSPECTIVE

The reliance on one individual's intrinsic motivation to create and manage a reserve may also threaten the reserve's long-term conservation, particularly if the landowner's motivations and goals are not carried over to their heirs. This represents a major potential pitfall of conservation on private land. In fact, the IUCN only defines a protected area as such if specific means are established for the perpetuity of conservation (Dudley, 2008). In other private reserves, perpetual conservation has been addressed by creating and funding private foundations that outlive the owner, or by donating the land to governments or institutions after the landowner's death (Butler, 2010). However, such approaches imply large economic losses for the landowner's inheritors. Self-imposed restrictions, such as the obtention of the legal protected-area status of the Los Barranquillos Refuge, are an attempt to perpetuate a land-owner's self-determination and pass it on to future generations (Gooden & Grenyer, 2018). This, of course, faces risks and perpetual conservation is not necessarily guaranteed – but some donations of large natural estates to public institutions have likewise resulted in their subsequent development or degradation (Butler, 2010) and publicly protected areas are similarly under threat of economically motivated management (e.g. Müller et al., 2019) and of legal changes, as identified even prior to the Covid-19 pandemic (Kroner et al., 2019). The legal protection reported here thus provides a prospect for the future as good as others.

4.1 | The landowner's perspective

Maintaining the Los Barranquillos Wildlife Refuge has hinged on the owner's personal economic input, and the lack of public incentives represents a risk for conservation in the long term (and the likely failure to initiate conservation in other estates). The landholder notes that tax deductions, payment for environmental services and direct financing measures related to the conservation actions should be implemented and expanded to recruit more landowners into private protection (as also suggested elsewhere; Rey Benayas & Bullock, 2015; Rissman et al., 2007; Selinske et al., 2016; Yasué & Kirkpatrick, 2018). This is because some landholders can be intrinsically motivated to conserve

biodiversity yet lack the resources to do it. In fact, funding private conservation actions could represent an inexpensive means of achieving conservation policies and targets. Intrinsically motivated landowners may be willing to dedicate their land for conservation purposes and provide their own work under modest incentives or cost-sharing agreements, which can potentially be less expensive than the apparatus behind public protection. This could be particularly beneficial if targeting multiple landowners of contiguous estates, as it would allow better landscape-scale protection for species with large ranges such as the lynx.

Noneconomic support by authorities can be equally important. Intangible rewards such as public recognition, trust, reciprocity, solidarity and the removal of bureaucratic barriers to conservation can improve landholder satisfaction in conservation programmes, as highlighted by the landholder and the conservation literature (Drescher & Brenner, 2018; Farley, Walsh, & Levine, 2017; Shanee et al., 2015). Authorities hold a wealth of environmental information and technical know-how that could aid in the creation and maintenance of private conservation initiatives. Private actors, including companies, foundations and individuals, should be regarded by the authorities as partners to achieve conservation, rather than competitors, stakeholders to be controlled, or agents whose success in conserving nature may evidence the malfunctioning of public environmental protection (landowner's pers. obs.). Technical support, public recognition of private conservation efforts and help with problems such as poaching could improve landholder satisfaction and incentivise conservation on private land. The Refuge landowner and the major guard also suggest that conservation scientists aid landowners interested in nature conservation with the definition of rigorous monitoring protocols and data analyses to assess the success of conservation measures.

As final messages from the landholder aimed at expanding biodiversity conservation under private initiative, governments should incentivise landowners with voluntary programmes for conservation on private land to complement public reserves, but also motivate landowners through technical support, recognition and trust. Naturalists should keep transmitting the importance of biodiversity and encouraging society to preserve it. Academics should help define the ways to address conservation, get their hands and feet dirty by getting involved in applied projects and expand the reach of individual initiatives by educating and inspiring people to protect biodiversity elsewhere. As for other landowners, he notes that 'there is nothing like the satisfaction of seeing our extraordinary flora and fauna recolonise and flourish on your own property – it is a great way to return something to the world'.

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AUTHOR CONTRIBUTIONS

PS created the Reserve and owns it; JMS is the major guard of the Reserve; ABL and JMRB wrote the manuscript; PS and JMS provided data and comments to illustrate the case study. All authors approved the final version.

PEER REVIEW

The peer review history for this article is available at <https://publons.com/publon/10.1002/2688-8319.12019>

DATA AVAILABILITY STATEMENT

The data underlying Figure 1 were downloaded from UNEP-WCMC and IUCN (2020), where they are freely accessible. The data underlying Figure 4 are available online (Leverkus et al., 2020).

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

- Alagador, D., Cerdeira, J. O., & Araújo, M. B. (2014). Shifting protected areas: Scheduling spatial priorities under climate change. *Journal of Applied Ecology*, 51, 703–713.
- Butler, T. (2010). *Wildlands philanthropy. The great American tradition*. San Rafael, CA: Earth Aware Editions.
- Cadotte, M. W., Barlow, J., Nuñez, M. A., Pettorelli, N., & Stephens, P. A. (2017). Solving environmental problems in the Anthropocene: The need to bring novel theoretical advances into the applied ecology fold. *Journal of Applied Ecology*, 54, 1–6.
- Chan, K. M. A., Balvanera, P., Benessaiah, K., Chapman, M., Díaz, S., Gómez Baggethun, E., ... Turner, N. (2016). Why protect nature? Rethinking values and the environment. *Proceedings of the National Academy of Sciences of the United States of America*, 113, 1462–1465.
- Child, M., Peel, M., Smit, I., & Sutherland, W. (2013). Quantifying the effects of diverse private protected area management systems on ecosystem properties in a savannah biome, South Africa. *Oryx*, 47, 29–40.
- Clements, H. S., & Cumming, G. S. (2017). Positives and pathologies of natural resource management on private land-conservation areas. *Conservation Biology*, 31, 707–717.
- Delibes-Mateos, M., Redpath, S. M., Angulo, E., Ferreras, P., & Villafuerte, R. (2007). Rabbits as a keystone species in southern Europe. *Biological Conservation*, 137, 149–156.
- Drescher, M., & Brenner, J. C. (2018). The practice and promise of private land conservation. *Ecology and Society*, 23, art3.
- Dudley, N. (ed). (2008). *Guidelines for Applying Protected Area Management Categories*. Gland, Switzerland: IUCN. x + 86pp. WITH Stolton, S., P. Shadie and N. Dudley (2013). *IUCN WCPA Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types, Best Practice Protected Area Guidelines Series No. 21*. Gland, Switzerland: IUCN.
- Duque, A. (1977). *El Mito de Doñana*. Madrid: Servicio de Publicaciones del Ministerio de Educación.
- EUROPARC-España. (2019). *Anuario 2018 Del Estado de Las Áreas Protegidas En España*. Madrid: Fundación Fernando González Bernáldez.

- Farley, K. A., Walsh, K. C., & Levine, A. S. (2017). Opportunities and obstacles for rangeland conservation in San Diego county, California, USA. *Ecology and Society*, 22, art38.
- Gooden, J. L. (2019). Cultivating identity through private land conservation. *People and Nature*, 1, 362–375.
- Gooden, J., & Grenyer, R. (2018). The psychological appeal of owning private land for conservation. *Conservation Biology*, 33, 339–350.
- Gosálvez, R. U., & Solís, P. (eds). (2009). *Inventario Natural Del Refugio de Fauna Los Barranquillos Chico Mendes (Sierra Morena Oriental - Ciudad Real)*. Ciudad Real: Forestal Chico Mendes S.L.
- Huber-Stearns, H. R., Bennett, D. E., Posner, S., Richards, R. C., Fair, J. H., Cousins, S. J. M., & Romulo, C. L. (2017). Social-ecological enabling conditions for payments for ecosystem services. *Ecology and Society*, 22, 18.
- IPBES. (2019). *Global Assessment Report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. I. N. Brondizio, E. S. HTN, & J. Settele, S. Díaz, (Eds.). Bonn, Germany: IPBES secretariat.
- Jones, K. R., Venter, O., Fuller, R. A., Allan, J. R., Maxwell, S. L., Negret, P. J., & Watson, J. E. M. (2018). One-third of global protected land is under intense human pressure. *Science*, 360, 788–791.
- Knight, R. L. (1999). Private lands: The neglected geography. *Conservation Biology*, 13, 223–224.
- Kroner, R. E. G., Qin, S., Cook, C. N., Krithivasan, R., Pack, S. M., Bonilla, O. D., ... Mascia, M. B. (2019). The uncertain future of protected lands and waters. *Science*, 364, 881–886.
- De la Montaña, E., Rey-Benayas, J. M., & Carrascal, L. M. (2006). Response of bird communities to silvicultural thinning of Mediterranean maquis. *Journal of Applied Ecology*, 43, 651–659.
- Langholz, J. A., & Lassoie, J. P. (2001). Perils and promise of privately owned protected areas. *BioScience*, 51, 1079–1085.
- Langholz, J. A., Lassoie, J. P., Lee, D., & Chapman, D. (2000). Economic considerations of privately owned parks. *Ecological Economics*, 33, 173–183.
- Leverkus, A. B., & Castro, J. (2017). An ecosystem services approach to the ecological effects of salvage logging: Valuation of seed dispersal. *Ecological Applications*, 27, 1057–1063.
- Leverkus, A. B., Rey Benayas, J. M., Solís, P., & Sierra, J. M. (2020). Data for: Enabling conditions for the implementation and conservation outcomes of a private nature reserve. <http://hdl.handle.net/10481/62838>
- Lindenmayer, D., Thorn, S., & Noss, R. (2018). Countering resistance to protected-area extension. *Conservation Biology*, 32, 315–321.
- Müller, J., Noss, R., Thorn, S., Bässler, C., Leverkus, A. B., & Lindenmayer, D. (2019). Increasing disturbance demands new policies to conserve intact forest. *Conservation Letters*, 12, e12449.
- Palomo, L. J., & Gisbert, J. (eds). (2002). *Atlas de Los Mamíferos Terrestres de España*. Madrid: Organismo Autónomo de Parques Nacionales, p. 525.
- Pasquini, L., Fitzsimons, J. A., Cowell, S., Brandon, K., & Wescott, G. (2011). The establishment of large private nature reserves by conservation NGOs: Key factors for successful implementation. *Oryx*, 45, 373–380.
- Rey Benayas, J. M. (2015). Vegetation restoration and other actions to enhance wildlife in European agricultural landscapes. In H. Pereira, & L. Navarro (Eds.), *Rewilding European Landscapes* (pp. 127–142). Cham, Switzerland: Springer.
- Rey Benayas, J. M., Escudero, A., Martín Duque, J. F., Nicolau, J. M., Villar-Salvador, P., García de Jalón, D., & Balaguer, L. (2010). A multiinstitutional Spanish Master's program in ecosystem restoration: Vision and four-year experience. *Ecological Restoration*, 28, 188–192.
- Rey Benayas, J. M., Meltzer, J., De las Heras-Bravo, D., & Cayuela, L. (2017). Potential of pest regulation by insectivorous birds in Mediterranean woody crops. *PLoS ONE*, 12, e0180702.
- Rissman, A. R., Lozier, L., Comendant, T., Kareiva, P., Kiesecker, J. M., Shaw, M. R., & Merenlender, A. M. (2007). Conservation easements: Biodiversity protection and private use. *Conservation Biology*, 21, 709–718.
- Rissman, A. R., Owley, J., L'Roe, A. W., Morris, A. W., & Wardropper, C. B. (2017). Public access to spatial data on private-land conservation. *Ecology and Society*, 22, art24.
- Selinske, M. J., Coetzee, J., Purnell, K., & Knight, A. T. (2015). Understanding the motivations, satisfaction, and retention of landowners in private land conservation programs. *Conservation Letters*, 8, 282–289.
- Selinske, M. J., Cooke, B., Torabi, N., Hardy, M. J., Knight, A. T., & Bekessy, S. A. (2016). Locating financial incentives among diverse motivations for long-term private land conservation. *Ecology and Society*, 22, art7.
- Shanee, N., Shanee, S., & Horwich, R. H. (2015). Effectiveness of locally run conservation initiatives in north-east Peru. *Oryx*, 49, 239–247.
- Shoo, L. P., Olson, D. H., Mcmenamin, S. K., Murray, K. A., Van Sluys, M., Donnelly, M. A., ... Hero, J. M. (2011). Engineering a future for amphibians under climate change. *Journal of Applied Ecology*, 48, 487–492.
- Stolton, S., Redford, K. H., & Dudley, N. (2014). *The Futures of Privately Protected Areas*. Gland, Switzerland: IUCN.
- Syphard, A. D., Butsic, V., Bar-Massada, A., Keeley, J. E., Tracey, J. A., & Fisher, R. N. (2016). Setting priorities for private land conservation in fire-prone landscapes: Are fire risk reduction and biodiversity conservation competing or compatible objectives? *Ecology and Society*, 21, art2.
- UNEP-WCMC and IUCN. (2020). *Protected Planet: The World Database on Protected Areas (WDPA)*. Cambridge, UK: Author. Retrieved from www.protectedplanet.net.
- Villafuerte, R., & Delibes-Mateos, M. (2019). *Oryctolagus Cuniculus*. The IUCN Red List of Threatened Species 2019: ET41291A45189779. <https://doi.org/10.2305/IUCN.UK.2019-3.RLTS.T41291A45189779.e>. Downloaded on 01 June 2020.
- Watson, J., & Venter, O. (2017). A global plan for nature conservation. *Nature*, 48, 550–551.
- Welsh, R., Webb, M. E., & Langen, T. A. (2018). Factors affecting landowner enrollment in wetland restoration in northeastern New York State. *Land Use Policy*, 76, 679–685.
- Yasué, M., & Kirkpatrick, J. B. (2018). Do financial incentives motivate conservation on private land? *Oryx*, 1–12.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

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