

## Game Reserves in Spain: the public management of hunting

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### Abstract

In Spain, Game Reserves (GR) are territorial public hunting management units that cover 3.5% of the country and ~ 10% of the Natura 2000 Network. The first GR were established in 1966 and by 2011 there were 49. Their primary purposes were to promote wild ungulate populations, their sustainable use, and to provide social, economic, and recreational benefits to local communities and hunters, generally. During the 1980s following a political federalization process, GR became the responsibility of regional governments and their role has never been evaluated, even though the political, rural ecological, and administrative frameworks underwent substantial changes. In this paper, we present a review of the state of GR in 2011, identify their successes and problems, and provide recommendations for the future. The GR have been fundamental to sustainable hunting and the protection of wildlife, particularly, game species. Currently, their virtues are not widely appreciated and they do not receive sufficient financial and human resources to meet their objective fully. We propose several initiatives that might improve the use of existing resources and increase the profile of these publicly managed areas.

**Key words:** wild ungulates; Natural Protected Areas; Natura 2000 Network; sustainable hunting.

### Resumen

#### Reservas de Caza en España: la gestión pública de la caza

Las Reservas de Caza (RC) constituyen una figura de gestión cinegética pública del territorio en España. Abarcan el 3.5% del territorio y ocupan aproximadamente el 10% de la Red Natura 2000. Su declaración comenzó en 1966, y desde entonces no ha cesado, llegando en la actualidad a las 49 RC. Fueron creadas esencialmente para la promoción de las poblaciones de ungulados silvestres, el aprovechamiento ordenado de este recurso y la satisfacción social, económica y recreativa de las comunidades locales y de los cazadores en general. Quedaron fuera de la tutela del estado tras su descentralización a partir de principios de los años ochenta del pasado siglo, y su función en conjunto no ha sido nunca evaluada, al tiempo que el panorama político, rural, ecológico y administrativo ha sufrido profundos cambios. Este artículo pretende ofrecer una panorámica actualizada de la situación de las RC a principios del siglo XXI, evaluar sus logros y problemática actual, así como proponer algunas actuaciones para el futuro inmediato. Las RC han sido pioneras en el aprovechamiento sostenible de la caza y de gran utilidad para la protección de la fauna en general y las especies cinegéticas en concreto. Actualmente no gozan del reconocimiento popular, y no reciben los recursos necesarios económicos y humanos suficientes para seguir cumpliendo su función adecuadamente. Se proponen una serie de medidas para aprovechar mejor los recursos disponibles y poder dar a conocer a la sociedad el valor de estos terrenos de gestión pública.

**Palabras clave:** ungulados silvestres; Áreas Naturales Protegidas; Red Natura; caza sostenible.

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### Introduction

In general, populations of wild ungulates in Europe have recovered during last decades (Apollonio *et al.*, 2010). With some exceptions (e.g., García-González and Herrero, 1999), the populations of the vast major-

ity of species have increased in number and range (Gortázar *et al.*, 2000), primarily, because of socio-economic changes associated with the abandonment of rural areas, increases in the tertiary economic sector and agricultural mechanization. Consequently, forests have increased, naturally and artificially, and environ-

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mental conditions for those species have improved. In Spain, however, at the beginning of the 1960s there was a massive rural exodus from the country to the large industrial areas, and some territories that provided exceptional conditions for supporting game hunting were declared public hunting grounds; i.e., Game Reserves (GR), which were managed by the state government (Ortuño and de la Peña, 1976). They were designed to promote game hunting, control poaching, provide economic benefits to local communities, promote hunting tourism, and aid the recovery of wildlife populations, which has been successful in sub-Saharan Africa (Lindsey, 2007). Despite the importance of hunting in Spain, one of the countries with a higher hunting demand worldwide (Hofer, 2002), however, the importance of GR in nature conservation and the sustainable use of natural resources has not been thoroughly evaluated.

This paper provides a review of GR in Spain, identifies their achievements, and proposes actions for their success in the future.

## Materials and methods

In April, 2011, the first meeting on GR was held in Cofrentes, Valencia, (Spain), which provided a general overview of their state and allowed us to make direct contact with most of the technicians associated with the country's GR. They provided information about specific aspects of the GR including the date when they were established, size, legislation, administrative data, natural attributes, and management practices. Thereafter, we executed the first phase of the Project Cycle Management and Logical Framework (European Commission-Europe Aid, 2001), which is used in the design of environmental projects (Atauri and Gómez-Limón, 2002). We developed a problem tree based on the hierarchical organization of the cause-effect relationships among the various problems faced by each of the GR (Fig. 2), which formed the basis of an objective tree, that included operational objectives, intermediate results, and general objectives. In turn, we created a plan in which choosing the correct measures identifies the correct operational objectives, which lead to intermediate results before achieving the ultimate management objectives as identified by the initial problem analysis (Fig. 3). That approach permits an evaluation of the state of the GR and provides a basis for the development of appropriate strategies for their

improvement. In all but two of the GR in Spain, big game hunting is the primary objective. The other two were designated for the promotion of waterfowl and, therefore, we evaluated those, separately.

The cartography of the GR was derived using a GIS and the original maps of each GR.

## Results

Questionnaires were sent to the managers of each of the GR ( $n = 49$ ) and 40 (82%) replied; however not all of the questions on all of the forms were answered.

### The declarations

Following state Law 37/66, the first GR was established in 1966. In 1973, Law 2/73 brought about the establishment of additional GR. Since the 1980s, and following the federalization process, a third period of establishment occurred (Table 1).

### Area covered by GR in Spain

By 2011, GR covered 3.5% of Spain (Table 1). Among 45 GR (92%), 53% have increased and 31% have decreased in size. Four % municipalities contain GR, with some regions reaching up to 31% (Cantabria), 25% (Asturias) and 15% (La Rioja) (Fig. 1).

### Human resources and budget

Among the personnel ( $n = 399$ ) at the GR ( $n = 40$ ), 63% worked full-time and 37% worked part-time, and, on average, there were 3.6 employees /10,000 ha<sup>-1</sup>. The general trend has been for the change from hunting rangers to non-specialized ones. Seventeen of 37 (75.5%) GR did not have a specific budget, and of those that did have one the average represented 4.4 € ha<sup>-1</sup>.

### Protected Areas and management of neighboring areas

Forty-eight of the 49 GR, at least partially, lie within a Protected Area (PA). Some of the PAs have been completely (Sierra Nevada and Daimiel), par-

**Table 1.** Game Reserves and regions in Spain in 2011

Game Reserve	Year Established	Area (ha)	Game Reserve	Year Established	Area (ha)
Andalusia		127,515	28 Fuentes Carrionas	1966	49,471
1 Cazorla-Segura	2003	65,057	29 Lagunas de Villafáfila	1986	32,675
2 Cortes de la Frontera	1973	12,306	30 Las Batuecas	1973	21,513
3 Serranía de Ronda	1970	29,754	31 Mampodre	1966	31,400
4 Sierra de Tejada y Almijara	1973	20,398	32 Riaño	1966	78,995
Aragon		191,653	33 Sierra de la Culebra	1973	67,340
5 Benasque	1966	23,913	34 Sierra de la Demanda	1973	75,167
6 Els Ports de Tortosa - Beseit*	1966	1,529	35 Sierra de Gredos	1970	37,216
7 Garcipollera	1994	5,742	36 Sierra de Urbión	1973	115,895
8 Los Circos	1966	25,294	Catalonia		232,225
9 Los Valles	1966	36,354	37 Alt Pallars-Aran	1966	106,661
10 Masías de Ejulve - Maestrazgo	2007	3,980	38 Boumort	1991	13,097
11 Montes Universales	1973	49,778	39 Cadí	1966	49,448
12 Viñamala	1966	45,062	40 Cerdanya-Alt Urgell	1966	19,003
Asturias		214,404	6 Els Ports de Tortosa-Beseit*	1966	22,908
13 Aller	1989	22,352	41 Encanyissada	1986	908
13 Cangas de Narcea	1991	10,581	42 Freser-Setcases	1966	20,200
14 Caso	1989	30,794	Extremadura		37,253
16 Degaña	1966	8,716	43 Cijara	1966	24,243
17 Ibias	1991	8,225	44 La Sierra	2001	13,010
18 Picos de Europa	1970	3,865	Galicia		7,792
19 Piloña	1989	5,491	45 Os Ancares	1966	7,792
20 Ponga	1989	20,953	La Rioja		106,934
21 Sobrescobio	2001	6,792	46 Cameros-Demanda	1973	106,934
22 Somiedo	1966	88,335	Madrid		11,276
23 Suevo	1966	8,300	47 Sonsaz	1973	11,276
Cantabria		180,186	Murcia		14,183
24 Saja	1966	180,186	48 Sierra Espuña	1973	14,183
Castile - La Mancha		63,860	Valencia		40,313
25 Serranía de Cuenca	1973	6,675	49 Muela de Cortes	1973	36,009
26 Sonsaz	1973	57,185	6 Els Ports de Tortosa-Beseit*	1966	4,304
Castile and Leon		546,014	Total		1,773,608
27 Ancares Leoneses	1973	36,342			

\*: Els Ports de Tortosa-Beseit GR lies within Aragon, Catalonia, and Valencia.

tially (Viñamala), or simultaneously (Picos de Europa) converted into National Parks. Some of the GR overlap other PAs, particularly Nature Parks, Sites of Community Importance, and Special Protection Areas (all of which form the Natura 2000 Network), Biosphere Reserves, and Ramsar Sites. GR cover ~10% of the terrestrial Natura 2000 Network, and 77% of the area of the GR lies within the Natura 2000. There are extensive territories of neighboring or almost neighboring GR management (Fig. 1 and Table 1) such as the Cantabrian Mountains (590,287 ha), the Pyrenees (344,774 ha), the Sierra de la Demanda, Urbión, and Demanda Cameros (297,996 ha), Sonsaz (68,461 ha), and Els Ports de Tortosa-Beseit (28,741.25 ha).

The ecosystems within the GR have been included in important networks, particularly, Natura 2000, that was created to protect nature. Comparatively to protected areas National Parks, the later occupy 0.8% of the country; 11.8% is part of PA areas *sensu lato*, and 7.8% are Nature Parks (Europarc-Spain, 2010), while GR are 3.5%.

### Game species

All of the large game species in Spain are hunted: wild boar *Sus scrofa*, red deer *Cervus elaphus*, roe deer *Capreolus capreolus*, fallow deer *Dama dama*, Iberian

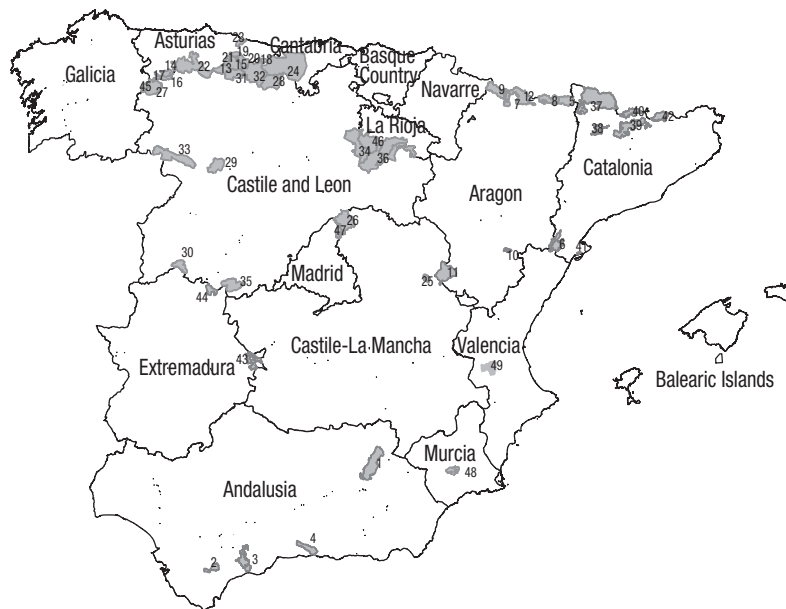


Figure 1. Location of Game Reserves in Spain in 2011.

wild goat *Capra pyrenaica hispanica* and *Capra pyrenaica victoriae*, Cantabrian chamois *Rupicapra pyrenaica parva* and Pyrenean chamois *Rupicapra p. pyrenaica*, aoudad *Ammotragus lervia*, mouflon *Ovis aries*, and wolf *Canis lupus signatus*. Small game species include rabbit *Oryctolagus cuniculus*, red partridge *Alectoris rufa*, grey partridge *Perdix perdix*, red fox *Vulpes vulpes*, woodcock *Scolopax rusticola*, and hare (Iberian hare *Lepus granatensis* and European hare *L. europaeus*). In the GR (n = 39), the most commonly hunted species were wild boar (97%), roe deer (69%), red deer (61%), chamois (59%), fallow deer (41%), Iberian wild goat (31%), mouflon (13%), and aoudad (2%). As many as six large game species and small game species are hunted in a single GR. In some GR, only a single large game species is hunted, and the average is 3.3 large game species. Considering the original species that motivated the declaration of every single GR, in almost all of the GR, the number of species of wild ungulates has increased.

### Population monitoring and hunting quota

In most (82%, n = 40) of the GR, the populations of wild ungulates are monitored, primarily, using total counts and, to a lesser extent, the kilometric abundance index, distance sampling, and hunting battues. Some ~18% of the GR monitor the populations of small game species. In addition, some of the GR monitor endan-

gered species such as bearded vultures *Gypaetus barbatus*, brown bear *Ursus arctos*, and capercaillie *Tetrao urogallus*. Large game hunting quota accomplishment (n = 25 GR) is 78%, with 90% of red deer and 56% for roe deer. Currently, there is not hunting quota for wild boar.

### Large game hunting methods

Within the GR (n = 39, 81.2%), the most common hunting methods are, in order of importance: battues, still hunting, and waiting. Battues are most commonly used to hunt wild boar and are not used to hunt aoudad and chamois, which are pursued using a still hunt. Iberian wild goat and wild boar are hunted using a waiting method. In the vast majority (80%) of the GR, hunting plans are used.

### Damage compensation and poaching

In 2009, damages totaling 185,063 € were reported (n = 20, 41%), which affected 12 GR. Damages occurred in all of the GR and most of these were to agriculture. In some GR, compensation is paid for losses caused by wolf predation on livestock and, in some cases, compensation is made for losses caused by collisions with automobiles. In the GR (n = 38), poaching is viewed as a moderate (73%), major (18%), or minor (9%) problem.

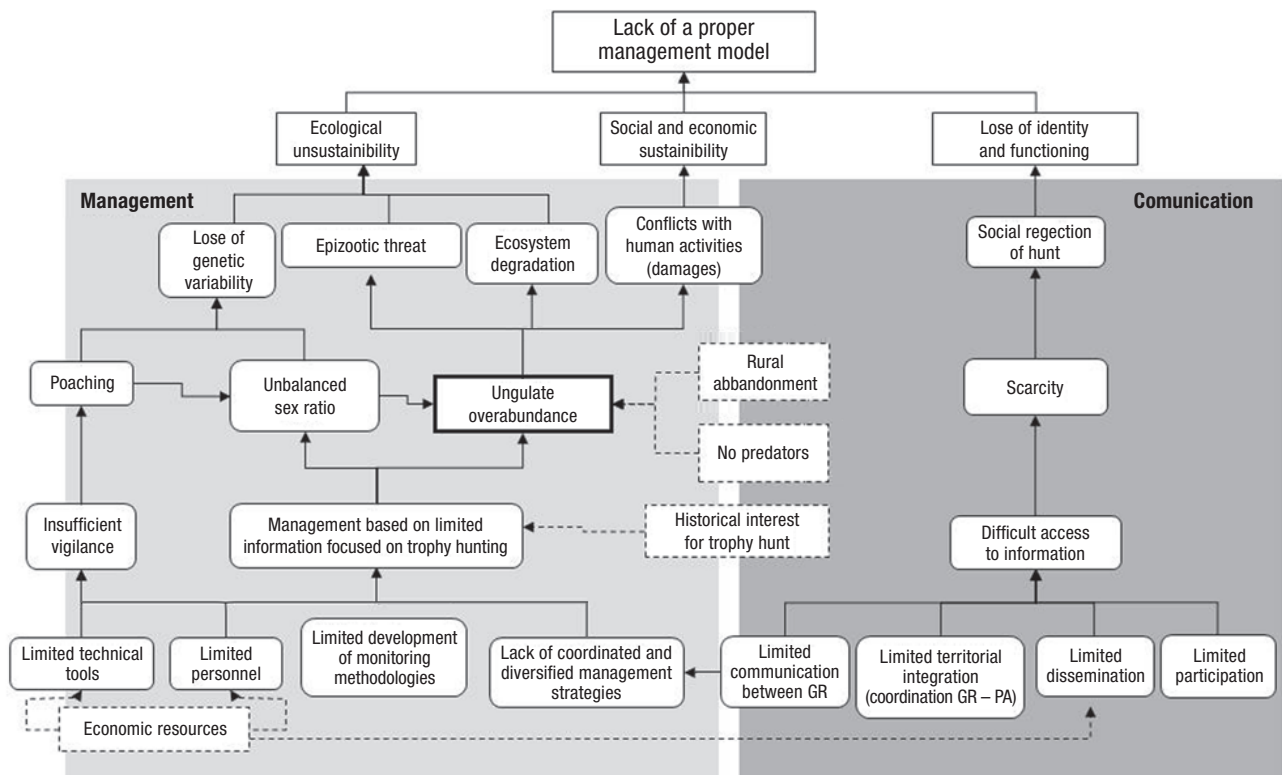


Figure 2. GR problems. Non-continuous lines indicate external conditioning.

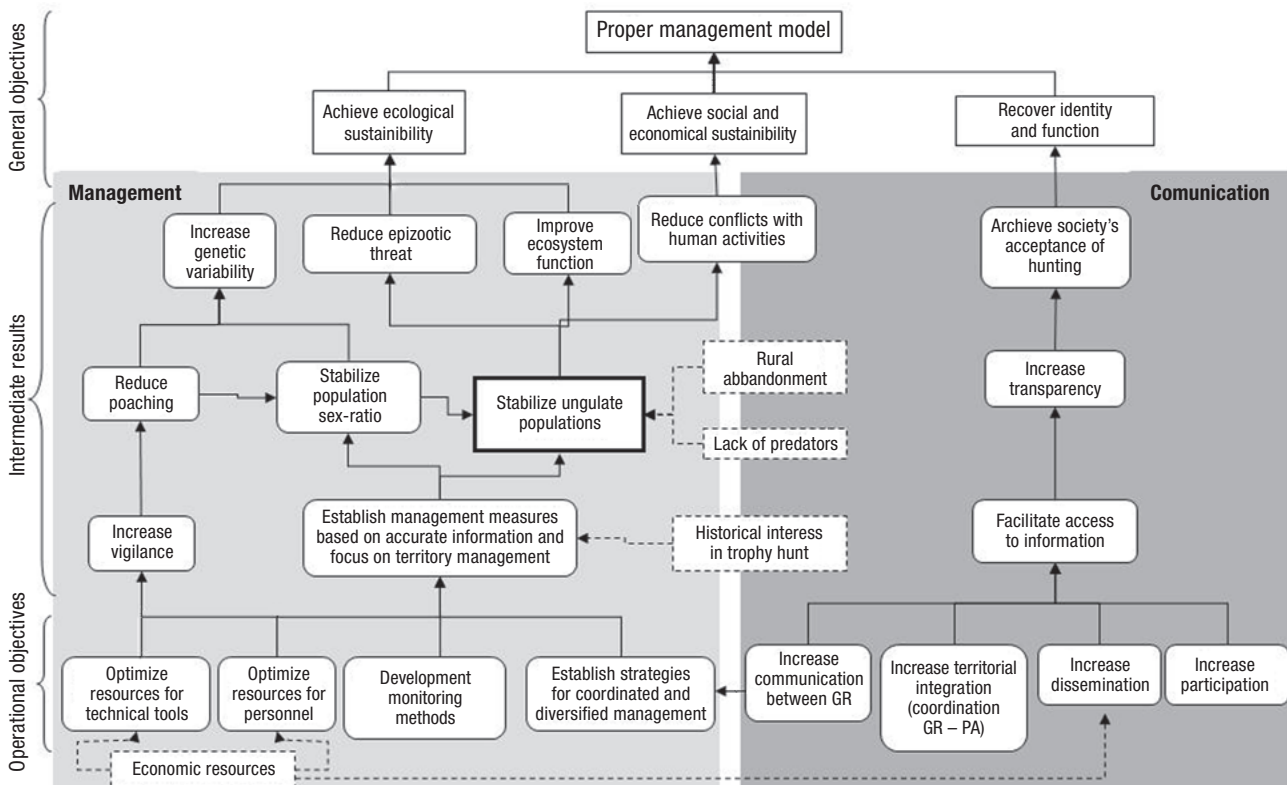


Figure 3. Management objectives for GR in Spain.

### Capacity building, assistance, divulgation, and participation

In 85% of the GR ( $n = 39$ ), the personnel training and in general capacity building through different courses ( $n = 39$ , 80%) is undertaken (e.g., biology of game and endangered species, new technologies, animal health). In 83% of the GR ( $n = 33$ ), management received technical assistance from consultancy contracts (51%), public enterprises (42%), or both.

The work done in the GR ( $n = 25$ , 51%) has been disseminated through popular publications (16%) and, primarily, a combination of divulgation with reports and scientific publications (68%). Public participation in the management decisions at the GR ( $n = 36$ ) includes advisory boards, through which all of the interest groups are represented (hunters, farmers, landowners, regions, and municipalities) (57%).

### Logical Framework

The survey detected 23 problems, two of which were external to GR management (rural abandonment and lack of predators), and three that were of a general nature (ecological, socioeconomic unsustainability, loss of identity and function). The main problems that affected the daily management of the GR included the lack of human and material resources, poaching, limited public understanding of the existence and role played by GR, and compensation for damage caused by game species. Other problems included the risk of epidemics, the deterioration of ecosystems, and persistent conflicts between the objectives of the GR and human activities. In addition, the lack of understanding by the human population has led to a social rejection that causes their loss of identity and role in society (Fig. 2 and 3).

### Discussion

The high proportion of questionnaires that were returned by the GR provided a sound basis upon which to assess the status of the GR in Spain. The establishment of the GR, which was inspired by the need for nature conservation and the wise use of natural resources, has represented an important reference in the management of forests, game hunting, and biodiversity. In that regard, the GR continue to play an important role, but unfortunately, this is not well known in

Spain or elsewhere. Most of the wildlife populations that were targeted for recovery have recovered and, some have expanded their range (Gortázar *et al.*, 2000).

The GR have bodies that represent pioneering experiences in human participatory processes level in territorial management and an important example for protected areas. In addition, they monitor wildlife populations and develop hunting plans, which provide the basis for the management of game species. Some GR and hunted protected areas have provided important long-term data series (García-González *et al.*, 2004; Marco *et al.*, 2011) and valuable research on the effect of hunting on wildlife populations (Milner *et al.*, 2006; Coltman *et al.*, 2003; Rughetti and Festa-Bianchet, 2011). Furthermore, the GR have provided benefits to landowners (Domínguez *et al.*, 2011) as in other similar territories (Harris and Pletscher, 2002), and relatively inexpensive access to hunt.

In most cases, the overlap between PA and GR has not led to the elimination of GR and, usually, the design of the PA has followed or taken into consideration of the existing GR, which had led to a certain degree of coordinated management.

The main problems that affect the GR are the lack of human and material resources, poaching, limited public understanding of the existence and role played by GR (i.e., their visibility), and compensation for damage caused by game species, which is one of the main emerging problems in the management of populations of wild ungulates in Europe (Apollonio *et al.*, 2010). In the GR in Spain, the non-accomplishment of hunting quotas illustrates the difficulties in insuring that these quotas are met and the need for specialized personnel to enforce them. Today, the original objective of promoting hunting must be balanced against the need to constrain it, which is a significant issue elsewhere in Europe (Apollonio *et al.*, 2010; Putman and Moore, 1998).

The dissemination of the work done in GR is not sufficient to inform the public of the importance of GR; therefore, it should be increased following, for instance, the example of Protected Areas, which in Spain receive at least 26 million € per year (Europarc-E, 2010).

The complexities of managing GR, the need for accurate information on the abundance and population trends of game species, and a shortage of permanent staff in the GR are the main reasons why enterprises and consultancies are called on to participate in the monitoring of wildlife populations. This information is crucial for management and represents the main technical and scientific information developed by GR. Some socioeco-

conomic information is produced (Domínguez *et al.*, 2011), even if this aspect is relatively new, in spite of its importance together with biological data for a correct management (Gordon *et al.*, 2004).

The main original objective of the GR, to promote populations of game species, has been accomplished. In the last decade, new objectives have had to be developed from within a different political, socioeconomic, and natural context. GR represent important economic investments for the regions and if they are retained, they should have the objectives and resources that are consistent with contemporary views of nature conservation and the sustainable use of natural resources. An appropriate framework might be an Action Plan for GR that aims to achieve ecological, economic, and social sustainability within the context of ecosystem services (Balvanera *et al.*, 2006; Costanza *et al.*, 1987).

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